

Two-Stage Reconstruction of the Frontonasal Flap with Pedicle Release: Case Report and Surgical Technique

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ABSTRACT

Two-stage reconstruction of the frontonasal flap with delayed pedicle release is a reliable technique for the management of nasal ala defects, particularly in older patients with basal cell carcinoma. We present the case of a 70-year-old male with a 2.5 cm ulcerated basal cell carcinoma affecting the right nasal ala, involving the lateral curvature, alar line, and adjacent nasal base skin. Complete oncologic excision was performed with preservation of nasal cartilaginous support, followed by coverage with a laterally based frontonasal flap. In the first stage, the flap was transferred to the defect while maintaining the vascular pedicle intact to ensure perfusion. After 21 days, the pedicle was carefully released in a second-stage procedure, allowing precise adjustment of contour, symmetry, and alar curvature without compromising vascular supply. Postoperative outcomes demonstrated complete flap survival, optimal aesthetic integration, and functional preservation, with high patient satisfaction. This case highlights the effectiveness of a two-stage frontonasal flap with delayed pedicle release for nasal ala reconstruction in high-risk populations. The approach ensures vascular safety, allows secondary refinement, and provides superior aesthetic and functional results compared with single-stage or alternative local flap techniques. The report underscores the clinical relevance of meticulous planning, staged transfer, and pedicle management in complex nasal reconstruction.

KEYWORDS: Frontonasal flap, two-stage reconstruction, pedicle release, nasal ala defect, basal cell carcinoma, reconstructive surgery.

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INTRODUCTION

Reconstruction of defects in the nasofrontal and nasal region represents one of the greatest challenges in reconstructive surgery due to the anatomical complexity of the nose and its proximity to functionally and aesthetically critical structures, such as the nasal tip, alae, dorsum, and glabella. This area is particularly vulnerable to malignant skin lesions, with basal cell carcinoma (BCC) being the most frequent neoplasm in older adults. It is estimated that more than 80% of BCCs are located on the head and neck, with a significant proportion affecting the nasofrontal region due to chronic sun exposure and the thinness of the skin, which increases the risk of local invasion and recurrence if adequate resection is not performed.

Surgical management of BCC in the nasofrontal region requires not only complete excision of the lesion with appropriate safety margins but also immediate restoration of form and function. Resulting defects may range from small tissue losses, which can be managed with primary closure or skin grafts, to larger defects that require local or regional flaps. In this context, the frontonasal flap has been established as a reliable and versatile technique, capable of providing coverage for medium to large defects with favorable aesthetic outcomes due to its similarity in color, texture, and thickness to nasal and glabellar skin, as well as its robust vascularization from the angular artery and branches of the dorsal nasal artery.

Despite these advantages, transfer of the frontonasal flap may be limited by tension on the vascular pedicle, which maintains flap viability. Excessive tension or inadequate manipulation of the pedicle may result in partial necrosis, retraction, or deformity of the flap. To minimize these risks, two-stage reconstruction has been described, in which the flap is initially transferred to the recipient site while maintaining the primary vascular supply. Subsequently, in a delayed second-stage procedure, the pedicle is released, allowing adjustment of position, reduction of excess tissue, and optimization of symmetry and final contour without compromising flap viability.

This two-stage approach is particularly relevant in older patients, such as the present case: a 70-year-old male with nasofrontal basal cell carcinoma. In this age group, tissue perfusion may be compromised by systemic factors such as hypertension, diabetes, atherosclerosis, or smoking, increasing the risk of postoperative complications and partial flap failure. Careful planning, which includes initial preservation of the vascular pedicle and subsequent release, reduces these risks and achieves superior functional and aesthetic outcomes.

The literature reports multiple local flap techniques for nasal reconstruction, including bilobed flaps, nasolabial flaps, and unilateral or bilateral frontonasal flaps. However, documentation on the use of two-stage frontonasal flaps with

delayed pedicle release, especially in older patients with BCC, remains limited, highlighting the relevance of this type of case report.

