

Case Series

Functional outcome of subtalar arthrodesis using compression screws in cases of subtalar arthritis

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ABSTRACT

Subtalar arthritis, which frequently results from fractures that are inadequately reduced surrounding the talus or calcaneus, induces chronic pain, rigidity and functional impairment. Subtalar arthrodesis is a conventional therapy for subtalar arthritis. Subtalar arthrodesis employs compression screws to facilitate the joint fusion, which may serve as an alternative. We conducted a retrospective analysis of 20 patients having subtalar arthritis who underwent subtalar arthrodesis with compression screws between September 2022 and January 2024. The American Orthopaedic Foot and Ankle Society (AOFAS) scores were the primary outcomes that were assessed before and after surgery. Seventeen out of twenty patients that performed subtalar arthrodesis were able to achieve an effective fixation at the arthrodesis location. The success rate was 85%, with 17 of the 20 patients achieving successful fusion. The AOFAS scores improved about a mean of 65 prior to surgery to 88 and 93 at six and 10 months postoperatively, correspondingly, with a mean time to fusion of 16 weeks. High fusion rates and substantial AOFAS score improvements are indicative of the efficacy of subtalar arthrodesis with compression screws in enhancing functional outcomes and alleviating pain in patients having subtalar arthritis.

Keywords: AOFAS score, Compression screws, Functional outcome, Subtalar arthritis, Subtalar arthrodesis

INTRODUCTION

Subtalar arthritis is an orthopedic disorder that significantly reduces the quality of life by causing severe discomfort and restricted mobility. It is frequently the result of long-standing instability, rheumatoid arthritis or trauma.¹ The subtalar joint is essential for the complicated mechanics of the foot and for accommodating uneven ground. Consequently, its dysfunction presents significant challenges for patients.² The subtalar joint is a diarthrodial joint that is composed of the surfaces that articulate of the anterior, middle and posterior aspects of the talus bone situated above the calcaneus bone below.³ Consequently, the subtalar joint is crucial for the proprioception and propulsion of the foot and ankle during the locomotion cycle, as well as for the absorption of impact and

ambulation on irregular ground surfaces.⁴ These cases, regardless of whether they are addressed surgically or conservatively. Ultimately, functional disability, loss of joint mobility and discomfort will be observed. Subtalar arthrodesis is an effective treatment for this discomfort.⁵

Subtalar arthrodesis, which involves the surgical fusion of the subtalar joint, has become a definitive treatment option for the relief of pain and the restoration of function.⁶ The installation of compression screws over subtalar arthrodesis has become increasingly popular throughout the various techniques due to its benefits of encouraging bone fusion, equilibrium and mitigating consequences.⁷ An in-situ arthrodesis could be performed with a 90% success rate when only fusion is recommended to repair the calcaneus and subtalar articulation.^{8,9} Previous

research showed Activity alterations, orthoses and corticosteroid injections are among the conservative alternatives to therapy for post-traumatic subtalar arthritis.^{10,11} Although surgeries that are minimally invasive, such as arthroscopic debridement, may offer relief, they are typically only temporary.¹² Arthrodesis or fusion, historically has been a particularly dependable and definitive treatment option when conventional therapies are no longer sufficient.

If successful, it typically leads to improved clinical outcomes.¹³ Upon undergoing subtalar arthrodesis, the patient experiences pain relief and the procedure is disclosed to be efficient at resolving the functional disability of the hind foot caused by a variety of factors.¹⁴ The most effective outcomes for posttraumatic arthritis have been observed described after arthroscopic procedures for those with isolated subtalar arthritis who have minimal or no deformity, no significant bone loss and are not candidates for a concomitant anterior foot procedure.¹⁵ However, there is a scarcity of data on subtalar fusion that specifically focuses on trauma patients.

In patients given the diagnosis of subtalar arthritis, the objective of this investigation is to assess the functional results of subtalar arthrodesis with compression screws. This research aims to offer invaluable knowledge into the success rate of this surgical process and its influence on the patient's quality of life by conducting an exhaustive examination of postoperative outcomes which involves pain relief, mobility, as well fusion rates.

CASE SERIES

A retrospective evaluation was conducted where compression screws were employed to perform subtalar arthrodesis on 20 patients at a Civil Hospital Ahmedabad during the period of September 2022 to January 2024. Patients who required primary subtalar arthrodesis due to extensively comminuted calcaneal fractures and the patients who developed secondary subtalar arthritis as a result of posttraumatic calcaneal or talus fractures were included in the study. Exclusion criteria included infection, compromised vascular supply, Charcot arthropathy, arthritis targeting the ankle and talonavicular joints and primary subtalar arthritis.

