

# Elegant Solutions for Complex Paramedian Forehead Flap Reconstruction

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## KEYWORDS

- Paramedian forehead flap • Nasal reconstruction • Alar rim
- Cartilage graft • Surgical delay • Topical nitroglycerin
- Steroid injection • Nasal scars

Elegant solutions are frequently sought by both artists and engineers. In dance, for example, elegance is defined by the minimum amount of motion that results in the maximum visual effect. Similarly, engineers strive to provide simple and practical solutions to their challenges while efficiently balancing the demands of time, materials, and other constraints. The confluence of art and engineering is never more intertwined than it is in complex multistage nasal reconstruction. The surgeon must draw on both the practical and scientific qualities of an engineer and the creativity of an artist. Experienced surgeons can quickly identify challenges, craft efficient solutions, and optimize reconstructive benefits for their patients with each surgery. In short, experienced surgeons reconstruct complex nasal defects with the most elegant of solutions.

The basic principles and techniques of facial reconstruction have been in use and relatively unchanged for a surprising number of years. As early as the fourth century, a Byzantine physician named Oribasius described advancement flaps, recognized the importance of tension-free closure, and warned of complications in poor wound healers, the elderly, and individuals in generally poor health.<sup>1</sup> Because the human eye can perceive asymmetries of only millimeters, the modern facial

plastic surgeon must be creative and precise to recreate facial symmetry as much as is humanly possible.

In evaluating a patient for facial reconstructive surgery, the reconstructive ladder of increasing complexity and surgical involvement must always be discussed and patients must be guided to the surgical option that best suits their needs and goals. A skin defect can be closed primarily, allowed to heal by secondary intention, repaired with a split or full-thickness skin graft, or reconstructed with a local, regional, or free flap. This article describes refinements in the technique of paramedian forehead flap (PMFF) nasal reconstruction by the senior author (SRM) over his years of practice in a university setting.

## PREOPERATIVE PLANNING

There are several factors to consider before initiating any discussion of reconstructive options for a specific patient. In patients undergoing Mohs surgery, the margins should be pathologically clear before reconstruction. If there is a significant risk of recurrence, methods of reconstruction may be suggested that allow for easy monitoring, such as skin grafting. In such a case, a more cosmetically

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The authors have nothing to disclose.

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Facial Plast Surg Clin N Am 19 (2011) 465–479

doi:10.1016/j.fsc.2011.06.003

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acceptable definitive reconstruction can be deferred to a later date.

Certain patient populations have poor peripheral circulation, putting them at risk for flap necrosis. Risk factors that cause endothelial dysfunction and impaired neoangiogenesis include tobacco use, poorly controlled diabetes, and irradiation.<sup>2,3</sup> Tobacco use, in particular, increases the risk of flap necrosis and skin slough, and this has been well documented in patients who have undergone rhytidectomy.<sup>4,5</sup> A study in patients undergoing breast reconstruction with a transverse rectus abdominis muscle flap suggests the results are best when a patient abstains from smoking for at least 4 weeks both preoperatively and postoperatively.<sup>6</sup> We also advise our patients to abstain from smoking for a minimum of 4 weeks both preoperatively and postoperatively. However, because many Mohs reconstructions present with little forewarning, the smoking status of the patient must be factored into a safe reconstructive plan, with the performance of a delayed PMFF often the method of choice in a patient who smokes.

## THE DELAY PHENOMENON

The practice of surgical delay improving a flap's viability has long been noted. Surgical delay seems to cause several mostly transient effects, including division of sympathetic nerves causing initial release and then depletion of adrenergic factors from nerve endings, vasodilation occurring parallel to the long axis of the flap, ischemic conditioning, blunted release of vasoconstrictive metabolites, and, later, neoangiogenesis. Animal studies have reported maximally increased blood flow at the distal ends of random pattern flaps in as few as 4 days and lasting as long as 14 days.<sup>7-11</sup> Most relevant human studies have investigated breast reconstruction and generally endorse best results with a delay of 7 to 14 days.<sup>12,13</sup> We currently recommend a delay of 7 to 10 days and have a low threshold to perform a delay stage before reconstruction for at-risk patients. It is often difficult for both the surgeon and the patient to commit to surgical delay because of the additional stage of reconstruction that is required. However, we strongly believe that the addition of a delay stage before a given reconstruction can significantly decrease the chances of a flap-related complication. As otolaryngologists, many of us were taught, "If you think of a tracheotomy, perform a tracheotomy"; as facial plastic surgeons, we offer the perspective, "If you think of a delay stage, perform a delay stage." The

additional cost of a delay stage is worth the prevention of distal flap necrosis and the multiple surgeries often required for its repair.

## SURGICAL TECHNIQUE

### *General Principles*

It is important to think of the face in terms of aesthetic subunits and to approach each reconstruction with these in mind. As much as possible, incisions should be placed at the borders of aesthetic subunits where they are least noticeable. Generally, a scar within a subunit is more obvious than a scar located at a border between subunits. As a result, the best reconstruction may involve removing additional tissue and rebuilding an entire subunit if the defect involves 50% or more of that subunit.<sup>14</sup> However, there are some exceptions, and a blind adherence to the 50% rule should be no substitute for an artistic reconstructive eye. For example, with lighter skin color, such as Fitzpatrick type I or II, a scar may be placed across a subunit without being noticed as much as with darker skin color. In addition, in contrast to thinner nasal skin, thicker sebaceous nasal skin can be a poor match with the forehead. In this situation, a PMFF might not be the best choice for reconstruction, and one may wish to avoid excising the remaining portion of a subunit if it would make the difference in requiring a pedicled flap for coverage.<sup>15</sup>

### *PMFF*

The PMFF is extremely useful for nasal defects with a diameter larger than 1.5 cm because it can provide a significant amount of nasal coverage with minimal donor defect and is usually an ideal color match for the nose. The flap is centered on the supratrochlear vessels at the medial canthus and should be about 1.2 cm in width at its base. A foil template should be created to match the defect and outlined at the forehead with adequate length to reach the defect in a tension-free manner. The flap can then be elevated and inset. The pedicle can be safely divided and inset 3 weeks later. For full-thickness defects that involve the intranasal lining, the PMFF can be folded over to close the intranasal defect as an alternative to full-thickness skin grafting or a mucosal flap.<sup>16-18</sup> In this situation, a 3-stage operation can be performed at 3-week intervals with delayed placement of a large auricular cartilage batten graft in stage 2. A large cartilage graft, preferably from the septum, abutting the nasal sidewall is often used to provide extra support and prevent collapse.

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