Evaluation of management of malleolar fractures of ankle joint

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Abstract :

Introduction: Malleolar fractures are some of the most common fractures treated by orthopedic surgeons and there are a large number of controversies regarding its treatment modalities. Material and methods: Fourty patients of malleolar fractures (with young male predominance) were treated and followed for an average of 11 months. Thirty patients were treated operatively while 10 conservatively. Fractures were classified using anatomical, Lauge Hansen's classification AO (Association for Osteosynthesis) classification. Complications were noted and results assessed. Results: Fall at same level and vehicular accidents were the most common etiologies. Supination external rotation injuries and AO type B injuries were common. Superficial infection, malunion, nonunion occurred in two cases each. Thirty Six of 40 patients had satisfactory results.

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

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

Introduction

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

Although fractures around 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 this joint has 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 around the ankle.

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Aims and Objectives

1. The diagnosis and demographic analysis of malleolar fractures among various injuries
2. Analysis of the merits and demerits of different surgical methods used for stabilization of fractures.
3. Comparision of results of non-operative treatment of malleolar fracture of ankle joint.

Material and Methods

This study was carried out from August 2001 to December 2003. Forty patients of malleolar ankle fractures who were admitted to hospital were 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 any ankle joint.

b) Patients of any sex, in the age group of 20-65 years.

c) Patients who were fit for surgery.

d) Patients having malleolar fractures of ankle joint for which closed method of treatment was indicated.

Exclusion criteria :

a) Patients with open ankle fractures.

b) Patients with fracture and open epiphyses
c) History of a previous fracture of either ankle
d) Patients unfit for surgery and or anesthesia
e) Patient unwilling to give written consent for surgery

Cases were diagnosed by 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-Hansen, AO/Orthopaedic Trauma Assocation (OTA) classification systems, and by the number of malleoli involved[1].

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 were considered as indicative of clinical syndesmotic instability. Radiologically, 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 mono-malleolar fractures, avulsion fractures and stable fractures, patients with unhealthy skin, those medically unfit for surgery and those who would not cooperate for postoperative regimen were managed by closed reduction.

Conservative management included the application of a short-leg cast for stable or undisplaced ankle injuries, a long-leg cast for fractures that were 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. 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 carried out till complete fracture healing occured.

Operative management was employed when lateral column was unstable and when the talus was shifted more than 2mm laterally. The lateral fractures were approached either through a 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 l/3 tubular plate or neutralization plate.

The medial malleolus was approached medially 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 carried out for fractures in which there was disruption of the syndesmosis (exceeded three millimeters), when medial stabilization could not otherwise be obtained, and also when widening of the syndesmosis was made (when there was space of more than five millimeters between the distal aspects of the tibia and the fibula, as seen on the mortise radiograph). A 4.5 millimeter 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.

The posterior malleolus was fixed when the fragment comprised more than 25 per cent of the surface, (according to estimates of the fracture size made from plain radiographs) This was done with the use of a lag screw through a stab incision made over the tibia from the anterior direction. It was directed anteroposteriorly, thereby 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 radiologically.

Follow up of cases was carried out 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 regarding 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 using criteria as shown in Table I.

Observation

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 to 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 the right ankle was affected in 18 cases and left ankle in 22 cases.

Mechanism of injury : Sixteen cases (most of them in older age group) 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 the operative group and had, fractures of humerus, femoral shaft, trochanteric, clavicle, and stable compression vertebral fractures. One of the patients in the conservative group had concussion head injury.

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

Thirty eight fractures united in a satisfactory manner at an average of 13 weeks (range of 6-16weeks). Two fractures resulted in nonunion.

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

Table 4 : Functional outcome

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

Table 1 : Functional end results and fracture types based on malleolarity

Malleolar types	Method of treatment	Results				Total
		Excellent	Good	Fair	Poor	
Medial Malleolar	Conservative	2	3	1	0	6
	Operative	3	2	1	0	6
Lateral Malleolar	Conservative	0	1	1	2	4
	Operative	1	0	0	0	1
Both Malleolar	Conservative	0	0	0	0	0
	Operative	4	7	7	2	20
Trimalleolar	Conservative	0	0	0	0	0
	Operative	0	1	0	2	3

Table 2 : 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) Supination External Rotation	Conservative	2	3	1	-	6
	Operative	4	1	2	-	7
II(SA) Supination Adduction	Conservative	-	1	-	1	2
	Operative	3	3	2	1	9
III(PER) Pronation External Rotation	Conservative	-	-	-	-	-
	Operative	-	1	-	3	4
IV(PA) Pronation Adduction	Conservative	-	-	1	1	2
	Operative	2	4	3	1	10

Table 3 : Functional end results and fracture types based on AO type

Malleolar 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 twinge of discomfort that did not require any form of medication or any modification of activity

Complications

In the Open reduction and Internal Fixation (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 good results. Poor bone quality was noted in five patients, but satisfactory stable fixation could be achieved. In the closed treatment group, no loss of reduction was seen immediately after the application of a molded below-knee cast.

One case had superficial infection in the ORIF group. This 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 surgical 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, while the other had malunion 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.

Discussioon :

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:

1) Closed treatment, including manipulative reduction and immobilization in a plaster cast.
2) Open reduction and internal fixation. Burwell and Charnley showed that anatomical reduction and satisfactory fixation led to a rapid return of function[2].

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 increasingly favours primary operative intervention for a displaced or unstable fracture of the ankle. The greatest emphasis is placed on anatomical reduction and rigid fixation of the lateral malleolus. Fractures of the medial malleolus as also those of the posterior malleolus have also been fixed whenever indicated [4,5,6,7,8,9,10,11].

The present series used both operative and conservative methods for the management of ankle injuries. There were 40 cases in this series of which 32 were operated and 8 treated conservatively with follow up of an average of 11 months (a range of 9 to 15 months). The population with 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[12,13,14]. Most ankle injuries occur more in males who are in the third decade of their lives. It reflects increased physical activity of working men of this age group.

In this study it was found that most ankle injuries were due to fall at same level (40%) which were comparable to Kristensen series (58.9%), Van Laarhoven (58%), Bauer etal (60%)[12,14,15]. Vehicular accidents were the second most common cause. Two wheeler accidents have

increased in frequency in last few decades due to increase in their density as well as disorderly traffic on the roads.

The high incidence of supination-external rotation injuries is common in this series which is similar to the series published by Van Laarhoven, Egol. Generally, these fractures account for about 60 per cent of all ankle fracture. AO type B fractures were common in our series as also in the series published by Makwaana et al, Van Laarhoven et al.[11,14,16]

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 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 Wilson showed that closed reduction of fractures involving less than 25 percent 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[18].

In many fractured ankles, the syndesmosis is stable after reduction and internal fixation of the fibular fracture and any associated medial malleolar fracture. Yablon stated that anatomical reduction of the fibula was the key factor in achieving a good outcome of treatment of ankle fractures that have accompanying syndesmotic disruption[17].

We had excellent and good results in 60% cases, which were similar in conservatively treated and operated groups, however these results cannot be compared as the indications were different because the conservatively treated group had monomalleolar undisplaced, stable fractures.

Most of the poor results were seen in pronation external rotation group or its counterpart in AO type C injuries. Roberts RS also noted that the poorest objective results were obtained in pronation external rotation group. Yilmaz E et al also had similar opinion[19,20].

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].

Conclusion

Ankle injuries are common in young males, following stumbling or following vehicular accidents 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 but which risks associated with any surgery.

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