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Functional outcome of surgically treated ankle fractures

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Abstract
Purpose: Ankle fractures are amongst the most common injuries treated by orthopaedics surgeons. Open reduction and internal fixation is the standard of care for unstable ankle fractures. In this study, we intend to study the functional outcome of surgically treated ankle fractures.
Method: In the year 2012 to 2014, a total of 45 patients who underwent open reduction and internal fixation were assessed during follow-up using subjective as well as objective criteria.
Results: The patients were followed up at 6 weeks, 3 months and 6 months and were evaluated using the Olreud and Molander Ankle score as well as subjectively in terms of pain relief, gait variations, return to pre-trauma activity levels, radiographs, ankle joint function and subtalar joint function. It was noted that surgically fixed ankle fractures had good functional outcomes. A significant improvement was noted in the ankle function from 3rd month to 6th month post-operatively. There were no serious early or late complications.
Early treatment without delay, anatomical reduction and fracture fixation, stringent postoperative mobilization and rehabilitation definitely improves the outcome of an ankle fracture.

Keywords: Surgically treated, ankle fractures

Introduction
Ankle fractures are among the most common injuries treated by orthopaedic surgeons. The ankle is a precisely aligned joint with little soft tissue coverage. As a result, severe injury combined with inadequate or inappropriate treatment can lead to severe complications and major disability [1-3]
Anatomic restoration of the joint is the goal of management in fractures about the ankle. Open reduction and internal fixation is the standard of care for unstable ankle fractures [4] However very few investigators have examined the functional recovery following operative treatment of ankle fractures [5].
The purpose of this study is to analyze the causes and the patterns of ankle fractures as well as functional outcome of surgically treated ankle fractures.

Materials and Methods
A prospective randomized study was carried out in Father Muller Medical College, Mangalore, from June 2012 to February 2014 and all the patients who fulfilled the below mentioned inclusion criteria were included in the study.

Inclusion Criteria
1. Cases of closed bimalleolar and trimalleolar ankle fractures
2. Skeletally mature patients above 18 years of age
3. Entire definite treatment done in our institution
4. Patients who comply with regular follow up for a period of at least 6 months

Exclusion criteria
1. Children below 18 yrs.
2. Patients who lost to follow up.

3. Multiple trauma or other injuries.
4. Open fractures.
5. Neurovascular injuries.

Patients were initially seen in the emergency department, a detailed history obtained and clinical assessment was done. Appropriate radiological and laboratory investigations were carried out. Patients who satisfied the inclusion criteria were considered for the study.

All patients underwent surgical fixation of the fractures, and post operatively were put on a plaster of paris (POP) slab. Post-operative antibiotics were continued for a period ranging from 3 to 5 days depending on the presence of other injuries and therapy was prolonged if there were signs of infection. Initial wound inspection was done on the third postoperative day. Once pain free, patient was trained in non-weight bearing crutch walking. The slab was continued till suture removal following which the patients were advised dorsiflexion and plantarflexion exercises.

At six weeks both groups of patients were reviewed, specific complaints were sought and check X-rays were taken. Ankle girths were measured to assess the amount of swelling in both groups and the range of dorsiflexion and plantar flexion were also assessed. The patients were further reviewed at three and six months postoperatively and subjective and objective assessment of the patients' ankles were done using a modification of the scoring system proposed by Olerud and Molander.

Table 1: The modified ankle score of Olerud and Molander (1984)

Table I: Scoring system devised by Olerud and Molendar (maximum 100 points)

PARAMETER	DEGREE	SCORE
1. Pain	None	25
	While walking on uneven surface	20
	While walking on even surface outdoors	10
	While walking indoors Constant and severe	5
		0
2. Stiffness	None	10
	Stiffness	0
3. Swelling	None	10
	Only in evenings	5
	Constant	0
4. Stair-climbing	No problems	10
	Impaired	5
	Impossible	0
5. Running	Possible	5
	Impossible	0
6. Jumping	Possible	5
	Impossible	0
7. Squatting	No problems	5
	Impossible	0
8. Supports	None	10
	Taping, Wrapping	5
	Stick or crutch	0
9. Work, activities of daily life	Same as before injury	20
	Loss of tempo	15
	Change to simpler job	15
	Severely impaired work capacity	0

A score of 90 to 100 is considered Excellent; 70 to 89, Good; 50 to 69 points, Fair and less than 50 is considered Poor. Subjectively patients were assessed for pain relief. A total score of 18-24 was considered good, 12-18 fair and below 12 poor.

