

Single-Stage Reconstruction of Severe Neglected Bilateral Cavovarus Foot Deformity in an Adult - A Case Report

¹Dr. Rajesh K Ambulgekar, Professor and Head, Department of Orthopedics, Dr Shankarrao Chavan Government Medical College, Vishnupuri, Nanded- 431606

²Dr. Hrishikesh Gaikwad, Junior Resident -3, Department of Orthopedics, Dr Shankarrao Chavan Government Medical College, Vishnupuri, Nanded- 431606

³Dr. Veer Pradip Ramchandra, Junior Resident -3, Department of Orthopaedics, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, Maharashtra. PIN 431606

⁴Dr. Raunak Ranjan, Junior Resident -3, Department of Orthopaedics, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, Maharashtra. PIN 431606

⁵Dr. Amit Yerne, Junior Resident -3, Department of Orthopaedics, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, Maharashtra. PIN 431606

⁶Dr. Arbaz Akram Khan, Junior Resident -3, Department of Orthopaedics, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, Maharashtra. PIN 431606

Corresponding Author: Dr. Rajesh K Ambulgekar, Professor and Head, Department of Orthopedics, Dr Shankarrao Chavan Government Medical College, Vishnupuri, Nanded- 431606

How to citation this article: Dr. Rajesh K Ambulgekar, Dr. Hrishikesh Gaikwad, Dr. Veer Pradip Ramchandra, Dr. Raunak Ranjan, Dr. Amit Yerne, Dr. Arbaz Akram Khan, “Single-Stage Reconstruction of Severe Neglected Bilateral Cavovarus Foot Deformity in an Adult - A Case Report”, IJMACR– August – 2026, Volume – 9, Issue –4, P. No. 809– 818.

Open Access Article: © 2026 Dr. Rajesh K Ambulgekar, et al. This is an open access journal and article distributed under the terms of the creative common’s attribution license (<http://creativecommons.org/licenses/by/4.0>). Which allows others to remix, tweak, and build upon the work non- commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Background: Severe neglected bilateral foot deformities presenting in late adulthood pose significant reconstructive challenges. We report a rare adult presentation of a 55 – year - old female with debilitating bilateral foot deformity of probable neuromuscular etiology, neglected since childhood.

Case Presentation: A 55-year-old female presented with severe rigid bilateral pes cavovarus deformity, with the left foot being more severely affected. Pre-operative imaging revealed high-grade ankle dislocation, medial sub luxation of the talus, calcaneal collapse, and complete disruption of the ankle ligamentous complex. She underwent single - stage left foot reconstruction comprising extensive soft tissue release, corrective

osteotomy, and external arthrodesis using Charnley compression clamps.

At six weeks, manipulation under anesthesia was performed with below-knee splinting. At six-month follow-up, she demonstrated a near-anatomically corrected foot with restoration of plantigrade alignment and independent weight-bearing capability.

Conclusion: Even in long-standing, severe adult cavovarus deformity with advanced ankle arthropathy, successful limb salvage and functional restoration can be achieved through a staged reconstructive protocol combining soft tissue balancing, bony realignment, and external fixation.

Keywords: Cavovarus Foot, Neglected Foot Deformity, External Fixation, Ankle Arthrodesis, Adult Reconstruction, Neuromuscular Foot, Charcot-Marie-Tooth.

Introduction

Severe rigid cavovarus foot deformity in adults most commonly arises from progressive neuromuscular conditions, with Charcot – Marie - Tooth disease (hereditary motor and sensory neuropathy type 1) being the predominant etiology.

The characteristic pathoanatomy includes hindfoot varus, forefoot adduction and supination, plantar flexion of the first ray, and claw toe deformity, collectively producing the classic 'inverted champagne bottle' appearance. When left untreated from childhood, these deformities progress to rigid contractures, severe arthritis, and talar sub luxation or dislocation due to chronic abnormal joint loading ^{1,2}.

