

The aesthetic challenges of the nasolabial fold

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Abstract

The authors review the pathogenesis of the nasolabial fold and the different surgical techniques that can be proposed to correct it when it is too prominent.

Introduction

Prominent nasolabial folds will draw the attention of the observer away from the aesthetic high points of the face, and instead focus the casual eye into its dark depths. Despite significant technical and surgical advances, options for the treatment of the prominent nasolabial fold have often yielded disappointing results. The variety of methods described should lead one to deduce that there is no one single method appropriate in the treatment of all nasolabial fold problems, and, that no one treatment option would be expected to provide aesthetically rewarding outcomes all the time.

The nasolabial (occasionally also referred to as the melolabial) fold forms the boundary between two areas of the face with uniquely different anatomic features. The superficial tissues of the upper lip consist of a dense fascial layer that is firmly approximated to the overlying skin and to the underlying perioral musculature, whilst the cheek is made up of a loose fascial sheet loosely connected to the skin via numerous small septations into which a significant amount of fat is normally interspersed. There is no gradual transition between the (lateral) cheek mass and the

(medial) upper lip. Instead, the nasolabial fold broadly demarcates these two areas. Generally, the nasolabial fold can be considered to be straight, convex or concave in shape. Its angulation varies quite widely between individuals.

The nasolabial fold is normally almost inappreciable in children, at rest, as a direct result of their skin's inherent elasticity and the turgor of their subcutaneous fat. The cheek mound and upper lip seem to move as a single unit in youth. However, the aging process results in progressive selective ptosis of the cheek tissues with a relative maintenance of the position of the upper lip tissues. Prominent rhytids are often present in youth, but only during active motion. As one ages, these rhytids are noted to persist even at rest. By the fourth decade of life, the tissues lateral to the nasolabial fold are often noted to have begun to develop significant laxity, subcutaneous fat atrophy, as well as dermal atrophy. These findings are accentuated by exposure to the actinic effects of solar ultraviolet radiation. Any atrophy of the underlying skeletal support, as with prolonged edentulousness, will further contribute to the sagging nature of the nasolabial fold. As the descent of the ptotic cheek mound abuts the relatively fixed upper lip (supported

by the underlying perioral and mimetic musculature) the progressive deepening of the nasolabial fold is the result. At this point, the cheek and upper lip seem to move as independent masses. At rest, the youthful cheek mound lies posterior to the nasolabial fold. As one ages, the mound moves progressively more anteriorly, eventually lying anterior to, and hanging over, the fold. With dynamic mimetic motion of the face, as in smiling, this anterior movement is accentuated. This relative anterior cheek mound position will further serve to delineate and accentuate the nasolabial fold. Furthermore, as one ages, the fold begins to descend below the level of the oral commissure and remains in this descended position even at rest. The degree of neuromuscular tone will, in some cases, significantly affect the degree of nasolabial fold prominence. This is most clearly seen in the patient with weakness of the seventh cranial nerve, where relative effacement of the fold is the rule.

The unique combination of skeletal support, cheek mound laxity, subcutaneous fat and dermal atrophy found in individual patients will determine the degree of nasolabial fold prominence. This, in turn, will define the surgical procedures most likely to benefit the patient. In other words, full cheek mound resuspension may not be required in the generally youthful patient who is just starting to develop some fold prominence. Simple fold augmentation or camouflage will often suffice here. Generally, one should attempt to correct the patient's prominence with both the most effective and the simplest method(s) available. Often, in severe cases, a combination of techniques may be required to correct the problem. These surgical maneuvers may be broadly divided into: augmentation or camouflage of the fold, direct fold excision and cheek mound resuspension.

Surgical options

Augmentation/camouflage techniques

These represent the simplest and least invasive surgical options available in the treatment of the prominent nasolabial folds. One needs to be very careful in analyzing the specific anatomical problem present in the individual patient. The

nasolabial fold should not be viewed in isolation, but rather a significant part of the whole. If there is a very redundant and lax lateral cheek mound present that is positioned well anterior to the fold even at rest, then simple augmentation of the fold may not yield the ideal aesthetic result. On the other hand, if there is early increase in the depth of the fold, or as an adjunct in treatment of severe prominence, augmentation techniques can be quite rewarding.

