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FIXATION OF SPLIT SKIN GRAFT USING SKIN STAPLES VERSUS SKIN SUTURES- A COMPARATIVE STUDY

General Surgery

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ABSTRACT

Introduction: The skin, being the body's largest organ, is frequently used for resurfacing various defects, making it an effective approach for managing large ulcers of different causes. The objective of this study was to compare the efficacy and clinical outcomes of using sutures versus staples in split-thickness skin grafts for wound healing.**Materials & Methods:** This prospective study involved 40 patients who underwent skin grafting with either sutures or staples for anchoring. Various parameters were recorded, and the results were analyzed.**Results:**The study found no significant statistical difference between the two groups in terms of skin graft take and complications.**Conclusion:** Both methods effectively anchored split-thickness skin grafts. However, staplers offer an advantage due to their faster application, which results in fewer complications and easier removal.

KEYWORDS

Split Skin Graft , Stapler , Suture

INTRODUCTION

The skin, or integument, is the body's largest organ, notable for its extensive surface area. The term "integument" comes from the Latin word *integer*, meaning “to cover.” This organ is in direct contact with the external environment, and its biological and mechanical properties are crucial for protecting and maintaining the delicate balance of the body's internal environment. [1]Its semipermeable nature helps prevent fluid loss, while its rich capillary network aids in thermoregulation. Langerhans cells within the skin contribute to the adaptive immune system, and the abundant nerve endings provide essential sensory functions, making it a critical sensory organ. Additionally, the skin plays a vital role in vitamin D metabolism. It is essential to restore any loss of skin that may occur due to various causes.

As the largest organ, skin is frequently used as the primary tissue for resurfacing different defects. Skin grafting involves transferring cutaneous tissue from one area of the body to another to repair defects. The graft, which is initially devoid of blood supply, becomes revascularized by the recipient site[2,3]. A skin graft typically involves harvesting a thin layer of skin from a donor site. Thus, skin grafting is one of the most commonly performed surgical procedures. Split-thickness skin grafts are harvested by taking the entire epidermis along with part of the dermis, leaving the remaining dermis to heal the donor site[3,4]. Split-thickness skin grafts are also used to cover skin and soft tissue defects.[5-7]

MATERIALS AND METHODS

The study aimed to compare the efficacy and clinical outcomes of using sutures versus staples in split-thickness skin grafting (SSG) for wound healing. This prospective, comparative study was conducted on patients requiring split-thickness skin grafts. It took place in the Department of General Surgery between june 2025 and december 2025, involving 40 patients who were divided into two groups which were randomly allocated theory chif system. Group A had their split skin grafts fixed using skin staples, while Group B had theirs fixed using 3-0 nylon sutures. The split-thickness skin grafting was performed using a Humby's knife, with informed consent obtained from all participants.

The inclusion criteria for the study were patients of either sex, aged between 18 and 60 years, who were undergoing split skin grafting to treat ulcers or raw areas. Additionally, patients had to have a preoperative wound culture that was free from streptococcal or other bacterial infections. The exclusion criteria included wounds that exposed bare bone, cartilage, or tendons.

Splin skin graft fixation using stapler

Split skin graft fixation using skin sutures

RESULTS AND OBSERVATIONS

In the prospective study conducted on 40 patients who have undergone Split Skin Graft . We found that out of the 40 patients total 18 patients were male and 22 were female. In group A 12 were female and 8 were male and In group B each having 10 male and female respectively

	Group A	Group B
Female	12	10
Male	8	10
Total	20	20

In comparing duration of surgery in group A we found it was 65+/- 10 min and in group B it was 75+/-10 min

On comparing 1st look / graft uptake at POD -5. We found almost comparable result.

