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Triple-Layer Midface Lifting: Long-Term Follow-Up of an Effective Approach to Aesthetic Surgery of the Lower Eyelid and the Midface

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Abstract
Background It is becoming more and more accepted that better aesthetic results can be obtained when the lower eyelid is considered as part of the midface when contemplating surgical rejuvenation. Descent of the orbicularis muscle and midface tissue causes malar bags, loss of volume over the tear-trough, apparent vertical lengthening of the lower eyelid, and an accentuation of the orbit-cheek junction.
Methods We describe a triple-layer technique that effectively corrects these problems, performed under local anesthesia and via a standard subciliary incision, to separately reposition the postseptal fat, suborbicularis oculi fat, and the musculocutaneous layer of skin and orbicularis oculi. We present a detailed analysis of the complications arising from a series of over 500 patients, in which this technique has been performed by the senior author.
Results The average patient age at the time of surgery was 51 years old (±7.9), with a median follow-up of 7 months (range 3–121). Complications were observed in 77 of 512 cases. In total, 44 of these cases required surgical reintervention under local anesthesia (rated as major complications and all reinterventions lasted <30 min) and 33 cases were treated conservatively (minor complications).
Conclusion The triple-layer midface lift is an effective way to reverse the combination of ptosis and changes in volume of the aging midface. It yields long-lasting results with a minimal risk for complications, particularly when a tarsal tuck is performed simultaneously in patients at high risk for the development of scleral show.
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Keywords Midface lift · Lower blepharoplasty · Postseptal fat · Suborbicularis oculi fat (SOOF)

Introduction

The lower eyelid is no longer considered in isolation when contemplating surgical rejuvenation; rather, it is a part of the midface. The midface is the central third of the face between two parallel imaginary horizontal lines: the superior line passing through the lateral canthi and the inferior line at the level of the columella. The youthful orbit-cheek junction is convex with no visible orbital rim [1]. Signs of aging in this area include (a) ptosis of lower-eyelid skin, orbicularis muscle, suborbicularis oculi fat (SOOF), and midface tissues, giving an accentuated nasojugal fold ("tear trough deformity"), malar bags or "festoons," and apparent vertical lengthening of the lower

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eyelid; (b) intraorbital fat atrophy, and (c) laxity of the orbital septum which results in bulging of the orbital fat and the impression of surplus fat in this area (pseudosurplus) [2].

In standard lower blepharoplasty [3], the orbicularis muscle is elevated from a subciliary incision to the infraorbital rim. Postseptal fat that is judged to be excessive is excised, and the skin-muscle flap redraped and trimmed. This excision of pseudosurplus fat can give a hollow look to the eyes which is aging in itself. To counter this problem, De la Plaza [4] replaces the intraorbital fat and contains it by suturing the capsulopalpebral fascia to the periosteum of the infraorbital rim, thus reinforcing the attenuated septum and avoiding fat resection. Hamra [1], on the other hand, uses fat repositioning via arcus marginalis release, or septal reset [5], to create a smooth transition from eyelid to cheek, camouflaging the infraorbital rim.

The effect of the standard lower blepharoplasty is limited. It fails to address the fundamental problem of the descent of midface structures, specifically the orbicularis oculi muscle, the SOOF, and the malar fat pad. This results in a visible infraorbital rim and an apparent lengthening of the lower eyelid (vertical lengthening). Three definitive surgical planes have been used so far to correct descent of the midface by vertical repositioning:

