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Combined Endoscopic Supraperiosteal Dissection and Percutaneous Sutures Suspension of the Malar Fat Pad in Rejuvenation of the Midface*

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ABSTRACT

Elevating the malar fat pad is a critical step in rejuvenating the midface. This could be effectively performed by open face lifts, limited incisions, or by the use of the endoscope. In endoscopic midface lifts, suturing the malar fat pad is technically difficult and only small bite are possible. Alternatively, percutaneous sutures were demonstrated by many authors to lift the malar fat pad without dissection. The technique was suitable for young patients with minimal midface aging. Combining the endoscopic technique with the percutaneous suture lift would thus offer the advantages of treating cases with advanced midface aging, and the strong anchoring of the malar fat pad. In the current study, the combined technique was used in 16 cases with stable 4.9mm. mean elevation of the malar fat pad over a 12 months period. No additional morbidity were documented from combining both techniques of midface rejuvenation.

INTRODUCTION

The midface is the anterior mobile area of facial expression and it occupies the area between the inferior orbital rim and the mouth. Aging of this region starts at a relatively early age of 30 years. It is characterized by: Loss of cheek convexity, infraorbital hollowness, deepening of the nasolabial fold and the nasojugal groove, and descent of the lid-cheek interface with lengthening of the lower eyelids (Fig. 1). All these signs occur secondary to the descent of the malar fat pad. This thickened subcutaneous fat pad is triangular in shape, having its base parallel to the nasolabial fold and its apex reaching the lateral aspect of the malar eminence. In the young individual, the upper border of the malar fat pad covers the infraorbital rim and the orbital part of the orbicularis oculi muscle. The fat pad is firmly attached to the overlying skin, while it is loosely-adherent to the underlying SMAS and elevator muscles of the upper lip. With aging, gravitational descent of the malar fat pad (and its overlying adherent skin) occurs in an inferior and medial direction. The upper border descent leads to lengthening of the lower eyelid, visibility of the inferior orbital rim and loss of the cheek projection. The lower portion of the fat pad moves inferiorly against the fixed nasolabial crease leading to fullness of the fold **[1,2,3]**.

The cause of the gravitational descent of the malar fat is the attenuation of the supporting ligaments with age. These ligaments anchor and support the fat pad to deeper structures like the periosteum and the facial skeleton. The orbitomalar ligament attaches the upper end of the malar fat pad to the inferior orbital rim and the SOOF (suborbicularis oculi fat). The zygomatic ligament arises from the periosteum of the malar bone at the origine of the zygomaticus major muscle. It penetrates and anchors the malar fat pad and is attached to the overlying skin. With aging these two ligaments lengthen and weaken the support of the malar fat pad. Deeper structures (periosteum, SOOF and muscles) are minimally affected by aging **[4,5]**. Loss of volume of the malar fat pad is also an aging factor but it is not consistent in all cases **[6]**.

The problem with midface aging is the fact that traditional face lift surgeries resulted in minimal improvement in this region. Subcutaneous face lifts dissected the skin superficial to the ptotic malar fat pad. SMAS face lifts achieved marked improvement to the lower face but had minimal lifting to the midface due to the weak ligaments attachments between the SMAS and the fat pad. The resultant deep nasolabial fold-after traditional face lifts- was treated by several methods with limited success **[7,8]**. In the early 1990's, the deep plane rhytidectomy was published by Hamra, and the independent elevation the malar fat pad was described by Owsley. Both techniques represented

