The Pull-up Spreader High (PUSH) Technique for Nasal Tip Support

Dario Bertossi, MD; Claus Walter, MD; and Pier Francesco Nocini, MD

Abstract

Background: Nasal tip depression is associated with nasal valve collapse. The pull-up spreader high (PUSH) technique was developed to enlarge the nasal dorsum and upwardly rotate and define the nasal tip by lifting the domes.

Objectives: The authors reviewed a case series to assess the long-term effectiveness of the PUSH technique in improving nasal airflow and aesthetic outcomes.

Methods: This retrospective study included 50 consecutive cases of PUSH rhinoplasty. Objective (acoustic rhinomanometry) and subjective (patient questionnaire) evaluations of the stability of the aesthetic result and improvement of airflow were conducted before and 3 years after PUSH rhinoplasty.

Results: PUSH rhinoplasty resulted in long-term stability of the aesthetic effect. All patients had pleasing aesthetic results and a general improvement in the nasal airway. When the degree of nasal obstruction was scored from 1 (greatest obstruction) to 10 (least obstruction), 22 patients rated their nasal function improved to a score of 10 and 28 patients to a score of 8. Rhinomanometry indicated that only 1 patient had worsened nasal airflow.

Conclusions: The PUSH technique enables stable upward rotation and improved definition of the severely depressed nasal tip through an open approach.

Level of Evidence: 4

Keywords

nasal tip, nasal surgery, nasal autospreaders, pull-up spreader high

Accepted for publication March 19, 2014.

Moderate to severe depression of the nasal tip is associated with internal malfunction of the nasal valve. Reversible factors that jeopardize nasal breathing, such as altered nasal cycle and vasomotor rhinitis, can be treated with medical therapy. Structural defects, including deviated septum and collapse of the internal nasal valve, require surgical treatment. The size of the nasal airway depends on the width and contour of the nasal septum and inferior turbinate and on the position and stability of the lateral nasal wall during pressure changes associated with ventilation. Instability or malfunction of the internal valve typically is treated by reconstructing the roof of the middle nasal vault with spreader grafts. In contrast, external valve instability requires alar or lateral wall support with cartilage or bone grafts. In 1969, Walter described a method for increasing an overly acute nasal valve angle by means of a composite skin-cartilage graft derived from the cephalic portion of the lower lateral cartilages and placed between the junction of the upper lateral cartilage and the septum. In 1984, Sheen described a method for reconstructing the roof of the middle nasal vault. Boccieri developed a method of attaching cartilaginous spreaders to the vestibular mucosa of the

Dr Bertossi is an Associate Professor and Dr Nocini is the Chief of the Department of Surgery, Chief of the section of Maxillo Facial Surgery at the University of Verona in Italy. Dr Walter is retired from private practice in facial plastic surgery in St Galle and Heiden, Switzerland.

Corresponding Author:

Dario Bertossi, Policlinico GB Rossi, Piazzale LA Scuro 37134, Verona, Italy.
E-mail: dario.bertossi@univr.it
lateral crura without bringing the skin between the nasal septum and the upper lateral cartilages.

In this study, we describe a novel surgical approach that improves upon the techniques of Walter and Boccieri. Our method involves rotation between the nasal septum and the triangular cartilages only in the cephalic portion of the lateral crura and retains attachment of the crura to the domes. This technique achieves more stable upward tip rotation and slight enlargement of the nasal dorsum in patients affected by light to moderate nasal obstruction and drooping nasal tip.

METHODS

This retrospective review comprised 50 consecutive patients who underwent rhinoplasty at the University of Verona, Italy, from January 2005 to December 2008. All patients presented with downward-rotated nasal tip, dorsal hump, and thin skin. None of the patients had severe nasal dorsum asymmetry. Clinical analyses were performed, including physical examinations, and 10 photographs were taken of each patient in the traditional views. Inclusion criterion was primary rhinoplasty; exclusion criteria were severe crooked nose deformity, severe nasal obstruction, coanal atresia, and allergies. The study was done in accordance to the Declaration of Helsinki, and all patients provided informed consent. All patients underwent open approach lateral oblique osteotomies. Mean follow-up time was 30 months (range, 24-36 months).

