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Compelling Reconstruction Case: Double Rotation Subcutaneous Fat Flap for Exposed Tendon Coverage After Mohs Micrographic Surgery of the Pretibial Region

Paulina Decker, B.S. [a, *] and Harib H. Ezaldein, M.D. [a]
[a] Miami Dermatology and Mohs Surgery, Department of Dermatologic Surgery Research, 4770 Biscayne Boulevard, Suite 900, Miami, Florida 33137

*** Corresponding author email address**: paulinadecker@gmail.com

Abstract

Reconstruction of distal pretibial defects remains challenging due to limited tissue laxity and poor vascular support, particularly when tendon is exposed and at risk for desiccation and delayed healing. We present a case of multiply recurrent squamous cell carcinoma of the distal pretibial region treated with Mohs micrographic surgery, resulting in a defect with exposed anterior tibial tendon. A double rotation subcutaneous fat flap was performed using adjacent adipose tissue to provide immediate vascularized coverage. The repair successfully protected the tendon and supported progressive granulation, allowing for uncomplicated healing with preservation of function and contour. This approach highlights a practical and tissue-sparing option for managing complex pretibial defects while promoting a favorable healing environment.

Keywords: Mohs micrographic surgery, squamous cell carcinoma, pretibial defect, subcutaneous fat flap, tendon coverage, secondary intention healing, dermatologic reconstruction

1. Introduction

Reconstruction of distal pretibial defects is challenging due to thin dermis, limited mobility, and poor vascularity.[1] When the anterior tibial tendon is exposed, inadequate vascular support impairs granulation and increases risks of desiccation, delayed healing, and infection.[2] Reconstruction must therefore provide both coverage and a vascularized environment.

Skin grafts and local flaps are often limited by poor graft take and restricted laxity, while more invasive flaps may be excessive.[3] Subcutaneous fat based flaps offer a vascularized, tissue sparing alternative that promotes angiogenesis and granulation.[4]

We present a case of recurrent squamous cell carcinoma (SCC) reconstructed with a double rotation subcutaneous fat flap, demonstrating a vascular sparing approach for reliable tendon coverage.

2. Case Presentation

A 69-year-old female with a biopsy-proven SCC on the left distal pretibial region **(Figure 1)**, measuring 1.0 × 1.2 cm, underwent MMS due to location and suspected deep dermal involvement.

Clearance was achieved after three stages, with final histology showing dense scar, focal epidermal atypia, and perineural inflammation without invasion. The final 3.5 × 3.7 cm defect extended to muscle fascia with exposed anterior tibial tendon **(Figure 2A)**.

Due to limited subcutaneous tissue and poor skin mobility of the distal leg, traditional advancement, transposition, and linear closures were avoided because of

risks of tension, ischemia, and tissue distortion. In the setting of multiple recurrent SCC, larger flap reconstructions and grafting were also avoided to preserve anatomy and enable surveillance. Split-thickness skin grafting was contraindicated given unreliable take over exposed tendon without a vascular substrate.[5] Therefore, a double rotation subcutaneous fat flap was selected to provide immediate vascularized coverage while maintaining structural integrity.

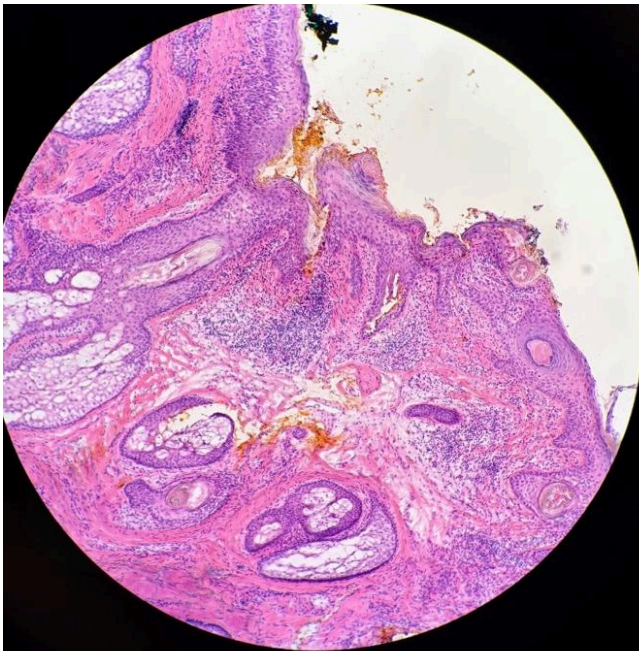

Figure 1. Biopsy Findings Consistent with Squamous Cell Carcinoma. Histopathologic image(10x) of the diagnostic biopsy showing atypical keratinocytes with pleomorphism, hyperchromatic nuclei, disorganized architecture beyond the basal layer, and evidence of keratinization and invasion (hematoxylin and eosin stain).

2.1 Reconstructive Technique

The flap was designed using two opposing semicircular arcs of subcutaneous fat, mobilized from perilesional tissue and rotated centrally to cover the exposed tendon. Dissection was performed in the deep subcutaneous plane to preserve the subdermal vascular plexus. The adipose flaps were then rotated inward, forming a continuous vascularized fat bridge over the tendon and creating a biologically active surface for granulation **(Figure 2)**.

Fixation was achieved with interrupted half-mattress 4-0 polypropylene dermal sutures, placed without excessive tension to preserve microcirculatory flow. Wound edges were tapered to promote epithelial migration, and hemostasis was achieved without cautery to prevent thermal injury to perforating vessels.

