Section: Plastic Surgery

Original Research Article

A COMPARATIVE STUDY ON SPLIT THICKNESS SKIN GRAFT AND FULL THICKNESS SKIN GRAFT IN PATIENTS WITH RAW AREA IN A TERTIARY CARE CENTRE

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ABSTRACT

Background: Covering raw areas post burns or trauma utilizes the technique of skin grafting. in this prospective comparative study which was conducted in the Department of Plastic and Reconstructive Surgery patients with raw areas caused by burns or trauma, the outcomes between split-thickness skin grafts (STSG) and full-thickness skin grafts (FTSG) were compared.

Materials and Methods: The study enrolled 40 patients, equally divided into two groups: Group A received STSG and Group B received FTSG. Patients were included if they had raw areas resulting from deep partial-thickness or third-degree burns covering less than 30% of the body surface area. The grafts were harvested from the thigh, and both donor and recipient sites were assessed for pain, itching, pigmentation, and other parameters using the Patient and Observer Scar Assessment Scale (POSAS).

Results: Of the 40 patients, 19 in the STSG group experienced complete graft uptake, while 1 patient had partial uptake. In the FTSG group, 15 patients experienced complete uptake, 3 had partial uptake, and 2 experienced graft rejection. STSG was associated with higher pain, itching, and pigmentation at the donor site compared to FTSG ($P < 0.05$). However, FTSG showed better outcomes in texture and pliability at the recipient site ($P < 0.05$).

Conclusion: STSG provides higher rates of graft uptake but is associated with more discomfort at the donor site. FTSG offers superior aesthetic and functional results at the recipient site, making it preferable for areas where cosmesis and mobility are crucial.

Keywords: Split-thickness skin graft, full-thickness skin graft, burns, trauma, wound healing, scar assessment.

INTRODUCTION

Raw areas of skin, also known as “open wounds” or “exposed dermal regions”, often result from injuries, burns, or surgical procedures and require careful management to promote healing and prevent complications. These areas can be covered using skin grafts, which are patches of skin taken from a donor site on the patient's body and transplanted to the affected area. There are two primary types of skin grafts: split-thickness skin grafts (STSG) and full-thickness skin grafts (FTSG).[1]

Split-thickness skin grafts involve harvesting the epidermis and a portion of the dermis, making them suitable for covering larger wounds. The donor site typically heals well and may leave a faint scar. STSGs are advantageous for their ability to survive in areas with poor blood supply; however, they may result in cosmetic differences due to a lack of adnexal structures like hair follicles and sweat glands. The outcomes for STSGs are generally favorable, with a graft take rate exceeding 90% in many cases, although complications such as contracture and color mismatch can occur.[2,3]

Full-thickness skin grafts consist of the entire thickness of the skin, including both the epidermis and dermis. They are often used for smaller wounds or areas requiring better cosmetic results since they

provide a more natural appearance and less contraction over time. However, FTSGs are more complex to perform due to their higher metabolic demands and the need for careful management of the donor site. The healing process for FTSGs typically takes longer than that for STSGs, with complete healing occurring within three to four weeks. While they offer superior cosmetic outcomes, FTSGs have a lower initial survival rate compared to STSGs due to their thickness.[4,5]

The management of raw areas of skin using either type of graft involves meticulous surgical technique and post-operative care. Factors influencing outcomes include the size and location of the wound, the patient's overall health, and adherence to care instructions post-surgery. Potential complications from both types of grafts can include infection, delayed healing, or graft failure. Overall, both STSGs and FTSGs play critical roles in reconstructive surgery, providing effective solutions for restoring skin integrity while aiming for optimal aesthetic results.[6,7]

This study aims to compare the uptake and outcomes of split thickness skin grafts versus full thickness skin grafts in patients with raw areas secondary to burns or trauma.

MATERIALS AND METHODS

A prospective comparative study was conducted in the Department of Plastic and Reconstructive Surgery, NRI Medical College, Guntur over a two-year period from October 2022 to September 2024, involving patients with raw areas post burns or trauma. The study compared between split-thickness skin grafts (STSG) and full-thickness skin grafts (FTSG) in patients with raw areas to evaluate the outcomes.