The surgical management of neglected adult cavovarus deformity is technically demanding. Unlike pediatric cases where soft tissue releases and tendon transfers may suffice, adult reconstruction often requires a combination

of extensive soft tissue release, multiple osteotomies, and Arthrodesis to achieve a plantigrade, painless foot ^{3,4}.

We present a case of severe bilateral neglected cavovarus foot deformity in a 55 – year - old female, with detailed description of the left foot reconstruction and six-month functional outcome.

Case Presentation

History and Physical Examination

A 55-year-old female presented to our orthopedic outpatient department with complaints of progressive deformity and difficulty in ambulation involving both feet, present since early childhood.

The deformity had been neglected due to socioeconomic constraints and lack of access to specialized care. Over the preceding decade, she had developed progressive pain, skin breakdown over the lateral border of the left foot, and complete inability to wear conventional footwear.

On clinical examination, both feet demonstrated severe rigid cavovarus deformity. The left foot exhibited marked hind foot varus, forefoot adduction and supination, a high longitudinal arch, and fixed clawing of all toes. The hind foot was non-correctible to neutral. The right foot showed a similar but less severe deformity. The patient walked with a cautious, varus-thrust gait pattern, bearing weight primarily on the lateral border of the left foot. Neurovascular examination revealed intact dorsalis pedis and posterior tibial pulses.

Sensation was diminished in a stocking-glove distribution, suggestive of an underlying peripheral neuropathy. There was no documented family history of similar deformity, and no prior surgical intervention had been attempted.

Figure 1: Pre-operative clinical photograph showing bilateral foot deformity with the patient supine on the examination bed. Note the severe left foot inversion and adduction.



Figure 2: Pre - operative clinical photograph showing bilateral feet with the left demonstrating severe cavovarus deformity and claw toe formation.



Figure 3: Pre - operative clinical photograph demonstrating the extent of bilateral foot deformity with severe left foot involvement.



Figure 4: Pre-operative clinical photograph showing both lower extremities with severe left foot deformity and relatively preserved right foot alignment.



Imaging

Plain radiographs of both ankles (anter oposterior and lateral views) revealed severe degenerative changes. The left ankle demonstrated medial sub luxation of the talus with complete loss of the tibiotalar joint space, fracture and collapse of the calcaneal body, and secondary arthritic changes at the sub talar and talonavicular joints. The talar neck appeared verticalized, and the navicular was displaced dorsomedially. The right foot showed similar but less advanced changes.

Figure 5: Pre-operative anter oposterior and lateral radiographs of both ankles demonstrating severe degenerative changes, talar sub luxation, calcaneal collapse, and loss of joint architecture bilaterally.



Figure 6: Pre-operative lateral radiograph of the left foot showing vertical talus, calcaneal fracture/ collapse,

severe mid foot arthropathy, and loss of the longitudinal arch.

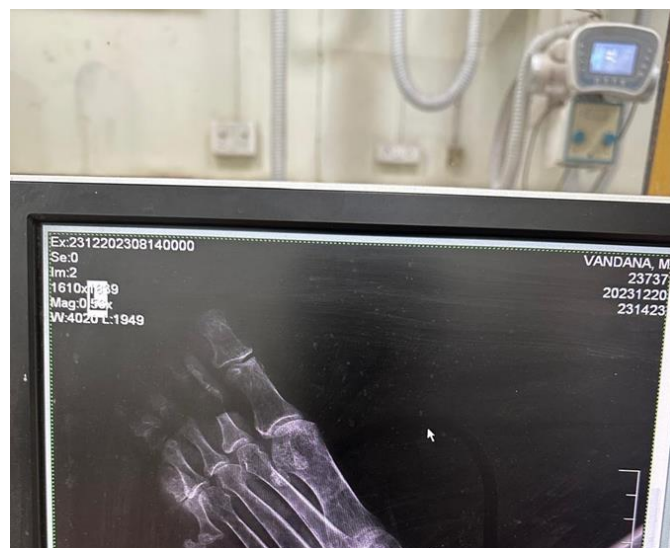


Figure 7: Pre-operative anter oposterior radiograph of the left ankle demonstrating medial talar sub luxation, distal tibiofibular widening, and complete loss of tibiotalar joint space.



