

Transection of the Nasal Base Muscles for the Correction of Plunging Tip: An Outcome Analysis

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Abstract

Background: The plunging-tip deformity has been attributed to the combined actions of nasal base muscles. However, there are no quantitative data in the literature to discuss the effect of muscle transections on the clinical outcome.

Objectives: This study was designed to assess the actions of the nasal tip, nasal base, and upper lip in patients with plunging-tip deformity and to compare their preoperative and postoperative activities following multiple myotomies.

Methods: Patients were treated for nasal base animation deformity by the transection of the depressor septi nasalis, myrtiformis, nasalis, and levator labii superior alaeque nasi muscles. The profile views of preoperative and 12 months postoperative photographs were selected for measurements. Rest and smile images were overlaid to achieve alignment, and movements were measured with reference to the Frankfurt horizontal plane.

Results: Twenty-seven (27) patients were included in the study. Movements of the nasal tip and nasal base were significantly reduced postoperatively. The upper lip shortened significantly in smile poses postoperatively compared with preoperative measurements. The change in the tip angle during animation significantly decreased in the postoperative measurements.

Conclusions: Movements of the nasal tip and the alar base contributed significantly to the hyperdynamic nasal tip deformity. Transection of the nasal base muscles is an effective treatment method with a weaker recovery of the muscle function in the long term. Dynamic upper lip shortening is an unexpected finding following surgery and should be investigated further.

Level of Evidence: 4



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Nasal tip plunging is a dynamic deformity which occurs during smiling. This phenomenon has been attributed to the activity of various muscles around the nose.¹⁻⁹ Classically, the activity of the depressor septi nasalis (DSN) muscle appeared as the main focus in several reports.¹⁰⁻¹⁴ However, many authors emphasized the combined action of upper lip elevators and the downward pull of the orbicularis oris, myrtiformis, and DSN muscles as contributing to the plunging-tip effect (Figure 1).^{2,3,8,9,12} However, Kosins et al¹⁵ concluded in a recent study that the concept of a “plunging tip” is an optical illusion. According to their measurements, the nasal tip changes its position

minimally during smiling while the alar crease and sub-nasale elevate disproportionately, creating the illusion of nasal tip plunging.

Plunging nasal tip is a unanimous clinical observation; however, the previously mentioned controversies on its

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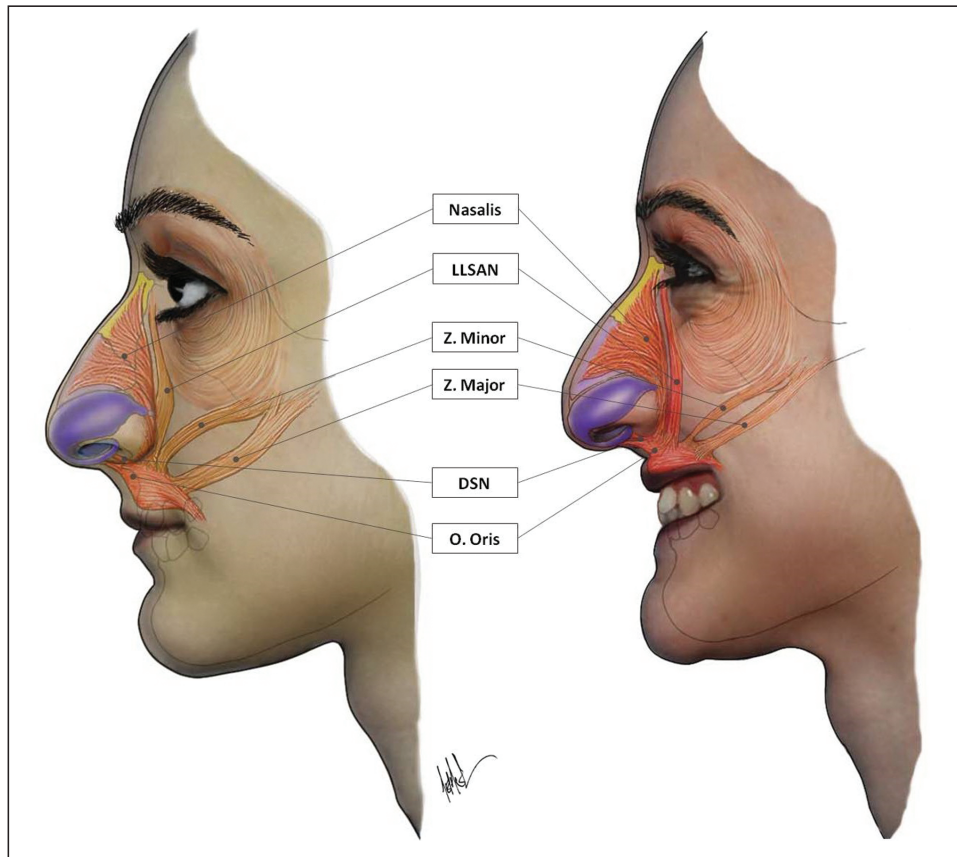


Figure 1. The combined action of the upper lip elevators and the downward pull of the orbicularis oris and depressor septi nasalis (DSN) muscles contribute to the plunging-tip effect during animation. The nasalis and the levator labii superior alaeque nasi (LLSAN) muscles are the vertical-vector elevators of the upper lip and alar base, whereas the zygomaticus minor and major muscles have oblique vectors of pull.

causes have led to various management techniques for its correction. The classical concept of plunging nasal tip is the transection of the DSN muscle.^{4,11-14,16-20} DSN transection has also been combined with the release of the levator labii superior alaeque nasi (LLSAN) muscles² and/or with the columellar strut grafts²¹ in several reports. Botulinum toxin injections to the DSN and LLSAN have also been suggested to correct tip ptosis.²² For over 10 years, the senior author (M.B.) has performed multiple myotomies of the nasal base muscles including the DSN, myrtiformis, and LLSAN muscles in selected rhinoplasty patients to correct dynamic tip deformity. However, Kosins et al,²³ in adherence to their previous optical illusion concept, reported a different treatment method involving no muscle transection that increases the level of the nasal tip defining point above the level of the alar crease-cheek junction with cephalic trim, caudal septal resection, tip position sutures, and tip grafts.

Although the reciprocal movement of the nasal base and nasal tip is the combined action of nasal tip depressors and alar base elevators, there are no quantitative data in the literature to discuss the effect of muscle transections on the clinical outcome.

The aim of this study is to assess the actions of the nasal tip, nasal base, and upper lip during smiling in rhinoplasty patients with plunging-tip deformity before the operation and to compare them with their postoperative actions following multiple myotomies of the nasal base.

