Original Research Article

Ankle Injuries: Various Presentations & Their Functional Outcomes

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Abstract:

Introduction: Ankle injuries are extremely common injuries. With ankle fractures, the primary concern is residual instability of the joint as mal-alignment and residual displacement can adversely affect biomechanical behavior of the ankle and result in loss of function.

Methods:50 patients with ankle fractures treated at Government Medical College & Rajindra Hospital, Patiala were included in the study. Following the radiological evaluation, open reduction and internal fixation of all fractures was done as per the standard approaches, depending on the mode of fixation planned.

Results: Road side accidents 48% was the most common cause of Ankle fractures. Weber type C 44% and Lauge Hansen Supination External Rotation 30% type was the most common type of ankle fracture seen. 100% of Pronation Abduction (PAB) Injuries had excellent outcomes in all Subjective, Objective & Radiographic Weber's criteria. With Supination External Rotation (SER) injuries, 60% had Excellent Subjective & Objective outcome and 66.67% had radiographic excellent outcomes.

Conclusion:We recommend use of Lauge Hansen's classification for directing management principles, which is better for both osseous and ligamentous injury assessment and their management.PAB & SAD injuries can be well managed with surgery with expected Good outcomes.On their counterpart, SER & PER injuries can be expected to result in less desirable outcomes and thus must be dealt with more seriously.

Key Words: Ankle fractures, operative, internal fixation, functional outcome

Introduction

The ankle and foot are highly evolved structures in the human body, which are designed to support body's weight and to help with movement over varied terrain. Ankle fractures are increasingly common injuries that require a careful approach for proper and effective management. The incidence of ankle fractures is approximately 187 fractures per 100,000 people each year. [1] Since the mid-1900s, this rate has increased significantly in many industrialized countries, most likely due to growth in the number of people involved in athletics and in the size of the elderly population. [2] There are similar fracture rates overall between women and men, but men have a higher rate as young adults, while women have higher rates in the 50 to 70-year age group. [3]

Ankle injuries that result from bending forces are commonly described as inversion or eversion injuries. Technically, inversion and eversion are motions of the subtalar joint and become supination and pronation when combined with ankle and midfoot motion. Internal and external rotation of the ankle refers to the rotation of the talus within the joint. Previous studies have shown the relationship of various patient variables in predicting the occurrence of ankle fractures. But not much work has been done on the factors which are associated with good or poor clinical outcomes. In this study we aimed to evaluate the functional outcome of surgical management of ankle fractures with various presentations according to the Lauge Hansen Classification.

Methodology

Fifty patients with ankle fractures treated at Government Medical College & Rajindra hospital, Patiala were included in the study. Patient's selection was based on:

A. Inclusion Criteria	B. Exclusion Criteria
1. Patients with age 18 years to 75 years. 2. Ankle Injuries occurring within 7 days of presentation. 3. Patients giving Consent for study.	1. Ankle injuries occurring before 7 days of presentation. 2. Associated Fracture of Tarsal and Pilon fractures. 3. Open fractures, Pathological fractures. 4. Polytrauma. 5. Any previous bony malformations, bony or articular lesions at ankle.

Following the radiological evaluation, patients were briefed regarding the operative treatment. If soft tissue injury like abrasions and lacerations or blisters were present, surgery was delayed until the skin had healed and such injuries were treated initially with analgesics, closed reduction and immobilization using a below knee pop backslab. This was to minimize risk of infection post operatively. Patients were operated immediately only if the patient presented immediately after injury and if skin over fracture site was healthy, provided general condition of the patient was stable. The operative approach for the fixation of all malleolus was done as per the standard approaches, depending on the mode of fixation planned. The lateral malleolar fracture was exposed first.

All Patients were operated under spinal anaesthesia in a supine position with tourniquet control and using image intensifier. The implants used were 3.5 mm DCP, LCP plates, 1/3rd or semi tubular plate, kirschner wire, cannulated screws and tension band wiring for the fibula. Tension band wiring and 4mm partially threaded cancellous screws were used for the medial malleolus. And for the posterior malleolus, a 4 mm cannulated partially threaded cancellous screw with or without washer was used. A single 3.5mm cortical screw was used in fixing of syndesmotic joint. Implants were selected based on the fracture pattern, quality of the bone and surrounding soft tissue.

