

Original Investigation

Skin Grafts vs Local Flaps for Reconstruction of Nasal Defects

A Retrospective Cohort Study

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IMPORTANCE Nasal defects commonly are a result of removal of skin lesions, and reconstruction presents a cosmetic challenge to surgeons. Conventional thought and study results have held that cosmetic outcomes of local flap reconstructions may be superior to those of skin grafts. However, local flap reconstructions require more adjunctive procedures. We propose that in select cases, skin grafts can provide aesthetic outcomes equal to those of local flaps with fewer adjunctive procedures.

OBJECTIVE To evaluate the cosmetic outcomes of skin grafts vs local flaps in the reconstruction of nasal defects.

DESIGN, SETTING, AND PARTICIPANTS This is a retrospective review of medical records for 103 patients who underwent nasal reconstruction with either skin graft (n=39) or local flap (n=64) between 2005 and 2013. All patients were treated by a single surgeon at an academic medical institution. Patients who had defects larger than 30 × 35 mm or a history of adjacent reconstruction that would detract from the cosmetic outcome of the procedure under analysis were excluded.

MAIN OUTCOMES AND MEASURES Cosmetic outcome was graded using a visual analog scale (VAS) score based on an ordinal 5-point Likert scale (1, excellent; 5, poor) by 4 independent raters blinded to reconstruction technique. Information was collected regarding patient demographics, defect size, pathology, type of reconstruction, and any postoperative procedures performed.

RESULTS The mean VAS score for the skin graft group was 2.18, while the mean score for the flap group was 2.12 ($P = .43$). The 39 patients with graft reconstruction had a total of 11 triamcinolone acetonide injections and 8 dermabrasion sessions postoperatively. The 64 patients with local flap reconstruction had a total of 259 triamcinolone acetonide injections and 13 dermabrasion sessions postoperatively plus 39 additional staged surgical procedures.

CONCLUSIONS AND RELEVANCE Skin grafts are a valuable reconstructive option that provide aesthetic outcomes comparable to those of local flap procedures and with less need for additional postoperative interventions in properly selected nasal defects.

LEVEL OF EVIDENCE 3.

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Nasal defects are often a result of removal of skin lesions. Skin cancer, for example—the most common malignant neoplasm, with more than 1 million cases in the United States each year—most frequently occurs on the head and neck, and the nose is the most common subsite. Approximately 90% of these cancers are basal cell carcinoma, while the remainder are primarily squamous cell carcinoma and malignant melanoma.¹ Mohs surgical excision is the commonly preferred treatment technique for skin cancer because it offers a high treatment efficacy (96%-99%) vs other modalities (radiation, cryosurgery, electrosurgery), while maximally preserving normal surrounding tissue.¹ But the surgery itself creates a nasal defect.

Whatever the cause of the defect, the nose presents a unique challenge because reconstructive surgery must achieve adequate preservation of function (to allow nasal airflow) and form (maintaining the cosmetically acceptable contoured structure and skin texture and thickness). A reconstructive ladder or treatment algorithm for nasal defect repair typically includes options such as healing by secondary intention, primary closure, delayed primary closure, skin grafting, random pattern flaps, and pedicled flap repair.² Conventional thought and study results have noted that local flaps may provide cosmetic outcomes superior to those of skin grafts. To date, there is little evidence to prove that either option, local flaps or grafts, provides better cosmetic outcomes than the other in reconstructing nasal skin defects. Our hypothesis is that in select cases, skin grafts can provide aesthetic outcomes equal to those of local flaps and with fewer adjunctive procedures. In the present study, we evaluate the cosmetic outcomes of skin grafts vs local flaps in the reconstruction of nasal skin defects.

Methods

This study was approved by the institutional review board of the University of Illinois at Chicago, and all patients provided their written informed consent. A retrospective review was performed using the electronic medical record to identify patients who underwent nasal skin defect reconstruction with either skin graft or local flap between 2005 and 2013. All patients were treated by a single surgeon (D.M.T.) at the University of Illinois Department of Otolaryngology-Head and Neck Surgery, Division of Facial Plastic & Reconstructive Surgery in Chicago, Illinois. Key technical points included the use skin grafts harvested from the preauricular donor site, defatting the skin graft to maximize graft survival, proper hemostasis using bipolar electrocautery, and splinting with a nonadherent dressing bolster removed 10 to 14 days after the surgery. In some cases, surrounding soft tissues or septal or auricular cartilage were recruited into the defect to compensate for discrepancies in thickness of the skin graft and depth of the defect. In most cases where cartilage was placed into the defect, the grafts were placed into a deeper layer of the defect to keep some vascularized tissues between the skin graft and cartilage.

The primary surgeon prefers to use skin grafts in patients with thin, less sebaceous skin, while local flaps were typically used in thicker more sebaceous skin. If skin grafts were used in thicker skin, cartilage grafts were frequently placed under the defect to elevate the base of the defect to make the defect more shallow. When local flaps were used, flaps were designed to try to recruit skin of equivalent thickness. In addition, skin grafts were more likely to be used in patients with Fitzpatrick type 1 or 2 skin.