In this context, the present case report describes the application of a two-stage frontonasal flap with pedicle release in a 70-year-old patient with basal cell carcinoma. The surgical technique employed, perioperative care, outcomes, and clinical considerations are detailed, aiming to provide a reference framework for reconstructive planning in similar patients and to contribute knowledge on safe and effective strategies for facial reconstruction in at-risk populations.

CASE REPORT

We present a 70-year-old male patient with a history of well-controlled arterial hypertension and no other relevant comorbidities, who consulted for an ulcerated lesion on the right nasal ala, approximately 2.5 cm in diameter, with pearly borders, easy bleeding upon contact, and progressive growth over the last 18 months. The lesion involved the entire nasal ala, affecting the lateral curvature, alar line, and adjacent skin of the nasal base, representing a reconstructive challenge due to the need to preserve alar shape, maintain symmetry with the contralateral side, and ensure aesthetic continuity of the nasolabial fold. Incisional biopsy confirmed nodular basal cell carcinoma, the most common cutaneous neoplasm in older adults, with nasal ala localization representing a high aesthetic and functional relevance due to anatomical complexity and proximity to the nasal airway.

Given the lesion's size and location, a two-stage frontonasal flap reconstruction with delayed pedicle release was planned to ensure flap viability and an optimal aesthetic result. This technique was selected based on the flap's robust vascularization from the angular artery and dorsal nasal artery branches, and its ability to provide skin with similar characteristics to the nasal region, preserving the texture, color, and shape of the nasal ala, while allowing precise adjustments in a second-stage procedure.

Under general anesthesia, the lesion was completely excised with 4 mm safety margins, preserving nasal cartilaginous support and avoiding compromise of the nostril. The resulting defect measured approximately 3×2.5 cm, involving skin, part of the subcutaneous tissue, and the lateral curvature of the nasal ala, requiring coverage that maintained minimal tension on surrounding tissues. A laterally based frontonasal flap was designed using glabellar and adjacent frontal skin as reference, ensuring the pedicle was sufficiently long and vascularized to allow transfer without compromising perfusion. Incisions respected subcutaneous and superficial muscular planes, and the flap was mobilized cautiously to avoid tension on the pedicle and preserve viability. The flap was sutured to the

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recipient bed with fine absorbable sutures to optimize edge adaptation and minimize tissue trauma, applying a gentle compressive dressing to maintain contact with the bed, prevent hematomas, and ensure perfusion. Immediate and early postoperative evaluation showed uniform pink coloration, capillary refill, and absence of partial necrosis or hematoma, allowing scheduling of the second-stage procedure.



Figure 1: image after the first-stage surgery.



Figure 2: image after the first-stage surgery.



Figure 3: image after the first-stage surgery.

After 21 days, with evidence of complete flap survival, the second-stage procedure was performed to release the pedicle and optimize nasal ala shape. Under local anesthesia with sedation, subcutaneous and muscular fibers restricting pedicle mobility were carefully released, allowing greater positional freedom and definition of the alar contours and nasolabial fold. Flap edges were refined and sutured with fine material, ensuring no tension on the remaining pedicle while preserving perfusion, confirmed by direct inspection and capillary refill testing. This second stage reduced the pedicle base width, improved symmetry between nasal alae, and refined the lateral curvature, achieving a natural, functional, and aesthetically

satisfactory result without compromising flap vascularization. No additional grafts or coverage were necessary.

Postoperative management included analgesia, prophylactic antibiotics, and local wound care, including sterile saline cleansing and protection from sun exposure, with weekly follow-ups during the first month and monthly assessments for the next three months. Clinical evolution was favorable, with complete flap survival, proper integration with surrounding tissues, preservation of alar shape, and minimal distortion of natural folds. The patient reported high satisfaction with functional and aesthetic outcomes, returning to routine activities one month after the second-stage procedure.



