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Skin Graft Care on Large Wound Defect After Necrotizing Fasciitis of The Leg

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Abstrak

Introduction: Necrotizing fasciitis (NF) is an aggressive bacterial infection that causes extensive necrosis of subcutaneous tissue and fascia. Treatment of NF includes radical surgical debridement, often resulting in large wounds that need to be closed using split-thickness skin grafts (STSG). However, clinicians should be fully aware of the postoperative management of patients with skin grafts due to its high risk of failure, especially in the lower limb. The success of a skin graft depends on the graft care along each step to provide the graft with the best chance of survival. **Case Illustration**: A 79-year-old male with a large open wound on the left foot after debridement of an abscess 1 month ago due to necrotizing fasciitis. A skin graft was performed on the patient one day after being treated. Donor skin was taken from the left femur area and attached to the open wound area of the left cruris region. The skin graft was fixed with prolene, then covered with antibiotic ointment gauze and sterile gauze, and immobilized with a backslab. One week later, graft take and no sign of infection or graft failure. Redressing was done, and the patient was controlled again in one week. **Discussion**: The healing process of the graft heavily relies on vascular integration and careful management, with special attention to short-term complications. **Conclusion**: STSG is an effective procedure for covering large area wounds, with advantages such as lower metabolic burden for recipient and better nutrient diffusion than FTSG. However, STSG needs proper graft care, and follow-up in the success of STSG.

Keywords: Graft care, Necrotizing fasciitis, Split-thickness skin graft, Surgical debridement.

I. INTRODUCTION

Necrotizing fasciitis (NF) is an aggressive bacterial infection that causes extensive necrosis of subcutaneous tissue and fascia. The estimated incidence of NF worldwide is approximately 0.24-0.4/100,000 people per year, and this infection is among the most challenging emergencies for healthcare providers.[1] However, in some countries, the incidence of NF is more common, with more than one case out of every 100,000 people per year.[2] Despite its low incidence, the infectious process in NF can spread rapidly, causing secondary infections of the skin, soft tissues, and muscles, leading to sepsis, systemic toxicity, multiorgan failure, and potentially fatal outcomes.[3]

Necrotizing fasciitis is an acute process that occurs rapidly over several days. In approximately 80% of cases, NF results from a direct sequel of a bacterial infection that enters through damage to the skin integrity.[4] Gram-positive cocci, particularly Staphylococcus aureus species and other Streptococcus bacteria, are responsible for most of these infections. Polymicrobial infections can also occur due to a combination of gram-negative and anaerobic involvement.[5] The infection spreads along the fascia, which has a poor blood supply. The overlying tissue is not initially affected, potentially delaying diagnosis and surgical intervention.

Treatment of NF includes radical surgical debridement, often resulting in large wounds that need to be closed by methods such as split-thickness skin grafts (STSG), local flaps, or guided tissue regeneration procedures.[6] STSG is a skin graft method that contains the epidermis and part of the dermis. This contrasts with a full-thickness skin graft (FTSG), which consists of the epidermis and the entire dermis.[7] Unlike flaps, STSG has no blood supply, so it must rely on a well-vascularized wound bed for graft growth. Generally, STSG autografts are taken from the lateral thigh and the torso, as these locations are aesthetically hidden and easy to take due to their large surface.[7]

Clinicians should be fully aware of the postoperative management of patients with skin grafts. The wound should be closely monitored for bleeding, infection, and ischemia.[7] Any changes to the wound require immediate communication with the plastic and reconstructive surgeon. Not only that, but wound care should also be monitored until complete healing is achieved. The success of a skin graft depends not only on the surgeon but also on the interprofessional team caring for the patient.[7]

The role of STSG treatment in the success of skin grafts is important, so in this case report, the author will discuss the treatment and follow-up of post-STSG patients for indications of postoperative defects of abscess debridement in the sinistra cruris region. This case report is expected to be useful as learning material in providing STSG treatment

II. CASE ILLUSTRATION

A 79-year-old male with a large open wound on the left foot after debridement of an abscess 1 month ago. The patient was reported to have necrotizing fasciitis 1 month ago, so debridement was performed, which left the patient with a large open wound. Physical examination revealed an open wound with extensive granulation in the cruris sinistra region, negative active bleeding, negative pus, and negative pain.

