

# NASAL RECONSTRUCTION AFTER MOHS SURGERY: MANAGEMENT OF DEFECTS ACCORDING TO ANATOMICAL UNITS AND DIMENSIONS

**Nguyen Huu Quang<sup>1,2\*</sup>, Vu Dinh Tam<sup>1</sup>, Ta Thi Ha Phuong<sup>1</sup>, Nguyen Canh Tung<sup>1</sup>, Nguyen Huu Sau<sup>1,2</sup>, Nguyen Hong Son<sup>1</sup>, Nguyen Dinh Quan<sup>1</sup>, Vu Nguyen Binh<sup>1</sup>, Le Thanh Hien<sup>1</sup>**

---

## ABSTRACT

**Objectives:** Skin cancer frequently affects the nose, particularly in sun-exposed areas such as the ala, apex, root, and bridge. Even minor nasal lesions can pose aesthetic and psychosocial challenges for patients, necessitating nasal reconstruction tailored to anatomical units and defect size. The primary goal of reconstructive surgery is to restore the original shape, emphasizing three-dimensional space, symmetry, color, and compatibility with surrounding tissue structures. Despite numerous options for post-cancer surgery reconstruction, establishing a gold standard for nasal defect management remains elusive.

**Materials and methods:** A retrospective study was conducted in 41 patients following Mohs surgery for basal cell carcinoma. Defects are approached based on rhinoplasty principles, considering anatomical units, defect size, and location to select appropriate reconstruction methods.

**Results:** Among the patients, 17 (41.5%) had nasal alar defects, 5 (12.2%) had nasal apex defects, 4 (9.8%) had nasal root defects, 7 (17.1%) had nasal bridge defects, and 9 (22%) had complex defects involving multiple anatomical units. Patients with nasal alar defects < 1.5cm underwent reconstruction using the nasolabial flap, while those with larger defects (> 1.5cm) underwent forehead flap reconstruction, including auricular cartilage grafts for nasal alar defects. Complex lesions (22%) were reconstructed using a combination of forehead flap and rotation or V-Y flap. Nasal root defects (7.3%) were reconstructed using the glabellar flap.

**Conclusions:** Nasal reconstruction, employing local or regional flaps, consistently yields positive functional and aesthetic outcomes due to the similarity in color and skin flap thickness with adjacent structures. The forehead flap, with its constant blood supply, vitality, and versatile design, is particularly effective for complex nasal lesions.

**Keywords:** *Basal cell carcinoma, nasal defects, nasal reconstruction.*

---

<sup>1</sup> The National Hospital of Dermatology and Venereology

<sup>2</sup> Hanoi Medical University

\* Correspondence: [nguyenhuuquang@hmu.edu.vn](mailto:nguyenhuuquang@hmu.edu.vn)

Received 29 June 2023

Revised 27 September 2023

Accepted 29 November 2023

DOI: <https://doi.org/10.56320/tcdlhvn.42.130>



## 1. INTRODUCTION

The significance of the nose and periorbital region in facial aesthetics underscores the importance of ensuring both functional viability and high aesthetic quality during reconstruction. Being one of the most prominent and sun-exposed facial features, the nose poses an elevated risk of skin cancer, particularly basal cell carcinoma. Surgical intervention, with Mohs surgery being recognized for its multiple advantages, remains the gold standard in skin cancer treatment.<sup>1,2</sup>

Nasal defects can encompass varying degrees of skin, cartilage, muscle, bone, or inner membrane involvement, and even the slightest imperfection can evoke aesthetic and psychosocial concerns in patients. Therefore, an approach to nasal reconstruction must consider the anatomical unit, size, and specific features of the defect. The roots of nasal reconstruction trace back thousands of years to early Indian medical practitioners, with subsequent refinements and innovations continually enhancing these ancient techniques.<sup>3,4</sup>

Burget and Menick have significantly advanced nasal reconstruction methodologies by introducing subunit aesthetic principles. Despite these advancements, local flaps and skin grafts remain pivotal in addressing soft tissue reconstruction and skin defects.<sup>5</sup> Our research aims to refine the approach to nasal defects, aligning with the fundamental principles of rhinoplasty based on anatomical units and defect location. Through this approach, we intend to discern and implement the most appropriate reconstruction methods for nasal defects.

