

# Paramedian Forehead Flap



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## KEYWORDS

- Paramedian forehead flap • Forehead flap • Local facial flap • Nasal reconstruction
- Midface reconstruction

## KEY POINTS

- The paramedian forehead flap (PMFF) is well suited for reconstructing complex defects of the nose and nasal tip.
- The flap produces an excellent tissue color and texture match for nasal reconstruction.
- The flap is an interpolated axial flap based primarily off the supratrochlear artery. Collateral arteries include the dorsal nasal branch of the angular artery and supraorbital artery. Given such a rich blood supply, this is a reliable and durable flap.
- The pedicle can be narrow allowing primary closure of the donor site inferiorly. Superiorly, when larger areas of tissue are harvested, the surgical site can be left to heal by secondary intention that usually produces a cosmetically acceptable scar.
- Disadvantages include conspicuous donor site, thick flap when used for nasal reconstruction, and requirement for a multistage procedure.
- Complications include poor donor site healing, flap necrosis and hematoma formation, residual nasal deformity, impaired nasal function, and unaesthetic outcome.

## INTRODUCTION

Regional flaps to reconstruct nasal structures have been described as early as 600 BC. The origins of the forehead flap for nasal reconstruction can be traced to the forehead rhinoplasty, Indian method, performed by the Khangiara family of India since AD 1400. This classic Indian forehead flap rhinoplasty was popularized in the United States by Kazanjian in the 1930s. Kazanjian had described a vertical flap from the forehead midline supplied by paired supratrochlear vessels. Incisions were made from the hairline to the area above the nasofrontal angle. This flap

was then elevated and rotated 180° at the level of the eyebrows to allow for inset into the nasal areas. The Kazanjian-described flap was limited in its reach to the inferior portions of the nasal structure such as the columella. To increase the reach of the flap, subsequent surgeons have tried to modify the length of the incisions to lower the arch of rotation. But it was Millard who demonstrated that bilateral supratrochlear artery pedicles were not essential for flap viability and that central forehead tissue can reliably be transferred on a unilateral paramedian blood supply, which lowered the arc of rotation increasing flap length.

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Anatomic studies by McCarthy and colleagues<sup>1</sup> in the 1980s supported Millard's technique and showed that the blood supply to the forehead is from an arcade of vessels supplied by the supratrochlear, infratrochlear, supraorbital, dorsonasal, and angular branches of the facial artery. This robust anastomotic plexus is actually centered on the medial canthal region and can supply a unilaterally based flap even after division of the supratrochlear, supraorbital, and infraorbital vessels. The modern PMFF is perfused by this rich vertically oriented axial blood supply with its arc of rotation located near the medial canthus and has the ability to reach the columella.<sup>2</sup>

Subtle modifications based on specific patient requirements have been described without alteration of this blood supply.<sup>3-5</sup> The PMFF is also commonly used concomitantly with other procedures such as bone and cartilage grafts for total nasal reconstruction.<sup>6-8</sup> Split flaps and adjunctive tissue expansion modifications of the PMFF have also been described.<sup>9-11</sup> This article describes a traditional 2-stage technique and presents the case of a patient with a posttraumatic nasal deformity reconstructed with a PMFF (Fig. 1).

## INDICATIONS/CONTRAINDICATIONS

Indications and contraindications of the paramedian forehead flap	
Indications	Contraindications
<ul style="list-style-type: none"> <li>• Reconstruction of complex posttraumatic and postablative nasal deformities</li> <li>• Deformity of the nasal-orbital ethmoid complex, medial canthus and radix<sup>11-13</sup></li> <li>• Reconstruction of the exenterated orbit<sup>14</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Patients with soft tissue loss or prior surgery or trauma at the donor site</li> <li>• Patients unwilling or unable to tolerate multiple staged operation</li> </ul>

## TECHNIQUE/PROCEDURE

### *Preoperative Planning*

The preoperative nasal subunit analysis is one of the many elements considered when planning nasal reconstruction with the PMFF.<sup>2,15</sup> The placement of incisions is important when reconstructing facial structures. Ideally, incisions should be

placed in natural creases and borders such as between the nasal subunits to minimize the appearance of scars. The sole use of nasal subunit analysis to plan nasal reconstruction has led some surgeons to become overzealous in the removal of healthy tissue, resulting in less esthetic outcomes. In a retrospective review of 1334 nasal reconstruction cases, Rohrich and colleagues<sup>16</sup> cautioned against this overreliance on the subunit principle because it had resulted in the loss of excessive healthy surrounding nasal tissue and the need to reconstruct larger defects. However, the nasal subunit analysis is important because it allows the surgeon to identify what structures have been lost or altered and areas that may require reconstruction. This analysis is only one of the many considerations when determining a patient's reconstructive needs.

In patients with a naturally low anterior hairline or a prominent widow's peak, gaining adequate flap length can be an issue. In these cases, the surgeon may consider extending the incision for the pedicle through the eyebrow toward the level of the superior medial orbital rim and then dissecting the pedicle from the surrounding soft tissues around the supratrochlear artery. But by doing this, the vascular contributions from the supraorbital plexus are decreased, and caution should be exercised in patients at risk for vascular compromise. An alternate method for these patients may be to angle the distal portion of the flap in an oblique manner just inferior to the hairline to increase flap length. If hair-bearing scalp must be incorporated into the flap, depilatory maneuvers can be undertaken, and this is often time consuming, requiring multiple rounds of treatment.

Another method of increasing flap size is through the placement of a tissue expander before flap elevation. Kheradmand and colleagues<sup>9</sup> reported on 48 patients who had a tissue expander placed before forehead flap elevation. The investigators commented that this technique had allowed for better control of the flap thickness, had improved vascular supply to all layers of the flap, had increased the availability of tissue for reconstruction, and had made primary closure of the donor site easier.<sup>9</sup> Opponents to this technique have argued that the placement of tissue expanders causes an extra step and a conspicuous forehead deformity preoperatively.<sup>2</sup> The authors limit the use of the expander to cases in which dual flaps will be elevated and when most of the central forehead tissue is planned for harvest.

When treating patients with vascular compromise such as patients with atherosclerotic

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