Nasal obstruction was measured by anterior mask rhinomanometry and the Costantian method at 10 days preoperatively and 8 months postoperatively (ie, assessment after 6-month interval). At the same office visits, patients completed an anonymous questionnaire rating their nasal obstruction from 1 (greatest obstruction) to 10 (least obstruction). The questionnaire is reproduced in Appendix A, which may be viewed at www.aestheticsurgeryjournal.com.

Surgical Technique

After columellar skin incision and elevation of the soft tissues, the upper portion of the lateral crus was split and rotated medially, separating it from the vestibular mucosa without completely interrupting its connection to the dome (Figure 1). The upper lateral crus then was inserted into a precise pocket between the nasal septum and the upper lateral cartilage. After the nasal septum was undermined, the cartilages of the nasal dome and tip were lifted and fastened directly to the lateral walls and the upper lateral cartilages with 2 polydioxanone 5-0 sutures (Ethicon, Somerville, NJ) (Figure 2). In some cases, the third suture was inserted, not affecting the function, but providing only a better aesthetic result, whereas the upper laterals were too wide under the lateral cruras. The cephalic portion of the lateral crus functioned as an alar spreader. Because the lateral crus remained attached to the dome, the graft could be positioned higher to enable greater upward rotation of the nasal tip. Twisting the dome clockwise in the frontal plane produced an improved dome shape. This maneuver, denoted the pull-up spreader high (PUSH) technique, narrows the nasal tip by lifting the strips of the lateral crura medially. The superficial dorsal part of the lateral crus subsequently can be adjusted by

Figure 1. (A) Lines of sectioning with a no. 15 scalpel blade. (B) Upward rotation of the cephalic portion of the lateral crus, as demonstrated in a 33-year-old woman. (C) Fixation of the cephalic portion of the lateral crus to the nasal septum with polydioxanone 5-0 sutures (Ethicon).
scalpel, creating a supratip break. The alar spreaders widen the nasal dorsum, but they may not overlap sufficiently over the thick portion of the foundation. In this case, conventional cartilage grafts can be added to camouflage residual defects that might emerge in the long-term. Then we applied the cutaneous (nylon 7-0; Prolene, Ethicon) and mucosal (polygalactine 6-0; Vycril, Ethicon) sutures. Nasal medication was changed on day 3 and removed on day 7 postoperatively. Nasal medication was done with Steri-Strips and Acquaplast. Clinical examinations were performed on days 3, 7, 14, and 30 postoperatively and at 6-month intervals thereafter. The clinical examination was done extranasally evaluating the nasal shape and postoperative edema. Internal nasal examination was done with the nasal speculum and the handheld Storz nasal endoscope.

RESULTS

From January 2005 to December 2008, 50 consecutive patients (24 men, 26 women) underwent rhinoplasty to treat light to moderate collapse of the internal nasal valve. Of these, 45 patients (90%) were treated with the PUSH technique alone. The other 5 patients were treated with the same technique, adding small (<3 mm) cartilage grafts to improve aesthetic result on defective areas. The mean age of the study group was 32.2 years (range, 23 to 55 years). The results of anterior nasal mask rhinomanometry and the Costantian method indicated that 18 patients had light nasal obstruction (LNO) and 32 had moderate nasal obstruction (MNO) preoperatively (Table 1). LNO had pre-surgical measurements of 450 ± 50 mL/14 s for quiet breathing and 1010 ± 160 mL/14 s for forced inspiration. MNO presurgical measurements (mean ± SEM) were 328 ± 50 mL/14 s for quiet breathing and 1010 ± 160 mL/14 s for forced inspiration.

