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Original Article

Outcome Assessment of Local Flap versus Skin Graft in Small Facial Defects Reconstruction

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ABSTRACT

Background: Facial reconstruction after trauma or lesion excision requires techniques that restore both function and aesthetics. Local flaps and skin grafts are commonly employed for small facial defects, yet the optimal choice remains debated. This study aimed to compare the functional and aesthetic outcomes of local flap reconstruction versus split-thickness skin grafting in small facial defects.
Material and Methods: A prospective comparative study was conducted on 78 patients presenting with facial defects measuring up to 5 cm in diameter. Patients were randomly assigned to two groups: Group A (n = 39) underwent local flap reconstruction (advancement, rotation, or transposition flaps), and Group B (n = 39) received split-thickness skin grafts. Postoperative outcomes were evaluated at 1 week, 1 month, and 3 months, assessing graft/flap survival, aesthetic and functional results, and complications. Statistical analysis was performed using SPSS v26.0, with $p < 0.05$ considered significant.
Results: Baseline demographic and defect characteristics were comparable between groups ($p > 0.05$). The mean operative time was longer for flaps (76.4 ± 12.3 min) than grafts (68.2 ± 11.7 min; $p = 0.004$). Complete take was higher in the flap group (94.9%) versus graft group (84.6%; $p = 0.046$). At three months, the mean aesthetic score was significantly better in the flap group (4.3 ± 0.6) compared to grafts (3.5 ± 0.7; $p < 0.001$). Satisfactory color match, texture conformity, and contour restoration were more frequent with flaps ($p < 0.05$). Contracture (10.3%) and pigment mismatch (25.6%) occurred only or predominantly in graft cases ($p < 0.05$). The mean hospital stay was shorter in the flap group (3.4 ± 1.2 days) than in the graft group (4.1 ± 1.6 days; $p = 0.049$).
Conclusion: Both techniques achieved acceptable coverage; however, local flap reconstruction yielded superior aesthetic and functional results with fewer postoperative complications. Skin grafting remains suitable for selected cases but carries a higher risk of pigmentary and contracture-related sequelae.

Keywords: *Facial reconstruction; Local flap; Skin graft; Aesthetic outcome; Contracture.*

INTRODUCTION

Facial soft-tissue defects pose unique reconstructive challenges because the face is a highly visible and functionally important anatomical region where colour, texture, thickness and contour must be restored to preserve expression and social function [1]. The principal aims of facial reconstruction are reliable wound coverage, restoration of anatomy and preservation of local function, while minimizing donor-site morbidity and achieving the best possible aesthetic match [1,2].

Reconstructive options for small to moderate facial defects commonly include primary closure, secondary intention, skin grafting (split- or full-thickness) and local/regional flap transfer. Skin grafts are technically straightforward, permit rapid resurfacing of superficial defects and can be an excellent option when adjacent tissue is limited; however, grafts frequently produce inferior colour and texture match, and are prone to secondary contraction and pigmentary change—factors that may compromise long-term aesthetic results in cosmetically sensitive sites [2,3]. By contrast, local flaps recruit adjacent, like-for-like tissue and generally provide superior colour/texture concordance and reduced secondary contraction, though

they are surgically more complex and may introduce donor-site scars or contour irregularities such as trap-door deformity if not carefully designed [3,4].

Recent cohort and comparative studies have examined aesthetic and functional outcomes after flap versus graft reconstruction of facial defects. Several contemporary series report higher independent observer and patient satisfaction scores with local flap reconstruction for many facial subunits, particularly when restoration of contour and mobility is important; nevertheless, selected graft reconstructions—especially full-thickness grafts placed on well-vascularized beds or on flat surfaces—can achieve acceptable cosmetic results and may require fewer staged adjunctive procedures in appropriately selected cases [5,6]. Objective metrics such as colourimetry have also been used to quantify the degree of skin-match after different reconstructive techniques, underscoring that colour difference and scar quality remain important determinants of perceived outcome [4,7].

Given the tradeoffs between technical simplicity and aesthetic fidelity, comparative, prospective data that directly evaluate operative parameters, graft/flap survival, aesthetic scores and functional outcomes for small facial defects are clinically useful to guide procedure selection. The present study was designed to compare local flap reconstruction with split-thickness skin grafting for small facial defects, using standardized aesthetic and functional endpoints and follow-up to three months.