Figure 8: Pre-operative lateral radiograph of the left ankle showing severe ankle arthropathy with talar collapse, posterior sub luxation, and degenerative changes extending to the sub talar joint.

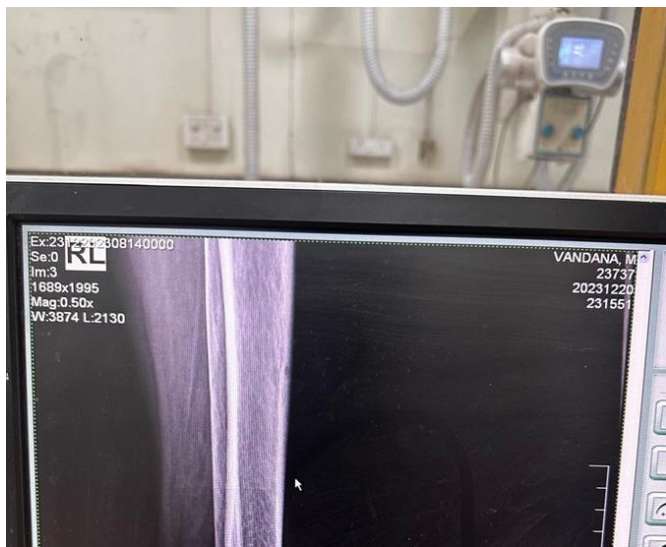


Figure 9: Pre-operative oblique radiograph of the left foot demonstrating severe degenerative changes throughout the hind foot and mid foot with bony sclerosis.



Magnetic resonance imaging of the left ankle confirmed a high-grade dislocation with significant medial sub luxation of the talus, dislocation of the distal tibio fibular syndesmosis, and medial sub luxation of the distal tibia and fibula. Diffuse bone marrow edema involved the talus, distal tibia, and fibula. There was complete disruption of the anterior and posterior tibiofibular ligaments, posterior tibiotalar ligament, and high-grade tearing of the sinus tarsi ligaments. Moderate joint effusion extended into the subcutaneous tissues along the lateral malleolus, forming a 2×1.6 cm collection. The Achilles tendon demonstrated mild signal alteration at its insertion, consistent with chronic tendinopathy. The flexor and extensor tendons were morphologically normal.

Figure 10: MRI findings report of the left ankle detailing high-grade ankle dislocation, complete ligamentous disruption, calcaneal collapse with fracture, and marrow edema involving the talus, distal tibia, and fibula.

Name	VANDANA GAIKWAD 55Y/F	Age	055Y - F
Date	29/11/2023	Patient Id	geservice
Referring Doctor	SELF	Center	bhagwati diagnostic centre

MRI LEFT ANKLE

Multiplanar MRI of the left ankle was performed using T1W, T2 W and PD with fat suppression.

FINDINGS :

Suboptimal imaging in view of excessive artefacts.

There is a high grade dislocation seen involving the left ankle joint in form of significant medial subluxation of talus, dislocation of lobe lower tibiofibular joint and medial subluxation of lower end of tibia and fibula.

Diffuse ill-defined marrow oedema seen involving the talus, lower end of tibia and fibula with fracture and collapse seen involving body of calcaneum.

There is complete tear seen involving the anterior and posterior tibiofibular ligament and posterior tibiotalar ligament.

High grade tear seen involving the ligaments within sinus tarsi.

Moderate joint effusion seen between the lower end of tibia and superior articular margin of calcaneum. It is extending along the subcutaneous tissue forming a collection measuring 2×1.6 cm in size along the lateral malleolus.

Tendo-achilles shows mild increased signal along its insertion site.

The flexor and extensor tendons are normal.

Plantar fascia is normal.

