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Case Reports and Series

Treatment of Foot Degloving Injury With Aid of Negative Pressure Wound Therapy and Dermal Regeneration Template

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ABSTRACT

Degloving injury of the foot continues to be a challenging condition to treat. Despite current advancements in reconstructive options, most of these injuries can result in amputations, causing physical and emotional impairment. Few reports have been published on the management of these complex traumatic injuries. Typical reconstruction options have included skin grafting and reattachment of the avulsed skin. Many treating physicians have encountered challenging issues in predicting tissue viability, knowing the extent of the injury, and making a logical decision for limb salvage procedures. The present report provides an algorithm of our approach in managing degloving injuries. A case of foot degloving injury, treated by serial surgical operations with the dominant aim of salvaging the avulsed tissue, is presented. The avulsed portion of the foot, with no identifiable vessels for microsurgical reattachment, was defatted and used as a full-thickness skin graft. Negative pressure wound therapy and a dermal regeneration template were used as adjunct techniques to help obtain good soft tissue coverage. The traditional treatment methods for degloving injuries and the applications of new wound care technologies are discussed.

Degloving is a shearing injury, either partially or completely circumferential, of the skin and subcutaneous tissue from the underlying rigid muscle and fascia. It can occur in any instance in which a swift tangential force is applied to a fixed portion or limb. Common presentations are an extremity caught between a rolling object and a fixed plane, such as “wringer arm,” or more currently prevalent, entrapped extremities in automobile accidents. Such injuries, with significant soft tissue damage and exposure, are difficult to treat without compromising the long-term functionality of the affected limb, especially in the foot. Despite previous reports of management, degloving remains a challenging condition to treat.

Several modalities of reconstruction are available, including reattachment of the avulsed skin, split- or full-thickness skin grafts, and local or distant flaps (1–3). In the present study, we report a case of successful reconstruction using combined modalities and staged operations. The use of defatted avulsed skin as a full-thickness skin graft was the mainstay of treatment, with the aid of negative pressure wound therapy (NPWT) and acellular dermal grafts.

Case Report

A 66-year-old male, with medical history significant for coronary artery disease and hyperlipidemia, had experienced a traumatic circumferential degloving injury from the mid-arch area of the foot to his toes, with concomitant contusion of the left pretibia, after his left foot had been run over by a tow motor in an industrial accident. At his presentation in the emergency department, the muscle, bone, and tendon components appeared intact, and the patient was able to actively move all 5 digits (Fig. 1). In the operating room, the initial close examination of the avulsed portion of the foot revealed no identifiable vessels for microvascular reattachment and the plane of avulsion was found to be suprafascial. The decision was made to use the avulsed skin as a graft. The skin was then defatted and tailored to be used as a full-thickness glabrous skin graft. Additionally, the wound bed was debrided, including the volar fat pad, and partial amputation was noted at the third, fourth, and fifth digits. Pulse irrigation and electrocautery were used to wash out the wound and control bleeding. The full-thickness graft was “pie-crusted” and anchored to the wound bed. NPWT was used over a silver-

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Fig. 1. Initial presentation of the patient in the emergency department.

Fig. 3. After debridement and partial graft loss, an area with exposed tendon was identified (*arrows*).

impregnated dressing to stabilize and protect the graft. During the acute course of the injury, the patient was taken to the operating room 3 times after the initial reconstruction. On postoperative day 2, a preplanned "second look" operation was performed for additional wound debridement and removal of the second, third, and fourth distal phalanxes. On postoperative day 4, additional excisional debridement was performed, and an area on the dorsal foot with an exposed tendon became evident (Figs. 2 and 3). This region was reconstructed with a 25-cm^2 dermal regeneration template (Integra®, LifeSciences, Plainsboro, NJ). During the intervals between the operations, NPWT was maintained to promote wound bed revascularization. The final stage of reconstruction was 27 days after the injury, with placement of a 150-cm^2 split-thickness skin autograft over the vascularized wound bed. After this final procedure, 95% of the dorsal skin graft was noted to be viable, and most of the degloved skin graft continued to be viable and adherent to the plantar side of the wound, except for small areas of tissue loss. At 47 days after his injury, NPWT was discontinued and switched to daily silver ointment dressing changes and physical therapy. At 68 days after the injury, the patient was able to return to work, using a protective boot and a scooter to limit ambulation. At a 3-year follow-up visit, the wound had maintained complete closure, and patient was able to bear weight fully wearing protective shoes (Figs. 4 and 5).

Discussion

The sole of the foot is composed of thick plantar skin and dense subcutaneous tissue and fat, and the skin in the dorsum is thin, with

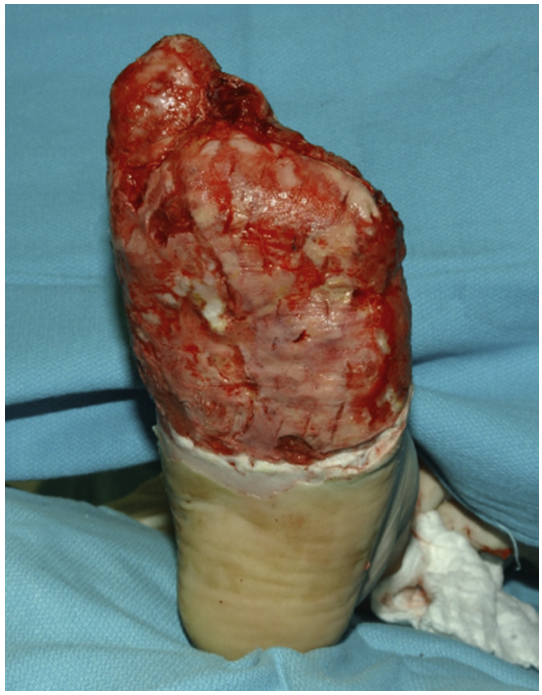

Fig. 2. Serial excisional debridement and amputations were performed.

Fig. 4. Complete healing after reconstruction of the sole with the avulsed flap.