Prospective Evaluation of Quality-of-Life Improvement After Correction of the Alar Base in the Flaccidly Paralyzed Face

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**IMPORTANCE** Nasal valve collapse caused by facial palsy is an often overlooked but disturbing sequela of flaccid facial paralysis.

**OBJECTIVE** To prospectively study the effect of fascia lata sling placement for correction of external nasal valve compromise in patients with flaccid facial paralysis, using a validated disease-specific quality-of-life outcome survey.

**DESIGN, SETTING, AND PARTICIPANTS** This was a prospective study of 68 patients from March 2009 to December 2013 who underwent fascia lata sling placement for correction of external nasal valve compromise.

**INTERVENTION** Fascia lata sling placement for the correction of external nasal valve compromise.

**MAIN OUTCOME AND MEASURE** Nasal Obstruction Symptom Evaluation (NOSE) scale.

**RESULTS** Sixty-eight disease-specific quality-of-life determinations were performed using the NOSE scale. Ratings were ascertained preoperatively and postoperatively. Sixty patients completed a NOSE scale prior to surgical intervention, and 40 completed the survey after intervention. There was a statistically significant difference in NOSE scores after fascia lata sling placement. The mean preoperative NOSE score was 37.6 (27.1), and the mean postoperative score was 16.6 (17.37) (Wilcoxon signed-rank test; \( P < .001 \)). All patients had improvement in their nasal obstruction, which persisted uniformly in follow-up.

**CONCLUSIONS AND RELEVANCE** The nasal valve is a zone that has historically been neglected, despite the fact that a highly effective surgical solution has existed for decades. We highlight the significance of nasal valve dysfunction in patients with flaccid facial paralysis, demonstrate a quantitative benefit in disease-specific quality of life after fascia lata sling placement for external nasal valve compromise, and suggest an updated treatment algorithm. This method offers a predictably successful, straightforward surgical solution to an overlooked functional problem in the patient with flaccid facial paralysis.
Patients with facial paralysis benefit from a zonal assessment of facial function, ensuring that no single region of the face is overlooked. It is tempting to focus exclusively on the most obvious area of asymmetry or to neglect an isolated asymmetry when the remaining zones are intact. This can lead to undertreatment of the more subtle symptoms that patients with flaccid facial paralysis experience. A notoriously overlooked problem, which is commonly present in patients with midfacial flaccidity, is nasal obstruction. This symptom is caused by flaccidity of the lateral nasal wall and inferior-medial displacement of the alar base. Obvious on frontal and nasal base view photographs and evident during nasal evaluation both at rest and with gentle inspiration, symptoms in this zone must be thoroughly evaluated and treated.

Nasal valve collapse due to nasal trauma, heredity, and complications from previous nasal surgery can be caused by a narrowed external and/or internal nasal valve and/or collapse of the upper lateral cartilage and/or ala on inspiration. However, in patients with flaccid paralysis of the midface, nasal valve collapse is caused by lack of tonic muscular support to the entire lateral nasal wall, especially at the level of the alar base. This causes both external nasal valve (ENV) narrowing and collapse during inspiration. Correction of the nasal valve is commonly performed in functional rhinoplasty by using alar batten grafts, lateral crural struts, lateral crural flaring sutures, and/or spreader grafts. These grafts are very effective at improving the function of the internal and/or ENV in patients without facial paralysis; however, these procedures do not adequately address inferior and medial displacement of the ala in patients with facial paralysis. Our method of ENV restoration in the patient with facial paralysis involves placement of a fascia lata sling from the accessory cartilages of the ala to the temporalis fascia, either as an isolated procedure, or in combination with other facial reanimation procedures.

Methods

A prospective study was performed of 68 patients who presented to our multidisciplinary facial nerve center setting from March 2009 to December 2013 and who were treated for nasal valve collapse with a fascia lata sling. All patients underwent preoperative interview and clinical assessment of the nasal valve. Nasal examination revealed inferomedial displacement of the alar base at rest and on gentle inspiration, responsive to superolateral digital displacement of the alar base. Patients had either isolated midfacial flaccidity, incomplete facial paralysis, or complete facial paralysis, although all had midfacial flaccidity rather than hypertonicity. Patients who complained of nasal obstruction were scheduled for fascia lata sling to the ENV at the time of their facial reanimation surgery. These patients were asked to complete the Nasal Obstruction Symptom Evaluation (NOSE) scale preoperatively and postoperatively. The NOSE scale has 5 items, each scored from 0 to 5. The total score range is 0 to 100, with 0 indicating normal and 100, severe nasal obstruction.

This study was approved by the institutional review board at the Massachusetts Eye and Ear Infirmary. Informed consent for the study was waived because the surveys are a part of routine clinical care. Patients were not compensated for their participation.

