

Application of FACE-Q and NOSE in Nasal Reconstruction with Paramedian Frontal Flap after Skin Cancer Resection

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Introduction: Nonmelanoma skin cancer (NMSC) is responsible for high morbidity and mortality, resulting in a high cost to the health system. The nose is the leading region affected by this type of tumor and may need reconstruction by tissue transfer. The paramedian forehead flap (PFF) is one of the main options used, and the factors that influence the result should be studied. The FACE-Q questionnaire allows the assessment of appearance, quality of life, and side effects related to the procedure, whereas the Nasal Obstruction Symptom Evaluation questionnaire enables the nose function evaluation.

Methods: This study evaluates nasal reconstruction with a PFF after resection of NMSC with the FACE-Q questionnaire and Nasal Obstruction Symptom Evaluation. Spearman Rank correlation coefficient tests between the questionnaire results and patients' characteristics were performed.

Results: The questionnaires were completely answered by 49 patients who underwent this reconstruction between 2011 and 2019 in a cancer center. The patients' evaluations demonstrate high satisfaction with appearance, quality of life, side effects, and function. Completing reconstruction under 6 months was associated with a higher quality of life among patients ($P = 0.002$). Reconstruction of lining or scaffold, moment of flap division, complications, and number of operations did not show an association.

Conclusion: This study suggests that the PFF is a reliable option for nasal reconstruction. Identifying the total reconstruction time as an impact factor on patients' quality of life should be considered when planning treatment. (*Plast Reconstr Surg Glob Open* 2021;9:e3533; doi: [10.1097/GOX.0000000000003533](https://doi.org/10.1097/GOX.0000000000003533); Published online 8 April 2021.)

INTRODUCTION

The incidence of nonmelanoma skin cancer (NMSC) is greater than 1 million annual cases.¹ In the United States, where this type of cancer is the most frequent, approximately 10,000 diagnoses are performed daily, with mortality of 4500 people per year and an annual cost of US \$ 8.1 billion to the health system.²⁻⁴ Due to its location on the face, the nose is the anatomical unit most affected by this neoplasm.⁵

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Surgical excision of NMSC is one of the primary treatment modalities.^{6,7} However, the nasal region may need reconstruction with tissue transfer. The paramedian forehead flap (PFF) is recognized as the best option for these cases for several reasons. Skin quality, tissue availability, reliable vascularization, and similarity to the nose are some of its advantages.^{8,9} Despite these characteristics, several factors inherent to patients' surgical and oncological conditions can affect the reconstruction outcome.

Nowadays, patient-reported outcomes (PROs) are the preferred method to assess patient satisfaction. The FACE-Q is a standardized questionnaire for PRO divided into 3 domains: appearance, quality of life, and adverse effects.¹⁰ Recently, this tool has been translated and validated for application in other languages.¹¹ Similarly, Nasal Obstruction Symptom Evaluation (NOSE) is a scale for functional assessment of nasal obstruction,

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also adapted and validated for application in other languages.^{12,13}

Because of the relevance of NMSC in the nose and the complexity of reconstruction with a PFF, the evaluation of objective factors that affect the reconstruction outcome is essential to allow the treatment improvement. Thus, this study evaluates the result of nasal reconstruction with PFF for NMSC treatment using the FACE-Q and NOSE questionnaires in a cancer center.

METHODS

Study Design and Data Collection

All patients who underwent nasal reconstruction with a PFF due to NMSC at Cancer Institute of the State of São Paulo between January 1, 2011, and December 31, 2019, were identified. These patients were invited to participate in the study by signing a free and informed consent form. Exclusion criteria were loss of follow-up, patients' inability to complete questionnaires or unfinished nasal reconstruction. The Ethics Committee for the Analysis of Research Projects approved this study, following the Declaration of Helsinki and the Document of the Americas.

Data from age, sex, skin color, income, education, comorbidities, histological type of skin cancer, staging, and follow-up length were obtained from medical record analysis. Data related to operations were also evaluated, such as affected nasal subunits, reconstruction of the nasal lining or structural framework, surgical time to pedicle division, complications, total number of operations per patient, and time to complete the reconstruction.

