



Research Article

Patient Perspectives in Single-Stage Nasal Alar Reconstruction: Navigating Functionality and Aesthetics in Concha Cartilage Supported Nelaton-Flaps

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ARTICLE INFO

Keywords:

Alar reconstruction
single-stage
outcome
patient's perspective
nasolabial flap

ABSTRACT

Introduction: Nasal alar defects pose significant challenges due to the nose's central role in facial aesthetics and function. Various causes, including skin cancer resection, necessitate effective reconstruction techniques. Despite several available methods, identifying an ideal approach remains elusive.

Methods: This study introduces a single-stage reconstruction technique employing the nasolabial-folded-flap (NFL) with conchal cartilage support. A structured patient questionnaire evaluated functional and aesthetic outcomes, pain, healing and satisfaction. The survey involved six patients who underwent nasal reconstruction using this approach in 10 months.

Results: Patients expressed high satisfaction with functional and aesthetic outcomes. Functional aspects received very satisfactory ratings (mean 1.7), with aesthetically appealing results (mean 2). Reconstructed noses harmonized well with patients' faces (mean 2), with a moderate impact on daily activities (mean 2.7). Mild pain was occasionally reported (median 2.2) and healing was perceived as very successful (median 1.5). Patients were highly satisfied with care and support (median 1) and felt adequately informed (median 1.5). They strongly recommended this reconstruction technique to others (median 1).

Discussion: The NFL with conchal cartilage support proves versatile and cosmetically pleasing in single-stage reconstruction for full-thickness nasal alar defects. Patients demonstrated a strong willingness to recommend this approach to individuals with similar defects, showcasing its potential advantages. Despite limitations, our findings underscore the technique's promise in nasal reconstruction.

1. Introduction

The nose has a central position in the face and is therefore exposed to notice of the finest irregularities or asymmetries [1, 2]. Its function is of the highest importance, as it plays crucial roles in breathing, olfaction, and phonation [3]. The nasal alar region provides support and stability to the nostrils, helping to maintain their shape and prevent collapse during breathing. It also plays a role in regulating the airflow through the nostrils [4], allowing for efficient breathing and proper ventilation of the nasal passages. The nasal alar contributes to the structure of the nasal valve, which is responsible for maintaining appropriate airflow resistance and controlling the direction of the airstream during breathing [5].

Causes of nasal defects include injury, infections, and tumour resection [6]. Non-melanoma skin cancer (NMSC) is the most common cancer and its incidence has increased in recent years [7]. According to several studies, a mean increase in incidence rates of NMSC of 3-8% has been observed in the United States, Canada, Europe and Australia since the 1960s [8, 9]. This progression and the favourable location in the nasal alar [10], leads to a higher rate of occurrence of NMSC in this subsection of the nose and as a result, the reconstruction of this aesthetically and functionally important region is more often needed. Although a variety of techniques are available for the reconstruction of full-thickness defects in this region, including helical rim grafts, forehead flaps, nasolabial flaps and free flaps, an ideal technique is not yet identified [11].

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<https://dx.doi.org/10.60122/j.IJS.2024.20.08>

Received 16 April, 2024; Accepted 23 May, 2024

Available online 3 July, 2024

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The nasolabial-folded-flap (NFL, syn. nelaton-flap [12] or spear-flap [11]) in some opinion- remains the favoured technique in the reconstruction of the nasal alar in larger full-thickness defects. In most cases single stage is performed, but a second stage can be useful for positioning the alar base or sculpturing the margin of the alar crease [13]. Nasolabial flaps are based superiorly on the angular artery and can be used with or without cartilage support [14]. These flaps achieve satisfying structural and cosmetically pleasing results in single-stage reconstruction [14]. Further, if folded to reconstruct the inner lining, it can come with a satisfactory three-dimensional mucosal lining [6].

We designed a patient questionnaire to evaluate the patient's perspective evaluating the postoperative result using our explicit method (nasolabial-folded-flap and conchal cartilage) in a single-stage alar reconstruction.

2. Material and Methods

The nasolabial-folded-flap (NFL) is seen as a versatile, functional and cosmetically pleasing technique, in reconstructing alar full-thickness defects in single-stage. Here we present a step-by-step guide to our slightly modified nasolabial-folded-flap.

2.1. Reconstructive Steps of the NFL

The following steps are undertaken during the nasal reconstruction with the NFL, which is partially demonstrated in (Figure 1). We normally conduct this operation with general anaesthesia, in some cases local anaesthesia can be used in compliant patients.



Fig 1. A) Pictures preoperative, B-G) intraoperative and H, I) result for the nasolabial-folded-flap with conchal cartilage.

