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Case Series

Modified inverted-L glabellar flap for coverage of nasal dorsum defects: a case series

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ABSTRACT

Nasal reconstruction, particularly of the nasal dorsum, presents significant challenges due to the intricate aesthetic subunits and complex vascular supply. Traditional techniques often face limitations in terms of coverage and aesthetic outcomes. This study aims to enhance reconstructive outcomes by employing advanced flap designs, specifically the Inverted-L and modified frontonasal or glabellar flaps, to address these limitations. This study presents a single-surgeon retrospective case series involving sixteen patients diagnosed with isolated Basal Cell Carcinoma on the nasal dorsum. Between 2019 and 2021, patients underwent wide lesion resections with clear margins, followed by flap coverage using the Inverted-L or modified frontonasal flap. The flap design was planned to avoid the supratrochlear artery and ensure optimal vascular supply. Postoperative care included the use of medical-grade silicone sheets for scar management, and patients were monitored for two years for any recurrences or complications. The patient cohort included a diverse age range with no long-term flap compromise or dehiscence reported. The mean follow-up period was 24 months (range, 6 months to 3 years). Minor complications involved the removal of absorbable internal stitches in three cases due to granuloma and pustule formation. All patients achieved satisfactory aesthetic results with no tumor recurrence or significant adverse events. This case series demonstrates the efficacy of the Inverted-L flap in nasal dorsum reconstruction, offering significant improvements in both aesthetic and functional outcomes. The technique allows for versatile flap manipulation while maintaining robust vascular support, crucial for optimal healing and minimal scar visibility.

Keywords: Basal cell carcinoma, Flap design, Facial plastic surgery, Nasal reconstruction, Surgical oncology

INTRODUCTION

The nose is intricately divided into nine aesthetic subunits, columella, dorsum, lateral walls, nasal alae, soft tissue facets and the nasal tip.[1] Its vascular supply is chiefly provided by the angular, nasopalatine and anterior ethmoidal vessels, drawing a rich blood supply from both the internal and external carotid systems, with a comprehensive network of anastomoses along the midline. This vascular architecture facilitates the safe design of either axial or random vascular pedicle flaps. Predominantly, the external carotid through its terminal branch, the angular artery, ascends parallel to the nasal side, branching extensively towards the ala, lateral walls and nasal dorsum. The angular artery concludes its course at the medial canthus by anastomosing with the dorsal nasal artery, a terminal branch of the internal carotid system.[2] Dr. González-Ulloa's 1956 proposition for a subunit-based nasal dorsum defect reconstruction aims to enhance outcomes and reduce complications, leveraging detailed facial anatomy and vascular inputs.[1,3] Any defect exceeding half of a subunit is considered as encompassing the entire subunit.[4] The nasal dorsum, a focal aesthetic

element, presents a significant reconstructive challenge.[5] Initially described in 1967 by Rieger, the frontonasal or glabellar flap is a random-type rotational flap, intended for nasal tip defects up to 2 cm.[6,7]

Starting from the defect's upper boundary, it arches through the nasal-cheek junction reaching the glabella, then descending to the contralateral inner canthus with a broad lateral nasal wall base. Over time, several enhancements such as Marchac's axial flap based on angular artery perforators at the inner canthus have been documented, facilitating flap thinning and mobilization through combined rotation and advancement.[4,8] This study diverges from existing methodologies by focusing not only on the subunit principle but also on the utilization of detailed facial vascular anatomy to optimize reconstructive outcomes.

The integration of advanced flap designs, such as the Inverted-L and modified frontonasal or glabellar flaps, directly responds to the limitations observed in traditional approaches, particularly in handling complex nasal defects. This allows for more precise defect coverage and improve aesthetic results by minimizing disruption to key anatomical features. This study highlights the importance of adaptation in surgical practices to enhance patient outcomes and offers a refined framework that can be adopted in facial reconstructive surgery worldwide.

CASE SERIES

From 2019 to 2021, sixteen patients with isolated Basal Cell Carcinoma and no locoregional invasion underwent nasal dorsum lesion resections at Hospital Angeles, in Queretaro, Mexico, in collaboration with the Surgical Oncology team. Lesion sizes varied between 0.3 and 0.8 mm, with post-resection defects averaging 1.5 cm, the largest being 2 cm. All specimens underwent intraoperative examination to ensure negative margins before proceeding with the planned skin flap coverage. The defects were primarily covered using the previously demarcated "J" or "Inverted L" flap, followed by weekly reviews and suture removal typically after 7 days. Post-operative scar care consisted of two months of medical-grade silicone sheet compression. Patients were monitored oncologically for two years, with no recurrences or procedure-related adverse events reported. All patients whose pictures have been included in this manuscript have signed photography release forms.

Surgical technique

Flap planning accounted for the post-oncological resection defect sizes, starting with the distinctive back cut at the glabella of the frontonasal or glabellar flap. A perpendicular line was drawn relative to the defect yet parallel to the nasal dorsum's major axis, about 1.3 cm from the inner eye canthus, adhering to a 4:1 resection size ratio, avoiding the supratrochlear artery by setting boundaries at the ipsilateral corrugator and eyebrow line (Figures 1 and 2). Supra-perichondral dissection was executed to elevate the flap for advancement and rotation, with boundaries extending to the lateral edge of the contralateral nasal dorsum and upward to the nasal bones. The defects were closed using absorbable 5-0 sutures, maintaining flap irrigation by preserving the supratrochlear and ipsilateral angular arteries as demonstrated in the accompanying diagram (Figures 3-6).