1. The subperiosteal approach, introduced by Tessier [6] and modified by Hester et al. [7], uses the periosteum to elevate the midface structures via sutures in the deep temporal fascia. This involves extensive dissection and is routinely associated with prolonged postoperative edema [8]. It also involves elevation of an anatomical structure that does not become ptotic with age: the periosteum.
2. The suborbicularis plane, first described by Furnas [9] for the treatment of festoons, has been popularized by many authors, including Hinderer et al. [10], Hamra [11] (as the plane for his composite rhytidectomy), and Fogli [12]. This plane allows elevation of the orbicularis oculi and malar fat pads but could cause problems with edema and lower-lid retraction. The abundance of orbicularis muscle and exudate promotes fluid accumulation in the skin, creating edema that causes skin quality to deteriorate.
3. Hamra [13] modified the suborbicularis dissection to address these problems by continuing deep to the zygomaticus muscles: the zygorbicular dissection. This approach is used either alone, as part of a lower blepharoplasty, or in conjunction with a deep-plane rhytidectomy so that the composite eyelid flap is advanced vertically on a "mesentery" of zygomatic muscle [13]. Hamra makes no mention of the SOOF in his description of the zygorbicular technique, or whether this structure is included in the composite flap.
4. Other authors have utilized flaps of isolated orbicularis muscle to address a conspicuous orbit-cheek junction and to obliterate festoons [12, 14]. The muscle flap is suspended to the periosteum at the lateral orbital rim to achieve vertical support to the eyelid. The benefit of suspending an isolated muscle flap is that the upward force vector achieved will neutralize possible downward forces after skin excision which could result in lower-lid retraction. This mirrors the principle of superficial muscular aponeurotic system (SMAS) resection-plication rhytidectomy, where the tension is transmitted via the SMAS rather than the skin [14]. However, the orbicularis suspension alone will not achieve elevation of all the midface structures unless the dissection proceeds beyond the infraorbital rim.

In this article we describe a technique that involves the separate manipulation of three anatomical structures—the postseptal fat, the SOOF, and a musculocutaneous flap-in order to obscure a prominent infraorbital rim and improve the orbit-cheek junction, thus rejuvenating the midface and periorbital areas.

Methods

The Triple-Layer Midface Lift

The surgery is performed under local anesthesia: 1 % lidocaine with 1:200,000 epinephrine, buffered with a 1:10 ratio of 0.7 % sodium bicarbonate solution. The anesthesia is used to block the sensory branches of the maxillary division of the trigeminal nerve, i.e., the lateral zygomaticotemporal, medial zygomaticotemporal, zygomaticofacial, and infraorbital nerves. In addition, local anesthetics are applied below the septum just prior to marginal release and incision of the septum, blocking infraorbital sensory nerve supply. The skin incision is infiltrated to utilize the vasoconstrictor effect of epinephrine. On average, a total of 6 cc is used. A bilateral procedure takes the senior author about 45 min to perform.

A high subciliary incision is made through the skin at the lateral extent of the skin markings. Curved scissors are used to develop a plane deep to the pretarsal orbicularis oculi muscle. The skin and muscle are then cut simultaneously along the length of the incision with the scissors. The upper blade of the scissors should be angled superiorly to bevel the incision, leaving 2–3 mm of muscle on the superior flap. This preserves sensation to the eyelid margin, which occurs via infraorbital nerve branches passing from deep to superficial through the orbicularis muscle. A 4/0

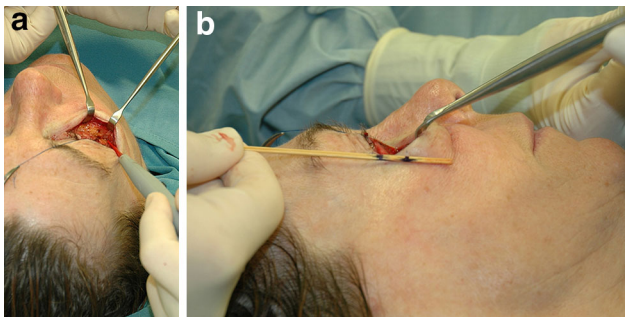

Fig. 1 **a** The perioperative approach to undermining the SOOF in the supraperiosteal plane is depicted. **b** The extent of undermining over the orbital rim shown in a lateral view

Prolene suture is used to retract the posterior lamella superiorly, which aids dissection and protects the globe from desiccation. Skin hooks are placed in the myocutaneous flap and used to gently retract the anterior lamella superiorly at a 45° angle. This slight tension on the anterior lamella aids the subsequent dissection.