2.1.1. Measurement

The broadest width of the defect is measured. The maximum width of the nasolabial-folded-flap is determined to be the same plus 1-3 mm to facilitate a convex alar rim.

2.1.2. Marking

A nasolabial-folded-flap is outlined parallel to the nasolabial fold, normally maintaining a distance of 1 cm from it on both sides depending on defect size. The flap extends from the base of the nasal sidewall (cranial to the defect) to approximately 0.5 cm caudal to the left corner of the mouth.

2.1.3. Incision and Elevation

The flap is incised at the epidermal level and subcutaneous elevation is performed until the flap's base is approximately 1 cm above the defect of the nasal sidewall. Hemostasis is crucial not to risk necrosis of the flap due to haemorrhage (Figure 1B).

2.1.4. Donor Site Closure

The nasolabial elevation defect is now closed using a simple interrupted suturing technique (Figure 1I).

2.1.5. Cartilage Graft Measures

The lowest portion from the alar base to the anterior border of the defect, usually a part of the lower lateral cartilage of the nose is used and a 5-7 mm length is added.

2.1.6. Harvesting the Cartilage Graft

Access to the auricle is obtained by dissecting the border between the cavum conchae and the scapha, creating an incision approximately 2-3 cm in length. The skin then is elevated, and submucoperichondrial dissection of the cartilage is performed. Harvesting a cartilage span of up to 3 cm is possible without creating structural problems for the pinna.

2.1.7. Preparation of the Cartilage Graft Bed

A tissue pocket is created at the former site of the nasal sidewall, and the cartilage graft is anchored using 4-0 prolene for subcutaneous or epimuscular fixation directly at the piriform aperture. Another pocket is formed in the direction of the nasal tip, and the cartilage graft is therefore fixed overlapping the former lower lateral cartilage or the septum cartilage using 4-0 prolene sutures (Figure 1F).

2.1.8. Thinning of the NFL

The distal portion of the nasolabial-folded-flap is then thinned until it reaches epidermal thickness. It is then folded around into the future defect region using the cartilage graft as a turnover point (Figure 1G).

2.1.9. Inner Layer Formation

To form the inner layer, the distal portion of the flap needs to be resected to the needed length of the mucosal defect. After marking the exact turnover point, the flap is further thinned in the proximal region. To address flap thickness, the flap can be carefully thinned proximal to the folding edge while preserving its blood supply.

2.1.10. Inner Layer Closure

The inner layer is now sutured using 4-0 or 5-0 vicryl to achieve complete closure of the inner layer defect.

2.1.11. External Skin Readaptation

The overlying skin is now readapted and the flap is fitted, especially in the ventral nasal tip and alar base, using monocryl 5-0. If insufficient coverage of the outer layer at the alar base occurs, a V-Y plasty can be performed using non-absorbable 4-0 prolene sutures (Figure 1H, II).

3. Study Design

We aimed to assess patient satisfaction and evaluate the patient's view in functional and cosmetic outcomes following the reconstruction of nasal defects using the cartilage-supported nasolabial-folded-flap technique. A survey-based questionnaire was utilized to gather the necessary data. The survey participants included our patients who underwent nasal reconstruction using the nasolabial-folded-flap technique and cartilage from the conchal in a single-stage manner. Six patients underwent surgery with this technique in SLK Kliniken Heilbronn, Germany, Department for Otorhinolaryngology/Head and Neck, Plastic surgery during an eight-month period from March to November 2023.

3.1. Questionnaire

A structured questionnaire was developed specifically for this study to assess patient satisfaction and evaluate subjective functional and cosmetic outcomes. The questionnaire consisted of ten questions, addressing various aspects of nasal reconstruction. Each question was designed with multiple-choice answers, providing respondents with five response options. The patients were asked to rate their experiences on a scale from 1 to 5 (a to e), with 1a) indicating the highest level of satisfaction and 5e) representing the lowest. The questions covered overall satisfaction, functional outcomes, aesthetic evaluation, impact on daily activities, pain or discomfort, healing, satisfaction with care and support, informed consent and likelihood of recommending the procedure to other patients (Table 1).

Table 1. Questionnaire.