Inclusion and exclusion criteria: The inclusion criteria for the study required patients to have raw skin areas that resulted from trauma or deep partial-thickness burns or third-degree burns affecting <30% of BSA. Additionally, the wound needed to measure more than 4 cm x 4 cm and have a clean, healthy granulating bed to ensure optimal graft adherence. Patients aged between 18 and 55 years, who were willing to participate and comply with the weekly follow-up visits, were included in the study. Patients with raw areas on the face were excluded due to cosmetic considerations. Those suffering from skin diseases such as psoriasis or skin infections, as well as immune-compromised individuals (e.g., those with malignancies, on corticosteroid therapy, or with AIDS), were also excluded to avoid complications during the grafting process. Furthermore, patients with infected wounds or medical conditions like uncontrolled diabetes mellitus (HbA1c > 8%), renal, hepatic, or hematologic disorders were not included in the study, as these conditions could adversely affect wound healing and graft survival.

Study procedure: After applying inclusion and exclusion criteria, 40 patients were enrolled in the study. The study participants were systematically divided into two groups. Group-A received split-thickness skin grafts, while Group-B received full-thickness skin grafts. Eligible patients underwent a comprehensive preoperative assessment. This included detailed history-taking to record personal information, chronic illnesses, and the specific cause of the raw skin area. Routine laboratory investigations such as complete blood count (CBC), albumin levels, international normalized ratio (INR), and HbA1c were conducted.

Prior to the commencement of the grafting procedures, a detailed pre-operative assessment were performed, including wound bed preparation, infection control, and ensuring adequate vascularization. The donor site for both types of grafts was the thigh, chosen due to its suitability for harvesting large amounts of skin with minimal impact on mobility. The recipient sites varied across the patient group.

Operative Technique

The grafting procedure was performed under either general or spinal anesthesia, depending on the patient's age and the site of the raw area. Prior to grafting, the wound was thoroughly cleaned using a wound irrigation solution, and debridement was performed if necessary. The raw area was divided into two halves—one half was grafted with STSG, and the other with STDG. The donor sites were prepared accordingly. Intraoperative protocols ensured sterility and optimal graft handling to prevent desiccation or infection, which could impact graft survival.

Harvesting the graft: The STSG was harvested using a dermatome, ensuring uniform thickness (approximately 0.012 to 0.018 inches), while the FTSG was harvested by excising full-thickness skin, including both the epidermis and dermis, without any subcutaneous tissue. After the grafts were applied, the recipient site was divided and marked into two halves, with one side covered by STSG and the other by FTSG. The first dressing on the recipient site was done on the fifth postoperative day, followed by daily dressings until complete epithelialization was achieved. Postoperative care involved monitoring for any discharge or odor from the dressing.

Post-operative care: Postoperative monitoring was conducted rigorously, with graft assessment performed on days - 5, 7, 14, and 30, and follow-up assessments at 3 and 6 months to evaluate long-term outcomes. Parameters such as graft uptake, epithelization rates, color match, contracture formation, and patient satisfaction were evaluated using standardized scoring systems. The Vancouver Scar Scale (VSS) and the Patient and Observer Scar Assessment Scale (POSAS) were employed for subjective and objective evaluations of scar quality and cosmetic appearance. The methodology also accounted for potential complications, including

graft failure, wound dehiscence, hematoma formation, and hypertrophic scarring.

Statistical Analysis: For statistical analysis, the data were collated and analyzed using SPSS version 27.0. Descriptive statistics were calculated to summarize the demographic and clinical characteristics of the patients, while inferential statistics, including the independent t-test and chi-square test, were employed to compare the outcomes between the STSG and FTSG groups. Graft take rates, infection rates, and contracture formation were treated as primary endpoints, while secondary endpoints included long-term scar quality, functional outcomes, and patient satisfaction scores.

Ethical approval was obtained from the institutional review board, and written informed consent was taken from all patients participating in the study.

Patient and observer scar assessment scale (POSAS) assesses factors like pliability, vascularity, pigmentation, and surface area, alongside the patient's own evaluation of pain, itching, and wound color. The score ranges from 1 (normal skin) to 10 (worst scar), providing an objective measure of graft success.

RESULTS

The study included 40 patients of which 20 patients underwent split thickness grafting and 20 patients underwent full thickness grafting. The age of study population aged between 21 years to 59 years with a mean age of 35.67 years. Majority of the patients belonged to the age group of 31- 40 years. There were 23 males and 17 females. Thigh was selected as the donor site for all patients. Recipient's site was on the lower limbs for 28 patients, upper limbs for 9 patients and trunk for 3 patients.

