Section: Trauma and Orthopaedics

Original Research Article

FUNCTIONAL OUTCOME OF SUBTALAR ARTHRODESIS IN POST-TRAUMATIC SUBTALAR ARTHRITIS

Shankarlinga S[1], Mahesh Kumar Dindivanam[1], Prashantkumar[1]

[1]Sanjay Gandhi Institute of Trauma and Orthopaedics, Bangalore, Karnataka, India

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Corresponding Author:
Dr. Prashantkumar,
Email: prashantkumargudgunti@gmail.com

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Abstract

Background: Chronic pain and functional impairment due to subtalar joint involvement in fracture calcaneus malunion necessitate effective interventions. This study assesses the functional outcomes of subtalar joint fusion using a double lag screw technique, focusing on the posterior facet from calcaneus to talus. **Materials and Methods:** Between January 2019 and June 2020, ten isolated subtalar arthrodesis procedures were performed using the double lag screw technique from posteroinferior calcaneus to talus. Patient ages ranged from 28 to 50 years, with 7 males and 3 females. Follow-up assessments were conducted for up to 12 months post-surgery. **Result:** Fusion was successful in 18 out of 20 joints, yielding an impressive overall fusion rate exceeding 90%. The average fusion period was 4.5 months, ranging from 3 to 6 months. Notably, no significant correlations were found between the type of accident, patient weight, and the recovery duration. **Conclusion:** The utilization of 6.5 mm double lag screws across the posterior facet of the subtalar joint resulted in successful fusion in 90% of patients, accompanied by substantial pain relief. This technique proves to be straightforward and dependable, offering a reliable method for achieving subtalar joint fusion, thereby alleviating chronic pain associated with arthritis.

INTRODUCTION

The subtalar joint is a complex joint formed by the talus bone's anterior, middle, and posterior facets above, and the calcaneus bone below. Its main function is to control hindfoot inversion, eversion, and transmit loads from the ankle to the foot. This joint is crucial for walking, shock absorption, and maintaining balance on uneven surfaces. Injuries like calcaneal fractures, especially intra-articular ones, often lead to subtalar joint degeneration or arthritis due to chondrocyte death and abnormal loading.[1]

Surgical correction and fixation are common for intra-articular calcaneal fractures to minimize joint incongruency and malalignment. Proper realignment post-injury is essential to optimize patient outcomes. While surgery can prolong joint longevity and delay the need for fusion, many young patients may still require a second fusion due to increased joint stress from the injury.[2]

Post-calcaneal fracture complications often include painful arthritis, joint deformities, loss of calcaneum height, soft tissue impingement, and arch flattening. Trauma disturbs the bone's alignment, affecting the subtalar joint's primary function as the foot's inverter and evertor. Anatomic reduction during surgical fixation is critical to prevent subtalar joint deterioration, but even with optimal care, post-traumatic arthritis can develop.[3]

Conservative treatments for post-traumatic subtalar arthritis include activity modification, orthoses, and corticosteroid injections. While minimally invasive procedures provide temporary relief, arthrodesis (fusion) remains the most reliable treatment once conservative measures fail. Subtalar arthrodesis aims to alleviate pain, restore alignment, and stabilize the hindfoot by fusing the subtalar joint.[4]

In cases where hindfoot realignment is necessary, additional procedures like bone block grafting, osteotomy, tendon relocation, or release are performed alongside subtalar arthrodesis. This study evaluates the functional outcomes of subtalar arthrodesis using 6.5 mm cannulated screws fixation to treat post-traumatic arthritis.[5]

MATERIALS AND METHODS

Between January 2019 and June 2021, we conducted 20 isolated subtalar arthrodesis procedures using the double lag screw technique, securing the posteroinferior calcaneum to the talus. The initial injuries were due to falls from heights in 16 patients and bike accidents in 4. The average patient age was 39 years, ranging from 28 to 50, with 14 male and 6 female participants.

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Inclusion Criteria

- Posttraumatic unilateral subtalar arthritis.

Exclusion Criteria

- Bilateral subtalar arthritis
- Primary subtalar arthritis
- Inflammatory subtalar arthritis
- Subtalar dislocation
- Talocalcaneal coalition
- Posterior tibial tendon dysfunction
- Presence of active infection around subtalar joint
- Presence of vascular compromise at the level of hindfoot
- Presence of medical comorbidities
- Arthritis involving multiple joints.

The indication for surgery was severe pain and disability in an incongruent subtalar joint. Patients presented, on average, 14 months after the initial trauma, ranging from 10 to 18 months. All patients exhibited normal calcaneum height and talar declination angle. They reported severe hindfoot pain unresponsive to conservative treatments such as analgesics, orthosis, and physiotherapy. Clinical, radiographic, and functional evaluations were conducted, utilizing the American Orthopaedic Foot and Ankle Society (AOFAS) clinical rating system postoperatively. Clinical examination revealed tenderness on the lateral side of the ankle and heel.