Patients with defects larger than 30 × 35 mm or a history of adjacent reconstruction that would detract from the cosmetic outcome of the immediate defect reconstruction were excluded from this study. The patients were cross-referenced with the photographic medical record. Patients who did not have postoperative photographs were excluded. A total of 103 patients were included in the study: 39 who underwent skin graft reconstruction and 64 who had reconstruction by local flap.

Information was collected regarding patient demographics, defect size and subsite, pathology, type of reconstruction, and any postoperative procedures performed. Four independent raters, blinded to the reconstruction technique, used a visual analog scale (VAS) score based on an ordinal 5-point Likert scale to grade cosmetic outcomes from photographs (1, excellent; 2, very good; 3, good; 4, fair; 5, poor). Two of the raters were facial plastic surgical fellows, and the other 2 had no prior medical training. Representative nasal reconstructions are depicted in the **Figure**. The skin graft technique is shown in the **Figure**, A and C; local flap reconstruction is shown in the **Figure**, B and D.

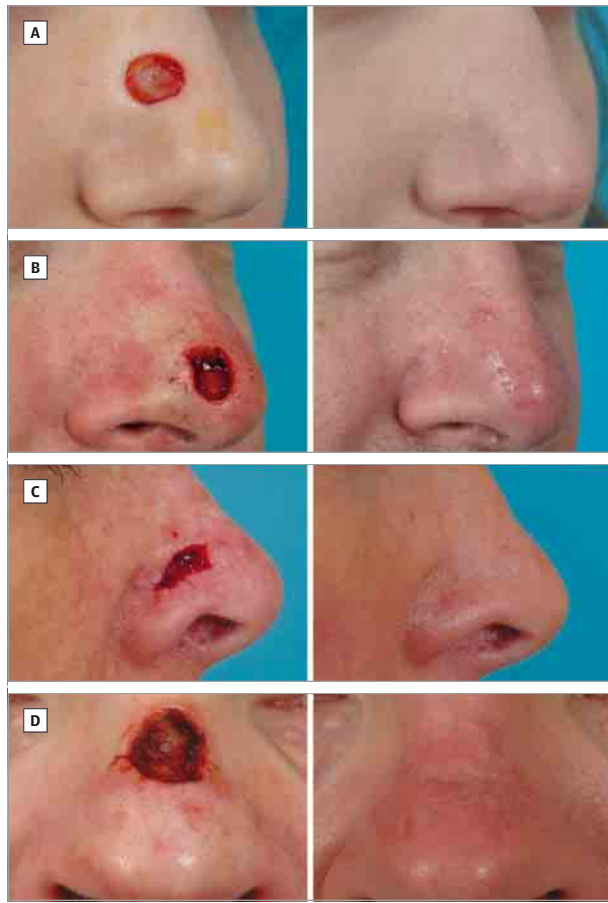
We used descriptive statistics such as mean (SD) and proportion to analyze patient characteristics and the Wilcoxon rank-sum test to compare the VAS scores between the skin graft group and the flap group. Interrater reliability tests were performed using the Cronbach α coefficient. Finally, to examine the statistical significance of the number of postoperative interventions between 2 treatment groups, we used the generalized estimating equations model based on Poisson distribution.

Results

A total of 103 patients were included in the study: 39 underwent skin graft reconstruction, and 64 underwent local flap reconstruction. The mean follow-up period from surgery to postoperative photographs was 13.0 months for the skin graft group, and 19.1 months for the flap group ($P = .04$ for the difference). In total, the tip was the most commonly involved subunit, followed by the ala, then the dorsum and/or sidewall. Among the subunits, the ala had the largest difference in use between the 2 methods (skin grafts were used 10% more than local flaps), but the difference was not significant ($P = .28$). Patient characteristics are summarized in **Table 1**.

The primary outcome measured in this study was the postoperative cosmetic VAS score graded by 4 independent raters (2 facial plastic surgery fellows, and 2 people with no formal medical training). The VAS scores are summarized in **Table 2**.

Figure. Clinical Images of Nasal Defects Before and After Reconstruction With Either Skin Graft or Local Flap Procedures



Panels A and C show skin graft reconstruction, and panels B and D show local flap reconstruction.

The mean score for the skin graft group was 2.18 (median, 2.50), while the mean score for the flap group was 2.12 (median, 2.00) ($P = .43$). The Cronbach α coefficient (.86) revealed good agreement between raters.

The numbers of postoperative interventions are listed in Table 2. The 39 skin graft patients underwent a total of 11 triamcinolone acetonide injections (Kenalog; Bristol-Myers Squibb) and 8 dermabrasion sessions postoperatively. The 64 local flap patients underwent a total of 259 triamcinolone acetonide injections and 13 dermabrasion sessions plus 39 additional staged surgical procedures. There was no significant difference in dermabrasion rates between the 2 groups ($P = .49$), but the flap group had a significantly higher percentage of Kenalog injections ($P < .001$).

