Aesthetic and reconstructive rhinoplasty: A continuum

Frederick J. Menick*

Plastic Surgery, 1102 N. El Dorado Pl., Tucson, AZ 85715, USA

Received 31 March 2012; accepted 9 April 2012

Summary  The anatomy and aesthetics of the nose never change and are similar for cosmetic and reconstructive rhinoplasty. The disciplines differ in the cause of injury, which determines the site and degree of damage, the subsequent deformity, and the therapeutic approach to repair.

The cosmetic surgeon modifies the bony-cartilaginous framework to support and mould the overlying skin. A thick, scarred or large skin envelope may limit the expected result but cannot be altered.

When severe scarring or necrosis occurs after a cosmetic rhinoplasty or filler injection, missing external skin and internal lining become a controlling factor in achieving nasal shape and must be replaced in exact dimension and border outline, guided by the principles of aesthetic nasal reconstruction.

This paper illustrates the use of a 3 stage forehead flap and anatomic reconstruction of the tip cartilages to repair a full thickness necrosis of the tip after a cosmetic filler injection. An overview of presentation and treatment of this complication is presented with reconstructive guidelines to direct the surgeon to successful repair.

Anatomy and aesthetics never change and are similar for every nose and every deformity. All noses consist of skin, bone and cartilage, and lining. The guidelines of Sheen,1 Gunter and Byrd2 or the nasal subunits of Burget and Menick,3 communicate the same requirements of surface definition, projection, symmetry and contour.

Disciplines only differ in the cause of injury, which determines the site and degree of damage, the deformity, and the approach to repair. Cosmetic rhinoplasty alters the midlayer framework—with progressive skin and lining injury. Cancer requires skin excision, with support and lining loss. Cocaine destroys lining, damaging septal support and, with greater chemical injury, scarring or necrosis of external skin. Trauma fractures the nasal bones, lacerating skin and lining, with soft tissue amputation or late contraction. Cosmetic filler injections cause direct local necrosis of the skin and middle lamella or embolic vascular obstruction, leading to full thickness necrosis.

* Tel.: +1 520 8814525; fax: +1 520 881 2962.
E-mail address: drmenick@drmenick.com.
Case study

After four rhinoplasties, this 50 y/o woman was injected with a hyaluronic acid filler to improve tip projection. "The tip turned white and then black' with necrosis. The wound healed secondarily. The skin of the tip and dorsum was scarred (Figure 1AB). The tip lacked projection. Her breathing was satisfactory.

Defect analysis

The surface defect does not reflect the true tissue loss. The wound is contracted by scar, drawing adjacent normal skin to its centre and creating a flat atrophic surface, obliterating expected tip convexity. The tip cartilages were destroyed by tissue slough and prior rhinoplasties.

Unfortunately, the variety of defects is infinite; while surgical training, clinical experience and skill are finite. Fortunately, the Normal-described by topographic subunits of skin quality, outline, and 3D contour-never changes and guides repair.

Preop planning

Principles of unit reconstruction4,5 direct repair

1. Alter the wound in size, outline, depth and position. The Subunit Principle is applied—if a defect encompasses more than 50% of a convex subunit (i.e. the tip or ala) and will be resurfaced with a flap, residual skin is excised to resurface the defect as a subunit, rather than a patch. This restores uniform tip skin quality, camouflages border scars in the joins between subunits, and harnesses contraction on the flap’s deep surface to recreate the uniform convexity of the tip, in combination with shaped cartilage grafts, rather than a pin-cushioned patch.

Because the borders of relatively flat subunits-(dorsum, sidewall) are indistinct, no additional dorsal skin is excised.

2. Replace missing skin in exact dimension and outline to avoid distorting residual landmarks outward or inward.

3. No local anaesthesia is injected into the donor or recipient site, avoiding intraoperative fluid distortion and vasoconstriction.

