CHAPTER **28**

TECHNIQUE PEARLS FOR APPLICATION AND MAINTENANCE OF SPLIT-THICKNESS SKIN GRAFTS IN FOOT WOUNDS

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INTRODUCTION

Open wounds of the lower extremity may prove challenging to heal. In addition to increasing complexity of reconstruction, traumatic, and salvage efforts, open wounds have also proven to be an increased burden on the healthcare system. The application of split-thickness skin grafts (STSGs) to chronic extremity wounds has often been considered undesirable because of the perceived high incidence of failure, especially in neuropathic patients with plantar diabetic foot wounds.

In 2500-3000 BC, members of a Hindu tilemaker caste reportedly grafted gluteal skin to re-create a nose, and as early as 1872, Ollier and Thiersch described the technique of STSG placement (1). We will offer some technical pearls in the execution of applying a STSG to lower extremity wounds, as well as some encouraging data that have been published by the authors.

Figure 1. This wound has been treated with serial debridement and negative pressure wound therapy for 4 weeks, prior to the date of the STSG procedure. Note the granular base with exposed fascia, tendon, capsule, and bone.

TECHNIQUE

Many techniques exist to heal open or chronic wounds, most of which focus on secondary intention. STSG placement has rarely been discussed as a primary means of healing wounds, particularly those on the diabetic foot. The authors have developed a method of STSG placement that can be performed in a consistent fashion.

Patients required a healthy, granulating wound bed, which was usually aided by perioperative debridement and treatment with a wound vacuum-assisted closure (VAC) device (Figure 1). In the operating room, the surgical sites are prepped with chlorhexidine antiseptic and draped to the groin (Figure 2). A rough measurement of the recipient site is recommended in order to plan the harvest site portion of the procedure (Figure 3). Local bupivacaine 0.25% with epinephrine can be used to prepare the wound bed to decrease excessive bleeding and potential hematoma formation.

Figure 2. Chlorhexidine is used to sanitize the skin from the foot to the thigh. Chlorhexidine is chosen as it able to be washed away with normal saline before harvest and application.

Figure 3A.The recipient site is grossly measured in order to optimize the harvest portion of the procedure.

Figure 3B. The donor site is measured.

Figure 4A. A sagittal saw is utilized to create fresh margins of bone.

Figure 4B. A debridement of the wound is performed to also create a fresh margin of granulation. This is also a final opportunity to resect fibrous tissue and structures before the application of the graft.

Wound beds were sharply debrided to healthy, bleeding tissue, either with a surgical blade or using hydrodebridement (Versajet, Smith and Nephew). Specific care is taken to remove prominent or exposed bone and fibrous tissue, as well as overhanging margins of skin and soft tissue (Figure 4). Once an optimal surface topology has been rendered, a sterile scrub brush is used to further agitate and texture the wound base (Figure 5). High velocity irrigation can be used to remove remaining debris and further sanitize the recipient site for graft application.

The STSG is often harvested from the ipsilateral thigh, and can be performed simultaneously to the wound bed preparation. Prior to surgical prep, the area to be harvested is shaved with a liberal margin (Figure 6). The area to be harvested is anesthetized with 0.25% bupivacaine with epinephrine and then lubricated with mineral oil (Figures 7, 8). An electric dermatome is used to harvest the skin at a range of 0.012 to 0.018 inches thick. If available, it is preferred that the graft be pie-crusted, rather than meshed. This has proven to be useful in increasing incorporation for foot wounds, specifically in the plantar aspect.

The graft can be sutured in place using 4-0 chromic gut sutures or staples (Figure 9). Recipient sites were dressed with a layered negative pressure wound therapy (NPWT) dressings containing polyvinyl alcohol and polyurethane for a minimum of 3 days followed by a compressive dressing and aggressive protection from external pressure (Figure 10).

The donor site is dressed with occlusive petrolatum gauze with 3% bismuth tribromophenate, 4x4s and transparent film dressing (Tegaderm) (Figure 11). Elastic cotton padding and 6-inch ace bandage are then applied to hold compression over the thigh. Wounds are assessed weekly.

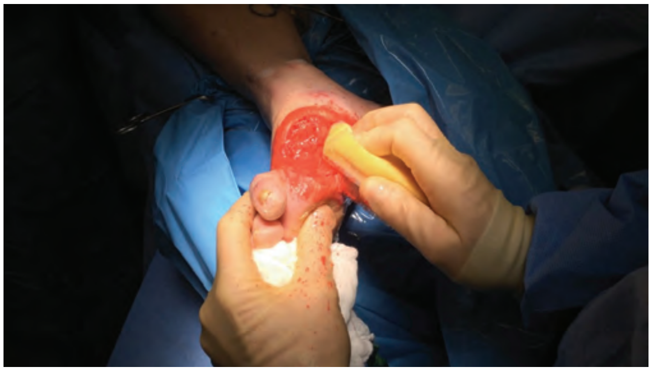

Figure 5. The wound bed is scrubbed aggressively to texturize the wound base, prior to a final lavage of fluid under high pressure.

