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Refinements in Nasolabial Fold Reconstruction for Facial Paralysis

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Objectives/Hypothesis: The objective of this study was to describe a methodology for creation of a nasolabial fold in patients with facial paralysis and to report patient-reported outcome measures following this procedure.

Study Design: Retrospective case series.

Methods: All patients who underwent nasolabial fold modification at our institution since July 2010 were included in our analysis. Patient demographics and characteristics of their facial paralysis were noted. Preoperative Facial Clinimetric Evaluation scores were compared with postoperative scores to quantify outcomes. Pre- and postoperative photos were then presented to an observer for ratings of overall midfacial appearance.

Results: Thirty-one patients were included in the review. Most of the patients were male. The average onset of paralysis was 50 years, and the average age at time of surgery was 61 years. The majority of patients had flaccid paralysis, with 10% of patients having synkinesis. Most patients presented with complaints of oral incompetence or drooling and generalized facial asymmetry. Facial Clinimetric Evaluation scores ($P<.004$) and overall midfacial appearance ($P<.05$) improved significantly following surgery.

Conclusions: The nasolabial fold is an important aesthetic component of the face commonly affected in patients with facial paralysis. We demonstrate quantitative improvement in quality of life scores and aesthetic appearance following nasolabial fold refinement and describe the procedure in depth.

Key Words: Facial paralysis, facial nerve, nasolabial fold, reanimation.

Level of Evidence: 4.

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INTRODUCTION

The nasolabial fold (NLF) is an important aesthetic landmark in the face separating the cheek from the upper lip. It is comprised of fibrous tissue into which the levator muscles of the upper lip attach.[1] With age, the NLF becomes pronounced, and can be attenuated by various techniques.[2] Patients with flaccid facial paralysis often present with effacement of the NLF, which can result in obvious asymmetry. During the first stage of a normal smile, the upper lip is pulled toward the nasolabial fold, followed by zygomaticus major and levator labii superiorus contraction, which pulls the entire lip, fold, and cheek superiorly.[1] Thus, patients with flaccid facial paralysis who undergo dynamic rehabilitation of the oral commissure may still appear asymmetric if the NLF is not recreated.

Various methods for restoring the NLF have been described,[3–6] but oftentimes require the use of synthetic material,[5] muscle transfer,[6] or fail to address the oral commissure and external nasal valve (ENV). We describe a method for restoration of the NLF using fascia lata that can be performed in conjunction with static suspension of the oral commissure and/or ENV, and highlight our experience with the procedure over the past 3 years.

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MATERIALS AND METHODS

Institutional review board approval was obtained from the Massachusetts Eye and Ear Infirmary Human Studies Committee. All patients who underwent NLF modification at our institution from July 2010 to January 2014 were included in this review. Demographic data including gender and age were recorded. Etiology of facial paralysis and type of facial paralysis (i.e., flaccid versus hypertonic) were noted. The age of onset of the facial paralysis as well as the age at time of NLF modification were also recorded. Each patient's chief complaint was abstracted from the progress notes.

Patient Selection

Patients with flaccid facial paralysis who were not candidates for or declined dynamic rehabilitation of the oral commissure and with significant effacement of the NLF were typically candidates for static surgery. Patients with inferior malposition of the oral commissure at rest are offered oral commissure elevation. Those with subjective nasal obstruction and anatomic collapse of the ENV responsive to manual alar lateralization were also offered ENV correction. Facial Clinimetric Evaluation (FaCE)[7] scale scores were completed by patients to assess quality of life (QOL), but were not used to guide surgical management. The FaCE scale was validated by Kahn et al. to serve as a patient-based instrument to measure facial impairment and disability, and has been used extensively in our Facial Nerve