## 2. MATERIALS AND METHODS

### Study design

The study was conducted at the National Hospital of Dermatology and Venereology in Vietnam. This study was designed as a retrospective study.

### Subjects

Patients who received reconstructive surgery following removal surgery for basal cell carcinoma of the nasal area between January 2020 and October in 2022 were included in the study.

### Procedures

The assessment of each patient's medical record involved a thorough examination based on specific criteria, including age, gender, anatomical location, diagnosis, defect size, depth of defect, and the method of reconstruction (considering flap type, cartilage grafting requirements, and replacement of nasal mucosal lining). Additional parameters, such as relapse, follow-up time, complications, and associated factors, were also analyzed. Nasal defects were systematically categorized by size, anatomical location, and depth, with depth classifications distinguishing between shallow defects involving skin, subcutaneous tissues, and nasal muscles; deep defects with cartilage-bone invasion; and complex defects featuring transorgan involvement. All transorgan defects were addressed through reconstruction with a forehead flap. Post-surgery, comprehensive reconstruction of all nasal components was undertaken, and patients were actively monitored for a minimum of 6 months. Our approach to nasal defects considers aesthetic units, features, and defect size, as detailed in Table 1.

**Table 1. Rhinoplasty methods**

Anatomical units	Technique
<b>Bridge of nose and side wall,cm</b>	
< 1.5	Direct closure Displaced flap (with nasal lateral wall) Glabellar flap
1.5 - 2.5	Glabellar flap (base of the bridge of the nose) Bilobed flap Dorsal nasal flap
> 2.5	Forehead flap Dorsal nasal flap Cheek advancement flap
<b>Apex of nose, cm</b>	
< 0.5	Direct closure
< 1.5	Bilobed flap V-Y advancement flap
1.5 - 2.5	Dorsal nasal flap Forehead flap
> 2.5	Forehead flap
<b>Ala of nose, cm</b>	
< 1.5	Nasolabial flap
> 1.5	Forehead flap

### Statistical analysis

The data were encrypted and analyzed using the statistical algorithm with SPSS 20.0.

### Ethical approval

The study was approved by the Ethical Review Board of the National Hospital of Dermatology and Venereology, Vietnam, and written informed consent was obtained from all subjects before their enrollment in the study.

### 3. RESULTS

In our study, we examined 41 patients who underwent nasal reconstruction subsequent to Mohs surgery for basal cell carcinoma. Among these individuals, 18 were male (44%), and 23 were female (56%), with ages ranging from 30 to 81 years and a median age of 61.4 years.

Defects were classified based on their location as follows: 17/41 (41.5%) had nasal alar defects, 5/41 (12.2%) had nasal apex defects, 4/41



(9.8%) had nasal root defects, 7/41 (17.1%) had nasal bridge defects, and 9/41 (22%) presented complex defects involving trans-organ defects or defects from two anatomical units. Specifically, 6/41 (14.7%) patients with nasal alar defects had a size < 1.5cm and were reconstructed using the nasolabial flap on the same side. Meanwhile, 10/41 (24.4%) patients with nasal defects larger than

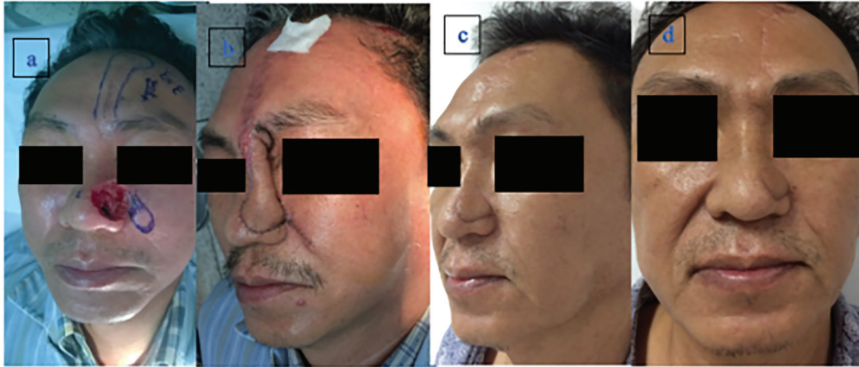
1.5cm underwent reconstruction with a forehead flap, including four patients who received auricular cartilage grafts for nasal alar reconstruction. Complex lesions (22%) were reconstructed using a combination of the forehead flap with the rotation flap or V-Y flap. Additionally, 3/41 (7.3%) patients with nasal root defects were reconstructed using the glabellar flap (Table 2).

