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Research Article

Split-Thickness Versus Full-Thickness Skin Grafting for Auricular Reconstruction After Non-Melanoma Skin Cancer Excision: A Retrospective, Single-Center Cohort Study.

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Abstract

Background and Objective: Non-melanoma skin cancer frequently affects the ear, where reconstruction is challenged by limited local tissue availability. Skin grafting is a simple and reliable option, but the choice between full-thickness (FTSG) and split-thickness skin grafts (STSG) varies in clinical practice. This study aimed to compare outcomes following auricular reconstruction using these two techniques.

Methods: We conducted a retrospective, single-center cohort study of 141 patients who underwent auricular reconstruction after excision of non-melanoma skin cancer between January 2022 and December 2024. Patients received either a STSG or a FTSG. Graft take, surgical characteristics, and postoperative complications were compared between the two graft types.

Results: STSG showed higher graft take than FTSG (90.0% vs 78.9%; mean difference 11.0%, 95% CI 0.6–21.5; P=.04). Complication rates did not differ significantly between groups.

Conclusion: STSG provided comparable and possibly higher graft take, while complication rates were comparable between techniques.

Keywords: auricular reconstruction; skin graft; split-thickness skin graft; full-thickness skin graft; non-melanoma skin cancer; basal cell carcinoma; squamous cell carcinoma; graft take.

INTRODUCTION

Non-melanoma skin cancer (NMSC) represents a substantial proportion of dermatological and plastic surgical activity and is strongly associated with cumulative ultraviolet exposure.[1,2] Lesions frequently occur on sun-exposed areas of the head and neck, including the ear, which is recognized as a high-risk site associated with comparatively higher rates of local recurrence and metastasis for keratinocyte carcinomas.[3] The combination of thin soft tissue, underlying cartilage, and limited adjacent tissue presents unique reconstructive challenges.[4,5]

Auricular reconstruction requires a balance between oncologic safety and restoration of form. Primary closure is often not feasible because of limited tissue mobility, and local flaps may be restricted by defect size or anatomical location. Skin grafting therefore represents a simple and reliable reconstructive option in many cases.[5,6]

Both split-thickness (STSG) and full-thickness skin grafts (FTSG) are widely used in clinical practice, and the two techniques differ in their biological behavior and clinical properties. STSGs have lower metabolic demands and are more tolerant to ischemia.[7] By contrast, FTSGs depend on rapid re-establishment of perfusion through plasmatic imbibition, inosculation, and subsequent angiogenesis, and are therefore more vulnerable to failure when the recipient bed is compromised.[8] FTSGs retain the full dermal layer and are often preferred for their improved aesthetic outcomes,

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including better color match[9,10] and reduced secondary contraction.[11]

Despite these differences, the choice of graft type is often influenced by surgeon preference rather than by standardized criteria. Comparative outcome data between STSG and FTSG specifically in auricular reconstruction remain limited, with much of the available evidence derived from other anatomical regions.[12]

The aim of this study was to compare graft take, postoperative complications, and surgical characteristics between STSG and FTSG in auricular reconstruction following excision of NMSC.

MATERIALS AND METHODS

Study Design and Setting

This retrospective, single-center cohort study was conducted at the Department of Plastic and Breast Surgery, Aalborg University Hospital, Denmark, in accordance with Danish regulations on the protection of patient data and the principles of the Declaration of Helsinki. The study was approved by hospital management as a quality-improvement project, which waived the requirement for ethics-committee approval. The study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cohort studies.13 We included patients who underwent surgical resection of basal cell carcinoma (BCC) or squamous cell carcinoma (SCC) located on the auricle between January 1, 2022, and December 31, 2024. Data were collected between February 1, 2025, and April 30, 2025. Postoperative complications were assessed over a one-year postoperative period by review of patient medical records.

Participants

All consecutive adult patients reconstructed with either an STSG or an FTSG following resection of auricular NMSC during the study period were eligible for inclusion. A total of 141 patients met these criteria and were included. Patients reconstructed by techniques other than skin grafting, such as primary closure, local flaps, or wedge excision, were outside the scope of this study and were not included.

Data Collection and Variables

Clinical data were extracted from the electronic patient record system and entered into a predefined REDCap database. The dataset comprised patient demographics (age, sex, smoking status, and anticoagulant or antiplatelet use), tumor characteristics (histological diagnosis, size, and anatomical location on the auricle), surgical variables (graft type, donor site, and graft size), and postoperative outcomes. Standardized definitions were applied to ensure consistency across reviewers.