METHODS

Five hundred and seventy-one (571) primary rhinoplasties were performed by the senior author (M.B.) between November 2005 and March 2015. Forty one of these patients were treated for nasal base animation deformity by transecting the nasal base muscles, including the DSN, myrtiformis, nasalis, and LLSAN. Thirty-four patients were female and seven patients were male. All patients completed a written informed consent form, which was prepared according to the Declaration of Helsinki. The patients were operated on under general anesthesia and discharged from the hospital the following day. The routine postoperative follow-up schedule consisted of visits at 7 days, 3 weeks, 6 months, and 12 months. Routine photographic documentation was

made at the preoperative and 12 months postoperative visits unless extra documentation was required for the other visits. All patients were treated with a closed rhinoplasty approach. The preferred technique of the senior author (M.B.) involves subperichondrial dissection with preservation of the dynamic musculoaponeurotic system and its ligamentous connections.²⁴ We aimed to compare the preoperative and postoperative dynamics of the nose. Therefore, to evaluate the effect of muscle division, the cases with surgical interventions that can directly affect the nasal tip position and nasal base movements apart from the muscle transections were excluded. We also excluded patients with open rhinoplasty, strut grafts, septal extension grafts, tip augmentation grafts, secondary nasofacial surgical or nonsurgical interventions, and patients who could not be contacted in the follow-up period.

Surgical Technique for Nasal Base Muscle Transections

Similar nasal base muscle transection techniques have been described in the literature by several authors.²⁵⁻²⁷ A 10 mm incision in the upper gingivobuccal sulcus is made, and the DSN and myrtiformis muscle bundles are dissected and transected. The other two incisions are made inside the vestibule on the pyriform aperture border at the classical lateral osteotomy sites. The fibers of the nasalis and LLSAN muscles are dissected and transected through these incisions. The rhinoplasty operation is conducted according to this initial muscle division procedure (Video).

Image Alignment and Measurements

Each patient was photographed in rest and smile sequences at the preoperative and 1-year postoperative visits utilizing standard rhinoplasty views. The whole forehead, ear, and neck were included in the photographs. Lateral rest and smile images of the same visit were overlaid utilizing Adobe Photoshop cc 2015 (Adobe Systems Inc., San Jose, CA) to achieve the best alignment utilizing the forehead, tragus, and ear canal as static landmarks. Then, rest and smile images were placed side by side and a Frankfurt horizontal line (FH) was drawn on both (Figures 2A-D).

The image pairs were transferred to Microsoft Office PowerPoint (Microsoft Corporation, Redmond, WA) with full adjustment to 4:3 slide height (19.05 cm), and the tip definition point, alar base, and lip tubercle were marked with a small round shape 0.1 cm in diameter, under the “Shapes” tab (Figure 3A). Then, the vertical distances from



Video 1. Watch now at <https://academic.oup.com/asj/article-lookup/doi/10.1093/asj/sjy063>

the FH line to the tip definition point and alar base, and from the alar base to the lip tubercle, were measured utilizing the “Line” tool again under the “Shapes” tab (Figure 3B). The measurements were defined as the tip position, alar base position, and upper lip length, respectively. The units are arbitrary. The tip angle, as described by Byrd et al,²⁸ could not be applied here, because the cheek obliterates the alar crease junction during forceful smile in some patients. Because this is a retrospective study, we were not able to mark the alar crease junction on the patient preoperatively, as previously done by Kosins et al.^{15,23} Therefore, another measurement method was utilized instead: the angle formed by dropping a perpendicular line from the FH line, intersecting another line from the lowest point on the alar base to the most projecting part of the nasal tip, was measured by placing a goniometer on the images (Figure 3C). All measurements were made on both the rest and smiling poses of the preoperative and postoperative photographs.

Statistical Analysis

The values recorded in the rest and smile poses were compared separately for the preoperative and postoperative sequences. Then, we compared the percentage of change in the preoperative and postoperative images from the rest to smile poses in the tip and alar base positions, the upper lip length, and the changes in the tip angle.

The measurements taken in the rest and smile poses in the preoperative and postoperative photographs were compared by utilizing a paired *t* test. The percentage of change in the preoperative and postoperative measurements was

