

Evaluation of Management of Malleolar Fractures of Ankle Joint

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Abstract: Introduction: This is one of the most common fractures treated by orthopedic surgeons and lot of controversy exist in treating modality of treatment Material and methods: 40 patients of malleolar fractures with young male predominance were treated and followed for average 11 months. 30 patients were treated operatively while 10 conservatively. Fractures were classified using anatomical, Lauge Hansen's classification and AO classification. Complications were noted. Results were assessed using criteria, which included pain and tenderness, movement at ankle and deformity.

Results: Fall at same level and vehicular accident were the common etiologies. Supination external rotation injuries & AO type B injuries were common. Superficial infection, malunion, nonunion occurred in two cases each. 36 of 40 patients had satisfactory results. Discussion: The results were comparable to other series.

Conclusion: Conservative treatment in selected fractures is justified. Surgical treatment with stable fixation gives good results in terms of early mobilization, faster rehabilitation and more rapid return of function with risks inherent to any surgery.

Key words: Malleolus, Conservative, Operative, Functional, Movement

I. Introduction

Ankle fractures are the most common types of fractures treated by orthopedic surgeons. There has been an increased prevalence of such fractures over the last two decades both in young, active patients and in the elderly.

Although fractures about the ankle have traditionally been considered non-controversial with respect to the indications for operative intervention, recent advances in the understanding of the biomechanics of the ankle have given rise to particular areas of clinical uncertainty. These include the indications for the operative treatment of isolated fractures of the lateral malleolus, the operative technique for and postoperative management of injuries of the syndesmosis, and the reliability of radiographic assessment of fractures about the ankle.

AIMS AND OBJECTIVES

- I) Diagnosis, demographic analysis of malleolar fractures among various injuries
- II) To analyze the merits and demerits of different surgical methods of stabilization.
- III) To compare results of non-operative treatment of malleolar fracture of ankle joint.

MATERIAL AND METHODS

This study was carried out during August 2001 to December 2003. Forty patients of malleolar ankle fractures who were admitted in this hospital are included in this study. Patient was informed about study in all aspects and informed written consent was obtained.

Inclusion criteria: -

- a) Patients having any malleolar fracture of ankle joint.
- b) Patients of any sex & in age groups of 20-65.
- c) Patients who are fit for surgery.
- d) Patients having malleolar fractures of ankle joint for which closed method is indicated

Exclusion criteria: -

- a) Open ankle fracture,
- b) A fracture and open epiphyses,
- c) A previous fracture of either ankle,
- d) Patient is unfit for surgery and or anesthesia.
- e) Patient not giving written consent for surgery.

Cases were diagnosed on history, clinical examination and investigation. Statistical data included name, age, sex, ward, chief complaints, history, general examination, investigations, treatment done, operative technique and type of implants used, post operative complications of surgery and follow up results.

Fractures of the ankle were evaluated using plain radiographs in anteroposterior, lateral and mortise views. The fractures were classified using the Lauge-Hansen¹, AO/OTA classification systems, and by the number of malleoli involved.

Instability of the syndesmosis was identified on the basis of the mechanism of injury and the fracture pattern. Pain elicited with the squeeze test (manual medial-lateral compression across the syndesmosis) and the external-rotation stress test was considered as indicative of clinical syndesmotic instability. Radio logically tibiofibular clear space of less than five millimeters and widening of the medial clear space of more than four millimeters were considered as indications of syndesmotic instability. Intraoperatively, the fibula was manipulated to determine if there was excessive lateral displacement indicating syndesmotic injury. Patients with minimally displaced monomalleolar fractures, avulsion fractures and stable fractures. Patients with unhealthy skin, those who were medically unfit for surgery and those who would not cooperate for postoperative regimen were managed by closed reduction.

