Reconstruction of the Nasal Soft Triangle Subunit

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Background: Of all nine subunits, the soft triangle is perhaps the most challenging to recreate. The complexity of soft triangle reconstruction resides in its proximity to such important structures as the nasal tip, nasal ala, and distal columella. If the soft triangle is not properly reconstructed, problems with nasal function and aesthetics often arise. Anatomical asymmetries in the lower third and abnormal shadowing can occur following insufficient restoration.
Methods: A retrospective review was completed of all patients undergoing reconstruction of the nasal soft triangle subunit at the University of Texas Southwestern Medical Center in Dallas, Texas, from 1995 to 2010. Defects with only external skin intact were classified as type I. Defects involving both skin and underlying soft tissue with intact mucosa were classified as type II. Finally, transmural defects with violated mucosa were classified as type III. Surgical outcomes were graded on a scale of I to IV. Grades given were based on the complexity of the existing defect and restoration of the soft triangle, with higher grades given when adjacent structures were not distorted.
Results: Of the 14 cases reviewed, two (14 percent) were type I defects, nine (64 percent) were type II defects, and three (21 percent) were type III defects. Three patients (21 percent) required revision with subsequent resurfacing and two (14 percent) required resurfacing alone. All but one patient (93 percent) had a grade of 2.0 or better, with the one patient opting not to undergo revision.
Conclusions: The authors believe their method of soft triangle reconstruction using the proposed algorithm is an easy approach to soft triangle reconstruction that will yield consistent surgical and clinical success from aesthetic and functional perspectives. Furthermore, the authors were able to achieve excellent aesthetic outcomes without compromise or facing any structural complications. (*Plast. Reconstr. Surg.* 131: 1045, 2013.)
CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.

Nasal reconstruction demands not only a firm understanding of the involved anatomy but also foresight into the dynamic effect wound healing will have on adjacent structures. Of all nine subunits, the soft triangle is perhaps the most challenging to recreate. Initially described by Converse as the area between the dome and nostril rim, the soft triangle consists of two juxtaposed layers of skin separated by a layer of loose areolar tissue (Fig. 1).[1] The external layer consists of squamous epithelium and the internal lining is a composite of squamous and transitional epithelium.

Basic surgical principles of nasal reconstruction focus on restoration of the preexisting form and function without distortion of adjacent structures. The complexity of soft triangle reconstruction resides in its proximity to such important structures as the nasal tip, nasal ala, and distal columella. If the soft triangle is not properly reconstructed, problems with nasal function and aesthetics often arise. The soft triangle and its relationship to the nasal ala are critical for patency of the external nasal valve. Scar contracture and anatomical

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Received for publication May 15, 2012; accepted November 20, 2012.

DOI: 10.1097/PRS.0b013e3182879ea7

Disclosure: *The authors do not have any commercial association or financial relationships that might pose or create a conflict of interest with the information presented.*

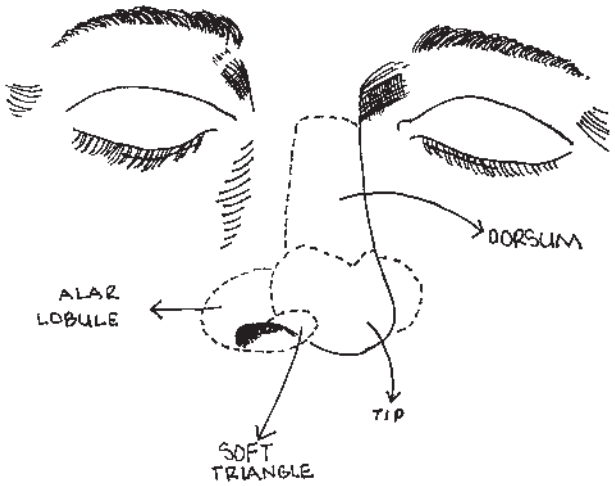

Fig. 1. Illustration of the nasal subunits of the lower third. The dorsum, tip, and paired soft triangles and alar lobules are shown. Note that the columella is not labeled.

distortion of this region not only decrease the diameter of the valve but also impair the physiology of nasal airflow.[2,3] Inadequate reconstruction of the soft triangle can have detrimental effects on nasal aesthetics, emphasizing the importance of this subunit and its intimate relationship to the adjacent structures. Anatomical asymmetries in the lower third and abnormal shadowing can occur following insufficient restoration. The goal of this article is to present our experience with reconstruction of the soft triangle and its adjacent structures and provide an algorithm to help guide the reconstructive surgeon when faced with defects of this region.