Discussion

Repair of nasal defects can be challenging given the contours and nature of skin on the nose. It is commonly accepted that local flaps match the skin texture and color better than skin grafts, and thus tend to have a better cosmetic outcome. A prior

Table 1. Clinical and Demographic Characteristics of the Patients Undergoing Nasal Reconstruction by Procedure Type

Patient Characteristic	Patients, No. (%)	
	Skin Graft (n = 39)	Local Flap (n = 64)
Male	13 (33)	17 (27)
Female	26 (67)	47 (73)
Age, y	53.2	58.3
BCC pathology	30 (77)	52 (81)
Mean defect size, mm	10.6 × 12.9	13.7 × 16.9
Follow-up duration, mo.	13.0	19.1
Nasal defect location		
Ala	15 (38)	18 (28)
Tip	16 (41)	23 (36)
Dorsum and/or sidewall	8 (21)	18 (28)

Abbreviation: BCC, basal cell carcinoma.

Table 2. Ratings by Independent Reviewers and Postoperative Interventions by Nasal Reconstruction Type

Characteristic	Skin Grafts	Local Flaps	P Value
Mean VAS score ^a			
Rater 1	2.33	2.41	
Rater 2	2.38	2.38	
Rater 3	1.77	1.59	.43
Rater 4	2.23	2.11	
Average	2.18	2.12	
Postoperative interventions			
Triamcinolone acetonide injection, No. (No. per surgery)	11 (0.28)	259 (4.00)	<.001
Dermabrasion, No. (No. per surgery)	8 (0.21)	14 (0.22)	
Second-stage surgery	0	22 (0.34)	.49
Third-stage surgery	0	22 (0.34)	

Abbreviation: VAS, visual analog scale.

^a VAS scores were based on an ordinal 5-point Likert scale (1, excellent; 5, poor) by 4 independent raters blinded to reconstruction technique.

report has demonstrated that full-thickness skin grafting overlying a separately harvested auricular cartilage graft for deep nasal alar defects has acceptable aesthetic and functional outcome (though not directly compared with local flap reconstruction), and its single-stage operation may be preferred over using a reconstructive method that requires a second stage, such as the nasolabial flap.³ Our study sought to directly compare cosmetic outcome in skin graft reconstruction vs local flap repair of nasal skin defects as the primary outcome.

The distribution of reconstructed defects across the nasal subunits was fairly evenly spread. The largest difference was for defects of the ala, with skin grafts being used only 10% more in reconstruction than local flaps. However, the sample may not have been large enough to detect statistical significance. The primary surgeon (D.M.T.) prefers to use skin grafts in the alar region to avoid crossing flaps over the alar groove.

A previous study comparing flaps vs full-thickness skin grafts after Mohs surgery on the nose found a statistically significant difference in cosmetic outcome, with the flaps hav-

ing a better overall cosmetic score than the skin grafts.⁴ This is contradictory to our results—we found that skin grafting offers a single-stage reconstructive method with a cosmetically acceptable overall outcome not significantly different from that obtained with local flaps. One reason may be that the primary surgeon of the present study typically harvests skin grafts from the preauricular area, which differs from other commonly used donor sites (supraclavicular, postauricular) in thickness and texture.

The increased number of interventions associated with flaps vs skin grafts may indicate flap edema that persisted over a longer period. Local flaps such as the bilobed transposition flap can form a “pincushioning” effect, where the circumferential scar of the lobed flap contracts and the flap becomes more evident. Injections of triamcinolone acetonide administered over a period of time can improve this flap. On the other hand, skin grafts can be problematic owing to mismatches in skin thickness, tone, and texture. Some of the mismatches can be improved with dermabrasion, but the skin coloration will usually persist. In patients with thicker skin, the flap that moves adjacent skin in to close the defect will be more effective than in patients with

thinner skin; a depressed skin graft will leave a more noticeable deformity.

Of note, we predicted that a higher VAS score (worse perceived outcome) would be seen from the facial plastic surgery fellows and that better scores would be seen from our non-medical observers. This turned out to be true: VAS scores 1 and 2 (Table 2) were from facial plastic surgery fellows. Formal medical and aesthetic training in facial plastic surgery would naturally make a rater more critical of subtle irregularities than a general layperson would be.

Our study was limited by its retrospective design and small sample size. However, to our knowledge, it is the largest study to date to compare reconstructive outcomes of nasal skin defects.

Conclusions

Skin grafting is a valuable and reliable nasal reconstructive option that provides aesthetic outcomes comparable to those achieved by local flaps in properly selected nasal defects and should be considered particularly when fewer postoperative interventions may be preferred.

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Acquisition, analysis, or interpretation of data: Sapthavee, Munaretto, Toriumi.

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