**Table 2. Defect classification**

RHINOPLASTY	Ala of nose	Apex of nose	Root of nose	Bridge of nose	Complex	Sum
Nasolabial flap	7	-	-	5	3	15 (36.6%)
Bilobed/u-flap	-	5	-	2	-	7 (17%)
Glabellar flap	-	-	3	-	1	4 (9.8%)
Forehead flap	10	-	-	-	-	10 (24.4%)
Combination	-	-	-	-	5	5 (12.2%)
Sum	17/41 (41.5%)	5/41 (12.2%)	3/41 (7.3%)	7/41 (17%)	9/41 (22%)	41 (100%)

Following the surgical procedures, all flaps exhibited robust viability, underwent successful healing, and had stitches removed as early as the 7th day post-surgery. Specifically, the pedicled frontal flap had stitches removed between the

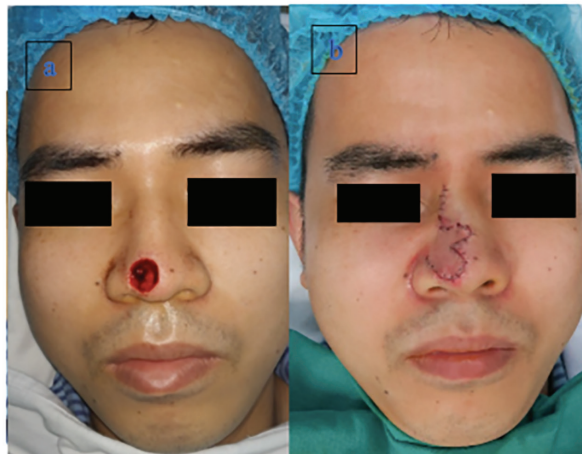
12th and 14th days after frontal transposition flap surgery (Figures 1 and 2). Throughout the 6 to 30 months of follow-up for the 41 patients, no instances of cancer recurrence were observed, and the scarring quality was aesthetically pleasing



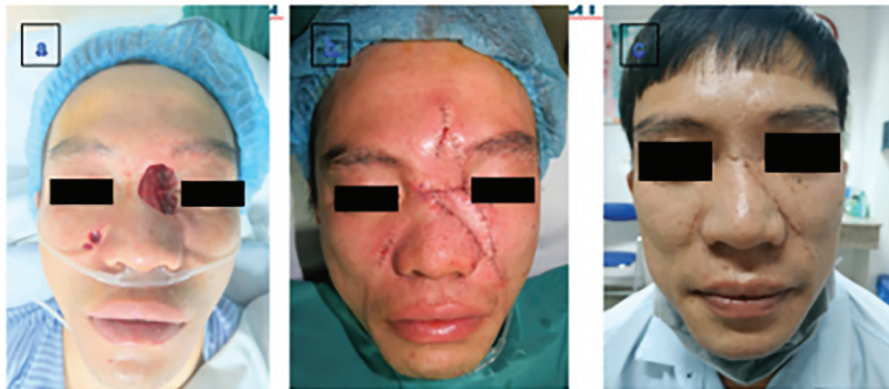
**Figure 1. Defect of nasal ala and nasal bridge. a- Defects and preoperative design: Nasolabial flap for nasal mucosal defect, forehead flap covers. b- date of cutting stitches of pedicled frontal flap. c, d- after 6 months of nasal reconstruction. Image source: Nguyen Huu Quang.**



**Figure 2. Nasal alar defect. a- Preoperative defect and forehead flap design. b- After nasal reconstruction with forehead flap. c- After 12 months of plastic surgery. Image source: Nguyen Huu Quang.**