Operative procedure [6]

Under spinal anaesthesia the patient was put in supine position on table with sand bag underneath the affected side buttock. Pneumatic tourniquet was applied to the proximal thigh, prophylactic antibiotics were given prior to inflation of the tourniquet. The affected limb was scrubbed with chlorhexidine gluconate solution from the knee joint to the nail tip and then painted with betadine solution and spirit, and draped. Open reduction and internal fixation of the malleolar fractures were performed by tension band wiring, 4 mm cannulated cancellous screws with washers, semi tubular plating with screws or with an intra medullary device.

Internal Fixation of the Lateral Malleolus

Fixation of the fracture was done using 1/3 tubular plate with or without a lag screw, with lag screws alone or with an intramedullary device namely a Rush pin. Rush pin was used in case of undisplaced pronation abduction or pronation external rotation injuries and was passed through an incision made at the tip of the lateral malleolus and passed retrograde under C-arm guidance.

Fixation of the Medial Malleolus

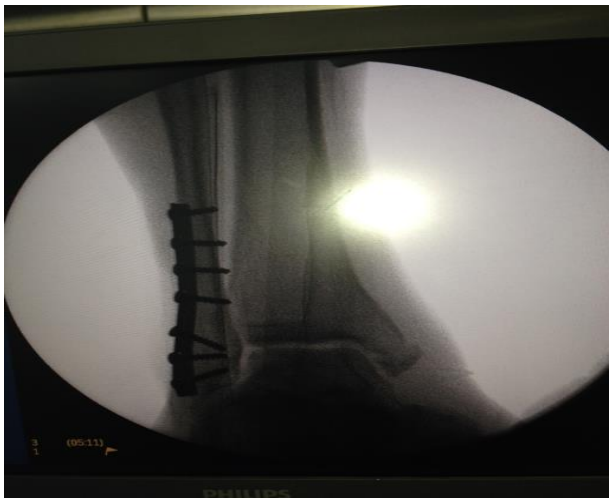
The fracture was fixed by passing one or two 4 mm cannulated cancellous screws with washer, or by tension band wiring depending on the configuration and size of the fracture fragment.

Posterior lip fractures

Posterior lip fragments were reattached with one or two lag screws, occasionally supplemented with K-wires, washers. The most secure fixation was provided by interfragmentary fixation with lag screws, which glide through the fragment adjacent to their head and be threaded only into the opposite fragment. Such screws were placed from posterior to anterior if the fragment is exposed using a posterolateral incision.

Operative Photographs

Fixation fracture using 1/3rd tubular plate



Intraoperative C-arm image

Statistical analysis

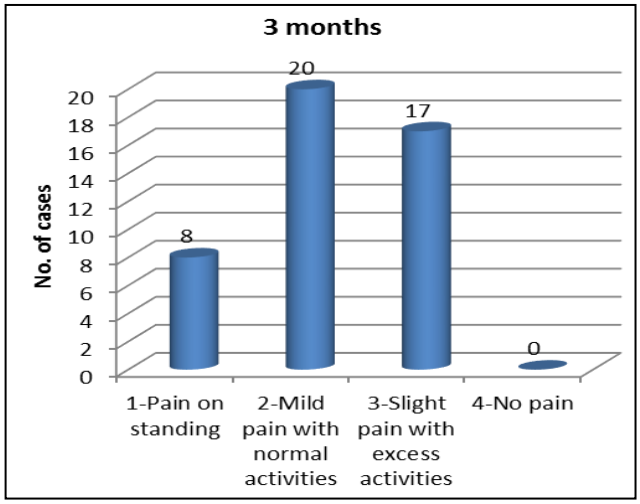
Descriptive statistical analysis was carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance was assessed at 5 % level of significance. Student t test (two tailed, independent) was used to find the significance of study parameters on continuous scale between two groups. Intergroup analysis on metric parameters, Chi-square/Fisher Exact test was used to find the significance of study parameters on categorical scale between two or more groups [7].