Figure 4: Immediate postoperative image



Figure 5: Immediate postoperative image

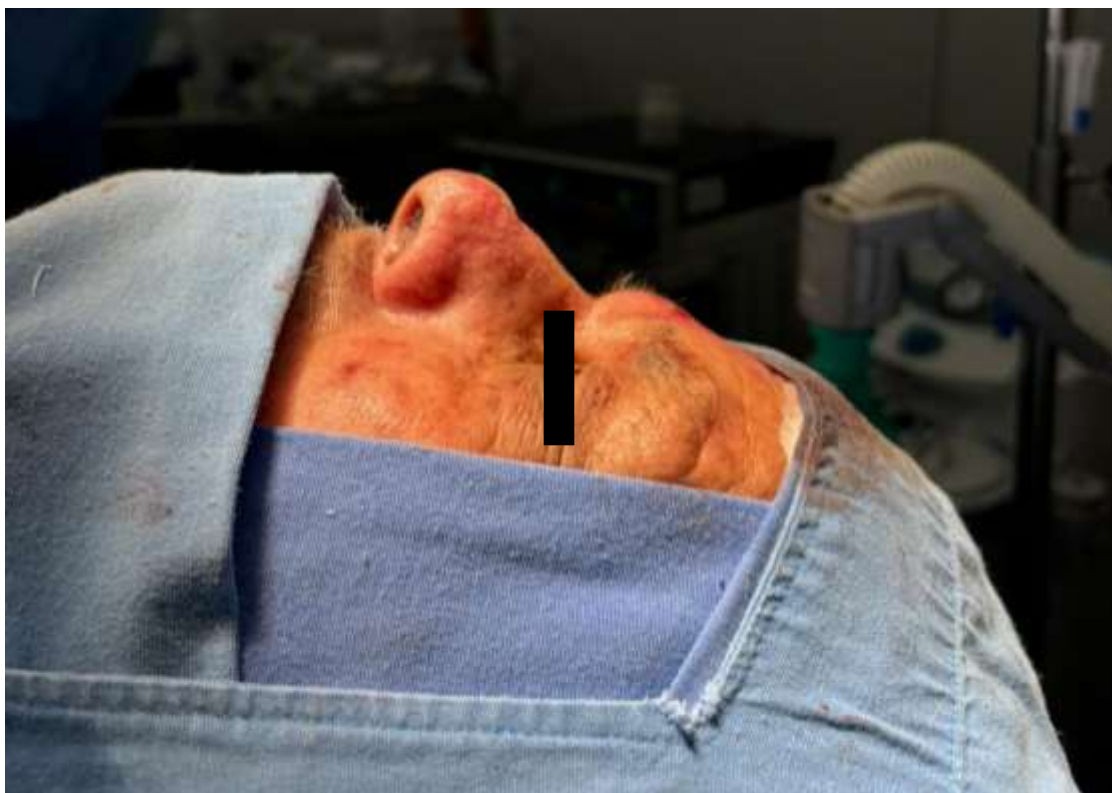


Figure 6: Immediate postoperative image

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This case demonstrates the effectiveness of the frontonasal flap in reconstructing nasal ala defects in older patients with BCC, showing that the two-stage strategy with delayed pedicle release combines oncologic safety, vascular preservation, and superior aesthetic outcomes. Careful planning and meticulous technique optimize flap survival in the first stage and allow fine adjustments in the second stage, minimizing risks of partial necrosis and improving facial harmony. This approach is a reliable and reproducible option for nasal ala reconstruction, providing evidence on the relevance of two-stage flaps and delayed pedicle release as a safe and effective strategy in at-risk populations.

DISCUSSION

Reconstruction of nasal ala defects poses a significant challenge in reconstructive surgery due to anatomical complexity, functional importance of alar support, and the need to maintain symmetry and aesthetic contour. Lateral defects, such as in our 70-year-old male patient with BCC of the nasal ala, require an approach combining oncologic safety, vascular preservation, and satisfactory aesthetic outcomes. BCC is the most common cutaneous malignancy in older adults, predominantly affecting sun-exposed areas such as the nasofrontal region and nasal ala, increasing the likelihood of lesions involving skin,