Two small secondary donor sites (1.2 × 2.2 cm and 1.1 × 0.9 cm) were closed primarily under minimal tension. The wound was dressed with Vaseline, Telfa, and Hypafix.

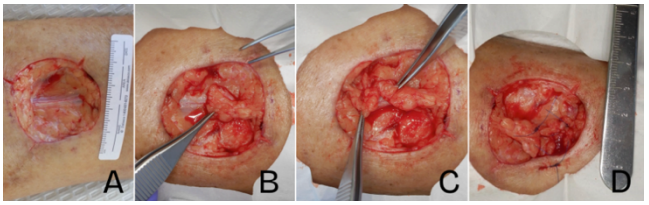

Figure 2: Reconstruction of Pretibial Defect With Exposed Tendon Using a Double Rotation Subcutaneous Fat Flap. (A) Pretibial defect after final Mohs stage for SCC with exposed anterior tibial tendon. (B) Initial mobilization of peri-defect subcutaneous fat. (C) Rotation of fat flaps for vascularized tendon coverage. (D) Immediate postoperative appearance with six-point anchoring suture for stabilization.

2.2 Postoperative Course

Postoperatively, zip-up compression stockings were used to reduce edema and improve venous return. Daily wound care included hypochlorous acid cleansing followed by Vaseline application. Doxycycline 100 mg BID was prescribed for five days, and an antimicrobial wash was recommended during showering to reduce infection risk.

At one week **(Figure 3A)**, the fat bed demonstrated healthy granulation tissue, indicating early angiogenesis.

By 7 weeks **(Figure 3B)**, the wound exhibited a well-vascularized granulating base with fibrin deposition and progressive epithelialization from the margins. Mild surrounding erythema was consistent with normal secondary intention healing, without evidence of infection or flap compromise. Contour of the pretibial region was preserved with gradual wound contraction.

At 15 weeks **(Figure 3C)**, complete epithelialization was achieved with durable soft tissue coverage over the previously exposed tendon. The reconstruction maintained stable contour without dehiscence, infection, or necrosis, with only mild residual erythema consistent with ongoing vascular remodeling. Tendon protection was preserved without functional limitation.

At 6 months **(Figure 3D)**, the site demonstrated a mature, well-remodeled scar with sustained contour and no evidence of breakdown or flap compromise. Subtle residual erythema and textural variation persisted, consistent with normal scar maturation. Durable tendon coverage and preserved function were maintained.

3. Discussion

Pretibial tendon exposure is challenging due to thin dermis, limited mobility, and poor vascularity. Without coverage, tendons lack capillary support for granulation, increasing risks of desiccation, delayed healing, infection, and necrosis.[1] Vascularized coverage is essential, with adjuncts such as platelet-rich fibrin improving granulation in smaller wounds ≤2.25 cm.[6]

Vascularized adipose techniques support this approach, showing pedicled fat can envelop extensor tendons and promote healing.[7] Similarly, the double rotation subcutaneous fat flap provides immediate vascularized coverage while preserving perforators and the subdermal

plexus.[8] The adipose layer acts as a biologically active scaffold supporting angiogenesis and collagen deposition.[2,4,9]

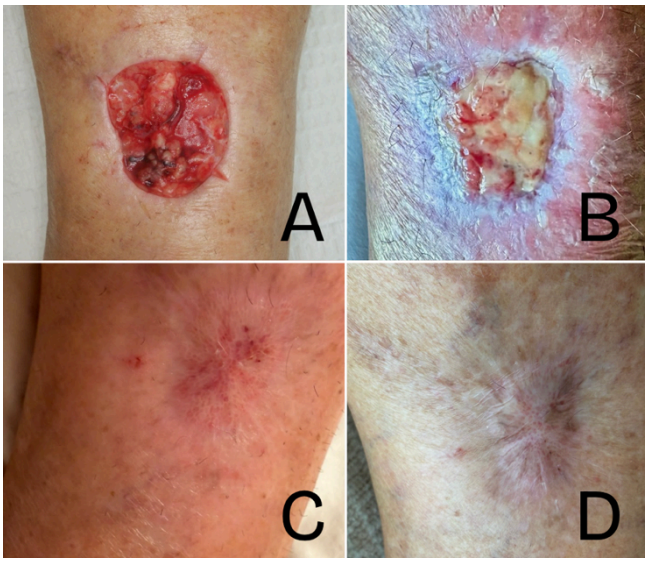

Figure 3: Sequential Postoperative Healing and Long-Term Outcomes Following Double Rotation Subcutaneous Fat Flap Reconstruction. (A) One-week postoperative appearance with viable flap and no necrosis or infection. (B) Seven-week appearance showing vascularized granulation, fibrin, and epithelialization. (C) Fifteen-week appearance with complete epithelialization and stable contour; mild residual erythema. (D) Six-month appearance with a mature scar, preserved contour, and no complications or recurrence.

This flap reduces tension and ischemia while preserving anatomy and minimizing donor-site morbidity. It is efficient, performed under local anesthesia, and avoids more extensive reconstruction. Alternatives are limited: skin grafts often fail over tendon, local flaps may lack mobility,[5] and muscle or fasciocutaneous flaps may be unnecessarily invasive.[3]

Following coverage, secondary intention healing produced rapid granulation and a well-contoured neodermis. While adjuncts may aid smaller wounds, this case shows vascularized adipose coverage alone can support reliable healing even in larger defects, underscoring the value of physiologically guided reconstruction.

Artificial Intelligence Disclosure

Authors of this paper ensure that the manuscript complies with the Journal's strict prohibition on generative artificial intelligence in both text and clinical imagery.

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