Similar surgical techniques have been described in less detail previously. Figure 1 illustrates the procedure. Briefly, with the patient under general anesthesia, the distance from the ala to the helical root is measured, and a graft measuring 2 cm longer is harvested. An incision is made in the lateral thigh and carried through the soft tissue until the tensor fascia lata is encountered. Blunt finger dissection elevates the soft tissue away from the fascia. Then, 2 vertically oriented nicks are made in the fascia, 1 cm apart and parallel to one another. A scissors is introduced through each nick and pushed both superiorly and inferiorly, a distance corresponding to the desired length of the graft, and a short transverse incision is made at both the superior and inferior extremes of the wound to remove the segment of fascia lata. Lighted retractors facilitate the harvest and limit the length of incision required. In the face, a temporal incision is made extending into the preauricular area, exposing the true temporalis fascia. A second incision is made in the alar crease, and a narrow subcutaneous tunnel is created between the temporal incision and the alar incision to accommodate the graft. Next, the fascia is introduced into the tunnel, and the medial edge of the graft is sewn to the sesamoid cartilages of the ala with a combination of 4-0 Prolene and 4-0 Vicryl interrupted sutures. The alar incision is closed prior to lateral graft placement.
inset. The lateral edge of the graft is then secured to the true temporalis fascia using the same inset sutures, with care to appropriately lateralize the ala, thereby opening the ENV. It is important to use both a braided absorbable suture to provide soft-tissue support during the initial healing phase, and a permanent suture, to provide long-term support. Mild overcorrection is desired to account for the slight relaxation that occurs in the early postoperative period. The temporal incision is closed with 4-0 nylon suture, and a light compressive dressing is applied.

Results

Sixty-eight patients underwent fascia lata sling reconstruction for facial paralysis–associated ENV compromise. Of these patients, 37 completed preoperative and postoperative questionnaires and hereinafter are referred to as the responders. Thirty-one patients did not respond to the postoperative survey and are referred to as nonresponders. The average patient age was 49.9 years (range, 18-81 years) in the responder cohort and 51.2 years (range, 19-86 years) in the nonresponder cohort. Nineteen patients in the responder cohort were male (51%), and 18 (49%) were female. Thirteen patients (42%) were male, and 18 (58%) were female in the nonresponder cohort (Table). The Table also summarizes the etiology of facial paralysis in our patient population separated by cohort. Significant differences in age, sex, etiology, and surgery performed were not found between the cohorts (Table). Three patients had isolated buccal branch injuries, 1 had incomplete unilateral facial paralysis (House-Backmann grade, 4/6), and 64 had complete unilateral facial nerve paralysis. Twenty-five patients (37%) had only a fascia lata sling to the ENV; 38 (56%) also had a free gracilis transfer, and 5 (2%) had a temporalis muscle transfer at the time of the fascia lata sling. All patients in this series reported clinically significant improvements in their nasal airway on postoperative interview. All patients demonstrated less collapse of the ENV at rest and during inspiration on postoperative nasal examination. Figure 2 and Figure 3 demonstrate the preoperative and postoperative appearance of a patient with flaccid facial paralysis who underwent a fascia lata sling with correction of ENV dysfunction. The mean preoperative NOSE score was 37.6 (27.1), and the mean postoperative score was 16.6 (17.37). A significant improvement in NOSE scores was demonstrated postoperatively ($P < .001$; Wilcoxon signed-rank test).

Three patients had postoperative complications. One patient with an initially good result experienced graft loosening from the temporalis fascia that required resecuring the sling to the temporalis fascia in a second operation, with no further problems. Another patient developed a granulomatous reaction to the suture material at the medial inset site, which responded to office debridement. In addition, a patient developed a generalized allergic reaction with bilateral facial edema, possibly from topical ointment. This resolved with discontinuation of the ointment.

Discussion

Facial asymmetry, whether from an isolated branch injury or from complete failure of the facial nerve, can have a consid-
erable impact on patient quality of life (QOL). Thorough evaluation requires systematic inspection of all facial regions.\textsuperscript{1} Deficits in the periorbital region require immediate attention because of the risk of corneal exposure. Weakness in the oral commissure and the lower lip regions are generally obvious because of the resultant oral incompetence, articulation difficulties, and inability to smile. Likewise, eyebrow region abnormalities are usually noticeable because of eyebrow height discrepancy and possible visual field deficits. However, evaluation of nasal valve function must be deliberately included to ensure that this important aspect of facial function not be overlooked.

Nasal obstruction is known to decrease QOL. Recently, the NOSE scale, a validated and reliable instrument, has been used to demonstrate that septoplasty and functional rhinoplasty result in notable improvement in disease-specific QOL and higher patient satisfaction.\textsuperscript{8-11} Patients undergoing facial nerve transection with immediate suture suspension of the ENV were observed to have lower postoperative NOSE scores than patients in whom suture suspension was not performed.\textsuperscript{12} However, to our knowledge, this report is the first to demonstrate a statically significant improvement in NOSE scores (Wilcoxon-signed rank test; \(P < .001\)) postoperatively in patients with facial paralysis after nasal valve correction with a fascia lata sling.