Figure 11: MRI impression report confirming high-grade dislocation with medial talar sub luxation, diffuse marrow edema, complete tears of the anterior and

posterior tibiofibular ligaments, posterior tibiotalar ligament, and sinus tarsi ligament disruption.

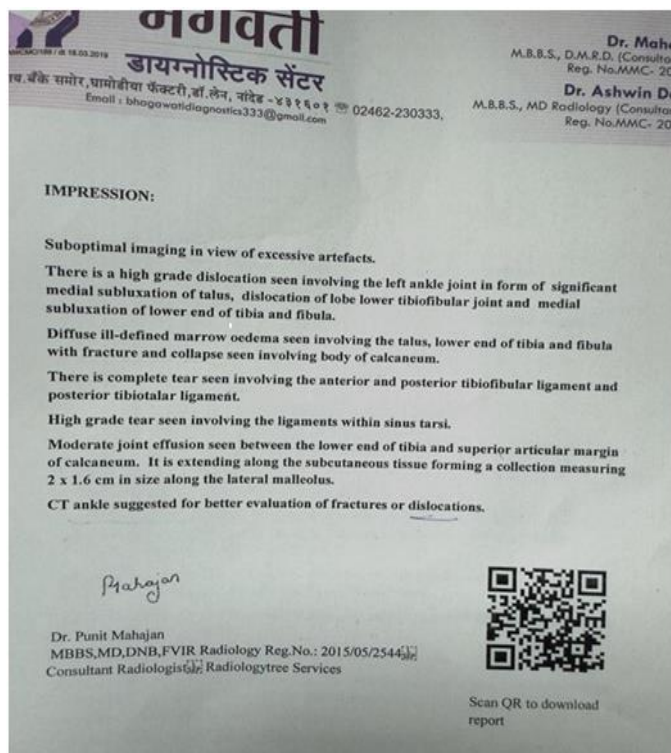


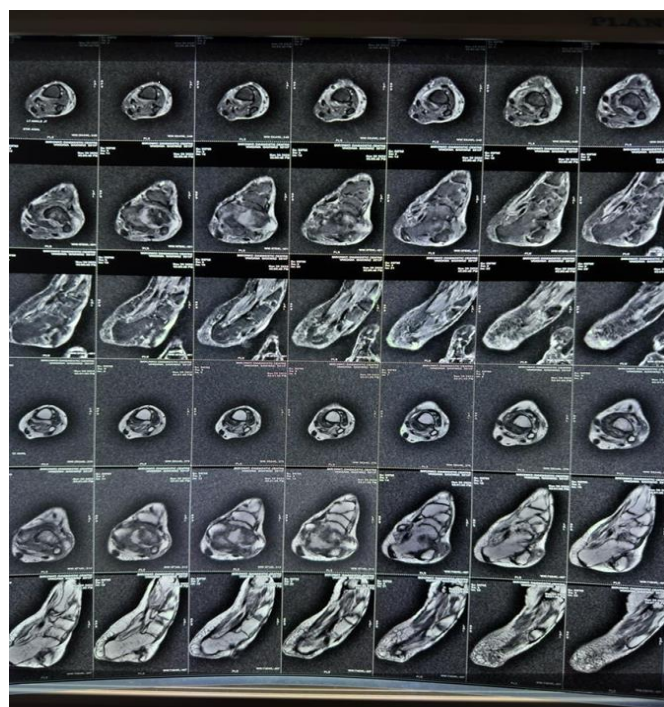
Figure 12: MRI T1-weighted and T2-weighted sagittal and axial images of the left ankle demonstrating severe arthropathy, talar subluxation, bone marrow edema, and soft tissue swelling.



Figure 13: MRI T1-weighted sagittal images of the left ankle showing extensive degenerative changes, talar displacement, and soft tissue edema.



Figure 14: MRI T2-weighted fat-suppressed axial and sagittal images demonstrating joint effusion, complete ligamentous disruption, marrow edema, and subcutaneous fluid collection along the lateral malleolus.