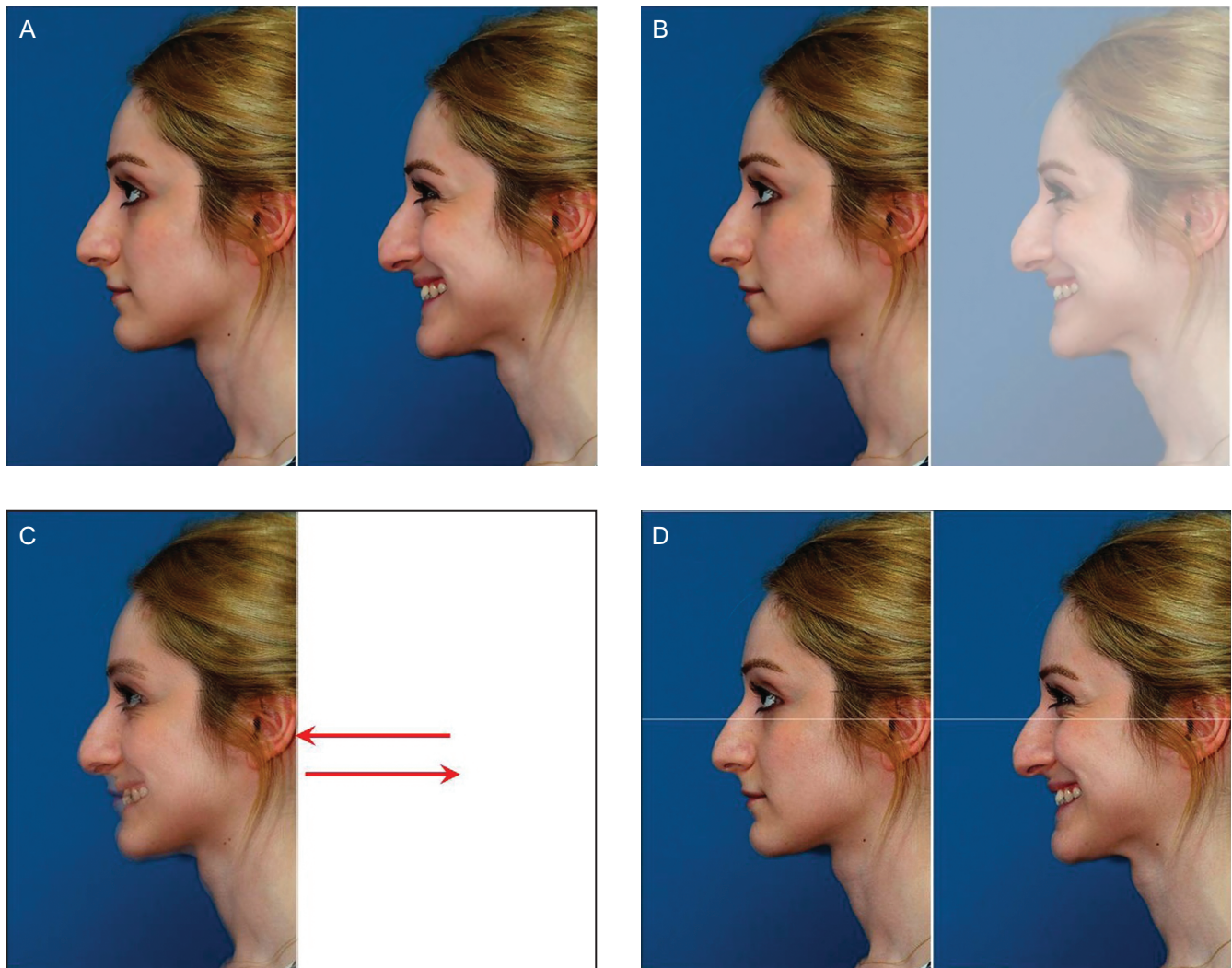


Figure 2. Each patient was photographed in rest and smile sequences at the preoperative and 1-year postoperative visits using standard rhinoplasty views. The whole forehead, ear, and neck were included in the photographs. (A) Lateral rest and smile images of the same visit were placed side by side utilizing Adobe Photoshop cc 2015 (Adobe Systems Inc. San Jose, CA). (B) Transparency of one of the images was reduced to 50% to 70% and (C) overlaid to achieve the best alignment using the forehead, ear, and neck contours as static landmarks. (D) After achieving the best alignment of the rest and smile images, the transparent figure was slid back and its opacity increased again to 100%. Then a Frankfurt horizontal line (FH) was drawn crossing on both figures.

compared by utilizing a nonparametric, Wilcoxon signed-rank test. A 5% significance level was utilized in all statistical analyses. The SPSS statistical software package (SPSS software version 22; IBM Corp., NY) was utilized for the calculations.

RESULTS

Twenty-seven patients who matched the criteria were included in the study. Twenty-five patients were female and two patients were male. The mean age was 27 years (range, 20-49 years) and the mean follow-up time was 18.7 months (range, 12-54 months). There were no major

complications necessitating any secondary interventions in any of the patients. Unilateral upper lip numbness lasting five weeks occurred in one patient. Eleven patients had complaints about feelings of restricted movements around the nose and the upper lip in the first 3 postoperative months, although no apparent muscle dysfunction was noted; we have attributed this to edema, which takes approximately 3 months to resolve. During this time, movements around the nose and lips feel grosser due to edema. Recovery of muscle function started at different times and caused transient asymmetry with certain movements only in one patient (Figure 4). None of the patients requested a revision surgery. Although no objective method was

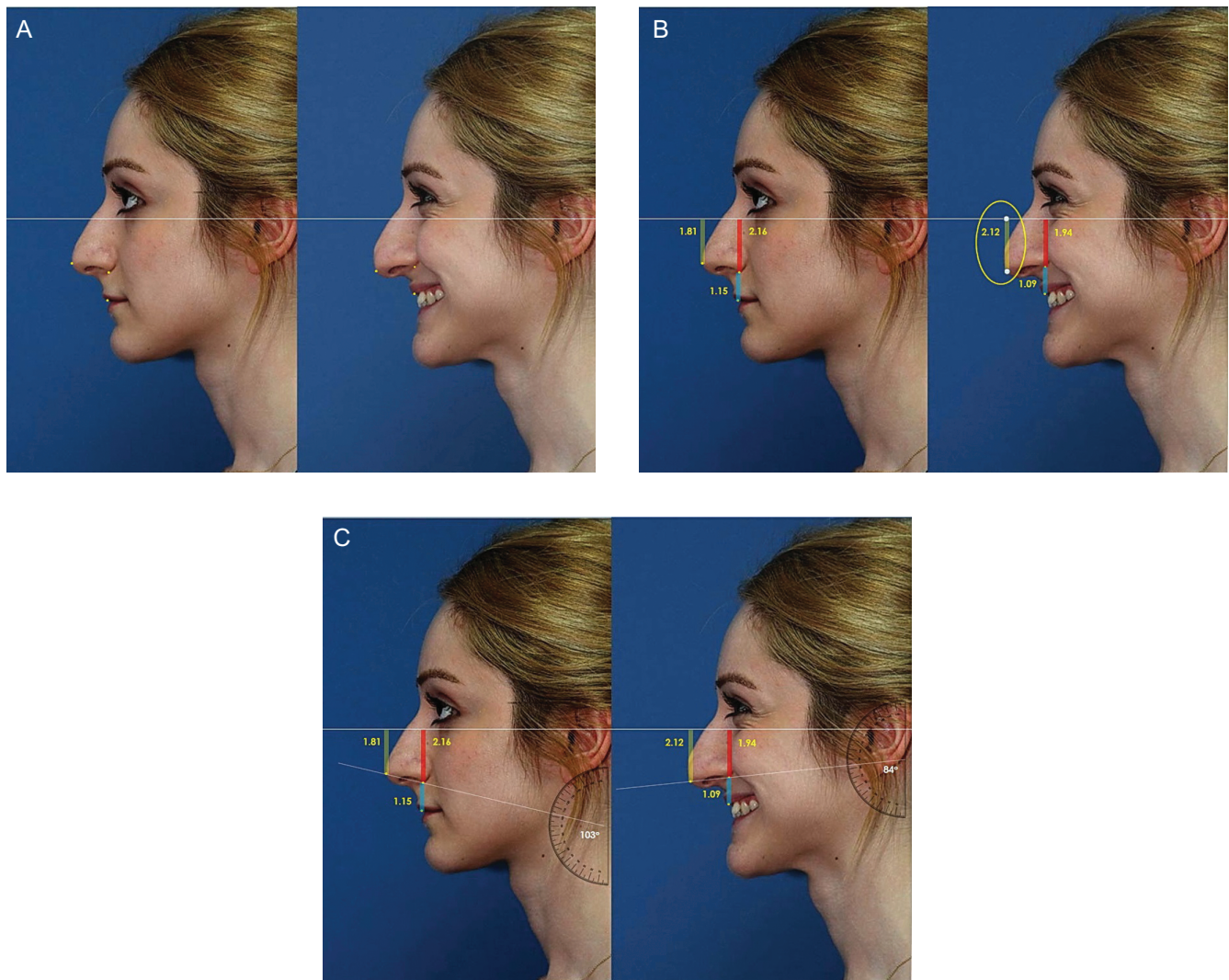


Figure 3. (A) The Photoshop images were transferred to Microsoft Office PowerPoint with full adjustment to 4:3 slide height (19.05 cm). Tip definition point, alar base, and lip tubercle were marked with a small round shape 0.1 cm in diameter under the “Shapes” tab. (B) Vertical distances from the FH line to the tip definition point and the alar base, and the vertical distance from the alar base to the lip tubercle, were measured using the “Line” tool also under the “Shapes” tab. (C) The tip angle was measured with a line between the tip definition point and the alar base by placing a goniometer on the images.

utilized to evaluate patient satisfaction, we note general satisfaction with the results.