MATERIAL AND METHODS

Study Design and Setting: A prospective, hospital-based comparative study was conducted in the at a tertiary care teaching institution. The study aimed to evaluate and compare the functional and aesthetic outcomes of local flap reconstruction and split-thickness skin grafting for small facial defects.

Sample Size and Selection Criteria: A total of 78 patients presenting with post-traumatic or post-excisional facial skin defects measuring up to 5 cm in diameter were enrolled. They were randomly assigned into two equal groups of 39 each:

- **Group A (Local Flap Group):** Reconstruction with advancement, rotation, or transposition flaps.
- **Group B (Skin Graft Group):** Coverage using split-thickness skin grafts harvested from the thigh or supraclavicular region.

Patients were selected by simple random sampling after meeting the inclusion and exclusion criteria.

Inclusion Criteria

- Patients aged between 18 and 65 years.
- Defects resulting from trauma, benign lesion excision, or scar revision.
- Defects confined to the face and amenable to local flap or graft coverage.
- Patients providing written informed consent.

Exclusion Criteria

- Defects requiring regional or free flaps.
- Presence of active infection or exposed bone without periosteum.
- Patients with systemic comorbidities affecting wound healing (e.g., uncontrolled diabetes mellitus, peripheral vascular disease).
- Patients unwilling to participate or for follow-up.

Surgical Technique: In Group A, local flaps such as rotation, advancement, or nasolabial flaps were designed based on defect size, shape, and location. Flaps were raised in the subdermal plane with meticulous hemostasis, ensuring tension-free closure and adequate vascularity.

In Group B, split-thickness skin grafts were harvested using a manual dermatome at 0.012–0.015 inch thickness and secured over the defect using sutures or staples. The donor sites were dressed with non-adherent paraffin gauze. All procedures were performed under local or general anesthesia, depending on defect characteristics and patient preference.

Postoperative Care: Flap sites were monitored daily for color, temperature, and capillary refill. Graft sites were inspected on postoperative day 5 for take assessment. Donor areas were managed with sterile dressings until epithelialization. Sutures were removed on the 7th to 10th postoperative day.

Outcome Assessment: Patients were followed up at 1 week, 1 month, and 3 months postoperatively. The following parameters were evaluated:

1. **Graft/Flap Survival:** Percentage of take or necrosis.
2. **Aesthetic Outcome:** Graded by a panel of three blinded plastic surgeons using a 5-point Likert scale for color match, texture, and contour.
3. **Functional Outcome:** Assessment of facial mobility and restoration of local anatomy.
4. **Complications:** Infection, hematoma, partial graft/flap loss, hypertrophic scarring, and contracture.

Statistical Analysis: Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Quantitative data were expressed as mean ± standard deviation (SD) and compared using Student's t-test. Categorical variables were analyzed using Chi-square or Fisher's exact test, as appropriate. A *p*-value of <0.05 was considered statistically significant.

RESULTS

The mean age of participants in the local flap group was 42.6 ± 11.3 years, and in the skin graft group, 41.8 ± 10.7 years, showing no statistically significant difference (p = 0.72) (Table 1). The male-to-female ratio was comparable between groups (24:15 vs. 22:17; p = 0.64). The average defect size was similar in both cohorts (8.9 ± 2.5 cm² vs. 9.1 ± 2.3 cm²; p = 0.68). Etiologically, post-traumatic defects accounted for the majority of cases (51.3% in Group A and 53.8% in Group B), followed by post-excisional defects and scar revisions. The most frequently affected regions were the cheek (32%) and nose (27%), with no significant intergroup difference in distribution (p > 0.05).

The mean operative time was marginally longer in the local flap group (76.4 ± 12.3 minutes) compared to the skin graft group (68.2 ± 11.7 minutes), and this difference was statistically significant (p = 0.004) (Table 2). A complete flap or graft take was observed in 94.9% of patients in Group A, compared with 84.6% in Group B (p = 0.046). Minor partial necrosis occurred in 5.1% and 12.8% of patients, respectively (p = 0.18).