Table 1. Implemented Grading Scale

Grade	Result
I	Poor
II	Satisfactory
III	Good
IV	Excellent

PATIENTS AND METHODS

After institutional review board approval, a retrospective review was completed of all patients undergoing reconstruction of the nasal soft triangle subunit at the University of Texas Southwestern Medical Center in Dallas, Texas, from 1995 to 2010. Defects of the soft triangle without any restriction regarding size or depth of the defect were included. An attempt was made to isolate defects involving only the soft triangle subunit; however, its intimate relationship and proximity to adjacent structures make this virtually impossible. A total of 14 cases were identified that met the criteria of defects isolated to this particular subunit. All operations were performed by the senior author (J.F.T.). Defects were then classified with regard to the depth of the deficiency. For simplicity, defects with only external skin intact were classified as type I. Defects involving both external skin and underlying soft tissue with intact mucosa were classified as type II. Finally, transmural defects with violated mucosa were classified as type III.

Data collected included defect type and method of reconstruction used. In addition, demographic data including age and sex were also documented. Surgical outcomes were graded on a scale of I to IV (Table 1), with I being poor and IV signifying a superb result. The grades were assigned by two different blinded plastic surgeons not associated with the study, and based on standardized photographs taken in the preoperative and postoperative periods. Grades given were based on the complexity of the existing defect

Table 2. Soft Triangle Reconstructions from 1995 to 2010

Type	Sex	Age (yr)	Method	Grade	Revision	Resurfacing
I	F	75	Graft	3.5	None	None
I	F	54	Graft	3.0	None	None
II	F	67	NLF	3.5	None	None
II	F	78	NLF	2.0	None	None
II	M	68	NLF	2.0	Once	Once
II	F	76	NLF	3.0	None	None
II	F	59	NLF	4.0	None	Once
II	M	68	NLF	3.5	None	None
II	F	65	NLF	3.0	None	Once
II	F	66	NLF	4.0	None	None
II	F	66	NLF	1.5	None	None
III	F	46	PFF	3.0	None	None
III	M	55	PFF	4.0	Once	Once
III	F	76	PFF	4.0	Once	Twice

F, female; M, male; NLF, nasolabial flap; PFF, paramedian forehead flap.

and restoration of the soft triangle, with higher grades given when adjacent structures were not distorted.

RESULTS

Of the 14 cases reviewed (Table 2), two (14 percent) were type I defects, nine (64 percent) were type II defects, and three (21 percent) were type III defects. Three patients (21 percent) required revision with subsequent resurfacing, and two (14 percent) required resurfacing alone. All but one patient (93 percent) had a grade of 2.0 or better, with the one patient opting not to undergo revision, thus resulting in a less than optimal result.

DISCUSSION

Often plagued with cutaneous malignancy, the soft triangle is not only the smallest nasal subunit but arguably the most difficult to reconstruct. Since the initial description of the soft triangle by Converse in 1955,[1] multiple authors have further defined its importance and intricate anatomical details.[2] Variability exists in the characteristics of this particular region, as the soft triangle in a thin-skin patient is typically concave, whereas the contrary holds true for individuals with a thicker skin envelope. The ideal technique to implement for repair is thus further complicated by its inherent variability. Previously proposed reconstructive options are composed primarily of local flaps with or without the implementation of cartilage.[4–7] Other authors have suggested composite graft reconstruction with good results.[8–14] In this article, we propose an all-encompassing yet simple and practical algorithm for approaching defects in and around the soft triangle subunit.

