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Original Article

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Functional Outcome of Arthrodesis by Cannulated Cancellous Screws in Malunited Fractures around Ankle Joint

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ABSTRACT

Introduction: Ankle fractures are very common injuries to the ankle which generally occur due to a twisting mechanism and accounts for 10% of all fractures. Neglected ankle fractures are common in our regions. Patients first consult traditional healers and it is when the signs persist that they consult the surgeon for a swollen and painful ankle. In such condition, Arthrodesis becomes a versatile procedure. This can be done by screws, plating or nailing.

Aim of the Study: The aim was to study the functional outcome of arthrodesis by cannulated cancellous screws in malunited fractures around the ankle joint.

Methods and Materials:

Study Design: Prospective observational clinical study

Study Sample Size: This study includes 30 patients with ankle fractures which were malunited or mal-reduced and arthrodesis was performed with multiple cannulated cancellous screws.

Center of Study: The study was conducted in the Department of Orthopedics, Chalmeda Anand Rao Institute of Medical Sciences

Study Period: Duration of study was from November 2019 to May 2023.

Results: The outcome was evaluated using the visual analog pain scale and by American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hind foot Score. 80 percent patients achieved excellent results with mild complications, no pain after 9 months of procedure.13.3 percent cases had superficial skin infections, and 6.7 percent cases had deep wound infections.

Conclusion: Hence, the present study concluded that arthrodesis with screw fixation is useful method for arthrodesis of ankle arthritis secondary to malunion.

Key Words: Arthrodesis, Cannulated cancellous screws, Malunion, Ankle-Hind foot Score, Wound, Screws infections

INTRODUCTION

Ankle fractures are common, representing 14% of all fractures requiring hospitalisation.[1] Ankle fractures affect the lateral malleolus in 55% of cases.[2] They are associated with significant morbidity in all age groups. Diagnosis is made with plain radiographs of the ankle.

Treatment must be operative depending on fracture displacement, ankle stability, presence of syndesmotic injury, and patient activity demands.

Treatment of ankle fractures is successful in most cases; failure of treatment will result in malunion. Malunited ankle fractures will affect the patient's day-to-day life activities due to pain, swelling, functional impairment, and development of joint arthrosis.

The broad goals of treating ankle fractures are restoring the ankle joint to normal alignment, healing the fracture, and preventing arthritis. Malunited and mal-reduced cases must be fixed by arthrodesis by plating, nailing, or screws.

In this study, we have included neglected and mal-reduced cases of ankle fracture and arthrodesis was performed by open method through anterior approach. Cannulated cancellous screws were used to achieve reduction. Screws gives good purchase in joint and *helps to compress fracture fragments*.

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This procedure has less hardware than plating, is cheap with low incidence of hardware irritation, post-operative stiffness, and gives fewer wound problems. However, this technique needs good bone quality and patient compliance. The goal of surgery was to create a painless, stable, functional and plantigrade ankle.

AIM OF THE STUDY: The aim of the study was to study the functional outcome of arthrodesis by cannulated cancellous screws in malunited fractures around the ankle joint.

MATERIALS AND METHODS

Study Design: Prospective observational clinical study

Study Sample Size: A total of 30 cases were studied in this study

Center of Study: Adult patients with Malunited ankle fractures who were admitted for treatment in the Department of Orthopedics, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar.

Study Period: Duration of study was from November 2019 to January 2023.

Inclusion criteria:

Age group of 40 to 80 years, Neglected Ankle fractures, malunited ankle fracture, compliant patient

Exclusion criteria:

Age less than 40 years and more than 80 years, Neuropathic joints, Active infection over ankle, Ankle deformities, Osteoporotic bones, Peripheral vascular disease, and non-compliant patient.

Surgical technique

Under anesthesia, patient was placed in supine position. Tourniquet was inflated. 10cm long longitudinal incision over anterior aspect and across the ankle joint was given. Subcutaneous tissue and superficial fascia were incised. Anterior tibial tendon was identified and retracted. Incision over deep fascia was given cutting through extensor retinaculum and then plane between extensor hallucis longus and extensor digitorum longus then further longitudinally anterior surface of distal tibia is exposed, fibrous tissue was removed with bone nibbler. With help of osteotome, joints were opened. A guide wire of size 1.5 or 2.5mm was put to stabilize the fractures and hence fixed with multiple cancellous cannulated screws of sizes 6.5 to 8mm for subtalar joint and 4.5mm for mid tarsal joint commonly. After controlling subchondral bone bleeding, bilateral iliac bone graft was taken, this cancellous graft was put, and fixation was done as required. Medial screws were put first followed by other screws and fractures are stabilized. Thorough wound wash was given and wound closed in layers and aseptic dressing done. Post operatively non-weight bearing was advised and put in plaster for four to six weeks.