The mean values for the preoperative and postoperative tip, alar base, upper lip position, and tip angles are provided in [Table 1](#). The median values for the percentage of change in the preoperative measurements and postoperative measurements are provided in [Table 2](#). Representative photographs of the patients’ preoperative and postoperative measurements are provided in [Figures 5 to 8](#).

Nasal Tip Position

The tip position was significantly lower in the smile pose (1.83 ± 0.44) compared to the rest pose (1.55 ± 0.39) in the preoperative evaluation ($P < 0.001$). Postoperatively, tip

position was still lower in the smile pose (1.42 ± 0.34) compared to the rest pose (1.32 ± 0.31), although this change was significantly less in the postoperative (8.8%) evaluation compared to the preoperative (16.9%) evaluation ($P = 0.003$).

Alar Base Position

The alar base moved upward significantly when the patient changed from rest (2.04 ± 0.26) to smile pose (1.78 ± 0.25) preoperatively ($P < 0.001$). Postoperatively, the alar base was raised when the patient changed from a rest pose (2.05 ± 0.24) to a smile pose (1.96 ± 0.26) ($P < 0.001$), but this change was significantly less in postoperative (4.1%) evaluation compared to preoperative (13.7%) evaluation ($P < 0.001$).

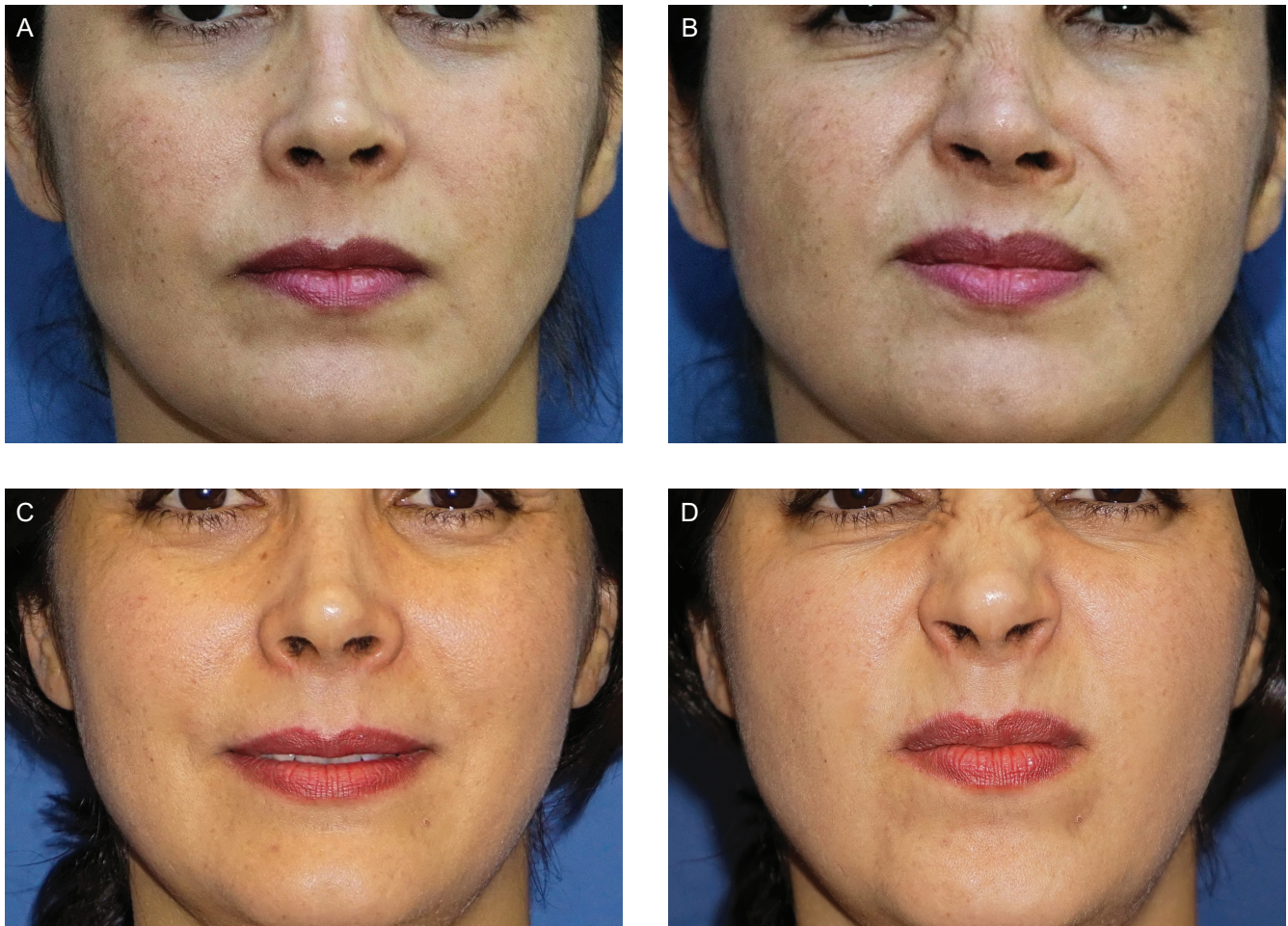


Figure 4. Transient dynamic asymmetry in nose wrinkling occurred in a 31-year-old woman in the early postoperative period and recovered completely. (A, B) Thirteen-week postoperative photographs and (C, D) 18-month postoperative photographs are shown.

