

“Mirror Face Lift”: Concept, Description, and Evaluation 1 Year Postoperatively

Marc Divaris, MD*
Ebaa Sabri, FRCS†
Sydney Ohana, MD‡

Background: The mirror facelift^{1,2} is a new concept of mid-face rejuvenation that we apply during the preoperative consultation to explain and show the patient the possible results that can be achieved postoperatively and have this result stay stable over time and in different positions. It is characterized by (1) the use of a mirror during the preoperation visit and the taking of pictures from different angles, allowing for a precise analysis of the redistribution of the facial soft tissues on each hemi-skeleton; (2) the Divaris et al² locked cheek lift technique (Locked Cheek-Lift), which is done with 2 vectors that achieve a tri-dimensional redistribution of the soft tissues; and (3) postoperative photographs which are very useful in precisely evaluating the results and comparing them with the preoperative pictures.

Methods: Two hundred and sixty patients (216 women and 44 men), average age 53 (34 to 73 years old), were operated on between 2010 and 2016, applying the concept of mirror lift in the consultation to show the patients the expected possible results after the surgery. The patients see for themselves the deterioration of the facial condition (looking older) with the anti-mirror position as well as the younger appearance of the face following the mirror position. Surgically, the locked cheek lift technique was performed by the same surgeons. The follow-up 1 year later was done by the same team. The fat compartment positions were evaluated during this period.

Results: The fat compartments' stability was evaluated 3 months and a year postoperatively to assess the stability of the result over time. The mean value is 4.62 out of 5 in anti-mirror position before surgery and 1 year postoperatively. The mean value is 4.34 out of 5 after 1 year measured in both standing and lying positions. Postoperative edema and ecchymosis were limited.

Conclusions: The concept of the Mirror Facelift is to precisely reposition the soft tissues of the face on the bone structure by correcting the fat compartments that have migrated over years. It harmoniously redistributes the soft tissues without any palpebral cutaneous incision, thus allowing for a short recovery period free of any risk of palpebral complications. (*Plast Reconstr Surg Glob Open* 2020;8:e2697; doi: 10.1097/GOX.0000000000002697; Published online 26 March 2020.)

INTRODUCTION

The holy grail of all patients is to find not only a refreshed or rejuvenated face, but his/her face of yesterday. The Divaris et al² locked cheek lift (LCL) technique (Locked Cheek-Lift) differs from other techniques, pulling the tissue in single axis to achieve a rejuvenation is not always sufficient. The redistribution in 3 planes respecting

the bony skeleton without any palpebral incisions is a better option.

When we lift our cheeks with both hands in front a mirror, we get an oval. However, when the jowls are big and when the lower part of the face has widened, doing the “hand cheek-lift” is not enough. This is why, during the preoperative consultation, we ask the patient to hold a mirror in their hand and tilt their head back at 45 degree. All patients discover their young face or the face that they would like to have. This explains why we like to take our selfies lying down.

In appearance, this simple movement allows more than any computer simulation to give a good idea of

Received for publication May 14, 2019; accepted January 17, 2020.

From the *Department of Plastic and Maxillo-facial Surgery, University of Pite Salpetriere, Paris, France; †Private Practice, Paris, France; and ‡Private clinic, Paris, France.

Copyright © 2020 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 \(CCBY-NC-ND\)](#), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

DOI: 10.1097/GOX.0000000000002697

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

the result and it also establishes a good, comprehensive patient-surgeon communication.

The mirror facelift aims to present the same face in a standing and in a lying position.

Applying the LCL surgical technique makes it possible to achieve this goal. This lifting is an original technique that, thanks to its double axis traction, restores the tri-dimensionality of the face. The aim of this lifting is to reposition the soft tissues of the face (skin, fat and SMAS) according to their initial position when the patient was young.

This technique permits the repositioning of the malar fat pad to reduce the orbital hollow and the lid-cheek distance, to improve the nasolabial fold by redistributing cheek volume upward without distortion nor asymmetrical contour deformity, and without a palpebral incision.

MATERIALS AND METHODS

Two hundred and sixty patients (216 women and 44 men) have been operated on with the application of mirror face concept, between March 2010 and October 2016, by Divaris et al² technique (LCL technique) performed by the same surgeons. Patients ages ranged between 34–73 years old (average 53).