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a breakthrough in solving the problem of midface aging by lifting the cheek fat pad with a standard face lift incision [9,10]. By the mid 1990's, lifting of the whole midface in a subperiosteal plane became popular using classical face lift incisions [11]. With the success in lifting the midface-using the previous supraperiosteal and subperiosteal techniques, limited incisions were introduced to rejuvenate that area. Using either lower blepharoplasty, temple, intraoral or a combination of the previous incisions, the midface could be elevated in a more youthful position [12,13,14]. Endoscopic techniques were also applied to rejuvenate the midface. They have the advantage of minimal incisions but the disadvantage of the need of special training [15,16]. Whatever the route used to access the midface, there are two different dissection planes: Supraperiosteal and subperiosteal. The supraperiosteal route lifts the malar fat pad by cutting the ligaments (orbitomalar and zygomatic) that are attenuated with age. The fat pad is then repositioned in a more superior position by sutures till it adheres by fibrous tissue in its new location. The subperiosteal route on the other hand, lifts the whole midface complex (periosteum, muscles and fat) and is also stabilised by sutures in a more superior position. Advantages of the supraperiosteal lift include the excellent treatment of the main cause of the midface aging (descent of the malar fat pad) with a minimal change in the patient's features. It is however more difficult to execute than the subperiosteal route, and the suture-holding property of the malar fat pad are weaker than that of the periosteum. Subperiosteal midface lift resulted in less improvement of the position of the malar fat compared to supraperiosteal lifts. Excessive tension on the periosteum is commonly needed to be transmitted to the malar fat pad. This may result in features change as the intermalar distance is increased. Prolonged facial oedema is another disadvantage of the subperiosteal lift. It is however easier to perform and the periosteum has an excellent suture-holding capability. In general, subperiosteal midface lifts are more suitable for younger patients with moderate midface aging [17,18,19]. Endoscopic supraperiosteal midface lift was introduced by Isse in 1997. It has all the previously mentioned advantages and disadvantages of the endoscopic technique and the supraperiosteal dissection plane. It carries however an additional disadvantage which is the difficulty of suture placement in the malar fat pad by the endoscopic route [15].

A technique of lifting the malar fat pad by percutaneous sutures was published independently in 2002 by Keeler et al. [20] and, Sassaki and Cohen [21]. The surgical methodology uses a single temple incision and two loops of 4-0 polypropylene sutures to lift the malar fat pad without dissection. This simple technique is suitable for young patients with minimal midface aging. The longevity of the elevation is however in question as the midface ligaments were neither interrupted nor repositioned [3,7,8].

In the current work, a combination of endoscopic supraperiosteal midface lift with suspension by percutaneous sutures is introduced. This combined technique avoids the disadvantage of the difficult suture placement with the endosope, and the lack of dissection of the malar fat pad with the isolated percutaneous elevation.

PATIENTS AND METHODS

The study included 16 patients-suffering from signs of aging of the midface, treated in the period from November 2004 till December 2006. They were all females with age ranging from 36 to 61 years (mean 45.8 years). All patients were medically-free from any systemic disease, had no previous rejuvenation procedures done to their faces, and had no major facial asymmetry.

All patients were subjected to endoscopic supraperiosteal midface lift as described by Isse [15] with suspension of the malar fat pad using 2 percutaneous sutures. Two incisions (one lateral forehead and one temple incision) were used on each side to perform the procedure. The sites of the incisions -as well as the extent of dissections- were meticulously planned to ensure symmetry. The lateral forehead incision (1.5cm in length) was vertically-oriented at the anterior hair line 5cm. from the midline. The temple incision was 3cm. in length. It was oriented parallel to the nasolabial fold and was located 2cm. inside the temporal hairline. The upper end of the incision was 2cm. lateral to the temporal crest (Fig. 2 left). The sites of exit -of the 2 percutaneous sutures used in this study- were marked on a line parallel to the nasolabial fold. This line was drawn 1.5cm. lateral to the crease. Point (a) was located 1cm. inferior to the intersection of this line with another line drawn from the earlobe to the alar base. Point (b) was marked 1cm. superior to the intersection of the line parallel to the nasolabial fold, with another line drawn from the earlobe to the angle of the mouth (Fig. 2 left).