Of historical interest is injectable silicone¹. Silicone worked wonderfully well as an agent of augmentation, but has been abandoned largely due to public concerns with regard to its safety. The simplest technique available for fold augmentation is the injection of collagen^{2,3}. Although the effects can be dramatic, temporary amelioration in the range of months is the rule. It's primary benefits are simplicity of technique and little in the way of down time for the patient, who can easily return to normal daily activities within a day. Furthermore, it is very easy to titrate the exact amount of augmentation needed. Collagen's temporary nature and uncommon allergic reactions are its major limitations.

In patients who express concern over implantation of non-biodegradable material, autologous fat transfer is an option to consider. The procedure can be performed under local anesthesia. The fat is usually harvested from the right and left lower quadrants of the abdomen via a camouflaged umbilical incision, usually utilizing only the aspiration power that can be generated from a 50 ml syringe connected to a spinal needle or to a commercially available specific fat harvesting cannula. The harvested fat should then be thoroughly cleared of blood, free fatty acids and other tissue residue, by repeated rinsing in saline solution. Prior to direct fold injection, the musculodermal attachments at the level of the fold need to be undermined and released. This can be accomplished through an access incision in the floor of the nasal vestibule. Release of these fibrous attachments, with fine scissors or with a notched dissector, will allow precise deposition of the fat into a well defined pocket. As with collagen, one needs to overcorrect by about 25% to allow for the inevitable early absorption that will take place. The duration of improvement is unpredictable^{4,5}.

The full result often lasts for only two to three months. At best, 60-70% of the transferred adipocytes may still be present at one year. In order to achieve full lasting augmentation, repeated procedures may be required. Variable absorption of transferred fat at different parts of the fold may become evident. This may be treated conservatively waiting for some/all of the rest of the graft to resorb and thus even the fold out, or further augmentation may become necessary either with collagen or fat to achieve symmetry. The patient should be warned preoperatively of this possibility. The decision to repeat lipotransfer should be based primarily on its longevity following the first procedure. Aesthetically, the patient's nasolabial fold areas may be unattractive for days or even weeks after the procedure due to necessary overcorrection. If, after some resorption of the graft to achieve aesthetic balance, there follows a period of rapid graft disappearance, the aesthetic down time for this patient is likely too great to warrant further procedures. However, should the patient be noted to retain significant amounts of fullness in their nasolabial folds at nine to 12 months, further augmentation to build upon the initial result may be a reasonable consideration. Thus, it is of utmost importance to critically analyze one's results with regard to this procedure. The results of lipotransfer will vary considerably from patient to patient.

Dermal or fascial augmentation are also viable options. A dermal graft may be harvested from the preauricular or postauricular areas (especially useful if done at time of rhytidectomy), or the groin. Unless done at the time of rhytidectomy (in which case no additional incisions are required) this procedure necessitates the formation of a small scar at the donor site. This scar would usually be expected to heal inconspicuously, however, as always there is the possibility of adverse scar formation. Temporalis fascia can be easily harvested via an incision hidden in the hair. It too can be harvested under local anesthesia. The temporalis fascia varies greatly from one area of the temporalis to another. As such, it is best harvested about 2 cm superior to the attachment of the auricle to facilitate access to the thickest area of fascia. One of the major limiting factors in utilization of

temporalis fascia is the limited volume of material available for augmentation. The fascia and the dermis can be rolled onto themselves to increase thickness of transferred material. The two grafts need to be precisely cut to size so that an even length and girth is inserted into each nasolabial fold. Introduction of the graft can be performed by a variety of techniques, including via the use of various commercially available cannulas. The simplest method involves first releasing the musculodermal attachments to form a nasolabial tunnel as previously described. At this point, a large straight needle can be utilized to fixate an absorbable suture (e.g., 3.0 chromic) to one end of the graft. The needle and attached suture and graft are then passed sequentially through a 10 or 12 French Fraser suction that has been previously inserted into the nasolabial tunnel. The graft is pulled through the suction tip to allow for a precise and atraumatic augmentation of the nasolabial fold. The patient's aesthetic down time with this procedure is generally somewhat less than for lipotransfer but greater than for collagen injection. The results are variable. Most patients achieve a minimum of six months of improvement. In addition, ingrowth of fibroblasts at the recipient site will allow for long lasting improvement. We have a number of patients who have achieved sustained benefits two years after fascial transfer. If there is continued augmentation present at a point in time so long removed from the initial procedure, this would imply that the transferred fascia has acted as a suitable framework for ingrowth of recipient cells. Thus, a sustained benefit at one to two years would be expected to be maintained indefinitely. However, the aging of lateral cheek elements will continue, often therefore, making further procedures necessary.