A below knee PoP back slab was applied post operatively for soft tissue protection in selected patients. The foot was kept elevated over pillows. Radiological evaluation was done in the postoperative period which included both anteroposterior and lateral views and were graded as per the Kristenson's criteria. Patient was mobilized on the 3rd postoperative day, non-weight bearing on the affected leg with the help of walker or crutches. Patients were discharged on the tenth day on an average.

Patients were advised to continue non weight bearing ambulation with a walker or crutches for a period of 6 weeks. The pop slab was removed after soft tissue/ skin condition normalized. Check x rays were done at 6 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 after 6 weeks. Partial weight bearing was started with support as tolerated. 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.

Table 1. Baseline characteristics of patients included in the study

Number of patients	50
Average age (standard deviation)	38 [SD±14] years
Males	76% (38)
Mode of injury	
Road Side Accidents	48% (24)
Fall from stairs	30% (15)
Sports	4% (2)
Mechanism of Injury	
Supination external rotation	30% (15)
Pronation external rotation	26% (13)
Supination adduction	16% (8)
Pronation abduction	28% (14)
Complications	
Blisters	6% (3)
Superficial surgical site infection	6% (3)

Discussion

We had 50 cases in our series, from 18 to 75 years of age with Mean age of 38 years (SD=14). Maximum patients 40% were from the age group of 18-30 years and out of these 20 patients, 95% were males and 5% were females. This was probably due to more active and energetic lifestyle of younger male population rendering them more vulnerable to trauma. Minimum 6% were from the age group 61-75 years and 100% of these were females. Females with age more than 60 years were more prone because if osteoporosis is left untreated, even minor stumbling or fall can cause ankle fractures. Ashoka Yadav [5] observed in his study the mean age of injury as 45 years, with a bimodal distribution, with peak incidence of ankle fracture in younger men and older women and a 50 year gap between peaks. Kishore [6] reported mean age of 36 years with a male predominance of 66.6%, both of which are comparable to this study.

Out of 50 Patients, 78% involved the Right side and 22% involved the Left side. Both Males 76% and Females 83% were affected more on their respective Right sides than the left side. This may be due to right side being the dominant side in these patients. Kishore [6], Roberts SR [14] and Beris et al [12] also observed right side being more affected than the left side in their respective groups.

Road side accidents was the most common cause of ankle fractures among all the age groups, except between 61-75 years, where Fall from stairs 66.7% was the most common cause. This may be due osteoporosis prone age group of 61-75 years, in which minor stumbling or fall can cause ankle fracture. This age group is also more prone to falls due to disorders related to higher functions, neuro-musculoskeletal balance and coordination.

In this study, Supination-External Rotation (SER) 30% was the most common Lauge-Hansen type of ankle fracture. Supination-Adduction 16% was the least common type of all. Within the SER group, SER IV 60% was the most common subtype. In PAB group, PAB I 57% was the most common subtype. Kishore M [6] (40%) and Beris [12] (45%) also observed Supination-External Rotation as the commonest pattern in their groups.

In this study, 6% patients with ankle fractures had blisters at the time of presentation. All of these had a History of Fall from Height, sustained injuries on their Right side and were in the age group of 45-60 years. All of these three were classified as Weber Type B and Lauge Hansen SER Type IV on radiographs. Saurabh Sagar Mehta [7] reported incidence of blisters as 6.6% in current literature which is comparable to this study.

In this study, Medial malleolus was fixed with Two Cannulated Screws in 66% of the patients and with Tension Band Wiring (TBW) in 34% of the patients. Lateral Malleolus was fixed most commonly with Plating (Lc-Dcp, Dcp, 1/3rd-tubular plates) in 72% of the patients, and with Screws in 28% of the patients. Posterior Malleolus was fixed with two Cannulated screws in 100% of the patients. Syndesmotic screw fixation was done in 26% of the patients and involved three cortices from the fibula to the tibia. All of the above methods achieved adequate reduction.

In this study, PoP Backsplint was used post operatively in 66% of the total patients for a mean period of 3.8 weeks. PoP backsplint for two weeks was given to promote rapid soft tissue healing and reduction of swelling. In this group, 44% of the patients was given PoP for upto 6 weeks duration. PAB injuries were associated with backsplint use for less than 2 weeks in 28% of patients. Similarly, SER in 30% and PER in 26% were associated with use of PoP Backsplint for more than six weeks. Ashoka Yadav [5] used PoP backsplint or cast for 6-8 weeks postoperatively in their group. Kishore [6] also used postoperative backsplint for 6 weeks and noted that the postoperative immobilization in a plaster slab or a cast upto six weeks does not affect the final outcome with respect to achieving the ankle and subtalar range of movements as most of the patients had achieved full range of motion at the end of 12 weeks.

