

Outcome Study after Nasal Alar/Peri-alar Subunit Reconstruction: Comparing Paramedian Forehead Flap to Nasolabial Flap

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Objective: Contours of the lower nasal third are unique and present challenges in surgical reconstruction. The nasal alar intricate curved anatomy makes the area easily compromised after Mohs surgery. Managing patient and surgeon expectations with regard to aesthetics and functionality remains the reconstructive goal. The purpose of the study was to compare patients' perspective on aesthetics and functional outcomes of nasal alar reconstruction post Mohs ablative surgery using nasolabial or forehead flaps.

Methods: A single surgeon's results of 23 patients, who underwent nasal alar reconstruction post Mohs surgery, were included for analysis (15 forehead and 8 nasolabial flaps). Initially, 103 consecutive patients undergoing nasal reconstruction were reviewed, with 67 excluded due to nonalar subunit involvement and an additional 13 excluded for other discussed reasons. Mean follow-up period was 2.3 years. Evaluation of a patient satisfaction questionnaire assessed aesthetics and functionality and also surgical scar noticeability. Additionally, 3 board-certified plastic surgeons assessed postoperative images.

Results: Twenty-three patients completed the survey. There was no statistically significant difference in gender ratio, follow-up time, or scar noticeability among groups. A difference was noted in both aesthetics and functionality score ($P < 0.03$) for both variables favoring forehead flaps. Results from the surgeon's questionnaire also confirmed the superiority of forehead flaps concerning scar, alar contour/symmetry, and nostril opening symmetry.

Conclusions: The forehead flap has a better functional and aesthetic outcome and an overall superior level of satisfaction post Mohs ablative surgery. (*Plast Reconstr Surg Glob Open* 2019;7:e2209; doi: 10.1097/GOX.0000000000002209; Published online 16 May 2019.)

INTRODUCTION

The contours of the lower nasal third are unique and present challenges in surgical reconstruction. This study focused on the nasal ala, with its intricate anatomy of curves and subtle concavities and convexities, making the area easily compromised in the excision of cutaneous neoplasms and subsequent reconstruction. Malignancies,

such as basal cell carcinoma, are the most common tumor of the skin and are most often found on the nasal ala.¹ Managing patient and surgeon expectations with regard to aesthetics and functionality remains the reconstructive goal.^{2,3} Numerous reports on reconstructive options to the nasal ala exist in the literature; however, no detailed comparisons of reconstruction methods have been made based on patient satisfaction.²⁻⁶ Some authors claim patient satisfaction; however, postoperative images often shows obvious deformities and no objective data to support such claims.⁷

In this institution, 2 methods are mostly used in nasal alar reconstruction: the paramedian forehead flap and the nasolabial flap. Due to the ideal quality of its color and texture, forehead skin has been acknowledged as the best donor site to resurface the nose in general.^{8,9} However, nasolabial flap is one of the oldest classic methods specifically used in nasal alar reconstruction.¹⁰

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Received for publication September 24, 2018; accepted February 13, 2019.

Presented at Plastic Surgery The Meeting 2017, Orlando, FL.

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DOI: 10.1097/GOX.0000000000002209

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

Recently, the nasolabial flap has fallen out of favor even for the reconstruction of the nasal ala mainly due to nasal obstruction, nostril opening asymmetry, and disruption of upper lip function due to scar contraction.¹¹ Plastic surgeons resource to nasolabial flaps mainly to spare patients of the inconveniences of multistage procedure seen with the forehead flap and possible morbidity and mortality in elderly patients.¹² Occasionally, the nasolabial flap is preferred due to forehead flap inability to reach distal nasal regions due to cases where patient's forehead is prohibitively narrow.

That is not to say that forehead flap does not have its disadvantages. Those mainly being visible donor site scarring, multiple staged procedure, and some suboptimal results depending on nasal region.¹⁰

The purpose of the study is to compare aesthetics and functionality of nasal alar reconstruction post Mohs ablative surgery using nasolabial or forehead flap from the patient's point of view.