Question	Options
Q1. How satisfied are you overall with the functional outcome of the nasal reconstruction?	a) Very satisfied b) Satisfied c) Neutral d) Unsatisfied e) Very unsatisfied
Q2. How do you assess the aesthetics of the reconstructed nose?	a) Very aesthetically appealing b) Aesthetically appealing c) Neutral d) Aesthetically unsatisfactory e) Very aesthetically unsatisfactory
Q3. Do you feel that the reconstructed nose harmonizes well with your face?	a) Yes, completely b) Yes, partially c) Neutral d) No, not really e) No, not at all
Q4. How much does the functional outcome of the nasal reconstruction affect your daily activities (breathing, sense of smell, etc.)?	a) Not affected at all b) Slightly affected c) Neutral d) Moderately affected e) Strongly affected
Q5. How satisfied are you with the functionality of your reconstructed nose in daily life?	a) Very satisfied b) Satisfied c) Neutral d) Unsatisfied e) Very unsatisfied
Q6. Do you experience any pain or discomfort in the area of the reconstructed nose?	a) No, not at all b) Occasionally mild pain c) Neutral d) Frequent pain e) Severe and persistent pain

Q7. How well has your nasal reconstruction wound healed?	a) Very well b) Well c) Neutral d) Moderately e) Poorly
Q8. How satisfied are you with the care and support during the reconstruction process?	a) Very satisfied b) Satisfied c) Neutral d) Unsatisfied e) Very unsatisfied
Q9. Do you feel adequately informed about the various steps and potential risks of nasal reconstruction?	a) Yes, completely b) Yes, partially c) Neutral d) No, not really e) No, not at all
Q10. Would you recommend this type of nasal reconstruction to other tumour patients with similar nasal defects?	a) Definitely b) Probably yes c) Neutral d) Probably not e) Definitely not

The survey was conducted around five (N=3) to ten weeks (N=3) postoperatively in face-to-face and telephone interviews with the participants. The surgeon administered the questionnaire to ensure clarity and consistency in data collection. Participants' responses were recorded electronically or manually on the survey forms.

4. Results

Responses were collected from our cohort of six patients, two males and four females (mean age=68.2) who had undergone the explicit single-stage nasal reconstruction with the nasolabial-folded-flap and conchal

cartilage following non-melanoma and melanoma skin cancer resection in 10 months in our clinic. Within our cohort, three resections were on the left, three on the right side consecutive to one diagnosed stage T1a and T3b malignant melanoma, three EADO IIA [15] classified basal cell carcinomas and one patient with a T1 squamous cell carcinoma. The reconstruction took place in full-thickness alar defects ranging from 2/1.5 cm to 3/2.5 cm (width/height ratio) with operation time between 83 and 155 minutes using nasolabial-flaps ranging from 7/2 to 9/2.5 cm (width/length ratio). One of the patients had diabetes mellitus and none were on anticoagulation medication. However, two patients were smokers (Table 2).

Table 2. Patient characteristics.

Patient	Age (years)	Sex	Side	Diagnosis	Stage	ECOG
A	83	m	R	MM	T3b	0
B	73	f	R	BCC	EADO IIA	1
C	63	m	L	BCC	EADO IIA	0
D	58	f	L	SCC	T3	0
E	53	F	R	BCC	EADO IIA	0
F	93	f	L	MM	T1a	0

Patient	Operation time (min)	Complications	Postoperative result donor region (1-5)	Postoperative result reconstructed region (1-5)	Defect size W/H	Flap size W/H	Diabetes mellitus	Anticoagulation	Smoker
A	105	No	2	1	2.5 × 1.8 cm	8 × 2 cm	No	No	No
B	100	No	1	2	2.5 × 2 cm	7 × 2.5 cm	Yes	No	Yes
C	155	No	1	3	3 × 2.5 cm	9 × 2.5 cm	No	No	No
D	83	No	1	1	2 × 1.5 cm	7 × 2 cm	No	No	Yes
E	105	No	1	1	2.5 × 1.5 cm	7 × 2.5 cm	No	No	No
F	122	No	1	1	2 × 2	8 × 2 cm	No	No	No

The survey was administered at varying postoperative time points, with participants providing feedback at different stages of their recovery, ranging from five (N=3; 50%) to ten weeks (N=3; 50%) postoperatively.

The results of our questionnaire (Table 3) indicated high levels of patient satisfaction with nasal alar reconstruction outcomes. The overall satisfaction on functional aspects was answered with a median of 1.5 (very satisfied) and a mean of 1.7 (very satisfied). The subjective assessment of aesthetics was answered with median with 2 and a mean of 2 (both aesthetically appealing). Regarding to the harmony of the reconstructed nose with the face, our cohort answered with a median and a mean of a grade 2 (yes, partially). Within the interviews, the patients

reported moderate affection by the nasolabial-folded-flap reconstruction of their daily activity with a median of 2 and a mean of 2.7 reported in grades and showed a high grade of satisfaction with daily functionality in median with 2 and mean of 1.8. The cohort reported occasionally mild pain within the operated area (median and mean 2.2). Regarding to the postoperative period, patients reported a “very well” healing process in median and mean with 1.5. Given the essential care and support in our clinic patients stated to be very satisfied (median 1 and mean 1.3). The patients received adequate information and were graded with a “yes, completely” (mean and median 1.5). Overall, the patients would highly recommend this reconstruction technique to other patients (median 1, mean 1.3).