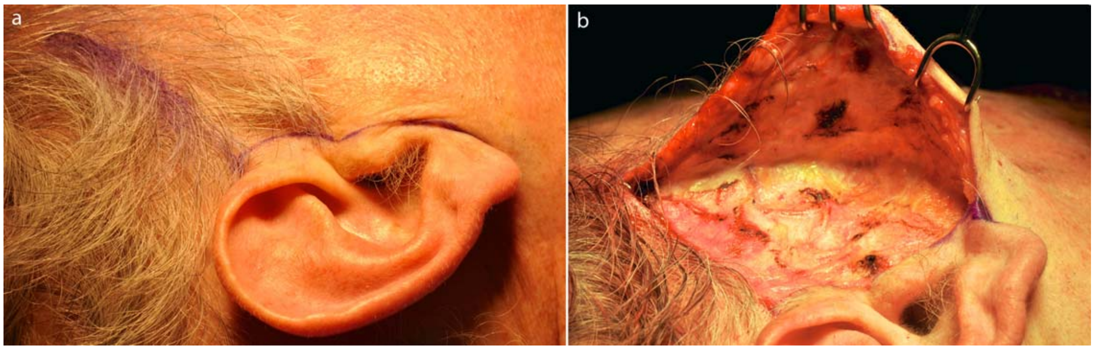

Fig. 1. (a) Marked temporal incision. (b) Raising of s sub-superficial musculoaponeurotic system flap. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

Center for outcomes assessment. Pre- and postoperative photographs of each patient were then presented to an observer for overall assessment of midfacial appearance. The observer was temporally blinded (i.e., was unaware of which photograph represented the pre- vs. postsurgical state) and was asked to grade overall midfacial appearance on a scale from 1 to 10, with 10 representing completely normal appearance and 1 representing disfiguring deformity. Patients with photographs revealing clear evidence of intervention (i.e., surgical bandages, suture) were excluded from the analysis.

Surgical Technique

The face and right lateral leg are prepped and draped, and a temporal and pre-auricular incision is made on the paralyzed side of the face (Fig. 1a). The parotidomasseteric fascia is identified and used as the floor of the dissection. A sub-superficial musculoaponeurotic system (SMAS) plane is elevated anteriorly toward the anterior border of the parotid gland using monopolar electrocautery (Fig. 1b). Once the anterior border of the parotid is identified, attention is turned toward the region of the effaced NLF. A sickle-shaped segment of skin is marked at the region of the desired NLF (Fig. 2a) and the epidermis is sharply dissected from the underlying dermis (Fig. 2b). Remaining hair follicles are cauterized to prevent ingrown hairs. The resulting tab of dermis is used for attachment of the fascia lata (Fig. 2c). A tunnel is then created in the sub-SMAS plane from the NLF incision toward the lateral incision (Fig. 2d). If ENV suspension is required, an incision is made in the nasofacial sulcus, and a sub-SMAS plane is elevated superiorly. If oral

