

Functional Outcome of Subtalar Arthrodesis in Post-traumatic subtalar Arthritis in fracture calcaneum

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Abstract

Introduction: Involvement of the subtalar joint in fracture calcaneus malunion may give rise to chronic pain and permanent functional impairment. This study evaluated the functional result of subtalar joint fusion and effectiveness of a technique using double lag screw from the posteroinferior calcaneus to the talus.

Materials and Methods: In between JULY 2019 and July 2020, we performed 10 isolated subtalar arthrodeses by double lag screw technique from posteroinferior calcaneus to talus. The average patient age was 39 (range 28–50) years. There were 7 males and 3 females. All the cases were followed for upto 8 months after the procedure.

Results: 9 out of 10 joints were fused except one who developed infection, resulting in an overall fusion rate of above 90%. The average time for fusion was 4.5 months (ranging from 3 to 6 months). There was no correlation between the type of accident, the weight of the patient, and the recovery period.

Conclusion: Using the double lag screws of 6.5 mm across the posterior facet of subtalar joint resulted in fusion of joint in about 90% of patients. The relief from pain was obtained in 90% of cases. This is a simple and reliable technique for achieving fusion of the subtalar joint.

Keywords: Arthritis, chronic pain, subtalar arthrodesis

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I. Introduction

The subtalar joint is a complex diarthrodial joint formed by the articulating surfaces of the anterior, middle, and posterior facets of the talus bone above and the calcaneus bone below. The primary function of the subtalar joint is to invert and evert the hindfoot and effectively transmit the load from ankle to foot. The subtalar joint, therefore, facilitates ambulation and shock absorption during gait and on uneven ground surfaces but also plays an important role in foot and ankle proprioception and propulsion during the gait cycle.

Since the majority of calcaneal fractures are intra-articular and result in articular surface disruption. Attempts at surgical correction and fixation of these injuries as best possible are common. Intra-articular fracture of the calcaneum predisposes to subtalar joint degeneration (known as arthritis) via trauma-induced chondrocyte death and abnormal loading (contact pressures) that result from residual joint incongruity or malalignment[1]. As a result, advanced subtalar joint arthritis may be associated with significant limitation in performing both recreational and work-related activities.

Anatomical reduction of the subtalar joint and restoration of hindfoot alignment as much as is feasible following injury are critical to optimizing patient outcome after calcaneal trauma. Although subtalar arthritis is known to be the most common complication of most intra-articular calcaneal fractures, surgical reduction and fixation have been shown to maximize joint longevity and significantly slow the need for early fusion surgery[2-5]. Nonetheless, by virtue of the fact that many of these patients are often young at the time of injury and by definition, damage a bone and joint complex that is forced to do more work and bear more load than most other parts of the body, many still end up facing the need for a second fusion procedure in their lifetime.

Painful arthritis and deformity are common sequelae after calcaneal fractures, the majority of which involve the subtalar joint. Other concerns are loss of height of calcaneum, soft tissue or tendon impingement, and flattening of longitudinal arches.[6,7] This bone supports all of one's weight, helps maintain alignment and function of the structures around it, and comprises a significant portion of the subtalar joint above it which functions as the primary inverter and everter of the foot to facilitate accommodation on uneven surfaces. Disturbance of these relationships as a result of trauma to the bone and joint can therefore have profound consequences—making anatomic reduction and realignment critical during surgical fixation of calcaneal fractures for delaying the deterioration of the subtalar joint. Unfortunately, even in the best of circumstances

many patients still go on to develop post-traumatic arthritis after calcaneal fracture, and unfortunately, there has yet to be a successful way to replace this joint once it has been damaged.

Conservative treatment options for post-traumatic subtalar arthritis include activity modification, orthoses, and corticosteroid injections. Minimally invasive procedures including arthroscopic debridement may provide relief, but are usually only temporizing. Arthrodesis—or fusion—has historically been the most reliable and definitive form of treatment once conservative measures are no longer adequate—and generally results in improved clinical outcomes if successful.

Subtalar arthrodesis is a well-tolerated treatment for alleviating some of the most common symptoms that arises from advanced post-traumatic subtalar arthritis. The primary goals of this surgical procedure are to mitigate pain, restore alignment, and confer improved stability of the hindfoot by eliminating painful motion, arthritis, and deformity at the subtalar joint through fusion.

When only fusion is indicated for the calcaneus and subtalar articulation then an in-situ arthrodesis can be performed with a 90% chance of success. When hindfoot realignment is also required, in order to improve altered mechanics or shoe-ability, additional, more complex procedures must be concomitantly performed to correct distorted anatomy, such as bone block grafting, osteotomy, tendon relocation or release, and other intervention. The aim of this study was to evaluate the functional outcome of subtalar arthrodesis along with 6.5 mm cannulated screws fixation to treat post-traumatic arthritis.

