International Journal of Research in Orthopaedics
Opondo EA. Int J Res Orthop. 2019 Jul;5(4):546-550
http://www.ijoro.org

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20192616

Delayed surgical reconstruction of adult ankle malunion by supramalleolar osteotomy

Everisto A. Opondo*

Department of Surgery, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya

Received: 25 May 2019
Revised: 10 June 2019
Accepted: 11 June 2019

***Correspondence:**
Dr. Everisto A. Opondo,
E-mail: opondodr@gmail.com

ABSTRACT

Background: Malunion of the ankle fractures is a frequent cause of morbidity. The normal ankle is essential for normal mobility. Ankle malunion is a common cause of chronic pain, posttraumatic arthritis and work related disability. The importance of proper treatment of these injuries cannot be over emphasised. Lateral talar shift of only 1 mm decreases the tibio-talar contact area by 42%. This increases contact pressure stress by 36%. Together with instability this results in chronic pain and arthrosis.
Methods: A retrospective study was designed to review 21 cases reconstructed after several months to many years of neglect prior to this review. The case reports, operative records, X-rays and CT scans of the patients in addition to physical examination findings were analysed.
Results: Good to excellent results were achieved using basic orthopaedic instrument and implants. This technique is an important armamentarium to orthopaedic surgeons in the third world where late presentation of ankle fractures is common and ideal implants are scanty.
Conclusions: Good to excellent radiological and functional outcomes are achievable with proper preoperative planning and corrective supramalleolar osteotomies.

Keywords: Supramalleolar osteotomy, Malunion, Fibula lengthening

INTRODUCTION

Ankle fractures are a common cause of morbidity and disability following skeletal trauma. Ankle fractures are among the commonest of skeletal injuries with a reported incidence of 125/100,000/year.[1-6] Malunion is equally common with a reported occurrence of up to 68% in some studies.[1] The main objective of treating ankle malunion is to restore the anatomy of the ankle mortise, fibula length and orientation. Talar shift and tilt are normally caused by fibula shortening and malrotation.[2] Ankle fracture malunions are an important cause of chronic pain, functional impairment and ultimately post traumatic arthrosis.[1] In the young and working population this leads to loss of many man-hours because of the importance of the ankle joint in mobility.

Modes of treatment of ankle malunions are varied and controversial. Apparently stable fractures might in the course of treatment malalign and eventually heal as malunion. Malunion rates of upto 68% are reported in the literature.[1,7] Where resources are scarce and in areas where conservative management predominates it is essential to have some extra corrective skills for malunion instead of routinely offering patients arthrodesis of pains management.

The results of this study compare favourably with many other studies.[3,7-10] Its currently believed just like Weber (1972) that the fibula remains the main key pillar in the ankle joint biomechanics. That anatomic restoration of the ankle mortise is possible only by reinstatement of the

fibular length and rotation.[2] The purpose of this study is to report a cheap and reproducible technic to the trauma surgeons involved in the management of these injuries.

METHODS

A retrospective of review adult patients with old ankle malunion initially treated conservatively by casting were included. The patients were treated by surgical reconstruction by the author at selected private hospitals in Nairobi, Kenya between January 2015 and December 2017. The principal author was involved in the surgery of all the cases.

Data was collected using case reviews, radiographic findings, history and clinical examination. Pre-operatively, plain antero-posterior and lateral X-rays were done for both ankle joints. Where malunion was unclear on plain radiographs CT-Scans were done for the affected ankle joint. Fibula length and mal-rotation were studied and deficit corrected on the planning images using the technique of weber.[2]

Surgical technique

Informed consent was obtained from all patients after explaining the procedure. All the procedures were performed under spinal anesthesia. An intravenous second generation cephalosporin was given during induction of the anesthesia before the application of tourniquet. The surgery was conducted under intermittent intraoperative Fluoroscopy. In all the cases supra malleoli fibula osteotomy and one stage lengthening and correction of the mal-rotation was done. Tricortical bone graft was harvested from the ipsilateral tibial plafond and fixation done by 3.5 mm dynamic compression plates (Synthes). Medial malleolus osteotomy was always done first if mal-aligned then followed by correction using long 4.0 mm lag screws (synthes). The medial malleolus being done first facilitated easier eventual mobilization of the talus. Any other additional osteotomy depended on the images and intraoperative findings. In Weber type C sometimes a syndesmotic screw was fixed (Figure 1 and 2 A-D).