Local anesthesia with intravenous sedation was used in all the cases. Nerve block (lidocaine 0.5% with epinephrine 1:200,000) was applied to the auriculotemporal, zygomatictemporal, zygomaticfacial, and the infraorbital nerves. This was fol-

lowed by local infiltration of the whole area of dissection by a diluted local anesthetic solution (lidocaine 0.25% with epinephrine 1:400,000). An average of 35cc. was used to infiltrate each side of the face. A combined blind and endocopic dissection of the lateral forehead was performed in a subperiosteal plane; while the temple dissection was carried under the superficial temporal fascia. Release the temporal crest attachment was done and both pockets were connected (Fig. 3). The midface was entered by dissecting lateral to the sentinel vein (Fig. 4) and the medial zygomatict-emporal nerve. Under endoscopic control, this supraperiosteal midface dissection in carried-out deep to the orbicularis oculi muscle and superficial to the zygomaticus major muscle. Release of the orbitomalar and the zygomatic ligaments was done using a combination of sharp and blunt dissections. The plane of dissection was continued deep to the malar fat pad in an inferior and medial direction till the nasolabial fold was reached. Similar dissection was performed to the contralateral side.

Elevation and suspension of the dissected midface was performed by 2 percutaneous 3-0 Ethibond sutures (braided polyester, coated, white, non absorbable). The direction of each cable suture was carefully planned to ensure symmetry in the vectors of elevation. The first cable (Fig. 2 right, blue) was oriented between the point (a) and the inferior end of the temple incision. The second suture was inserted in the line joining point (b) with the upper end of the temple incision (Fig. 2 right, red). A 1mm. stab incision was performed at each of the two points (a & b). A thin suture-passing needle was used to penetrate the length of the malar fat pad (through the temple incision, under the dissected soft tissue). It exited the skin at the desired point (a). The suture was attached to the eye located at the tip of the needle and the needle was withdrawn. The suture was then retrieved at the temple incision. A similar second path of the needle was used 1cm. parallel to the first one. The other end of the suture was then attached to the needle and was also retrieved at the temple incision. A gentle pull on the suture with a sawing motion was performed to set the suture loop under the skin at point (a). A similar maneuver was used to inset the second loop at point (b). The sutures were then passed in the deep temporal fascia-using a French eye needle-at their corresponding ends of the temporal incision. The malar fat pad is elevated as the knots were tided and secured. The same sutures insertion was then performed to the contralateral side and symmetry of midface elevation was checked. All incisions were closed in layers. Additional upper blepharoplasty was performed in certain cases when indicated. No drains were used but a mild compression dressing was applied for 3 days. Skin sutures were removed at the 7th postoperative day. Intraoperative and postoperative antibiotics were routinely used.

To evaluate the results of the combined techniques in this study, two points were studied: The stability of the elevation of midface over time and the rate of complications. To test the stability of the elevation of the midface, the length of the lower eyelid was measured. The distance from the ciliary margin to the malar crescent **[1]** (junction of the thin eyelid skin with the thick cheek skin) was measured in mm. at the vertical level of the lateral limbus of the cornea (Fig. 1). This measurement was recorded preoperatively, and at 3 and 12 months postoperatively. All patients were photographed preoperatively and at 3 and 12 months postoperatively. Complications-including suture infection, skin dimples, bruising and asymmetry-were documented over the 12 months period of the study.

RESULTS

All cases of the current study had a satisfactory, symmetrical and stable elevation of their midfaces (Figs. 5-8). Additional upper blepharoplasty was performed in 8 cases. The results of the lower eyelid measurements are shown in (Table 1). The mean lower eyelid distance of the 16 cases was 22mm. preoperatively, and 16.4mm. at 3 months postoperatively. At the end of the 12 months study period, the mean distance was 16.9mm. This represents a stable 4.9mm. elevation of the malar fat pad over time using the combined approach.

Table (1): Mean length of the lower eyelid (right side + left side divided by 2) of all cases in mm. measured preoperatively, at 3 months and at 12 months postoperatively.

