



Role of ankle arthrodesis in traumatic and non-traumatic diseases: A study of 20 cases

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Abstract

Introduction: Ankle arthrodesis is a common procedure for fusion of the distal part of the tibia and the talus. The indications vary from arthritis (post-traumatic), inflammatory conditions, degenerative conditions and avascular necrosis of the talus to extreme deformities of the ankle. Ankle arthrodesis, which accounts for more than 85% of ankle surgeries. This article is intended to study functional outcome of ankle arthrodesis in ankle arthropathy.

Material and Methods: This article contains a prospective study of 20 patients with a mean age of 44.8 years, males – 15 and females -5, who underwent ankle arthrodesis for the diagnosis of traumatic arthritis (18 patients), charcot ankle arthropathy (1 patient) and rheumatoid arthritis (1 patient), with a follow up period of 12 months.

Results: Out of 20 patients, 95% showed radiological union at follow up period of 12 months and 17 patients had good to excellent functional outcome using AOFAS score. Mean AOFAS ankle hindfoot scale at 12 months was 72.85 with standard deviation of 12.04.

Conclusion: For patients with ankle arthritis the gold standard salvage procedure is ankle arthrodesis, as the procedure effectively relieved the pain of patients and corrected the deformity, hence helped them to return to the Activities of Daily Living with minimal complications and near complete functional recovery subjectively.

Keywords: ankle arthrodesis, ankle arthritis, intramedullary transcalcaneal nail

Introduction

Ankle joint and subtalar joints are two crucial components of ankle hind foot complex for the normal activity and flexibility around the ankle area for weight bearing, walking and other strenuous activities. Ankle and subtalar joints can be damaged due to various causes like injuries, developmental disorders, infective disorders or chronic tendon dysfunction at ankle joint or hind foot. This can cause severe pain, deformity and walking dysfunction for those patients who do not obtain satisfactory efficacy from conservative treatment, surgical treatment might relieve pain and restore function. Tibiotalar joint replacement plus fusion of subtalar joint was previously proposed^[1]. However this surgery is complicated and has uncertain long term outcomes.

Ankle arthrodesis is a common procedure for fusion of the distal part of the tibia and the talus. The indications vary from arthritis (post-traumatic), inflammatory conditions, degenerative conditions and avascular necrosis of the talus to extreme deformities of the ankle. Ankle arthrodesis, which accounts for more than 85% of ankle surgeries^[2].

Ankle arthrodesis was first described in 1879 by Albert and has proven to be an effective means to treat ankle arthritis. It still remained the gold standard solution for end stage arthritis or instability of the ankle,

Against which other surgical procedures are compared. Charnley in 1951 was the pioneer in utilizing and proving the effectiveness of compression across a fusion site for bone healing using his innovated uniplanar clamp that takes his name. He found from his experience that ankle joint does not possess the same natural potential for bony union as exists in the other joints and attributed this mostly to the ischemic nature of the body of the talus in the arthritic ankle^[3].

Materials and Methods

Twenty Patients aged between 20-65 years, diagnosed with ankle arthropathy, visiting outdoor or emergency of Kalpana Chawla gov't medical college Karnal between June 2018 to 2019 were included in this prospective study.

The indications for ankle arthrodesis include traumatic arthritis, Charcot joint arthropathy, rheumatoid arthritis. Contraindications to the technique include Class 1, 2 and 3a of Takakura classification of ankle arthritis, infection of the skin through which the approach was planned and open injuries.

Patients not fit for the surgery due to anesthetic or other comorbidities were excluded from the study.

Patients were followed for 12 months and outcome was evaluated with American Orthopedic Foot and Ankle Society (AOFAS) score.

Surgical Technique

Optimal Position

The ideal position in which the ankle is fused involves the ankle being held in neutral dorsiflexion / plantar flexion, 5° of valgus, 5° to 10° of external rotation and slightly posteriorly displaced talus relative to the calcaneum [4,5].

Technique for Open arthrodesis

Any of the 4 methods (Tibiotalar calcaneal arthrodesis, anterior approach with plate fixation, arthrodesis with external fixation, Tibiotalar arthrodesis with screws) as per the surgeon's preference and familiarity with the technique were employed.

In the post-operative period strict limb elevation, with below knee slab immobilization was done for 48-72 hours. Intra venous antibiotics one dose pre-operative and post-operative for 3-4 days were used and were later converted to oral prophylactic dosage. Suture removal was done on 15th post-operative day and slab was converted to below knee cast and advised with non-weight bearing ambulation for 4 months. Thereafter, the follow up x-rays were taken and the patient was mobilized with toe touch weight bearing while full weight bearing ambulation was allowed over a period of next 3 weeks.

Results

Twenty patients (15 males and 5 females) with a mean age of 44.8 years underwent ankle arthrodesis for diagnosis of traumatic arthritis (18 patients), Charcot arthropathy (1 patient) and rheumatoid arthritis (1 patient). At 1 year of follow up we observed radiological union was achieved in 95 % patients. We, at 12 months follow up, obtained a functional outcome score of 72.85 (23 to 82) with standard deviation of 12.04 using AOFAS Ankle Hind foot Scale Total Score.