PATIENTS AND METHODS

Patients

A single surgeon's (K.C.) results in 103 consecutive patients who underwent nasal reconstruction post Mohs ablative surgery over a 5-year period were analyzed. Surgical reports and photographs were reviewed. Due to defect involvement beyond our targeted area, 67 patients were excluded from the study. A total of 36 patients were included based on nasal alar involvement only. Cutaneous replacement was achieved with either a paramedian forehead flap ($n = 25$) or a nasolabial flap ($n = 11$). Paramedian forehead flaps entailed a 3-stage surgical process and nasolabial flaps entailed 2. Reconstructive bias favored the use of nasolabial flaps for elderly patients with high risk of surgical complications and smaller defects closer to the nasolabial fold.

Clinical and operative records were reviewed and information gathered regarding age, sex, site, extent of the tissue loss, method of repair, postoperative complications, and follow-up interval. The patients were told the research team would be kept blinded to their names to minimize response bias. For each question, point totals were averaged, and Student *t* test was applied to ascertain statistically significant differences between nasolabial and paramedian groups.

Three board-certified plastic surgeons were asked to evaluate these patients' photographs independently. Each patient had a minimum of 3 photographs, including frontal, lateral, and basilar. Within each reconstructive group (nasolabial versus paramedian), percentages of each qualifier within a given parameter were derived by obtaining an average of the rater responses.

Surgery

The forehead flap was one of the first flaps used and reported in surgery of the face. In paramedian forehead flaps, the first stage consisted of raising a forehead full thickness flap without thinning it (except for columellar

area). The technique involved a creation of a template of the nasal wound using a marking pen along perimeter and then transferring the outline to a foil suture packet with collodion and sterile surgical tape. The template was then mapped to the upper forehead while maintaining appropriate length of the planned pedicle and 180-degree rotation of the template to allow for appropriate orientation of the flap when turned down. Midline or paramedian forehead flaps can be raised on either the supratrochlear or supraorbital vessels from one or both sides; most surgeons elevate the flap on a single supratrochlear vascular pedicle. Three weeks later, at the second stage, skin and subcutaneous fat were elevated and thinned except for columellar area. In addition, underlying muscle and cartilage were shaped to create a rigid matrix on which the thin skin can overlie. The third stage involved transection of the pedicle 3 weeks after the second stage (6 weeks from initial surgery).

A nasolabial flaps were designed over the nasolabial fold allowing the donor closure to lie in the nasolabial crease. Flaps were elevated to include a perforating branch of the angular artery then transferred into the defect and inset. Primary closure of the donor defect required undermining of the adjacent cheek skin to accommodate the subcutaneous pedicle. A second stage to divide the pedicle was performed 3–4 weeks later.

The questionable reliability of the distal aspect of a nasolabial flap rotated to the nasal tip must be weighed against the proven durability of a forehead flap. Cheek advancement and nasolabial flaps have long been popular for the repair of lateral nasal defects particularly in elderly patients. Nasolabial transposition flaps may be based either inferiorly or superiorly. Superiorly based flaps are more common¹³ and were only one used in this study. Nasolabial flaps are perfused by direct cutaneous perforators from extensions of the anterior facial artery or by dermal vessels from the adjacent cheek.

Patient Satisfaction Survey

A patient satisfaction survey was conducted for this study. Patients were interviewed by telephone privately after Institutional Review Board phone interview training. Authors included a questionnaire assessing function and aesthetics (5–15 scale) and the noticeability of surgical scar to others (Fig. 1). Patients were also asked to volunteer any information regarding their healing experience. Patients from both groups answered the satisfaction questionnaire at least 3 months after all stages of the surgery were completed.

