

The Versatility of Expanded Applications of the Dorsal Nasal Flap in Nasal Reconstruction

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Abstract

Background: Aesthetic nasal reconstruction always offers a challenge to the plastic surgeon, especially with large defects of more than 2cm. The modification of the dorsal nasal flap might offer a superior alternative for the forehead flap.

Objective: In this study, we aimed to assess the outcomes of the dorsal nasal flap in the reconstruction of large nasal defects beyond the original indications.

Patients and Methods: We have prospectively studied 12 patients older than 40 years with skin-only nasal defects occupying the distal 2/3 of the nose, larger than 2cm in size, and/or located less than 5mm from the alar rim. A modified dorsal nasal flap was done in all the cases.

Results: The mean age of patients was 59.33 ± 7.01 years. The mean dimensions of lesions were 25 ± 2.32 mm with a mean distance of 2.57 ± 1.62 mm from the alar rim. Regarding Aesthetic outcomes, patients and surgeons expressed excellent color match in 91.7% of patients. As for alar retraction, patients and doctors expressed good to excellent results in 83% of patients. Additionally, patients and physicians reported good to excellent nostril shape in 83.3% and 66.6% of patients respectively. Regarding the flap thickness, patients and doctors expressed good to excellent results in 91.6% and 75% of patients respectively.

Conclusion: The dorsal nasal flap seems to be more applicable than classically reported. Defects up to 29mm in size and/or defects located 2mm from the alar rim result in acceptable to excellent aesthetic outcomes when the modified dorsal nasal flap applied in this work is used. Our modified dorsal nasal flap resulted in excellent outcomes in 4 cases, accepted outcomes in 5 cases, and unfavorable outcomes in 3 cases.

Key Words: Nasal reconstruction – Dorsal nasal flap – Expanded applications of the dorsal nasal flap – Aesthetic evaluation.

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Informed Consent: Informed consent was obtained from all individual participants in this study for the publication of images and data.

Introduction

Nasal reconstruction surgery represents one of the oldest and most important facial surgeries. Nasal surgery history goes back to 1500 BC. During its very long history, many advances have been achieved introducing new surgical techniques and ameliorating the old ones. However, the use of nasal flaps remains the cornerstone of nasal reconstructive surgeries, but with certain indications regarding the defect size and location [1,2].

In 1967, Reiger first described the dorsal nasal flap, using it in the repair of lower nose defects. As they described, this type of flap was suitable only for the lower half nasal defects of 2cm or less in diameter and of more than 5mm from the alar rim [3]. Following that, in 1985, Marchac and Toth modified the Rieger flap by defining an axial pedicle based on vessels emerging from the medial canthus [4]. Additionally, several modifications have been applied to the flaps based on the dorsal nasal artery, however, most of the literature agrees on the principle indications described by Rieger [5,6].

Recently, it has been suggested that dorsal nasal flap is more applicable than what has been known and allows reconstruction of defects with variable sizes and sites. The flap can be advanced from the upper nose and the glabellar skin down to the lower nose [7,8]. However, some modifications to this type of flap have been applied. This includes the lengthening of the leading edge and modifying

the rotation arc which helps overcome the pivotal tension always accompanying the dorsal nasal flap. This modification allows the closure of larger defects (more than 2cm) in single-stage procedures with perfect aesthetic and functional outcomes [6,9]. In addition, this modification has many advantages. Being a one-stage procedure, it allows a rapid return to ordinary life and work. Moreover, being a part of the nasal skin it provides perfect color and texture match. Furthermore, unlike the forehead flaps, it avoids the large forehead scars associated with them. The scar of the dorsal nasal flap is hidden in the glabellar lines with better cosmetic outcomes [9,10].

This study aims to evaluate the efficacy of the dorsal nasal flap in the reconstruction of nasal defects beyond the original indications which are defects at the caudal half of the nose measuring less than or equal 2cm in diameter, and located 5mm or more from the alar margin.

Patients and Methods

This is a prospective study conducted on 12 patients who presented to the plastic surgery outpatient clinic of Fayoum University Hospitals, complaining of skin lesions occupying the caudal 2/3 of the nose, during the period from April 2018 to June 2021. The study protocol was revised and approved by the Research Ethics Committee of the Faculty of Medicine, Fayoum University, Fayoum, Egypt.

Inclusion criteria:

- Patients older than 40 years.
- Patients with lesions at caudal 2/3 of the nose.
- Lesions with expected defect more than 2cm in diameter and/or less than 5mm from the alar rim.

Exclusion criteria:

- Patients age younger than 40 years.
- Patients with elevated nasal tip and/or short dorsum.
- Patients with a lesion at cranial 1/3 of the nose.

