Nasal Tip Depressor Manipulation through Upper Buccal Sulcus Approach in Selected Open Primary Rhinoplasties

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Background: During smiling, the prominent action of nasal tip depressors (NTDs) antagonizes the rhinoplasty nasal tip support maneuvers and favors scarring forces, pulling the nasal tip in a less projecting vector. The NTDs’ disinsertion is feasible through the open rhinoplasty approach. Yet, the reliability of the open approach to manipulate all NTD attachments is still questionable. The upper buccal sulcus approach (UBSA) is a reliable approach to manipulate variable anatomy of the NTDs.

Methods: Thirty-two patients had primary open rhinoplasty between 2016 and 2020. All patients showed hyperactive NTDs during smile preoperatively. Through UBSA, disruption of NTDs was done. Aesthetic outcome was evaluated by comparing the pre/postoperative nasal tip projection (NTP) and nasolabial angle (NLA) in lateral views.

Results: The sample included 28 women and four men, and the mean age was 30.7 years. The mean follow-up period was 23.8 months. Preoperatively, 53% (n = 17) of patients showed normal NTP measurements; this percentage increased to 87.5% (n = 28) postoperatively. The mean NLA for the 32 patients was 91.0 degrees preoperatively, which was increased to 102.5 degrees postoperatively. These aesthetic results were maintained throughout the follow-up period, with no significant increase in the incidence of complications.

Conclusions: The combination of the UBSA with open rhinoplasty resulted in objective visualization and manipulation of the NTDs. This was proven by the maintained NTP and NLA in aesthetic optimum values throughout the follow-up period. We believe that UBSA can be safely combined with open rhinoplasty as a reliable hidden approach to manipulate hyperactive NTD cases. (Plast Reconstr Surg Glob Open 2022;10:e4481; doi: 10.1097/GOX.0000000000004481; Published online 19 August 2022.)
NTD attachments. The UBSA can be a reliable approach to visualize and objectively manipulate the variable anatomy of the depressor septi nasi muscle (DSNm) and other NTDs.

The variable anatomy of the NTDs is thoroughly described in the literature. Normally, the DSNm acts to drop the nasal tip caudally, widen the nostril area, and facilitate nasal air inflow. The DSNm is a paired muscle that originates from the maxilla, just above the related central incisors. The midportion fibers of the DSNm insert into the anterior nasal spine (ANS), footplates of the medial crura, and then to the membranous septum.

The DSNm is hyperactive in 31% of the Middle Eastern population, and its fibers may extend to join the deep portion of the Pitanguy’s ligament. On the other hand, the superficial portion of the Pitanguy’s ligament receives fibers from the superficial orbicularis oris nasalis muscle (SOONm), which is the dominant component of the columellar base. The SOONm lies superficial to the DSNm fibers, and its lower fibers form a junctional area with the superficial orbicularis oris libialis. This junctional area represents the upper lip crease that appears with a forceful smile. Also, the levator labii superioris alaeque nasalis acts as NTD through the intermingling fibers with SOONm. Collectively, the NTDs are DSNm, SOONm, and the levator labii superioris alaeque nasalis through their connections with the Pitanguy’s ligaments.

In the current study, we evaluate the effectiveness of combining open rhinoplasty and UBSA to manipulate NTDs and maintain nasal tip aesthetic outcome.

**PATIENTS AND METHODS**

In a retrospective study, 32 patients had open rhinoplasties in our private practice during the interval between 2016 and 2020. The open rhinoplasty approach was used to correct variable aesthetic presentations. All included patients showed hyperactive NTDs during preoperative evaluation. The NTDs’ hyperactivity was demonstrated by nasal tip caudal displacement and upper lip vertical height reduction with smiling. In some patients, the NTDs’ hyperactivity may also cause a prominent upper lip crease during animation. Patients with posttraumatic nasal deformities or cleft nasal deformities were excluded from the study.

Preoperative evaluation included standard full-face photography in anteroposterior and lateral views. The expected outcomes and complications were explained in detailed informative consent. The surgical decision was discussed with the patients to weigh their expectations against the reliable estimated outcomes.

**Standards of Photography**

The senior author used a single camera (Nikon D5100 DSLR Camera with 18–55mm f/3.5–5.6 Auto Focus-S Nikkor Zoom Lens) for all pre/postoperative photographs. The automode was used during photography to adjust the exposure and the white balance over the used background. The distance between the camera and the patient was fixed to be 5 feet. The camera stand was adjusted to a level that put the camera lens in the same plane of the patient’s face.

