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Surgical management of malleolar fracture with their functional outcome at tertiary care centre

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Abstract

Background: With the advent of A.O principles of management, the results of bimalleolar ankle fractures are better with emphasis on anatomical reduction of fracture, stable internal fixation, regaining full length of fibula and early active pain free mobilization. This study was done to analyse the results of surgical management of bimalleolar ankle fractures in a tertiary care hospital.

Materials and Methods: A prospective study was done in a tertiary care hospital in the year 2020 for 6 months. Cases with bimalleolar ankle fractures in the age group of 20-60 years were included in the study. Cases with systemic infection, open injury with dislocation, skin diseases and previous arthrodesis at target level. The Lauge-Hansen classification and AO classification were used to evaluate the fractures radiologically. The patients who were presented in the casualty and out-patient department were examined clinically and radiologically. Outcome was assessed subjectively and objectively with scoring system and graded accordingly. Post-op complications were also noted.

Results: In our study, 30 cases of bimalleolar ankle fractures were analysed. Classification used was Lauge-Hansen and A.O. classification. Road traffic accident was major mode of injury. Average injury surgery interval was 6 days. Malleolar screw for medial malleolus and plate and screws for fibula was common mode of fixation. Results were analysed using Olerud and Molendar subjective and objective scoring. The subjective scoring was excellent and good in 80% of cases and objective scoring was good in 22 cases.

Conclusion: Accurate anatomical reduction and fixation results in good functional outcome.

Keywords: bimalleolar ankle fractures, lauge – hansen, olerud and molendar scoring, functional outcome

Introduction

Background

Ankle fractures are one of the most common lower extremity injuries with an incidence of approximately 179 per 100,000 people a year [1]. As life expectancy continues to rise and adults continue to remain active, there is an expectation that ankle fracture incidence will increase over the next few decades [2, 3]. The distal fibula is the most commonly injured segment (67 percent) of ankle fractures, followed by bimalleolar ankle fractures (25 percent), and trimalleolar ankle fractures (seven percent) [1, 4]. However, posterior malleolus involvement may not be as uncommon as historically described [1, 4]. Literature shows the incidence of posterior malleolar fractures to be as high as 44 percent, often necessitating additional strategic planning for fixation of displaced articular fracture patterns [5, 6]. Though adequate posterior malleolar fracture reduction is critical for ankle biomechanical stability, controversy remains on the indications and methods of optimal fixation. Historically, the standard of care advocated for fixating posterior malleolar fractures if the injury involved approximately 25 percent of the articular surface. Recent studies challenge this paradigm, advocating for standardizing fixation of most posterior malleolar fractures [7, 8, 9].

With the advent of A.O principles of management, the results of bimalleolar ankle fractures are better with emphasis on anatomical reduction of fracture, stable internal fixation, regaining full length of fibula and early active pain free mobilization. This study was done to analyse the results of surgical management of bimalleolar ankle fractures in a tertiary care hospital.

Methodology

A prospective study was done among 30 cases with closed bimalleolar ankle fractures who were treated surgically at tertiary care hospital for 6 months in the year of 2020. Cases with bimalleolar ankle fractures in the age group of 20-60 years were included in the study. Cases with systemic infection, open injury with dislocation, skin diseases and previous arthrodesis at target level. The Lauge-Hansen classification and AO classification were used to evaluate the fractures radiologically.

The patients who were presented in the casualty and out-patient department were examined clinically and radiologically. Closed reduction and immobilisation with plaster of Paris was done for all cases. Check x-rays were taken and planned for surgery accordingly. High quality radiographs helps in planning for reduction and choosing proper implants. Radiographic views of contralateral ankle are taken in few cases for comparison. The size and position of the malleolar fragment and involvement of distal tibio-fibular joint was assessed by computed tomography and was done in four cases. Magnetic resonance imaging to assess soft tissue injury and ligamentous involvement was done in seven cases and is useful to obtain good functional outcome. Displacement and stability of the fracture was assessed by X-rays. In displaced fracture reduction was done immediately to maintain tibiotalar congruity. Stress radiographs were done in ten cases to assess preoperative syndesmotic injury. In syndesmotic instability shentons line broken and dime sign present. Malleolar plating was done to fix the fracture. Postoperatively, the affected limb was kept elevated on a pillow and active toe movements and quadriceps exercises were started. Patients were called for review at 6th week, 3rd month, 6th month and 12th month. If there is substantial evidence of union both clinically as well as radiologically, gradual weight bearing started accordingly. Patients were put on physiotherapy for mobilization of ankle joint. Outcome was assessed subjectively and objectively with scoring system and graded accordingly. Post-op complications were also noted.

Results

Among 30 study participants, 24 (80%) were males and 06 (20%) were females. 11 (36.67%) had left sided fracture and 19 (63.33%) had right sided fracture. Majority were in the age group of 41-50 years ^[10].