The results of the nasal obstruction questionnaire (Appendix A) indicated that 22 patients (18 with preoperative LNO, rated as 7 or 8 in patient questionnaire; 4 with preoperative MNO, rated as 5 or 6 in patient questionnaire) had improved nasal function from an average rating of 7 preoperatively to an average rating of 10 postoperatively, and 28 patients improved from an average rating of 6

Figure 2. (A) Intraoperative view of a lateral crus that is rotated upward and inserted between the nasal septum and alar cartilages in a 33-year-old woman. (B) Front view after completion of the pull-up spreader high technique. Nasal dorsum refinements were performed subsequently.
preoperatively to an average rating of 8 postoperatively (Table 2). Rhinomanometry results for patients with MNO showed no worsening of nasal airflow; presurgical measurements (mean ± SEM) were 328 ± 50 mL/14 s for quiet breathing and 1010 ± 160 mL/14 s for forced inspiration; postsurgical measurements were 540 ± 76 mL/14 s for quiet breathing and 1389 ± 210 mL/14 s for forced inspiration. Patients with LNO had presurgical measurements of 450 ± 50 mL/14 s for quiet breathing and 1010 ± 160 mL/14 s for forced inspiration and had postsurgical measurements of 610 ± 76 mL/14 s for quiet inspiration and 1858 ± 210 mL/14 s for forced inspiration.

Good aesthetic results were maintained for 3 years of follow-up, and only 5 of 50 patients were lost to follow-up (10% attrition rate; representative results, Figures 3 and 4). All cases of drooping tip were improved with no complications during 3 years of follow-up. There were no cases of supratip or polly beak deformity.

**DISCUSSION**

The removal of a strip of the cephalic lateral crura of the alar cartilage is a common maneuver for reducing volume in the nasal tip by means of a closed or open approach. This technique lifts the nasal tip and reduces its downward rotation by secondary scarring. The nasal tip then is defined by resecting portions of the cartilage in this area. Any change in the anatomic balance between alar and lateral cartilages can lead to valve collapse and nasal airway obstruction that necessitate spreaders and/or alar batten grafts. Traditional spreader grafts are positioned to distance the lateral wall from the septum, thereby improving internal valve action on inspiration. Typically, these grafts are 1 to 4 mm thick and may become necessary in hump resections of 1.5 to 3 mm or for nasal dorsum asymmetries.

The first surgical attempt to correct nostril collapse with pedicled alar cartilages was performed by Walter in 1969. This author separated the upper triangular cartilages from the septum and secured a composite skin-cartilage graft between the nasal septum and the upper lateral cartilage with a 4-0 nylon suture. The composite graft was composed of skin and cartilage from the chondrocutaneous helical rim and was applied to the alar base or nostril margin to correct or prevent functional respiratory disorders. When insufficient, the lining at the level of the intercartilaginous incision was supplemented by interposition of a chondrocutaneous composite graft from the ear concha. Specifically, a central portion of the concave cutaneous side of the graft was de-epithelialized to encourage the graft to assume the shape of the dorsal septal border. The skin margins of the graft then were carefully sutured to the edge of the vestibular skin and to the mucosa of the cavity at the expanded intercartilaginous incision on both sides. By this method, the convex cartilaginous part of the graft replaced the missing portions of both upper lateral cartilages (Figure 5).

