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The Adjustable Vector Deep Plane Midface Lift

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The ptotic aged midface has long been a challenge for cosmetic rejuvenation and has remained a challenge for even the most experienced practitioners.[1,2] Many popular techniques exist that are based on reversal of senescent vectors, but few of these actually specifically address the midfacial structures or can be performed as isolated procedures to address the midface.

Techniques recommended for midfacial rejuvenation include alloplastic implants,[3,4] for restoration of volume in the hypoplastic or atrophic midface, tissue transfer,[5,6] superficial and deep lifting techniques,[7-9] resurfacing procedures,[10] injectable fillers,[11] and suspension techniques.[12,13] Despite the multiple options described, many surgeons do not routinely address the midface in the global rejuvenation.

The technique described here is hybridized from existing contemporary literature and modified by the authors to incorporate adjustable suspension vectors to better control midfacial rejuvenation.

Indications

A wide range of patients may benefit from midface lifting. The most simple and obvious indication is a patient with midface ptosis. These patients exhibit a flat malar region with inferior, medial migration of existing facial structures, including the malar and buccal fat. In youth, the midfacial profile represents a single convexity and as the midface ages the profile is consistent with a double convexity (Fig 1). The fat pads may also exhibit atrophy, with the buccal fat being most likely to be atrophic. In addition, these patients may exhibit increased scleral show in the lower lid, obtuse nasolabial angles, and poor upper lip projection. However, most people naturally experience midface ptosis after age 30 to 40 years. Midface atrophy and/or hypoplasia is also treated if desired by the patients. Treatment for atrophy and hypoplasia of midface and surrounding tissue is augmentation with alloplastic or autologous materials. Ptosis is treated by midface lifting. Both augmentation and lifting of the midface can be done simultaneously. Patients may have accompanying malocclusions, and their deficient midface may be improved with maxillary impaction and or advancement. Despite the improvement from skeletal repositioning, some of these patients still require further midfacial suspension and are excellent candidates for simultaneous midface lift.

Many patients who present for brow and forehead lift, rhytidectomy, lower lid blepharoplasty, and nasolabial or nasojugal folds (tear trough deformity) correction are also candidates for midface lift.

The adjustable, multivector, subperiosteal midface lift may be performed as a separate procedure or in conjunction with virtually any other facial rejuvenation surgery. Because the procedure involves intraoral subperiosteal dissection as well as dissection on the superficial layer of the temporalis fascia, it lends itself to incorporation of common rejuvenation procedures.

Technique

Preoperative consultation addresses the patient's chief complaint as well as other surgical options for facial improvement or rejuvenation. Patients must be thoroughly educated as to postoperative recovery and sequelae of the procedure. They must be willing to accept 2 to 4 weeks of midface edema, infraorbital nerve paresthesias, and transient lip muscular dysfunction. Preoperative standardized photographs are taken with strict attention to patient positioning. A full-face frontal photograph, bilateral full-face photographs with Frankfurt horizontal parallel with the floor, and, most important, bilateral oblique views are taken. To properly standardize the oblique views, nasion point should be adjacent to the lacrimal caruncle for repeatable positioning (Fig 2).

Manually elevating the cheek with the surgeon's finger while having the patient look in a mirror can simulate the surgical result. This can also be done by having the patient moderately smile to elevate the

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FIGURE 1. The eyelid-midface complex maintains a single convexity in youth but assumes a double convexity with aging.

midface. Because this procedure incorporates adjustable vectors, the patient is shown various midface positions from superior lift only to a more superior lateral vector. By elevating the cheek, some patients will be left with redundant lower eyelid skin and wrinkles due to the increased tissue volume of the lifted cheek. These patients usually are concomitantly treated with periorbital CO_2 ultrapulse laser resurfacing, lower transconjunctival blepharoplasty, and/or skin excision lower lid blepharoplasty.

Patients who wear full upper dentures may need to forego wearing them for several days if the incision interferes with the denture flange.

FIGURE 2. Soft tissue nasion is lined up with the lacrimal caruncle of the eye to standardize oblique photographs.

The patient is marked with a surgical pen in the upright position. The region of maximum desired suspension is noted and marked. A temporal tuft incision is marked in a similar manner as for endoscopic brow lifting. A 1.5-cm incision is marked several centimeters posterior to the hairline perpendicular to a line connecting the lateral ala and the lateral canthus of the orbit (Fig 3).