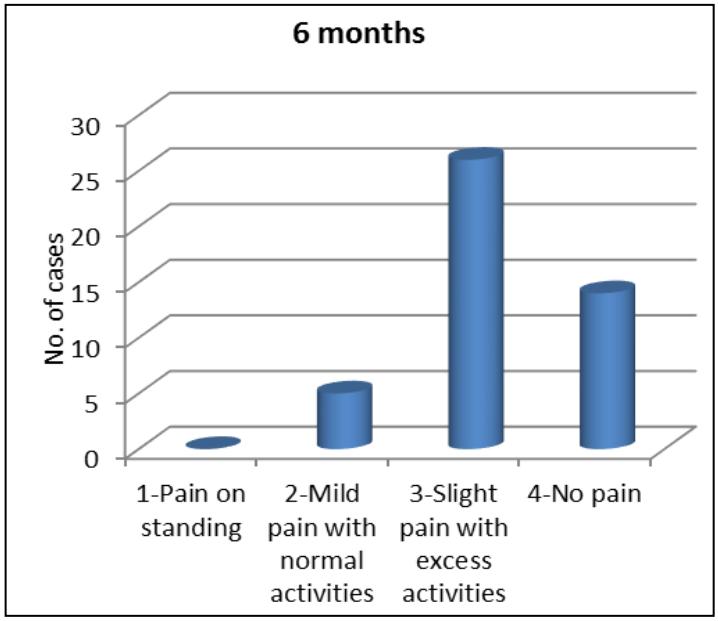
Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel were used to generate graphs, tables etc.

Results

Subjective Pain Measurement At 3 Months AMD 6 Months Post-Op

		6mpain			
		2	3	4	Total
3mpain	1	5	3	0	8
		62.5%	37.5%	.0%	100.0%
	2	0	18	2	20
		.0%	90.0%	10.0%	100.0%
	3	0	5	12	17
		.0%	29.4%	70.6%	100.0%
Total		5	26	14	45
		11.1%	57.8%	31.1%	100.0%

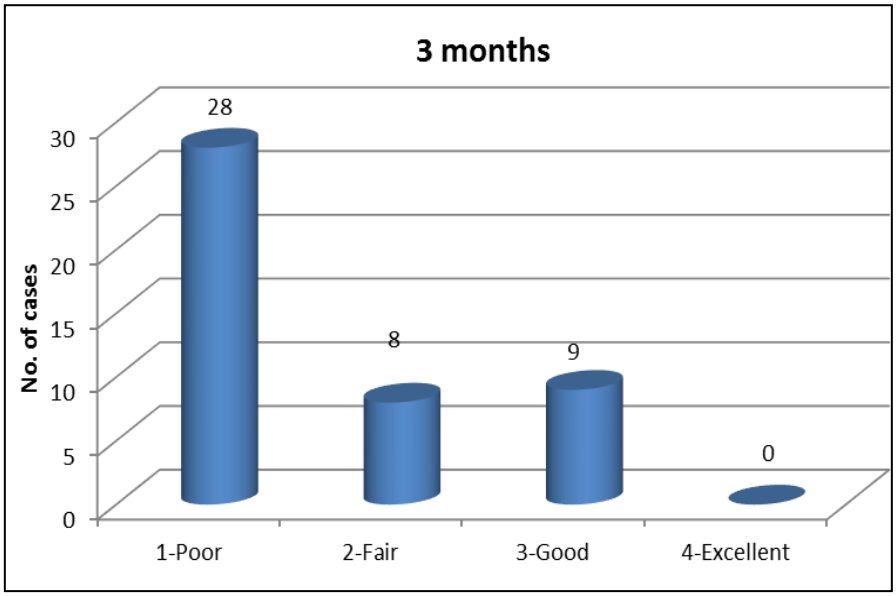


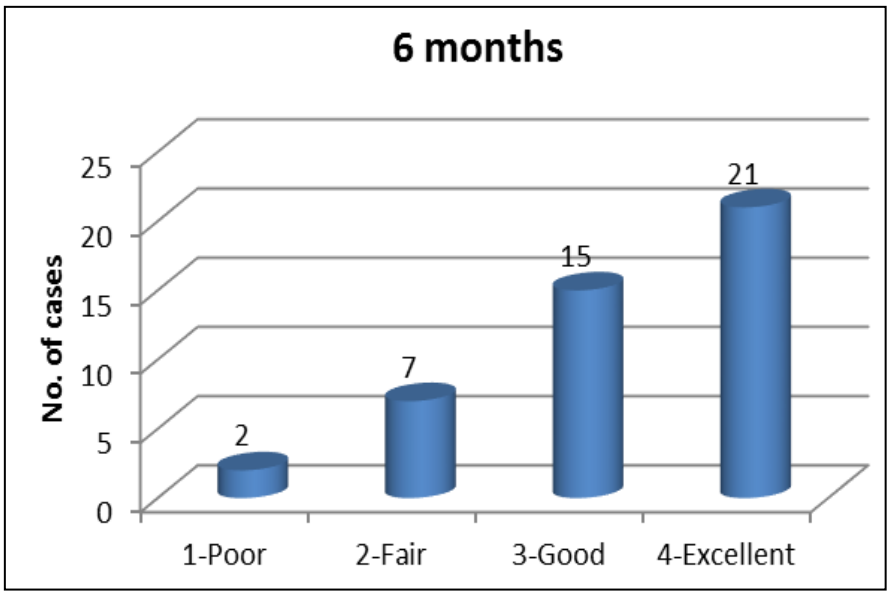


6mpain - 3mpain		
Wilcoxon signed rank test z value	p	
6.02	.000	< 0.01, HS

Inference: Significant improvement in the OMA scores from 3rd month post-op to 6th month post-op. Radiographs