Polytetrafluoroethylene (PTFE) has rapidly gained acceptance as a simple, non absorbable, reversible and reproducible method of augmentation of the nasolabial fold^{6,7}. A variety of available thicknesses is commercially available (Gore-tex, WL Gore and associates, Flagstaff, AZ). We prefer to use a 1-mm thick sheet that is rolled onto itself to give the desired degree of augmentation. Introduction of the prepared implant is exactly the same as that already described for the introduction of the fascial and dermal grafts.

There is very little aesthetic down time for treated patients and the results last as long as the implant is in place. Overcorrection is not necessary. In fact, we have observed the apparent thickening of the area of the implant over time, presumably as a result of the formation of a fibrous capsule around the implant. This may be viewed in a positive light, since this autoaugmentation (via fibrous capsule formation) may delay the necessity of performing further procedures in the future. Graft infection, and extrusion are possibilities that we have not seen at this site. Graft placement in a specifically created nasolabial tunnel is critical in ensuring the best result for the patient. In patients with a wide nasolabial angle (*i.e.*, significant concavity or significant convexity), ideal fold augmentation may necessitate the placement of two separate grafts in tandem, with one implant for the superior and one for the inferior parts of the fold.

Most recently, human dermal graft (Alloderm, Lifecell Corporation, Woodlands, TX) obtained from processed human tissue banked skin has been utilized for soft tissue augmentation⁸. This acellular allograft has an intact dermal framework that provides for reliable ingrowth of recipient fibrovascular cells, theoretically maintaining the desired augmentation indefinitely. Long-term results beyond 12 months are not available. The result appears to be maintained at one year^{8,9}. Again, this would imply graft incorporation and one would expect result maintenance. Our personal experience with Alloderm is limited, but thus far positive.

Camouflaging the nasolabial fold with surface treatments has very limited benefit and is probably best considered an adjunctive technique. Whether carbon dioxide laser resurfacing or dermabrasion is utilized, one can expect amelioration of any surface irregularities, smoothing of skin texture and possible elimination of fine wrinkles. These can be useful adjunctive treatments that can help realize the full aesthetic benefits of augmentation or resuspension approaches to the nasolabial fold. Resurfacing can most definitely improve the outcome in patients treated with direct fold excision. In fact, secondary resurfacing should probably be considered to be almost routine when the fold is excised as the primary treatment.

For patients with a significant amount of overhanging lateral cheek mound fullness, liposuction of the area immediately lateral to the fold has been proposed¹⁰. We feel that these patients are in fact manifesting moderate to severe ptosis of the cheek mound and in fact would be better served by resuspension of these tissues. Removal of subcutaneous fat in these patients may in fact unmask an even more unattractive ptosis of tissue in this area. Moreover, asymmetries and contour irregularities may be seen rather frequently after this procedure. This procedure should really be considered only as an adjunct or in the unusual patient with congenitally significant deposits of cheek fat/buccal fat. These latter patients are usually in the younger age group (20-35 years of age) and care should be taken to inform these patients that removal of lateral cheek mound/ buccal fat may ameliorate the depth of their nasolabial folds. But, such lipectomy may also contribute to a more severe and more aged appearance to the face. Thus, this procedure should be offered to only specifically chosen patients and with a great deal of caution, given the aesthetic trade-off that is usually necessary.