It has been well established that improving nasal airflow in patients with nasal valve collapse significantly improves QOL.\textsuperscript{8-10} Patients with midfacial weakness frequently report severe symptoms from nasal obstruction, although often they do not realize that it is an addressable problem and therefore may not bring it to the facial reanimation team’s attention unless specifically questioned.

The goal in nasal valve surgery is to improve a patient’s subjective feeling of nasal function. Many measures have been used to try to objectively measure nasal valve function, including computed tomography, acoustic rhinometry, and rhinometry; however, inconsistent results have been obtained, compared with measures for patient satisfaction and physical examination.\textsuperscript{5,13-17} Therefore, neither acoustic rhinometry nor rhinomanometry was used in this study. Instead, patient interview, nasal examination, and NOSE survey were used. The subjective improvement in nasal function was usually noted by the patient in the immediate postoperative period.

Patients with facial paralysis involving the midface have an atonic, inferomedially displaced ala that requires elevation and lateral displacement to improve nasal function.\textsuperscript{6} This movement is not achieved using the procedures most commonly used to improve traditional nasal valve collapse, such as alar batten grafting, lateral crural strut placement, introducing lateral crural flaring sutures, and/or spreader grafts.\textsuperscript{3-5} Therefore, these techniques do not adequately treat the nasal valve collapse seen in facial paralysis.

The ENV has been most commonly described as the cutaneous and skeletal support of the mobile alar wall, which, when excessively weak, requires support by cartilage or bone grafts to improve valvular stability.\textsuperscript{18} Although correct, this definition does not fully address the importance of the alar muscles in function of the ENV. Lack of alar muscle function considerably increases nasal resistance, especially at higher ventilation rates\textsuperscript{19,20} and, perhaps even more important, unfavorably affects the resting nasal tension that is required to open the nasal airway.\textsuperscript{20} The technique we describe herein provides superior and lateral displacement of the ala necessary for effective valve restoration in the paralyzed face.

Autologous fascia lata has distinct advantages over synthetic graft materials for static facial suspension. The low risk of infection and negligible extrusion rate make it a superior option to artificial materials.\textsuperscript{21,22} In our study, there were no postoperative infections, and only a single patient required tightening of the sling. Scar, hematoma, infection, and pain with walking (usually for \(<1\) week) are reported complications of fascia lata harvesting.\textsuperscript{23} However, the disadvantages are outweighed by its superiority with respect to infection and extrusion, particularly in irradiated beds. Static facial suspensions using expanded polytetrafluoroethylene have been plagued with a high complication rate, including infection and graft failure secondary to stretch, even when the graft is prestretched.\textsuperscript{24,25} Acellular human dermis carries a small risk of disease transmission and can stretch out over long-term follow-up.\textsuperscript{25} In our experience, the minor donor site morbidity of fascia lata is offset by the long-term success of its use in static reconstruction of different zones of the paralyzed face.

In our study, patients with flaccid facial paralysis were given the NOSE survey prior to nasal valve correction and postoperatively. A statistically significant improvement in NOSE scores was demonstrated, and this highlights the utility of addi-
ing ENV correction to the comprehensive treatment of patients with flaccid facial paralysis to improve disease-specific QOL. In the future, the NOSE surveys will be provided to all patients with flaccid facial paralysis presenting to the Facial Nerve Center. This will permit the use of the NOSE survey as a possible surgical criterion for ENV repair. While the current study was prospective, used validated disease-specific, patient-reported outcomes measures, a standard treatment algorithm, and had a follow-up rate of 95%, its shortcomings are that it was not randomized, it is a single institution experience, and did not correlate subjective outcome measures to objective measures.

**ARTICLE INFORMATION**

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**Study concept and design:** Lindsay, Bhama.

**Acquisition, analysis, or interpretation of data:** Lindsay, Bhama, Hohman, Hadlock.

**Drafting of the manuscript:** Lindsay, Hohman.

**Critical revision of the manuscript for important intellectual content:** Lindsay, Bhama, Hadlock.

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**Additional Information:** Dr Bhama is now with the Department of Otolaryngology, Alaska Native Medical Center, Anchorage.

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**REFERENCES**


**Conclusions**

Facial paralysis–associated nasal valve compromise is a commonly overlooked feature in flaccid facial paralysis and must be specifically addressed in the examination of the patient with facial paralysis. Treatment of the nasal valve with a fascia lata sling is a straightforward, safe, and highly effective procedure to restore nasal airflow and thus improve the QOL in patients with facial paralysis. This technique must be considered in patients with flaccid midfacial zones who respond to a Cottle maneuver during the physical examination.