Wound Infection - In group A patient we found 2 out of 20 got infection and in group B we found 6 out of 20 got infection

	Group A	Group B
Infection	2/20	6/20

Re-grafting required in 1 patient in group A and 2 patient in group B

	Group A	Group B
Re-grafting	1/20	2/20

Cosmetic appearance - Almost equal in the both groups

DISCUSSION

Skin grafts are categorized based on their source into autografts, homografts, allografts, and xenografts or heterografts. They are further classified according to the skin thickness into split-thickness skin grafts (STSGs), full-thickness skin grafts (FTSGs), and composite skin grafts. Within STSGs, there are additional classifications based on dermal thickness: thin, intermediate, and thick STSGs[8,9]. Additionally, ultra-thin grafts, which consist only of the epidermis without dermal components, are noted for their specific clinical uses.[10]

Skin graft classification

Source of graft and recipient	Terminology
Same individual	Autograft
Different individual or same species with same genetic background (identical twins)	Isograft
Different individual or same species	Allograft
Different species	Heterograft/ Xenograft

SPLIT THICKNESS SKIN GRAFT

A split-thickness skin graft (STSG) consists of the epidermis and a portion of the dermis, with its thickness influencing the graft type—thick, intermediate, thin, or ultra-thin. Epidermal thickness is at its minimum in infants, increases through puberty, and then decreases again with age. Dermal thickness also starts thin, reaches its peak around age 40, and then decreases in older adults. Overall, skin thickness varies: approximately 0.020 to 0.025 inches in children, 0.060 to 0.100 inches in males, and about 0.040 inches in females. Grafts thicker than 0.018 inches can lead to donor site complications and are less commonly used. Thinner grafts, ranging from 0.010 to 0.012 inches, are preferred for challenging recipient sites or when multiple grafts are required from a limited donor area. The dermal thickness in the graft affects its quality and the healing of the donor site.

Donor Sites

After harvesting a split-thickness skin graft, the donor site heals primarily through the regeneration of the epidermis from residual sweat glands and hair follicles. However, the loss of dermal tissue cannot be fully replaced, a condition known as "dermal loss."

When harvesting split-thickness skin grafts (STSG), the ideal donor site should have thick skin, be easily accessible without requiring repositioning, be discreetly located, and not be under constant pressure when the patient is lying down. While grafts can technically be taken from any part of the body, the lateral thigh, buttocks, and lower abdomen are preferred for smaller grafts. These areas have thicker skin, produce high-quality grafts, and heal well. The medial thigh, particularly in women and children, tends to have thinner skin and is generally avoided. Donor sites typically take 10 to 21 days to re-epithelialize, depending on the graft thickness. Complications such as infection and hematoma can hinder healing and may require intensive treatment. Skin thickness varies with anatomical location and medical conditions; for example, the trunk, posterior thighs, back, and post-auricular region have thicker skin, while long-term corticosteroid use can thin the dermis. It is also advisable to avoid hair-bearing areas when harvesting thicker grafts.

Skin Graft Fixation Techniques

For successful graft integration, it is crucial to ensure stable fixation and immobilization of the graft to the recipient bed. Proper alignment is essential, and moderate pressure should be applied to maintain firm contact between the graft and the recipient area. Various methods can be used to achieve this, including sutures, skin staples, tie-over dressings, compression-occlusive dressings, sealants, and negative-pressure wound therapy (NPWT). The approach to graft fixation can vary depending on whether a full-thickness or split-thickness skin graft is used and may require specific preparation for each type.

Skin Suturing

Suturing is a widely used and effective method for securing skin grafts. Both non absorbable and absorbable sutures can be employed. However, this technique can be time-consuming, as it involves both the application and subsequent removal of the sutures. Needle punctures may cause minor bleeding, and buried sutures, due to epithelial overgrowth, can complicate their removal. There is also a rare risk of stitch abscess. Absorbable sutures are particularly beneficial for meshed skin grafts, as they can remain in place without needing to be removed.