The patients are evaluated and examined in the medical office preoperatively; using a mirror, we show the patients all the defects, including the jowls, loss of definition of the lower face, hollowness of lower eyelids, the lid cheek distance, when the patient is in a natural position and evaluate these findings when the face is bending forward (anti-mirror position) and when the face is bending backward (mirror position). All these would be documented by photographs that have been taken by the same surgeons, the same camera, the same place and light.

When the patient bends the head backward (anti-mirror position), he/she looks older with all the accentuation of the soft tissues because of the laxity of the medio-facial ligaments and loss of the volumes in addition to gravity effects.

The patient is able to see the possible results that can be achieved postoperatively and we explain to him/her our goal to have this result in a stable way over time and when there is a changing in the position.

The surgical technique that would be applied is the LCL technique of Divaris et al.²

Follow-up was performed by the same team over a year postoperatively: on days 0, 1, and 7, 1 month, 3 months, 6 months and a year postoperatively.

Two evaluations were done:

- The position of the fat compartments was evaluated with the face bending forward (anti-mirror effect), pre- and postoperatively using photographs taken under identical conditions. To evaluate the position of the fat compartments a year postoperatively, we used a scoring system from 1 to 5 to evaluate the photographs in anti-mirror position from poor to excellent.
- The same scoring system was used to evaluate the photographs of the patients in standing and lying position after 1 year postoperatively. The aim is to obtain the same face, or close to it, in a standing up position and in a lying position.

SURGICAL TECHNIQUE

The operation is performed under general anesthesia by the same surgeons, using the technique of Divaris et al² LCL, in its dual planes of 2 objectives (Fig. 1):

- The ascending fat compartments restore malar volume using a fatty flap, preserving the integrity of the palpebral unit.
- Retensioning of the SMAS and of the cutaneous tissue along the preferred axis of each hemi-face (**See Video 1 [online]**, which displays the concept of mirror face lift showing the different positions and their effects on the face, in addition to explain the benefit of LCL surgical technique to achieve the goal, showing the surgical technique).

PHOTOGRAPHY

The photographs would be taken pre- and postoperatively to document the preoperative condition and then to evaluate the postoperative results and compare the finding with the preoperative condition and also to evaluate the stability of the result over the time and with position changing.

All photographs have been taken by the same surgeons, the same camera and the same atmosphere conditions including the light and the place. All patients have photographs of 3 positions of the head, 3 and 12 months postoperatively as well as preoperatively:

- Head in natural (rest) position
- Head in 45-degree flexion
- Head in 45-degree extension

Seeing the different angles of the face allows us to analyze the downward movement and the different positions of the fat compartments, the skin looseness along the mandibular edge as well as the appearance of the jowls.

Head in Natural (Resting) Position

The aging features include skeletonization of the lower orbital rim, the appearance of the tear troughs, the prominence of the nasolabial folds, loss of malar volume, and the appearance of jowls (Fig. 2A). The fibrous septa within the fatty subunits become loosened and are no longer able to maintain their role of restraint.^{3,4} The appearance of the jowls results from the confluence between the vertical fall of the fat compartments and the cutaneous and elongation of the SMAS and of the lower third of the face along the mandible.

Head in 45-degree Flexion (Anti-mirror Position)

There is an accentuation of the nasolabial folds, of the tear-troughs, an accentuated ptosis of the fatty compartments and jowls, an extension of the distance of the lid-cheek junction, and an accentuation of the lower orbital hollow (Fig. 2B). The soft tissues are no longer under tension because of the elongation of the septa.

Head in 45-degree Extensions (Mirror Position)

The fat compartments naturally return to their original position on the bone block, filling the orbital cavity,