One of the authors (J.N.) has performed this procedure with local anesthesia but most commonly uses intravenous sedation. The hair is prepped and several milliliters of 2% lidocaine, 1:100,000 epinephrine is infiltrated subcutaneously at the planned temporal incision. Several milliliters of the same local anesthetic are also infiltrated supraperiosteally over the lateral orbital rim above and below the frontozygomatic suture. Intraorally, the anterior maxilla is infiltrated with the same local anesthetic from the piriform aperture medially to the origin of the masseter tendon overlying the malar eminence. Superiorly, the local anesthetic is infiltrated to the level of the infraorbital rims bilaterally. The zygomaticomaxillary infiltration requires about 8 mL of local anesthesia on each side. This is basically the same technique as performed for local anesthesia with a maxillary osteotomy.

After waiting sufficient time for the vasoconstriction, a vestibular, full-thickness subperiosteal incision is made approximately 5 mm superior to the attached gingiva from the cuspid region to the maxillary first molar region. Using a No. 9 periosteal elevator, a subperiosteal dissection is performed from near the

FIGURE 3. A 1.5-cm incision (solid line) is made perpendicular to the alar-canthal line, several centimeters into the temporal tuft.

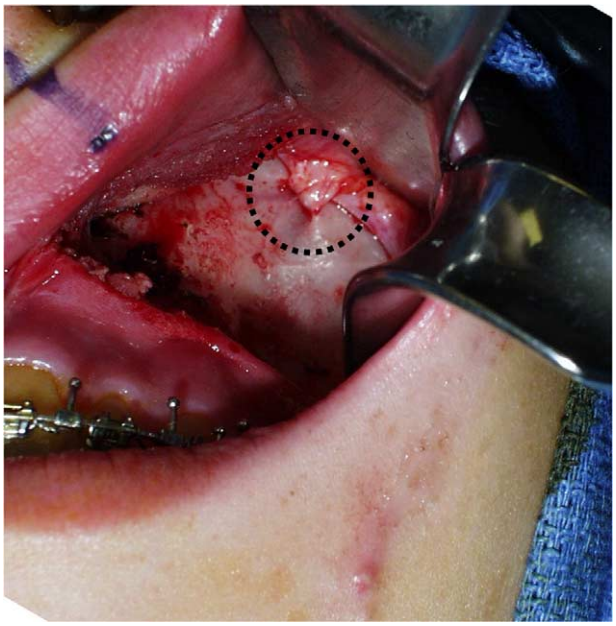

FIGURE 4. Dissected maxilla with the infraorbital nerve circled.

piriform aperture medially to the region where the masseter tendon is visualized laterally at the beginning of the zygomatic arch (Fig 4). Superiorly, the dissection is just inferior to the inferior orbital rim with extreme caution to protect the infraorbital nerve. Occasionally, the zygomaticofacial nerve may be seen laterally and this is also preserved, if possible.

Next, the periosteal elevator is angled superolaterally to dissect in the subperiosteal plane along the lateral orbital rim and over the frontozygomatic sutures (Fig 5). After passing over the lateral orbital rim, the elevator is advanced just past the rim into the temporal recess. This is a safe region when approached from the subperiosteal plane and is the same region exposed when treating zygomaticomaxillary fractures. The dissected periosteum over the anterior maxilla is then stretched by placing a finger or elevator under the flap and distending it to ensure maximum freedom.

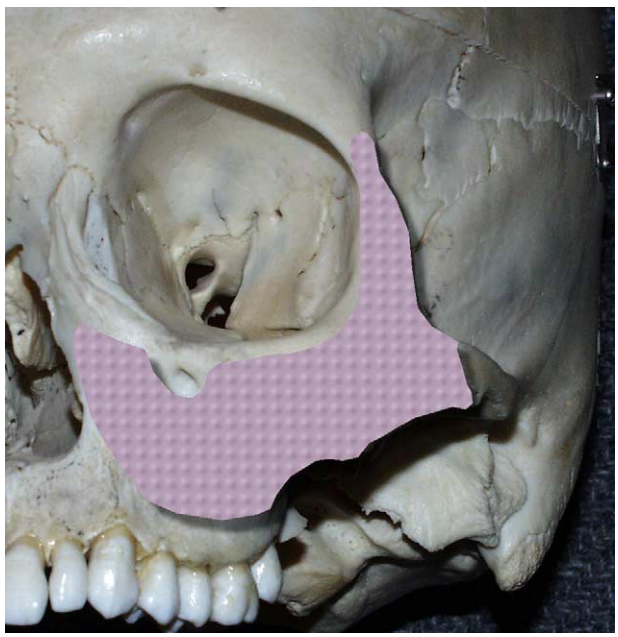

FIGURE 5. Outlined region illustrates the region of subperiosteal dissection.