Table 1. The Mean Values for the Preoperative and Postoperative Measurements

	Preoperative (rest)	Preoperative (smile)	Postoperative (rest)	Postoperative (smile)
Tip position	1.55 ± 0.39	1.83 ± 0.45	1.32 ± 0.31	1.42 ± 0.34
Alar base position	2.04 ± 0.26	1.78 ± 0.25	2.05 ± 0.24	1.96 ± 0.26
Upper lip position	1.29 ± 0.13	1.24 ± 0.14	1.40 ± 0.18	1.25 ± 0.16
Tip angle	107.3 ± 6.8	89.3 ± 8.4	116.8 ± 4.8	107.2 ± 5.2

Upper Lip Length

The upper lip length was significantly shortened in the smile pose (1.24 ± 0.14) compared with the rest pose (1.29 ± 0.13) in the preoperative evaluation ($P = 0.01$). In the postoperative evaluation, the upper lip length was still shorter when the patient was smiling (1.26 ± 0.16) compared with the patient's rest pose (1.40 ± 0.18) ($P < 0.001$). However, the change in lip length in the preoperative evaluation (3.9%) was significantly less

compared with the postoperative evaluation (10.5%) ($P < 0.001$).

Tip Angle

The tip angle was significantly decreased when the patient smiled (89.3 ± 8.4) compared with the patient's rest pose (107.3 ± 6.8) in the preoperative evaluation ($P < 0.001$). Postoperatively, the tip angle was again decreased in the smile pose (107.2 ± 5.2) compared with the rest pose

Table 2. The Median Values for the Percentage of Change in the Preoperative and Postoperative Measurements

	Preoperative	Postoperative	P value
Tip position	16.7%	8.8%	$P = 0.003$
Alar base position	13.7%	4.1%	$P < 0.001$
Upper lip length	3.9%	10.5%	$P < 0.001$
Tip angle	17.7%	8.3%	$P < 0.001$

(117.8 ± 4.8) ($P < 0.001$). However, the change in the angle in the postoperative evaluation (8.3%) was significantly less than the change in the angle in the preoperative evaluation (17.7%) ($P < 0.001$).

DISCUSSION

Tip plunging is a combined action of the DSN, myrtiformis, orbicularis oris, nasalis, and LLSAN muscles acting simultaneously in opposite directions. It has been demonstrated that the nasalis and pars alaris portion of the levator labii superioris alaeque nasi muscle elevates the ala, whereas the labialis portion combined with the DSN, myrtiformis, and superficial orbicularis oris nasalis (SOON) depresses the tip.^{3,5,8,9,12,29} In the present study, the patients with a plunging tip were treated by the transection of these muscles except the SOON. The actions of the nasal tip and alar base along with the lip length were measured on preoperative and postoperative photographs.

Both the downward movement of the nasal tip and the upward retraction of the alar base during smile were significant in our preoperative measurements. Also, the narrowing of the tip angle was significant. These findings indicate that the movements of both the nasal tip and the alar base have a significant contribution to the dynamic deformity of the plunging tip.

The significant downward movement of the nasal tip in our measurements is not consistent with the findings of Kosins et al,¹⁵ who noted the plunging-tip illusion as the elevation of the alar crease and subnasale along with only minimal movement of the nasal tip. The downward movement of the nasal tip in smiling poses proved to be significant in our study. There might be two reasons for this inconsistency: the difference in the measurement methods, and the difference in patient selection. Regarding, the difference in the measurement methods, we made all measurements on the photographs without any life size ruler on the patients. Our measurement units were arbitrary and this might be a weakness of our method. To overcome this problem, only the percentage of change was compared rather than making a direct comparison between measurements. The ratio of change in the length of the nasal tip or alar base position was shown to be significant. The same

measurement method was applied on the sequential photographs with best alignment utilizing static landmarks. No direct comparison was made between the preoperative and postoperative photographs to avoid matching errors. The second reason might be the difference in patient selection. The patients in the study by Kosins et al were included according to their own complaints, which might be a subjective observation. However, the patients with hyperdynamic nasal tip deformity who had the features of “rhinogingivolabial syndrome”¹ were selected by the senior surgeon in our study, according to the patients’ preoperative examination and photographic analyses. Roughly, 7% of all our primary rhinoplasty patients had the features of hyperdynamic nasal tip deformity and were selected as candidates for the treatment. The incidence and severity of hyperdynamic nasal tip deformity might differ between various patient populations^{1,4,12} and might be the main reason for the difference in the two studies.

Various treatment methods to correct hyperdynamic deformities of the nose have been reported in the literature. Many studies target the DSN activity either by transection or resection of the muscle²⁰ and sometimes with further reinforcement with strut grafts²¹ to reduce the downward movement of the nasal tip. There are also reports on the transection of the LLSAN muscle and the upper lip elevators to correct the alar retraction.^{25,27} However, the primary concern in the latter studies was not to correct the nasal tip drooping during smile but to reduce the upward movement of the alar base to correct asymmetries^{25,27} or the gummy smile deformity.²⁶ Arregui et al² have reported a different method to balance the seesaw effect of the nasal tip-alar base action. They liberated the alar arch from the anterior nasal spine to the pyriform aperture and divided the alar arch at the level of the accessory cartilages to allow cephalic rotation of the domes. Considering the nasal base anatomy,^{8,14,24,30} their method might not directly affect the activity of nasal base muscles. Unfortunately, they did not give any objective data to compare the preoperative and postoperative nasal tip and nasal base dynamics for discussion. Patients with severe nasal deviations may also have asymmetries in their nasal musculatures, as mentioned by several authors.^{31,32} Although we did not observe any apparent muscle asymmetries, these patients may require asymmetric interventions, such as unilateral muscle divisions.

Our treatment method included the transection of the DSN, myrtiformis, LLSAN, and nasalis muscle bundles, which have direct effects on the seesaw action of the nasal tip and alar base. Hence, the change between the rest and smile poses for all measurements were significantly less compared with preoperative evaluation. Although the movements of the nasal tip and alar base during smile still existed in the long-term examination, they were significantly weaker than the preoperative measurements, and