Dissection of the anterior lamella continues in a plane between the septum and orbicularis to the arcus marginalis. The dissection then continues beyond the arcus marginalis in the supraperiosteal plane in order to elevate the SOOF (Fig. 1a, b). Dissection here should be performed lateral to the midpupillary line. This avoids damaging the infraorbital nerve which lies 1 cm inferior to the infraorbital rim in line with the medial limbus. The inferior limit of dissection is at the level of the alar rims. The lateral extent of the dissection is in line with the lateral orbital rim. The zygomaticotemporal nerve may be encountered toward the lateral edge of the dissection (this has occurred in $\sim$10 % of our cases). The nerve should be preserved, if encountered, as damage causes numbness of the midface, albeit transient. The senior author favors the use of diathermy with an insulated Colorado needle for dissection, to provide a bloodless field (Fig. 1a). An additional benefit of the use of diathermy is that the patient will feel discomfort as the zygomaticotemporal nerve is approached despite local anesthetic infiltration, warning the surgeon that the nerve is close and to discontinue any further lateral dissection at this point.

When the dissection is completed, a triple-layer approach is used to create the most optimal continuation of tissue from the cheek into the lower eyelid (Table 1).

Layer 1 release of the arcus marginalis is performed, again using diathermy with the Colorado needle. The septa dividing the lower orbital fat into compartments are divided, allowing the fat to herniate across the entire infraorbital rim. The fat is carefully teased inferiorly and redraped over the lower orbital rim from the levator labii alaeque nasi medially to the lateral canthus laterally (Fig. 3a, b).

Table 1 A short overview of the triple-layer midface lift from deep to superficial planes of dissection

Layer 1: deepest layer
Dissection: marginal release of intraorbital fat by incision of the septum just over the orbital rim
Suturing: redraping of this fat and fixation to the periosteum (5/0 Vicryl inverted points)
Layer 2: middle layer
Goal: strictly vertical lifting of SOOF
Suturing: full bite of SOOF with nonresorbable 4/0 Prolene visi black needle and fixation to lateral orbital rim 5 mm below lateral canthus
Layer 3: superficial layer
Goal: strictly vertical lifting of musculocutaneous flap (without separating skin from the muscle)
Suturing: full bite of orbicularis muscle without making a dimple in the overlying skin (with a resorbable Vicryl 4.0 suture) and fixation to lateral orbital rim between lateral canthus and suture of layer 2

The fat is fixed to the periosteum with 5/0 Vicryl interrupted sutures (Figs. 2b, 3a). Knots should be placed in the plane between the fat and the periosteum (inverted) to prevent palpable irregularities through the thin skin of the lower eyelid.

Layer 2 the SOOF is then lifted superiorly and fixed to the lateral orbital rim periosteum with 4/0 Prolene interrupted sutures (Figs. 2c, d, 3b), just inferior to the lateral canthus.

Layer 3 ultimately, the myocutaneous flap is then elevated and fixed to the periosteum just superior to the SOOF fixation with a 4/0 Vicryl suture through the orbicularis. Care is taken to dissect no more than 1 cm of muscle free from the skin (if any) to minimize postoperative edema in this area. True vertical repositioning is guaranteed by taking a bite of muscle 1 cm vertically inferior to this anchoring point (Figs. 2e, f, 3c, d).

The retraction suture is removed and skin resection is performed. To avoid over-resection of skin, the skin resection is performed with the patient's eyes and mouth open to their maximum extent. The incision margins should still be opposed after resection with the patient in this position. A 3-mm strip of orbicularis is trimmed from the margin of the inferior flap to prevent postoperative prominence at the site of the skin incision. The skin incision can then be closed. The senior author prefers to close just the skin lateral to the lateral canthus with three interrupted Prolene sutures (6/0). The subciliary margins will oppose without the need for any sutures or Steri-Strips, which can cause discomfort. We have had no problems with wound healing using this method. A detailed video of the entire procedure as described can be viewed without charge