The repair

Stage I

The hairline, frown lines, supratrochlear vessels, and the subunits of the nose and lip are marked. The uninjured subunits tell us what remains but do not tell us what is missing. If available, a contralateral subunit is used to design a template of the Normal and reversed to define the exact dimension and border outline of the missing subunit. But the tip has no contralateral Normal. So two options are available to determine the "true" skin deficiency. A facial moulage of plaster of Paris can be

Figure 1 A-B-The nasal tip is scarred, atrophic, and under projecting. The tip cartilages were ablated by multiple prior rhinoplasties and soft tissue necrosis. A prior Gore-Tex implant was present over the nasal bridge. The regional units of the nose, frown lines and hairline are marked with ink. The tip subunit and inferior dorsum will be resurfaced with a forehead flap, after excision of residual skin within the tip subunit. This controls postoperative pincushioning.
augmented preoperatively with clay to create an ideal model. Or bone wax can be applied to the nasal surface intraoperatively. Onto this model, a paper template of ¼” paper tape and collodion is formed and transferred to foil, describing the skin required to resurface the tip subunit (Figure 2A–D).

Skin and scar were excised within the tip to recreate the defect and release the alar elements laterally. The middle and lateral crura were missing. An old dorsal Gortex implant was removed.

Cartilage grafts were designed in a subunit shape—slightly smaller in all dimensions—which, when seen through thin conforming cover, would mould overlying skin into a subunit contour.

The tip cartilages were reconstructed anatomically—a technique applicable to secondary rhinoplasty and reconstructive surgery. Because septal and ear cartilage were unavailable or inadequate, 2.5 cm × 5 mm × 3 mm strips of rib perichondrium and cartilage were fixed with 5–0 polypropylene suture to a columella strut, sutured between the medial crura, as a gig. They were bent backward to create facsimiles for the middle and lateral crura, establishing projection and definition, lobule fill, and lateral tip convexity (Figure 3A). A dorsal onlay rib graft shaped the dorsal subunit—about 3.5 cm long and 8 mm wide.

Because the defect was greater than 1.5 cm in diameter and required cartilage replacement, it must be resurfaced with a regional flap.

The forehead consists of skin, subcutaneous fat, and frontalis muscle, perfused by a random cutaneous, myocutaneous, and axial blood supply. Unfortunately, a forehead flap is flatter and thicker than nasal skin.

At the first stage of the traditional 2 stage flap, soft tissues are excised distally, eliminating the frontalis and some of the axial vessels within the subcutaneous fat. The wider the area of thinning, the greater the vascular injury, and the less the flap’s ability to tolerate tension. Weeks later, the pedicle is divided and the inset completed.

Figure 2  AB—The ideal tip shape and projection are visualized. Bone wax is applied over the scarred tip and sculpted into an ideal shape and dimension. CD—Quarter inch Steri-Strips are applied over the intraoperative model and consolidated with collodion. The three-dimensional paper template is radially incised, flattened to 2 dimensions, and transferred to foil from a suture pack. This template acts as a guide to determine the dimension and border outline of the skin required to resurface the ideal tip.
Because significant flap re-elevation during pedicle division will jeopardize vascularity, poorly designed or malpositioned cartilage grafts cannot be modified within the tip.

Large, deep defects — requiring complexly contoured cartilage grafts and soft tissue sculpting—or those missing lining—are best resurfaced in three stages with a full thickness forehead flap. If lining was also missing, a modified folded skin extension would be added to supply cover and lining.

The foil template was positioned just below the hairline, vertically above the supratrochlear artery. The pedicle

![Figure 3](image_url)

**Figure 3**  A The borders of the tip subunit are incised, prior to excision of tip skin and scar. The middle and lateral crura were absent. Thin strips of perichondrium and rib cartilage are fixed to a columellar strut, positioned between the medial crura, and bent backwards to create an anatomic facsimile of the middle and lateral crura. A dorsal rib graft, with the shape of the ideal dorsal subunit, was placed. BC. A right full thickness, vertical paramedian forehead flap is outlined over the right supratrochlear vessels, using the template based on the intraoperative wax model. The inferior pedicle is 1.2–1.3 cm in width and is carried through the medial brow to allow easy donor closure inferiorly, increase the flap’s reach and lower its pivot point. No distal thinning is performed.