Surgeon Satisfaction Survey

Three board-certified plastic surgeons that were not involved in the conduction of the study were invited to objectively and independently analyze postoperative 2D images in attempt to identify aesthetic superiority, if any, between both methods. The surgeons were given 3 de-identified photographs for each patient in the study and a questionnaire focusing on scar noticeability, alar contour, telangiectasia, alar symmetry, and nostril opening symmetry. Each area was scaled 1–3, 3 being the best possible

	Always-1	Every now and then-2	Never -3
1. How often do you have trouble breathing?			
2. How often can you smell odors?			
3. How often do you have bloody nose?			
	Very poor-1	Moderately-2	Excellent-3
4. How do you assess your quality of speech?			
	Dissatisfied-1	Moderately-2	Satisfied -3
5. How satisfied are you with your total nasal functioning?			
6. How satisfied are you with your nasal wing(s) appearance?			
7. How satisfied are you with your nasal tip appearance?			
8. How satisfied are you with the size of your nostril?			
9. How satisfied are you with the color of your nasal skin?			
10. How satisfied are you with your total nasal appearance?			
	Yes	No	
11. Over the past month, have other people noticed and scar or abnormality where you had the surgery on your nose?			
12. When you look at your nose, do you notice any scar or abnormality?			
13. Are you a diabetic?			
14. Are you a smoker?			

Fig. 1. Patient satisfaction survey.

outcome, and 1 being nonfavorable (Fig. 2). The questionnaire also allowed surgeons to give their subjective opinion at the bottom of each page.

Statistical Analysis

The data were expressed by mean (range and SD), median (range), and percentages. Comparison between groups was made using the 2-sample *t* test for all the continuous variables: age, postoperative time, function, and aesthetic results from the self-assessment questionnaire. Fisher's exact test was employed to compare gender and scar noticeability.

RESULT

Out of the 36 patients included in this retrospective study, 5 had the surgery too recently, one was deceased, one discontinued surgery due to health issues, one experienced flap failure warranting more surgeries, and 5 did not answer their phone. Finally, 23 (64%) patients completed the survey and were divided into 2 groups: those who had forehead flaps comprised of 15 (68%) patients and 8 patients (32%) who had nasolabial flaps done to reconstruct nasal alar defects due to Mohs ablative surgery. Preoperative and postoperative photographs are shown in Figures 3–6.

The mean age was 67 (range, 42–92 years), 28 (77%) females, and 8 (22%) males. All patients had at least 3 months follow-up time after completion of all stages of reconstruction with a mean follow-up period of 2.3 years; 0.6–4 years follow-up for forehead flap group and 0.3–4.3 years follow-up for nasolabial flap group. Comorbidities of diabetes and smoking were similar between groups, including 2 smokers and 2 diabetics in the forehead flap group (13.3%) and one smoker and one diabetic in the nasolabial flap group (12.5%). The mean age (range 43–92 years forehead flap group, 42–89 years nasolabial flap group, $P = 0.65$), gender ratio ($P = 0.35$), and postoperative follow-up time ($P = 0.57$) were not statistically significant between the 2 groups.

Patient-reported Outcomes

The percentage in each group that reported their scar to be notable to others was not significant between both groups ($P = 0.62$). There was a difference in both the aesthetics and functionality scores (P values 0.03 for both variables). For both of these scores, the forehead group had a higher score (Table 1).

While interviewing patients, they were given the opportunity to comment on their healing process and overall experience. Comments regarding healing in the

Surgeon's Questionnaire	
Appearance of postoperative scar line	
3	Not visible
2	Noticeable upon close inspection
1	Noticeable without close inspection
Telangiectasia or erythema	
3	Not visible
2	Noticeable upon close inspection
1	Noticeable without close inspection
Contour of the alar crease	
3	Unchanged from preoperatively
2	Asymmetry noticeable upon close inspection
1	Asymmetry noticeable without close inspection
Alar symmetry	
3	Unchanged from preoperatively
2	Asymmetry noticeable upon close inspection
1	Asymmetry noticeable without close inspection
Nostril opening symmetry	
3	Unchanged from preoperatively
2	Asymmetry noticeable upon close inspection
1	Asymmetry noticeable without close inspection

Fig. 2. Surgeon's questionnaire.

forehead flap group included: difference in nasal alar thickness (13.3%), bump at medial eyebrow (13.3%), and social anxiety due the appearance between the first and second stages of forehead flap (33.3%). Furthermore, 2% of patients wished to have seen images from the stages of surgery beforehand. However, those patients underwent surgery many years ago, and the senior author has since adopted the approach of utilizing images to explain the procedure to new patients. Patients in the nasolabial group reported drooling (12.5%), nasal opening asymmetry (25%), skin color difference at the flap site (25%), and difficulty shaving around surgical scar due to a permanent deep "wrinkle" (12.5%).