II. Materials and Methods

In between July 2019 and April 2021, we performed 10 isolated subtalar arthrodeses by double lag screw technique from posteroinferior calcaneum to talus. The initial trauma was a fall from a height in 8 patients and a bike accident in 2. The average patient age was 39 (range 28–50) years. There were 7 males and 3 females.

Inclusion criteria :-

- 1) Posttraumatic unilateral subtalar Arthritis.

Exclusion criteria :-

- 1) Bilateral subtalar arthritis
- 2) Primary subtalar arthritis
- 3) Inflammatory subtalar arthritis
- 4) Subtalar dislocation
- 5) Talocalcaneal coalition
- 6) Posterior tibial tendon dysfunction
- 7) Presence of active infection around subtalar joint
- 8) Presence of vascular compromise at the level of hindfoot
- 9) Presence of medical comorbidities
- 10) Arthritis involving multiple joints.

The indication for operation was severe pain and disability in an incongruent subtalar joint [Figure 1]. The average duration of the presentation of the patient was 14 months (range 10–

18 months) after the initial trauma. All patients had calcaneum height and talar declination angle within normal limits. All patients presented with the complaints of severe hindfoot pain, which was not relieved by conservative measure such as analgesics, orthosis and physiotherapy. All patients were clinically, radiographically, and functionally evaluated. The clinical rating system of the American Orthopedic Foot and Ankle Society (AOFAS) was used for the clinical evaluation postoperatively. On clinical examination, tenderness was elicited on palpation over the lateral side of the ankle and heel.

Operative procedure

After taking informed and written consent regarding the loss of eversion and inversion movements at subtalar joint, the patient is taken in supine position on operating table. Tourniquet was applied in the proximal thigh after exsanguinations of affected lower limb. Painting and draping were done of affected lower limb upto the iliac region for harvesting bone graft. The operation was performed under spinal or general anesthesia. A lateral curvilinear incision was made to approach the talocalcaneal joint. After dissecting the talocalcaneal joint capsule, joint surface is prepared by removing all of cartilage at articular surface of both talus and calcaneum by using osteotome and curette. The bone surface is roughened to stimulate bleeding via drilling. Anatomical reduction and alignment achieved at subtalar joint with keeping subtalar joint in 5-10 degree valgus position via traction and manipulation. Bone graft was inserted into the gap which remained after achieving alignment at subtalar joint which was harvested from the autologous iliac crest. Two 6.5 mm partially threaded cannulated

screws were inserted from the calcaneum to the talus over the preinserted guide-wire under c-arm [Figures 2,3 and 4]. The bleeding allows the two bones to heal together after the joint is fixed with screws. At the end of the procedure, the tourniquet was released, and thorough wash was done with saline, followed by subcutaneous closure with absorbable suture and skin closure with non-absorbable suture and below knee slab was applied for 14 days. Post operative radiographs were taken to evaluate at the end of the procedure [Figures 5,6 and 7].

Postoperative strategy

All the cases were followed for upto a period of 8 months .Isometric exercises were started on the 1st postoperative day. Check dress was done on postoperative day 2 or day 3. After 14-15 days stitches were removed and below knee cast were applied. Patients are kept non weight bearing upto 6 weeks after surgery. After 6 weeks partial weight bearing was allowed with below knee walking cast. Clinical and radiographic evaluation was done regularly at 4 weeks interval until solid union of arthrodesis was observed and then full weight-bearing was allowed (Figure-8,9,10).



Fig-1 : Preoperative Radiograph showing subtalar arthritis



Fig-2 : Guide wire insertion from posteroinferior part of Calcaneum



Fig-3 : Intra-operative radiology to ensure screws fixation.



Fig-4 : Fixation via 6.5mm CC screws after guidewire insertion through subtalar joint.



Fig-5 : Postoperative x ray showing screw fixation (AP view)



Fig-6 : Postoperative xray showing screw fixation (Lateral view)



Fig-7 : Postoperative X ray showing screw fixation



Fig-8 : Follow up x-ray of subtalar arthrodesis after 4 months of surgery.