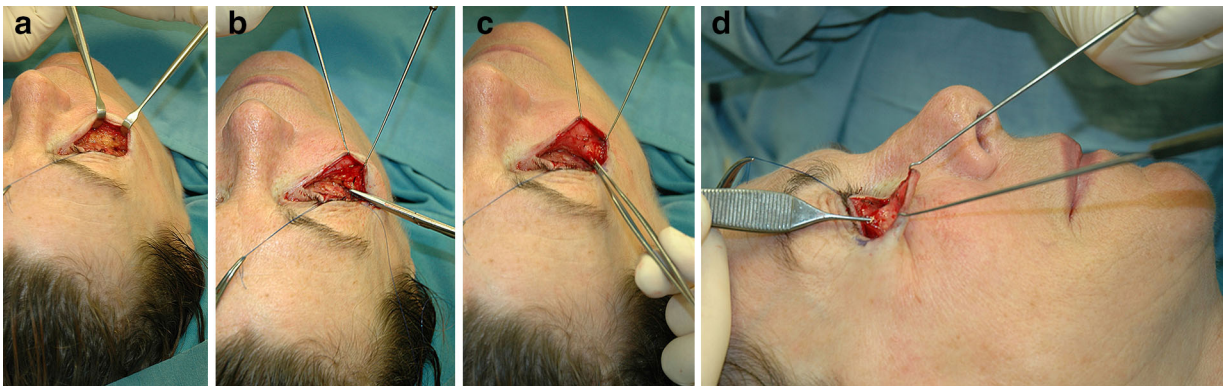

Fig. 2 **a**, **b** Point of traction of the SOOF, **c**, **d** the point of traction of the musculocutaneous flap is shown from a cranial and a lateral view

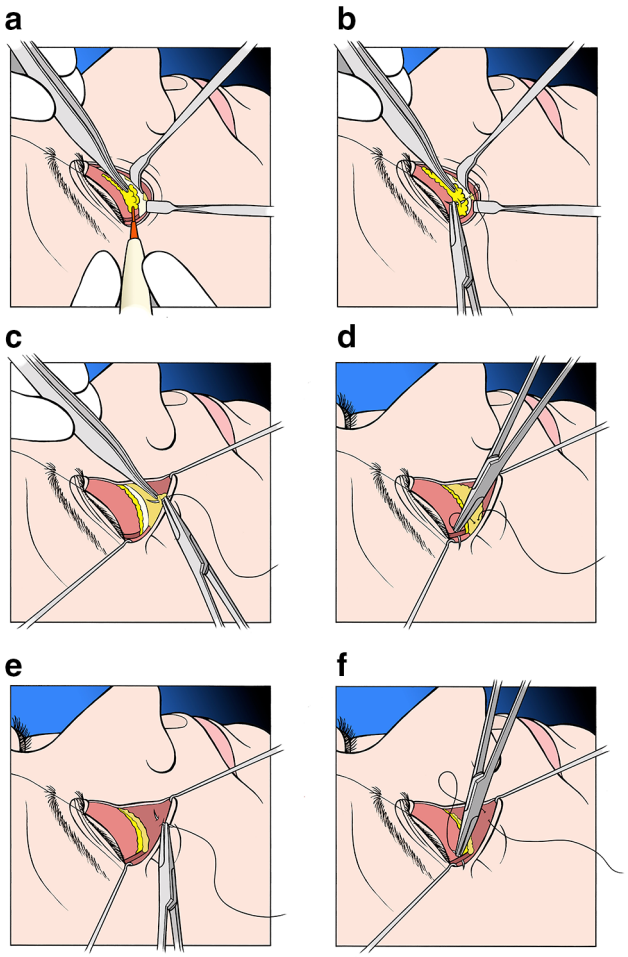

Fig. 3 Drawings of the different perioperative steps of the triple-layer midface lift are presented. **a** Layer 1, step 1: marginal release of the septum is performed, allowing the intraorbital fat to prolapse over the orbital rim, **b** layer 1, step 2: the intraorbital fat is fixed to the periosteum, **c** layer 2, step 1: the point of traction of the SOOF, **d** layer 2, step 2: the point of anchoring of the SOOF to the lateral orbital rim, **e** layer 3, step 1: the point of traction of the musculocutaneous flap, **f** layer 3, step 2: the point of anchoring of the musculocutaneous flap

at www.surgytec.com/video/lifting-the-midface-including-the-soof.

