

SURGICAL MANAGEMENT OF MALLEOLAR FRACTURES IN ADULTS

ABSTRACT

Background and objectives: Ankle fractures are one of the most common lower limb fractures. Acute injuries to ankle joint gain importance because body weight is transmitted through it. Conservative treatment can provide satisfactory results if anatomical reduction is maintained in many of the ankle fractures. The other unstable, displaced and open fractures require surgical treatment involving open reduction and internal fixation. Objectives were to study the efficacy, functional outcome and complications of surgical management of malleolar fractures of ankle.

Methods: A prospective study involving 30 patients admitted with malleolar fractures, which are classified according to Lauge-Hansen's classification and treated according to the AO system are presented. The follow-up period was for a minimum of 6 months. Assessment of the outcome was done using Olerud and Molander scoring system.

RESULTS: In this study, excellent results were found in 18(60%) cases, good results were found in 06(20%) cases, fair results were found in 04(13.33%) cases, poor results were found in 02(6.66%) cases according to Olerud-Molander ankle score.

INTERPRETATION AND CONCLUSION: The most prevalent cause of malleolar fractures was a vehicular accident (RTA). Supination external rotation injuries were the most common. Regardless of the kind of surgery, anatomical reduction is necessary for a successful functional result. The complications were minimal and rectified within two weeks.

INTRODUCTION:

Ankle fractures are some of the most frequent fractures of the lower limb. They account for 10% of all fractures, accounting for a large amount of the trauma burden, although only around 2% of ankle fractures are open⁽¹⁾. Twisting injuries, vehicular accidents, and falls are the most prevalent causes of ankle fractures, followed by sports injuries⁽²⁾. Diabetes mellitus and obesity are common comorbidities in adults above forty⁽³⁾. Ankle fractures are classified using the **Lauge-Hansen Classification**⁽⁴⁾.

38 Malleolar fracture treatment can be divided into three approaches: nonsurgical, staged,
39 and surgical. In general, nonsurgical treatment for stable ankle fractures and surgical
40 treatment for unstable ankle fractures are acceptable ⁽⁵⁾.

41 Non-operative treatment with immobilization can give satisfactory results if anatomical
42 reduction is maintained and closely followed. However, cast immobilization can also lead
43 to muscle atrophy, cartilage degeneration, and a stiff, painful, and swollen joint ⁽⁶⁾. Staged
44 treatment with external fixation and delayed internal fixation is done in high-energy
45 injuries or fracture dislocations with compromised surrounding soft tissue ⁽⁷⁾. Open
46 reduction and internal fixation of the fractured bone with devices such as metal plates,
47 screws, tension bands, or external fixation are used in surgical treatment ⁽⁸⁾. These
48 surgical procedures are designed to give anatomical reduction and stability, allowing for
49 quick mobilization. Complications from surgery include wound infection, pulmonary
50 embolism, implant failure, amputation, and redo surgery ⁽⁹⁾.

51 Although a non-operative approach is applicable in undisplaced fractures, surgical
52 management has been favored for more than 40 years ⁽¹⁰⁾. Malleolar fractures that are not
53 properly treated might result in painful arthritis ⁽¹¹⁾. The importance of perfect anatomical
54 reduction and firm fixation in malleolar fractures cannot be overstated ⁽¹²⁾.

55
56 **METHODOLOGY:**

57 This is a prospective study involving 30 patients with fresh unimalleolar,
58 bimalleolar and trimalleolar fractures, who were treated at Dr. PSIMS & RF,
59 China Avutapally . AP and lateral view Xrays of the ankle joints of the
60 patients, were taken. A detailed history of the mode of injury and any
61 associated medical illness is recorded. The patient's general condition was
62 assessed, and he or she were then thoroughly examined.

63
64 **SURGICAL TECHNIQUE:**

65 All of the procedures were performed under spinal anesthesia without tourniquet. The
66 fibula was the first bone to be exposed. After removing the hematoma from the fracture
67 site, fracture is reduced and fixed. After clearing the soft tissue interposition, the fracture
68 site was reduced. Tension bandwiring, cancellous screws, K-wire fixation, or semitubular
69 plating were used for ORIF of malleolar fractures. Follow up was done for 4 months
70 according to Olerud-Molander Ankle Score.

RESULTS

MODE OF INJURY

Table 1:

MODE OF INJURY

Road Traffic Accident	-	16
Twisting injury/ self fall	-	10
Fall from height	-	4

MALLEOLARITY

Table 2:

Unimalleolar fractures	10
-	
Bimalleolar fractures	18
-	
Trimalleolar fractures	2
-	

In present study 60% were bimalleolar fracture, 33.33% were unimalleolar fractures and 6.66% were trimalleolar fractures.

INJURY PATTERN

Injury pattern according to Lauge-Hansen classification is as follows:

Table 3:

Injury pattern	Number of cases
Supination-Adduction	3
Supination-External rotation	18
Pronation-Abduction	2

Pronation-External rotation	7
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Supination-external rotation injuries are the commonest (60%) and pronation abduction injuries are the least common injuries in this study (6.66%).

RESULTS

The results were analyzed based on Olerud-Molander ankle score.