Direct nasolabial fold excision

Direct nasolabial fold excision represents a simple and very gratifying procedure in well-selected patients¹¹. The skin in the area of the nasolabial fold tends to scar quite well in elderly patients, especially those with thin skin. Furthermore, as mentioned, second stage resurfacing may be quite useful in this patient population. Generally, the fold is excised in an elliptical fashion. Direct nasolabial fold excision may be worthwhile in the patient with prominent asymmetry of the nasolabial folds between right and left sides. By differential curvature, length or width of the ellipses utilized in fold excision, one can nicely adjust the asymmetric folds to bring them to a more equal visual appearance. The major disadvantage of this technique is obviously the presence of a long facial scar. This usually heals without consequence, but may of course be erythematous for a year or more post-operatively. This redness may be camouflaged with cover make-up, but may still be quite

noticeable. Further, many male patients will not accept the need to use make-up. As is the case with any facial scar, the scar resulting from nasolabial fold excision is also susceptible to adverse healing. The patient needs to be made aware of this possibility. This procedure is probably best not offered to the patient with thick sebaceous skin, as this will more often than not, result in a very noticeable, poorly approximated scar.

Resuspension procedures

Once again, detailed analysis of the individual patient should guide the treatment plan. Much controversy continues to exist with regard to whether or not all patients with prominence of the nasolabial fold actually require rhytidectomy for optimal correction. As outlined, we feel that rhytidectomy or resuspension is not necessary in all patients. However, commonly, in the patient with nasolabial mound prominence, one often notes significant cheek mound ptosis with anterior positioning of this mound relative to the fold, even at rest. In such a situation, optimal fold correction requires a resuspension procedure of some sort. The question then becomes what procedure is most likely to provide the most benefit. The answer to this question will, to a certain degree, depend upon what resuspension procedures the surgeon is comfortable with. It is better for the novice surgeon to perform a standard skin flap/SMAS rhytidectomy and to utilize an adjunctive fold augmentation or camouflage procedure, than to venture into a deep plane lift, if he/she is unfamiliar with the latter. As always, safety of outcome must remain a priority.

Much of the controversy surrounding nasolabial fold resuspension, centers around the superficial musculoaponeurotic system (SMAS). Barton noted that long lasting and aesthetically gratifying nasolabial fold improvement seemed to be more easily achieved by utilizing standard skin only, subcutaneous rhytidectomy dissections, than by SMAS plication and resuspension techniques¹². Yousif *et al.* have subsequently anatomically demonstrated that traction exerted on the SMAS lateral to the nasolabial fold results in deepening of the crease¹³. This is not sur-

prising, since the SMAS, in fact, surrounds the zygomaticus muscles. The zygomaticus has fibers that insert on the deep surface of the nasolabial crease. Thus, traction on the SMAS will pull these fine muscles and result in deepening of the nasolabial fold. In order to avoid this unfortunate and frustrating result, it is necessary to release all of these retaining deep attachments of the SMAS. Simply exerting more pronounced lateral SMAS traction will not by itself have the desired end result. With such release, aesthetically pleasing cheek mound resuspension with effacement of the fold is a natural sequela. Meticulous and knowledgeable dissection is a requirement. The key to safe dissection of the SMAS flap is to remain in the loose areolar tissue plane between the SMAS and the parotidomasseteric fascia. Branches of the facial nerve pass just deep to the masseteric fascia which is quite thin and easily violated in some patients. Hence, once one reaches the lateral border of the masseter muscle, the safest method of further elevation is by the use of blunt finger dissection to release the loose attachments between the SMAS and the masseteric fascia. Once the SMAS attachments have been fully released, one may pull on it superolaterally to determine that nice fold effacement has been accomplished. If this is not the case, then further attachments remain that require release.

One can circumvent the potential difficulties associated with complete SMAS elevation via utilization of the subperiosteal approach to rhytidectomy¹⁴. However, this technique is probably best suited to the treatment of the relatively young patient (up to 40 years of age) who is demonstrating early nasolabial fold prominence and only mild anterior movement of the lateral cheek mound. With more significant advanced ptosis and fold prominence, one either has to combine the subperiosteal lift with limited standard subcutaneous or SMAS dissections, or more simply a standard SMAS elevation and release.

Conclusions

The nasolabial fold remains an aesthetically challenging area for the plastic surgeon. Nume-

rous options for its treatment are available. It is the logical application of this myriad of procedures, often in combination, that allows one to achieve the best and most rewarding results for these patients. Aesthetic down time and the utilization of the simplest procedure to achieve the consistently best result, should always be key considerations.

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