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Triple Arthrodesis as Surgical Management of Charcot Joint with AVN Talus Caused by Neglected Old Fracture Talus with History of Diabetic Type II: A Case Report

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ABSTRACT

A chronic, non-infectious degenerative disease of the foot and ankle joints, Charcot neuroarthropathy (CN) is frequently linked to peripheral neuropathy and diabetes mellitus. Joint dislocation, fractures, and deformities are its hallmarks, and they can result in serious side effects such ulceration, osteomyelitis, and limb amputation. We report the case of a 53-year-old woman who was diagnosed with a neglected talus fracture and had a 23-year history of limping due to type 2 diabetes mellitus. Clinical and radiological evaluations revealed a fixed 130° equinus deformity and extensive midfoot and hindfoot destruction, consistent with Eichenholtz Stage III Charcot joint.

The patient underwent a triple arthrodesis procedure, combining debridement, osteotomy, and internal fixation using cannulated and cancellous screws, along with autologous bone graft harvested from the iliac crest. Post-operative management included non-weight-bearing mobilization and casting in a plantigrade position. Radiographic follow-up at three months showed stable fusion, proper alignment, and no signs of implant failure. Clinically, the patient reported reduced pain and improved function, with the ability to perform daily activities with minimal assistance.

This case highlights the importance of timely diagnosis and appropriate surgical intervention in advanced CN to prevent further deformity and preserve limb function. Triple arthrodesis proved effective in restoring foot alignment and achieving a stable, plantigrade foot. Patient compliance and individualized treatment planning, considering comorbidities, are crucial for optimal outcomes in managing Charcot arthropathy.

Keywords: Charcot neuroarthropathy, triple arthrodesis, diabetes mellitus, hindfoot deformity.

INTRODUCTION

Trauma to a neuropathic extremity causes neuropathic arthropathy, also known as Charcot arthropathy, which is a progressive degeneration of the foot and ankle joints caused by denervation. Foot fractures and dislocations may result from it.

In people with different peripheral neuropathies, Charcot neuropathic osteoarthropathy is characterized by bone and joint fragmentation of the foot and ankle. Acute localized inflammation is caused by

diabetes, neuropathy, trauma, and changes in bone metabolism. The foot's skeletal architecture may be irreversibly disrupted by the inflammatory response, leading to aberrant plantar pressures that increase the risk of ulceration, osteomyelitis, and amputation. According to reports, between 0.1% and 0.9% of diabetics have Charcot.

According to Volkman and Virchow, peripheral neuropathy that results in a lack of protective feeling may make the foot more vulnerable to acute or recurrent damage. Continued weight-bearing exacerbates the pathology (hence the term neurotraumatic). As a result, individuals may sustain fractures and develop severe abnormalities if they continue to be active. Increased lateral column plantar pressure on the foot due to varus ankle/hindfoot puts the patient at risk for developing lateral foot ulcers. Talar collapse brought on by avascular necrosis or neuropathic fracture exacerbates these abnormalities and adds to the disparity in limb length.

A nonbraceable deformity linked to instability is the main reason for surgical reconstruction. Additional indicators include the presence of osteomyelitis, recurring ulcers, imminent ulceration, the inability to heal an ulcer, and/or severe pain. The preferred technique for surgically treating CN abnormalities in this area is arthrodesis of the ankle and/or hindfoot. The quality of the bone and the existence or absence of an active infection play a major role in the fixation decision (internal or external).

CASE PRESENTATION

Figure 1. Clinical Picture of Patient's Ankle, Ankle position fixed on 130° of equinus deformity

A 53 years old female complained of the swollen right ankle since 2 weeks, she was able to walk without any assistive device but limping, pain on her ankle was denied. She was referred from other hospital diagnosed with Neglected Fracture Right Talus. She had been diagnosed with type 2 diabetes six months prior, and her condition was managed with medication. She added that after falling and receiving treatment from a masseuse 23 years ago, she has been limping ever since. The patient's socioeconomic status is fairly good, and they have no history of drug or alcohol problems. During the physical examination, we discovered a noticeable growth around her ankle, which was placed on a 130° equinus deformity, but no indication of inflammation or infection.

Figure 2. Right Ankle X-Ray AP/Lateral View, Malalignment and destruction of navicular bone and partially cuniform medial, intermediate dan lateral, cuboid, talus and os calcaneus, also subluxation of tibiotalar joint

Figure 3. Right Foot X-Ray AP/Lateral Foot, Malalignment and destruction of navicular bone and partially cuniform medial, intermediate dan lateral, cuboid, talus and calcaneus, deformity of shaft to base phalanx proximal digiti II pedis dextra suspected old fracture

Figure 4. Right Ankle CT-Scan 3D Reconstruction

Figure 5. Clinical Picture Durante Op

Based on the history taking, physical examination and radiographic imaging, we assessment this patient with Right Hindfoot Charcot Joint Eichenholtz Classification Stage III and decided to underwent triple arthrodesis combined with autologous bone graft.

