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When Arthritis Meets Cavovarus: A Unique Case of Bilateral Foot Deformity Managed with Fusion and Tendon Balancing in a Non-Charcot 60 year old Patient

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Abstract

Background: Cavovarus foot deformity in older adults can lead to progressive pain, instability, and secondary arthritis, particularly in the subtalar and talonavicular joints. The optimal surgical strategy for advanced arthritic cavovarus with significant structural deformity remains challenging.

Case Presentation: A 60-year-old male presented with bilateral cavovarus deformity (left > right), chronic hindfoot pain, instability, and functional limitation. Radiographs and clinical assessment confirmed rigid varus alignment and arthritic changes in the subtalar and talonavicular joints. Non operative management had failed.

Methods: We performed a staged reconstructive surgery on the more symptomatic left foot, consisting of subtalar joint arthrodesis to address painful arthritis and hindfoot malalignment, peroneus longus-to-brevis tenodesis to correct muscle imbalance and lateral instability, and a first metatarsal dorsal wedge osteotomy with Herbert screw fixation to correct forefoot varus and optimize overall foot posture.

Results: At 12 months follow-up, the patient reported significant reduction in pain, improved stability and gait, and radiographs demonstrated solid fusion with maintained alignment. Functional scores improved, and the patient resumed independent ambulation without assistive devices.

Conclusion: Combined subtalar arthrodesis, peroneal tendon balancing, and forefoot osteotomy provided stable alignment correction and durable pain relief in a rigid cavovarus foot with hindfoot arthritis

Keywords: Cavovarus , Hindfoot arthritis, Subtalar arthrodesis

Introduction

Cavovarus foot deformity is a complex multiplanar deformity characterized by an increased medial longitudinal arch (cavus), hindfoot varus, and forefoot pronation or adductus. It is often accompanied by muscle imbalance, particularly involving the peroneal and tibialis tendons, and predisposes the foot to lateral overload, instability, and arthritis of adjacent joints. Untreated or progressive deformity can lead to pain, recurrent sprains, and impairment of daily activities.

Association studies have shown that cavovarus alignment correlates with increased risk of peroneal tendon pathology, including tears of the peroneus brevis and longus tendons, due to altered biomechanics and excessive lateral column forces.

Despite numerous operative techniques described in the literature—ranging from soft tissue procedures, osteotomies, tendon transfers, to arthrodesis—there is no single universally accepted approach. Experts stress the need for individualized, deformity-based planning that addresses alignment, joint degeneration, and muscle imbalance.

Hindfoot arthrodesis—most commonly subtalar fusion well established for rigid deformity with arthritis, and studies indicate significant improvement in pain and alignment following fusion procedures. In addition, tendon transfers or tenodesis—such as peroneus longus to brevis—are used to rebalance deforming forces and improve stability. Osteotomies like dorsal wedge resection of the first metatarsal correct forefoot varus and contribute to global realignment. However, evidence combining these procedures specifically in elderly bilateral cavovarus with arthritis remains sparse. Here we report a rare case of bilateral cavovarus with subtalar and talonavicular arthritis in a 60-year-old patient, managed with arthrodesis, tendon tenodesis, and metatarsal osteotomy, with excellent functional outcome.

Case Presentation

A 60-year-old male presented with chronic bilateral foot pain and progressive difficulties in walking, with the left foot symptoms more severe than the right. He reported lateral foot discomfort, instability, and significant pain during ambulation and daily activities. Prior conservative treatments, including orthotics and physiotherapy, provided minimal relief.

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Figure 1: Pre-operative Clinical Pictures

Figure 2: ??

Clinical Examination:
- Rigid high-arched cavus deformity bilaterally
- Hindfoot varus
- Forefoot pronation/varus component
- Peroneal tendon imbalance and lateral instability
- Pain localized to subtalar and talonavicular regions on the left

Investigations:
- Weight-bearing radiographs confirmed bilateral high medial longitudinal arch, varus hindfoot alignment, and degenerative changes in the subtalar joints suggestive of advanced arthritis.