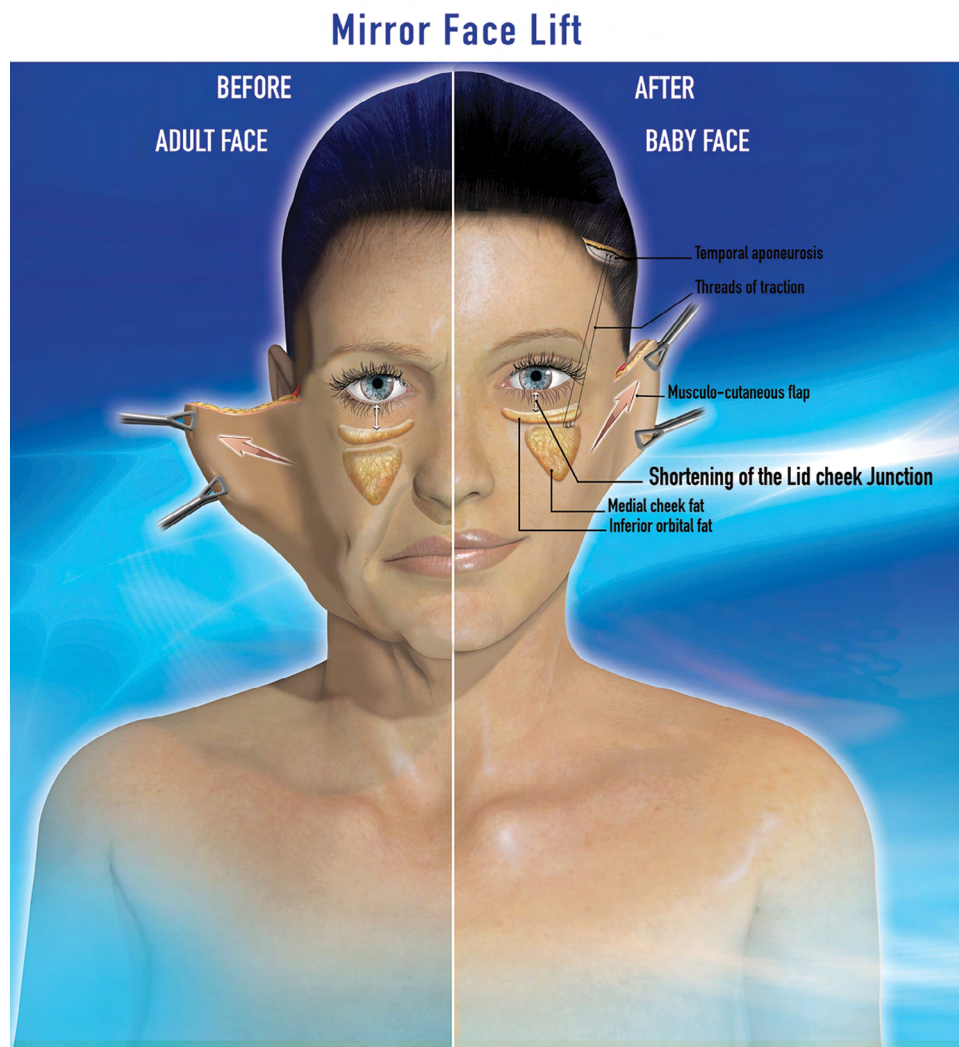


Fig. 1. Mirror Facelift, two axes: (1) vertical fatty flap respecting the palpebral unit, lifting the entire fatty column and compacting the inferior orbital fat compartment, which results in filling the under orbital hollow and decreasing the lid-cheek distance. (2) The traction and treatment axis of the SMAS and of the skin is parallel to each corresponding hemi-skeleton.

reducing the lid cheek distance with a correctly repositioned palpebral unit, and without excess skin (Fig. 2C).

By this horizontal position of the maxillo-malar block, the fat compartments are no longer subject to the law of gravity, resulting in a shortening of the cutaneous septal ligaments.

In addition, the musculo-cutaneous tissues sliding along each mandibular branch along the preferential hemi-skeletal axis provide a linear jawline.

RESULTS

Out of 260 patients who underwent the procedure, only 152 patients (114 women and 38 men) completed the follow-up data and were thus included in this study.

The fat compartments' position evaluation is essential to assess the success of the procedure. This evaluation has been done in a subjective way. The subjective way is the patients' satisfaction, evaluated by a questionnaire filled out

by the patients to assess their satisfaction of the postoperative position of the fat compartment using a mirror, and photographs to compare the findings with the preoperative photographs. This questionnaire was scaled from 1 (poor) to 5 (excellent) after subjective assessment using the mirror.

