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Three-stage folded forehead flap for nasal reconstruction: Objective and subjective measurements of aesthetic and functional outcomes



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KEYWORDS

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Summary Background: The three-stage folded forehead flap (FFF) proved to be a simple and readily available method of lining replacement. To date, no clinical trial has evaluated the outcomes of the FFF on the nose shape and function.

Methods: Patients undergoing a full-thickness unilateral alar reconstruction with a forehead flap between January of 2010 and December of 2015 were included for analysis. Patients were divided into two groups: The FFF group included patients that had a unilateral alar reconstruction using a three-stage FFF; the standard forehead flap (SFF) group included patients that had a reconstruction using a two-stage forehead flap in combination with another method for lining reconstruction. The following objective measurements were performed: the alar thickness, nostril and hemi-nose areas, and nostril height. Subjective evaluation of the results was performed using the NAFEQ score. Independent raters also evaluated the appearance of the nose.

Results: Thirty-one patients were included: 15 in the FFF group and 16 in the SFF group. In both groups, the reconstructed ala was thicker than that on the normal side, the reconstructed nostril was smaller than the normal nostril, and the reconstructed hemi-nose was bigger than the normal side. Moreover, 84% of the patients were satisfied with their total nasal functioning. All the patients were satisfied with their total nasal appearance.

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Conclusion: The FFF showed objective, subjective, aesthetic, and functional results comparable to other lining reconstruction techniques.

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Introduction

The nose plays a crucial role in facial proportion and harmony.¹ Not only is it an aesthetic structure but also a functional organ. The duality of the nasal form and function makes nasal reconstruction a challenging procedure. In full-thickness defects, the external skin coverage, the rigid midlayer, and the internal lining must all be reconstructed to obtain optimal results.²⁻⁴ Because of its similarity with the nasal skin, the forehead has been acknowledged as the best donor site for external coverage of the nose.^{5,6} The midlayer should be reconstructed with cartilage grafts to shape the nose, provide a solid support, and brace the repair against gravity and secondary contractions.^{4,7,8} Internal lining reconstruction remains the most difficult and challenging part of the nasal reconstruction. Ideally, this layer should be thin, soft, and well vascularized. In the past, the undersurface was left to heal secondarily, resulting in scar contraction and distortions.⁹ Subsequently, different techniques have been described such as hingeover flaps,^{4,10} local flaps,^{11,12} skin grafts or two-layer composite grafts from the ear to the underlying raw surface of a covering flap,⁴ prelaminated forehead flaps,¹³ mucosal flaps,⁷ and free flaps.¹⁴

Intranasal lining flaps elevated on the basis of axial vessels have transformed nasal repair. They provide a thin and supple lining and are considered a first-line option by many authors. However, these flaps are destructive to the intranasal anatomy, are not always available, and are limited in size.⁴ The use of a folded forehead flap (FFF) for lining reconstruction has been first described in two stages and was recently modified by Menick who added a third stage to the procedure.^{5,15} This new modified folded flap proved to be a simple, efficient, and readily available method of lining replacement for commonly encountered defects. The reconstructed lining retains most of its original dimensions and remains thin, conforming, and well vascularized with a minimal amount of complications, allowing a reproducible, highly satisfactory, functional, and cosmetic reconstruction of full-thickness defects.¹⁵

To date, no clinical trial has evaluated the outcomes of the three-stage FFF for lining reconstruction with regard to the nose shape and function. This study was designed to assess these shortcomings. The objective of this trial is to compare the three-stage FFF to other techniques of lining reconstruction using objective measurements. The study also subjectively evaluates the aesthetic appearance and function of the nose using specific nasal reconstruction validated scores.

Patients and methods

Study population

Ethical approval was obtained from the institutional review board of Saint-Louis hospital, Paris, France. A retrospective

review of all patients undergoing a forehead flap nasal reconstruction between January of 2010 and December of 2015 was conducted. All patients undertaking a full-thickness unilateral alar reconstruction with a forehead flap were included for analysis. Patients with bilateral alar defects, partial-thickness defects, lack of follow-up, lack of postoperative photographs, and reconstruction without using a forehead flap were excluded from analysis. Included patients were then divided into two groups: (1) The FFF group included patients that had a unilateral alar reconstruction using a three-stage FFF for external coverage and lining reconstruction, and (2) the standard forehead flap (SFF) group included patients that had a unilateral alar reconstruction using a two-stage forehead flap in combination with any other method for lining reconstruction.

Surgical technique

All the surgeries were performed by the senior author (JB.D.). The defects were reconstructed according to the subunit principle.¹⁶ When the defect exceeded 50% of the subunit, adjacent normal tissue was discarded. All forehead flaps were designed according to the uninjured contralateral side.

In the FFF group, in addition to the external skin template, a second template for the missing lining was drawn more distally on the forehead separated by 3 mm from the external skin template to allow rolling-in of the lining. The forehead flap was then elevated in all layers to include the frontalis muscle in the distal third and the periosteum in the proximal third. The distal lining segment was folded in and sutured to the remaining nasal mucosa. The two raw surfaces of the flap were opposed using separate mattress sutures. Three weeks later, in the second stage, the flap was incised at the new alar margin. At this time, the frontalis muscle and the subcutaneous tissue were discarded and cartilage grafts were added between the two layers. Three weeks after the second stage, the pedicle was divided, and if needed, additional thinning of the proximal part was done.

In the SFF group, the lining was reconstructed using intranasal mucosal flaps, nasolabial flaps, or hinge-over flaps or a combination of these techniques. The forehead flap was elevated subcutaneously distally and the frontalis muscle was included proximally. Cartilage was inserted between the external coverage and the internal lining during the first stage. Three weeks later, the pedicle was divided, and the superior aspect of the flap was re-elevated and debulked.

Evaluation of results

Photographs were taken in a studio with a consistent background, lighting, seating position, and camera. Patients were photographed by the same photographer in four different views: frontal, oblique, lateral, and basal. All basal view photographs included a metric ruler placed on the upper lip

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