The Preventive Tarsal Tuck

Patients with eyelid laxity who presented a risk for postoperative complications were identified preoperatively using the "anterior distraction" test (i.e., delayed return to the resting position after the lower eyelid is pulled anteriorly away from globe) and the "snap back test" (i.e., delayed return to the resting position after lower eyelid is pulled inferiorly). In such cases, a preventive tarsal tuck was also performed as follows: A 4/0 Prolene suture is used starting from the inner side of the orbital rim 5 mm cranial to the lateral canthus via a separate incision (or via the lateral part of the incision of an upper blepharoplasty). A puncture hole is then made with an 11 blade through the most lateral part of the tarsus (just where the last eyelashes are seen) and used as an exit point for the needle. The curvature of the needle is used to exit again, back through the same puncture hole, just next to where the needle was introduced to facilitate suture tying through the periosteum. As a result, the lateral part of the tarsus is tightened and lifted and the curvature of a youthful eye is restored without skin excision or lateral canthopexy.

Extra operating time in such cases is no more than 5 min per side, and the extra effort is considered worthwhile to prevent serious complications without causing eye distortion, frequently observed after formal lateral canthopexy.

In a small number of cases ($n = 8$), a minimal quantity of fat was injected in the areas adjacent to the surgical plane of dissection as an adjuvant from the 6th postoperative month onward (8 cc was equally divided over the nasolabial fold, central part of the midface, tear trough, malar eminence, and anterior part of the cheek, gradually fading out to the temporal region). Cases in which

Table 2 Procedure distribution among patients with number of complications

Procedure	No. patients	Complications		
		None	Minor[a]	Major[a]
Triple-layer midface lift only	287	257	15	15
Triple-layer midface lift + upper-eyelid blepharoplasty	117	95	8	14
Triple-layer midface lift + tarsal tuck	44	39	0	5
Triple-layer midface lift + MACS-lift	22	17	3	2
Triple-layer midface lift + endoscopic forehead lift + upper-eyelid blepharoplasty	18	12	4	2
Triple-layer midface lift + full-face rhytidectomy	10	6	2	2
Triple-layer midface lift + endoscopic forehead lift	6	3	0	3
Triple-layer midface lift + MACS-lift + upper-eyelid blepharoplasty	4	3	1	0
Triple-layer midface lift + upper-eyelid blepharoplasty + lateral brow-lift	4	3	0	1
Total	512	435	33	44

[a] Minor complications were treated conservatively and major complications required surgical correction which in all cases was a procedure done under local anesthesia and taking <30 min

lipofilling was used to address more profound facial volume loss in the same session were excluded from this overview.

Between 2000 and 2012, a total of 512 consecutive patients were treated with the triple-layer midface lift as described. Complications were noted meticulously during this period and categorized as minor (treated conservatively) or major (requiring surgical reintervention under local anesthesia).

Results

The average patient age at the time of the operation was 51 years old (±7.9), with a median follow-up of 7 months (range 3–121). A total of 225 patients had additional surgical procedures in the same session as the triple-layer midface lift (see Table 2). In 44 cases, eyelid laxity was confirmed preoperatively by an anterior distraction test time >5 s and a negative snap back test. In these cases, the triple-layer midface lift was combined with a tarsal tuck to prevent scleral show.

Complications were observed in 77 of 512 cases. Forty-four cases required surgical reintervention under local anesthesia; these were rated as major complications and all reintervention procedures lasted <30 min. Thirty-three cases were treated conservatively and were all transient; these were rated as minor complications (see Table 3 for specifications). Scleral show was the most common major and minor complication.