Surgeon-reported Outcomes

Results from the surgeon's questionnaire also confirmed the superiority of paramedian forehead flap in terms of aesthetic results. The average scores of 3 independent board-certified surgeons who assessed patients' postoperative photographs are demonstrated in Table 2.

DISCUSSION

Ninety-two years has passed since Blair reviewed the various techniques available for restoration of the nose and concluded that forehead flaps worked best for major defects. Although plastic surgery techniques and technology has greatly evolved, the forehead flap has stood the test of time not only for major defects but for small defects, such as on the nasal ala; and for the first time in the literature, this observation came from patients themselves.



Fig. 3. A 65-year-old woman presenting with A, right alar/peri-alar wound following Mohs procedure. B, Preoperative. C and D, 16-month postoperative follow-up.

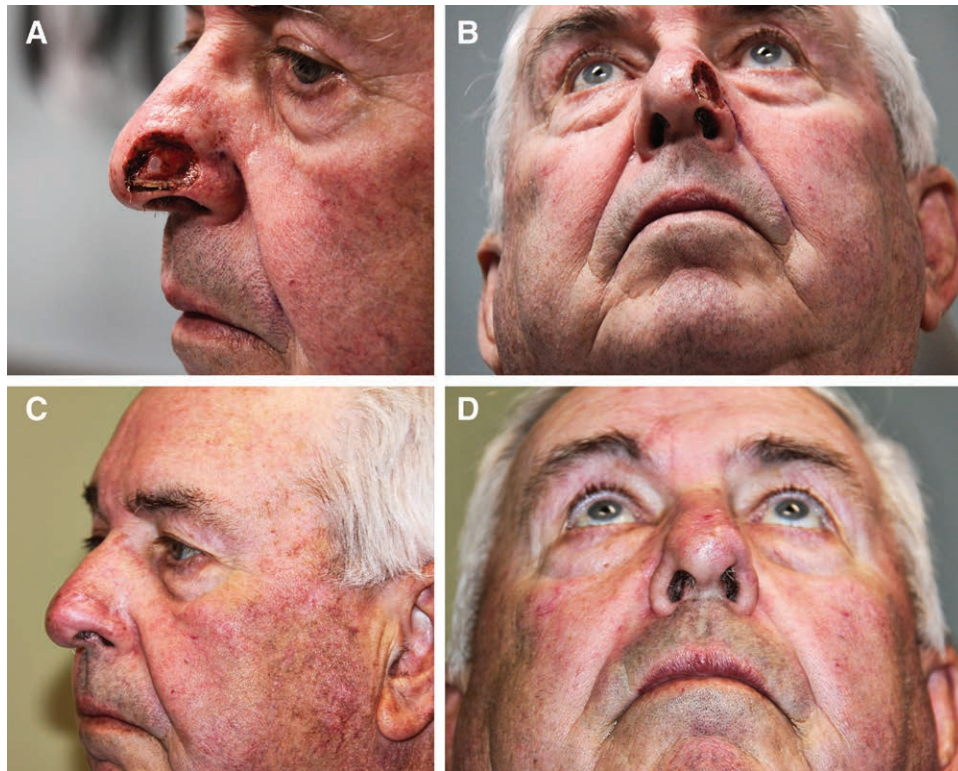


Fig. 4. A 74-year-old man presenting with left alar/peri-alar wound following Mohs procedure. A and B, Preoperative. C and D, Eight-week postoperative follow-up.



Fig. 5. A 83-year-old woman presenting with right alar wound following Mohs procedure. A and B, Preoperative. C and D, 19-week postoperative follow-up.



Fig. 6. A 70-year-old woman presenting with left alar/peri-alar wound following Mohs procedure. A and B, Preoperative. C and D, 3-week postoperative follow-up.