In this study, Outcome on Postoperative Xray according to Kristenson's criteria was seen as Good in 72% and Fair in 28% of the patients in the group. None of the patients (0%) had a Poor outcome. In the study by Ashoka Yadav [5], Good result on postoperative x ray was seen in 66.6% and Fair in 33.4% of the patients.

Kristenson's Good outcome was found to be associated with an 100% of Pronation Abduction (PAB) type of injuries, followed by 66.7% Supination External Rotation (SER) types, 62.5% of Supination Adduction (SAD) type and 53.8% of Pronation External Rotation (PER) type of ankle fractures.

In the present study, 100% of Pronation Abduction (PAB) Injuries had Excellent outcomes in

all Subjective, Objective & Radiographic Weber's criteria. Supination Adduction (SAD) injuries had 100% Excellent Subjective & Objective outcomes, and 62.5% cases had Radiographic Excellent outcomes. 84.6% Pronation External Rotation (PER) injuries had Subjective & Objective Excellent outcome, and 54% had radiographic Excellent outcome. 60% of Supination External Rotation (SER) injuries had Excellent Subjective & Objective outcome and 66.67% had radiographic excellent outcomes.

Table 2: Functional outcomes according to Weber's Criteria

Weber's Criteria	Subjective			Objective			Radiological		
Outcome	Excel	Good	Poor	Excel	Good	Poor	Excel	Good	Poor
SER	60 %	40 %	0 %	60%	40%	0 %	66.7%	33.3%	0 %
PER	84.6%	15.4%	0 %	84.6%	15.4%	0 %	54 %	46%	0 %
SAD	100%	0 %	0 %	100%	0%	0 %	37.5%	62.5%	0 %
PAB	100%	0 %	0 %	100%	0%	0 %	100%	0 %	0 %

In the study by Ashoka Yadav [5], the final outcome as per the Weber's radiological criteria was 57.5% Good, 37.5% Excellent and 5% poor and Subjective criteria was 50% Good, 45% Excellent and 5% poor. Objective criteria were 55% Good, 35% Excellent and 10% poor result which showed Excellent correlation between the postoperative radiological score and presentation of patients. In the study by Kishore [6], the final outcome as per the Weber's radiological criteria was 66.6% Excellent, 26.6% Good and 6.8% poor result which showed excellent correlation between the immediate postoperative radiological score and the final radiological outcome. Objective and subjective findings were also comparable.

Table 3: Comparison of functional outcomes in various studies

Study	Excellent	Good	Poor
Ashoka Yadav	37.5%	57.5%	5%
Kishore M	66.6%	26.6%	6.8%
Present Study	72%	28%	0%

Postoperative radiographs showing various modes of internal fixation used

Above observations suggest that although SER injuries are more common in nature, PAB & SAD injuries can be well managed with surgery with expected excellent outcomes. On their counterpart, SER & PER injuries can be expected to result in less desirable outcomes and thus must be dealt with more seriously as a Radiological score deficiency (66.67% & 54%, respectively) directly leads to a functional score deficit also (60% & 84.6%, respectively). Evidence based conditioning of surgeon and patient can be of benefit to decide for more aggressive rehabilitation methods in prone groups viz Supination External Rotation & Pronation External Rotation type of ankle fractures.

Conclusion

Current opinion has increasingly favored primary operative intervention for a displaced or unstable fracture of the ankle, with the greatest emphasis on anatomical reduction and rigid fixation of the fractures of the lateral malleolus, and fractures of the medial malleolus and those of the posterior malleolus have also been fixed whenever indicated.

Our study used Lauge- Hansen's classification for mechanism of injury & for radiological classification. We recommend use of Lauge Hansen's classification for directing management principles, which is better for both osseous and ligamentous injury assessment. In this study, we conclude that all ankle fractures need serious assessment and management and should be treated with internal fixation. The sooner we start the treatment, the better it is. With internal fixation of ankle fractures, we can expect excellent to good functional results.

Conflict of Interest: None

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