**Figure 3. Nasal apex defect. a- Preoperative defect. b- After bilobed flap. Image source: Nguyen Huu Quang.**



**Figure 4. Defect of nasal root and left medial canthus. a- Preoperative defect. b- after reconstructive surgery combining V-Y nasolabial flap with glabellar flap. c- After 9 months of plastic surgery. Image source: Nguyen Huu Quang.**

#### 4. DISCUSSION

Nasal reconstruction is challenging from both functional and aesthetic perspective. Achieving the best cosmetic results is one of the main goals of reconstructive surgery. A successful rhinoplasty case involves achieving a barely noticeable scar line between the nose and surrounding tissues, harmonious color, and a thickness consistent with the good symmetry of the sides.<sup>1,4</sup>

As mentioned earlier, Burget and Menick proposed the “subunit” principle, which involves excision of the remaining healthy skin and reconstruction of the entire nasal subunit when the associated defect occupies a surface area of the subunit of 50% or more.<sup>2,3</sup> In our study, nasal reconstruction was based on the subunit principle. However, if the scar is disguised inside the subunit, then no additional healthy tissue is removed.

The main significant advantage of local flaps is that they help give the ideal skin tone, the right thickness and texture to the defective area. An absolute aesthetic result can be achieved if the most suitable flap design is chosen<sup>5</sup>. Local flaps depend on the amount of skin tissue remaining,

which is often insufficient for large nasal defects. Therefore, regional flaps, especially forehead flap is the right choice when a certain amount of skin is needed for nasal reconstruction.

Regional flaps are used to reconstruct large or entire thickness defects of the nose. They are designed to pick up skin from nearby areas, such as the forehead or cheeks. The place for the skin flap can be closed directly more easily than in the nasal area, since in this place held looser, the skin has more elastic properties.<sup>5,6</sup>

The bilobed flap is one of the best options for defects of the lower 1/2 nasal bridge and the nasal apex area up to 1.5 cm in size. Its main advantages include easy design, excellent color harmony, density and thickness of the skin flap that resembles the surrounding skin, good skin flap vitality, and will often undergo one-step surgery. Its disadvantage is that it does not follow the principles of nasal subunit reconstruction, the limitation is that only small defects < 1.5cm can be shaped<sup>7</sup>. In our study, 7/41 (17%) patients underwent bilobed flap reconstruction and showed good results both functionally and aesthetically (Figure 3).

The nasolabial flap is a good choice for defects in the nasal ala, lateral nasal wall and 1/3 below the bridge of the nose. It can also be effectively and safely applied as an alternative to the nasal mucosa. The place for the skin flap is usually closed directly and the scar is hidden into the nasolabial groove. Because the nasolabial groove has an abundant blood supply, the nasolabial flap can be designed in many different forms. Having an abundant blood supply, low donor zone complication rate, and its flexibility for various nasal defects are the main advantages of the nasolabial flap.<sup>5</sup> The disadvantage of the nasolabial flap is that it only for the defect with size of less than 1.5cm. In our study, 15 out of 41 (36.6%) patients underwent nasolabial flaps reconstructed with various designs from transposition flap to island flap and showed good results both functionally and aesthetically (Figure 4).

A glabellar flap is used to reconstructed the upper 1/3 of the nose. This flap can be designed in the form of a V-Y flap.<sup>8</sup> They are easily applied with color and tissue organization structure homologation. In our study, flaps were designed in 2 forms of rotation flap and V-Y flap to reconstruct defects of lower 1/3 of the nasal bridge and upper half of the medial canthus (4 defects 9.8%) (Figure 4).

The forehead flap is one of the best options for nasal reconstruction, especially for lesions as large as > 1.5cm or transorgan defects, due to skin quality, harmonious color, appropriate size and constant blood supply. Forehead flap remains the standard technique for enlarged nose defects. It can be used to reconstruct the entire nose, defect both nasal alar<sup>9,10</sup>. Although the forehead flap is usually done in 2 times, it can also be done 1 time or 3 times. Little et al. reported complications,

such as flap necrosis, nasal obstruction, and nasal wing groove formation in 16.1% of 205 cases.<sup>9</sup> In our study, 15/41 forehead flap reconstruction (36.6%) with a variety of designs ranging from merely covering the surface of the nose to the flap sandwich technique combined with cartilage graft to replace nasal alar cartilage, showed good results, with no complications (Figure 1,2).