Surgical Procedure

The patient underwent single-stage left foot reconstruction under spinal anesthesia with thigh tourniquet control. Through a combined medial, lateral, and posterior approach, an extensive soft tissue release was performed.

This included plantar fascia release, fractional lengthening of the Achilles tendon, posterior ankle and sub talar capsulotomy, release of the talonavicular and calcaneocubital capsules, and recession of the tibialis posterior and long toe flexors.

A corrective calcaneal osteotomy (Dwyer-type closing wedge) was performed to correct hind foot varus, combined with a dorsiflexion first metatarsal osteotomy to address the plantar flexed first ray.

The severely degenerated ankle and subtalar joints were debrided, and the talus was reduced into a plantigrade position.

Given the severity of bone loss and ligamentous incompetence, internal fixation was deemed insufficient. Therefore, external arthrodesis was performed using Charnley compression clamps.

Transfixion pins were placed in the distal tibia, talus, calcaneus, and mid foot, and connected with external bars. The construct provided rigid stabilization while allowing fine-tuning of alignment.

Intraoperative fluoroscopy confirmed satisfactory reduction and axial alignment. The wounds were closed in layers, and a bulky sterile dressing was applied.

Figure 15: Intra-operative photograph demonstrating the surgical field following soft tissue release, corrective osteotomy, and application of the Charnley external compression clamp construct. Note the surgical incisions and excised bone fragments.



Post-operative Course

Figure 16: Immediate post-operative anteroposterior radiograph showing the Charnley external fixator in situ with restored tibiotalar alignment and corrected hindfoot position.



Figure 17: Immediate post-operative lateral radiograph demonstrating the Charnley external fixator with corrected hind foot alignment, restored talar position, and neutral ankle alignment.



Figure 18: Immediate post-operative clinical photograph showing the left foot with Charnley external fixator in place, sterile gauze bandaging, and restored foot position.



Figure 19: Immediate post-operative clinical photograph demonstrating the Charnley external compression construct with measurement calibration and secure pin fixation.



The patient was discharged on post-operative day seven with non – weight - bearing crutch ambulation and instructions for strict limb elevation. Pin-tract care was initiated with daily cleansing using povidone-iodine solution. At the six-week follow-up, there was evidence of early radiographic consolidation at the arthrodesis site; however, mild residual equinus contracture and mid foot stiffness were noted. The patient was taken to the operating theatre for manipulation under general anesthesia, during which the hind foot and mid foot were gently mobilized through a controlled range of motion to address capsular adhesions. A below-knee walking splint was applied in the corrected position, and progressive protected weight-bearing was commenced.

Follow-up

At six-month follow-up, the patient demonstrated a dramatically improved clinical outcome. The left foot was plantigrade with neutral hind foot alignment, corrected forefoot adduction, and restoration of a near-normal longitudinal arch. The external fixator had been removed at week ten after radiographic confirmation of fusion. She was able to bear full weight independently, ambulate without assistive devices for short distances,

and wear modified extra-depth footwear. There was no evidence of wound complications, deep infection, or neurovascular deficit. The patient expressed high satisfaction with the functional and cosmetic outcome.

Figure 20, 21, 22: Six - month follow-up clinical photographs showing the corrected left foot with restoration of plantigrade alignment, neutral hindfoot, and near-normal longitudinal arch. The right foot remains unoperated.



Discussion

Severe neglected cavovarus foot deformity in the sixth decade of life represents the end-stage sequelae of decades of abnormal biomechanics. The differential

diagnosis for bilateral childhood-onset cavovarus deformity includes Charcot-Marie-Tooth disease, spinal cord anomalies (e.g., tethered cord, diastematomyelia), post-poliomyelitis syndrome, and arthrogryposis multiplex congenita. In the present case, the clinical phenotype - bilateral rigid cavovarus with claw toes, ankle arthropathy, and diminished sensation—was most consistent with Charcot-Marie-Tooth disease, although confirmatory electrophysiological or genetic testing was unavailable^{1,2}.

