INTRODUCTION

Minimally invasive rhinoplasty procedures have had increased public acceptance/desire for augmentation of the nose.1–4 Recent studies have demonstrated the use of fat grafting for nasal augmentation with good rates of satisfaction in the majority of patients.4 Different anatomical zones such as the nasal sidewall and dorsum may be sculpted via injections. Post rhinoplasty asymmetries, contour irregularities, and saddle nose deformities may also be treated using fat grafts in patients reluctant to undergo further surgical revision.2

This article addresses the effects of nasal aging on the pyriform aperture and nasofrontal anatomy and describes a minimally invasive injection technique with fat grafting to reverse findings of nasal aging and provide long-term nasal enhancement in minor contour deformities and nasal scarring.

FACIAL AND NASAL AGING

Pyriform atrophy has been noted to have profound effects on the nasal tip, soft tissue envelope, upper lip, and nasolabial fold.3 The entire soft tissue envelope slides down the nasal bones and as the tip plunges, the upper lip lengthens, loses volume, and involutes. Pyriform atrophy is often associated with deepened nasolabial folds and gives the upper lip, nose, and nasolabial folds a “sucked” in appearance.

Nasal aging is associated with changes in the glabellar region, forehead, and brow, which are subject to the loss of prominence with the thinning of soft tissues and deepening of frown lines.5 Supraorbital brow and glabellar projection influence the nasofrontal junction in patients experiencing facial aging and in patients with a high radix or shallow nasofrontal junction.

PROCEDURE

See video, Supplemental Digital Content 1, which displays the minimally invasive rhinoplasty technique using Millifat. This video is available in the “Related Videos” section of the Full-Text article on PRSGlobalOpen.com or at http://links.lww.com/PRSGO/B69.

AREAS ADDRESSED IN TECHNIQUE

1. Pyriform/nasal base and tip projection;
2. Columella injection for minimally invasive strutting and tip elevation with natural supra-tip break;
3. Treatment of Nasal Aging and Possible Long-term Nasal Enhancement with Fat Using Injectable Tissue Replacement

Summary: This article addresses nasal aging using a minimally invasive procedure with an algorithm that includes the diagnosis of a patient’s nose within the context of the individual’s facial anatomy. Pyriform augmentation for the elevation of tip projection and columellar strutting with injectable fat are, to our knowledge, applied for the first time as important steps in minimally invasive rhinoplasties. This procedure offers patients with more subtle nasal changes with aging or other causes to be treated with potentially long-lasting improvements, which can be easily retreated. New techniques using injectable liquid cartilage grafts are being explored.
3. Dorsal nasal augmentation, symmetry, and/or smoothing;
4. Glabellar and superior orbital rim augmentation in patients with atrophy secondary to age, genetics, and/or in patients with high radix.

The donor site is infiltrated with a tumescent solution infused with a vibratory cannula or infiltration cannula and syringe through a 14-G needle incision. Lipoharvest is carried out with 2 m and 1 mm hole cannulas (Marina Medical; Millenium Medical Technologies, Inc. Carlsbad, CA). Once the fat is removed, it is rinsed with normal saline to eliminate any residual tumescent fluid and injected with 18, 19, and 20-G cannulas on a Celbrush (Cytori Inc., San Diego, CA).

Millifat (2.0 mm parcels) and microfat (1.0 mm) are 2 main types of fat grafts used. Millifat, used for its structural qualities, is injected into the pyriform, columella, radix, brows, and glabella, whereas microfat is used for superficial injection. A puncture incision is made with an 18-G needle on either nasolabial fold. The pyriform aperture is injected, and fat is grafted from the nasal spine along the nostril sill and around the pyriform aperture. Fat is injected along the periosteal surface taking care not to penetrate the nasal mucosa. The filling of the pyriform aperture produces elevation of the nasal base and tip with a reduction in the nasolabial angle, which softens the appearance of maxillary dental protrusion.