The algorithms developed all involve a subunit reconstruction. Given the native size of the subunit, it is incongruent to performing defect-only reconstruction. The difficulty in its reconstruction lies in its geographically distant location on the nose and its complex shape, which is essentially quadrilateral, with both convex and concave curvatures. Failure to adequately reconstruct the soft triangle places multiple adjacent subunits (the ala, tip, and columella) at risk of permanent deformity. The techniques developed are very straightforward and predicated on the surgeon's comfort level with their execution. It is important to note, however, that because of its small size and proximity to multiple different nasal subunits, large defects involving the soft triangle inherently involve parts of the tip, columella, and even ala. In such cases (most often, those involving type III defects), reconstruction often necessitates a paramedian forehead flap.

Fig. 2. Type I defect with skin intact but soft-tissue and mucosal lining defects (*above*) reconstructed with composite graft harvested from the conchal bowl (*center*). (*Below*) Final result 4 months postoperatively.

Fig. 3. Type II defect including surrounding structures with mucosa intact but with absent soft tissue and overlying skin (*above*). Reconstruction consisted of cartilage graft from the conchal bowl with a nasolabial flap (*center*). (*Below*) Final result 2 months after division and inset.

Type I defects, which essentially have external skin intact but soft tissue and mucosa lining defects, are easily and reliably reconstructed with composite graft harvested from the conchal bowl. This is done to provide a stable scaffold to which the soft tissues heal, preventing the problems of retraction and notching. The conchal bowl graft is harvested through an anterior

conchal bowl incision, leaving a small area of denuded and open donor-site defect that is allowed to heal by secondary intention. The graft is thinned carefully, contoured, and sewn in place with through-and-through transfixion sutures. Depending on the expected reliability and vigor of the patient's healing, the cartilage component of the graft may be harvested as a smaller area than the skin graft component to facilitate or improve take (Fig. 2).

Type II defects have intact mucosa but lack soft tissue and overlying skin. These are the most common soft triangle defects and require both cartilaginous reconstruction and external nasal skin. The cartilage grafts in our experience were uniformly conchal bowl grafts. Again, these are harvested from an anterior conchal bowl incision. They often are sufficiently thick grafts that can be placed along the lower alar rim to prevent notching at such a distal location. The choice of coverage is predicated on both the patient's facial appearance and the patient's choice. Our initial choice of coverage is a superiorly based pedicled nasolabial flap. The soft, somewhat spongy nature of the flap facilitates its inset and its healing. This provides a concave surface that is essentially identical to the native soft triangle. The flap is elevated along the nasolabial fold, thinned aggressively, contoured, and then inset under a very slight amount of tension. This is then left in place for at least 3 weeks. After 3 to 4 weeks, the flap is divided and elevated over at least 70 percent of its maximal surface area, thinned, contoured, and inset to precisely match the contralateral side. Aggressive thinning and elevation are essential to the success of the reconstruction. It should be noted that no attempt is made to recreate a mucosal surface deficit with a nasolabial flap. For patients who have a very poorly developed nasolabial fold that will show a significant donor-site scar, the preference is an axial pattern ipsilateral paramedian forehead flap, well thinned and contoured as a subunit reconstruction (Fig. 3).

Type III defects are the least common. They are essentially complete mucosal, soft-tissue, and skin defects. It must be noted that isolated soft triangle defects are few and far between. The vast majority of these defects involve adjacent structures. An ipsilateral axial paramedian forehead flap using the Menick "fold-in" technique[5] to reconstruct the lining in addition to a cartilage graft is the preferred method of reconstruction. It should be emphasized that the flap is thinned and contoured significantly and partially deepithelialized at its most distal portion to allow a relaxed and easy turn-up for lining and inset. Again, cartilage grafting is essential for a safe and reliable reconstruction. If one finds himself or herself faced with an isolated type III defect involving only the soft triangle, the authors still recommend the use of the forehead flap to achieve the desired results. A narrow, properly thinned, and well-inset forehead flap will provide the surgeon with a superior result both functionally and aesthetically. Donor-site morbidity is minimal in these situations, with easy primary closure and dermabrasion as needed (Fig. 4).