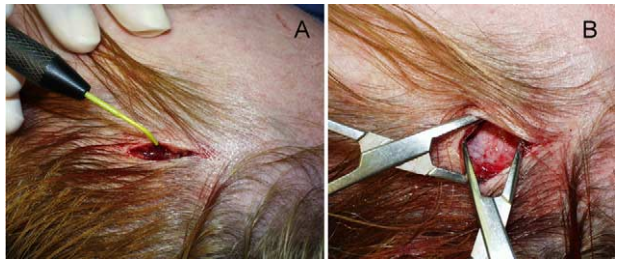

FIGURE 6. *A,* Skin incision performed with the radiofrequency microelectrode. *B,* Dissection to the superficial layer of the temporalis fascia.

Attention is then focused to the temporal incision marking. Using a radiofrequency microelectrode (Ellman International, Hewlett, NY) on pure cutting current (or a scalpel), the incision is made just through the subcutaneous plane. Using a hemostat, the fine layers of the temporoparietal fascia are bluntly dissected (this layer contains the frontal branch of the facial nerve, but not in the region of this incision) until the superior layer of the temporalis fascia is identified (Fig 6).

If significant ptosis of the midface and lateral orbital regions exists, a skin eclipse may be removed at this incision to further tighten the adjacent structures.

The periosteal elevator is then directed (while staying intimate to the superficial layer of the temporalis fascia) to meet the tunnel from the intraoral incision (Fig 7). When the broad tip of the periosteal elevator contacts the lateral orbital rim, it is twisted and scraped along the bone to burrow and enter the

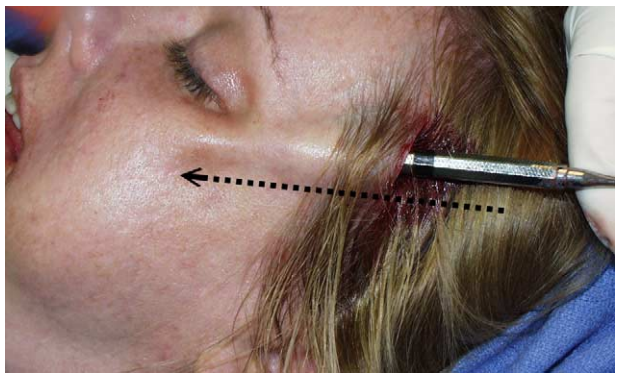

FIGURE 7. A periosteal elevator is used to enter the subperiosteal plane over the frontozygomatic region of the lateral orbital rim.

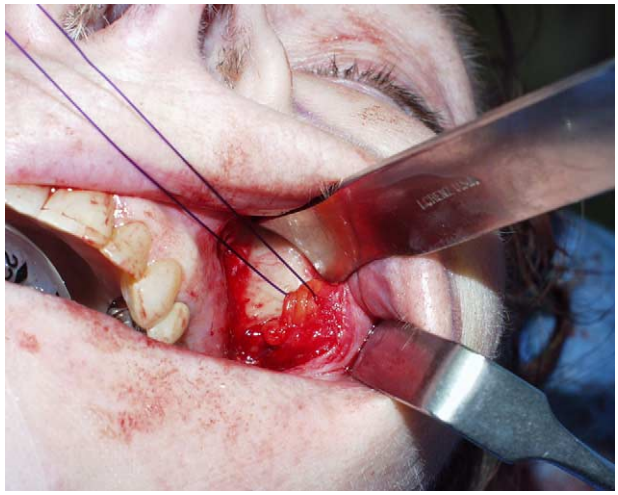

FIGURE 8. Malar fat pad tissue is secured with a 2-0 PDS suture.

subperiosteal plane. Staying on the superficial layer of the temporalis fascia in the temple and under the periosteum over the orbital rim will protect the frontal branch of the facial nerve in this region. This completes the tunnel that connects the intraoral and temporal regions.

At this point a 2-0 PDS suture is used to secure the composite tissue in the region of the first molar. (This suture engages fat tissue, periosteum, and possibly muscle fibers from adjacent structures.) A double bite is performed to securely engage the soft tissue (Fig 8).