The patient was admitted to inpatient care on the next day (Figure 1). During hospitalization, the patient was given IVFD NaCl 0.9% 500 cc / 8 hours, Ceftriaxone injection 2x1 gr, Ketorolac injection 3 x 30 mg, and Ranitidine injection 2 x 50 mg. A skin graft was performed on the patient one day after being treated. Donor skin was taken

from the left femur area and attached to the open wound area of the left cruris region. The skin graft was fixed with Prolene, then covered with antibiotic ointment, gauze, and sterile gauze, and immobilized with a backslab. In the donor area of the syncytial femur, antibiotic ointment gauze was applied, covered with sterile gauze, and wrapped with an elastic bandage. The patient was discharged the next day. Antibiotic ointment was applied to the donor area of the syncytial femur, covered with sterile gauze, and wrapped with an elastic bandage.

One week later, a follow-up was done. The first week's follow-up showed graft take and no sign of infection or graft failure (Figure 2). Redressing was done, and the patient was controlled again in two weeks.

Three weeks after discharge, the patient showed encouraging signs of healing. Most of the grafted skin was still well-attached to the wound bed, with no signs of tissue breakdown or necrosis (Figure 3). Around the edges of the graft, there was some mild crusting and scabbing, which is not uncommon at this stage. A few small areas near the lower part of the graft were healing a bit more slowly, but there was no pus or discharge, and nothing to suggest infection. The skin around the wound showed no redness, warmth, or swelling, and the patient had no fever or other signs of systemic illness. Wound care was carried out gently, using moist, non-stick dressings. In the slower-healing spots, an antimicrobial ointment was applied to support tissue repair and prevent infection. Overall, the graft was progressing well, and the patient's recovery remained on track.

FIGURE 1. PRE-OPERATIVE CONDITION.

FIGURE 2. POST-OPERATIVE DAY 7TH CONDITION.

FIGURE 3. THREE WEEKS AFTER DISCHARGE CONDITION.

III. DISCUSSION

Split-Thickness Skin Graft (STSG) is the transfer of skin tissue containing the epidermis and part of the dermis from one part of the body (donor) to another (recipient).[7] The use of STSG is highly indicated to cover large wounds. STSGs have several advantages compared to a thicker skin graft. STSGs have higher metabolic activity and nutritional diffusion due to their thin layer.[7,8] Unlike the STSGs, FTSGs need more robust recipient wound beds and should avoid unhealthy beds like chronic ulcers. However, STSGs have certain disadvantages when compared to other methods, such as occasionally having poor color and texture similarity to the surrounding recipient site skin, being highly susceptible to trauma, having poor recipient site sensation, requiring anesthesia or surgery (in contrast to secondary intention healing), and requiring longer wound care for both the donor and recipient sites (in comparison to flap closure).[7,8]

There are several challenges to successful grafting. Among these are a failure to integrate the graft with the host tissue, a lack of adherence that causes the graft to loosen over time, immunological reactions that result in graft rejection, the potential for infections, and an improper vascular anastomosis with the host vasculature that causes sustained hypoxia and ultimately necrosis of the grafted tissue.9 This certainly shows the importance of knowing the mechanism of graft take physiology, proper wound care, and follow-up in the success of STSG.

After skin transplantation, the survival of the graft is initially supported by the diffusion of essential nutrients from the host wound bed to the graft through a process known as plasmatic imbibition (Table 1).[9,10] However, this is limited by the range of diffusion. Within 48 hours, the graft's vascular buds begin forming anastomoses with the host tissue's vessels through inosculation, creating a connection crucial for the survival of the graft. This process facilitates the development of a functional vascular network between the graft and the recipient tissue, significantly enhancing the graft's viability. Following inoculation and neovascularization, the formation of new blood vessels from the host tissue to the graft occurs within 72 hours and lasts 7 days.[10] Neovascularization and a successful graft take are indicated by the development of pink color within 3 to 7 days. Although the graft may continue to be lighter than the surrounding skin, the pink color fades over the next one to two months.[9]

