Complex Nasal Reconstruction: Methods to Avoid a Forehead Flap

INTRODUCTION

- Approximately 4.7 million people are bitten by dogs every year in the United States, of which 44,000 were facial injuries.¹
- Facial dog bite injuries can include damage to the soft tissues but the unique architecture and lack of tissue for mobilization make closure of nasal defects challenging.
- Thoughtful debridement of devitalized tissue is important as vital structures may lie within the wound.
- A local flap can be used for small defects while larger defects will require a forehead or nasolabial flap.²
- The nasal subunit principle (first described in 1985 by Burget and Menick) advocates for replacement of an entire subunit rather than simply patching the defect when a large portion of a subunit has been removed, either traumatically or surgically ³.
- The nose consists of nine subunits: the nasal dorsum, two sidewalls, tip, two alae, columella, and two soft triangles.
- The subunit principle allows for scars to be camouflaged within the contours of the nasal surface, resulting in a superior aesthetic outcome ³.
- The surgeon must consider the three major layers of the nose during reconstruction: skin, osteocartilaginous framework, and mucosa.

CASE DESCRIPTION

A 26-year-old male presented following a facial dog bite in which he sustained a large soft tissue avulsion involving multiple nasal subunits. No other injuries were noted. Upon inspection, the soft tissue defect was found to involve the nasal tip, bilateral soft triangles, right ala and columella. The underlying bilateral lower lateral cartilages including the middle and medial crux were exposed but without significant damage. In addition, the inferior nasal lining was avulsed with the missing soft tissue piece (Fig. 1). He was counseled about the need for multi-stage reconstruction. Options for nasal reconstruction including the forehead flap were discussed with him. To limit additional visible, scarring coverage was provided with a nasolabial flap.

The right nasolabial fold was chosen as the donor site, given the orientation of the defect. The flap measured 8 x 2 cm. The flap was not defatted at the time of inset, as not to disrupt the blood supply. A portion of the underlying fat was used to cover the columellar defect and avoid cartilage desiccation. A nasal trumpet was inserted into the right nostril to help maintain the nostril contour. This was removed at the first post-op visit (Fig. 2).

Twelve days after the flap was elevated and secured to the defect, the graft was defatted and partially inset around the ala. Twenty-five days following the initial injury, the flap was partially divided. Forty-two days following the initial injury, the flap was inset, and final contouring was performed. He was taken to the operating room a total of four occasions, including the initial operation and the reconstruction was completed in 6 weeks.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

Mickel J. Voigt, OMS-II, Kayla Humenansky, DO





Fig1. Dog bite injury leading to avulsion of multiple nasal subunits



Fig2. Post-op day 9

OUTCOMES

Soft tissue avulsions generally involve significant loss of tissue requiring thoughtful reconstruction. In general, tissue defects in which primary closure is unobtainable can be managed by local tissue rearrangement. If local tissue is lacking, skin grafting may be considered. However, skin grafting is suboptimal in facial reconstruction given the often patch-like appearance and secondary contracture resulting in distortion of important facial landmarks. One area prone to distortion and lacking in excess local tissue is the nose.

Nasal reconstruction presents a unique challenge for the reconstructive surgeon. While free flap nasal reconstruction has been described, complex nasal reconstructions primarily rely on skin flap coverage from local or regional sources. Small, superficial defects can be managed by local tissue rearrangement, such as a V-Y advancement, bilobe or banner flaps. Large, deep defects or those in close proximity to other important structures require a regional flap (i.e. paramedian forehead or nasolabial flap) for coverage.⁴ Defects near the medial canthus heal well with secondary intention, while the nostril rim is easily distorted by closure with local flaps.

In general, a paramedian forehead flap is employed for defects larger than 1.5 cm, those requiring cartilage replacement, or those defects located within the infratip lobule or columella.⁵ This versatile flap offers coverage of all the nasal subunits, at the expense of a vertical forehead scar. For patients wishing to avoid a vertical scar, the nasolabial flap is an excellent choice. Historically, the nasolabial flap is described for resurfacing of alar defects; however, as presented here it can be used to resurface other nasal subunits as well. One of the major benefits of a nasolabial flap is the ability to camouflage the scar within the nasolabial fold. Similar to the forehead flap, the undersurface of the nasolabial flap can be skin grafted if nasal lining is required. The flap is also durable, allowing for coverage of cartilage reconstruction.

Table 1. Pros and Cons of Forehead and Nasolabial Flap	
	Forehead Flap
Pros	Robust blood supply (supratrochlear artery)
	Large amount of skin and tissue available
	Can be used for larger defect (>1.5 cm)
Cons	Multi-stage procedure
	Transfer of hair-bearing tissue in patients with low hairline
	Does not tolerate tension

Nasolabial Flap
Robust blood supply (angular branch of facial artery)
Proximity to nasolabial region
Thickness of flap can be modified to meet patient's needs
Inconspicuous donor scar
Multi-stage procedure
Limited amount of tissue available
Tendency to pincushion
Cannot be used for defects >1.5 cm unless modified





The nasolabial flap is an excellent option of nasal reconstruction; however, there are some limitations of the nasolabial flap. While a paramedian forehead flap can be extended into the hairline if necessary, the nasolabial flap does not extend beyond the mandibular border; thereby limiting its ability to cover more remote nasal defects. While we have proven its ability to resurface the ala, nasal tip, and columella, it is unlikely that it will reach the dorsum. As seen in this case presentation, the nasolabial fold should not be discounted as an excellent option for reconstruction of multiple nasal subunits.

1. O'brien, Daniel C., et al. "Dog Bites of the Head and Neck: an Evaluation of a Common Pediatric Trauma and Associated Treatment." American Journal of Otolaryngology, vol. 36, no. 1, 2015, pp. 32-38., doi:10.1016/j.amjoto.2014.09.001.

2. Brown, David L., et al. Michigan Manual of Plastic Surgery. 2nd ed., Wolters Kluwer Health, 2016.

3. Burget, Gary C., and Frederick J. Menick. "The Subunit Principle in Nasal Reconstruction." Plastic and Reconstructive Surgery, vol. 76, no. 2, 1985, pp. 239–247., doi:10.1097/00006534-198508000-00010.

4. Menick, Frederick J. "Practical Details of Nasal Reconstruction." Plastic and Reconstructive Surgery, vol. 131, no. 4, 2013, doi:10.1097/prs.ob013e3182827bb3.

5. Menick, Frederick J. "Nasal Reconstruction." Plastic and Reconstructive Surgery, vol. 125, no. 4, 2010, doi:10.1097/prs.0b013e3181d0ae2b.

Fig3. Final results following multi-stage nasolabial-flap reconstruction

CONCLUSION

REFERENCES