Boccieri developed a technique involving an inverted v-shaped columellar incision and 2 marginal incisions of the nasal vestibule. In this approach, a portion of the lateral crus is detached from the mucus membrane below while retaining a medial cephalic portion to preserve a fibromucous connection between the 2 strips of alar cartilage (mini-spreaders grafts) and the lateral crus (Figure 6). This connection enables upward traction of the nasal tip complex. The 2 mini-spreaders grafts are rotated centrally and vertically, attached in 2 pockets on either side of the dorsal septum, and secured with 2 u-shaped 5-0 Vicryl sutures (Ethicon). The amount of tip rotation can be adjusted relative to the position of the graft along the septum; that is, the higher the placement of the mini-spreaders grafts on the septum, the greater the degree of tip rotation. Following placement of marginal (5-0 Vicryl; Ethicon) and columellar (6-0 Prolene; Ethicon) sutures, anterior nasal packing is inserted. After 24 to 48 hours, nasal packing is removed, and a splint is placed for external containment. Boccieri reported a general aesthetic improvement in the preoperative nasal deformity in all cases. Rhinomanometric results indicated an improvement in mean nasal airflow, and no patients had worsened airflow. The mean ± SEM nasal flow for the group was 308 ± 34 mL/14 s during

---

**Table 1. Patient Age and Nasal Obstruction Before Rhinoplasty With the Pull-up Spreader High Technique**

<table>
<thead>
<tr>
<th></th>
<th>Men (n = 24)</th>
<th>Women (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, y (range)</td>
<td>33.1 (24–58)</td>
<td>30.5 (23–55)</td>
</tr>
<tr>
<td>No. of patients with preoperative LNO</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>No. of patients with preoperative MNO</td>
<td>19</td>
<td>13</td>
</tr>
</tbody>
</table>

Abbreviations: LNO, light nasal obstruction; MNO, moderate nasal obstruction.

---

**Table 2. Patient Evaluation of Degree of Nasal Obstruction**

<table>
<thead>
<tr>
<th></th>
<th>Men (n = 24)</th>
<th>Women (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNO Presurgical = 7</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Postsurgical = 10</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>MNO Presurgical = 6</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>Postsurgical = 8</td>
<td>16</td>
<td>12</td>
</tr>
</tbody>
</table>

Abbreviations: LNO, light nasal obstruction; MNO, moderate nasal obstruction.

---

At 10 days preoperatively and 8 months postoperatively, patients evaluated their degree of nasal obstruction on a scale of 1 (greatest obstruction) to 10 (least obstruction).

Including 4 with MNO.
Figure 3. This 50-year-old man presented with droopy nasal tip, irregular nasal dorsum, thin skin, slight nasal hump, and complaints of slight nasal obstruction. (A, C, E) Preoperative. (B, D, F) The patient 3 years after undergoing rhinoplasty with the pull-up spreader high technique. Note upward tip rotation and improved nasal dorsum shape, better nasal labial angle proportion, and aesthetic improvements.
quiet inspiration and 1034 ± 107 mL/14 s during forced inspiration. The mini-spreader grafts restored valve function with an approximate 1.7-fold increase over preoperative flow. Mean postsurgical values were 523 ± 64 mL/14 s during quiet inspiration and 1759 ± 1.57 mL/14 s during forced inspiration.

The PUSH technique requires an incision of 6 to 9 mm along the cephalic portion of the lateral crus. Once freed from the mucosa, the lateral crus is rotated and inserted between the nasal septum and upper lateral cartilage and remains attached to the dome, enabling stable upward rotation of the nasal tip. The domes are brought closer together to provide further definition and slight dorsal widening without affecting nasal tip projection. The PUSH technique should not be performed when the cephalic trim is <3 mm or when the patient has a weak lateral crus. A supratip break can be created after PUSH fixation, and the area posterior to the domes can be remodeled by scalpel.