Case Number	Age (years)	Preoperative	3 months postoperative	1 year postoperative
1	36	19.5	15	16
2	56	25.5	19.5	20
3	46	22.5	17	17
4	54	25	15	16
5	52	24	16.5	17
6	39	20	17	17.5
7	44	21.5	15	16
8	41	22	16	16.5
9	37	23.5	18	18
10	47	22	16.5	17
11	61	26.5	18.5	19
12	39	20	15	15
13	45	21.5	16	16.5
14	38	19	15.5	15
15	49	21	17	17.5
16	50	20	15	16

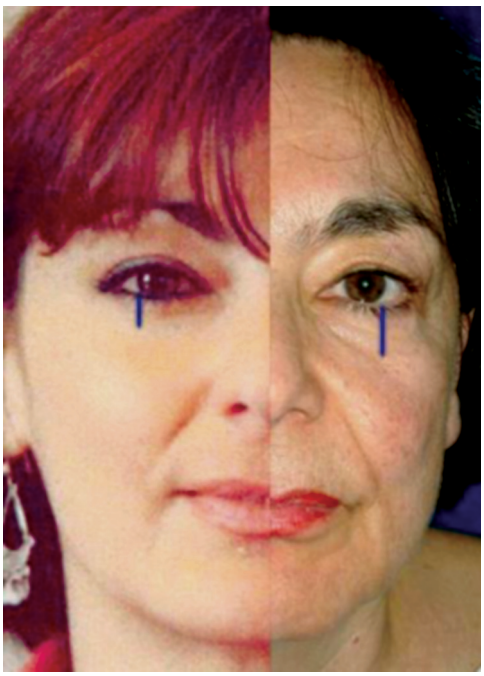

Fig. (1): Composite picture of case number 4: The left side is her picture 26 years ago while the right side is her preoperative photograph. Note the signs of midface aging and the difference in her lower eyelid length due to the descent of the malar fat pad.

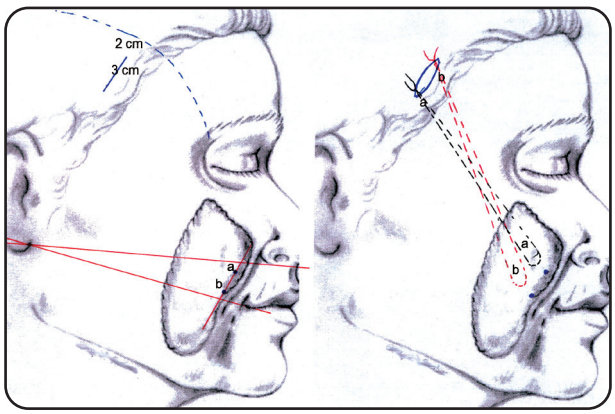

Fig. (2): Left: Markings of the two points of exit of the percutaneous sutures (a,b) and the length, direction and inclination of the temple incision. Right: Application of two sutures to lift the dissected malar fat pad. The first suture (a, blue) is attached to the deep temporal fascia at the lower end of the incision while the second suture (b, red) is secured at the upper end.

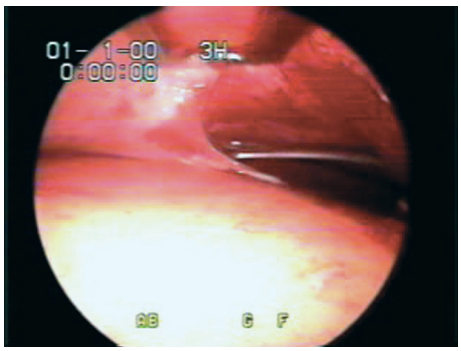

Fig. (3): Endoscopic view of the release of the right temporal crest ligament to connect the forehead pocket (left side, medial) with the temple pocket (right side, lateral).

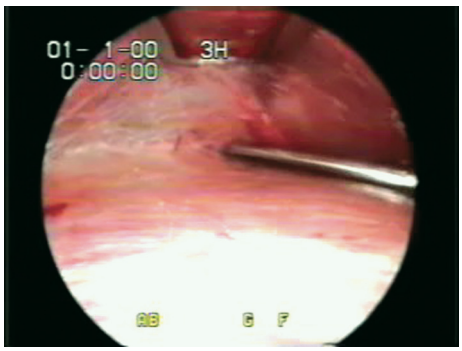

Fig. (4): Endoscopic view of the right temple dissection. The port to dissect the midface is entered lateral (right) to the sentinel vein.

