

# Outcome of ankle arthrodesis in posttraumatic arthritis

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## ABSTRACT

**Background:** Ankle arthrodesis is still a gold standard salvage procedure for the management of ankle arthritis. There are several functional and mechanical benefits of ankle arthrodesis, which make it a viable surgical procedure in the management of ankle arthritis. The functional outcomes following ankle arthrodesis are not very well known. The purpose of this study was to perform a clinical and radiographic evaluation of ankle arthrodesis in posttraumatic arthritis performed using Charnley's compression device.

**Materials and Methods:** Between January 2006 and December 2009 a functional assessment of 15 patients (10 males and 5 females) who had undergone ankle arthrodesis for posttraumatic arthritis and/or avascular necrosis (AVN) talus ( $n=6$ ), malunited bimalleolar fracture ( $n=4$ ), distal tibial plafond fractures ( $n=3$ ), medial malleoli nonunion ( $n=2$ ). All the patients were assessed clinically and radiologically after an average followup of 2 years 8 months (range 1–5.7 years).

**Results:** All patients had sound ankylosis and no complications related to the surgery. Scoring the patients with the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot scale, we found that 11 of the 15 had excellent results, two had good, and two showed fair results. They were all returned to their preinjury activities.

**Conclusion:** We conclude that, the ankle arthrodesis can still be considered as a standard procedure in ankle arthritis. On the basis of these results, patients should be counseled that an ankle fusion will help to relieve pain and to improve overall function. Still, one should keep in mind that it is a salvage procedure that will cause persistent alterations in gait with a potential for deterioration due to the development of subtalar arthritis.

**Key words:** Ankle arthritis, ankle arthrodesis, outcome of ankle arthrodesis

## INTRODUCTION

The ankle arthroplasty has been used to treat ankle arthritis patients, however the traditional operative treatment for ankle osteoarthritis has been tibiotalar arthrodesis.<sup>1-3</sup> Those patients who do not respond to nonoperative treatment modalities are candidates for ankle arthrodesis, provided pathologic changes in the subtalar region can be ruled out. Ankle arthrodesis has been accepted as a salvage procedure.<sup>4</sup> Since 1879, when Albert first described arthrodesis of the ankle,<sup>5</sup> more than 30 different techniques have been described. The open technique with compression and internal fixation is still widely

used for ankle arthrodesis with major deformity.<sup>6</sup> A modified Blair's technique has been described where the talar body is preserved,<sup>7</sup> but this procedure is technically demanding. Since all the ankle motion is lost after arthrodesis, some investigators have turned to total ankle replacement, but joint replacement is not always successful even in more favorable joints. This study presents intermediate term followup functional outcome of patients with ankle arthrodesis in posttraumatic arthritis.

## MATERIALS AND METHODS

15 patients of ankle arthrodesis operated for ankle arthritis between January 2006 and December 2009 were included in study. There were 10 males and 5 females. All the patients had posttraumatic arthritis secondary to avascular necrosis of talus ( $n=6$ ), malunited bimalleolar fracture ( $n=4$ ), distal tibial plafond fractures ( $n=3$ ) and medial malleoli nonunion ( $n=2$ ) [Figure 1a]. All the 15 patients had undergone open ankle fusion by anterolateral approach [Figure 1b] in supine position under tourniquet control and spinal anesthesia. Compression was achieved using Charnley's compression device and an additional calcaneotibial Steinmann's pin to maintain the desired alignment (neutral flexion, 0°–5° of valgus, 5°–10° of external rotation with slight posterior displacement of the talus, Figures 1c-f, 2a-d, 3a-e). The patient was made ambulant with non weight bearing on operated site after 48 hours. All the patients were evaluated

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clinically and radiologically at 6 weeks and tibiocalcaneal Steinmann's pin was removed and the patients were allowed to bear weight as tolerated with Charnley's compression device *in situ*. The Charnley's compression device was removed after 12 weeks and below knee walking cast was applied. Walking cast was removed once the radiological features showed bridging trabecular bone across the arthrodesis site [Figures 1e,f, 2c and 3c,d].