Follow up

Postoperatively, initially an incomplete back slab Dynacast was applied for 2 weeks. There after a complete cast was applied for 4 weeks. At 6-8 weeks any syndesmotic screws were removed and minimal partial weight bearing was commenced at 8 weeks. Normally at 3 months full weight bearing was commenced as dictated by the healing on check X-rays.

There after repeat X-rays were done at 4 months and 6 months of follow until union was achieved. The implants were removed any time after 18 months. All the patients were evaluated by clinical examination, the functional Olerud-Molander ankle score (OMAS) and the final X-rays.

RESULTS

In total only 21 patients fulfilled the criterion for inclusion into this study. Fourteen female and seven male patients were recruited into the study. Ages ranged from 20 to 50 years. Majority of the (14) patients were aged between 40- 50 years and of these 10 were females. The durations from time of the fracture to malunion varied from 6 months to 3 years (Table 1). Accurate evaluation is essential for good outcome. When in doubt CT scan of the ankle was done for further analysis (Figure 2D). In one patient with chronic ankle pains at one year post injury the X-rays (Figure 1) showed only subtle changes (Figure 2A-C). But a CT scan of the same patient was more revealling of the malunion (Figure 2D).

Table 1: Duration of malunion prior to reconstruction (n=21).

Months	Male	Female	Total
3-6	4	3	7
7-12	2	7	9
13-36	1	4	5
Total	7	14	21

Table 2: Distribution of the functional results after surgical ankle reconstruction by the Olerud-Molander (OMAS) ankle score (n=21).

OMAS scores	Totals
Excellent (91-100)	12
Good (61-90)	7
Fair (31-60)	2
Total	21

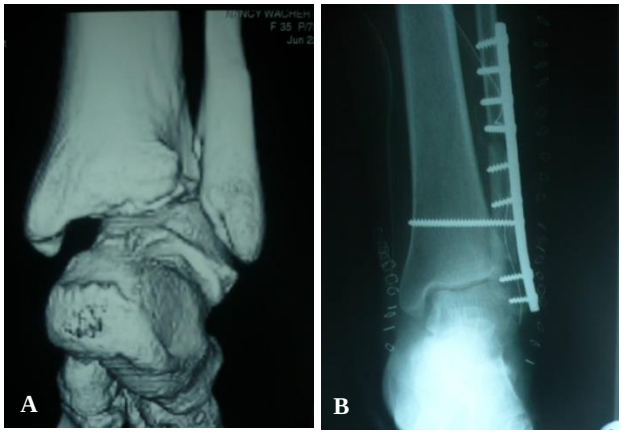

Figure 1 (A and B): 49 year old female managed by dynacast for 8 weeks and subsequently operated 3 months later.

It is reasonable to compare the normal side to the painful side because of individual variations. This patient was managed by one stage fibula lengthening and bone grafting. She was asymptomatic on final follow up.

The duration between the primary injury and reconstruction ranged from months to years but the rediolgical results were excellent (Figure 1). The average duration of surgery was 2 hours, hospital stay 3 days and then casting was done for 4 weeks. Partial weight bearing commenced after 4 weeks and full weight bearing when union was complete.

In all cases patients were full weight bearing by 3 months. There was no long term loss of reduction. The main outcome evaluation measurement instrument was the Olerud & Molander score (OMAS).[5] The functional outmes was excellent 12 patients post surgery (Table 2, Figures 3 A-F). Despite the small numbers most patients had good to excellent results. The 2 patients with fair results were obese and this could have contributed to their fair functioonal results but their X-rays revealed anatomical alignment (Figure 4). In this study no patient had poor results. A further detailed analysis of the OMAS score is shown on Table 3.

Figure 2 (A-C): Left ankle weber C fracture treated in a cast seen on 2nd and 3rd X-ray; (D) Bilateral CT scan evaluation of patient with X ray in figure 1 after complaining of ankle pain for one year showing left talar tilt on coronal view and axial view showing increased fibula rotation.