Complication

Fifteen percent patients had superficial infection, 20% patients had slight residual equinus ranging from 5° to 10°, 15% patients had delayed wound healing, 5% patients developed callosities on the foot, 5% patient had nonunion, 5 % had pin tract infection and one patient with deep infection landed into nonunion.

Discussion

The goals of ankle arthrodesis are relief of pain and deformity and the development of a solid fusion. Numerous techniques and devices have been described and created to achieve these goals.

In our present study age of the patient ranged from 20 years to 65 years at the time of surgery. The overall average age was 44.8 years. Average age in traumatic patients was 46.27 years, in Charcot joint patient, age was 30 years and in Rheumatoid arthritis patient age was 33 years.

Similar observations have been reported by other authors also. BS Narayana Gowda *et al.* [6] (2012) observed mean age of 40.52 years at the time of surgery. Balaji SM *et al.* [7] (2017) observed

mean age of 50 years.

In our present study the right ankle was operated on 13 cases and 7 on the left ankle, which comprises 65% and 35% of total cases respectively. Popelka S. *et al.* [8] (2010) operated on right limb in fifteen cases and the left foot in eleven cases which comprise of 57.7% and 42.31 % of the total cases respectively.

In our present study of 20 cases, 15 (75%) cases were male and 5 (25%) cases were females. BS Narayana Gowda *et al.* [9] (2012) observed 10 males and 5 females that is 66.67% males and 33.33% females.

In present study of 20 cases, majority of cases were post traumatic i.e. 18 (90%) while we had one case of Charcot joint arthropathy and rheumatoid arthritis each. Valderrabano V *et al.* [10] (2009) evaluated data from 390 patients (406 ankles) and concluded that post traumatic ankle OA was seen in 78% of the cases (n = 318), secondary arthritis in 13% (n = 52), and primary OA in 9% (n = 36). Hence, it is concluded that trauma is the most common cause of ankle arthritis.

We achieved Radiological union in 95% of the cases at 12 month follow up, while Mendicino *et al.* [11] achieved union rate of 95% at average 17 weeks follow up Similarly, BS Narayana Gowda *et al.* [9] (2012) who achieved the sound union in all patients at an average of 20.6 weeks (range 15–28 weeks). Felix NA *et al.* [12] (1998) observed union was achieved in 25 of 26 (96%) ankles. Hiranya kumar S. [13] observed union rate of 96.55% at an average 16 weeks follow up. (Refer TABLE1)

Using AOFAS ANKLE HINDFOOT SCALE TOTAL SCORE for evaluation of functional outcome of arthrodesis, we observed mean AOFAS score of 72.85 (23 to 82) with standard deviation of 12.04 at 12 month follow up, which is considered to be good as per Gowda N.B.S. *et al.* (2012) [9] BS Narayana Gowda *et al.* [9] (2012) scored the patients with the AOFAS Ankle-Hindfoot scale and found that 11 of the 15 had excellent results (80-92), two had good (70-79), and two showed fair results (60-69). Chou LB *et al.* [14] (2000) observed the patients scored an average of 66 on the ankle-hind foot scale following surgery. BC Thiago *et al.* [15] (2014) observed average score of 69, Boer *et al.* [15], with a mean of 70 points in this regard. Hamett *et al.* obtained an average of 63 points [16]. (Refer Table 2)

We obtained good results of arthrodesis. This procedure helped patients to relieve pain reliably and improve overall function. There was good patient satisfaction. Subjectively and objectively, the patients with ankle fusion function quite well in Activities of Daily Living. Ankle arthrodesis can still be considered as a gold standard salvage procedure for the management of ankle arthritis. Commonly encountered complications were residual equinus (20% cases), superficial infection (15% cases) and delayed wound healing (15% cases), which were managed effectively by one or the other intervention. Only one case had callosities on the sole of foot and one case had deep infection which landed into infective nonunion and implant failure.



Fig 1: Ankle arthrodesis with screws



Fig 2: Ankle Arthrodesis with Transcalcaneal Nail

Table 1: Radiological Union

Study	Union rate (%age)
Mendicino <i>et al.</i> [11]	95%
BS Narayana Gowda <i>et al.</i> [9]	100%
Felix NA <i>et al.</i> [12]	96%
Hiranyakumar S. [13]	96.55%
Present study	95%

Table 2: AOFAS Hind Foot Average Score

Study	Aofas Ankle Hind foot Average Score
CHOU LB <i>et al.</i> [14]	66
BC Thiago <i>et al.</i> [15]	69
Boer <i>et al.</i> [15]	70
Hamett <i>et al.</i> [16]	63
Present study	72.85

Conclusion

From this study, we concluded that for patients with ankle arthritis the gold standard salvage procedure is ankle arthrodesis, as the procedure effectively relieved the pain of patients and corrected the deformity, hence helped them to return to the Activities of Daily Living with minimal complications and near complete functional recovery subjectively. However, as this is a salvage procedure, alterations in gait and potential for deterioration due to development of arthritis in the adjacent joints may be the long term complications.

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