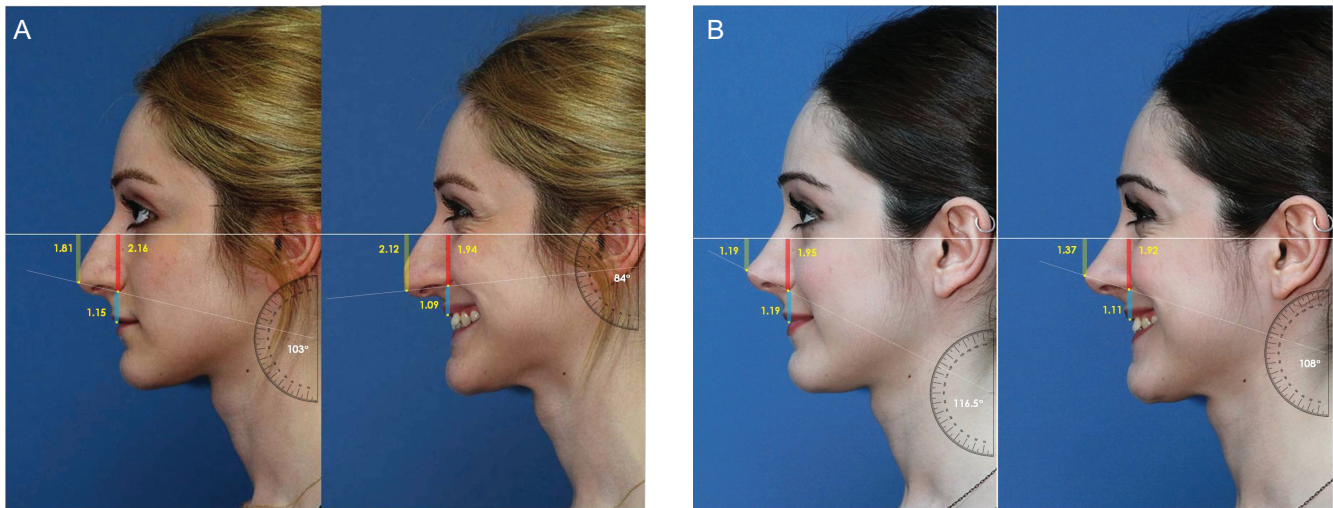


Figure 5. (A) Preoperative measurements of a 22-year-old woman who presented with hyperdynamic nasal tip deformity. Downward movement of the nasal tip, upward retraction of the alar base, and shortening of the upper lip were all significant. (B) Postoperative 18-month view of the same patient. There are major changes in the activities of both the nasal tip and alar base after the transection of the nasal base muscles.

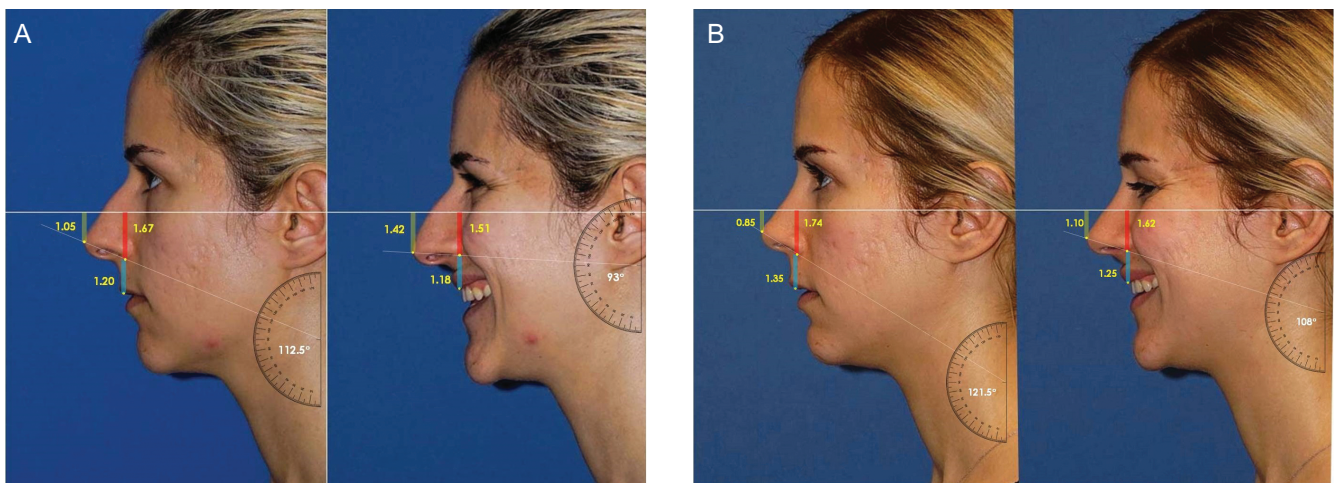


Figure 6. (A) Preoperative measurements of a 27-year-old woman. Downward movement of the nasal tip and upward movement of the alar base were significant, with minimal shortening of the upper lip. (B) Postoperative 14-month view of the same patient. Despite the reduction of the nasal tip and alar base activities, upper lip shortening increased.

the tip angle was significantly wider both in the static and dynamic poses postoperatively. These findings demonstrate that the transection of nasal base muscles does not eliminate their function permanently but it is still an effective treatment method to balance the position and actions of the nasal tip and the alar base. The weaker functional recovery might be attributed either to the reattachment of the divided ends of the muscles or to the function of the remaining intact muscle slips of the nasalis and LLSAN. The SOON has been reported to be the dominant muscle of the columellar base,⁸ and Benlier et al⁵ emphasized the importance of cutting it in severe smiling deformities. Because we did not transect the SOON in our surgical technique, it

might also be responsible for the postoperative nasal tip movement. Utilizing columellar strut grafts for nasal tip support or resecting muscle segments to prevent reattachment might be offered as additional measures to minimize the postoperative nasal tip and nasal base action. However, the necessity of such maneuvers is debatable according to our clinical results.

Shortening of the upper lip during forceful smile in preoperative measurements was an expected finding according to the previous reports.^{1-7,10-13} Following the transection of DSN and LLSAN muscles, one may expect to find lengthening of the upper lip and correction of a gummy smile.^{19,25-27,33} However, the lip length shortened even