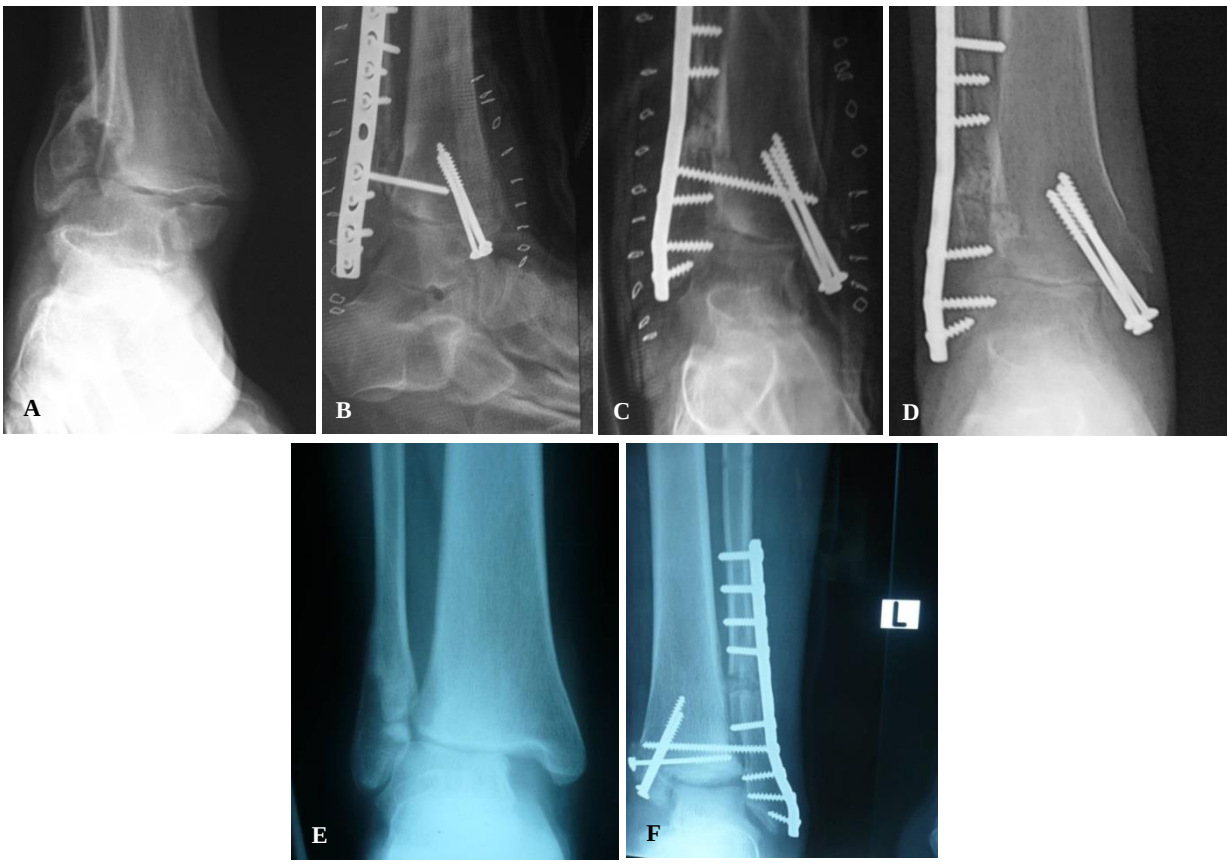

Figure 3 (A-C): Malunion corrected after 3 years; (D) 33 year old female operated after 3 years after removal of the syndesmotic screw; (E , F) adult female with malunion and syndesmotic disruption pre-operative and post operative X rays.