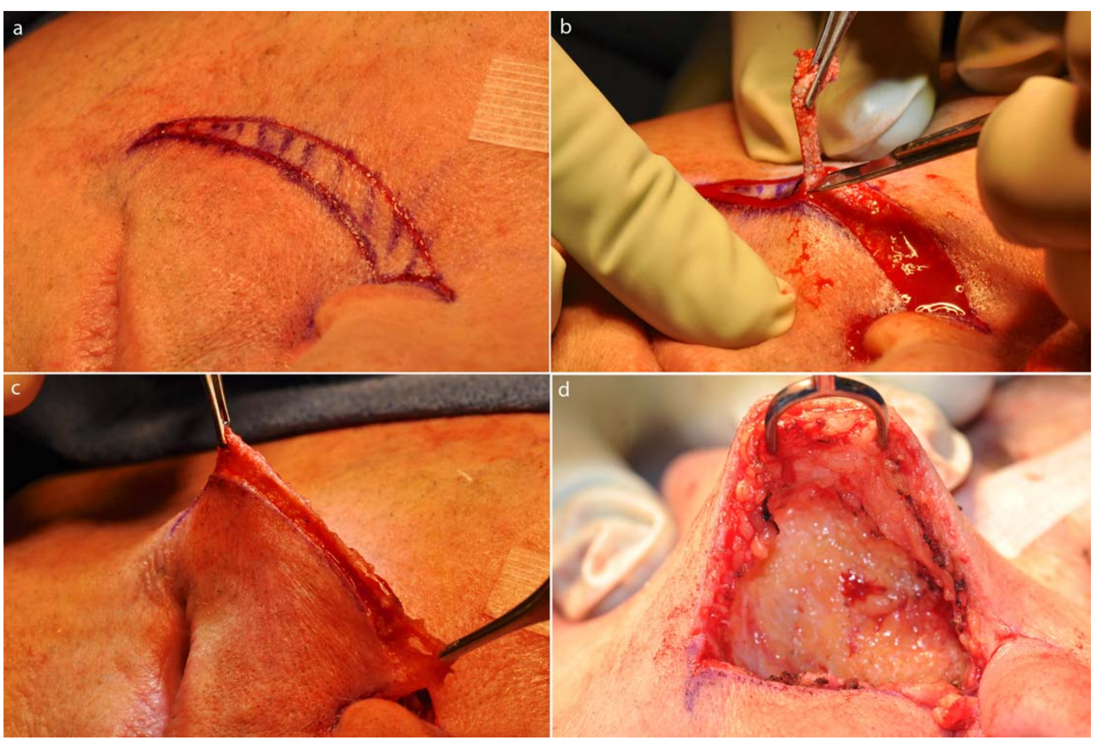

Fig. 2. (a) Skin marked for de-epithelialization. (b) De-epithelialization. (c) Dermal tab following de-epithelialization. (d) Retrograde elevation of sub-superficial musculoaponeurotic system flap from nasolabial fold incision. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

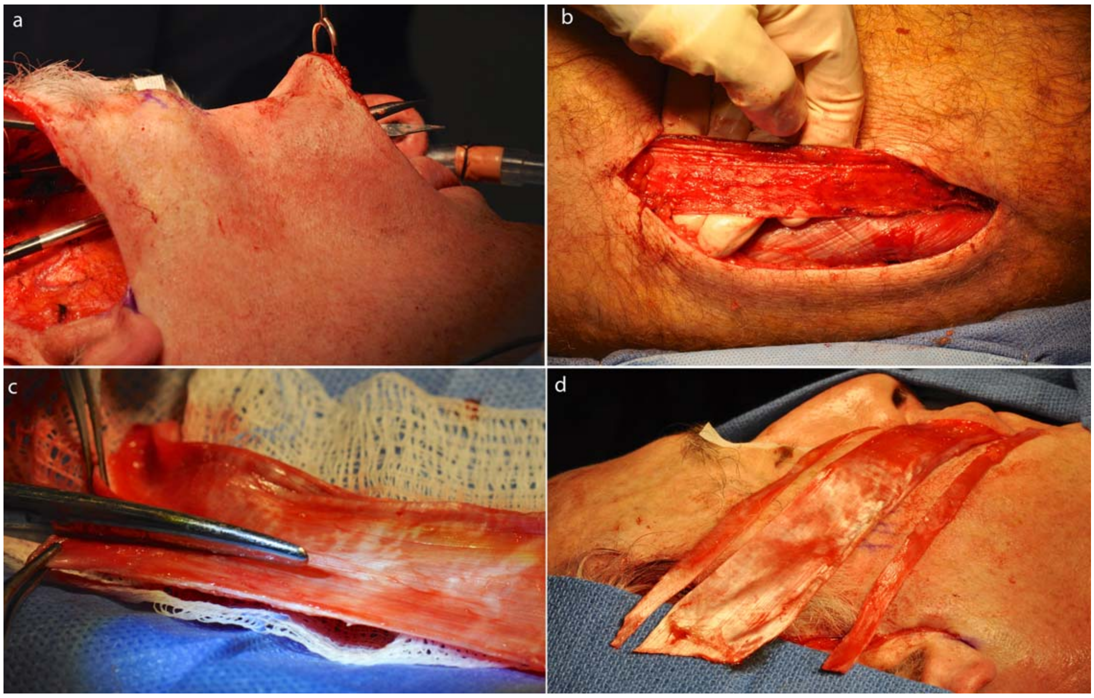

Fig. 3. (a) Scissors passed deep to skin flap to demonstrate continuity between temporal and nasolabial fold incisions. (b) Fascia lata following elevation from underlying muscle. (c) Trimming the fascia lata on the back table. (d) Proposed placement sites for fascia lata strips. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

commissure elevation is also required, the modiolus is also exposed at this time.