Operative Procedure:

After obtaining informed consent regarding the potential loss of subtalar joint movement, patients were positioned supine on the operating table. A tourniquet was applied to the proximal thigh after exsanguination of the affected limb. A lateral curvilinear incision allowed access to the talocalcaneal joint. Following joint capsule dissection, articular cartilage on both talus and calcaneum was meticulously removed using osteotomes and curettes. The bone surfaces were roughened for optimal healing. Anatomical reduction and alignment were achieved, maintaining the subtalar joint in a 5–10-degree valgus position. Autologous iliac crest bone graft filled the gap, and two 6.5 mm partially threaded cannulated screws were inserted from the calcaneum to the talus, guided by preinserted wires under fluoroscopy. The bleeding induced fusion between the bones. After the procedure, the tourniquet was released, saline wash was performed, and subcutaneous closure was done with absorbable sutures. Non-absorbable sutures closed the skin, and a below-knee slab was applied for 14 days. Postoperative radiographs were taken for evaluation.

Postoperative Strategy: Patients were followed for up to 12 months. Isometric exercises commenced on the first postoperative day. Dressings were checked on the 2nd or 3rd postoperative day. Stitches were removed after 14-15 days, and below-knee casts were applied. Patients remained non-weight bearing for 6 weeks post-surgery, followed by partial weight-bearing with below-knee walking casts. Regular clinical and radiographic evaluations occurred at 4-week intervals until solid arthrodesis union was confirmed, allowing full weight-bearing.

Figure 1: Pre-op Xray showing subtalar arthritis

Figure 2: Guide wire insertion from posteroinferior part of calcaneum

Figure 3: Postoperative x ray showing screw fixation (AP view)

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Figure 4: Postoperative xray showing screw fixation (Lateral view)

Figure 5: Dorsiflexion at ankle after 4 months of surgery

Figure 6: Plantarflexion at ankle after 4 months of surgery

RESULTS

18 out of 20 joints successfully fused, with two cases developing an infection, resulting in an overall fusion rate exceeding 90%. The infection was effectively treated with intravenous antibiotics and regular dressings. On average, fusion occurred within 4.5 months, varying between 3 to 6 months. No significant correlation was found between the type of accident, patient weight, and the recovery period. Among the patients, 14 (70%) experienced residual pain, while 6 (30%) reported no complaints. No complications such as non-union or wound dehiscence were observed during the 20-24 weeks of follow-up. Surgical scars were present in all cases.

In the evaluation of dorsiflexion and plantarflexion at the ankle after 4 months of surgery, the outcomes indicated positive progress. The functional outcomes, assessed using the AOFAS score, revealed that 8 (40%) patients achieved an Excellent score, 6 (30%) were rated as Good, 4 (20%) as Fair, and 2 (10%) as Poor. Notably, the talonavicular joint appeared normal in all cases, whereas degenerative changes were observed in the calcaneocuboid joint of two patients.

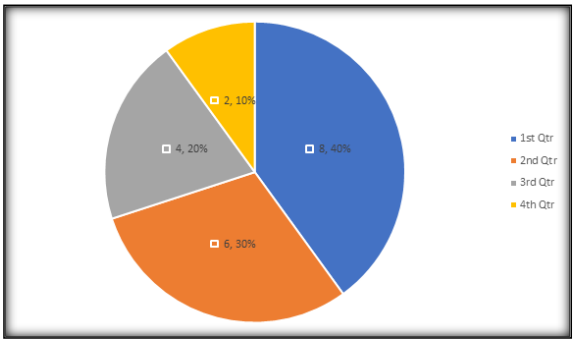

Figure 7: Foot score AOFAS, Exlent- 8 (40)%, Good- 6(30)%, Fair-4 (20%) and Poor- 2 (10%)

DISCUSSION

In addressing the complications following calcaneal fractures, it is crucial to explore all potential sources of pain and meticulously restore the hindfoot's anatomy. Previous studies by Mann, Beaman, and Horton emphasized the importance of considering forefoot abduction and adduction, with reports indicating a 50% loss in these movements after isolated subtalar arthrodesis. Interestingly, postoperative casting cessation sometimes led to transient synovitis of the ankle within the initial 2-3 months. This observation highlights the complexity of joint movements, as even successful subtalar arthrodesis can impact adjacent joints, like the ankle. Patients should be informed that the ankle functions as a hinge, and rapid walking with long strides on uneven surfaces might subject the ankle to unusual forces, potentially causing discomfort. It's noteworthy that while radiographic signs of arthrosis

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often manifest, they might not always align with clinical symptoms.[6]

Screw fixation has emerged as a reliable method in subtalar arthrodesis, boasting union rates that frequently surpass 90%. However, the technical challenges lie in screw positioning, especially considering the intricate orientation of tarsal bones. To optimize compression and promote successful fusion, screws must be placed perpendicular to the joint plane. Innovative targeting devices have been developed to enhance the precision of screw placement while minimizing intra-operative exposure. The choice of using two screws is strategic, aiming to limit rotational micromotion, ultimately contributing to a more robust union. These advancements in surgical techniques underscore the ongoing efforts to refine subtalar arthrodesis procedures, ensuring better outcomes for patients undergoing this critical intervention.[7-9]

CONCLUSION

The findings emphasize the effectiveness of isolated subtalar arthrodesis as a potent surgical solution for patients grappling with post-traumatic arthritis of the hindfoot. The utilization of two cannulated screws for screw fixation not only provides compression but also enhances stability crucial for successful fusion at the arthrodesis site. Remarkably, approximately 90% of patients achieved joint fusion, underscoring the procedure's reliability. Furthermore, the study exhibited a remarkable 100% success rate in relieving pain, further supporting the favourable outcomes associated with this intervention.

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