Table 1. Stage of Skin Graft Take on The Recipient Site.[12-13]

Stage	Event
Imbibition	Day 0-3. The graft receives nutrients from the plasma through direct contact.
Inosculation	Day 3-7. The exact mechanism is unknown. Graft and donor site regenerate or generate new blood

	vessels, which anastomose and allow blood flow to begin.
Revascularization	Day 7-21. New blood vessel is formed. Reinnervation begins, and the graft takes on the recipient site's sweating pattern.
Reinnervation	Generally begins within the first month and can take several months to years to fully complete.

As discussed earlier, STSG is generally adherent to the recipient wound bed 5 to 7 days after SG placement. Intraoperatively applied dressings will remain in place until 5 to 7 days postoperatively to minimize shear and traction on the healing SG.[11,12] At 5 to 7 days postoperatively, the dressing is removed, and the SG is observed. The graft should be pink, indicating successful inosculation and revascularization. After observation, the SG was covered with antibiotic gauze and petroleum jelly/Vaseline to keep the SG moist. Over the next 7 to 14 days, dressing changes should be performed every 24 to 72 hours. The patient, home care, or primary healthcare facility can change these dressings. At 2 to 3 weeks postoperatively, the SG should be adherent and epithelialized so the patient can shower and stop frequent dressing changes.[7]

STSG requires a collaborating interprofessional team. The donor location, recipient location, and date of the following dressing change should be fully explained to the patient by the surgeon so that the entire healthcare team can treat the patient appropriately.[7] In this way, the newly grafted wound will not be disturbed. The wound should be closely monitored for bleeding, infection, and ischemia. Any changes in the wound require immediate communication with the surgeon. In addition, as many of these patients are immobilized, special care is needed to ensure that the patient is not in a state of deep vein thrombosis. Wound dressing changes should be made according to the surgeon's preference. The success of STSG depends not only on the surgeon but also on the interprofessional team caring for the patient.[7]

Short-term complications of STSG may include fluid build-up between the STSG and the wound bed that can threaten the success of STSG, including seroma, hematoma, and infection. In the case of seroma, a synthetic absorbable wound dressing can cover a wound, absorb exudate, and maintain the proper moisture balance. Meanwhile, in cases of hematoma and infection, the press bandage technique can be performed, and topical and systemic antibiotics can be given to the patient.

This case report presents a 79-year-old male patient who came to the plastic surgery clinic with a large open wound on the left leg after debridement of an abscess 1 month ago. The patient was diagnosed with a postoperative debridement defect of an abscess at the left lower extremity. After 1 week of STSG surgery, the patient came to the plastic surgery clinic for control. This is in accordance with the literature review in the research of Braza et al., 2023, which states that 5 to 7 days after skin graft placement, the dressing attached during intraoperative will be removed and the skin graft observed.[7] The results of graft observation at the first poly control (1 week after surgery) showed that the graft was pink, indicating successful inosculation and revascularization. For 1-2 weeks afterward, the patient was educated to change the dressing every 1-3 days. By 2 to 3 weeks postoperatively, the SG adherent and epithelialized

IV. CONCLUSION

In conclusion, STSG is an effective procedure for covering large area wounds, with advantages such as higher metabolic activity and better nutrient diffusion than FTSG. Although STSG has some drawbacks, such as potential color and texture mismatch with the surrounding skin and its

vulnerability to trauma, it can be successful if proper care and monitoring are provided. The healing process of the graft heavily relies on vascular integration and careful management, with special attention to short-term complications like seroma, hematoma, and infection. The success of STSG also depends on a skilled interprofessional medical team and effective communication with the patient to ensure optimal monitoring and care

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VI. Conflict of Interest

The authors declare no conflict of interest.

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VIII. Author Contribution

The author contributions are as follows: conceptualization: E.K. and S.P.; data collection and analysis: E.K. and S.P.; drafting of the article: E.K.; critical revision of the article: S.P. Syed Faqeer Hussain Bokhari; critical revision of the article and Proofread. All authors reviewed and agreed to the published version of the manuscript.

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