Attention is turned toward the lateral thigh, where a 10-cm craniocaudally oriented incision is made in the lateral thigh through skin. Monopolar electrocautery is then used to dissect through subcutaneous fat until the fascia lata is identified. A 15-cm-long portion of fascia is typically harvested. For modification of an NLF, an approximately 2.5-cm-wide segment of fascia is required. The oral commissure and ENV each require 1-cm-wide segments for elevation, thereby necessitating a 4.5-cm-wide segment of fascia for elevation of all three structures (Fig. 3b). A suction drain is placed, and the wound is closed using 3-0 absorbable polyfilament suture for the deep tissues, and 4-0 poliglecaprone suture in a running intradermal fashion for the skin. The leg is wrapped with an elastic bandage. If available, a second team may perform the harvest simultaneously with preparation of the facial wound.

The fascia is then trimmed into three segments (Fig. 3c,d) as described above. For ENV reconstruction, fibrofatty tissue of the ENV is everted using Adson-Brown forceps (Fig. 4a), and a 4-0 polypropylene suture is passed through the fibrofatty tissue, parallel to the nasofacial sulcus. The suture is then passed deep to superficial through the fascia lata, and then superficial to deep such that the knot lies on the deep surface of the fascia lata, preventing delayed extrusion. Two more sutures are placed in the same fashion, and then all three are tied. For NLF reconstruction, a de-epithelialized tab of dermis is sutured to the fascia lata such that the fascia lata lies deep to the tab, and the knots remain on the undersurface of the fascia (Fig. 4b). The modiolus of the oral commissure (Fig. 4c) is then sutured to the remaining strip of fascia using 2-0 polyglactin suture, taking care to bury the knots.

The strips of fascia are then passed deep to the cheek flap and into the temporal region for inset (Fig. 4d). Each strip is retracted superiorly while the surgeon examines the face to determine the ideal amount of tension for suspension. Lateral inset is performed using 2-0 polypropylene suture in a horizontal mattress fashion. Two sutures are placed into each fascia strip. Skin closure of the temporal wound is completed with 5-0 poliglecaprone (simple, interrupted, buried knots) for the deep layers and 5-0 nylon in a simple running fashion for the skin. The nasolabial incision is closed using 5-0 nylon in a simple interrupted fashion, and the nasofacial incision using 6-0 nylon in the same manner. The head is wrapped with a standard rhytidectomy-style dressing. The drain is removed on the first postoperative morning and the patient is discharged.

Statistical Analysis

Differences between FaCE scores and pre/post ratings were assessed using a Wilcoxin signed rank test to overcome deviations from normality. All statistical analyses were performed using Stata/SE 12.1 (StataCorp, College Station, TX).

RESULTS

Thirty-one patients underwent NLF modification from July 2010 to January 2014. Twenty-eight of these patients also underwent concurrent correction of the ENV. Most patients (68%) in the study cohort were male. The average age at onset of paralysis was 50 years, and the average age at time of surgery was 61 years. Most patients (90%) in the cohort had flaccid paralysis (Table I).