Patients' evaluation and preparation:

A detailed history was obtained from all patients regarding the onset, course, duration of the lesion, and previous operations at the same site or other facial lesions excision. Then all patients were subjected to careful examination of the lesion assessing the lesion nature (e.g. nodule, ulcer, or ulcerated nodule), site, size, distance from the alar rim, and mobility over the underlying nasal framework. In addition, cervical lymph nodes were examined. A biopsy from the lesion was obtained preoperatively from all patients. Moreover, routine preoperative labs were performed including complete blood count, coagulation profile, liver function tests, kidney function tests & fasting blood sugar test.

Intra-operative details:

All operations were performed under general anesthesia. Patients were positioned in a supine position with their upper bodies tilted upwards. The lesions were marked with a 3-5mm safety margin all around as all cases were basal cell carcinoma, and flap incisions were marked. Adrenaline 1:200.000 was infiltrated before lesion excision with an insulin needle and infiltrated under the flap with another needle to prevent tumor cell seeding. The lesion was excised according to the skin markings with excision of enough tissues deep into the lesion. Histopathological examination was done for all cases to ensure that all margins and depths were free. During the operation we measure; nasal length (measured from nasion to nasal tip), defect dimensions, and distance from alar rim. The defects were classified into; defects larger than 2cm, defects located less than 5mm from the alar rim, or both. The dorsal nasal flap was done as designed. The flap was elevated in the plane just deep to nasal SMAS, with extreme caution not to disturb tissue around the pedicle site (medial canthal region). The donor site was closed primarily in all cases by 4/0 polypropylene sutures. The flap was inset and secured in place by 5/0 and 6/0 polypropylene sutures.

Follow-up:

All patients were subjected to a postoperative follow-up period of at least one year.

Results

General characteristics:

The mean age of the study group was 59.33 ± 7.01 years old (ranging from 50-67 years old) with a male to female ratio of 1:1. All included patients had basal cell carcinoma but only in one case there was another small lesion at left side of nose that was biopsied preoperatively and revealed benign lesion (seborrheic keratosis) and was not excised at the same sitting (Fig. 4). Out of the included 12 patients, 7 patients (58.3%) were included because the defect size was more than 2cm in diameter and located less than 5mm from the alar rim (Fig. 1).

3 patients (25%) of them were included because defects were more than 2cm in diameter only (Fig. 2), and 2 patients (16.7%) were included because the defect only located less than 5mm from the alar rim (Figs. 3,4). The defects' mean diameter was 25 ± 2.32 mm (ranging from 20 to 29mm), and they were 2.57 ± 1.62 mm distant from the alar rim.

Aesthetic outcomes:

The aesthetic outcome was assessed according to both patients' and authors' perspectives. They assessed the color match, alar retraction, nostril shape, flap thickness, scars, and general appearance. Each of the six parameters was rated as excellent, good, fair, poor, or very poor.



(A) Preoperative photo of BCC at nose.



(B) Intraoperative photo of the defect.



(C) Intraoperative photo after flap inset and suturing to the defect.



(D) Six months postoperative photo.

Fig. (1): A case with size (>2cm) and site (<5mm from alar rim) expanded application of dorsal nasal flap.



(A) Preoperative photo of BCC at right side of nose.



(B) Intraoperative photo of the defect.



(C) Three months postoperative photo.

Fig. (2): A case with size only (>2cm) expanded application of dorsal nasal flap.



(A) Preoperative photo of BCC at tip of nose.



(B) Intraoperative marking of the flap.



(C) Six months postoperative photo.

Fig. (3): A case with site only (<5mm from alar rim) expanded application of dorsal nasal flap.



(A) Preoperative photo of BCC at tip of nose with small lesion at left side of nose that was biopsied preoperatively and revealed a benign lesion (seborrheic keratosis) and was not excised at the same sitting.



(B) Intraoperative marking of the flap.



(C) Intraoperative photo of the defect.



(D) Six months postoperative photo.

Fig. (4): A case with site only (<5mm from alar rim) expanded application of dorsal nasal flap.

Color match:

Both patients' and authors' evaluation results were the same, they reported excellent outcomes in 91.7% (11 patients) and fair outcomes in 8.3% (one patient).

Alar retraction:

Excellent results mean minimal or no retraction while very poor result means marked retraction. Patients' evaluation showed that 66.7% of the study group (8 patients) expressed excellent results, 16.7% (2 patients) described good results, 8.3% (one patient) described fair results, and 8.3% (one patient) described very poor results. The authors evaluated 58.3% of the study group (7 patients) with excellent results, 25% (3 patients) were described to have good results, 8.3% (one patient) with poor results, and 8.3% (one patient) with very poor results.