The next step is to pass the suture from the intraoral to the temporal dissection. This can be done with passing needles, awls, fine tonsil hemostats, or wire passers, but the authors prefer the use of a narrow tonsil hemostat with fine tips. The instrument is passed through the temporal incision over the bony lateral orbital rim, across the malar eminence, and exits intraorally through the vestibular incision (Fig 9A). The needle is cut off of the suture and the 2 suture ends are pulled through the dissection tunnel and exit the temporal incision (Fig 9B). Some surgeons do not cut off the needle, but we believe that this can increase the possibility of nerve damage or bleeding when dragging the needle through the incision tunnel. Although this damage could be lessened by using a smaller needle, it is difficult to grasp enough tissue intraorally with a smaller needle.

The final step is to elevate the midface by placing traction on the suture ends. If the dissection is properly performed, impressive elevation and augmentation of the unilateral malar region is apparent. The more tension placed on the suture, the greater the bulge of the augmentation over the malar region. If the symmetry of the lift is acceptable the suture is secured. If the region of augmentation is not that desired by the surgeon or patient, the same suture is placed in the same manner, but at the level of the cuspid instead of the first molar. This will provide a more infraorbital and less zygomatic lift (Fig 10). The surgeon then decides which suture provides the desired vector and removes the other suture. Both sutures may be left in place to provide maximum lift and augmentation.

The suture must then be secured to the superficial layer of the temporalis fascia. Because the needle has been previously detached for passage a passing needle must be reattached. A curved, threadable needle (No. 14 MS192 1/2 circle; Schein Medical, Melville, NY) is threaded on one end of the PDS suture; then a deep bite is taken through the temporal fascia, and the suture is secured and tied (Fig 11).

The same procedure is performed on the contralateral side. It is imperative at this point to make sure that both sides are symmetric. If the second side is not symmetric, then the suture is repositioned and tensioned to emulate the previous side. Due to the fact that the patient is in the supine position, the augmentation usually appears overcorrected, but in actuality is usually pleasing in the upright position after healing (Fig 12).

The temporal incisions are closed in 2 layers with 4-0 gut suture and the intraoral incisions are closed in a routine manner with the same suture. In some cases, due to the degree of tissue elevation, the in-

FIGURE 9. A tonsil clamp is passed through the dissection tunnel *(A)* and into the mouth *(B)*.

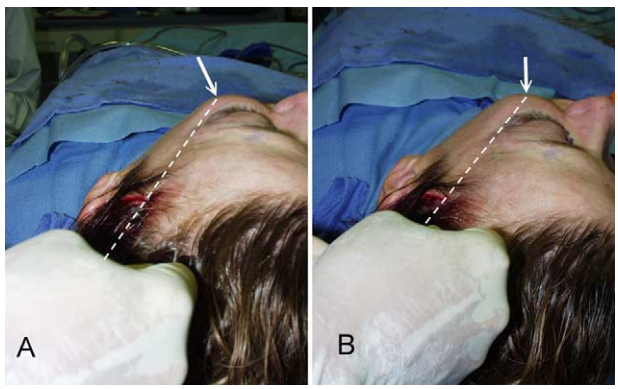

FIGURE 10. *A,* Zygomatic elevation from securing the fat pad in the first molar region. *B,* More infraorbital elevation from grasping the fat pad in the cuspid region.

FIGURE 11. The suture is rethreaded on a needle and sewn to the superficial layer of the temporalis fascia.

traoral incision may not approximate due to the tethered tissues. In this case, the mucosa is released from the deeper structures until enough laxity is achieved to close the mucosa. No special dressings or bandages are placed. The patient is placed on appropriate antibiotics, analgesics, and a tapering dose of oral steroids.

Postoperative Course

Most patients resume normal activity after 48 hours but remain swollen in the midfacial region. The patients must be reassured that the swelling is postoperative in nature, will resolve, and does not represent the final augmentation. In addition most of these patients will have some degree of paresthesias of the region innervated by the infraorbital nerve. Some patients will also have some degree of perioral muscular dysfunction. This occurs from the dissection of the muscle origins of the lip elevators and periosteum from the underlying bone or muscular trauma. The patient should have been informed of this preoperatively and must be reassured that this too will return to normal over the next several weeks. In this series of 16 patients, no permanent nerve deficits or muscle dysfunction was noted. Little[14] reported an 8% incidence of lip paresis in a similar type of midface lift, all of which were temporary. He attributes this to nerve damage versus temporary muscle dysfunction. We believe that the temporary paresis is due to the disruption of the muscle origins of the mimetic muscles and/or muscle trauma.