Skin Staples

Skin staples offer the advantage of quick and straightforward application, making them particularly useful for covering large areas. This method has become increasingly popular over the past two decades. However, the removal of staples can be painful, and there is a risk of graft edges becoming trapped, potentially leading to wastage and affecting the contour of the defect. Staples can also be used to secure pressure dressings. For example, the "glove technique" involves fixing the rolled edge of a sterile glove with staples to one side of the grafted area, then stretching the glove over a cotton bolster and securing it on the opposite side to apply continuous compression, such as for dorsal foot grafts. Tie-over bolster dressings are advantageous for uneven or irregular surfaces, as they provide effective compression and graft immobilization. More details on this technique are provided in the section on full-thickness skin grafts (FTSG).

Postoperative Care

Once grafts are applied, they typically adhere to the recipient bed within a few hours, with complete graft uptake usually occurring by the fifth day. The timing of the first inspection of the recipient site depends on the condition of the wound. Early inspection is necessary for infected or granulating wounds, whereas it can be delayed for clean, fresh wounds. Typically, the initial graft inspection is conducted between the fifth and seventh day, though it may be extended to up to 10 days in some cases. If the dressing becomes soaked or shifts, an early change on the third day may be required. While early inspection can provide an indication of graft uptake, it also risks disturbing the graft. During the first inspection, even if the graft appears adhered, it may not fully integrate, often reflecting a "dermal take." Loose or non-adherent grafts and those appearing pale should be gently removed to prevent infection. Any fluid trapped beneath the graft should be expelled through punctures, and gentle pressure on the area can aid in this process. The raw areas left after debridement of non-viable grafts will usually heal rapidly. Following inspection, non-adherent dressings should be replaced, and splints may be used until the next dressing change in about three days. Children may require sedation for dressing changes and suture removal, and splints may need to be worn for a longer period.

Graft Failures and Complications

The success of a skin graft heavily depends on the condition of the vascular bed. Disruptions in this process can lead to graft loss. Common causes of graft failure include: (1) disruption of the graft, (2) an inadequate recipient bed, and (3) host-related factors. One of the primary reasons for the failure of autologous skin grafts is hematoma formation. Blood clots can obstruct direct contact between the graft and the recipient bed, hindering revascularization. Similarly, fluid accumulation, such as seroma, beneath the graft can cause graft loss. To minimize the risk of seroma or hematoma, a light pressure dressing is recommended, and ensuring proper hemostasis is crucial.

Before applying a skin graft, it is crucial to prepare the recipient bed adequately. In cases where complications such as seroma or hematoma are anticipated, meshing the graft—either manually or with a mesher—can facilitate drainage. For patients undergoing elective surgery, it is advisable to discontinue anticoagulant medication at least 3 days prior. Infection is another significant cause of graft failure. Purulent infections can mechanically interfere with and destroy the graft, while non-purulent infections like those caused by Pseudomonas can compromise the graft even after it has initially adhered. Preventative measures include thorough preparation of the wound bed and removal of excessive granulation tissue. Additional factors contributing to graft failure include poor vascularity of the recipient bed and movement of the graft. To avoid these issues, it is important to immobilize the grafted area effectively. Mechanical shear is also a common cause of graft loss. Proper immobilization techniques, such as using splints, tie-over bolster dressings, or vacuum-assisted closure (VAC) devices, depending on the graft type and recipient site, are essential to prevent graft failure.

CONCLUSION

Split-thickness skin grafting is a highly effective technique for addressing wounds resulting from infection, trauma, or surgery. This study evaluated the use of skin staples versus skin sutures for fixing split-thickness skin grafts. The findings highlighted significant differences in preoperative wound cultures and graft take at the second inspection, underscoring the importance of infection control and graft survival. While factors such as initial graft take, postoperative care, surgery duration, and comorbidities did not show significant differences between the two methods, they are still relevant. Both techniques proved effective, allowing physicians to select based on patient comfort, expertise, and cost considerations. In conclusion, our study supports skin stapling as the preferred method for graft fixation due to its ease of use and rapid application, making it a practical and efficient choice.

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