Using photographs in identical conditions: standing, mirror, and anti-mirror position, the mean value is 4.62 out of 5 in anti-mirror position preoperatively and 1 year postoperatively (Table 1). The mean value is 4.34 out of 5 after 1 year in standing and lying position (Table 2).

COMPLICATIONS

Although this technique is safe, we had a few routine complications which can occur in any lifting procedure.

- Two patients presented with hematoma postoperatively, which required evacuation in the operative theater under local anesthesia.

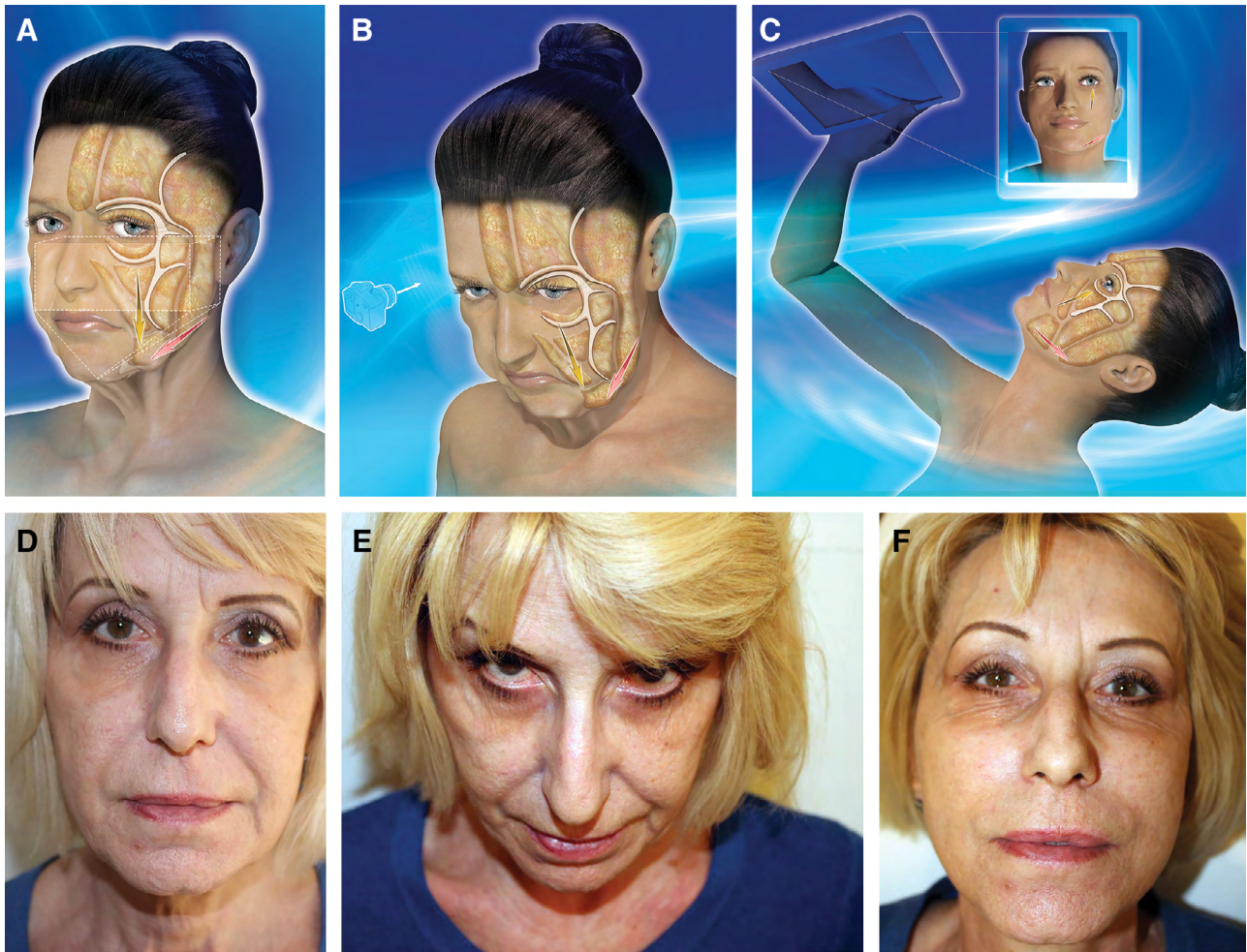


Fig. 2. Different mirror positions of a 60-year-old woman show volume loss in the inferior orbital region, which results in a square-looking face. Front view (A, D): (1) Baby face is on the right side: higher cheekbone and shorter distance between the cheek and the nose. (2) Adult face is on the left side: larger orbital aperture, lower cheekbone. Anti-mirror position (B, E): Jowls and tear troughs are accentuated. It's clearly visible that the right facial hemi-skeleton is higher and thinner. Mirror position (C, F): (1) The soft tissues settle back exactly on the bones. The suborbital region is plumped and the lid-cheek distance is shortened. The bi-pupillary line is harmonious, supported by the lifting of the fat compartments. (2) There is zero palpebral skin excess.

- Three patients required intra-lesional steroid injections to treat hypertrophic scars.
- We did not experience any problems with vascularity.
- There were two cases of transient temporal facial nerve dysfunction. We observed these patients closely and Vitamin B, B6, B12, and steroids were prescribed. The temporal facial nerve function returned to normal within a period of 12 to 16 weeks.
- We never practice a lower lid blepharoplasty when doing an LCL. Nonetheless, for 2 patients, the excess skin did not redistribute well. We had to carry out a cutaneous lower blepharoplasty to correct this. Both patients were thick-skinned men.

DISCUSSION

The Mirror Facelift is a concept in three acts: preoperative, operative, and postoperative.

Preoperative

- We start by taking front pictures, profile pictures, and 3/4 pictures.
- The patient takes a hand mirror and analyses his/her face with the surgeon, which allows an interactive discussion.
- We then ask the patient who is still holding the mirror to bend his/her head downward, which allows us to evaluate the importance of the jowls and the fat pads as they have slid down. This downward position also allows us to analyze 1 year postoperatively the stability and the rising of the fat compartments.