After pyriform aperture injection, a needle incision is made at the midline of the nasal tip and the cannula is gently threaded between the medial crura. Once the cannula touches the nasal spine, retrograde injection is carried out approximately half way up the columella and the tip is inspected. If a supratip break has been created, no further injection is performed at this time. The tip is again inspected at the end of the procedure. If mild recurrent plunging is seen from the dispersion of fluid within the fat graft, a small amount of fat is again grafted in the columella. Several columns of fat may be placed up to 3 quarters of the way up the columnella, which will produce the desired supratip break in patients having treatment for an aging nose. This same needle incision also permits fat injection cephalad along the nasal bridge for purposes of augmentation of a nasal hump. If resistance is encountered during insertion of the cannula, a gentle probing movement and/or a slight change in direction is performed. At no time is the cannula aggressively inserted, and if bleeding is encountered with aspiration, there may be accidental intravascular placement of the cannula and no further injection is performed. A second needle incision is used to fill the radix via caudal insertion of the cannula and fat injection in a retrograde fashion. For patients with a high radix or dorsal hump, fat injection is performed on the periosteum of the glabella for augmentation and blending of the glabella and medial brows into the superior forehead. In the case of overcorrection at the time of fat grafting, the Celbrush can be reversed and the fat removed or compression of the line of injection with retrograde pressure can exteriorize the fat.

DISCUSSION

The primary advantage of this minimally invasive procedure is that it can be performed during a separate surgery or in a clinical setting with topical and local anesthesia. Dissection is carried out with a larger, blunt tipped, 18-G cannula after a needle incision through the skin only. The 1–2 mm parcel size of the fat graft makes embolization less likely and because a blunt cannula is used with a needle incision. Unless a blood vessel of very small caliber is lacerated, free fatty acids and other debris cannot get inside the lumen and embolize. Dissection is to be done with a slow and gentle probing motion, which allows the cannula to pass easily into the correct plane. Furthermore, this technique allows for the choice between fillers and fat, though we prefer fat.

We have treated approximately 90 patients over the past 2 years, primarily for nasal aging during facelift surgery, with no complications. Improvement has been observed in virtually all patients, and 3 patients have requested further treatment with fat grafting. No patients requested removal of the grafts or reported nasal obstruction. An overall improvement in nasal aesthetics was obtained, including the glabella and lower forehead along with the degree of pyriform and dental projection. Pyriform aperture augmentation provides support to the upper lip, resulting in some degree of vertical shortening of the upper lip through upward movement and sagittal advancement. In addition, the base of the nose is projected forward and upward, improving the appearance of nasal aging while elevating the nasal tip. A very effective change in the nasolabial fold depth is also noted. Patients with more pronounced nasal deformities will still benefit from our approach but are more likely to relapse over time (see figure, Supplemental Digital Content 2, which displays a 70-year-old patient with severe caudal prolapse of the soft tissue envelope and loss of pyriform support is shown preoperatively (A, C). Patient is shown 6 months postoperatively with long-term improvement in her nasal aesthetics after being treated with a facelift and the minimally invasive rhinoplasty using millifat (B, D). Patient is shown...
again 1 year post-treatment (E, F). Fat injection volumes and locations: 4 cm\(^3\) total into the pyriform (2 cm\(^3\) on each side), 2 cm\(^3\) into the glabella, 1.5 cm\(^3\) into the columella, and 1.5 cm\(^3\) into dorsum, [http://links.lww.com/PRSGO/B70](http://links.lww.com/PRSGO/B70). We are exploring injectable cartilage and nasal suspension sutures as another option in these patients. Patients with bulbous nasal tips are not good candidates, as the tip will only have mild improvement in width with elevation. Patients desiring permanent long-term correction of more complicated deformities should be informed that not all deformities will respond to this technique. Finally, it is important to note that precise knowledge of both nasal anatomy and the signs/symptoms of embolization are necessary to successfully perform this procedure.

**CONCLUSIONS**

The minimally invasive rhinoplasty with Injectable Tissue Replacement (ITR\(^2\)) fat grafting is a new, reproducible approach, which has demonstrated moderate-to-high rates of satisfaction in our patient population. The use of fat as a natural filler for the nose has resulted in long-lasting effects in our patients up to 1.5 years after the procedure (Fig. 1).

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It was not necessary to obtain approval from an institutional review board, as fat-grafting is a long-established procedure, and the microinjection device applied in this study received ISO 13485 certification and CE marking. All devices used for fat harvest and processing were manufactured in the United States, registered,
and listed with the US Food and Drug Administration (FDA). Patients were preoperatively informed via written consent for all surgical procedures, anesthesia, intraoperative video recording, and photography.

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