Fig. (5): Case number 2: Preoperative eyelid distance of 25.5mm. (left) and postoperative eyelid distance of 20mm. (right).

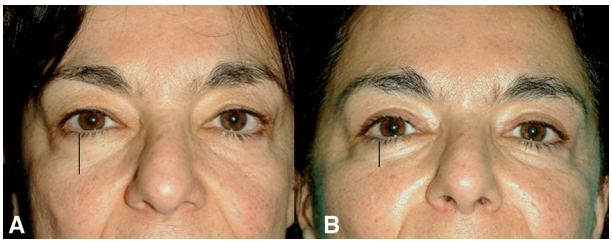

Fig. (6): Case number 4: Preoperative eyelid distance of 25mm. (left) and postoperative eyelid distance of 16mm. (right).

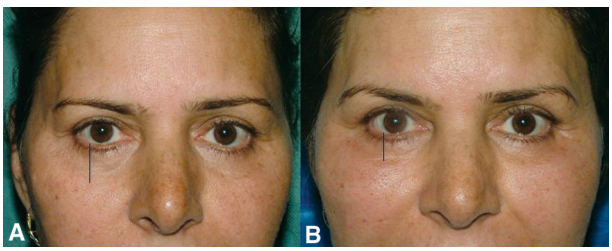

Fig. (7): Case number 6: Preoperative eyelid distance of 24mm. (left) and postoperative eyelid distance of 16mm. (right).

Fig. (8): Case number 9: Preoperative eyelid distance of 23mm. (left) and postoperative eyelid distance of 18mm. (right).

There were no major complications encountered in the study. The facial nerve and all major sensory nerves were intact. Ecchymosis occurred in all cases and lasted for a period of 2-3 weeks. However, one case (case 10) had severe bruising for a prolonged period of 7 weeks. Intraoperative bleeding was encountered in this case and compression was needed to control the haemorrhage as the endoscopic field was obscured by an unreachable source of bleeding. No blood transfusion was needed but the patient had compression dressing for 7 days. Skin dimpling at the site of the percutaneous sutures occurred in all cases. It was mild and was tolerated by the majority of the cases. It resolved completely in one month period. The dimpling was generally more prominent for the second suture (point b). Two cases had persistent dimpling on one side (case 3 and 13) that required intervention at 3 month postoperatively. Under local anaesthesia, a needle was introduced to undermine the dimpling area to release the skin adherence. The condition resolved in one case and was only improved in the second case (case 13). In that case, a second procedure was needed in the form of fat graft by injection (0.5cc.).

DISCUSSION

The term 'malar fat pad' was first used in the surgical literature by Owsley in 1993 **[10]** to describe the thickened subcutaneous fat pad of the midface. Gravitational descent of this fat pad is responsible for the aging signs of the midface. The logical solution to rejuvenate the midface would be to lift the fat pad in a more superior and youthful position. This could be achieved by either elevating the fat pad alone (supraperiosteal dissection) or by elevating the whole midface complex (subperiosteal dissection) of periosteum, muscles and fat pad. Both methods of elevation could be achieved by endoscopic techniques with minimal incisions. Isse **[15]** introduced the endoscopic supraperiosteal midface lift. By releasing the ligament attachment of the malar fat pad, the midface was elevated and anchored to the deep temporal fascia. The technique resulted in excellent improvement of the midface with minimal complications. However, sutures placement in the malar fat pad were difficult to perform. The upper end of the dissected fad pad was anchored by two polypropylene sutures. The bite-size was limited to the small needle-size that can be introduced and maneuvered by the endoscope.