The pathognomonic radiological findings of advanced disease include talar subluxation, calcaneal varus, dorsomedial navicular displacement, and secondary degenerative arthritis spanning the ankle, subtalar, and mid foot joints. Our patient exhibited all these features, with the left ankle demonstrating near-complete dislocation and calcaneal body collapse.

Surgical correction in this context must address deformity in all three planes. Isolated soft tissue procedures are universally inadequate in the rigid adult foot. Our approach combined

- (1) plantar release and Achilles lengthening to correct equinus
- (2) calcaneal and metatarsal osteotomies to realign the hind foot and forefoot
- (3) arthrodesis of the destroyed ankle and subtalar joints. The use of Charnley external compression clamps provided several advantages in this setting: the ability to gradually compress the arthrodesis site, intra operative adjustability of alignment, avoidance of bulky internal hardware in osteoporotic bone, and reduced risk of deep infection in a patient with compromised soft tissues⁵.

The six-week manipulation under anesthesia was a critical adjunct. Despite adequate initial correction, the prolonged pre-operative deformity resulted in capsular

and peri articular contractures that limited motion. Early controlled mobilization under anesthesia, followed by splinting, prevented recurrent equinus and optimized mid foot flexibility without compromising the arthrodesis mass.

The six-month outcome - conversion of a non-plantigrade, painful, functionless foot to a stable, weight-bearing extremity - supports the feasibility of limb salvage even in extreme cases. Alternative management would have included talectomy, tibiocalcaneal arthrodesis, or below-knee amputation; however, our reconstructive strategy preserved limb length and achieved a more physiological gait pattern ^{6,7}.

Limitations of this report include the absence of pre-operative electrophysiological studies, lack of long-term follow-up beyond six months, and the unknown status of the contralateral foot, which may require future staged reconstruction.

Conclusion

This case demonstrates that severe neglected bilateral cavovarus foot deformity with advanced ankle arthropathy can be successfully reconstructed in adulthood through a comprehensive single-stage approach. The combination of extensive soft tissue release, corrective osteotomy, and external arthrodesis with Charnley clamps, followed by staged manipulation and splinting, can restore plantigrade alignment and independent ambulation even after five decades of deformity.

Patient Consent Statement

Written informed consent was obtained from the patient for publication of this case report and accompanying clinical images. All identifying information has been removed to ensure patient anonymity.

References

1. Holmes JR, Hansen ST. Foot and ankle manifestations of Charcot – Marie - Tooth disease. *Foot Ankle Int.* 1993; 14(8):476-486.
2. Wicart P, Cavalli H, Seringe R. Cavovarus foot in Charcot-Marie-Tooth disease: patho physiology, diagnosis, and management. *Orthop Traumatol Surg Res.* 2019; 105 (2):319-328.
3. Mann RA, Missirian J. Pathophysiology of Charcot – Marie - Tooth disease. *Clin Orthop Relat Res.* 1988; (234): 221-228.
4. Paulos L, Coleman SS, Samuelson KM. Pes cavovarus: review of a surgical approach using selective soft - tissue procedures. *J Bone Joint Surg Am.* 1980; 62 (6): 942-953.
5. Charnley J. Compression arthrodesis of the ankle and shoulder. *J Bone Joint Surg Br.* 1951; 33-B(2):180-191.
6. Nihal A, Gellman RE, Embil JM, Trepman E. Treatment of adult acquired cavovarus foot deformity. *Foot Ankle Int.* 2012; 33(4):302-308.
7. Ward CM, Dolan LA, Bennett DL, Morcuende JA, Cooper DM. Long-term results of reconstruction for treatment of a flexible cavovarus foot in Charcot-Marie-Tooth disease. *J Bone Joint Surg Am.* 2008; 90 (12): 263 1-2642.
8. Wetmore RS, Drennan JC. Long-term results of triple arthrodesis in Charcot – Marie - Tooth disease. *J Bone Joint Surg Am.* 1989; 71(3):417-422.