**Surgical Procedure**

Under general hypotensive anesthesia, lidocaine/adrenaline solution was infiltrated to the nose and upper buccal sulcus, tackling the areas of incision and dissection. Through the open rhinoplasty approach, the columellar and rim incisions were used in all patients. The senior author used a triple plane dissection to deal with different components of Middle Eastern individuals with prominent soft tissue envelope. First, the subcutaneous dissection plane allowed exposure of the cartilaginous framework and debulking of the prominent soft tissue. Second, the subperiosteal dissection plane allowed exposure of the cartilaginous framework through complete separation of the SOONm to the nasal base. The lower flap of the UBSA included the frenulum that overlaid the DSNm. The DSNm could be easily identified originating from the upper incisive fossa. Complete disinsertion and partial excision of the DSNm from the base of the columella were done objectively and under vision. Just before skin and nasal mucosal closure, the UBSA mucosal incision was repaired with 4/0 Polyglactin 910 suture (Vicryl Rapide, Ethicon Inc, Johnson & Johnson Medical N.V.) in a VY fashion to avoid frenulum shortening and increase the vertical height of the upper lip.

A combination of structural and preservation rhinoplasty concepts was implemented to correct different aesthetic complains. These surgical steps were individualized.

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**Findings**

Preoperatively, 53% (n = 17) of patients showed normal NTP measurements; that percentage increased to 87.5% (n = 28) postoperatively. The mean NLA for the 32 patients was 91.0 degrees preoperatively, which increased to 102.5 degrees postoperatively. These aesthetic results were maintained throughout the follow-up period with no significant increase in incidence of complications.

**Meaning:** The upper buccal sulcus approach can be combined with open rhinoplasty as a reliable hidden approach to manipulate hyperactive nasal tip depressor patients.

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**Takeaways**

**Question:** Through the upper buccal sulcus approach, does the manipulation of nasal tip depressors maintain nasal tip projection and nasolabial angle in aesthetic values during follow-up?

**Findings:** Preoperatively, 53% (n = 17) of patients showed normal NTP measurements; that percentage increased to 87.5% (n = 28) postoperatively. The mean NLA for the 32 patients was 91.0 degrees preoperatively, which increased to 102.5 degrees postoperatively. These aesthetic results were maintained throughout the follow-up period with no significant increase in incidence of complications.

**Meaning:** The upper buccal sulcus approach can be combined with open rhinoplasty as a reliable hidden approach to manipulate hyperactive nasal tip depressor patients.
according to each patient’s presentation, aiming to have optimum functional and aesthetic outcomes. Insertion of a floating columellar strut was used in some patients to maintain nasal tip support and projection when indicated. The columellar strut was harvested routinely from the nasal septum cartilage and inserted into a pocket created between the two medial crura of the lower lateral cartilages, with preservation of the interdomal ligament.

**Post-operative Follow-up and Evaluation**

All patients had follow-up visits to our clinic for removal of sutures and splints. Standard photography was used to document and evaluate postoperative results. In lateral view, NTP and NLA were measured. To calculate these measurements, lateral views of each patient were plotted to a PowerPoint slide. Arrows were inserted to measure the NTP and NLA. The horizontal facial plane was used to correct any minor deviation of the standards of the lateral facial view.

The NTP was measured from the alar base to the nasal tip, then a vertical plane line adjacent to the most projecting part of the upper lip was drawn perpendicular to the horizontal facial plane. This vertical plane intersects and divides the nasal projection line into two parts. The nasal projection is calculated as the percent between nasal tip anterior to the vertical line and the nasal tip posterior to the vertical plane line, and the normal aesthetic value reference was 50%–60% (Fig. 3A).

The NLA was the angle measured between two lines, A and B, where line A passed through the most anterior

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**Fig. 1.** A 34-year-old female patient presented with hyperactive NTDs, causing significant upper lip vertical height reduction with smiling. A, The patient in normal anterior view. B, The same patient in a full smiling anterior view.

**Fig. 2.** A 23-year-old male patient with hyperactive NTDs. A, An inverted V-shaped incision in the upper buccal sulcus. B, Intraoperative view showing the DSNm just before surgical disruption of its columellar attachment.
and the most posterior points of the nostrils, and line B was a vertical line drawn perpendicular to the horizontal facial plane. The normal aesthetic value reference was 90–95 degrees for men and 95–100 degrees for women (Fig. 3B). Postoperative NTP and NLA measurements were compared with the corresponding preoperative measurements. All calculated values were statistically analyzed.