Outcomes

The primary outcome was graft take, expressed as the percentage of the graft surface area that healed, which was assessed by specially trained wound nurses using a standardized method established in a prior prospective study.14 Secondary outcomes included infection, hematoma, total necrosis, and donor-site complications. Infection was defined as a clinical wound infection requiring antibiotic treatment; hematoma as a postoperative collection of blood at the graft site; and total necrosis as complete (100%) graft loss.

Statistical Analysis

Continuous variables are presented as mean (standard deviation) and compared using the Welch two-sample t-test. Categorical variables are presented as counts (percentages) and compared using the Pearson chi-squared test (with continuity correction for 2×2 tables), with the Fisher's exact test applied when expected cell counts were small. Graft take is reported as the group mean with 95% confidence interval (CI), and the between-group difference is reported as a mean difference with 95% CI. Missing data were handled by complete-case analysis, and the number of observations contributing to each analysis is reported. To protect patient confidentiality, groups comprising five or fewer patients are reported as "≤5". All tests were two-sided, and a P value below .05 was considered statistically significant. Analyses were performed using R statistical software (version 2026.01.2+418).

Surgical Technique

Tumor excision was performed according to standard oncologic principles. Reconstruction with either an STSG or an FTSG was undertaken on the basis of defect characteristics, patient co-morbidities and wishes as well as the surgeon's preference. FTSGs were harvested with a scalpel, defatted, and sutured into place; the preauricular region, clavicular area, and upper arm were the most common donor sites. STSGs were harvested from the thigh using an electric dermatome, trimmed to fit the defect, and applied to the recipient site. In both techniques, fixation was achieved with monofilament, non-absorbable sutures, followed by a compressive (tie-over) dressing to ensure adequate contact between the graft and the recipient bed. Dressings were typically removed after approximately one week in our plastic surgery wound clinic.

RESULTS

Participants and baseline characteristics

A total of 141 patients were included, of whom 58 underwent reconstruction with an STSG and 83 with an FTSG. The two groups were comparable with respect to demographic

characteristics and most baseline clinical variables (**Table 1**). Patients were predominantly male (approximately 80% in both groups) and elderly (mean age 78.1 years in the STSG group and 74.7 years in the FTSG group; P=.06).

Table 1. Demographic and baseline characteristics.

Variable	N	STSG (N=58)	FTSG (N=83)	P value
Age, years	141	78.1 (9.0)	74.7 (11.4)	.06
Sex	141			.73
Female		11 (19%)	19 (23%)	
Male		47 (81%)	64 (77%)	
Anticoagulant/antiplatelet use	141	25 (43%)	22 (27%)	.06
Type of agent (among users)	47			.94
Anticoagulant		15 (60%)	12 (55%)	
Antiplatelet agent		10 (40%)	10 (45%)	
Current smoking	141	≤5	≤5	>.99
Side of ear	141			.51
Right		28 (48%)	46 (55%)	
Left		30 (52%)	37 (45%)	

Values are mean (SD) or n (%). STSG, split-thickness skin graft; FTSG, full-thickness skin graft. P values from the Welch two-sample t-test (continuous variables) and the Pearson chi-squared test (categorical variables). Smoking counts of five or fewer are reported as "≤5" to protect patient confidentiality.

Tumor and surgical characteristics

BCC was the most common diagnosis (74% in the STSG group and 77% in the FTSG group) (**Table 2**). The distribution of graft type differed significantly by tumor location (P<.001).

STSG accounted for a higher proportion of conchal (cavum conchae) defects (19% vs 6%) and posterior auricular defects (28% vs 13%), whereas FTSG was used more frequently for helical defects (46% vs 17%) (**Table 2**).

Table 2. Tumor characteristics.

Variable	N	STSG (N=58)	FTSG (N=83)	P value
Cancer diagnosis	141			.83
BCC		43 (74%)	64 (77%)	
SCC		15 (26%)	19 (23%)	
Tumor size, mm	141	15.3 (10.3)	11.0 (5.2)	.004
Tumor location	141			<.001
Anterior		21 (36%)	29 (35%)	
Helix		10 (17%)	38 (46%)	
Posterior		16 (28%)	11 (13%)	
Conchal bowl (cavum conchae)		11 (19%)	≤5	

Values are n (%) or mean (SD). BCC, basal cell carcinoma; SCC, squamous cell carcinoma. P values from the Pearson chi-squared test (categorical variables) and the Welch two-sample t-test (continuous variables).