Follow up:

All the patients were followed up for suture removal and later at 1,2,3,6,9 months. Partial weight bearing in walker boot till 8 weeks and full weight bearing after 12 weeks. 3 months post operatively, patients were able to walk, good pain relief was achieved in all cases. The outcome was evaluated using the visual analog pain scale and American orthopedic foot and ankle society (AOFAS) ankle hind foot score. The ankle and subtalar joint movement were assessed as normal, limited, or absent. Follow-up showed favorable recovery. The pain was decreased in all cases in second postoperative month.

RESULTS

The study was conducted in the Department of Orthopedics, Chalmeda Anand Rao College of Medical Sciences. The results of the study were out of 30 cases 22 were males (73%) and 8 were females (27%) (table 1) ; 13 patients (43%) were 40-50 years, 6 patients (20%) were 51-60 years, 9 patients (30%) were 61-70 years, 2 (6%) were 71-80 years (table 2) ; 6 patients (20%) had supination-adduction injury,12 patients (40%) had supination-external rotation, 8 patients (27%) had pronation-abduction, 4 patients (13%) had pronation- external rotation (table 3).

Of all participants, 42 cases (70%) were male and 18 cases (30%) were female.

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Out of 30 cases 22 were males (73%) and 8 were females (27%).

Table 1: Showing the Gender Distribution of Patients:

Gender	Number of patients (percentage)
Male	22(73%)
Female	8(27%)

Table 2: Showing Age of Distribution:

Age of patients	Number of patients (%)
40-50	13(43.5%)
51-60	6(20%)
61-70	9(30%)
71-80	2(6.6%)

Table 3: Showing Classification by Lauge-Hansen, Which Considers Position of Foot at Time of Injury and Direction of Deforming Force

Mechanism of injury	Number of patients (%)
Supination - adduction	6(20%)
Supination – external rotation	12(40%)
Pronation - abduction	8(26.6%)
Pronation-external rotation	4(13.3%)

AOFAS score:

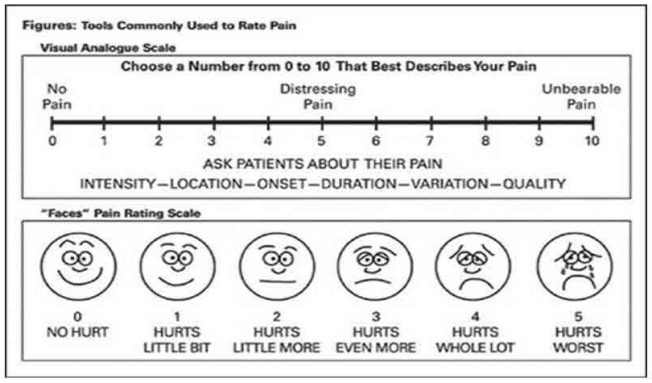
	Number	Mean
Pre-operative AOFAS	30	26.6
Post-operative AOFAS	30	73.4

AOFAS (American Orthopedic Foot and Ankle Society) Ankle-Hind Foot Scale:

Category	Criteria	Points
Pain (40 points)		
	None	40
	Mild, occasional	30
	Moderate, daily	20
	Severe, almost always present	0
Function (50 points)		
Activity limitations, support requirement		
	No limitations, no support	10
	No limitation of daily activities, limitation of recreational activities, no support	7
	Limited daily and recreational activities, can	4
	Severe limitation of daily and recreational activities, walker, crutches, wheelchair, brace	0
Maximum walking distance, blocks		
	Greater than 6	5
	4-6	4
	1-3	2
	Less than 1	0
Walking surfaces		
	No difficulty on any surface	5
	Some difficulty on uneven terrain, stairs, inclines, ladders	3
	Severe difficulty on uneven terrain, stairs, inclines, ladders	0
Gait abnormality		
	None, slight	8
	Obvious	4
	Marked	0
Sagittal motion (flexion plus extension)		
	Normal or mild restriction (30° or more)	8
	Moderate restriction (15° - 29°)	4
	Severe restriction (less than 15°)	0
Hindfoot motion (inversion plus eversion)		
	Normal or mild restriction (75%-100% normal)	6
	Moderate restriction (25-74% normal)	3
	Marked restriction (less than 25% normal)	0
Ankle-hindfoot stability (anteroposterior, varus-valgus)		
	Stable	8
	Definitely unstable	0

AOFAS Ankle-Hindfoot Scale, Subjective Portion (90 points total)

VAS (Visual Analogue Scale)



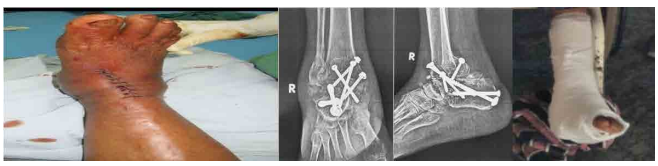
CASE 1:

A 52-year-old male malunited bimalleolar fracture of right ankle with no dnvd, Arthrodesis of right ankle at tibio-talar, talo-calcaneum was done with partial talectomy and iliac crest bone graft was placed. Pre, intra and post-operative period was uneventful, wound healthy, below knee slab was removed after 6 weeks. Range of movements were good. Weight bearing was started after 8 weeks post-operative

Preoperative image: x-ray of bimalleolar fracture of right ankle

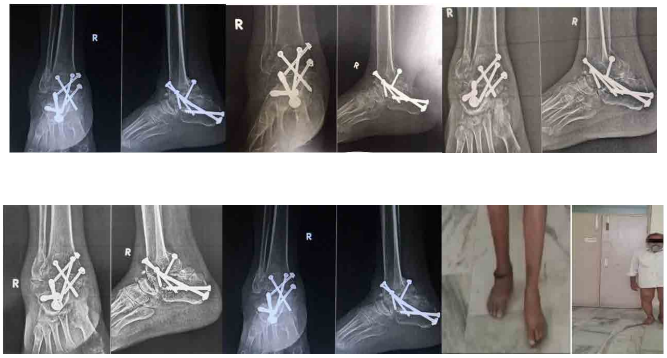
Intra operative images: Arthrodesis of right ankle with iliac crest bone graft

Post-operative images: showing healthy wound immediate postoperative x-ray and below knee slab



Follow up images:

At 1 month, 2 months, 3 months ,6 months and 9 months and weight bearing

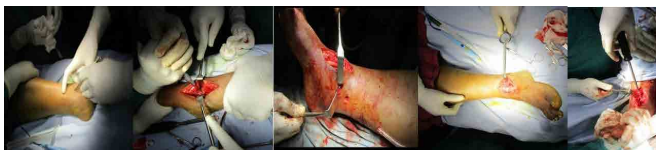


CASE: 2

A 58-year-old female with bimalleolar fracture of right ankle with no dnvd, with no comorbidities. Arthrodesis of tibio-fibular and tibio-talar was planned. Pre, intra and post-operative period was uneventful. Wound was healthy. Below knee slab was applied until 3 weeks postop. Weight bearing was started at 8 weeks postoperatively.

Preoperative Image: showing x-ray image of bimalleolar fracture of right ankle

Intraoperative Images: Arthrodesis of right ankle



Postoperative Images: showing healthy wound, below knee slab, follow up x-rays, weight bearing

DISCUSSION

Ankle fractures are 10 percent of all fractures and all fractures needs operative treatment[10] with plating or screw fixation. Tri malleolar is more common than uni or bimalleolar fractures.[5] But due to inability to adhere with medical follow-up, anticipation of noncompliance, and poor access to medical care. The fractures can lead to malunion and hence arthrodesis or arthroplasty or osteotomies are needed depending on presence of deformity. Surgical techniques[1] are usually complex in neglected cases to avoid intraoperative complications and do proper reduction to have a functional congruent joint.

In our study, we did arthrodesis procedure with cannulated cancellous screws and anatomical restoration of ankle is achieved. Arthrodesis[2] is done with anterior approach, whose disadvantage lies a risk of neurovascular injury and skin necrosis. We managed precisely. We did not record any neurovascular defects.

Screw fixations proved better by causing less hardware irritation, being cheap and less incidence of post-operative stiffness[12], arthritis[4], wound dehiscence compared to other methods.

Our study has some limitations such as the sample size, which is not large enough, and this method needs good bone quality. This study was done over a period of 38 months with rigorous follow up with 1,2,3,6,9 months. Management of neglected cases of ankle fracture is individualized according to the pattern of fracture, syndesmotic injury, talar injury, associated articular cartilage damage, ligaments injury, radiological signs of arthrosis, [9] age at the time of presentation, gender, occupation, patient expectation, and lifestyle. Neglected cases of ankle fracture[6] usually need more workup of radiological assessment, which will help proper preoperative planning.[3]

Partial weight bearing is started once fusion is confirmed on x rays, usually after 4 weeks and complete weight bearing[7] at two months. Poor outcomes[12] are usually due to poor surgical techniques and bad quality reduction. This Surgical treatment is recommended by our study as it aims to have stable, painless joint.

CONCLUSION

Primary indication of arthrodesis in acute cases is a painful stiff ankle joint. In our study, ankle arthrodesis by cannulated cancellous screw fixation could be proposed in the treatment of malunited ankle fractures more commonly. Guidelines are still needed for the management of cases with delayed presentation or neglected ones.

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Conflict of Interest: Nil

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Authors' Contribution: All authors contributed to the study conception and design, data collection, analysis and interpretation of results, and manuscript.

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