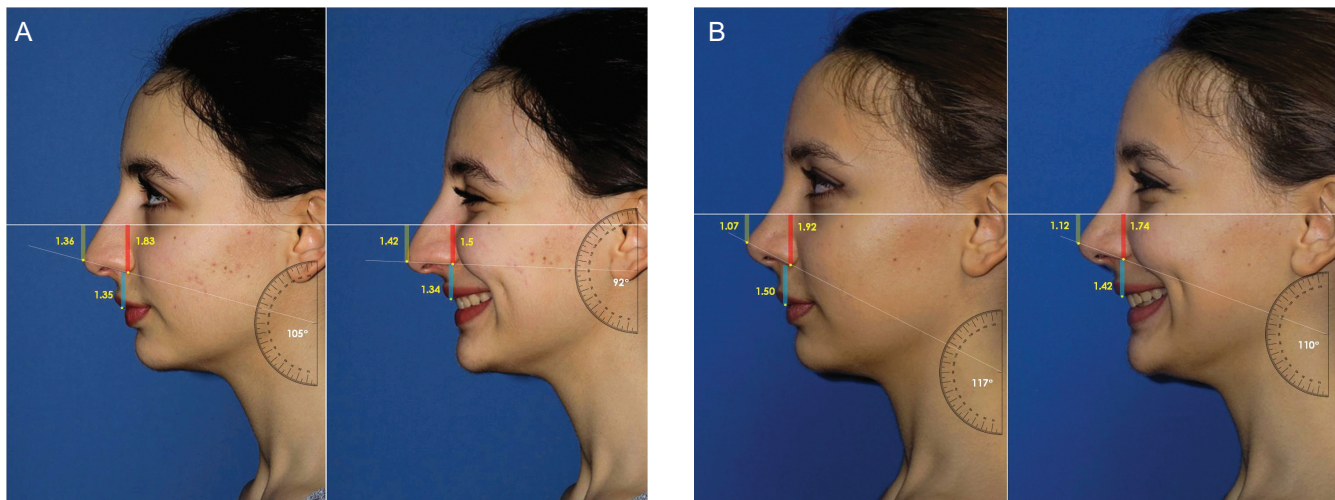


Figure 7. (A) Preoperative measurements of a 21-year-old woman. The activities of the nasal tip and alar base are not strong, and shortening of the upper lip is minimal. However, nasal tip-alar base angle change is apparent. (B) Postoperative 13-month view of the same patient. Despite minor reduction in the activity of the nasal tip, change in the alar base activity reduced the nasal tip-alar base angle difference.

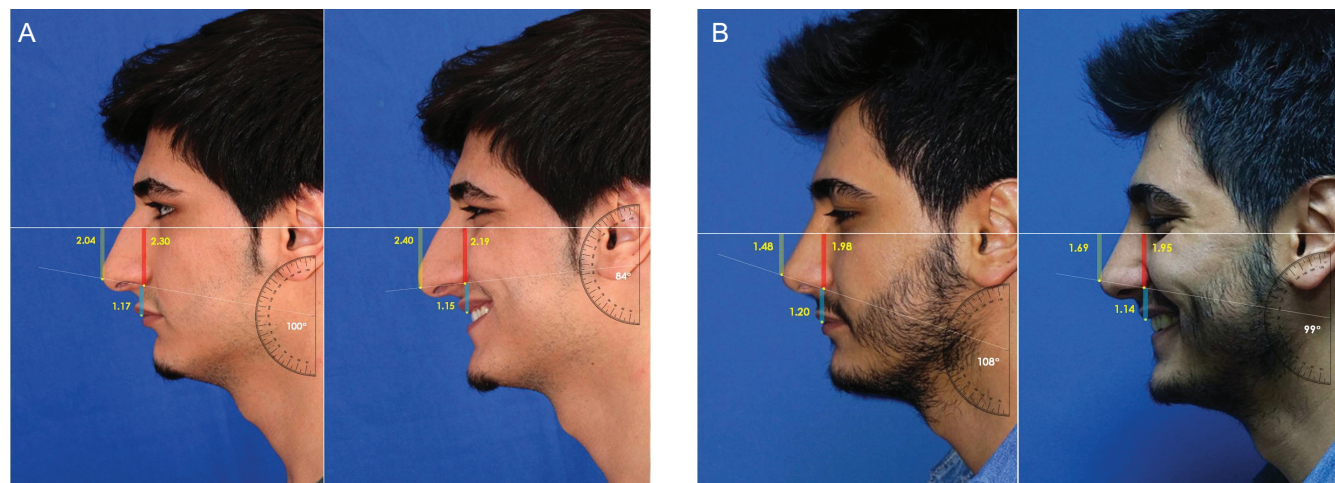


Figure 8. (A) Preoperative measurements of a 25-year-old man. Downward movement of the nasal tip appears stronger than the upward retraction of the alar base. (B) Postoperative 23-month view of the same patient. The mobility of nasal tip and alar base were reduced by utilizing a balanced seesaw action.

more in the smiling poses after surgery in our postoperative measurements. A possible explanation for this finding is the dynamic change of the alar base, which is one of the landmarks for lip length measurement. Lip length has been measured as the distance between the lip tubercle and the alar base in profile views, because the alar base is the least affected landmark from the rhinoplasty techniques that may change the upper lip length, such as posterior septal angle trim and septal caudal shave. Transection of the nasalis and LLSAN muscle bundles decreased the upward movement of the alar base; however, the elevator muscles of the upper lip, including the levator labii superioris and the zygomaticus major and minor, are active with their normal excursion. Thus, the distance between the lip

tubercle and the alar base becomes shorter in smile poses. A similar finding has been reported by Ho et al,³⁴ who investigated the effect of depressor septi muscle resection on upper lip length at the midline on frontal view photographs. They reported a decrease in upper lip length in the majority of the rhinoplasty patients following depressor septi nasi resection. Considering their report, the contribution of intact upper lip elevators might be speculated on for the upper lip shortening effect. In the absence of vertical vector muscles of the nasal base, dominance of oblique vector elevators, such as the zygomaticus major and minor, might create a thinning effect of the upper lip because of their stronger transverse pull similar to a rubber band. On the contrary, caudal septal extension grafts and columellar

strut grafts have been shown to increase both the nasolabial angle and the upper lip length.³⁵ This is one of the reasons why patients with tip grafts were excluded from this study. Including these patients would preclude assessing the effect of muscle transection on nasal tip dynamics.

The main drawback of our surgical technique is the temporary restriction of the facial expression muscles around the nose and upper lip. Recovery of muscle function may be delayed or asymmetrical, and it may be annoying for the patients temporarily. It should be discussed in detail with the patient that it will take some time for edema to resolve and the patient might not be able to perform fine movements around the nose and lip during this period. Therefore, surgeons should be more precautious in suggesting this type of procedure to patients who are photographed for their profession or work in front of cameras (actors, models, etc.). Thus, the candidate patients for the nasal base muscle transection procedure should be informed about the postoperative healing process. There are a few limitations to this study, such as its retrospective design. A prospectively designed study on life-size photos including larger patient populations from both genders or different ethnicities would have provided more information on the nature of this dynamic deformity.

CONCLUSION

Movements of both the nasal tip and the alar base play a significant role in the hyperdynamic nasal tip deformity. Transection of the nasalis, LLSAN, DSN, and myrtiformis muscles is an effective treatment method to balance the position and actions of the nasal tip and the alar base. The transection procedure does not eliminate muscle function permanently, and a weaker recovery of the muscle function does not occurs in the long term. Upper lip shortening in dynamic poses following surgery is an unexpected finding of the current study and should be investigated further. Also, further studies on larger patient populations including subgroups of females or males or different ethnicities or closed and open approaches may provide more valuable data on this subject.

Supplementary Material

This article contains supplementary material located online at www.aestheticsurgeryjournal.com.