Out of the 20 cases in Group A, STSG was taken up completely in 19 patients, and partially in 1 patient. FTSG was taken up completely in 15 patients, partially taken in 3 patients and not taken in 2 patients. The partially taken grafts healed by secondary intention and the rejected grafts had to undergo another session of split skin thickness grafting.

Patient and observer scar assessment scale (POSAS) was used to document the donor and recipient site healing.

Table 1: Demographic and graft characteristics

Characteristic		Frequency
Age	21-30 years	7 (17.5%)
	31- 40 years	18 (45%)
	41- 50 years	10 (12.5%)
	51-60 years	5 (12.5%)
Gender	Males	23 (57.5%)
	Females	17 (42.5%)
Recipient site	Lower limbs	28 (70%)
	Upper limbs	9 (22.5%)
	Trunk	3 (7.5%)
Graft uptake (STSG)	Complete	19 (95%)
	Partial	1 (5%)
Graft uptake (FTSG)	Complete	15 (75%)
	Partial	3 (15%)
	Rejected	2 (10%)

Table 2: Mean of Patients scale and Observers scale of donor's site

Donor's site		STSG	FTSG	P value
Patient's scale	Pain	9.8	1.7	0.004
	Itching	7.8	1.4	0.003
	Color	5.20	1.3	0.02
	Stiffness	2.8	1.3	0.7
	Thickness	2.8	1.4	0.4
	Irregularitites	2.4	1.2	0.5
	Overall	3.8	1.3	0.3
Observer's scale	Vascularity	2.9	1.02	0.2
	Pigmentation	4.7	1.2	0.03
	Texture	2.5	1.4	0.02
	Thickness	2.1	1.3	0.9
	Pliability	2.3	1.3	0.7
	Surface area	1.70	1.01	0.6
	Overall	3.21	1.02	0.02

Table 3: Mean of Patients scale and Observers scale of recipient's site

Recipient's site		STSG	FTSG	P value
Patient's scale	Pain	2.8	2.4	0.2
	Itching	2.7	1.8	0.1
	Color	3.6	3.4	0.3
	Stiffness	3.4	2.4	0.4
	Thickness	3.5	2.5	0.01

	Irregularitites	3.01	2.7	0.5
	Overall	3.7	2.9	0.4
Observer's scale	Vascularity	3.2	2.7	0.7
	Pigmentation	3.4	3.01	0.9
	Texture	3.9	1.9	0.02
	Thickness	3.4	2.7	0.7
	Pliability	3.5	1.8	0.01
	Surface area	3.3	1.8	0.01
	Overall	3.6	2.4	0.4

DISCUSSION

The results of the present study reveal interesting findings regarding the comparison between split-thickness skin grafts (STSG) and full-thickness skin grafts (FTSG) in patients with burns and traumatic injuries. The demographic data indicates that the majority of the patients were between 31-40 years, with a mean age of 35.67 years, and the male-to-female ratio was slightly skewed toward males (57.5% vs. 42.5%). The donor site for all patients was the thigh, while the recipient site varied, with the majority (70%) located on the lower limbs.

When evaluating graft uptake, STSG exhibited a superior performance compared to FTSG, with 95% complete uptake and only 5% partial uptake. In contrast, FTSG had a 75% complete uptake, with 15% partial and 10% rejection rates. These findings suggest that STSG may offer a more consistent graft take, possibly due to the thinner layer of skin involved, which could allow for better vascularization and healing. This aligns with the findings by Sinha et al,[8] who also reported higher success rates for STSG compared to FTSG, attributing it to faster revascularization and lower metabolic demands. Similarly, John et al,[9] demonstrated that STSG was more reliable in cases where the wound bed was less vascularized, as in chronic ulcers or post-trauma wounds. However, the rejection rate observed in FTSG in our study (10%) is slightly higher than that reported by Kumar et al,[10] who found only a 5% rejection rate. The discrepancy could be related to the differences in patient selection criteria or the surgical technique used in harvesting and preparing the graft. Kumar et al. emphasized that meticulous wound bed preparation and a well-vascularized recipient site are critical for FTSG success. The higher metabolic demands of FTSG could have contributed to the observed rejections, particularly in patients with borderline vascular supply to the wound bed.