Nostril shape:

Regarding nostril shape evaluated by the patients, 58.3% of the study group (7 patients) expressed excellent nostril shape, 25% (3 patients) expressed good nostril shape, 8.3% (one patient) expressed poor shape, and 8.3% (one patient) described very poor result. According to the authors' evaluation; 58.3% of the study group (7 patients) expressed excellent nostril shape, 8.3% (one patient) with good nostril shape, 16.7% (2 patients) expressed fair nostril shape, 8.3% (one patient) expressed poor shape and 8.3% (one patient) described very poor result.

Flap thickness:

Regarding flap thickness evaluated by the patients, 58.3% of the study group (7 patients) expressed excellent results, 33.3% (4 patients) expressed good results, with only 8.3% (one patient) described very poor results. According to the authors' evaluation; 50% of the study group (6 patients) expressed excellent result, 25% (3 patients) expressed good result, 16.7% (2 patients) described fair result, and only 8.3% (one patient) described poor result.

Scars:

Regarding scars evaluated by the patients, 66.7% of the study group (8 patients) expressed excellent scar appearance, 16.7% (2 patients) described good results, 8.3% (one patient) described fair results, and 8.3% (one patient) described poor scar appearance. According to the authors' evaluation; 66.7% of the study group (8 patients) expressed excellent scars appearance, 16.7% (2 patients) expressed good results and 16.7% (2 patients) with fair results.

General appearance:

Regarding general appearance evaluated by the patient, 50% of the study group (6 patients)

expressed excellent appearance, 25% (3 patients) described fair results, 16.7% (2 patients) described good results with only 8.3% (one patient) described very poor appearance. According to the authors' evaluation; 33.3% of the study group (4 patients) had an excellent appearance, 25% (3 patients) described good result, 16.7% (2 patients) described fair result, and 16.7% (2 patients) described poor result with only 8.3% (one patient) described very poor appearance.

Postoperative complications:

Regarding postoperative outcome, all cases showed sound coverage, no hematoma formation, and no infection. Flap necrosis occurred only in one patient showing partial tip necrosis resulting in alar rim dehiscence and was revised one month later with no complications to the revision.

Discussion

Skin cancers are the most common cancers and are most frequently localized in the head and neck region especially the nose as it is the most projecting and hereby the most sun-exposed area. The most common skin cancer seen is BCC followed by SCC and melanoma [11,12,13].

The dorsal nasal flap was first described by Rieger in 1976 [5] and expanded by Marchac in 1985 [6] with multiple subsequent modifications. However, all the reports agreed on the initial indications; coverage of defects of the distal half of the nose that measure less than or equal 2cm in diameter and are present at a distance of 5mm or more from the alar margin [6]. The main disadvantage of the dorsal nasal flap is the limited rotation of the flap that lead to tension on the margin of the nose. If the defect is on the nasal tip, the limited rotation will cause the tip elevation, providing good cosmetic results in old age patients, on the contrary, lateral wounds may cause alar elevation and asymmetry [14].

Our study prospectively evaluated the versatility of the flap and the aesthetic outcome of using a dorsal nasal flap outside the classic indication. We chose this flap and sought to expand its applications due to the advantages of having more aesthetic outcomes with very well-hidden scars and less donor site morbidity. Additionally, it avoids the long forehead scar which comes with its alternative the forehead flap. Moreover, it is considered a single-stage procedure with superior outcomes regarding the color and texture match.

Authors addressing the same subject regarding modifying the dorsal nasal flap raised the same valid points as we did. They were concerned with the value of expanding these flap applications being a single-stage procedure. This overcomes the temporarily disfiguring multistage procedure for many patients. For example, patients who require an early return to their work, or patients living and working

far from medical centers who may have difficulties returning for the second stage. Additionally, some patients can't live without their glasses that the forehead flap would interfere with, or elderly patients who refuse to frighten small grandchildren. Other than social impact, the modified flap avoids large forehead scars and frequent margin hair removal which comes with forehead flap [5,9].

Other authors suggested that the forehead flap shouldn't be used in a skin-only defect and these modifications could expand the use of elongated dorsal nasal flap in reconstructing defects up to 35 mm in diameter in a single stage. Therefore keeping the forehead flap for the full thickness defects requiring cartilage and lining reconstruction or for larger and complex defects [15].

We performed 12 dorsal nasal flaps with various indications outside the classic ones either larger defects in 3 cases, different locations in 2 cases, or due to both indications size and site of the defect in 7 cases.