Table 4: Olerud-Molander ankle score

Parameters		Score
1. Pain	Never	25
	While walking on uneven surface	20
	While walking on even surface outdoors	10
	While walking indoors	05
	Constant and severe	0
2. Stiffness	None	10
	Present	0
3. Swelling	None	10
	Only evenings	05
	Constant	0
4. Stair climbing	No problems	10
	Impaired	05
	Impossible	0
5. Running	Possible	05
	Impossible	0
6. Jumping	Possible	05
	Impossible	0
7. Squating	No problems	05
	Impossible	0
8. Type of supports	None	10
	Taping, wrapping	05
	Stick or crutch	0

9. Work and Activities of daily life	Same as before injury	20
	Change to part time work/Simpler job	15
	Severely impaired work capacity	0

Poor: 0 %-60 %, Fair: 61 %-80 %, Good: 81 %-90 %, Excellent: 91 %-100 %.

Follow up was done until fracture union. Results were analyzed clinically & radiographically. Union was seen in all the fractures at the end of 10 weeks. Overall functional outcome for our patients is as follows:

Table 5:

Results	No. of patients	Percentage
Excellent (>90%)	18	60%
Good (81%-90%)	06	20%
Fair (61%-80%)	04	13.33%
Poor (<60%)	02	6.66%

COMPLICATIONS

The following complications were seen, postoperatively.

- Superficial infections with and without skin necrosis.



Fig 1 : Exposure of Fracture Site



Fig 2 : Fixation with C.C. Screw

Fig1: cc screw fixation to medial malleolus

FIXATION OF LATERAL MALLUOLUS WITH SEMI TUBULAR PLATE



Fig 1 : Draping of the Limb



Fig 2 : Lateral Skin Incision for Lateral Malleolus





Fig 6 : Fixation of Semi Tubular Plate with 3.5 mm Cortical Screw



Fig 7 : Semitubular Plate Closed with Soft Tissue



Fig 8 : Skin Closure

DISCUSSION:

Ankle fractures are among the most prevalent lower limb fractures, comprising 10% of all fractures, with only a small proportion (2%) being open fractures ^[13]. The most common causes include twisting injuries, road traffic accidents, falls from height, and sports injuries ^[14]. In this study, road traffic accidents were the leading cause (53.33%), followed by twisting injuries or self-falls (33.33%) and falls from height (13.33%). These findings highlight the importance of preventive measures such as road safety awareness and protective gear for sports enthusiasts to reduce the incidence of ankle fractures ^[15].

Regarding fracture patterns, bimalleolar fractures (60%) were the most common type, followed by unimalleolar fractures (33.33%) and trimalleolar fractures (6.66%). The Lauge-Hansen classification revealed that supination-external rotation injuries were the most frequent (60%), while pronation-abduction injuries were the least common (6.66%) ^[4].

These findings align with previous studies indicating that rotational mechanisms, particularly supination-external rotation, are the most common causes of ankle fractures.

Treatment approaches varied based on fracture stability and soft tissue conditions. While non-surgical treatment with immobilization remains an option for stable fractures, its complications, such as muscle atrophy, cartilage degeneration, and joint stiffness, emphasize the need for careful patient selection and follow-up^[16]. Staged treatment with external fixation and delayed internal fixation was utilized in high-energy injuries or cases with compromised soft tissue^[3]. Surgical treatment remains the gold standard for unstable fractures, providing anatomical reduction and early mobilization^[17]. However, complications such as wound infection and implant failure were noted, underscoring the importance of meticulous surgical technique and postoperative care^[18].

The functional outcomes, assessed using the Olerud-Molander ankle score, revealed excellent results in 60% of patients, good outcomes in 20%, fair outcomes in 13.33%, and poor outcomes in 6.66%^[19]. The high percentage of excellent and good results suggests that surgical intervention, when indicated, yields favorable functional outcomes. Nonetheless, the presence of fair and poor outcomes highlights the need for individualized treatment planning, rehabilitation, and patient education to optimize recovery and prevent long-term complications such as post-traumatic arthritis^[20].

SUMMARY:

Thirty cases of malleolar fractures, surgically repaired using various techniques, were followed in this study. Road traffic accidents were the leading cause of injury, accounting for 53.33 % of patients. Supination-external rotation (Lauge-Hansen's classification) type was the most common type of injury, comprising 60% of all the cases. Lateral malleolus was fixed with a semi-tubular plate / tension band wiring, and medial malleolus with malleolar screws / tension band wiring. The complication faced was postoperative skin infection, seen in 2 patients. After the study concluded, excellent to good results were seen in 24 (80%) cases, whereas 4 (13.33%) cases had fair results and 2 (6.66%) had poor results.

CONCLUSION:

The most prevalent type of malleolar fracture is supination-external rotation injury, which is also the most frequently associated type with dislocations and complications. The Pronation-External rotation type

had minimal complications. A good functional outcome is achieved through perfect anatomical reduction and restoration of articular congruity, as well as early surgical fixation with appropriate implants. By restoring sufficient stability and mobility to the ankle joint, a good functional outcome was achieved. Understanding the mechanism of injury is critical for successful reduction and internal fixation. When using one third tubular plate to fix the lateral malleolus, the lateral malleolar bend should be replicated. For lateral ankle stability, the length of fibula must be maintained. In all intraarticular fractures, anatomical reduction is critical, especially if a weight-bearing joint such as the ankle is involved. Open reduction and internal fixation ensures a high level of reduction. Nearly 90% of patients had satisfactory outcomes. The more severe the injury, the less satisfactory the outcome. Non-union of the malleoli because of soft tissue interposition should be avoided. Large percentage of complications were minor and resolved within two weeks. For small fracture fragments and osteoporotic bones, tension band wiring is preferred.

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