18 of the 20 patients were studied having a secondary posttraumatic subtalar arthritis, regarding an average onset of 18 months following the initial injury. The remaining two patients underwent primary subtalar arthrodesis and had extensively comminuted calcaneal fractures.

Comprehensive clinical evaluations were conducted to evaluate the presence of subtalar arthritis, including hindfoot edema, pain, tenderness on the lateral aspects, so range of motion, hindfoot malalignment, neurovascular status, as well as infection indicators. Weight-bearing anteroposterior, oblique and lateral foot views were included in the radiological evaluations. Computed

tomography (CT) scanning was implemented when arthritis symptoms were not readily apparent on X-rays.

The “American Orthopaedic Foot and Ankle Society (AOFAS)” assessment methodology was employed to quantify preoperative functional status. Compression screws were employed to fuse the subtalar joint, which was subsequently followed by rehabilitation and immobilization. Patients were monitored clinical and radiologically till radiological union was verified.

The AOFAS score was employed to evaluate postoperative functional outcomes and compare them to preoperative values. The mean AOFAS scores calculated by when it merges five patient-reported items regarding discomfort and performance with four physician-determined issues regarding function and alignment, on a scale of 0 to 100 points.

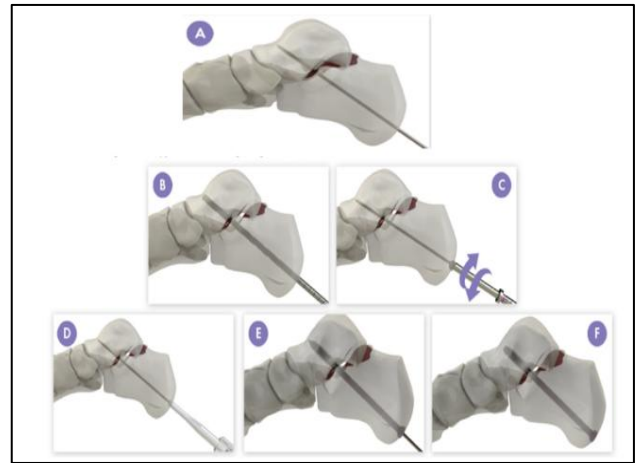


Figure 1: (A) Guide wire insertion, B- monster screws are inserted, (C) the screw length is measured using deep gauge, (D) the screw is inserted with the position and size is confirmed (E, F) removing the guide wire.



Figure 2: Preoperative X-ray showing subtalar arthritis.



Figure 3: Postoperative X-Ray demonstrating successful subtalar arthrodesis.

Surgical technique

In order to improve surgical access, patients were placed supine on the surgical table with a saline container placed on their ipsilateral hip to promote internal limb rotation. A 6 cm incision was performed from the bottom of the lateral malleolus to the base of the fourth metatarsal under aseptic conditions and tourniquet control. Care was taken to safeguard the sural and superficial peroneal nerves during the incision of subcutaneous tissues. The extensor digitorum brevis muscle was recognized and elevated subperiosteally.

The subtalar joint capsule was incised to reveal the joint and the peroneal tendons had to retract superiorly. In order to enable comprehensive visualization, a lamina spreader was introduced into the subtalar joint. Sharp osteotomes were employed to meticulously remove all damaged cartilage from the talus and calcaneus. In order to eradicate any remaining debris, the joint was irrigated with standard saline. The extraction of cancellous bone transplants through graft tubing was facilitated by a 2 cm incision in the proximal tibia. The grafts were subsequently inserted into the cavities that were created in the subtalar joint.

In order to rectify hindfoot alignment, the subtalar joint endured in a 5-degree valgus position throughout the procedure. Two 6.5 mm cannulated compression screws were inserted: the first was inserted through the posterior-inferior non-weight-bearing portion of the heel into the talus body using a guide wire and the second was inserted slightly anteriorly, crossing the posterior talar facet and terminating posterior to the talar neck.

The limb had been immobilized in a below-knee back slab for a period of two weeks and after that, it was placed in a below-knee plaster cast for four weeks. After six weeks, radiographs were taken to evaluate fusion. Physiotherapy was then initiated, which permitted partial bearing weight

on a pneumatic support for a period of ten weeks. Upon proof of union at sixteen weeks, full weight-bearing was permitted.