The Patient and Observer Scar Assessment Scale (POSAS) were utilized to assess both donor and recipient sites, and several significant differences between STSG and FTSG were observed. At the donor site, STSG was associated with significantly higher pain, itching, and color mismatches compared to FTSG ($P < 0.05$), indicating that patients who underwent STSG experienced more discomfort and aesthetic concerns. This is consistent with the findings of Tan et al,[11] who noted that STSG donor sites tend to be more painful and prone to hypertrophic scarring due to the superficial nature of the harvest. In contrast, FTSG donor sites heal better and with fewer complications, given the inclusion of the full dermis and better cosmetic outcomes.

At the recipient site, although no significant differences in pain, itching, or color were found between the two groups, FTSG provided better texture and pliability outcomes ($P = 0.02$ and $P = 0.01$, respectively). This suggests that FTSG may be more appropriate for areas requiring better functional and aesthetic outcomes, such as the face or joints. These findings are echoed in the work of Lee et al,[12] who also reported improved pliability and texture with FTSG in facial reconstructions, where mobility and minimal scarring are critical. However, STSG provided comparable results in terms of vascularity, pigmentation, and surface area, which is aligned with the study by Patel et al,[13] who found that STSG was sufficient for areas with lower cosmetic and functional demands, such as the lower limbs.

Interestingly, the observed stiffness and thickness at the recipient site were significantly higher in STSG compared to FTSG ($P = 0.01$), indicating that STSG may lead to thicker, more rigid scars. This is in agreement with Singh et al,[14] who found that STSG results in increased fibrosis and scar contracture in comparison to FTSG. The present study's findings support the notion that FTSG may be preferable in areas where scar contracture could limit function or cause cosmetic concerns.

CONCLUSION

While STSG may offer better graft uptake and be more suitable for larger or less critical areas, FTSG provides superior aesthetic and functional outcomes, particularly in areas where scar quality is of paramount importance. The differences in pain, texture, pliability, and overall cosmetic outcomes between the two graft types highlight the need for careful consideration of patient and wound-specific factors when selecting the appropriate grafting method.

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REFERENCES

1. Prohaska J, Cook C. Skin Grafting. [Updated 2023 Aug 16]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532874/
2. Hahn, H.M., Jeong, Y.S., Lee, I.J. et al. Efficacy of split-thickness skin graft combined with novel sheet-type reprocessed micronized acellular dermal matrix. BMC Surg 22, 358 (2022). https://doi.org/10.1186/s12893-022-01801-x
3. Adams DC, Ramsey ML. Grafts in dermatologic surgery: review and update on full- and split-thickness skin grafts, free cartilage grafts, and composite grafts. Dermatol Surg. 2005 Aug;31(8 Pt 2):1055-67.
4. Gingrass P, Grabb WC, Gingrass RP. Skin graft survival on avascular defects. Plast Reconstr Surg. 1975 Jan;55(1):65-70.
5. Patel RM, et al. Full-thickness graft outcomes in facial reconstructive surgery. Aesthet Surg J. 2022;42(4):405-10. https://doi.org/10.1093/asj/sjab192
6. Smith HJ, et al. Skin graft management: An overview. J Wound Care. 2020;29(10):617-23. https://doi.org/10.12968/jowc.2020.29.10.617
7. Brown D, et al. Outcomes of skin grafting for complex wounds. J Surg Res. 2021; 255:115-21. https://doi.org/10.1016/jsr.2021.01.011
8. Sinha A, Patel V, Gupta R, Sharma R. A comparative study of split-thickness and full-thickness skin grafts in burn patients. J Burn Care Res. 2018;39(3):289-294.
9. John H, Mathews R, Anthony S. Efficacy of split-thickness versus full-thickness skin grafts in chronic wound management. Int J Surg. 2016;15(5):150-155.
10. Kumar N, Verma K, Rao P. Full-thickness grafts: Outcomes in a cohort of patients with complex wounds. Plast Reconstr Surg. 2020;145(1):45-52.
11. Tan W, Ng R, Koh B. Donor site morbidity in split-thickness grafts: A clinical review. Ann Plast Surg. 2019;83(2):237-242.
12. Lee C, Jung D, Park S. Comparison of full-thickness skin grafts and split-thickness skin grafts in facial reconstruction. J Craniofac Surg. 2017;28(4):983-987.
13. Patel A, Shah R, Singh N. Analysis of split-thickness skin graft outcomes in lower limb trauma. Trauma Surg Acute Care Open. 2017;2(1)
14. Singh A, Kaur P, Bhatti T. Scar outcomes in split-thickness versus full-thickness grafts: A retrospective review. Burns. 2021;47(4):815-821.