Case 1

A 40-year-old female visited our outpatient clinic asking for an improvement of moderate signs of aging, particularly of the lower eyelid and midface. She felt that she

Table 3 Specification of complications

	n	% Of total (512 patients)
Major complications[a]		
Total number of scleral show requiring tarsal tuck	12	2.3
After primary triple-layer midface lift	8	1.6
Secondary tarsal tuck after relapse	3	0.6
Secondary tarsal tuck after triple-layer midface lift combined with preventive tarsal tuck[b]	1	0.2
Skin surplus requiring resection	7	1.4
Persistent edema (>3 months)	5	1.0
Lack of effect	4	0.8
Bleeding requiring surgical intervention	4	0.8
Festoon	5	1.0
Scar irregularities requiring correction	3	0.6
Redraping	2	0.4
Palpable subcutaneous suture	1	0.2
Ectropion	1	0.2
Total number of major complications	44	8.6
Minor complications[a]		
Minimal scleral show treated with Steri-Strips	11	2.1
Infection	9	1.8
Conjunctival irritation	7	1.4
Scar irregularities treated with massage	4	0.8
Edema (<3 months)	1	0.2
Bleeding	1	0.2
Total number of minor complications	33	6.4

[a] Minor complications were treated conservatively and major complications required surgical correction which in all cases was a procedure done under local anesthesia and taking <30 min

[b] 0.2 % of total number of cases ($n = 512$), 2.2 % of triple-layer midface lift combined with preventive tarsal tuck cases ($n = 44$)

Fig. 4 **a–c** A 40-year-old female visited our outpatient clinic asking for an improvement over the moderate signs of aging, particularly of the lower eyelid and midface. Under local anesthetics a triple-layer midface lift was performed, addressing also the mild ptosis of the cheek and the hollowing out of the orbital rim. **d–f** Long-term results after 8 years show a stable outcome with a shorter cheek-palpebra junction, elevated midface, and less fatigued overall appearance

looked less fit and energetic because of a deep tear trough and flattening out of her midface (Fig. 4a–c). Under local anesthesia, a triple-layer midface lift was performed; the mild ptosis of the cheek and the hollowing-out of the orbital rim were also addressed. Long-term results after 8 years (Fig. 4d–f) show a stable outcome with a shorter palpebra-cheek junction and elevated midface, conveying a less tired and more energetic overall appearance.

Case 2

A 51-year-old female presented with concerns about her tired appearance, particularly localized in the midface (Fig. 5a–c). A triple-layer midface lift was performed (without any ancillary procedure). Postoperative results after 1 year show a clear improvement throughout the midface (Fig. 5d–f). These results show that vertical repositioning of the midface fullness and better continuation of the cheek into the eyelid is associated with a healthy, younger appearance. Resection of any fat seems counterproductive; instead, extra filling could be considered to further improve the result.

Discussion

In this article we describe an effective method of addressing the complex combination of aging in the midface by ptosis and changes in volume distribution in three separate layers. With aging comes the descent of midface structures, together with fat atrophy intraorbitally and of the midface itself [2]. At the same time there is development of malar bags or festoons due to attenuation of the orbital septum and laxity of the orbicularis oculi muscle. Surgical procedures have focused on restoring the youthful contour of the orbit-cheek junction by resuspension of the soft tissues and providing soft tissue cover over the infraorbital rim. This has been performed by suspension via subperiosteal dissection [5, 6] or by manipulation of the postseptal fat [1, 3, 5], orbicularis oculi muscle [9–14], or SOOF [15–17]. We believe that the combination of these

Fig. 5 **a–c** A 51-year-old female complained about a tired look mainly concentrated in the midface. A triple-layer midface lift was performed (without any other ancillary procedure). **d–f** Postoperative results after 1 year show a clear improvement over the entire midface. It is becoming even clearer that vertical repositioning of the fullness of the midface and a better continuation of the cheek into the eyelid is associated with a healthy younger appearance

techniques into a single procedure is a preferable option. The triple-layer midface lift incorporates filling of the tear trough by redraping, vertical lifting of the SOOF, and a musculocutaneous lifting of the eyelid. This combination addresses both ptosis and changes of midface volume with the available tissue. Cases in which lipofilling was used to address more profound facial volume loss in the same session were excluded from this overview.