Patient on supine position, Incision according to anteromedial approach, superficial dissection: Skin, subcutaneous tissue, fat. Continued deep dissection: identification of Subtalar and tibiotalar joint, articular surface on tibiotalar joint is obtained in good condition, preservation of tibiotalar joint. Identification of talus, destruction of neck talus is obtained and the condition of talar body is still good. There are also spaces in the subtalar and talonavicular joints. Followed by debridement, osteotomy and decortication of the subtalar and talonavicular joints. Harvesting the right illiac bone graft and adding autologous bone

graft and insert graft from the rest of the neck talus to the bone defect. Then continued subtalar arthrodesis and talonavicular joint, using 1 cannulated screw on the navicular to talus sized 90mm, followed by using 4 pieces of cancellous screw sized 40mm 4.0 and 2 ring washers on the medial navicular to talus and calcaneus. Evaluation with C-arm -> good position, stability check on stable position. Followed by the installation of below knee cast on plantigrade position.

Figure 6.Below Knee Cast to achieved Plantigrade position

Figure 7. Post Operative Right Ankle X-Ray AP/Lateral/ Mortise View, Seen screw internal fixation on cuneiform medial-intermediate-lateral, naviculare, talus calcaneus on good position, gap and joint surface in good condition

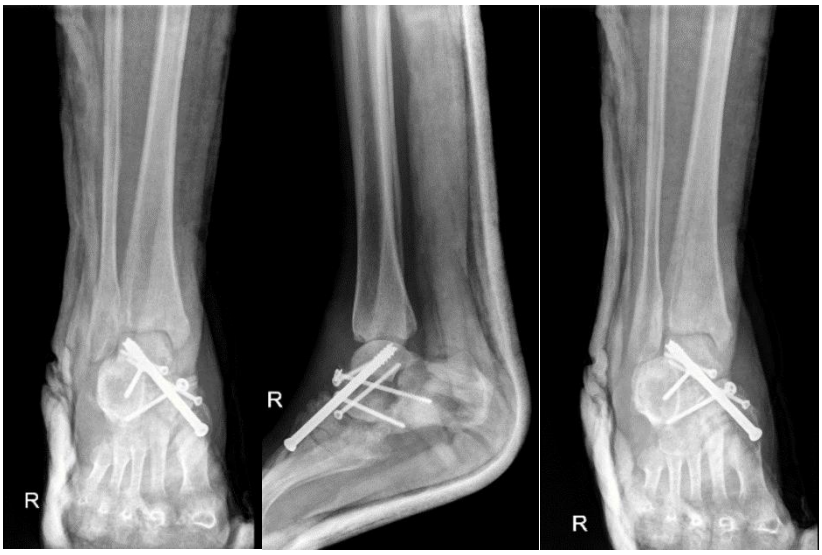

Figure 8. Post Operative Right Foot X-Ray AP/Lateral View

Figure 9. One Month Post Operative

Following the procedure, the patient experienced no problems. We have advised the patient to use two crutches for a non-weight-bearing exercise and to keep the cast on for at least two to three weeks as part of their post-operative rehabilitation. Every month following the surgery, the weight-bearing program will be modified based on clinical and radiographic examination.

Every month, we conducted a routine clinical and radiological assessment of the patient. Three months following the treatment, radiological imaging revealed positive outcomes, the implant was still in good alignment, and there were no indications of failure. We advised the patient to walk with some weight bearing. In addition, the patient said that she felt better following the surgery, that her foot looked better, that she could perform everyday tasks with less help than before, and that the pain gradually decreased.

DISCUSSION

For individuals with diabetes mellitus, Charcot neuroarthropathy poses a hurdle to limb salvage. Particularly in the early stages of the disease, it can be mistaken for mild sprains, deep vein thrombosis, osteomyelitis, cellulitis, and rheumatoid arthritis due to its difficult-to-diagnose signs and symptoms. Conservative measures include treating bone disease, unloading the affected foot, and avoiding additional fractures and/or dislocations may be taken into consideration in the early stages of the illness. As an outcome indicator, laboratory testing is also crucial. Kavarthapu stated that a HbA1c level of 8 or lower is required before to elective deformity correction, and that HbA1c is one of the numbers that should be maximized.