We believe our method of soft triangle reconstruction using the proposed algorithm (Fig. 5) is an easy approach to soft triangle reconstruction that will yield consistent surgical

Fig. 4. Type III defect with adjacent structures consisting of a complete mucosal, soft-tissue, and skin defect (*left*). Reconstruction with a paramedian forehead flap is shown (*center*). (*Right*) Postoperative photograph 11 months after division and inset.

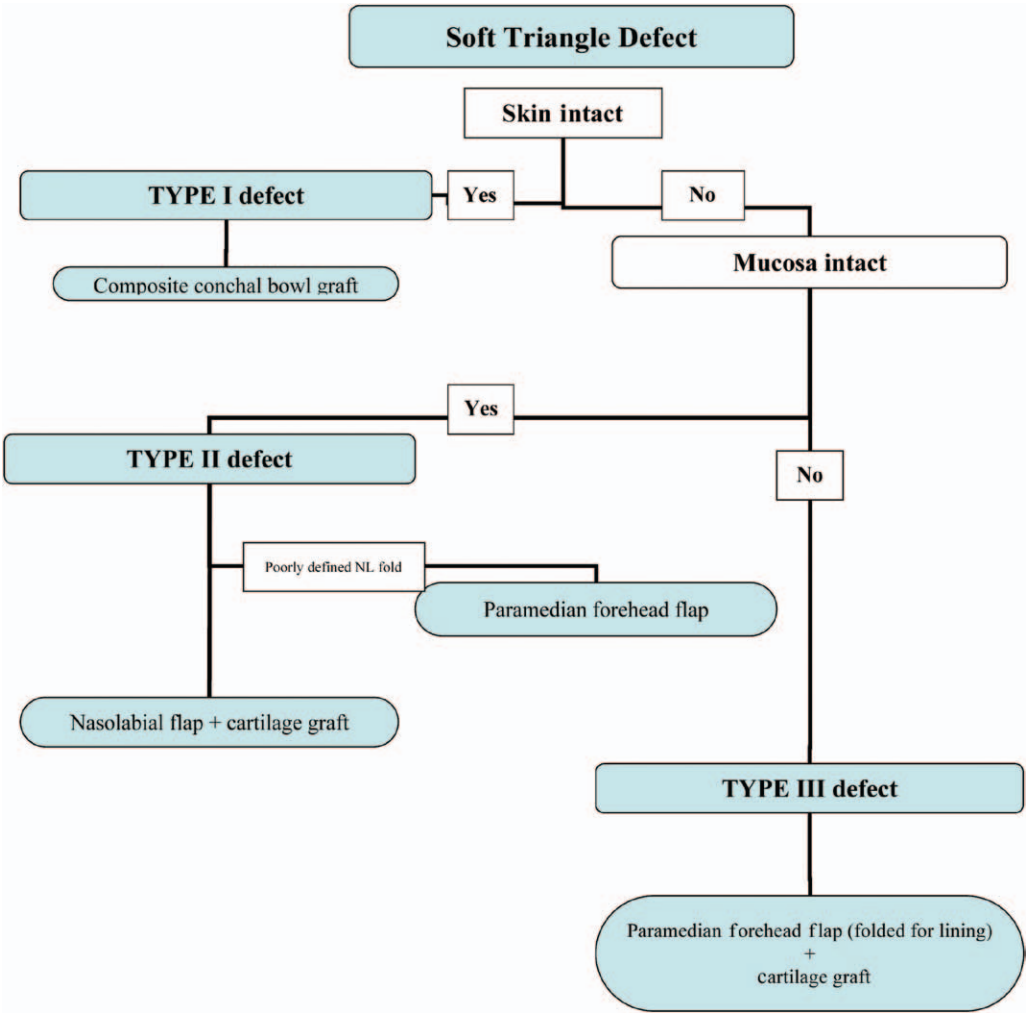

Fig. 5. Proposed algorithm for soft triangle reconstruction. *NL*, nasolabial.

and clinical success from aesthetic and functional perspectives. Furthermore, we were able to achieve excellent aesthetic outcomes without compromise and without facing any structural complications.

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