Decellularized Dermis As An Adjunctive Therapy in Refractory Neuropathic Pressure Ulcer: Case Study

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Introduction

Chronic neuropathic foot ulcers associated with diabetes, Charcot neuroarthropathy, and peripheral neuropathy arise from a combination of loss of protective sensation, progressive foot deformities, and autonomic dysfunction of the skin. These pathophysiologic changes predispose patients to repetitive, unrecognized trauma and abnormal pressure distribution across the plantar surface of the foot, ultimately resulting in tissue breakdown and ulcer formation. The presence of impaired microvascular circulation, chronic inflammation, and metabolic dysregulation further compromises the body's ability to mount an effective wound-healing response .Impaired healing and frequent bacterial colonization often involving complex biofilm formation make management particularly challenging. Biofilms can protect pathogenic organisms from host immune defenses and antimicrobial therapy, contributing to chronicity and recurrent infection. Current clinical guidelines suggest that advanced wound therapies should be considered when a wound fails to achieve at least a 50% reduction in size after four weeks of optimal standard treatment. In such cases, biologically active adjunctive therapies may help stimulate the stalled healing process. Decellularized dermal matrix has emerged as an effective adjunctive treatment for recalcitrant ulcers. By providing a structural extracellular matrix scaffold, it supports cellular infiltration, neovascularization, and the deposition of new tissue, thereby facilitating wound regeneration. Recent randomized controlled trials have demonstrated that the use of decellularized dermal matrices can significantly improve healing rates and accelerate time to wound closure when compared with standard care alone. These findings support the incorporation of dermal matrix products as part of a comprehensive treatment strategy for chronic neuropathic foot ulcers that have not responded to conventional therapy.

Method

A 66-year-old morbidly obese, male patient presented with a chronic neuropathic ulcer on the plantar aspect of the left foot, persisting for more than five years, reflecting significant underlying sensory neuropathy, structural foot deformity, and a persistently impaired healing environment. Failed treatments included various skin substitutes and biologic dressings.

A comprehensive, multimodal strategy was initiated including a series of applications of decellularized dermal matrix, selected to provide a scaffold that supports cellular infiltration, angiogenesis, and tissue regeneration. Additionally, total contact casting achieved consistent offloading of plantar pressures, in addition to targeted lymphedema therapy to reduce chronic swelling, improve microcirculation, and enhance delivery of oxygen and nutrients. The combined approach aimed to correct the mechanical, biologic, and inflammatory barriers to healing and to optimize conditions for successful wound closure.

Results

From November 2024 through September 2025, the patient underwent an intensive, staged wound-healing regimen including nine applications of split-thickness allograft to re-establish epithelial coverage and provide temporary biologic support, followed by eight applications of decellularized dermal matrix to enhance structural integrity, promote cellular infiltration, and stimulate angiogenesis.

The broader multidisciplinary wound-care plan emphasized consistent offloading, edema control, and optimization of local and systemic healing factors resulting in complete healing by September 2025.

Figure 1. Chronic wound greater than three years (November 2024)

Figure 2. 13 months Post Amputation; After 13th Applications (June 2025)

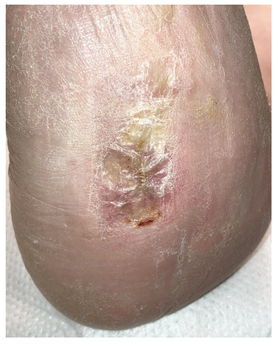

Figure 3. Closed wound; After 16 Applications (September 2025

Discussion

In this case, the strategic integration of advanced wound care modalities including the application of a decellularized dermal matrix, split-thickness allograft, total contact casting, and structured lymphedema management substantially improved the wound environment. These therapies worked synergistically to optimize local tissue conditions by enhancing effective offloading, reducing pathologic edema, improving microcirculatory dynamics, and supporting cellular migration and extracellular matrix formation necessary for tissue regeneration. The decellularized dermal matrix provided a biologically active scaffold that facilitated cellular infiltration and neovascularization, while the split-thickness allograft further promoted epithelialization and tissue coverage. Concurrently, total contact casting ensured consistent pressure redistribution and immobilization, which are critical for reducing repetitive mechanical stress at the wound site. Aggressive management of lymphedema played a key role in decreasing interstitial fluid accumulation, improving oxygen and nutrient delivery to the affected tissues, and enhancing the overall healing capacity of the limb. Through the coordinated implementation of these advanced therapies within a comprehensive wound care framework, the wound ultimately progressed to complete closure. This outcome highlights the importance of individualized, multidisciplinary care in the management of complex lower extremity wounds and reinforces the role of advanced biologic technologies as valuable adjuncts when incorporated into a well-structured treatment plan