The most common chief complaint at time of presentation was oral incompetence or drooling, followed by

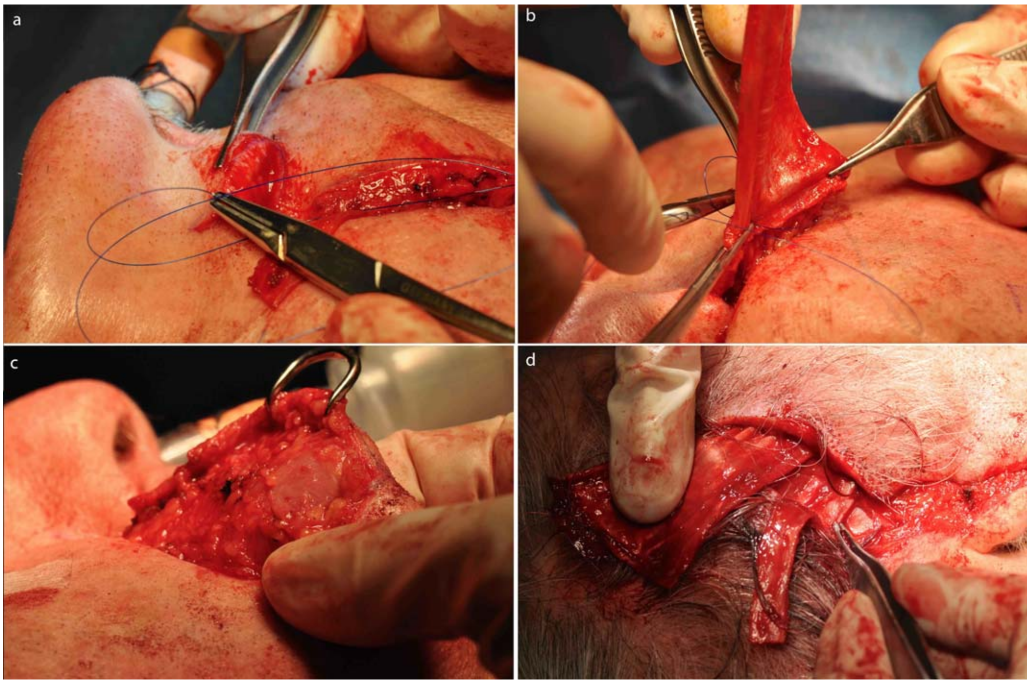

Fig. 4. (a) Suturing fascia lata to fibrofatty tissue of external nasal valve. (b) Suturing fascia lata to dermal tab. (c) Modiolus. (d) Fascia tunneled deep to skin flap into temporal region in preparation for inset. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

generalized facial asymmetry (Table I). The most common etiology of facial paralysis in the study cohort was cutaneous malignancy, followed by vestibular schwannoma and other causes as listed in Table II.

All but three of the patients in the study cohort underwent concurrent ENV correction. Preoperative FaCE scores were not available in three patients. Two patients had passed away at the time of this review. Of the remaining 26 patients, 20 (77%) had postoperative FaCE scores available. Twenty-one patients had pre- and postoperative photos suitable for analysis by the temporally blinded observer. Overall, there was a significant improvement in FaCE scores and observer rating (Table III).

TABLE I.
Cohort Characteristics (N = 31).

Demographics, no. (%)	
Male	21 (68)
Female	10 (32)
Age, mean ± SD (range), at:	
Onset of paralysis	49.5 ± 26.4 (0–84)
Time of operation	61.3 ± 16.4 (18–84)
Character of paralysis, no. (%)	
Synkinetic	3 (10)
Flaccid	28 (90)
Chief complaint at time of presentation, no. (%)	
Oral incompetence	17 (55)
Asymmetry	7 (23)
Multiple	6 (19)
Speech difficulty	1 (3)

SD = standard deviation.

TABLE II.
Etiology of Facial Paralysis (N = 31).

Etiology	No. (%)
Cutaneous malignancy	9 (29)
Vestibular schwannoma	5 (16)
Trauma	4 (13)
Parotid neoplasm	3 (10)
Congenital	3 (10)
Extratemporal facial nerve malignancy	2 (7)
Idiopathic	1 (3)
Intratemporal facial nerve neoplasm	1 (3)
Otologic	1 (3)
Stroke	1 (3)
Mandibular reconstruction	1 (3)

TABLE III.
Outcome Assessment.