Conservative management included the application short-leg cast for Stable or undisplaced ankle injuries, a long-leg cast for fractures that are unstable in rotation after obtaining closed reduction by reversing the mechanism of injury to the ankle, with radiographs taken immediately to ensure that there was no loss of reduction. Long-leg cast was used for up to 6 weeks, followed by a fracture brace and stable fractures were treated with protected weight bearing, which was advanced as comfort allowed and fracture healing progressed. Radiographic follow-up at frequent intervals was done till fracture healing.

Operative management was employed when lateral column was unstable and when talus shifted more than 2mm laterally. The lateral fracture was approached through either curved anterior or posterior incision centered over the fracture site. Torsion fractures were fixed with neutralization plate after interfragmentary fixation. Transverse fractures were fixed with 1/3 tubular plate or neutralization plate.

Medial malleolus was approached by medial approach and fixed with either single malleolar screw, cancellous screw, k-wire or with tension band wiring with 2 screws or k-wires.

In this study, operative fixation of the syndesmosis was done for fractures in which the disruption of the syndesmosis exceeded three millimeters, when medial stabilization could not otherwise be obtained and when of widening of the syndesmosis is made when there is a space of more than five millimeters between the distal aspects of the tibia and the fibula, as seen on the mortise radiograph. A 4.5millimeter screw was placed from the fibula medially into the tibia engaging three cortices. Removal of the screw was done at six weeks postoperatively for all cases.

Posterior malleolus was fixed when fragment comprised more than 25 per cent of the surface, according to estimates of the fracture size made from plain radiographs with use of a lag screw through a stab incision made over the tibia from the anterior direction, directed anteroposteriorly engaging the posterior fragment. Patients were put on below knee plaster at the time of discharge and advised non-weight bearing crutch walking. Partial weight bearing at six weeks, and full weight bearing when fracture had united, clinically and radio logically.

Follow up of cases was done at regular intervals of 6 weeks for an average of 11 months with a range of 9 to 15 months. After 10 to 14 days the stitches were removed. At each assessment all patients were questioned with regard to pain, use of analgesics, stiffness, swelling, activities of daily living, use of walking aids, and return to work and participation in sports. At examination, the gait; any thickening, swelling, or tenderness of the ankle; and the range of motion of the ankle were evaluated. Antero-posterior and lateral radiographs of the affected ankle and mortise radiographs of both ankles were made at the time of examination.

ASSESSMENT CRITERIA

The final result was graded as excellent, good, fair, or poor as using criteria as shown in annexure I

II. Observations

In this series 44 patients with malleolar ankle fractures were studied. Of these, 3 in the operative and 1 in the conservative group were excluded as they were lost for follow up or refused treatment. Of the 40 cases included in this study 10 (25%) cases were treated conservatively and 30(75%) cases by operative methods.

Age, sex distribution and side involved.

The average age for the whole group was 56.45 years,(25-88 yrs) Male to female ratio for the whole series was 1.44:1. In this study right side was affected in 18 cases and left side in 22 cases

Mechanism of injury:

16 cases (most of them in older age group) affected were due to twisting injury(fall from same level), 14 cases due to road traffic accident, 8 cases were due to fall from height and 2 cases were due to sports injuries.

Associated Injuries:

There were 7 cases (17.50%) with associated fractures. All were in operative group and had, humerus, femoral shaft, trochanteric, clavicle, and stable compression vertebral fractures. 1 patient in the conservative group had concussion head injury.3 patients had lacerated wounds.

Treatment of individual fractures

Medial malleolus was fixed with tension band wiring (17 cases,), malleolar screw (6 cases), K wire fixation (4 cases) and cancellous screw in one case. Lateral malleolus was fixed with lateral plate (11 cases), lateral plate with interfragmentary fixation (9 cases), K wires (3 cases). Posterior malleolar fixation was done in two cases while syndesmotic screw fixation was done in one case.

Functional end results

38 fractures united at an average of 13 weeks, with range of 6-16weeks. Two fractures ended in nonunion.

Patients were followed at regular intervals for an average of 11 months with a range of 9 to 15 months.