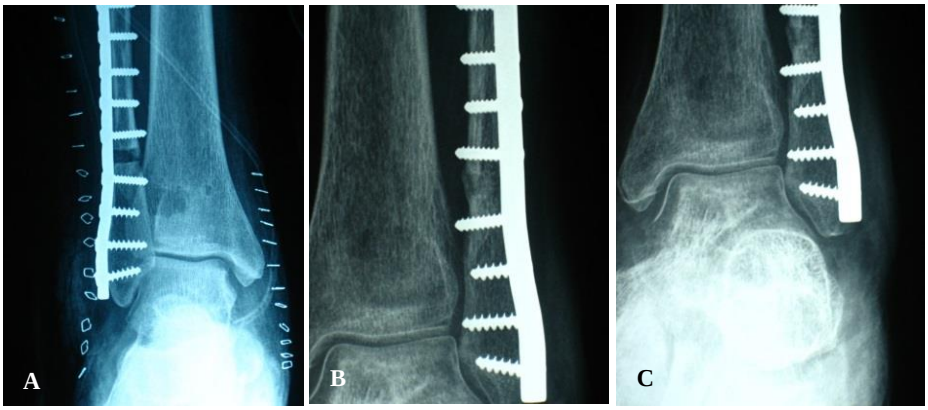

Figure 4 (A-C): Patient after surgical reconstruction with serial X-rays revealling anatomical alignment.

Table 3: Olerud and Molander score detailed analyses (n=21).

Parameter	Degree and score (Max 100)	Total score (Max 100)
Pain	None (25)	15
	While walking on uneven surface (20)	6
	While walking on even surface (10)	0
	While walking indoors (5)	0
	Constant and severe (0)	0
Stiffness	None (10)	16
	Present (0)	5
Swelling	None (10)	10
	Only evenings (5)	5
	Constant (0)	6
Stair climbing	No problem (10)	14
	Impaired (5)	7
	Impossible (0)	0
Running	Possible (5)	12
	Impossible (0)	9
Jumping	Possible (5)	12
	Impossible (0)	9
Squatting	No problem (5)	16
	Impossible (0)	5
Supports	None (10)	18
	Strapping used (5)	3
	Stick or crutch used (0)	0
Work and activity of daily living	Same as before injury (20)	12
	Loss of temporary function (15)	5
	Change of simple job (10)	4
	Severely impaired work capacity (0)	0

DISCUSSION

Ankle fractures are a common injury that results in significant morbidity if complicated by malunion. The reported incidence globally is around 125/100,000/year.[5,6] Studies show that with good early treatment of unstable fractures good to excellent results vary from 60-90 percent from different series.[5,6,8,11,12]

Late presentations of ankle fractures are not infrequent in the developing world. This could be attributed to scarcity of health facilities, specialists and lack of finances. I am not aware of any study in the developing world describing a corrective technique for ankle malunion using fibula osteotomy and lengthening. It is essential that specialists in this region have skills to manage these common and disabling injuries with good outcomes.

Where studies have been done the incidence of ankle fracture malunion is 5-68%.[1-3] The wide variation is because of the large variation in fracture types and treatment modalities. Giannini et al in their recent review

of 22 patients found only 2 with poor results.[7] The correction of malalignment was maintained in there review of 20 cases in 2012, and they also found that even in delayed fractures treatment was as quick and good as in fresh fractures.[9] In one of the largest studies involving 1822 patients, and 5 year follow up, the authors concluded that in fresh fractures with optimal surgical reduction and internal fixation 79.3% had good to excellent results.[5] In a study of the functional outcome of ankle fracture fixation after 5 years utilizing the Olerud and Molander score by Shah reported 62.0% of patients attained the pre-injury level of physical activities.[1] Half (50.7%) of their patients still complained of some sort of pain. In our case slightly less than half complained of some pain in strained conditions (Table 3). 63% of their patients still complained of stiffness as compared to slightly less the half in our cases. Fresh ankle fractures surgical fixation does not yield 100% good results. Studies show that excellent results are in the region of 70% after optimal reduction and fixation.[1,5] The results of late correction are nearly similar to fresh cases.

CONCLUSION

Supramalleolar osteotomy and fibula lengtheninig for delayed ankle reconstruction is a reliable mode of treatment of ankle malunion after conservative fractures management.

ACKNOWLEDGEMENTS

The hospitals for allowing access to the patients records and publication.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Opondo EA. Delayed surgical reconstruction of adult ankle malunion by supramalleolar osteotomy. Int J Res Orthop 2019;5:546-50.