	Preoperative (Mean ± SD)	Postoperative (Mean ± SD)	*P* Value*
FaCE scale score (n = 20 pairs)	45 ± 16	56 ± 18	.004
Observer assessment (n = 21 pairs)	3.19 ± 2.40	6.81 ± 1.60	.0001

**P* values are based on a Wilcoxon signed rank test.
FaCE = Facial Clinimetric Evaluation scale; SD = standard deviation.

Fig. 5. Selected preoperative (a, c, e, g, i) and postoperative (b, d, f, h, j) photographs. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

DISCUSSION

Patients with facial paralysis evaluated within 24 months of onset can be candidates for reinnervation procedures, such as masseteric to facial nerve transfer or cross-face nerve grafting. Although this management strategy is ideal because it preserves natural vectors of movement, these techniques rely on intact motor endplates and facial muscles to produce a result.[5] Thus, they are limited to patients with flaccid facial paralysis evaluated within 2 years of injury and synkinetic patients with autopreservation of facial musculature.

Patients who are not candidates for reinnervation surgery can be treated using static or dynamic techniques.[8] Although free tissue transfer is the gold standard for reanimation of the oral commissure,[9] not all patients are ideal candidates for the surgery or choose to undergo it. The elderly, those with significant comorbid conditions or poor prognosis, or patients with atherosclerotic disease are typically poor candidates. Moreover, in patients who do undergo free tissue transfer, the effaced nasolabial fold is sometimes inadequately addressed unless performed concurrently with deep-plane facelift.[6,10] Thus, static techniques are often the only available treatments for restoration of the NLF.[3–5]

Clodius[3] described a static technique similar to the one described herein, in which a de-epithelialized portion of upper lip skin was elevated and anchored deep to the cheek skin using fascia lata loops or muscle (masseter or temporalis). In his technique, anchoring sutures are placed transcutaneously around a bolster in the region of the NLF and kept in place for several days. Our method differs because it does not require transcutaneous suture placement to hold the NLF in place, it can be used concurrently with suspension of the oral commissure and external nasal valve via separate segments of fascia lata, and is possible to adjust later in the office setting by simply reopening the temporal incision. Additionally, tension on each segment can be adjusted individually to place each of the respective structures in its ideal anatomic position, permitting the surgeon to provide a more individualized approach to each patient (Fig. 4).

Other dynamic procedures for treating the paralyzed midface include temporalis turnover flap and orthodromic temporalis tendon transfer. Although both of these procedures may rehabilitate the oral commissure, the former may introduce bulk to the face and/or a disfiguring volume deficit in the temporal region. Orthodromic tendon transfer avoids these issues by preserving the natural vector of muscle pull,[11] but may fail to provide adequate definition of the NLF.

The technique described herein is straightforward, long lasting, easily adjustable in the office setting, and permits a tailored approach to the ENV, NLF, and oral commissure (Fig. 5). The technique results in improved FaCE scores, suggesting significant QOL benefits.

Perhaps the most evident limitation of our study is the lack of an objective outcome measure. Although we did use FaCE scores for outcome assessment,[7] these QOL measures are inherently subjective.[12] In future studies, an easy-to-use objective outcome measure is necessary to clearly define results[13,14] and assess for correlation with qualitative data such as QOL and patient satisfaction. Our QOL assessment is also limited by our sample size, because only approximately 60% of patients had pre- and postoperative QOL instrument scores available, introducing the possibility of attrition bias. Another limitation of this study is that most patients in our study also underwent concurrent ENV correction, which (in concert with NLF correction) may account for improvements in QOL and appearance.

CONCLUSION

The NLF is an important aesthetic component of the face and can become effaced in patients with flaccid facial paralysis. Several static techniques have been described to redefine the effaced NLF. We have described a method that reliably produces an NLF and can be used in conjunction with static suspension of the oral commissure and/or external nasal valve.

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