Functional outcome

Treatment groups	Excellent	Good	Fair	Poor
Conservative	2	4	2	2
Operative	8	10	8	4

Functional end results and fracture types based on malleolarity

Malleolar types	Method of treatment	Results				Total
		Excellent	Good	Fair	Poor	
MM	Conservative	2	3	1	0	6
	Operative	3	2	1	0	6
LM	Conservative	0	1	1	2	4
	Operative	1	0	0	0	1
BM	Conservative	0	0	0	0	0
	Operative	4	7	7	2	20
TM	Conservative	0	0	0	0	0
	Operative	0	1	0	2	3

Functional end results and fracture types based on Lauge and Hansen types

Lauge and Hansen	Method of treatment	Results				Total
		Excellent	Good	Fair	Poor	
I(SER)	Conservative	2	3	1	-	6
	Operative	4	1	2	-	7
II(SA)	Conservative	-	1	-	1	2
	Operative	3	3	2	1	9
III(PER)	Conservative	-	-	-	-	-
	Operative	-	1	-	3	4
IV(PA)	Conservative	-	-	1	1	2
	Operative	2	4	3	1	10

Functional end results and fracture types based on AO type

AO/OTA	Method of treatment	Results				Total
		Excellent	Good	Fair	Poor	
A	Conservative	3	4	2	-	9
	Operative	2	1	-	-	3
B	Conservative	-	-	1	1	2
	Operative	5	5	4	1	15
C	Conservative	-	-	-	-	-
	Operative	1	4	4	2	11

While 36 of the 40 patients had a satisfactory result, the ankles were by no means entirely normal. Most of these patients were totally free of pain, but about half had what might be termed a sensitive ankle. One had an occasional tinge of discomfort that did not require any form of medication or any modification of activity

Complications

In the ORIF group one patient had a surgical wound that could not be closed over the medial malleolus. This was allowed to heal by secondary intention, without problem. Poor bone quality was noted in five patients, but satisfactory stable fixation was always achieved. In the closed treatment group no loss of reduction was seen immediately after the application of a molded below-knee cast. One superficial infection occurred in the ORIF group, and was successfully treated with antibiotics. There were no cases of infection in the closed group, but one patient developed a superficial skin ulcer over the medial malleolus, which healed satisfactorily. Two patients complained of tenderness of the scar.

Malunion of the fracture was seen in two patients in the closed group. One had malunion of a fracture of the lateral malleolus and complained of persistent pain in the ankle, which limited her mobility. One had a malunion of fractures of the medial malleolus but had no pain or functional disability. Two patients had nonunion of the medial malleolus, but neither had symptoms or functional disability.

III. Discussion

The most common intra-articular fracture of a weight-bearing joint occurs in the ankle. Two methods of restoring function and preventing arthritis have been used: closed treatment, including manipulative reduction and immobilization in a plaster cast, and open reduction and internal fixation. Burwell and Charnley² showed that anatomical reduction and satisfactory fixation led to a rapid return of function.

The treatment of ankle fractures involves both a risk-benefit and a cost-benefit analysis. The primary risk associated with closed treatment is inadequate restoration of the biomechanics of the ankle, which can lead to a poor outcome. Conversely, while open reduction and internal fixation is an excellent method for the restoration of the normal anatomy of the joint, it is accompanied by the costs and risks of an operation.

Current opinion has increasingly favored primary operative intervention³ for a displaced or unstable fracture of the ankle, with the greatest emphasis on anatomical reduction and rigid fixation of the lateral malleolus, and fractures of the medial malleolus and those of the posterior malleolus have also been fixed whenever indicated^{4, 5,6,7,8,9,10,11}

In the present series had used both operative and conservative methods for the management of ankle injuries. We had 40 cases in our series of which 32 were operated and 8 treated conservatively with follow up of an average of 11 months with a range of 9 to 15 months.