Statistical Methods
Statistical analysis was done using MedCalc Statistical Software version 20 (MedCalc Software Ltd, Ostend, Belgium; https://www.medcalc.org; 2021). Continuous numerical variables are presented as mean and standard deviation, and categorical variables as counts or proportions and percentages. Paired numerical data are compared with the paired samples t test. The McNemar test is used to compare paired categorical data. P values less than 0.05 are considered statistically significant.

RESULTS
The study included 32 patients presenting with different aesthetic complaints and seeking rhinoplasty. The patients’ demographic data and follow-up periods were documented (Table 1).

All patients showed satisfaction with the aesthetic outcome, except for three patients. Two patients complained of upper lip and incisor area numbness that was resolved spontaneously over the following 3 months. The third patient complained of palpable dorsal irregularities that were managed at the clinic with filler injection under local anesthesia. No major complications were encountered that could lead to secondary corrective surgeries.

In the lateral view photographs, comparing preoperative and postoperative NTP measurements showed significant increase in the mean NTP postoperatively. Preoperatively, 53% (n = 17) of patients showed normal NTP measurements, and 47% (N = 15) showed abnormal NTP, either overprojecting or underprojecting. Postoperatively, 34.5% (n = 11) of patients had their NTP normalized, and the total percentage of patients with normal NTP increased to 87.5% (n = 28) (Table 2) (Fig. 4).

Table 1. Patient Demographic Data and Follow-up Periods

| Variable               | Value               |
|------------------------|---------------------|
| Women n/N (%)          | 28/32 (87.5)        |
| Men n/N (%)            | 4/32 (12.5)         |
| Age (y), mean ± SD (range)| 30.7 ±7.3 (19.0–47.0) |
| Follow-up period (mo), mean ± SD (range) | 23.8±5.6 (16.0–36.0) |

n, number of patients; N, total number of patients; SD, standard deviation.

Table 2. Comparison of NTP and NLA before and after Rhinoplasty

| Variable | Preoperative Mean SD | Postoperative Mean SD | Paired Difference | 95% LCL | 95% UCL | P*  |
|----------|----------------------|-----------------------|-------------------|---------|---------|-----|
| NTP (%)  | 51.7 ± 6.7           | 54.1 ± 3.3            | –2.3              | 0.8     | –4.0    | <0.05 |
| NLA (°)  | 91.0 ± 5.0           | 102.5 ± 4.8           | –11.5             | –13.2   | –9.9    | <0.001 |

*Paired-sample t test.
95% LCL, 95% lower confidence limit; 95% UCL, 95% upper confidence limit; N, total number of patients; SD, standard deviation, SE, standard error.
In the same manner, the NLA measurements were compared preoperatively and postoperatively in the lateral view photographs. The mean NLA for the 32 patients was 91.0 degrees preoperatively and increased to 102.5 degrees postoperatively. This comparison showed significant increase of the mean NLA to be more obtuse by...
11.5 degrees (Table 2, Fig. 5). Of note, the study included only four men (Table 1). Postoperatively, only one male patient showed a more obtuse NLA (96.5 degrees) than the normal aesthetic value for men. The remaining three male patients had normalized NLA matching the aesthetic value reference of 90–95 degrees.

All patients showed high satisfaction levels with the aesthetic outcomes (Figs. 6–8). The overall outcome was significant normalization of the NTP and turning NLA to be more aesthetically obtuse. These results were maintained during the follow-up period, which ranged from 16 to 36 months postoperatively (mean ± SD, 23.8 ± 5.6) (Table 1).

DISCUSSION

Preservation rhinoplasty is gaining in popularity, principally to preserve the natural osseocartilaginous framework. The preservation concepts widen to include the soft tissue envelope and alar area. Nevertheless, in a Middle Eastern nose with prominent soft tissue envelope and an under-projecting nose, the structural rhinoplasty is still essential to manipulate the nasal tripod and to debulk the masking effect of the soft tissue envelope. The partial preservative rhinoplasty includes a combination of preservation and structural techniques targeting a highly aesthetic and functional outcome.14,15

Combining open rhinoplasty with UBSA to manipulate NTDs is not a new technique. Rohrich et al16 published the famous article that described the transposition of type I and II DSNm through intraoral incision, yet the OOm role as a NTD was not appreciated. Also, in this pioneering study, the aesthetic outcome was subjectively evaluated by clinical observation and patients’ satisfaction.

Benlier et al1 in his study appreciated the importance of partial excision of the OOm in addition to DSNm transposition in a Middle Eastern population. But, he used open rhinoplasty in only four patients out of 38 and preferred to combine the UBSA only with closed rhinoplasties. Similarly, the evaluation in this study was subjectively based without using any objective tool for aesthetic outcome evaluation.