Compared with the techniques of Walter and Boccieri, the PUSH technique is more effective in improving nasal airway function because it lifts the nasal tip and widens the internal nasal valve. To achieve the desired thickness of the nasal dorsum and enlarge the nasal valve, we may insert a traditional spreader graft. The PUSH maneuver creates a stable nasal valve and supported tip while avoiding cartilage resections and excessive scarring of empty areas (ie, areas without cartilaginous support), an outcome associated with Walter’s technique that may necessitate insertion of a composite graft. The PUSH technique recreates the major tip support mechanism that is damaged during surgery. When compared with the Boccieri technique, the PUSH maneuver provides better tip definition because it retains a cartilaginous junction. In contrast, the junction of the cephalically trimmed cartilage is mucous in the Boccieri method. A cartilaginous junction is more stable over time, as demonstrated by our aesthetic outcomes that were maintained for 3 years of follow-up. The PUSH technique involves no mucosal retraction, preserves the lower lateral-upper lateral soft tissue junction, avoids alteration of the nasal valve, and effectively manages the tip-defining points, which can be repositioned by pulling the lateral crura strip onto the nasal septum. When necessary, we also can interrupt the lateral crura for slight nasal shortening and overlap after trimming the upper lateral crura.

The Boccieri technique appears to be indicated for reshaping the nasal tip when there is no deviation of the

Figure 3. (continued) This 50-year-old man presented with droopy nasal tip, irregular nasal dorsum, thin skin, slight nasal hump, and complaints of slight nasal obstruction. (A, C, E) Preoperative. (B, D, F) The patient 3 years after undergoing rhinoplasty with the pull-up spreader high technique. Note upward tip rotation and improved nasal dorsum shape, better nasal labial angle proportion, and aesthetic improvements.
Figure 4. This 30-year-old woman presented with a deviated droopy nasal tip. (A, C, E) Preoperative photographs showing overprojected nasal tip, flat columella, and slight hump. (B, D, F) The patient 33 months after rhinoplasty with the pull-up spreader high technique. Note improved shape of the nasal tip, which appears shorter and straightened with enhanced brow-tip aesthetic lines. Tip projection is improved, and a more pleasing nasal profile with satisfactory nasal-labial relationships is achieved.
nasal septum. It may be applicable to narrow nose syndrome (ie, short nasal bones, long and weak upper lateral cartilages, and thin skin) and respiratory disorders because mini-spreader grafts, although small, produce a major functional effect by enlarging the area of the nasal valve. A contraindication of the Boccieri technique is excessively thin or narrow lateral crura. If present, this technique poses a risk of fracturing the cartilage during harvesting and offers negligible functional benefits.

The PUSH technique represents a significant innovation compared with previous techniques. It does not create a vestibular skin defect, and the cartilage is not interrupted and remains attached to the domes. The PUSH technique may be applied to cases of severe drooping tip associated with narrow nose syndrome or to nasal valve malfunction to achieve significant and stable upward rotation of the nasal tip and improved airway obstruction. The connection between the dome and the cephalic portion of the lateral crus opposes the surgical movement of the cartilaginous structures. These opposing forces are proportional to the degree of rotation and are caused by interruption of the tip support mechanisms. Patients who have been treated with the PUSH technique occasionally require nasal spreaders (10% of patients) to avoid impacting any other graft or nasal function outcomes. When indicated, spreader grafts and alar batten grafts can be included. Open access, thin skin, and tip remodeling can precipitate nasal tip droop
over time. Older techniques that rotate alar cartilages may be prone to relapse and nasal tip drooping. The PUSH technique achieves nasal tip stability during the first 18 months (ie, the time where we observed nasal stability). Potential limitations (ie, potential reduced effects of the aesthetic result) of the PUSH technique include very thin cartilages and severe secondary nasal defects with scarring. Clinical examination is recommended to identify the ideal procedure for each patient. We report here that the PUSH technique produces encouraging aesthetic and functional outcomes.

CONCLUSIONS

The PUSH technique is not a substitute for traditional spreader grafts, but it can be an effective option in cases of narrow nose syndrome or cleft lip/secondary nose associated with a double dome and severely downward-rotated nasal tip. The PUSH maneuver enables nasal spreading and stable upward tip rotation without total excision of the nasal cartilages.

Acknowledgments

The authors thank Armando Boccieri, MD, for providing editorial guidance.

Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Funding

The authors received no financial support for the research, authorship, and publication of this article.

REFERENCES