TABLE 1. Differences between Surgical Groups

Variable	Response	Forehead (N = 15)	Cheek (N = 8)	P
Age (y)		68.87 ± 14.63	71.75 ± 13.93	0.65
Gender	Female	9 (60%)	7 (88%)	0.35
	Male	6 (40%)	1 (13%)	
Follow-up (y)		2.30 ± 1.09	2.00 ± 1.37	0.57
Function		14.80 ± 0.56	14.13 ± 0.83	0.03
Aesthetic		14.20 ± 1.15	13.00 ± 1.31	0.03
Scar	No	12 (80%)	5 (63%)	0.62*
	Yes	3 (20%)	3 (38%)	

Surgeons have been taught that nasolabial flaps are best suited for alar reconstruction in elderly patients and patients who are not demanding about the aesthetic outcome or who do not wish a staged reconstruction. However, it has become apparent that the choice of reconstructive method should not be based on age alone but should also take into account the patient’s mental status, wishes, and medical condition. This argument is especially relevant now where older individuals give a lot more value to their appearance.

Surgeons find themselves having to weigh risk versus benefit when it comes to older patients based on their own assumption that those patients would be just as happy

with less than perfect results. The literature often cites that nasolabial flaps give excellent results; only to find with a more critical analysis that most of those claims are very subjective to the performing surgeon’s biases and patients’ opinions are not taken into account.^{7,15,16}

In this study, the merits of these flaps in nasal reconstruction were evaluated by taking the subjective opinion of patients who underwent the procedure and 3 independent plastic surgeons’ input. The conclusion was made that forehead flaps gives a better result aesthetically and functionally.

A study performed in Japan compared forehead and nasolabial flaps in various types of nasal defects. The overall score was low in patients who underwent reconstruction of large alar tissue defects using forehead flaps,¹⁵ which is opposite from the results of this study. However, it was mentioned that nasal symmetry had a slightly lower score in the nasolabial group, which agrees with our findings. The author did mention that those findings could be due to racial differences in the anatomy and histology of the face.

This study is limited by selection bias as groups were unevenly distributed because of retrospective chart review, and all patients were White. The study has a relatively small sample size of only 23 patients included. In addition, pa-

TABLE 2. Average Result of Surgeon Analysis

	Postoperative Scar	Telangiectic/Erythema	Alar Contour	Alar Symmetry	Nostril Symmetry	Total Average
Forehead	2.20	2.78	2.69	2.42	2.51	12.60
Nasolabial	1.92	2.75	1.96	1.88	2.00	10.50

tients in the nasolabial group were selected primarily due to age and increased odds of surgical complications, which could translate to decreased overall health and poor wound healing. Additionally, investigator-generated patient-reported outcome questionnaires led to bias. Finally, a single surgeon performed all surgeries and different techniques to each flap could have had an impact in the outcome.

Many studies underscore the importance of the basilar view to look for symmetrical nares opening, to assess the results of nasal surgery. In this study, both patients and plastic surgeons were asked to comment on such feature. According to the 3 plastic surgeons' assessment in this study, forehead flaps also were shown to be superior with alar contour (2.16 versus 1.88) and nostril symmetry from basilar view (2.51 versus 2.00).

CONCLUSIONS

Due to the invasive nature of the paramedian forehead flap, the lengthy downtime, and psychosocial effect, many plastic surgeons have been leaning toward nasolabial flaps as their primary option to nasal alar reconstruction. However, patients who have had the forehead flap did not complain about those apparent inconveniences and were overall more satisfied with both aesthetics and functional results of the forehead flap despite its disadvantages. The authors originally predicted that function would be effected in the nasolabial group due to the occasional inevitable disruption of the upper lip anatomy. Surprisingly, patients in the nasolabial flap group were more unsatisfied with aesthetics rather than function.

Based on study results, surgeons should not focus on the immediate seeming inconveniences, but treat each patient centered on their individual presentation. Trying to spare patients from potentially trivial nuisances might lead to withholding of better surgical outcomes.

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ACKNOWLEDGMENT

The authors thank Michelle Jankowski, MAS, for statistical analysis, Deanna Gardner, DHSc, for final reviewing and

editing, patients for their participation on the survey, and finally to the 3 plastic surgery colleagues who assessed the postoperative images.

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