The patient cohort comprised of 15 males and 5 females, with an average age of 34 years. 17 of the twenty patients who underwent subtalar arthrodesis succeeded in achieving secure fusion at the arthrodesis site, yielding in an 85% fusion rate. The average time to fusion was 16 weeks. A mean AOFAS score of 65 was identified during the preoperative assessment. The 17 patients who achieved successful fusion exhibited substantial improvements in their postoperative evaluations, with mean AOFAS scores increasing to 88 at six months and 93 at ten months (Table 1).

Furthermore, complications were observed in three patients. Two patients developed calcaneocuboid and ankle arthritis, which required triple arthrodesis. In the case of the two patients, the severe pain and instability were likely caused by the arthritis in the calcaneocuboid and ankle joints. Following the failure of conservative treatments, including drugs, physical therapy and orthotics, their physicians advised them to undergo triple arthrodesis.³ The affected joints were fused during the surgery to establish a stable, pain-free foot using screws, the plates or screws. A single patient developed non-union because of its smoking behaviours and infection. There were eight patients who required implant removal because of chronic heel pain (Figures 2 and 3).

Table 1: AOFAS scores preoperatively and postoperatively.

Time point	Mean AOFAS score
Preoperative	65
6 months post-op	88
10 months post-op	93

DISCUSSION

Foot and ankle experts are using arthroscopic subtalar arthrodesis, a new method, as an alternative to open surgery.⁵ Rungprai et al, found a 5.1-point rise in pain VAS and 24.5 and 17-point increases in SF-36 physical and mental component scores at the most recent follow-up following arthroscopic posterior subtalar fusion.¹¹ They reported improvements of 31 to 50 points on average for their AOFAS scores. With mean increases of 4.8 on the pain NAS and 31.1 on the AOFAS score, the data that were currently available were comparable.

The posterior subtalar joint can be optimally prepared through the arthroscopic procedure, which eliminates the need for a bone implant. This enables ambulatory management and earlier rehab. Nevertheless, the findings of Coulomb et al, indicated that the clinical prognosis is unaffected by the fusion ratio above 33%, but it does not encompass the entire joint surface. The mean AOFAS score enhancements reported by Coulomb et al, were

between 31 and 50 points.¹² The present results were comparable, with mean gains of 4.8 points on pain NAS and 31.1 points on AOFAS score. Nevertheless, the current findings indicate that the clinical prognosis is unaffected by the fusion ratio if it exceeds 33%, even if it excludes the entire joint surface.

Chraim et al, reported a fusion rate of 80%, while 20% of the cases resulted in a severe pseudarthrosis necessitating additional surgery.⁸ The gait of patients was not significantly affected by loading, as evidenced by pedobarographic measurements, which indicated a propensity for the lateral column. Various results reported by patients were observed in this group. The results were satisfactory for 70% of the patients, while 20% of the patients encountered them to be adequate. The remaining 10% were dissatisfied with the results. The postoperative functional scores on the FOAS, AOFAS and FFI assessment instruments demonstrated a substantial improvement in comparison to the preoperative evaluation.

Banerjee et al reported that posttraumatic subtalar arthritis was the most prevalent clinical explanation for arthroscopic subtalar fusion.⁵ Weighted preoperative and postoperative American orthopaedic foot and ankle society scores had been 47 and 80.7, accordingly. The weighted mean fusion rate was 95% and the average latency to fusion was 10.2 weeks. The most prevalent complications were nonunion and pain resulting from prominent hardware. While the posterior group demonstrated a higher advancement in functional scores and a reduced complication rate, the lateral approach demonstrated a superior fusion rate. Arthroscopic fusion strategies have been demonstrated to be an acceptable substitute to open surgery.⁴ Randomized control trials comparing the two approaches are required to more reliably assess their respective outcomes, even though there was a trend toward a more beneficial practical result with the posterior procedure.⁵

The limitations associated with this investigation was the time limit of the study with a minimum follow-up of 16 months. The significance of arthroscopic results in the current can be verified by success ratio comparing fusion ratios to a preoperative control group.

CONCLUSION

Use of compression screws in subtalar arthrodesis effectively alleviates pain and enhances functional results in patients after the surgery posttraumatic subtalar arthritis. As per the success rate of the subtalar arthrodesis patients showing 85% fusion rate. This approach is as convenient as evidenced by the significant rise in AOFAS scores and the high percentage of an effective fusion.

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