Graft take and complications

STSG showed higher graft take than FTSG. Mean graft take (the percentage of the graft surface area that healed) was 90.0% (95% CI 83.1–96.9) in the STSG group and 78.9% (95% CI 70.9–87.0) in the FTSG group, corresponding to a mean difference of 11.0% (95% CI 0.6–21.5; P=.04) (**Table 4**).

Postoperative complication rates were low overall and did not differ significantly between groups (**Table 4**). Infection occurred in 10% of patients in the STSG group and in 16% of those in the FTSG group (P=.51). Rates of hematoma, total necrosis, and donor-site complications were similarly low, with no statistically significant differences between groups.

Table 3. Surgical characteristics.

Variable	N	STSG (N=58)	FTSG (N=83)	P value
Donor site	141			<.001
Thigh		58 (100%)	0 (0%)	
Clavicular		0 (0%)	40 (48%)	
Preauricular		0 (0%)	34 (41%)	
Other		0 (0%)	9 (11%)	

Values are n (%). STSG, split-thickness skin graft; FTSG, full-thickness skin graft. P values from the Pearson chi-squared test. The "Other" donor-site category includes the upper arm and other minor sites.

Table 4. Postoperative outcomes.

Variable	N	STSG (N=58)	FTSG (N=83)	P value
Graft take, %	132	90.0 (83.1–96.9)	78.9 (70.9–87.0)	.04
Graft size, mm	141	25.9 (11.0)	21.6 (5.4)	.008
Donor-site complications	140	≤5	≤5	.96
Infection	141	6 (10%)	13 (16%)	.51
Hematoma	141	12 (21%)	13 (16%)	.59
Total necrosis	141	≤5	12 (14%)	.26
Other complications	141	6 (10%)	6 (7.2%)	.73

Graft take is reported as mean (95% CI); other continuous values are mean (SD); categorical values are n (%) unless otherwise indicated. Hematoma combines minor and major events. Counts of five or fewer patients are reported as "≤5" (without a percentage) to protect patient confidentiality. P values from the Welch two-sample t-test (continuous variables) and the Pearson chi-squared test (categorical variables).

DISCUSSION

This study suggests that STSGs achieve comparable, and possibly higher, graft take than FTSGs in auricular reconstruction following excision of NMSC, while complication rates remain comparable between the two techniques, despite STSGs being used for significantly larger tumors.

The higher graft take observed with STSGs is consistent with their lower metabolic demand and greater tolerance to ischemia.7 In contrast, healing of FTSGs depend on rapid revascularization8 and are therefore more susceptible to partial graft failure. Similarly, STSGs have previously been shown to achieve higher graft take than FTSGs in the reconstruction of scalp defects.12

However, donor-site selection also carries practical implications. STSGs were harvested from the thigh, a site associated with appreciable donor-site morbidity, including pain and delayed healing, particularly in elderly patients, whereas FTSG donor sites (preauricular, clavicular, upper arm) are typically closed primarily.16 These trade-offs should be weighed alongside graft take when selecting a technique.

The low overall complication rates in our cohort are consistent with previous reports of auricular reconstruction after skin cancer surgery.4 Anticoagulant or antiplatelet therapy was common in this elderly cohort (Table 1). Although such therapy may increase the risk of perioperative bleeding, dermatologic and graft surgery is generally considered safe to perform without routinely discontinuing antithrombotic agents,14,15 and meticulous hemostasis and graft fixation remain important to avoid subgraft hematoma.

Limitations

Although FTSGs are often favored for their superior aesthetic outcomes, including improved contour and reduced contraction, which may be less relevant on the auricle,11 these outcomes were not evaluated in the present study. Because graft type was selected at the discretion of the operating surgeon and according to patient preference, allocation was non-random; the two groups therefore
differed systematically in tumor size and anatomical location (Table 2), raising the possibility of confounding by indication that could not be addressed by statistical adjustment in this descriptive analysis. The study is further limited by its retrospective, single-center design and by the relatively small number of complication events, which limits statistical power and increases the risk of type II error. Long-term recurrence rates and patient-reported aesthetic outcomes were not assessed.

CONCLUSION

In this cohort, split-thickness grafts achieved graft take at least equivalent to that of full-thickness grafts, with a comparable complication profile. The choice of graft type should be individualized on the basis of the operating surgeon's judgment, patient preference, aesthetic considerations,

and donor-site morbidity. Although these findings may help inform graft selection, they are hypothesis-generating rather than a decision rule and warrant prospective validation.

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