Fig-9 : Dorsiflexion at ankle after 4 months of surgery



Fig-10 : Plantarflexion at ankle after 4 months of surgery

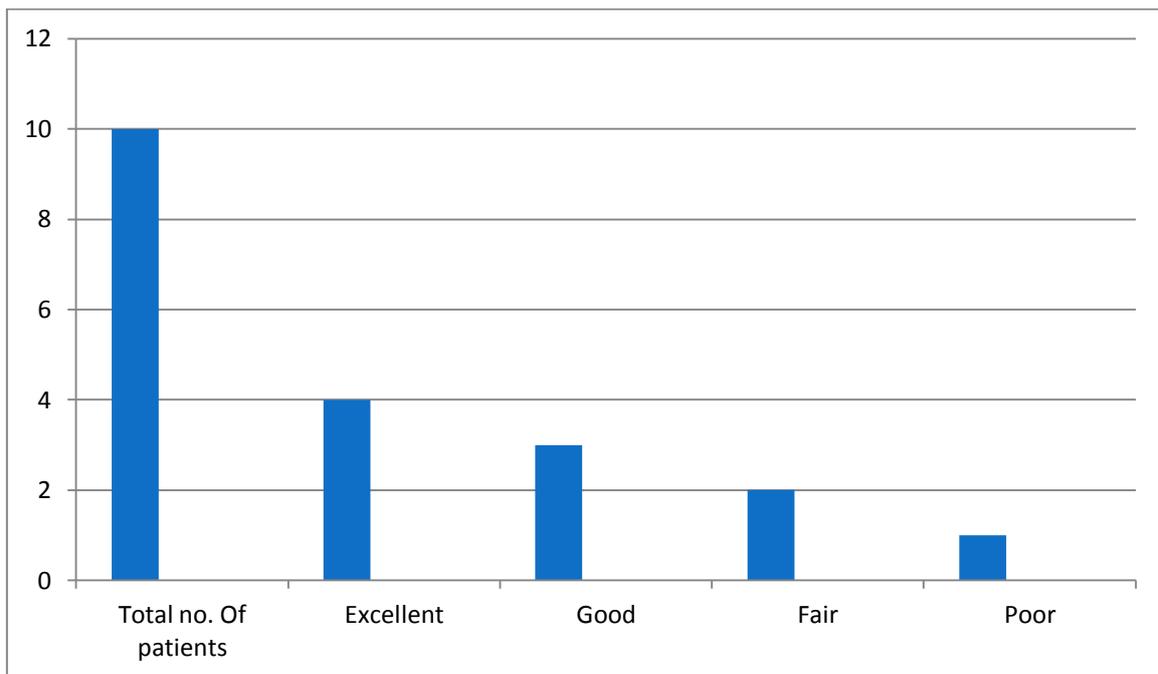


Figure-11 : Foot score = AOFAS

III. Results

9 out of 10 joints were fused except one who developed infection, resulting in an overall fusion rate of above 90%. Infection was treated with IV antibiotics and the regular dressing was done. The average time for fusion was 4.5 months (ranging from 3 to 6 months). There was no correlation between the type of accident, the weight of the patient and the recovery

period. In 7 (70%) patients, there was some residual pain; 3 (30%) had no complaints. During follow-up, complications such as non-union and wound dehiscence were not noticed in any of the patients. Follow-up was carried out for 20–24 weeks. Surgical scar was found in all cases.

Foot score

According to AOFAS score [Figure 11], 4 (40%) patients had Excellent score, good in 3 (30%) , fair in 2 (20%), and poor in 1 (10%). The talonavicular joint was normal in all feet and two showed degenerative changes in the calcaneocuboid joint.

Case

35 years old male with subtalar arthritis after fracture calcaneum.

IV. Discussion

In the surgical treatment of sequelae of calcaneal fractures, all possible causes of pain should be considered and the anatomy of the hindfoot restored. Mann and Beaman and Horton[8] reported a 50% loss of forefoot abduction and adduction after an isolated subtalar arthrodesis. These authors have frequently encountered patients after successful subtalar arthrodesis that will have a transient synovitis of the ankle during the first 2–3 months after cessation of postoperative casting. They recommended that most patients should understand that the ankle is also a hinge and that, having the subtalar joint fused, rapid walking with long strides on uneven surfaces may cause the ankle to sustain forces out of its usual plane of motion[9] most cases these radiographic changes of arthrosis do not correlate with clinical symptoms.

Screw fixation has become an accepted and reliable fixation method in subtalar arthrodesis, with union rates often exceeding 90%. Screw positioning can be technically demanding due to the orientation of the tarsal bones and the need to place the screws perpendicular to the joint plane for optimal compression. Targeting devices have been developed to improve the accuracy of screw positioning and to reduce intra-operative exposure. With regard to the number of screws, two screws are thought to limit rotational micromotion, which may result in a better union rate.

V. Conclusion

Isolated subtalar arthrodesis is an effective surgical intervention with significant clinical improvements in some patients with post-traumatic arthritis of the hindfoot. Screw fixation with two cannulated screws can give compression and added stability for fusion of the arthrodesis site. Fusion of joint in about 90% of patients, and the relief from pain was obtained in 100% of cases which favors the study.

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