Questionnaires

The FACE-Q questionnaire (see appendix A, Supplemental Digital Content 1, The FACE-Q questionnaire. <http://links.lww.com/PRSGO/B638>) assessed the result of nasal reconstruction through 3 domains. A different set of scales evaluated appearance (nose, nostrils, and forehead/eyebrows), quality of life (satisfaction with the outcome, decision, recovery of early symptoms, early life impact, psychosocial distress, psychological function, and social function), and adverse effects (nose and forehead/eyebrows/scalp). Each domain includes both the results of the nose and the donor area. Examples of questions are "How satisfied or dissatisfied have you been with the overall size of your nose?"; "With your facial appearance in mind, in the past week, how much would you agree or disagree with the statement: I feel positive about myself"; and "How much have you been bothered by your eyebrows looking uneven (one higher than the other)?" The answers were classified on a Likert psychometric scale, and the final result was converted into a numerical scale from 0 to 100.

Functional assessment was performed using the NOSE questionnaire (see appendix B, Supplemental Digital Content 2, The NOSE questionnaire. <http://links.lww.com/PRSGO/B639>). The presence of nasal congestion, nasal obstruction, and difficulty in breathing, among

others, were also classified on a Likert psychometric scale, and the final result converted into a numerical scale from 0 to 100.

Statistical Analysis

The data were described according to nature and distribution. Nonparametric variables were described by median and interquartile range (IQR), whereas parametric variables were described by mean and SD. Frequency percentages presented nominal or dichotomous variables. Spearman Rank correlation coefficient tests between the following variables were performed: FACE-Q (appearance, quality of life and adverse effects), NOSE, nasal subunits affected, reconstruction of the lining or structural framework, surgical time of pedicle division, complications, number of operations, and time to complete reconstruction. The strength of the association is indicated according to the correlation coefficient (Rho), that is, absent (0), weak (0.1), moderate (0.3), strong (0.5), or perfect (1, 0). We considered an alpha *P* value of 5% and the power of the study of 80%. All analyses were performed using Stata 14.2, Stata Corporation, College Station, Tex.

RESULTS

One hundred eleven patients were identified, of which 49 (44%) answered the questionnaires. Of the other 62 (56%) patients excluded from the study, 32 patients were discharged from the institution, 18 died, 6 were unable to answer the questionnaire due to neurocognitive impairment, 4 did not complete the reconstruction, and 2 refused to participate, not being included in the study.

The median age of the participants was 67.6 years (IQR 60.5–74.2 years). Of these patients, 27 of 49 were men (55.1%), and 22 of 49 were women (44.9%). The majority of the study population was white (48/49 [98.0%]). The median income was US\$ 250.00 (IQR US\$ 200.00–400.00). Regarding education, most patients have completed elementary school (27/49—55.1%), followed by high school (14/49 [28.6%]) and higher education (2/49 [4.1%]). Six patients (12.2%) did not have any education. The median of comorbidities presented by patients was 3 (IQR 2–4 comorbidities), the main ones being systemic arterial hypertension (57.1%), smoking (51.0%), diabetes (32.7%), and obesity (28.6%). The primary histological type was basal cell carcinoma, representing 81.6% of the cases, followed by squamous cell carcinoma (12.2%), and basal squamous carcinoma (6.1%). Regarding staging, 40.8% (20/49) of cases was T1, and 38.8% (19/49) was T2, followed by 14.3% (7/49) of T3 cases, and 6.1% (3/49) of T4 cases. The median follow-up of patients was 3.1 years (IQR 2.0–5.4 years) (Table 1). The median of nasal subunits involvement per patient was 4 (IQR 2.3–6.8 subunits). The main nasal subunits affected were the dorsum (57.1%) and lateral walls (53.1%), followed by the tip (49.0%) and alae (46.9%). Soft triangle (32.7%) and columella (8.2%) were less affected (Fig. 1).

About half of the patients required reconstruction of the lining (42.9%). The main techniques used were the

Table 1. Demographic Characteristics of the Patients Included in the Study

Demographic	Median or Value (Percentage)/ IQR 25%–75%
Age (y)	67.6/60.5–74.2
Sex	
Male	27 (55.1%)
Female	22 (44.9%)
Ethnicity	
White	48 (98.0%)
Mestizo	1 (2.0%)
Monthly income (US\$)	250.00/200.00–400.00
0.00–200.00	7 (14.3%)
200.00–400.00	30 (61.2%)
400.00–600.00	9 (18.4%)
600.00–800.00	3 (6.1%)
Education	
None	6 (12.2%)
Elementary school	27 (55.1%)
High school	14 (28.6%)
College/university	2 (4.1%)
Comorbidities per patient	3.0/2–4
Hypertension	28 (57.1%)
Smoking	25 (51.0%)
Diabetes	16 (32.7%)
Obesity	14 (28.6%)
Histological type	
BCSC	40 (81.6%)
SCSC	6 (12.2%)
BSCC	3 (6.1%)
Staging	
T1	20 (40.8%)
T2	19 (38.8%)
T3	7 (14.3%)
T4	3 (6.1%)
Follow-up (mo)	37.5/23.8–64.9
<6	2 (4.1%)
6–12	4 (8.2%)
12–24	7 (14.3%)
>24	36 (73.5%)