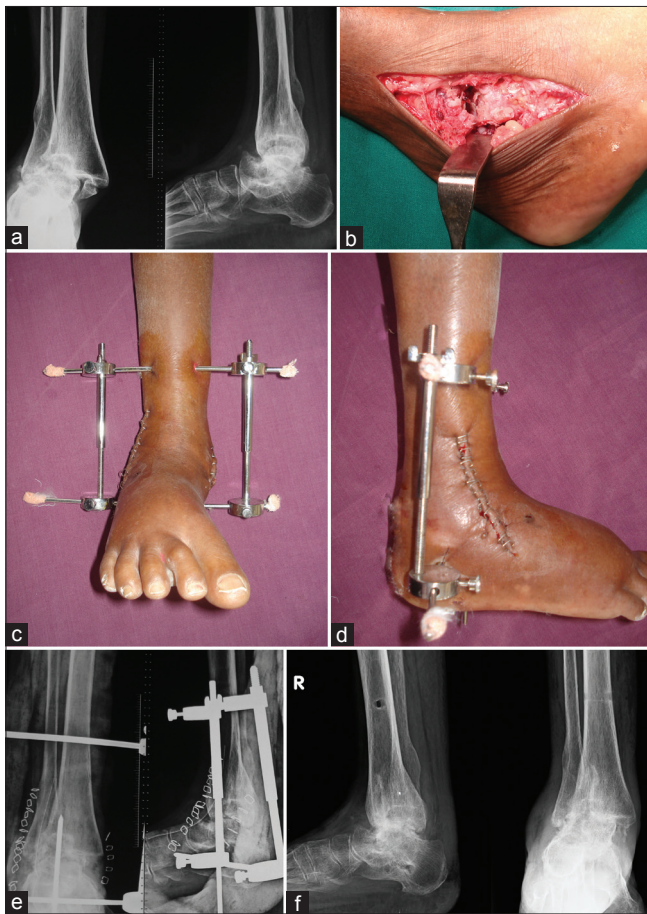
Cases with minimum followup of 1 year were considered for clinical evaluation. The patients were questioned for pain during daily activities. A complete orthopedic examination to evaluate, gait, limb length discrepancy, range of motion of the knees, ankles, and subtalar joints, neurovascular status, muscle strength, and presence or absence of tenderness and swelling. Special attention was made to the position of the fused ankle and the motion of the subtalar and midtarsal joints. Any valgus or varus deformities of the heel and the presence of the callosities were also determined. Ankle AP and lateral X-rays were taken to assess the fusion and

position of the arthrodesis. The opposite normal limb was used for comparison.

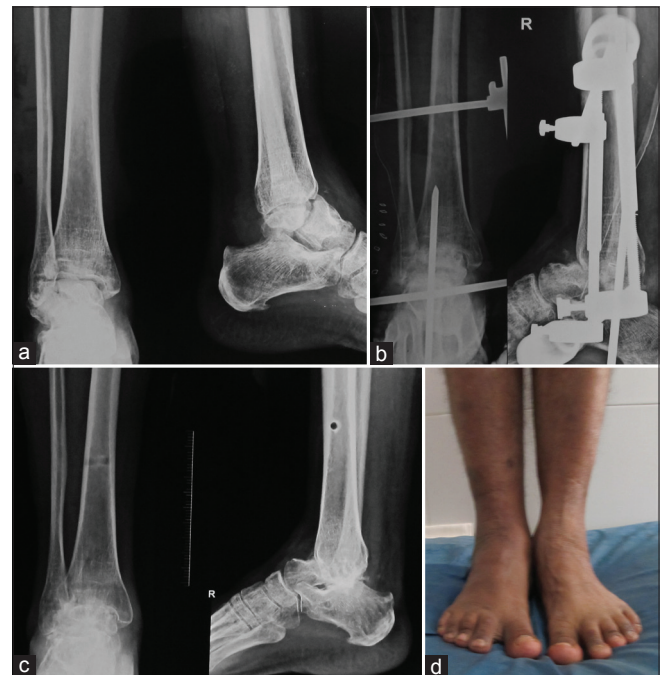
American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot scale was used to assess the results [Table 1]. The main emphasis of this system was on pain and the functional activities. A normal person would score 100 points. Because of lack of ankle motion, the maximum score that the patient with an ankle fusion could have was 92, since they could not earn the 8 points given for the full range of motion. A score of 80–92 was considered an excellent result, 70–79 a good result, 60–69 a fair result, and score less than 60 was considered a poor result. This scoring system was modified similar to the one used by Mazur *et al.*<sup>5</sup>

### RESULTS

The sound union occurred in all patients. Ankle fusion was achieved at an average of 20.6 weeks (range 15–28 weeks). We had three cases of cellulitis of ankle and foot during the initial few weeks, which was treated successfully with antibiotics, and five cases of pin tract infection which was healed completely after fixator removal. None of these led to deep infection. The mean age at the time of surgery was 40.52 years range (24–56 years) and the mean time of followup was 2.8 years (range 1-5.7 years). There were no complications related to the surgery. They were all returned