The complete detachment, rotation and advancement of the flap eliminated the need for a back cut, thereby enhancing aesthetic outcomes and ensuring defect coverage.[6] Skin approximation utilized tension-free 5-0 nylon simple stitches, oriented perpendicular to the wound (Figures 7-8).

RESULTS

Among all cases, none experienced long-term flap compromise or dehiscence, and the subsequent follow-up showed very satisfactory aesthetic results with no complications reported in the records or by any of the patients. The average follow-up was 24 months, with a maximum of 3 years and a minimum of 6 months. In 3 cases, the absorbable internal stitches (Vicryl) had to be removed due to the formation of granulomas and pustules, in other cases, nylon stitches were removed. Two significant cases are illustrated following a 3-month follow-up (Figure 9 and 10).

Figure 1: Preoperative surgical markings.

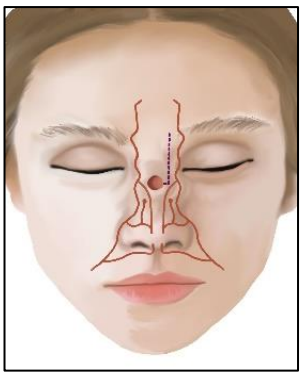

Figure 2: Vascular supply and flap boundaries.

Figure 3: Tumor resection.

Figure 4: Lateral incision preserving irrigation.

Figure 5: Flap advancement and closure.

Figure 6: Flap design for nasal reconstruction.

Figure 7: Preoperative markings for flap rotation.

Figure 8. Postoperative flap position and closure.

Figures 9 (A and B): Postoperative follow-up at 3 months.

DISCUSSION

Facial reconstruction following skin or soft tissue defect resections requires meticulous pre-surgical planning. The choice of local flap designs varies based on defect size and location. The donor site must provide adequate tissue in terms of color, texture, elasticity, and laxity. Furthermore, nasal reconstruction poses complex challenges, exacerbated by increased sun exposure and potential adverse aesthetic impacts. Optimal outcomes are achieved through precise surgical planning and possibly combining multiple reconstructive techniques for a single defect.

The frontonasal or glabellar flap has been the reconstructive option of choice for patients requiring coverage of the nasal dorsum subunit and occasionally the lateral wall for many years due to its versatility and the rotational and advancement characteristics it offers. However, in some cases, the aesthetic sequelae and disruption of the glabella can worsen long-term results.[9]

The modified "L" design presented here emerged after the initial planning of the original flap geometry. By performing the supraperichondrial dissection and advancing the flap by simply tracing the two perpendicular lines, coverage was achieved in all cases without needing a backcut on the glabella, thus guaranteeing the contralateral supratrochlear artery's blood supply.[10] Unlike the original proposed geometry, this allows for the perfusion of both the supratrochlear and angular arteries, as well as the subdermal plexus.[6] As a result, no cases showed decreased perfusion or color changes during postoperative follow-up.

The modified design of the "Inverted L" glabellar flap specifically addresses the limitations observed with conventional techniques, notably in reducing the risk of aesthetic disruption at the glabella and ensuring robust vascular support from the supratrochlear and angular arteries. While alternative flaps may require secondary interventions due to complications like flap necrosis or inadequate coverage, there has been an absence of major complications using the "Inverted L" design among our cases.[9,10]

Technical sophistication in flap preparation and placement is crucial, particularly in patients with previous nasal surgeries or unique anatomical challenges. The "Inverted L" flap allows for versatile manipulation while maintaining a critical blood supply. This aspect is particularly beneficial in promoting rapid healing and minimizing scar visibility, a primary concern among patients undergoing facial reconstructions.

Furthermore, the physiological benefits of maintaining arterial integrity include not only improved flap viability but also enhanced sensory retention in the nasal region. Long-term follow-up of our cases revealed that patients reported high satisfaction with both the functional and aesthetic outcomes, underscoring the effectiveness of this flap in preserving the nasal contour and sensation.

This technique holds significant promise for future refinements in nasal reconstruction. By allowing for personalized modifications of the flap design, it sets a precedent for individualized patient care, adapting to specific anatomical and defect-related needs. This approach could pave the way for further innovations in flap design, particularly in the realm of microvascular surgery, where even finer adjustments to the vascular supply could enhance outcomes.

However, current limitations must be acknowledged. The described flap may not be suitable for all defect types, especially those larger than 2 cm or located on the nasal dorsum, due to its insufficient coverage and potential to disrupt the nose's basic aesthetic structure. Future research should focus on expanding the applicability of this technique to a broader range of nasal defects and exploring combinations with other reconstructive methods to overcome these size limitations. Additionally, long-term studies are needed to assess the durability and aesthetic outcomes of these flap modifications over time.

CONCLUSION

The rich arterial irrigation of the nose provides good support for local flaps in the region and the ability to completely detach the skin and "reorganize" it at will is a great aid in the challenge of complex cutaneous defects. The appropriate selection of the flap and meticulous pre-surgical planning of the reconstructive options enhance aesthetic outcomes and subsequent oncological monitoring for proper patient progression. This innovation in the geometry of traditional flaps provides a good reconstructive option for the surgeon with a very acceptable aesthetic result.

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