BCSC, basal cell skin cancer; BSCC: basosquamous cell carcinoma; SCSC, squamous cell skin cancer.

chondro mucosal flap from the nasal septum (42.9%), nasolabial flap (33.3%), and folded forehead flap (19.0%). The free radial antebachial flap was used in 1 case (4.8%). The structural framework was reconstructed in 32.7% of the cases, mainly with conchal cartilage (56.3%) and septal cartilage (31.3%). Costal cartilage and PDS plaque were also used in one patient each (6.3%). Pedicle division occurred in the second operation in 79.6% of patients and 18.4% of patients in the third operation. The median time between flap inset and pedicle division was 56 days (IQR 35–98 days). About half of the patients (46.9%) completed the reconstruction with only 2 procedures, whereas 34.7% required 3 operations. Another 18.4% needed additional surgical procedures. The median time to complete the reconstruction was 5.1 months (IQR 1.9–14 months). Five (10.2%) patients had complications related to reconstruction requiring reoperation. In the PFF, 2 cases of partial necrosis (4.1%), one scar retraction and one nasocutaneous fistula, were identified. In contrast, in the donor site, only 1 case (2.0%) needed a new procedure for a poor cosmetic scar result (Table 2).

Evaluating the result with the FACE-Q questionnaire demonstrated high patient satisfaction with nasal reconstruction with the PFF. The appearance domain had a median score of 98.4 (IQR 92.1–100), whereas for the

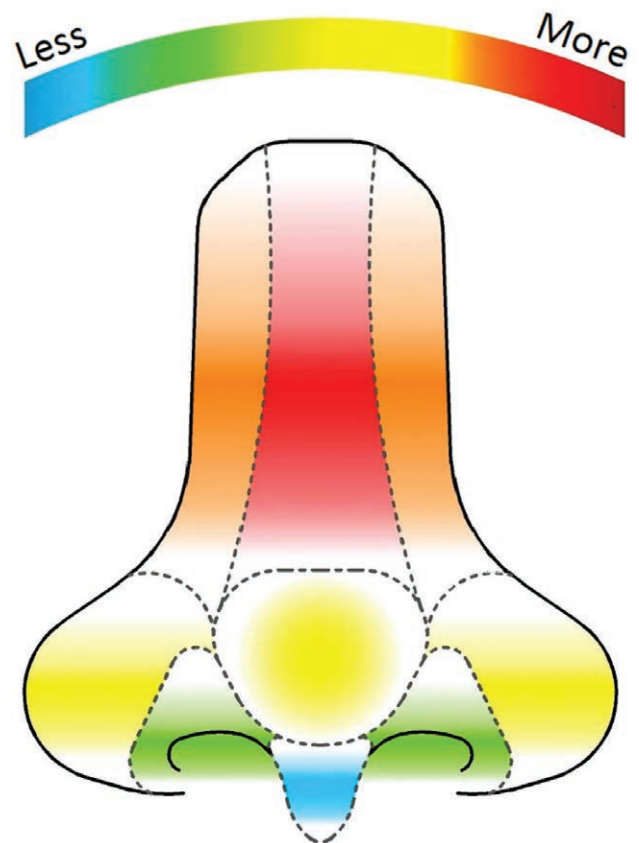


Fig. 1. Graphical representation of nasal subunits by frequency of involvement. The main nasal subunits affected were the dorsum (57.1%) and lateral walls (53.1%), followed by the tip (49.0%) and wings (46.9%). Soft triangle (32.7%) and columella (8.2%) were less affected.

quality of life domain, the score was 97.9 (IQR 87.8–99.5). Regarding the adverse effects domain by FACE-Q (4.2, IQR 0.0–8.3) or functional impairment by NOSE (0, IQR 0–5), the scores were low (Table 3).