**Figure 1:** (a) X-ray right ankle AP and lateral showing arthritic changes secondary to nonunion medial malleolus; (b) anterolateral approach to ankle; (c) immediate postoperative photo showing fixator *in situ*; (d) immediate postoperative photo showing fixator *in situ*; (e) immediate postoperative X-ray ankle showing fixator *in situ*; (f) 2 year 3 months followup X-ray right ankle AP and lateral showing union of ankle arthrodesis



**Figure 2:** (a) Preoperative X-ray right ankle AP and lateral showing arthritic changes secondary to fracture neck of talus; (b) immediate postoperative X-ray ankle with fixator *in situ*; (c) 2 year followup X-ray ankle showing solid union; (d) 2 year followup clinical photo showing not much difference compared to left side



**Figure 3:** (a) Preoperative X-ray of right ankle showing arthritic changes; (b) immediate post-op X-ray AP showing fixator *in situ*; (c) 2 year 6 months followup X-ray ankle AP showing union of arthrodesis; (d) 2 year 6 months followup X-ray ankle lateral view showing union; (e) 2 year 6 months followup clinical photo showing not much difference compared to left ankle

to their preinjury activities. Wearing shoes with appropriate heels in patients with more than 5° of equinus deformity, all the patients could walk on level ground without support. All the patients stated that they could walk up and down the stairs and hills without much difficulty.

Limb length discrepancies were insignificant (0.5–1.5 cm) except in one patient who had 2.5 cm secondarily due to distal tibial plafond fracture. The X-rays of six cases showed some evidence of degenerative changes in the subtalar joints, which did not correlate with the symptoms.

Scoring the patients with the AOFAS Ankle-Hindfoot scale, we found that 11 of the 15 had excellent results, two had good, and two showed fair results. The patients with fair results were those with complete AVN of the talar body where most of the necrotic bone has to be removed during surgery. One fusion had 5° of equinus deformity which was compensated with footwear.

## DISCUSSION

The patients with solid ankle fusion in this study functioned very well during the activities of normal daily living. All of them could walk on the level ground without pain. The fusion had permitted them to return to their former occupations and recreational activities. Our results were comparable with the results of the study done by Eylon S *et al.*<sup>6</sup> On this basis, all the patients could be classified as having very satisfactory results.

Six of the 15 could not run. Three had some minor discomfort after walking long distance. When good surgical

**Table 1: AOFAS Ankle-Hindfoot Scale (100 points total)**

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, cane	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 150)	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
Alignment (10 points)	
• Good, plantigrade foot, midfoot well aligned	15
• Fair, plantigrade foot, some degree of midfoot malalignment observed, no symptoms	8
• Poor, nonplantigrade foot, severe malalignment, symptoms	0

technique is used in carefully selected patients without the involvement of subtalar joint, ankle arthrodesis can be a reliable procedure for the relief of functionally disabling ankle arthritis, deformity, and pain.<sup>7</sup> The ankle arthrodesis is still the treatment of choice for most disabling ankle arthritis.<sup>9</sup> The high level of satisfaction in this group of patients reinforces the view that open arthrodesis, as opposed to ankle replacement or arthroscopic arthrodesis, continues to be the treatment of choice when there is severe varus or valgus deformity associated with the arthritis.<sup>10</sup> Although ankle arthrodesis may provide good early relief of pain, it is associated with premature deterioration of other joints of the foot and eventual arthritis, pain, and

dysfunction.<sup>11,12</sup> In studies ranging in size from 12 to 101 patients, rates of successful primary ankle fusion of 80–100% have been reported earlier.<sup>13-20</sup> In other studies ranging from 5 to 62 patients, substantial pain relief ranging from 80 to 100% was reported after successful fusion.<sup>17-24</sup>

To be considered as an alternative preferable to arthrodesis, a total ankle replacement should give better results than those presented here, without other disadvantages. Patients with rheumatoid arthritis and involvement of ankle may not meet the criteria for an ankle arthrodesis, may be because they have involvement not only of the ankle but also of the small joints of the foot, so that these joints cannot compensate for the fused ankle.<sup>25</sup> Therefore, patients with rheumatoid arthritis may be better candidates for the total ankle replacement.<sup>25</sup>

In this intermediate term following an arthrodesis for the treatment of end-stage ankle arthritis, pain is reliably relieved and there is good patient satisfaction. Subjectively and objectively, the patients with ankle fusion function quite well in ADL provided they have enough compensatory motion in the Chopart's and Lisfranc joints of the foot, the other ankle has a normal range of motion, and they wear footwear with appropriate height. On the basis of these results, patients should be counseled that an ankle fusion will help to relieve pain and to improve overall function; however, it is a salvage procedure that will cause persistent alterations in gait with a potential for deterioration due to the development of ipsilateral hindfoot arthritis.

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