Although infection and hematoma formation were more frequent in the graft group (7.7% and 5.1%, respectively), the differences were not statistically significant. The mean duration of hospital stay was shorter in the flap group (3.4 ± 1.2 days) than in the graft group (4.1 ± 1.6 days), showing borderline significance (p = 0.049).

At the three-month follow-up (Table 3), patients who underwent local flap reconstruction demonstrated superior cosmetic outcomes compared to those with skin grafts. The mean aesthetic score (assessed on a 5-point Likert scale) was significantly higher in the flap group (4.3 ± 0.6) than in the graft group (3.5 ± 0.7; p < 0.001). Satisfactory color match, texture conformity, and contour restoration were achieved in 89.7%, 92.3%, and 87.2% of patients in Group A, respectively, compared to 64.1%, 69.2%, and 61.5% in Group B, all showing statistically significant differences (p < 0.05). Preservation of functional mobility of adjacent facial structures was also significantly better with local flap reconstruction (94.9% vs. 76.9%; p = 0.018).

Overall complication rates were higher in the skin graft group. Contracture formation occurred exclusively in the graft group (10.3%), whereas no such cases were noted among patients with local flaps (p = 0.042). Pigment mismatch was observed in 25.6% of grafted patients compared to 7.7% in the flap group (p = 0.031). Although hypertrophic scarring and minor infection were more frequent in the graft group, these differences were not statistically significant (p > 0.05) (Table 4).

Table 1. Baseline Characteristics of Study Participants (n = 78)

Parameter	Local Flap Group (n = 39)	Skin Graft Group (n = 39)	*p*-value
Mean age (years)	42.6 ± 11.3	41.8 ± 10.7	0.72
Sex (Male : Female)	24 : 15	22 : 17	0.64
Mean defect size (cm²)	8.9 ± 2.5	9.1 ± 2.3	0.68
Cause of defect (%)			
– Post-traumatic	51.3	53.8	0.81
– Post-excisional (benign lesion)	35.9	33.3	
– Scar revision	12.8	12.9	
Defect location (%)			
– Nose	28.2	25.6	0.87
– Cheek	33.3	30.8	
– Forehead	20.5	23.1	
– Periorbital/lip region	17.9	20.5	

Table 2. Comparison of Postoperative Outcomes between Local Flap and Skin Graft Groups

Outcome Parameter	Local Flap Group (n = 39)	Skin Graft Group (n = 39)	*p*-value
Mean operative time (minutes)	76.4 ± 12.3	68.2 ± 11.7	0.004
Complete flap/graft take (%)	94.9	84.6	0.046
Partial necrosis (%)	5.1	12.8	0.18
Infection (%)	2.6	7.7	0.29
Hematoma/seroma formation (%)	0	5.1	0.12
Mean hospital stay (days)	3.4 ± 1.2	4.1 ± 1.6	0.049

Table 3. Aesthetic and Functional Outcome Assessment (at 3-Month Follow-Up)

Parameter	Local Flap Group (n = 39)	Skin Graft Group (n = 39)	*p*-value
Mean aesthetic score (1–5 Likert scale)	4.3 ± 0.6	3.5 ± 0.7	<0.01
Color match satisfactory (%)	89.7	64.1	0.009
Texture conformity satisfactory (%)	92.3	69.2	0.012
Contour restoration satisfactory (%)	87.2	61.5	0.008
Functional mobility preserved (%)	94.9	76.9	0.018

Table 4. Postoperative Complications

Complication	Local Flap Group (n = 39)	Skin Graft Group (n = 39)	*p*-value
Partial necrosis	2 (5.1%)	5 (12.8%)	0.18
Infection	1 (2.6%)	3 (7.7%)	0.29
Hypertrophic scar	2 (5.1%)	7 (17.9%)	0.08
Contracture	0 (0%)	4 (10.3%)	0.042
Pigment mismatch	3 (7.7%)	10 (25.6%)	0.031

DISCUSSION

This prospective comparative study found that local flap reconstruction for small facial defects produced superior aesthetic and functional outcomes and a lower rate of long-term complications (contracture, pigment mismatch) than split-thickness skin grafting, while grafting was associated with shorter operative time and a simpler technical course. These findings align with multiple prior reports which emphasize the benefit of recruiting adjacent "like-for-like" skin for facial reconstruction when feasible, particularly for subunits where colour, texture and mobility are critical to perceived outcome [8,9].