Outcomes

Complications have been rare, but as with any procedure, the patient must be aware of common sequelae. Many of the patients experience some form of subtotal infraorbital paresthesias. In this series reported by the authors, there were no patients with permanent sensory deficit. One patient reported a unilateral paresthesia for about 11 weeks, which returned to normal.

Some of the patients experienced some degree of perioral muscle dysfunction. This is very similar to the degree of dysfunction as seen when degloving the maxilla for a Le Fort osteotomy. All patients had return of normal movement within 1 to 4 weeks. One patient experienced an infection of the periorbital region that responded to oral antibiotics. Presumably this was related to the suture tract and removal of the suspension suture would be advocated if reinfection occurred.

Several patients experienced a degree of asymmetry that persisted for a period of weeks to months. Two of these patients requested further treatment. One of these patients had very atrophic facial features and in retrospect was not a good candidate for midface lift. (Patients with atrophic midfacial soft tissue have very little to lift; therefore, results may be less than desired.) It is stressed that this technique is designed to reposition ptotic tissue and not indicated if the patient has no drooping tissue to elevate. The other patient had a degree of asymmetry that the author thought was too subtle to correct and was within acceptable limits for a bilateral procedure. Some immediate postoperative asymmetry is not unusual and, as with most bilateral procedures, usually heals to acceptable levels.

Intraoral wound dehiscence was seen unilaterally on 2 smokers. One patient healed uneventfully by secondary intention with rinsing and irrigation, and

FIGURE 12. A typical intraoperative result. The midface will frequently appear overcorrected due to supine patient positioning and edema, but overcorrection is rare in the author's experience.

the second patient required closure with a similar flap as used in an oral antral fistula.

Discussion

The profile of the infraorbital and midface regions of youth represents a single smooth convexity; however, due to the senescent changes of the lower eyelid and midface this profile assumes a double convexity. This double convexity results from the soft tissues of the eyelid descending and the descent of the malar and buccal fat, skin, subcutaneous tissue, and associated structures. Classically these changes occur during the patient's entire life but become clinically evident around the third to fourth decade of life.[15,16]

These changes include attenuation of the facial muscles, actinic damage with the loss of elasticity of the eyelid skin, pseudoherniation of the periorbital fat, descent of the malar and buccal fat and associated structures from laxity of the supporting fibrous tissue, laxity of the osteocutaneous retaining ligaments, and aging changes at the cellular level.[17] Medially, these changes cause the tear trough deformity (nasojugal fold) and a hollow suborbital region. In the midface, the superolateral tissues become ptotic and descend against the fixed nasolabial crease, thus accentuating the nasolabial fold.[18] The loss of the malar prominence from the sum of all these changes transforms the heart-shaped face of youth to the pear-shaped face of senescence. These patients complain of a drawn and tired appearance.

Literature Review

A search of the National Library of Medicine PubMed biomedical literature shows 37 entries for "midface lift" and 21 entries for "subperiosteal midface lift."

Tessier[19] introduced the concept of subperiosteal elevation with facelift procedures in 1989. Hamra[20] and Tobin et al[21] advocated deep plane subperiosteal facelifting procedures. Ramirez[22,23] expanded on various surgical techniques and subperiosteal approaches to the face. Hester et al[24] described a transblepharoplasty approach in 1996, and Owsley and Zweifler[17] described a technique of midface lifting performed via a rhytidectomy incision performed in the deeper plane. Hobar and Flood,[25] in 1999, published a technique for midface lifting in conjunction with orbicularis oculi suspension where the malar fat pad is secured from high above and not close to the intraoral incision. Goldberg,[26] in 2000, reported a lower lid approach with repositioning of infraorbital pedicles to augment the infraorbital and midfacial regions. Little[14,27] also published multiple articles on midface lifting and, in 2000, published a technique of subcutaneous approach for midface lift and securing the tissue lower than previous authors, but still in the midcheek region. Finger,[28] in 2001, described a temporal/intraoral approach for midface lift, but in conjunction with superficial musculoaponeurotic system and skin dissection. Sclafani,[16] also in 2001, published a method of midface lift that uses eyelid incisions. In 2002, Keller et al[12] and later Sasaki and Cohen[13] published percutaneous methods for midface suspension that did not include subperiosteal dissection.