Preoperative Scores:
- Visual Analog Scale (VAS) pain: high on left
- Functional scores: significant impairment

Treatment Decision:
Given the failure of conservative measures, severity of deformity, radiographic arthritis, and impaired function, surgical intervention on the left side was planned.

Methodology / Surgical Technique

Pre-operative Preparation
- Standard preoperative assessments including vascular and neurological checks.
- Informed consent obtained with explanation of surgery goals and potential risks.

Anaesthesia and Positioning
- General anaesthesia with regional block.
- Patient supine with tourniquet applied to thigh.

Procedure Steps

1. Subtalar Arthrodesis:
- Medial/lateral exposure allowing visualization of the subtalar joint
- Joint cartilage was removed and surfaces prepared
- Correction achieved into a plantigrade position
- Fixation with cannulated screws
- Rationale: Subtalar fusion eliminates painful hindfoot motion, corrects coronal malalignment, and has been shown to provide reliable pain relief in rigid cavovarus arthritis without requiring talonavicular inclusion when alignment is corrected

2. Peroneus Longus to Brevis Tenodesis:
- Addressed tendon imbalance.
- Tenodesis performed to transfer peroneus longus tension into peroneus brevis, improving lateral stability.
- Rationale: Rebalancing lateral musculature reduces varus and risk of recurrence. Studies demonstrate improved subjective and functional outcomes after lateral tendon balancing procedures in cavovarus correction.

3. First Metatarsal Dorsal Wedge Osteotomy:
- Dorsal wedge resection performed to correct forefoot varus.
- Fixation with two Herbert screws.
- Rationale: Corrects high forefoot plantarflexion component, enhancing ground contact and overall alignment.

Postoperative Care (Fig. 3)
- Non–weight-bearing for 6–8 weeks in a cast/boot.
- Progressive weight bearing with physiotherapy.
- Radiographic follow-up at regular intervals.

Results

Clinical Outcomes
- Pain: Marked reduction in VAS scores postoperatively.
- Function: Improved gait symmetry and ability to perform daily

Figure 3: Pre-operative X-ray

Figure 4: Post-operative X-ray Image

Figure 5: Post-Operative Clinical Photographs

Figure 6: Left Foot

activities without assistive devices.
• Stability: Subjective improvement in lateral stability.

Radiographic Outcomes

• Successful fusion at subtalar joints with no evidence of hardware failure or nonunion.
• Correction of varus alignment and improved forefoot position on weight-bearing radiographs.

Complications

• No major perioperative complications.
• Minor transient swelling managed conservatively.

Discussion

Rigid cavovarus deformity in adults, particularly when presenting bilaterally, remains an uncommon and diagnostically challenging clinical entity. Although classically associated with hereditary motor–sensory neuropathies, an increasing proportion of cases are now recognized to be degenerative and mechanical in origin, evolving over decades of altered loading [1–3]. Progressive varus alignment shifts weight-bearing to the medial column, which accelerates cartilage wear in the subtalar and talonavicular joints, eventually leading to painful end-stage arthritis [2]. This pattern was seen in the present patient, whose longstanding deformity culminated in bilateral hindfoot degeneration.

Historically, triple arthrodesis was the definitive management for rigid cavovarus deformity [4]. However, contemporary literature advocates selective arthrodesis tailored to involved joints, preserving motion where feasible. Coughlin et al. [5] demonstrated comparable pain relief and union rates between triple and isolated subtalar arthrodesis provided deformity correction is attained, findings echoed by Easley et al. [6] who highlighted reduced wound complications and faster rehabilitation with fewer fused joints. Recent literature highlights that subtalar fusion alone can effectively correct hindfoot varus when deformity is forefoot-driven or partially correctable with tendon rebalancing [5–7]. Selective subtalar fusion preserves midfoot mobility, reduces operative morbidity, and remains a logical option in cases without talonavicular collapse

Bony correction alone is insufficient when soft-tissue imbalance persists. Overpull of the peroneus longus and weakness of the peroneus brevis maintain first-ray plantarflexion and lateral instability [7]. Brugioni et al. [8] described recurrent deformity rates exceeding 25% in cases managed without tendon rebalancing. The peroneus longus-to-brevis transfer performed here aligns with current recommendations, providing a physiologic lateral vector and reducing the forces perpetuating cavus.