- In the lying position, the face becomes triangular with the ascension the fat compartments and the correction of the jowls. The lid-cheek distance is shortened. There is no excess of the lower eyelid, the fat compartments have found their right place by a subcutaneous sliding along the skeleton, thus rebooting and correcting the hollow under the orbit. The neck

Table 1. Anti-mirror Position Preoperatively and 1 Year Postoperatively

Patients (152)	Score
106	5
39	4
4	3
2	2
1	1

Mean value: 4.62.

Table 2. Standing and Lying Position after 1 Year

Patients (152)	Score
85	5
42	4
18	3
6	2
1	1

Mean value: 4.34.

is tightened and the angles of the lips are slightly upturned and hence lose their bitter appearance. The face has been corrected and well rejuvenated without any injections of fillers or fat.

Simply tilting the head backward proves that we have the necessary tissues to create a natural result. The whole idea is to understand how to fix it so that we have the same face standing up and lying down. The mechanism is simple; it is the comprehension of the bony skeleton and thinking in 3 dimensions rather than 2. The photograph taken with head tilted back at a 45-degree angle (mirror position) will be compared with the full frontal photograph 1 year postoperatively.

The aging process comes from the distention of the mid-face ligaments that lead to the distortion of the interface between the skin and the fat compartments. On the other hand, the stability of the soft tissues is intimately linked to that of the bone.⁵

In the lying position, the ptosed soft tissues (fat, SMAS, and skin) will naturally find their place by sliding over the underlying bony skeleton. The aim is not to obtain a retension on the tissues by pulling the skin, or by stretching the tissues with fat or filler injections.

By sliding the soft tissues over the bony structures, the volume of soft tissues is redistributed 3-dimensionally.

We know that the aging process involves melting of the soft tissues and the decrease of the bony skeleton. Anthropometric and encephalic studies have provided a measure of 3 dimensions' bone bases.

Bartlett et al⁶ found a decrease in the anterior height of the facial mass directly correlated with loss of teeth and alveolar bone volume.

From scanning acquisitions and three-dimensional reconstructions, Pessa et al⁷ find that with age, the size of the orbits increases and the size of the maxilla decreases.

In 2007, Shaw et al⁸ showed, on 30 men and 30 women, a decrease of the maxillary angle with a recoil of the orbital margin associated with opening of the piriform opening in relation to a large bone resorption.