A strong correlation between the FACE-Q quality of life domain and reconstruction completion in less than 6 months was found ($P = 0.002$; $\rho = 0.47$). There was no difference or association between the other domains of FACE-Q or NOSE concerning the other variables analyzed (nasal subunits affected, reconstruction of the lining or framework, time to pedicle division, complications, or number of operations performed).

DISCUSSION

This study presents long-term results of patients undergoing oncological nasal reconstruction with a PFF. Patients' satisfaction with this technique is verified in terms of appearance, quality of life, and nose function, without detriment to the donor site.

The characteristics of the population analyzed in this study were similar to a sample of 420 patients undergoing the same type of procedure by Sanniec et al,¹⁴ such as age (67.6 versus 67.8 years), percentage of pedicle division in the second operation (79.6% versus 75.0%), and

Table 2. Surgical Characteristics Related to Reconstruction

Characteristics	Median or Value (Percentage)/ IQR 25%–75%	P
Nasal subunits affected	4/2.3–6.8	>0.05
Lining reconstruction	21 (42.9%)	>0.05
Chondro mucosal flap	9 (42.9%)	
Nasolabial flap	7 (33.3%)	
Fold-in forehead flap	4 (19.0%)	
Free forearm flap	1 (4.8%)	
Support reconstruction	16 (32.7%)	>0.05
Conchal cartilage	9 (56.3%)	
Septal cartilage	5 (31.3%)	
Costal cartilage	1 (6.3%)	
PDS plate	1 (6.3%)	
Flap division (d)	56/35–98	>0.05
2 stages	39 (79.6%)	
3 stages	9 (18.4%)	
4 or more stages	1 (2.0%)	
Complications	5 (10.2%)	>0.05
Partial necrosis	2 (4.1%)	
Retraction	1 (2.0%)	
Nasocutaneous fistula	1 (2.0%)	
Poor cosmetic result	1 (2.0%)	
Recurrence	5 (11.4%)	>0.05
No. operations	3/2–3	>0.05
2 operations	23 (46.9%)	
3 operations	17 (34.7%)	
4 or more operations	9 (18.4%)	
Completion of reconstruction (mo)	5.1/1.9–14	0.002
<6	29 (59.2%)	
6–12	7 (14.3%)	
12–24	6 (12.2%)	
>24	7 (14.3%)	

the number of operations per patient (3.0 versus 2.3). The lower involvement of the soft triangle and columella (32.7% and 8.2% versus 29% and 10%) can also be seen. In another study by Rohrich et al,¹⁵ in which a subgroup of 532 patients underwent nasal reconstruction with the PFF, basal cell carcinoma was the primary etiology (81.6% versus 66%), and the main subunit was the dorsum (57.1% versus 53.0%). In all studies, complication rates requiring a new surgical procedure were low (10.2% versus 3.8% versus 1.2%). Necrosis was the leading cause of all series.

The FACE-Q questionnaire used to evaluate the result is a recent tool.^{10,11} Different modules emphasize specific aspects of the face.^{16,17} The option to use FACE-Q Aesthetic instead of the skin cancer (see appendix C, Supplemental Digital Content 3, FACE-Q Skin Cancer Module – Cancer Worry. <http://links.lww.com/PRSGO/B640>) or head and neck cancer modules (see appendix D, Supplemental Digital Content 4, FACE-Q | Head and Neck Cancer–English Version. <http://links.lww.com/PRSGO/B641>) results from the greater emphasis on the appearance of the nose, which is a fundamental unit for the aesthetic harmony of the face.¹⁸ These other modules measure different functions from other structures, such as swallowing, salivation, smile, and speech. Thus, the NOSE questionnaire was adopted to assess respiratory obstruction.^{12,13}

The 44% proportion of responses to the questionnaires was considered high. Compared to a similar study, in which FACE-Q assessed patients' psychological stress undergoing surgical treatment for facial skin cancer, the percentage of response in this present study was higher (44.0% versus 34.2%).¹⁹ It is essential to highlight Brazil's

Table 3. Result of the Evaluation of Nasal Reconstruction with a Paramedian Forehead Flap Using FACE-Q Domains of Appearance, Quality of Life, and Adverse Effects, and NOSE

	Median/ IQR (25%–75%)
FACE-Q appearance	98.4/92.1–100.0
FACE-Q quality of life	97.9/87.8–99.5
FACE-Q adverse effects	4.2/0.0–8.3
NOSE	0/0–5
Time interval between questionnaires and completion of reconstruction (mo)	3.1/2.0–5.4
<6	8 (16.3%)
6–12	3 (6.1%)
12–24	8 (16.3%)
>24	30 (61.2%)