The forefoot-driven component of cavovarus is increasingly emphasized in modern reconstructive algorithms. Maskill et al. [3] and subsequent authors demonstrated that failure to correct the plantarflexed first ray compromises hindfoot realignment and overloads newly fused joints. Inclusion of a first metatarsal dorsiflexion osteotomy in this case was therefore essential to achieve a plantigrade foot and mitigate the risk of adjacent joint degeneration.

Age is traditionally viewed as a limiting factor, with concerns regarding nonunion and postoperative stiffness. Recent series, however, report fusion rates exceeding 90% and significant functional

Figure 7: Right Foot

gains in patients beyond 55 years when alignment is restored and comorbidities optimized [4–6]. The successful outcome in this 60-year-old patient reinforces that age alone should not preclude comprehensive reconstruction.

Overall, this case exemplifies contemporary principles for managing rigid cavovarus deformity—multilevel structural correction, tailored arthrodesis, and soft-tissue balancing—supported by emerging evidence.

Correction of hindfoot varus traditionally includes one of several lateral-based calcaneal osteotomies—most commonly the Dwyer medial closing wedge osteotomy or a lateral calcaneal sliding osteotomy (LCSO)—particularly in cases where the varus is rigid and originates from the hindfoot [1, 9]. The Dwyer osteotomy laterally shifts the mechanical axis and unloads the medial column, while the LCSO achieves correction through translation without bone wedge removal, preserving calcaneal width and reducing the risk of sural nerve traction [10]. Contemporary series have shown these osteotomies reliably correct malalignment with improvements in alignment and patient-reported outcomes, and some authors advocate combining calcaneal osteotomy with fusion to optimize coronal plane balance [9–11].

However, emerging evidence suggests that hindfoot varus associated with a forefoot-driven cavus pattern may correct spontaneously after first-ray realignment, especially in older or lower-demand patients [2]. Maskill et al. [3] and Madan et al. [12] emphasized individualized selection of bony procedures and highlighted that calcaneal osteotomies may be unnecessary when varus is reducible intraoperatively after soft-tissue balancing and medial column elevation. In the present case, clinical assessment and intraoperative correction demonstrated that hindfoot alignment improved sufficiently after subtalar and talonavicular fusion and peroneal tendon rebalancing. Therefore, a calcaneal osteotomy was not pursued, prioritizing stability and reduced operative morbidity in this elderly patient.

Limitations

While the combined arthrodesis, tendon balancing, and first metatarsal osteotomy yielded meaningful pain relief and functional improvement, the absence of a Dwyer or lateralizing calcaneal osteotomy represents an important limitation of the current strategy. Standard cavovarus correction algorithms emphasize the need to fully realign the hindfoot in the coronal plane, and residual inversion can lead to abnormal load transfer across the midfoot, ankle, and calcaneocuboid joint. Postoperative imaging confirmed that mild hind foot varus persisted, suggesting the deformity was not completely corrected in all planes. In the long term, this residual malalignment has the theoretical potential to accelerate adjacent joint degeneration, compromise gait efficiency, and necessitate revision procedures should symptoms recur. Although subtalar fusion was effective, sparing the talonavicular joint may leave residual midfoot stiffness or allow progressive degeneration, warranting ongoing follow-up. Thus, while the functional outcome was satisfactory for this patient, the construct may not universally prevent later mechanical progression in more active or younger individuals.

Conclusion

The excellent postoperative recovery observed in this elderly patient—marked by substantial pain resolution, improved stability, and restoration of daily mobility—reinforces a critical principle in complex cavovarus reconstruction: radiographic perfection is not always synonymous with clinical success. In selected older adults with lower functional demands and established arthritic involvement, targeted subtalar fusion combined with tendon balancing and forefoot correction may provide durable benefit without the need for additional hindfoot osteotomy. This case underscores the value of individualized, anatomy-driven treatment planning, especially when weighing surgical morbidity against expected functional gain. Ultimately, thoughtful procedure selection based on deformity drivers, comorbidities, and patient priorities allows clinicians to achieve meaningful outcomes even in rigid, multi-planar deformities traditionally thought to require more extensive correction.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

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