A strictly vertical vector for repositioning the musculocutaneous flap is desirable; therefore, in our technique, the anchor point for the flap is the inner periosteal surface of the orbital rim, using a resorbable suture (4/0 Vicryl). A frequently used alternative is to attach a sling to the temporal fascia; however, we believe this results in too much of an oblique vector in the face. Initially, the technique involved separating muscle from the skin; in the last 5 years, the technique has evolved and now there is a strong preference to leave the muscle attached to the skin. This should preserve the superficial lymphatic drainage system of the skin, preventing in almost all cases any prolonged swelling in the area of the skin muscle flap (from 20 to 30 % to <2 %). Such prolonged postoperative swelling in this area of the face is recognized as a major drawback of the classical technique which involves disrupting the skin-muscle interface.

Despite the multiple anterior anchoring points as described per layer, the manipulation of the septum, middle lamella, SOOF, and musculocutaneous flap resulted in such a significant degree of cicatrization that even mild scleral show persisted; in these cases, lipofilling by microfat grafting was considered the preferred adjuvant therapy. Correction using suture placement causes further tension so it was not felt to be an appropriate solution. Lipofilling in such cases was performed from the 6th postoperative month onward. An average of 8 cc of centrifuged microfat particles, harvested by a Tonnard type of harvesting cannula (Tulip®), was injected as three-dimensional dispersed

droplets using a curved cannula from lateral to medial and medial to cranial directions. The 8 cc was equally divided over the nasolabial fold, central part of the midface, tear trough, malar eminence, and anterior part of the cheek, gradually fading out to the temporal region.

Scleral show was the most common complication. It occurred in 4.4 % of all cases, requiring surgical correction in 12 patients (2.3 %). In 11 patients (2.1 %) it was only a temporary complaint that resolved with conservative management. The recent case review by Hester et al. [18] showed similar percentages, with 4.8 % of all cases requiring at least one correction for malposition of the eyelid after a midface lift. Proper examination prior to the procedure is paramount to identifying cases that are prone to developing scleral show. In this series, 44 patients were identified as high risk and underwent a simultaneous preventive tarsal tuck. McCord et al. [19], who advocated modified lateral canthoplasty in selected cases, drew similar conclusions. Despite this preventive tarsal tuck, scleral show still occurred in one case (2.2 %) of our group ($n = 44$). Compared to the 11 of 468 with a normal physical examination (2.4 %), we believe that the preventive procedure decreased the potential number of scleral show complications. In addition, patients who received a tarsal tuck after the initial procedure were more at risk of developing a relapse (3 of 8 cases, 37.5 %) compared to patients who underwent a preventive procedure (no relapse in 44 cases). There are most likely several confounding factors that influence the reported complication rate in this study, which is a clear limitation of the study design. Well-defined patient cohorts with strict inclusion criteria may be the key in identifying these confounders in future studies, with the goal of lowering the complication rates further.

Although there are alternative techniques using different approaches to the midface [15, 20–23], we believe a direct subciliary approach to the midface has several advantages. First, technically it seems to offer less experienced surgeons an easy-to-learn more extended technique with a steep learning curve in case a pinch-grip lower-eyelid correction will not be sufficient for patients with midface issues. Second, this approach allows for easy modification into a technique where lifting can be combined with lipofilling.

When dissection is performed as described above but limited to the orbital rim and not beyond, one can combine diathermic tightening of the septum with lifting of the third layer only (the musculocutaneous transposition). Subsequently, lipofilling of the midface and tear trough area can be performed, making midface procedures through a subciliary approach a reliable working horse in an otherwise high-risk operating field.

Conclusion

The triple-layer midface technique is an effective causally related therapy to reverse the combination of ptosis and volume changes of the aging midface. It yields long-lasting results with a more natural youthful appearance and a minimal risk for complications, particularly when a tarsal tuck is performed simultaneously in patients at high risk for the development of scleral show.

Conflict of interest All authors declare that they have no conflicts of interest or financial ties to disclose.

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