In a series of 62 patients divided into 3 age groups, Medelson et al⁹ found, a posterior maxillary regression with a decrease in the maxillary angle.

Kahn and Shaw¹⁰ confirmed the significant changes in the orbital setting by specifying the median erosion of the upper orbital frame and erosion of the outermost orbital margin for women and overall for men.

When treating the cheek area, restoring a volume by injection never takes in consideration the bone resorption.

During the "mirror effect," when the head is tilted backward, the fat compartments return to their original position (without any injection), and considering that the melting of the tissues has been proportional, a very natural result is obtained. Thus, during the pre-operative visit, in the mirror position, we discuss with the patient whether they are interested in a lipofilling.

Hence for 26 patients, we associated lipofilling when volume loss of the facial fat compartments was important.¹¹

Nowadays, facial reconstruction¹² is a method that tries to recreate the face of an individual from the characters of their skull. Used by forensic investigators, anthropologists, or archeologists, it remains controversial because of the weak correlation between skull bone and soft tissue facial features. This is another argument which demonstrates that understanding the bony skeleton is fundamental as well as the good redistribution of soft tissues.

One of the basic principles is our asymmetrical nature. Symmetry is a bias of the 21st century with the contribution of computers retouching that tends to symmetrize everything. But beauty lies in a subtle asymmetry.

Marc¹³ did an in-depth research for 2 years at the University of Paris Panthéon Sorbonne in 1994, and wrote his thesis "The Anthropogenesis Morphogenesis of the Medial Orbital Wall" by analyzing multiple skulls of human and non-human primates. By studying 350 adults' skulls he reached the conclusion of

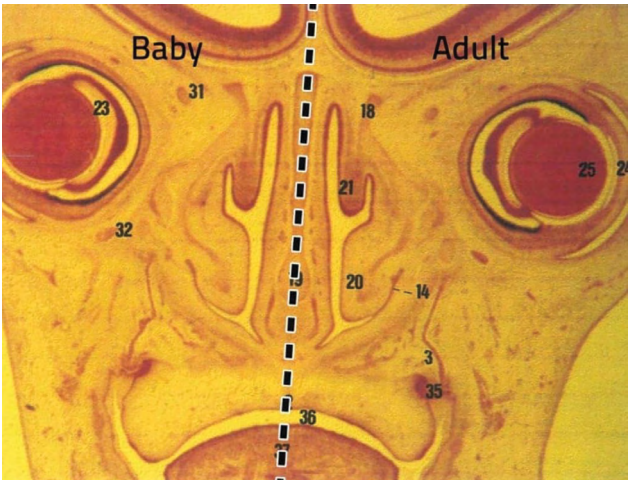


Fig. 3. Histological cut of cephalic extremity of a 12-week-old human fetus. Note the adult hemi-face to the right with a lower orbital region.

the asymmetry of the orbital bones. This asymmetry is already found in embryos when we observe histological cuts (Fig. 3). This asymmetry has also been found in different skulls dating from different eras of prehistory (Fig. 4).

His work concurs with Catalina-Herrera,¹⁴ who in 1988 studied 100 human orbits, notes an average width of 39 mm in men and 38 mm in women, with extremes going from 32 to 42 mm, an average height of 34 mm in both sexes, with extremes going from 29 to 41 mm. To summarize, we all have a strong and a weak hemi-face (Figs. 5, 6).

The weak side of the face (baby hemi-face) has certain characteristics: the orbital cavity is smaller and higher, the cheekbone is higher, the cheekbone/nose distance is shorter, and the chin-cheekbone axis is high oblique. It is also on this side that we unconsciously realize our best selfie profile because the face is more elongated.

On the strong side of the face (adult hemi-face), the orbital cavity is lower and more open, the cheekbone is

lower, the distance of cheekbone—nose is larger than on the baby side, and the axis of chin—cheekbone is low oblique.

Many anatomists have published this anatomic evidence, some a few centuries ago.^{15–21} This finding, observed by some and most often ignored by others, has an informal and artistic value. Indeed, this facial asymmetry is often reproduced by artists and sculptors, and it must be taken into consideration to explain the axis of the fall of the soft tissues and consequently, the exact axis of correction for their tightening.