Disclosures

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REFERENCES

1. Cachay-Velásquez H. Rhinoplasty and facial expression. *Ann Plast Surg.* 1992;28(5):427-433.
2. Arregui JS, Elejalde MV, Regalado J, Ezquerro F, Berrazueta M. Dynamic rhinoplasty for the plunging nasal tip: functional unity of the inferior third of the nose. *Plast Reconstr Surg.* 2000;106(7):1624-1629.
3. Figallo EE, Acosta JA. Nose muscular dynamics: the tip trigonum. *Plast Reconstr Surg.* 2001;108(5):1118-1126.
4. de Souza Pinto EB. Relationship between tip nasal muscles and the short upper lip. *Aesthetic Plast Surg.* 2003;27(5):381-387.
5. Benlier E, Top H, Aytig AC. A new approach to smiling deformity: cutting of the superior part of the orbicularis oris. *Aesthetic Plast Surg.* 2005;29(5):373-377; discussion 378.
6. Guyuron B. Soft tissue functional anatomy of the nose. *Aesthet Surg J.* 2006;26(6):733-735.
7. Barbosa MV, Nahas FX, Ferreira LM. Anatomy of the depressor septi nasi muscle: the basis for correction of deformities of the nose/lip junction. *J Plast Surg Hand Surg.* 2013;47(2):102-105.
8. Daniel RK, Glasz T, Molnar G, Palhazi P, Saban Y, Journal B. The lower nasal base: an anatomical study. *Aesthet Surg J.* 2013;33(2):222-232.
9. Gruber RP, Kwon E, Berger A. Commentary on: The lower nasal base: an anatomical study. *Aesthet Surg J.* 2013;33(2):233-236.
10. Figallo E. The nasal tip: a new dynamic structure. *Plast Reconstr Surg.* 1995;95(7):1178-1184.
11. De Souza Pinto EB, Da Rocha RP, Filho WQ, et al. Anatomy of the median part of the septum depressor muscle in aesthetic surgery. *Aesthetic Plast Surg.* 1998;22(2):111-115.
12. Benlier E, Balta S, Tas S. Depressor septi nasi modifications in rhinoplasty: a review of anatomy and surgical techniques. *Facial Plast Surg.* 2014;30(4):471-476.
13. Rohrich RJ, Huynh B, Muzaffar AR, et al. Importance of the depressor septi nasi muscle in rhinoplasty: anatomic study and clinical application. *Plast Reconstr Surg.* 2000;105(1):376-383; discussion 384-388.
14. Hwang K, Kim DJ, Hwang G. Relationship between depressor septi nasi muscle and dermocarilagenous ligament; anatomic study and clinical application. *J Craniofac Surg.* 2006;17(2):286-290.
15. Kosins AM, Lambros V, Daniel RK. The plunging tip: illusion and reality. *Aesthet Surg J.* 2014;34(1):45-55.
16. Lawson W, Reino AJ. Reduction columelloplasty. A new method in the management of the nasal base. *Arch Otolaryngol Head Neck Surg.* 1995;121(10):1086-1088.
17. Rauso R, Amore R, Tartaro G, Gherardini G. Intraoral approach for nasal tip upturning. *J Craniofac Surg.* 2012;23(4):1149-1150.
18. Tellioglu AT, Inozu E, Ozakpınar R, et al. Treatment of hyperdynamic nasal tip ptosis in open rhinoplasty: using the anatomic relationship between the depressor septi nasi muscle and the dermocarilagenous ligament. *Aesthetic Plast Surg.* 2012;36(4):819-826.
19. Kalantar-Hormozi A, Beiraghi-Toosi A. Smile analysis in rhinoplasty: a randomized study for comparing resection

- and transposition of the depressor septi nasi muscle. *Plast Reconstr Surg.* 2014;133(2):261-268.
20. Sinno S, Chang JB, Saadeh PB, Lee MR. Anatomy and surgical treatment of the depressor septi nasi muscle: a systematic review. *Plast Reconstr Surg.* 2015;135(5):838e-848e.
 21. Cetinkale O, Tulunay S. Augmentation of the columella-labial angle to prevent the “smiling deformity” in rhinoplasty. *Aesthetic Plast Surg.* 1998;22(2):106-110.
 22. Dayan SH, Kempiners JJ. Treatment of the lower third of the nose and dynamic nasal tip ptosis with Botox. *Plast Reconstr Surg.* 2005;115(6):1784-1785.
 23. Kosins AM, Lambros V, Daniel RK. The plunging tip: analysis and surgical treatment. *Aesthet Surg J.* 2015;35(4):367-377.
 24. Cakir B, Oreroğlu AR, Doğan T, Akan M. A complete subperichondrial dissection technique for rhinoplasty with management of the nasal ligaments. *Aesthet Surg J.* 2012;32(5):564-574.
 25. Pessa JE. Improving the acute nasolabial angle and medial nasolabial fold by levator alae muscle resection. *Ann Plast Surg.* 1992;29(1):23-30.
 26. Ishida LH, Ishida LC, Ishida J, Grynglas J, Alonso N, Ferreira MC. Myotomy of the levator labii superioris muscle and lip repositioning: a combined approach for the correction of gummy smile. *Plast Reconstr Surg.* 2010;126(3):1014-1019.
 27. Taş S. Correcting the alar base retraction in crooked nose by dissection of levator alaeque nasi muscle. *Ann Plast Surg.* 2016;77(4):383-387.
 28. Byrd HS, Hobar PC. Rhinoplasty: a practical guide for surgical planning. *Plast Reconstr Surg.* 1993;91(4):642-654; discussion 655.
 29. Hur MS, Hu KS, Park JT, Youn KH, Kim HJ. New anatomical insight of the levator labii superioris alaeque nasi and the transverse part of the nasalis. *Surg Radiol Anat.* 2010;32(8):753-756.
 30. Hur MS, Youn KH, Hu KS, et al. New anatomic considerations on the levator labii superioris related with the nasal ala. *J Craniofac Surg.* 2010;21(1):258-260.
 31. Tellioglu AT, Özakpınar HR, Cakir B, Tekdemir I. Importance of the levator labii alaeque nasi muscle in dorsal septal deviations. *J Craniofac Surg.* 2011;22(2):446-449.
 32. Tas S, Colakoglu S, Lee BT. Nasal base retraction: a treatment algorithm. *Aesthet Surg J.* 2017;37(6):640-653.
 33. Pi H, Kurlander DE, Guyuron B. Effects of the rhinoplasty maneuvers on upper lip position and incisor show. *Aesthetic Plast Surg.* 2017;41(1):135-139.
 34. Ho Y, Deeb R, Westreich R, Lawson W. Effect of depressor septi resection in rhinoplasty on upper lip length. *JAMA Facial Plast Surg.* 2014;16(4):272-276.
 35. Perkins K, Shah A, Patel A, Steinbacher D. The effect of nasal tip rotation on upper lip length. *Aesthet Surg J.* 2017;37(5):504-510.



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