The population of ankle fractures in this study was similar to the populations studied by other authors. The mean age of our patients was also similar to that in most reported series.(Bauer etal¹², Lindsjo¹³, Van Laarhoven¹⁴) Ankle injuries occur more in males in third decade. It reflects more physical activities of middle-aged workingman.

In this study it was found that ankle injuries were more due to fall at same level (40%) which were comparable to Kristensen¹⁵ series (58.9%), Van Laarhoven¹⁴ (58%), Bauer etal¹² (60%). Vehicular accidents were the second common cause. Two wheeler accidents have increased in frequency in last few decades due to increase in their density. Another cause is in disorderly traffic on the road.

The high incidence of supination-external rotation injuries is common in present series as in series of Van Laarhoven,¹⁴ Egol¹⁶. Generally, these fractures account for about 60 per cent of all ankle fracture .AO type B fractures were common in present series as in Makwaana¹¹ et al, Van Laarhoven¹⁴ et al series.

Most authors have stated that anatomical reduction of the displaced medial malleolus ensures correction of talar displacement and is of paramount importance in treating unstable fractures^{4,5} However, more recent studies have indicated that the talus is more accurately repositioned in the mortise by anatomical reduction of the lateral malleolus^{12,17} While a number of methods (cerclage wires, single or multiple lag screws, an intramedullary Rush rod, or a single malleolar screw) are available, the lateral plate, as advocated by the AO Group, has become widely accepted for the treatment of the fibular fracture Of the two fractures of the posterior malleolus with residual displacement, one had articular involvement of less than 25 per cent. McDaniel and Wilson¹⁸ showed that closed reduction of fractures involving less than 25 per cent of the posterior tibial surface led to a good or excellent result in eighteen of twenty-eight patients, even in the presence of residual displacement of more than two millimeters. If the fragment comprises more than 25 per cent of the surface, according to estimates of the fracture size made from plain radiographs, a good or excellent result can be expected in operated cases.

In many fractured ankles, the syndesmosis is stable after reduction and internal fixation of the fibular fracture and any associated medial malleolar fracture. Yablon¹⁷ et al. stated that anatomical reduction of the fibula is the key factor in achieving a good outcome of treatment of ankle fractures that have accompanying syndesmotomic disruption.

We had 60% excellent and good results which were same in conservatively treated and operated group however results cannot be compared as the indications were different that is conservatively treated group was having simpler (monomalleolar, undisplaced, stable) fractures.

Most of the poor results were in pronation external rotation group or its counterpart in AO type C injuries. Roberts RS¹⁹ also had poorest objective results in pronation external rotation group. Yilmaz E et al²⁰ also had similar opinion.

Reported complication rates for operative treatment of ankle fractures vary widely. Early complications of surgically treated ankle fractures include wound problems, infection, neurological or vascular injuries, failure or loss of reduction of fixation, as well as anesthetic and medical problems. A number of studies report late complications^{2,21}

IV. Conclusion

Ankle injuries are common in young male after stumbling or vehicular accident. Conservative treatment in selected fractures is justified. Surgical treatment with stable fixation after understanding mechanism of injury gives good results in terms of early mobilization faster rehabilitation, and more rapid return of function with risks inherent to any surgery.

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Annexure I

Assessment Criteria

Excellent	No pain
	- Complete range of active and passive movement
	- No tenderness
	- No deformity
Goal	- Minimal pain noted only after walking for unaccustomed Distance
	- Active and passive dorsiflexion, plantar flexion ROM 2/3 rd of normal ankle
	- No deformity
Fair	- Pain moderately incapacitating, no stick or other walking aid used, reduced with analgesics.
	- All movement at ankle painless, and ROM 2/3 rd of Normal ankle. No tenderness
Poor	- Pain severe requiring cane or brace and daily analgesics, Hindering work.
	- Movement at ankle is painful and ROM less than 1/3 rd of normal ankle or stiff ankle.
	- Tenderness at fracture site.
	- Deformity at ankle joint.