Chisholm, in 1997, began using similar temporal/intraoral surgical incisions but grasped the tissue just above the incision in the first molar region, which influenced one of the authors' (J.N.) current technique (B.A. Chisholm, unpublished data).[29]

Critical review of standardized preoperative and postoperative images in this series point out significant findings of what this procedure does and does not improve. The most impressive consistent finding is the impressive repositioning of volume in the midface region (Fig 13) to its natural location providing significant augmentation in the malar region. This was the main motivation for most patients undergoing the midface lift.

The second most significant finding was the improvement of the lateral infraorbital hollow (nasojugal fold, tear trough deformity) (Fig 14). The middle and medial trough are not improved in most patients. This region has long been a challenge for cosmetic surgeons and there are many procedures that address this region with surgical access through eyelid incisions. The adjustable vector deep plane midface lift does not carry the liability of those procedures that invade the lamellar structures and contribute to lower eyelid malposition. However, minimal vertical lift is achieved and little effect is seen in the medial tear trough. When performed in conjunction with other procedures such as blepharoplasty, endoscopic brow and forehead lift, and/or periorbital laser resurfacing,

FIGURE 13. Malar augmentation and midface volume restoration are shown in this patient who was treated with midface lift only. (Left shows preoperative, right shows 6 months postoperative.)

FIGURE 14. This patient shows significant improvement of the infraorbital region from midface lift, lower blepharoplasty, and CO_2 laser skin resurfacing. (Left shows preoperative, center is 6 months postoperative, and right is 1 year postoperative.)

the midface lift produced significant changes of the tear trough deformity from medial to lateral.

Although there was initial improvement of the nasolabial fold in some patients, this was usually transient and the author does not promote this procedure as a solution to nasolabial fold correction. The adjustable vector deep plane midface lift was performed in conjunction with treatments that addressed the nasolabial fold such as laser resurfacing, fat transfer, and GoreTex (W.L. Gore Inc, Flagstaff, AZ) implants. Long-lasting and permanent nasolabial fillers will likely be available shortly to improve the region of the nasolabial fold. Patients treated with these multiple modalities did experience significant improvement in the nasolabial fold (Fig 15).

Figure 16 shows the result of a midface lift with multiple other facial reconstructive procedures. The patient underwent midface lift with concomitant facelift, 4 quadrant blepharoplasty, endobrow lift, and full-face CO_2 laser resurfacing.

Figure 17 illustrates a midface lift performed with double arch osteotomy. The midface lift augments the midfacial and malar regions more than a maxillary advancement alone.

The midface is the heart of the oral and maxillofacial region and oral and maxillofacial surgeons have pioneered many surgical techniques in this area. This report describes a simplified technique for midface lifting with the ability to adjust the vector of the

FIGURE 15. Midfacial volume restoration and nasolabial fold improvement are seen in this patient treated with the adjustable deep plane midface lift, GoreTex implants to the nasolabial folds, and CO_2 laser resurfacing of the periorbital and nasolabial regions. (Left shows preoperative, center shows 3 months postoperative, and right is 1 year postoperative.)

FIGURE 16. This patient was treated with midface lift and multiple other facial cosmetic procedures. She is shown before and 4 months after surgery.

midfacial augmentation. This procedure involves surgical approaches familiar to most oral and maxillofacial surgeons and is easily performed in the ambulatory office environment. The adjustable midface lift can be performed independently for midface suspension and malar augmentation or in conjunction with maxillary osteotomy for added augmentation. In addition, this procedure can enhance the midface and be performed concomitantly with other soft tissue procedures such as rhytidectomy and blepharoplasty and brow lift.

Due to the fact that the procedure requires a deeper plane dissection in the temple and subperiosteal dissection in the midface, postoperative swelling, paresthesia, and lip paresis may persist from 2 to 6 weeks.

Patients with atrophic midfacial soft tissue or hypoplastic midface are poor candidates as there is little volume to lift. These patients would benefit more from alloplastic implants or other types of augmentation.

The adjustable midface lift procedure provides excellent malar volume restoration, through reposition-

FIGURE 17. Although maxillary advancement osteotomy will frequently augment the midface, further augmentation is possible with concomitant midface lift. (Left shows preoperative, right shows 6 months postoperative.)

ing and suspension of the aging midface, and also provides a more youthful appearance of the infraorbital region with a moderate recovery time. Patient and physician satisfaction is high and complications are low.