## 5. CONCLUSION

Through this study, we have found that the reconstruction of nasal defects should adhere to anatomical subunits, taking into consideration the size and characteristics of the defect. Utilizing local or regional flaps consistently yields favorable outcomes both functionally and aesthetically, as the adjacent structures share similarities in color and skin flap thickness. The forehead flap, specifically, is employed for complex nasal lesions. This flap boasts a constant blood vessel supply, good vitality, a diverse design, and is relatively straightforward during surgery, making it applicable in any operating room.

## REFERENCES

1. Losco, L., Bolletta, A., Pierazzi, D. M., Spadoni, D., Cuomo, R., Marcasciano, M., Cavalieri, E., Roxo, A. C., Ciamarra, P., Cantisani, C., & Cigna, E. (2020). Reconstruction of the Nose: Management of Nasal Cutaneous Defects According to Aesthetic Subunit and Defect Size. A Review. *Medicina (Kaunas, Lithuania)*, 56(12), 639. <https://doi.org/10.3390/medicina56120639>.
2. Owusu, J., Nesbitt, B., & Boahene, K. (2020). Management of Complicated Nasal Defects. *Facial plastic surgery: FPS*, 36(2), 158 -165. <https://doi.org/10.1055/s-0040-1709141>.



3. Newlove, T., & Cook, J. (2013). Safety of staged interpolation flaps after Mohs micrographic surgery in an outpatient setting: a single-center experience. *Dermatologic surgery: official publication for American Society for Dermatologic Surgery [et al.]*, 39(11), 1671 -1682. <https://doi.org/10.1111/dsu.12338>.
4. Papadopoulos, O., Kostopoulos, E., Karypidis, D., Tsantoulas, Z., & Moustaki, M. (2009). Review of nasal reconstruction. *The Journal of craniofacial surgery*, 20(4), 1072 -1077. <https://doi.org/10.1097/SCS.0b013e3181abb36d>.
5. Moolenburgh, S. E., McLennan, L., Levendag, P. C., Munte, K., Scholtemeijer, M., Hofer, S. O. P., & Mureau, M. A. M. (2010). Nasal reconstruction after malignant tumor resection: an algorithm for treatment. *Plastic and reconstructive surgery*, 126(1), 97 -105. <https://doi.org/10.1097/PRS.0b013e3181da872e>.
6. Konofaos, P., Alvarez, S., McKinnie, J. E., & Wallace, R. D. (2015). Nasal Reconstruction: A Simplified Approach Based on 419 Operated Cases. *Aesthetic plastic surgery*, 39(1), 91 -99. <https://doi.org/10.1007/s00266-014-0417-0>.
7. Steiger J. D. (2011). Bilobed flaps in nasal reconstruction. *Facial plastic surgery clinics of North America*, 19(1), 107 -111. <https://doi.org/10.1016/j.fsc.2010.10.013>.
8. Koch, C. A., Archibald, D. J., & Friedman, O. (2011). Glabellar flaps in nasal reconstruction. *Facial plastic surgery clinics of North America*, 19(1), 113-122. <https://doi.org/10.1016/j.fsc.2010.10.003>.
9. de Pochat, V. D., Alonso, N., Ribeiro, E. B., Figueiredo, B. S., de Magaldi, E. N., Cunha, M. S., & Meneses, J. V. (2014). Nasal reconstruction with the paramedian forehead flap using the aesthetic subunits principle. *The Journal of craniofacial surgery*, 25(6), 2070 -2073. <https://doi.org/10.1097/SCS.0000000000001152>.
10. Parrett, B. M., & Pribaz, J. J. (2009). An algorithm for treatment of nasal defects. *Clinics in plastic surgery*, 36(3), 407 -420. <https://doi.org/10.1016/j.cps.2009.02.004>.