In the current study, we combined the UBSA with open rhinoplasty to manipulate the variable anatomy of NTDs objectively. This combination allowed the exposure of the NTDs before dispersion of their fibers to different attachment sites. In conjunction with scarring forces after rhinoplasty, we believe that undisrupted NTD fibers can favor delayed recurrence of nasal tip deprojection.2 Also, by weakening of the NTDs, the levator septi nasi muscle becomes the overriding force, changing the balance to prevent nasal tip deprojection postrhinoplasty.17 The presence of the levator septi nasi muscle was doubted and described as a fibrofatty tissue seen between the medial crura, especially in cleft patients.18 Again, these variable anatomical and functional descriptions increased the reliability of the UBSA even with the open rhinoplasty approach.

The authors implemented many surgical steps to maintain the NTP and to rotate the NLA cephalically. In hyperactive NTD cases, the authors noticed improvement of the aesthetic outcome and an increase in the patients’ satisfaction after using the UBSA to manipulate the NTDs. Evidently, the aesthetic outcome in our study was successfully maintained along the follow-up period that extended up to 3 years in some cases. This outcome supported the previous studies, which presented the NTDs as a major cause behind the delayed deterioration of the aesthetic outcome in patients with hyperactive NTDs.19,20,21 These previous studies used the changes in the NTP and the NLA as an objective tool to evaluate the aesthetic outcome after closed rhinoplasty. Certainly, measuring both parameters in an animated pause would represent a more objective evaluation tool. However, we had difficulty standardizing the magnitude and the type of smile during pre/postoperative occasions. Moreover, the enervation difference between the voluntary and spontaneous smile can be considered as another limiting factor to use animated pauses as an objective evaluation tool.

Previous postrhinoplasty studies attributed the dynamic nasal tip droop to the persistent hyperactivity of the NTDs, which was overlooked during surgery.19,20 In the current study, we believe that hyperactive NTDs can favor the scarring forces, which act in a less projecting vector causing deterioration of the initial postoperative NTP even in static pause. Most of the scar remodeling phase occurs during the first 1 to 2 years postoperatively. Still,
the remodeling phase may extend for years; therefore, longer follow-up periods are needed to validate the long-term results. Consequently, the sample size and follow-up periods were our main study limitations. More studies, including a bigger sample size and longer follow-up periods, would produce more solid data and conclusions, especially if a comparative group with appropriate blinding methodology is included in the same study.

Some considered the disruption of the DSNm as a sacrifice of the function in favor of nasal aesthetics, as the NTDs’ main function is to dilate the nostrils that facilitate nasal air inflow. Theoretically, the disruption of the NTDs may cause postrhinoplasty functional disturbances, and this theory should be supported with more rhinometric studies in the future.

The UBSA was very beneficial in our study as a hidden incision with minimal morbidity, and at the same time, combining the UBSA with the open rhinoplasty technique showed no significant increase in the incidence of complications or the operative time. Generally, the UBSA can be used in open or endoscopic-assisted rhinoplasty techniques, especially in revisional and posttraumatic cases.

The UBSA gives direct visualization of the nasal bones and helps to perform objective lateral osteotomies for better nasal width control. Moreover, the UBSA provides a sufficient field to use different instruments such as the oscillating saw, electric burrs, or piezoelectric instruments. Using the UBSA in lateral osteotomy of the nasal bone through the subperiosteal plane results in less edema and ecchymosis postrhinoplasty. This is attributed to the preservation of the supra-periosteal vessels and lymphatics, better nasal bone support, and better blood drainage to the mouth rather than nasal mucosa. Additionally, an internal noninterrupted continuous lateral osteotomy can be performed without nasal mucosal incisions, which may scar the internal nasal valve area and reduce nasal air inflow postoperatively. Also, the UBSA gives direct access to the ANS, columella, and caudal septum, which in well-trained hands can be adequate to perform many steps of septorhinoplasty, as it gives direct access to fix the septum to the ANS and to manage the maxillary crest spurs objectively.

**CONCLUSIONS**

The combination of the UBSA with open rhinoplasty showed no significant increase in incidence of complications or the operative time. Moreover, this combination resulted in objective visualization and manipulation of the NTDs, and this was proved by the maintained NTP and NLA in an aesthetic optimum value during the follow-up period. We believe that UBSA can be combined safely with
open rhinoplasty as a reliable hidden approach to manipulate hyperactive NTD cases.

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PATIENT CONSENT
Patients provided written consent for the use of their images.

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