Table 1: Age distribution of study participants

Age groups	Male	Female	Total
21-30 yrs	06 (25%)	01 (16.66%)	7 (23.33%)
31-40 yrs	06 (25%)	01(16.66%)	7 (23.33%)
41-50 yrs	09 (37.5%)	01(16.66%)	10 (33.33%)
51-60 yrs	03 (12.5%)	03 (50%)	6 (20%)
Total	24	06	30

Table 2: Mode of injury of the study participants

Mode of Injury	Number (%)
Road Traffic Accident	18 (60%)
Self fall, Twisting	9 (30%)
Fall from height	3 (10%)

Most of the study participants had road traffic accident (60%) because of which they had ankle fracture, followed by self fall (30%) and fall from height (10%). These fractures were

classified by Lauge Hansen and Danis-weber. They are as follows....

Table 3: LAUGE HANSEN Classification of ankle fractures

Injury pattern	Frequency
Supination-Adduction	3 (10%)
Supination-External rotation	18 (60%)
Pronation-Abduction	2 (6.67%)
Pronation-External rotation	7(23.33%)

Based on the level of fibula fracture, the AO classification expands on Danis- Weber which is perhaps the most rudimentary classification the following distribution was seen.

Table 4: Danis-Weber classification of ankle fractures

Danis-Weber classification	Number
Type A	03 (10%)
Type B	18 (60%)
Type C	09 (30%)

Among 30 cases, 16 were treated by one third tubular plate, 10 with reconstruction plate and 2 were with K wires. Other two cases were treated conservatively. (Table 4) There was periosteal interposition at medial malleolus among 3 cases, comminuted small fragments of bone inside ankle joint among 3 and Saphaneous vein injury among 2 cases. (Table 5)

Table 5a: Treatment given to the study participants

Treatment	Number
One third tubular plate	16 (53.33%)
Reconstruction plate	10 (33.33%)
K-Wires	2(6.67%)
Conservative	2(6.67%)

Table 5b: Perioperative findings of the study participants

Perioperative findings	Number
Periosteal interposition at medial malleolus	3
Comminuted small fragments of bone inside ankle joint	3
Saphaneous vein injury	2

Table 6: Subjective outcome of study participants

Subjective Outcome	Number	Percentage
Excellent (>90%)	12	40%
Good (81%-90%)	12	40%
Fair (60%-80%)	04	13.33%
Poor (<60%)12	02	6.66%

When the outcome was assessed subjectively, 12(40%) had excellent outcome and another 12(40%) had good outcome. Only 2(6.66%) had poor prognosis. The same prognosis when assessed objectively it was found that 22 (73.33%) had good outcome. (Table 6 and 7)

Table 7: Objective outcome of study participants

Objective Outcome	Number	Percentage
Good (0-3)	22	73.33%
Fair (4-6)	6	20%
Poor (7-12)	2	6.66%

Table 8: Post-operative complications of the study participants

Post-operative complications	Number
Superficial infections with and without skin necrosis	6
Deep infections	2
Nonunion	2
Talar tilt	2
Talar shift	2
Malunion	1
Arthritis	1

After surgery among 6 cases there was superficial infection, deep infection, non-union, talar tilt and talar shift among two each cases. There was also malunion and arthritis. (Table 8)

Discussion

Our study consists of 30 cases of closed bimalleolar ankle fractures. Maximum incidence of the injury was in the fifth decade of life. Injury was more common in males-24 (80%) and females being 6 (20%). Right side was more commonly involved-19 patients (63.3%).

Among Supination-Adduction type, all patients had good to excellent outcome, we have addressed the fibular fragment which is too small to fix, using small size K wire or single malleolar screw or lag screw. We had used anteromedial approach to fix the fracture and address the articular pathology as suggested by Hamilton *et al.* [10] in their study instead of Hockey stick incisions used routinely for other type of fractures.

In both the patients with pronation abduction injury, we have fixed medial malleolus first followed by extra periosteal plating for fibula, the advantage of which (to overcome the higher incidence of nonunion in according to their study) has been reported by Bois AJ *et al.* [11].

In pronation external rotation injury restoration of the fibular length and rotation, ankle mortise and syndesmotc stability is important factor as noted by Porter DA *et al.* [12]. We had good to excellent results in all seven cases of pronation external rotation injury as we could maintain the syndesmotc stability and fibular length by syndesmotc screws and fibular plating.

In Hafiz *et al.* [13] study, subjective scoring outcome was excellent and good in 84% and objective scoring was good in 78.8% and poor in 4.2%. The results are comparable with our study that the subjective scoring of Olerud and Molander was excellent and good in 12 patients each (80%), Fair in 4 patients and poor in 2 patients. The objective scoring of Olerud and Molander was Good in 22 patients (73.3%), Fair in 6 patients and poor in 2 patients (6.6%).

In our series 12 cases had complications such as wound infection, nonunion and malunion. Superficial infection (27%) with skin necrosis was the commonest complication we encountered. Skin necrosis was very much less when plate and screws of 3.5 mm system is used. Miller *et al.* noted infection rate of 2.2% in his series of bimalleolar fractures [14]. Several authors like Huges *et al.* [15] and Phillips *et al.* [16] implicate factors such as Weber B type fracture pattern, shortened fibula and widened ankle mortise for early post traumatic arthritis. One patient among SER/Weber Type B had secondary ankle arthritis probably because of loss of articular reduction due to loosening of K-wire during follow up.

Conclusion

Pronation -External Rotation type had excellent and good results without much complications. The accurate anatomical

reduction and restoration of articular congruity and early surgical fixation with appropriate implants results in good functional outcome.

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