![Figure 4](image_url)

**Figure 4**  ABC-One month later, the forehead flap is thick and bulky. Forehead skin is completely re-elevated with 2–3 mm of subcutaneous fat, maintaining the proximal pedicle. Underlying excess subcutaneous fat and frontalis are excised and the underlying tip reconstruction is modified by soft tissue sculpting. An additional onlay tip graft is added. The thin covering flap is returned to the recipient site.
narrowed to less than 1.3–1.5 cm width and extended inferiorty through the medial eyebrow. The forehead was closed above the brow and a gap, under the hairline, would heal secondarily over 4–8 weeks (Figure 3BC).

**Stage 2—the intermediate operation**

One month later, the nasal tip was bulky and the left nostril asymmetric (Figure 4A). But fibrosis does not occur in a full thickness flap until the frontalis is excised or the SQ layer injured, so the external skin was unscarred and supple. Effectively physiologically delayed, the flap was completely re-elevated, with 2–3 mm of subcutaneous fat, from the entire nasal inset, based on the proximal pedicle, creating a thin, supple skin flap. The entire recipient bed was exposed. Primary cartilage grafts, previously fixed together at the 1st stage with sutures, are now healed together as a sculptable unit.

The excess of subcutaneous fat and frontalis was excised and delayed primary tip and nostril margin grafts of banked rib cartilage added to increase tip definition and position the left soft triangle rim inferiorly. This Intermediate operation permitted modification of the distal, most aesthetic part of the nose, prior to pedicle division. The uniformly thin skin flap was returned to the recipient site (Figure 4BC).

**Stage 3—pedicle division**

One month later (2 months after transfer) the pedicle was divided. The eyebrow was returned within the medial brow, as a small inverted "V", which will be mistaken for a frown line. The distal inset was completed. The area of secondary forehead healing was excised, closing the donor primarily.

**Stage 4—revision**

Almost all significant nasal reconstructions require a revision to refine delicate nasal landmarks and establish ideal symmetry.9 4 months later, the forehead scar was partially revised and an additional closed tip graft added.

Postoperatively, an attractive and aesthetic nose has been restored, correcting the deformities of multiple rhinoplasties and filler necrosis (Figure 5AB).

**Conclusion**

The cosmetic surgeon can modify bone and cartilage but not a large skin envelope or thick or scarred skin. The reconstructive surgeon can control the dimension, outline and quality of external cover and internal lining and recreate support.

When scarring or necrosis occurs after a cosmetic rhinoplasty or filler injection, the aesthetic demands remain the same, although the needs of repair are different. Missing external skin and internal lining become a controlling factor in achieving nasal shape and must be replaced in exact dimension and border outline. Autogenous subunit support must be “visible” through thin covering skin of correct size and outline.

The apparent simplicity of injectable fillers, high patient satisfaction, and infrequent complications may lead to a cavalier attitude, especially if employed with inadequate training or supervision or by those unfamiliar with their complications.10–13

Tissue necrosis can occur within 1–2 days of injection due to vascular compromise. Direct arterial injection with embolic destruction presents with pain and immediate blanching in the vascular territory of the vessel, often

---

**Figure 5** AB - Postoperatively, nasal contour is excellent. The deformities of past rhinoplasties and filler necrosis are corrected. Forehead and nasal scars are barely visible.
distant to the injection, leading to partial or full thickness nasal necrosis—i.e. nasolabial fold injections with embolic occlusion of facial and angular arteries.\textsuperscript{14}

Local pressure compression within a scarred or tight space presents with dull pain and slowly developing violaceous discolouration, often in patients with a history of prior rhinoplasty or injury.\textsuperscript{15} Many theoretical and anecdotal treatments are recommended in the literature.\textsuperscript{16–18}

The character of HA make it unique. It is hydrophilic and expands in volume postinjection, increasing the risk of direct vascular compression. The ability to dissolve hyaluronic acid with hyaluronidase may reverse the progression of injury.\textsuperscript{19}

Once irreversible, reconstruction is delayed until the wound is healthy, and the site, size, and depth of injury identified, and the true defect apparent. The defect is recreated and missing tissue replaced in exact quality, quantity, and anatomic layer, based on the contralateral Normal or Ideal.

**Ethical approval**

Not required.

**Funding**

None.

**Conflict of interest**

None declared.

**References**