References

1. Yousif NJ: Changes of the midface with age. Clin Plast Surg 22:213, 1995
2. Little JW: Volumetric perceptions in midfacial aging with altered priorities for rejuvenation. Plast Reconstr Surg 105:252, 2000
3. Binder WJ: Submalar augmentation: An alternative to face-lift surgery. Arch Otolaryngol Head Neck Surg 115:797, 1989
4. Flowers FS: Tear trough implants for correction of tear trough deformity. Clin Plast Surg 20:403, 1993
5. Coleman SR: Facial recontouring with lipostructure. Oper Clin Plast Reconstr 5:163, 1998
6. Lambros V: Fat injection for the aging midface. Oper Techn Plast Reconstr Surg 5:163, 1998
7. Duffy MJ, Friedland JA: The superficial-plane rhytidectomy revisited. Plast Reconstr Surg 93:1392, 1994
8. Ramirez OM: The subperiosteal rhytidectomy: The third generation face lift. Ann Plast Surg 28:218, 1992
9. Watson SW, Stone TL, Sinn DP: The 4-dimensional rhytidectoplasty. Am J Cosmet Surg 18:5, 2001
10. Niamtu J: Commonplace complications of laser resurfacing and their treatment. Oral Maxillofac Surg Clin North Am 12:579, 2000
11. Niamtu J: Fat transfer gun used as a precision injection device for injectable soft tissue fillers. J Oral Maxillofac Surg 60:838, 2002
12. Keller GS, Namazie A, Blackwell K, et al: Elevation of the malar fat pad with a percutaneous technique. Arch Facial Plast Surg 4:20, 2002
13. Sasaki H, Cohen AT: Meloplication of the malar fat pads by percutaneous cable-suture technique for midface rejuvenation: Outcome study (392 cases, 6 years experience). Plast Reconstr Surg 110:635, 2002
14. Little JW: Three-dimensional rejuvenation of the midface Volumetric resculpture by malar imbrication. Plast Reconstr Surg 105:267, 2000
15. Hoenig JA, Shorr N, Shorr J: The suborbicularis oculi fat in aesthetic and reconstructive surgery. Int Ophthalmol Clin 37: 179, 1997
16. Sclafani AP: The multivectorial subperiosteal midface lift. Facial Plast Surg 17:29, 2001
17. Owsley JQ Jr, Zweifler M: Midface lift of the malar fat pad: Technical advances. Plast Reconstr Surg 110:674, 2002
18. Owsley JQ Jr: Lifting of the malar fat pad for correction of prominent nasolabial folds. Plast Reconstr Surg 91:463, 1993
19. Tessier P: Subperiosteal face-lift. Ann Chir Plast Esthet 34:193, 1989
20. Hamra ST: The zygorbicular dissection in composite rhytidectomy: An ideal midface plane. Plast Reconstr Surg 102:1646, 1998
21. Tobin HA, Cuzalina A, Tharanon W, et al: The biplane facelift: An opportunistic approach. J Oral Maxillofac Surg 58:76, 2002
22. Ramirez OM: The central oval of the face: Tridimensional endoscopic rejuvenation. Facial Plast Surg 16:283, 2000
23. Ramirez OM: Three-dimensional endoscopic midface enhancement: A personal quest for the ideal cheek rejuvenation. Plast Reconstr Surg 109:329, 2002
24. Hester TR, Codner MA, McCord CD: The "centrofacial approach" for the correction of facial aging using the transblepharoplasty subperiosteal cheek lift. Aesthet Surg Q 16:51, 1996
25. Hobar PC, Flood J: Subperiosteal rejuvenation of the midface and periorbital area: A simplified approach. Plast Reconstr Surg 104:842, 1999
26. Goldberg RA: Transconjunctival orbital fat repositioning: Transposition of orbital fat pedicles into a subperiosteal pocket. Plast Reconstr Surg 105:743, 2000
27. Little JW: Autologous sculpture of the aging face by malar imbrication. Plast Reconst Surg Forum 21:23, 1998
28. Finger ER: Transmalar subperiosteal midface lift. Plast Reconstr Surg 108:1824, 2001
29. Chisholm B: Surgical facial rhytidectomy: The evolution of an esthetic concept. Oral Maxillofac Surg Clin North Am 12:719, 2000