subcutaneous tissue, and alar curvature, generating complex defects unsuitable for simple closure techniques. Various classifications of nasal defects have been proposed to guide reconstructive technique selection. According to Burget and Menick (1994), defects are classified as dorsal, tip, alar, or combined, considering size, depth, and location. For medium to large alar defects, the frontonasal flap is a reliable option, providing skin with similar characteristics, sufficient mobility, and a robust vascular base, allowing initial transfer without compromising perfusion. In our patient, the lesion involved the entire right nasal ala, affecting lateral curvature and the alar line, supporting the planning of a two-stage frontonasal flap with delayed pedicle release. The literature highlights that the two-stage strategy reduces the risk of partial necrosis by allowing neovascularization to establish in the recipient bed before manipulating the pedicle. The first stage consists of oncologic resection and flap transfer while keeping the pedicle intact, ensuring perfusion and initial tissue adaptation. The second stage, typically 2–3 weeks later, allows partial pedicle release, refinement of shape, adjustment of base width, and optimization of symmetry, critical in alar defects where lateral curvature and nasolabial fold continuity are key to aesthetic outcome.

Table 1. Classification of nasal defects and reconstructive recommendations (Burget & Menick, 1994)

Defect type	Location	Size	Recommended reconstructive options
A	Nasal dorsum	Small	Primary closure, skin graft
B	Nasal tip	Medium	Bilobed flap, paramedian forehead flap
C	Nasal ala	Medium to large	Nasolabial flap, frontonasal flap
D	Combined	Large	Two-stage frontonasal flap, combined paramedian forehead flap

Table 2. Comparison of nasal flaps by origin and vascularization

Flap type	Tissue origin	Vascularization	Main application in nasal ala	Main advantage
Local	Adjacent skin	Random (subcutaneous)	Small defects	Simple, quick, minimal trauma
Regional (frontonasal)	Glabellar and frontal skin	Defined pedicle: angular artery and dorsal nasal branches	Medium to large defects, nasal ala	Wide coverage, skin color and texture match, allows secondary adjustments
Free microvascular	Tissue from other body region	Artery and vein reconnected via microvascular anastomosis	Extensive or combined defects	Highly versatile, allows complex reconstruction

Table 3. Reported complications of frontonasal flap

Complication	Approximate frequency (%)	Recommended management
Hematoma	5–10	Drainage or gentle compression
Transient edema	10–15	Conservative management, cold therapy
Distal partial necrosis	2–5	Debridement and secondary healing
Aesthetic deformity	5	Secondary adjustment or minor revision

Table 4. Comparison of reconstructive techniques for nasal ala

Technique	Advantages	Limitations	Suitability for lateral ala defects
Skin graft	Quick coverage	Color and texture mismatch, contraction	Small defects
Nasolabial flap	Texture match	May cause alar tension or retraction	Medium defects, not extensive
Bilobed flap	Close coverage	Limited to tip/dorsum	Not optimal for lateral ala
Two-stage frontonasal flap	Secondary adjustment, wide coverage	Requires two stages, detailed planning	Medium to large lateral ala defects

CONCLUSION

Nasal ala reconstruction for BCC represents a significant surgical challenge due to anatomical complexity, lateral alar curvature, limited adjacent skin, and the need to preserve respiratory function and facial aesthetics. This case demonstrates that the two-stage frontonasal flap with delayed pedicle release is a reliable, reproducible, and highly effective strategy, providing complete defect coverage, vascular preservation, and satisfactory aesthetic outcomes. Careful planning allowed initial flap transfer with minimal pedicle tension, while the second-stage procedure enabled precise contour and symmetry adjustments, optimizing alar shape without compromising vascularization.

Compared with other reconstructive techniques, nasolabial and bilobed flaps have limitations for extensive lateral defects. The nasolabial flap, although nearby and well-vascularized, can create alar line tension and lateral curvature retraction, especially in older patients. Bilobed flaps suit the tip and dorsum but cannot adequately cover large alar defects without affecting symmetry. In contrast, the frontonasal flap provides skin with similar characteristics, a robust vascular pedicle, and allows secondary adjustment through delayed pedicle release, optimizing functional and aesthetic outcomes.

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