Su et al. **[22]** introduced a percutaneous suture technique to elevate the malar fat pad with minimal dissection. The technique was used extensively by Keller et al. **[20]**. Using a temple incision, two percutaneous sutures were used in each of the two tunnels to elevate the malar fat pad. A 3-0 polyglactin suture was temporary-used to saw and set the track for a permanent 4-0 polypropylene suture. A polytef bolster (2mm. in size) was attached to the end of the polypropylene loop to prevent cutting through the fat pad. In a total of 118 cases, they documented an average elevation -at 3 months postoperatively- of 2-3mm. in their early cases and 4-5mm. in the late cases (after addition of temple dissection). The method of measuring the degree of elevation was not clear, and no numerical values were given at 1 year. The authors also stated that in some cases, open face lift incisions were used and the malar fat pad was elevated by percutaneous sutures. The percentage of these open cases was not documented. A similar technique was used by Sassakia and Cohen **[21]** in a series of 392 cases, they achieved an average of 1-3mm. elevation of the malar fat pad. They; however, reported a 10% complication rate including asymmetry, dimpling, and visible scars at the stab incision sites. LaFerriere and Castellano **[23]** published their experience in 64 cases of percutaneous malar fat pad elevation with an average follow-up of 28 months. In their series, 26 cases had a concomitant open face lift in addition to the percutaneous sutures. Stability of the elevation was noted for the period of the study (28 months), however no numerical values were given to the amount of elevation. In addition, the authors did not compare the difference in stability between the isolated percutaneous sutures and the combined percutaneous sutures with open face lifts. They only stated that percutaneous sutures alone are suitable for younger patients with mild midface ptosis. An additional complication type was documented in their cases. Extrusion of the polytetrafluroethylene bolster-that was attached to the 4-0 polypropylene suture-occurred in two cases. In 2007, Boxrud et al. **[24]** presented a similar technique of suture suspension of the malar fat pad using percutaneous sutures without dissection. In a series of 55 cases, they achieved a satisfaction rating of 7.9 in a scale of 1 to 10. Complications were minimal but it included 2 cases of suture exposure at the temple incision. They stated that the technique was not suitable for thin-skin individuals, and cases with skin laxity and jowling. They also added that younger patients are the ideal candidates for this procedure.

In the current study, endoscopic supraperiosteal dissection of the malar fat pad was performed in all the cases. It had the advantages of the release of the ligaments and the minimal scars. The fat pad was then mobilized in a more superior position.

Unlike traditional endoscopic techniques **[15,16]** were small bites of the superior end of the malar fat pad were grasped, the released fat pad was anchored throughout its whole length by the percutaneous sutures. This represented a stronger and easier method of suture application to the fat pad. Isolated percutaneous sutures that was used by many authors **[20-24]**, did not release the ligament anchoring the malar fat pad and thus the mobilization depended on the strength of the sutures alone. The longevity of these techniques was also in question. Although many authors presented long-term stability of the isolated precutaneous sutures, yet no clear objective method was used to evaluate the elevation over time. In the combined technique of the current study, an objective measurement of the lower eyelid length was used to evaluate the stability of the elevation of the malar fat pad. Numerical data showing and average elevation of 4.9mm. were demonstrated. An additional advantage of the combined technique presented over the isolated percutaneous sutures is the fact that older patient with advanced midface aging can be effectively rejuvenated. In our current study, no bolsters were used at the end of the permanent suture. Unlike the isolated percutaneous elevation, the released fat pat in our cases was elevated under moderate tension. Thus, the need for an additional volume of the bolster to prevent cutting through the fat pad was not necessary. The use of strong braided material (3-0 Ethibond) allowed the gentle sawing action needed to set the suture under the skin to be performed with a single suture. Complications rate in the current study were comparable to those present in the literature. In addition, suture infection and exposure that occurred in certain cases published due to the permanent bolsters-were not present in the current study.

Conclusion: Combining endoscopic supraperiosteal midface lift with percutaneous suture suspension of the malar fat pad offers an alternative method to rejuvenate the midface. It is easier to perform than suturing the malar fat pad via the endoscope. In addition it offers better elevation of the malar fat pad than the isolated percutaneous technique. Long-term elevation of the midface was objectively demonstrated with minimal complications.

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