Table 3. Questionnaire results.

Respondent	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
A	1	2	2	4	2	1	1	1	1	1
B	2	3	3	2	2	3	1	1	2	3
C	3	3	2	2	2	2	2	1	2	1
D	1	1	1	5	1	4	2	2	1	1
E	1	1	2	2	2	2	1	1	1	1
F	2	2	2	1	2	1	2	2	2	1
median	1.5	2	2	2	2	2	1.5	1	1.5	1
mean	1.7	2	2	2.7	1.8	2.2	1.5	1.3	1.5	1.3

5. Discussion

Managing full-thickness defects of the nasal alar presents a challenging task. It is due to the intricate structure and the significant functional and aesthetic importance of this anatomical component resulting in unique anatomy, the free margin and the triple-layered complex structure [16]. To address this, the surgical repair involves the reconstruction of the internal nasal lining, the reinforcement of the wall to ensure proper nostril function and the adjustment of the external alar profile [11]. While there are numerous options for reconstructing full-thickness defects of the nasal alar, such as helical rim grafts, forehead flaps, nasolabial flaps and free flaps, an optimal technique has not yet been identified [11].

The introduced nasolabial-folded-flap (syn. nelaton or spear-flap [11, 13]) is seen as a versatile, functional and cosmetically satisfying technique in reconstructing alar full-thickness defects in a single-stage method [13]. Given the fact that in many cases in need of reconstruction, patients have multimorbidity and advanced age, our philosophy in full-thickness alar reconstruction is to rarely traumatize, use single-stage procedures and combine a high level of cosmetic appearance and functional outcome. The nasolabial-folded-flap as a single-stage procedure ensures a lower risk for multimorbid patients with an aesthetically pleasing outcome. Other authors obtained better results with the NFL than median forehead flaps in the reconstruction of the nasal alar [17]. Furthermore, as we see it, the donor region of the NFL is cosmetically superior compared with middle forehead flaps.

The nasolabial-folded-flap as a turnover-flap can be used without a cartilage graft [14]. In our opinion, the cartilage graft serves as a hypomochlion to better fold in the flap for inner lining reconstruction. It further gives stability and creates a convexity of the alar rim not risking scar contraction and a consecutive asymmetric long-term result. We address the cartilage donor region from the lateral auricular side and not from the retroauricular, therefore the scar is rarely identifiable after 3 weeks.

Our survey-based findings suggest that patients are highly satisfied with the functional and aesthetic outcomes of this explicit technique, as they presented a “very well” healing process and a moderate influence on everyday life (mild pain) was reported. Additionally, patients expressed a strong willingness to recommend this type of nasal reconstruction to others with similar nasal defects.

Several limitations should be considered when interpreting the results of this study. The study design relied on self-reported patient responses, which may be subject to recall bias or subjective interpretation. The survey was conducted at our specific institution and within a specific timeframe of 8 months, which may limit the generalizability of the findings. Moreover, other factors that could influence patient satisfaction and outcomes, such as pre-existing medical conditions or concurrent treatments, were not specifically accounted for this study. Further, we collected a small sample size due to a low patient count.

6. Conclusion

The nasolabial-folded-flap with cartilage support is a versatile single-stage technique which comes with high patient satisfaction. Therefore, our patients would recommend this type of nasal reconstruction to others with similar nasal defects.

Ethical Considerations

This study was conducted by ethical guidelines and regulations. Prior approval from the relevant ethical committee was not obtained. Informed consent was obtained from each participant before their inclusion in the study, ensuring their voluntary participation and confidentiality of their personal information.

Informed Consent

Given by the patients in (German) written consent forms.

Conflicts of Interest

We hereby declare that our article, fully complies with the guidelines set forth by the International Committee of Medical Journal Editors (ICMJE). Every author of this article has diligently completed and signed an ICMJE Disclosure of Interest Form.

Author Contributions

LSF: Conception and design, acquisition of data, and analysis and interpretation. SA: Acquisition of data, analysis and interpretation, drafting. TM: Conception and design analysis and interpretation of data and drafting. Importantly, each author also had a hand in the final approval of the version to be published.

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