From an anatomical point of view, we can schematically represent the maxillary malar block by a parallelepiped placed on top of a pyramid which represents the mandible. As we age, all the soft tissues are subjected to the universal law of gravity and fall along an axis that is parallel to the major bone axis (Fig. 7).

In the maxillo-zygomatic region (parallelepiped), the fatty compartments slide vertically downward due to a distension of the fascio-cutaneous septa, which no longer fulfill their role of fixity. Various authors^{22–24} have shown that

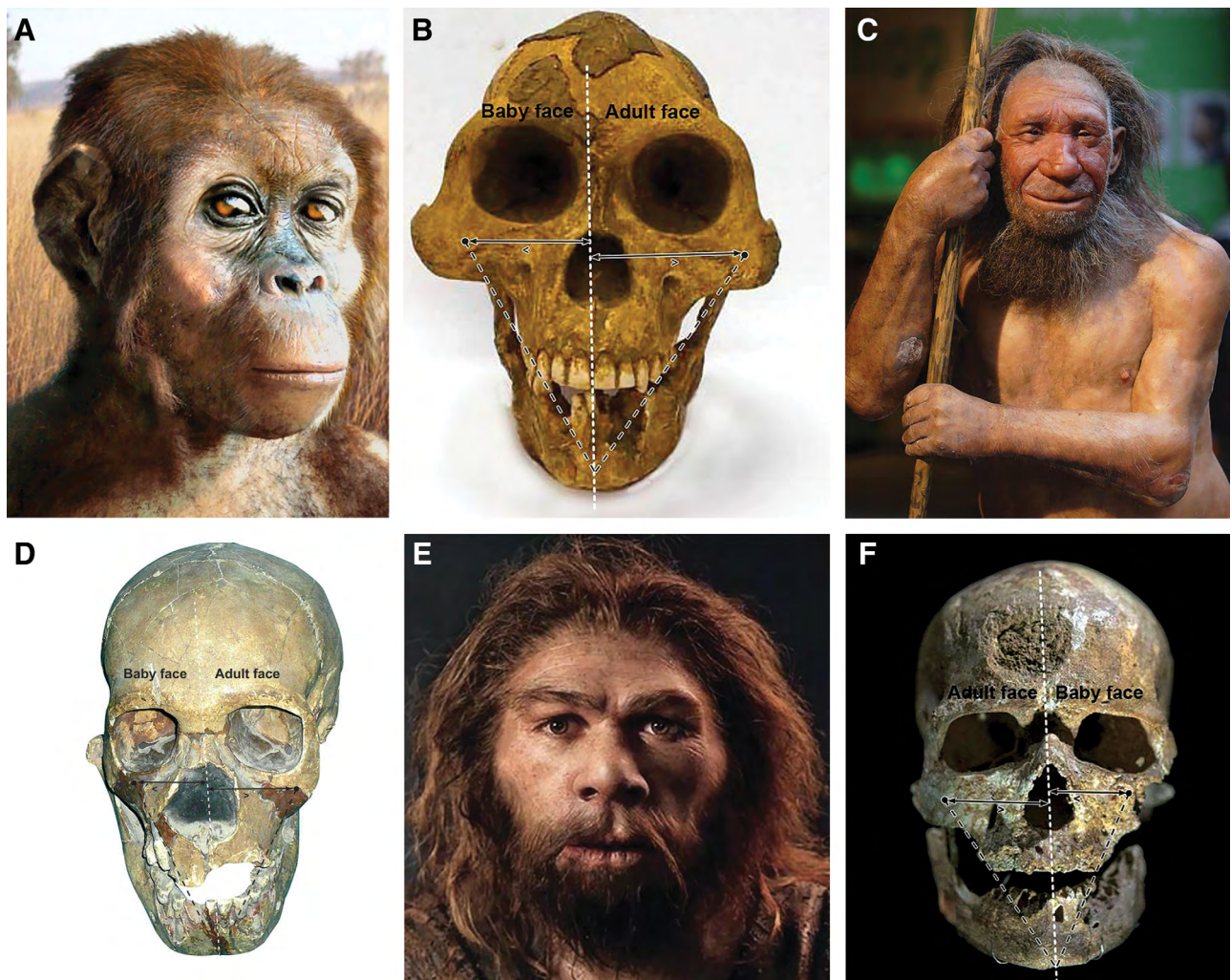


Fig. 4. Three illustrations of skulls from different eras of prehistory. We notice on each skull an asymmetry of both hemi-faces. (A, B) Human primates: skull of adult *Australopithecus Afarensis* Lucy. (C, D) Human primates: Skull of adult Neanderthal. (E, F) Human primates: Skull of adult Cro Magnon. Permission to reuse images A-F purchased from Lestertair/Shutterstock.com.