Regarding cases included in this study due to both site and size indication. We had 7 cases, 3 of which were central defects and 4 cases with lateral defects. 5 cases were located in the distal half of the nose less than 5mm from the alar rim and 2 cases were reaching the upper half of the nose.

Eren & Beden 2014 [7], used a dorsal nasal flap in 2 central defects reconstruction; defects were larger (up to 40mm), located in the distal half but without a specified distance from the alar rim. They insisted on the deep sweeping curve in the flap design and excised the rest of the tip subunit in case of tip asymmetric elevation. Both cases had minor wound dehiscence without flap loss and final excellent outcomes as described by the author but with no specific score applied. In comparison to this study, defect sizes were much larger than in our work. But wound dehiscence in the cases might indicate the tension applied to the flap tip. Another point of comparison is the need to excise the rest of the nasal tip subunit in case of asymmetric tip elevation; we didn't need to perform such defect extension.

In their 2007 retrospective study, Bitgood and Hybarger⁹ used dorsal nasal flaps in reconstructing 61 cases, the smallest defect measured 12x17mm and the largest 35x40mm. They started the incision at the nasofacial sulcus of the pedicle side and stopped shortly below the medial canthus narrowing the pedicle as possible for better rotation. Rotation of such a large flap resulted in a large donor site that required cheek advancement. Regarding complications, they reported two patients with stitch abscess, two patients with a hypertrophic scar, one patient with alar stenosis but the initial defect didn't include the alar rim, and one patient with combined flap and full-thickness skin graft

(FTSG) with graft loss but without any flap loss in any case. The authors described overall good cosmetic outcomes and the color match was good or excellent [9].

We had two cases enrolled for site indication only (less than 5mm from the alar rim). In these patients, dog ear correction and medial cheek dissection were performed and resulted in an acceptable outcome with only moderate thick flap without alar retraction or tip asymmetries.

Regarding cases included in the study for size only, we had 3 cases with central defects in the distal half of the nose and 5mm or more from the alar rim. We used the lateral nasal skin and nasofacial skin to elongate the dorsal nasal flap without exceeding the nasofacial sulcus to lengthen the flap leading edge which resulted in a larger donor site. One case required only mild medial cheek dissection but without any releasing incisions to close the large donor site. The second case required extensive medial cheek dissection and releasing incisions in the alar groove to close the large donor site. In the third case, we have to use a post-auricular FTSG to complete defect coverage.

The concept of lengthening the leading edge of the flap leads to a significant reduction in closure tension at the flap tip. Redondo et al., used this concept as a novel application in nasal reconstruction for multiple nasal defects. They used an elongated dorsal nasal flap which provides tissues from the lateral side of the nose, nasofacial groove, and cheek. They included 27 patients with a mean defect size of 24mm at the distal half of the nose. There was only one case suffering from asymmetric tip elevation that required revision, but the final results showed good to excellent functional and aesthetic outcomes [8].

Bitgood and Hybarger [9] used a combined flap with FTSG in defects larger than 35mm. With the rotation of the large flap, a large midline dog ear is created and corrected primarily, but harvested skin was used as FTSG to help in defect closure. No specified number of patients underwent the combined procedure but the author stated that they had an overall good color match and texture with slight hypertrophic scars. However, one case suffered from graft loss without flap loss.

Looking at our work, all 12 cases had not any extensions outside the nasal skin. In 8 cases (66.7%) of the study group, we didn't perform any additional extensions or incisions to the original flap despite being beyond classic indications. Of them, 7 cases had acceptable to excellent outcomes, and only 1 case with unfavorable outcomes. In one case, we used the classic flap with only releasing incisions to facilitate donor site closure with acceptable outcomes. In one case lateral nasal skin was used as elongation to the flap with acceptable outcomes.

In another case, we used FTSG combined with the flap as described by previous studies with unfavorable outcomes.

Eventually, we shall not neglect that a mild notch in the ala with perfect color match and no other asymmetries in only one operation is much more accepted by the patients than a long visible forehead scar and multiple operations.

Conclusion:

In an attempt to reconstruct 12 nasal defects using a dorsal nasal flap beyond the reported guidelines, the aesthetic outcome was excellent in 4 cases, accepted in 5 cases, and unfavorable in 3 cases. We can conclude that central defects have a better outcome than lateral defects. Defects up to 29mm in size and/or defects located 2mm from the alar rim result in acceptable to excellent aesthetic outcomes when a modified dorsal nasal flap is used. Hence, the dorsal nasal flap seems to be more versatile than classically reported. However much more cases are required to determine the exact versatility and extent of the dorsal nasal flap.

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