Patient was diagnosed Right Midfoot Charcot Joint Eichenholtz Classification Stage III, since we found the clinical finding of fixed 1300 equinus deformity, absence of swelling and erythema without any sign of acute inflammation. With the radiographic finding destruction of midfoot with consolidation of cuneiform bone and absence of navicular and cuboid bone. Talar body still intact with destruction of neck and talar head.

Table 1. The modified Eichenholtz classification [8].

Stage	Radiographic findings	Clinical findings	Treatment
0 (prodromal)	Normal radiographs	Swelling, erythema, warmth	Patient education, serial radiographs to monitor progression, protected weightbearing
I (development)	Osteopenia, fragmentation, joint subluxation or dislocation	Swelling, erythema, warmth, ligamentous laxity	Protected weightbearing with total contact casting or prefabricated pneumatic brace. Cast or brace should be used until radiographic resolution of fragmentation and presence of normal skin temperature (usually needed for 2–4 months).
II (coalescence)	Absorption of debris, sclerosis, fusion of larger fragments	Decreased warmth, decreased swelling, decreased erythema	Total contact casting, prefabricated pneumatic brace, Charcot restraint orthotic walker, or clamshell ankle-foot orthosis
III (reconstruction)	Consolidation of deformity, joint arthrosis, fibrous ankyloses, rounding and smoothing of bone fragments	Absence of warmth, absence of swelling, absence of erythema, stable joint ± fixed deformity	Plantigrade foot: custom inlay shoes with rigid shank and rocker bottom sole. Nonplantigrade foot or ulceration: débridement, exostectomy, deformity correction, or fusion with internal fixation.

Stages I-III described by Eichenholtz, Stage 0 added by Shibata et al. [9], because clinical signs of Charcot arthropathy were found to precede radiographic changes.

Apart from subjectivity, the Eichenholtz categorization has limitations. Anatomical location is not taken into account because it is a temporal staging method. Because the precise location and degree of osseous damage might also affect treatment decisions, this served as the catalyst for the creation of alternative classification schemes, including Brodsky's.

Table 2. Brodsky anatomic classification of Charcot arthroplasty (Types 1-3B) with Trepman et al. modification (Types 4 and 5)

Type	Location	Involved joints
1	Midfoot	Tarsometatarsal, naviculocuneiform
2	Hindfoot	Subtalar, talonavicular, calcaneocuboid
3A	Ankle	Tibiotalar
3B	Calcaneus	Tuberosity fracture
4	Multiple regions	Sequential, concurrent
5	Forefoot	Metatarsophalangeal

The surgical treatment was performed based on stage III Eichenholtz Classification of non plantigrade foot, with deformity correction of valgus midfoot (Table.2) and triple arthrodesis technique to achieved fusion of talonavicular, talocuboid and subtalar joint with multiple screws fixation. And below knee cast is applied 3 weeks in full plantigrade position of ankle joint.

Since the stages of the Eichenholtz classification primarily relate to radiographic abnormalities with specific physical examination findings, they do not take into consideration the symptoms and comorbidities of the patients. Clinical decision-making must take into account the unique symptoms and comorbidities of each patient. As long-term, poorly managed diabetes is closely linked to Charcot arthropathy, many individuals will present with additional musculoskeletal, ophthalmic, renal, and/or vascular complications. When creating a treatment plan, this needs to be taken into account because some disorders can make surgery impossible.

Radiographs may be negative in the early stages of the disease, but plain radiographs are still useful in detecting the distinctive abnormalities of Charcot arthropathy. In these situations, advanced imaging modalities like bone scans and MRIs are helpful because they enable early diagnosis, staging, and intervention. The most sensitive method for identifying early signs of Charcot neuropathy is magnetic resonance imaging (MRI), which can identify soft tissue edema,

arch collapse, joint effusions, and subchondral bone marrow edema of affected joints.

Although the ideal time to do surgery for CN is yet unknown, it is thought that doing so during the acute inflammatory phase of the condition may raise the risk of wound healing issues, make fixation more challenging, or possibly result in surgical failure. According to a previous study by Lowery et al., arthrodesis is the most popular treatment for CN, with a 76% fusion rate. Additionally, it is estimated that the overall cost of an arthrodesis procedure is at least 14% lower than that of a below-the-knee amputation. According to Simon et al., the average cost for an arthrodesis procedure and follow-up was $13.511, while the average cost for an extremity amputation was $25.090. As previously said, one of the factors we took into account while educating the patient to have surgery was cost-effectiveness. As a result, the patient would consent to surgery in order to improve their quality of life. In this study, it was demonstrated that the Triple Arthrodesis, which is fixed with screws, prevented further destruction advancement. Additionally, with a final AOFAS score of 86, the operation was successful in achieving plantigrade foot with outstanding function. But in order to guarantee a positive result, the patient's post-operative compliance was also crucial.

Declaration by Authors

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