Several retrospective and prospective clinical series have previously reported better patient satisfaction, improved tissue coordination and fewer pigmentary problems after local flap reconstruction compared with grafting for cheek and other facial defects [8,10]. Ebrahimi et al. demonstrated significantly improved early patient satisfaction and long-term skin colour scores with local flaps versus grafts in cheek reconstruction, and reported shorter hospitalization for flap patients—an observation consonant with the present series where aesthetic scores and colour match favoured flaps and hospital stay trended shorter in the flap cohort [8]. Mechanistically, local flaps bring the full thickness of nearby skin (epidermis, dermis and subcutaneous tissue) into the defect; this preserves local adnexal structures and vascularity, which improves texture, hydration and scar behavior compared with split-thickness grafts that lack full dermal elements [9,11].

Nevertheless, skin grafting remains an important option and is supported by contemporary reviews as a rapid, versatile technique that can be appropriate on flat surfaces or when donor-site morbidity and operative time must be minimized [12]. Modern refinements (use of dermal substitutes, careful harvesting technique and judicious donor selection) have narrowed the cosmetic gap between grafts and flaps in selected settings, and full-thickness grafts in particular can yield acceptable colour/texture match when the recipient bed and graft donor are well chosen [9,11]. These nuances explain why, in institutions with large case series, grafts are still used selectively and may show acceptable patient-reported outcomes in some facial locations [10,13].

Complication profiles in our cohort—higher pigment mismatch and contracture with grafts—echo larger multicentre and single-centre studies that identify graft contraction and dyschromia as recurring limitations of split-thickness grafting when used on cosmetically sensitive facial subunits [12,14]. Recent observational work also highlights that graft failure and poor take are influenced by recipient bed vascularity, infection risk and patient factors (smoking, comorbidity); these risks underscore the importance of patient selection and informed consent when offering grafts for facial defects [14]. By contrast, meticulous flap design and tension-free inset reduce secondary deformity and preserve mobility, but these advantages must be balanced against slightly longer operative times and the potential for donor-site or scar-line prominence [8,9].

Patient-reported outcomes and long-term satisfaction are increasingly emphasized in reconstructive decision-making. Large cohort studies using validated PRO instruments have shown that overall satisfaction after facial reconstruction may be high regardless of technique, but that scar appearance, need for revision procedures and younger age are important predictors of dissatisfaction and psychosocial distress [10,13]. This supports a tailored approach: when the defect involves a high-visibility subunit or restoration of dynamic function (perioral, periorbital, nasolabial areas), the incremental cosmetic benefit of a local flap usually justifies the additional technical complexity and slightly longer operating time [8,10].

Strengths of the present study include its prospective design, predefined aesthetic and functional endpoints, and blinded observer scoring. Limitations should be acknowledged: the follow-up period (three months) captures early and intermediate outcomes but may underestimate late changes (maturation of scars, pigment evolution) that other longitudinal studies have highlighted [10,13]. Our study used split-thickness grafts as the graft comparator; full-thickness grafts or grafts augmented with dermal substitutes can perform better cosmetically in some facial locations and would be logical comparators in

subsequent work [9,11]. Finally, while we minimized confounding by using standardized operative and postoperative protocols, surgeon selection bias (choice to use flap vs graft in marginal cases) is inherent to reconstructive series and may affect external validity.

CONCLUSION

Both local flap reconstruction and split-thickness skin grafting are effective techniques for managing small facial defects. However, the present study demonstrates that local flaps offer superior aesthetic and functional outcomes with a lower incidence of postoperative complications. Patients treated with flap reconstruction achieved better color match, contour symmetry, and preservation of facial mobility compared with those receiving skin grafts. While skin grafting remains a simpler and faster option, its higher rates of pigment mismatch, secondary contracture, and textural irregularities make it less desirable for aesthetically sensitive facial regions. Therefore, whenever technically feasible, local flap reconstruction should be considered the preferred approach for small facial defects to achieve optimal long-term cosmetic and functional results.

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