The time interval between the completion of the reconstruction and the questionnaires is also indicated.

public health system's reality, in which the current study was conducted. 95.9% of patients did not complete higher education, and 75.5% earn up to 2 minimum wages (US\$ 400.00). Just as the socioeconomic aspects directly affect cancer treatment, it is possible that these patients' expectations regarding reconstruction will also be modified, favoring the positive evaluation of the results.²⁰

The time to complete the reconstruction was the only variable expressing a statistically significant association ($P = 0.002$, $\rho = 0.47$). Patients who completed the reconstruction in less than 6 months (29/49 [59.2%]) had better results in FACE-Q's quality of life domain than patients requiring a longer time (20/49 [40.8%]). The median of 5.1 months (IQR 1.9–14 months) to end the process is consistent with the total number of operations per patient (median 3, IQR 2–3 operations). However, the number of operations, complications, or recurrence was not related to reconstruction satisfaction as an independent variable. Consequently, we can speculate that the most critical factor is the return to normal life.

Reconstruction of the nose with the PFF has benefits but also disadvantages. Consequently, this technique's indication should be restricted to more complex lesions concerning the extension and the need to repair the lining or the structural framework.^{8,9} The main advantages are the excellent donor site availability, similarity to the nose skin, and blood supply safety. These characteristics make this flap the first option for many reconstructions, as demonstrated by the excellent results in FACE-Q's appearance and adverse effects domains. Despite this, the need for additional surgical procedures for pedicle division and revisions prolongs the reconstruction time. Therefore, it can impact patients' quality of life (Fig. 2).

The forehead flap pedicle division in the second or third operation also showed no association with this sample results. In contrast, Ribuffo et al²¹ and Lo Torto et al²² demonstrated a better final aesthetic result in patients who underwent the PFF division in the third operation. Both studies showed a similar incidence of complications and total number of operations per patient. However, the time to complete the reconstruction was not evaluated.

Regardless of when the pedicle is divided, the first and second operation interval can be reconsidered. Classically,



Fig. 2. A 71-year-old man with a history of smoking, drinking, systemic arterial hypertension, diabetes, anxiety/depression, and chronic kidney disease. He presents basal cell carcinoma affecting the dorsum, lateral wall, and nasal tip (A/B). The lesion was resected and reconstructed using a paramedian frontal flap (C). The pedicle was divided after 56 days, presenting satisfactory aesthetic results and mild effects in the donor area, without additional procedures (D/E).

the flap division was performed in the second operation. Millard proposed an intermediate step for thinning with the vascular flow of the pedicle preserved.²³ Then, Burget and Menick²⁴ proposed changes in the technique but maintained the pedicle's division in the third operation, 3 weeks after the second procedure. More recently, safety in dividing the flap was demonstrated just 2 weeks after the initial stage without an increase in the adverse events rate.²⁵ Thus, early pedicle division can be an alternative to reduce the time to complete reconstruction, increasing the quality of life of patients, and enabling the optimization of financial resources.²⁵

Finally, the observation that the number of nasal subunits affected in this study does not influence outcome assessments may favor using the principle of totalization of partially affected subunits.²⁶ Although not necessarily

indicating the area in need of reconstruction, a higher number of affected subunits did not show worse evaluation results in the FACE-Q or NOSE questionnaires. Thus, completing the resection of a subunit to camouflage the scar, despite discarding the viable tissue, is a consistent technique. In another study carried out to assess the satisfaction of patients undergoing nasal reconstruction with a PFF with this principle, all patients presented satisfactory results.²⁷

The use of tools to evaluate PROs can identify factors associated with the success of the reconstruction. The fact that the measurement is performed according to patients' perception, and not doctors, offers real and occasionally different perspectives from what we are used to. The fact that the quality of life is influenced by the duration of the reconstruction process, but not by the number of operations performed, the moment of pedicle division,

or complications is relevant and should be considered in therapeutic planning.

Limitations of this study include its cross-sectional format and the use of the population of a cancer center in the Brazilian public health system.

CONCLUSIONS

This study suggests that the PFF for nasal reconstruction after resection of NMSC is a reliable option with good appearance, quality of life, and function, in addition to mild effects on the donor area. Identifying the total reconstruction time as an impact factor on patients' quality of life should be considered when planning treatment. This also highlights the importance of the objective identification of factors that may influence this planning.

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PATIENT CONSENT

The patient provided written consent for the use of his images.

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