Figure 6. An electric shaver is used to remove hair at the harvest site, as well as a liberal margin around the site. This will prevent hair from hindering adhesion of the dressing.

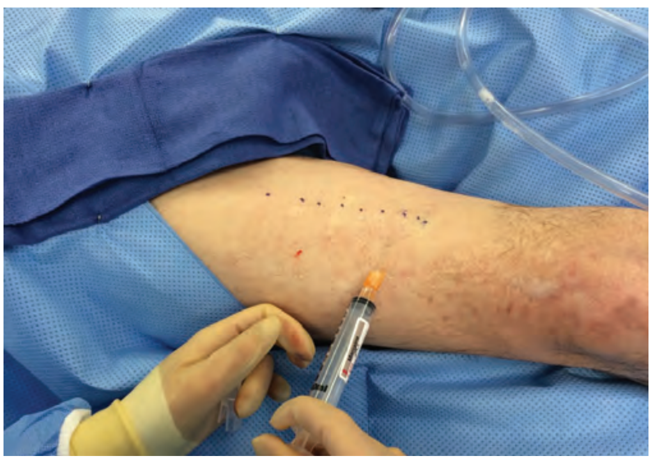

Figure 7. Multiple threads of local anesthesia are infiltrated from lateral to medial direction, beginning at the proximal aspect and continuing distal.

Figure 8. A tongue depressor is utilized to liberally apply mineral oil over the harvest site, as well as the dermatome.

Figure 9. A STSG is stapled into place and subsequently dressing with a multilayered STSG. This pie-crust still allows adequate drainage with negative pressure assistance, while offering increased surface closure.

Figure 10. A multilayered white and black foam dressing is applied to retain vitality of the graft with a moisture controlled negative pressure wound therapy.

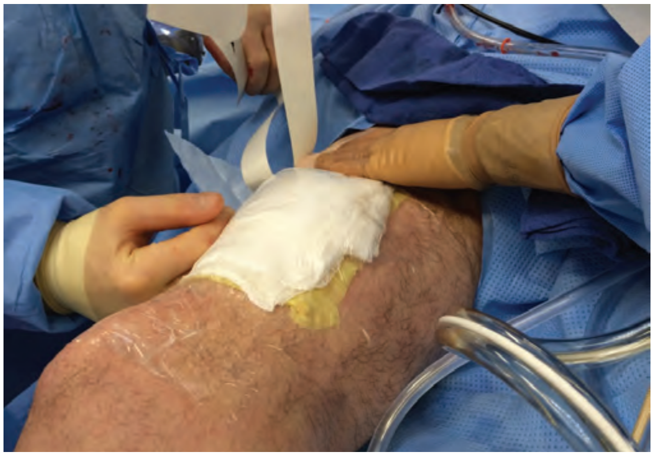

Figure 11. Xeroform, 4x4s, and a large adherent dressing are applied with wide margins from the harvest site. This dressing is then covered in a compressive dressing and changed weekly.

DISCUSSION

STSG placement has not traditionally been recommended for treating diabetic foot wounds, particularly those on the plantar, weight-bearing surface. There is a paucity of literature describing the ideal management of such wounds. Even less has been published supporting STSG placement, despite the fact that skin grafting has been performed for centuries. However, given our own experience, supported by one other report in the literature (2), we recommend performing STSG placement in order to heal chronic diabetic foot wounds. This is true even in select cases on the plantar surface.

In addition, as described in this study, we routinely use negative pressure wound therapy (NPWT) as an adjunct to prepare the wound bed before grafting and to postoperatively bolster the STSG. Advantages of using NPWT as a bolster dressing include improved graft take, ready conformance in difficult anatomic areas, ease of application, reduction in seroma and hematoma formation, and improved ability of patients to ambulate despite the dressing. Moisidis et al, in a randomized controlled trial, showed improved epithelialization and better STSG quality in patients who were treated with NPWT, a benefit the authors attributed to increased oxygenation at the site and continuous removal of exudate and bacteria (3).

In a comparison of people with diabetes undergoing STSG placement for wound healing versus conservative care with a standard paraffin gauze and iodine dressing, Mahmoud et al reported that 86% of the STSG patients healed at 8 weeks in contrast to only 46% in the conservative care group. Mahmoud et al also reported that more rapid healing time translated into decreased hospital length of stay and overall decreased cost of care (4).

In conclusion, a STSG is a viable tool in the resolution of wounds in the lower extremity. When comparing the costs of repeated biologic substitutes, compared to an operative procedure to apply a STSG, it is likely a more cost-effective solution for many patients.

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