		6m omsc				
		poor	fair	good	excellent	Total
3momsc	poor	2	7	13	6	28
		7.1%	25.0%	46.4%	21.4%	100.0%
	fair	0	0	2	6	8
		.0%	.0%	25.0%	75.0%	100.0%
	good	0	0	0	9	9
		.0%	.0%	.0%	100.0%	100.0%
Total		2	7	15	21	45
		4.4%	15.6%	33.3%	46.7%	100.0%

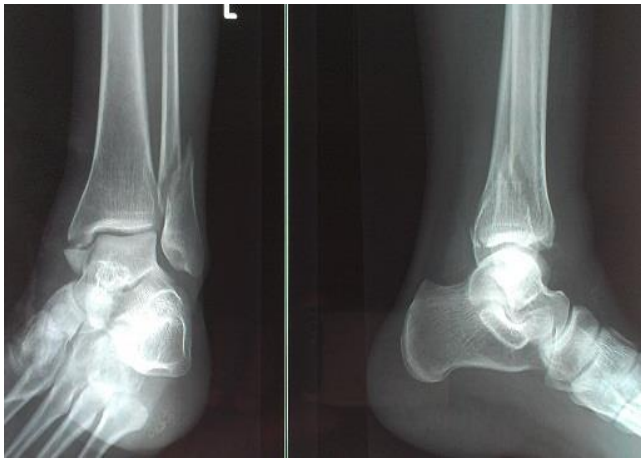




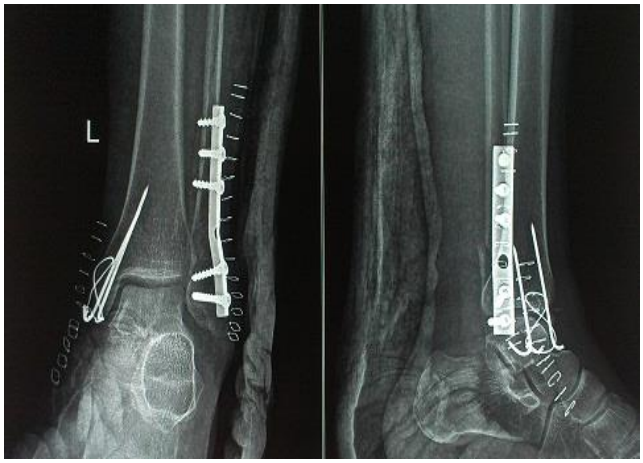
6m omsc - 3momsc

Wilcoxon signed rank test z value	p	
5.83	.000	< 0.01, HS

Inference: Significant improvement in the OMA scores from 3rd month post-op to 6th month post-op. Radiographs



Case No.12 Pre-Op



Case No.12 Post Op

Conclusion

In this study of 45 patients with ankle fractures who were treated operatively, the following salient findings were noted:

- Operative treatment for ankle fractures results in good functional outcome post-operatively.
- Anatomical reduction of the fracture was associated with better functional outcomes.
- A significant improvement was noted in the ankle function from 3rd month to 6th month post-op, assessed the Olreud and Molander Ankle score.
- No significant wound complications were noted.
- The most common late complications reported were persistent swelling and residual pain.

Early treatment without delay, anatomical reduction and fracture fixation, stringent postoperative mobilization and rehabilitation should help improve outcome in an operated ankle fracture.

Summary

Ankle fractures are among the most common injuries treated by orthopaedic surgeons. However very few investigators have examined the functional recovery following operative treatment of ankle fractures. The purpose of this study was to analyze the causes and the patterns of ankle fractures as well as functional outcomes of surgically treated ankle fractures.

A significant improvement was noted in the ankle function from 3rd month to 6th month post-op, assessed using the Olreud and Molander Ankle score.

Operative treatment for ankle fractures results in good functional outcome post-operatively. Anatomical reduction of the fracture leads to a better functional outcome.

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