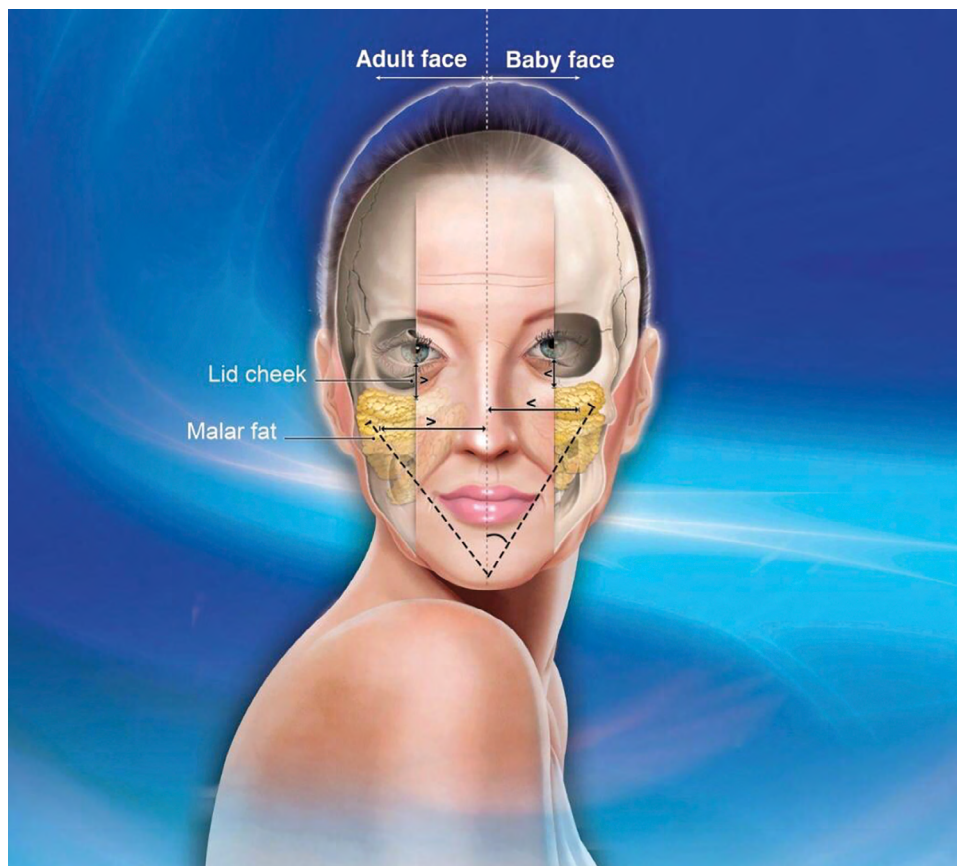


Fig. 5. Hemi-skeletal axis. The angle is more open on the adult hemi-face, and narrower on the baby hemi-face. The angle is shaped by 2 straight lines: (1) one line vertically connecting the superior inter-incisal point and the median chin point, and (2) one line connecting the median chin point and the apex of the zygomatic bone.

there is no elongation of the lower eyelid. The more the fat compartments slide under the skin, the longer the lid-cheek distance becomes.

This redistribution of volume can be found in the Gierloff et al study.²⁴ This study addresses the modifications of the sagittal projection of the fat pads and their redistribution from the top pole to the middle and inferior poles.

In the mandibular region (pyramid), the musculo-cutaneous tissues lengthen and follow an oblique axis toward the lower aspect of the jaw. The convergence of these 2 axes creates the jowls, giving the face a square geometric appearance, which is a distinct sign of aging. Furthermore, the lower part of the eye widens, and the lid-cheek distance increases.

Operative

In the operating room, we analyze the patient's face, and determine which is the adult side and which is the baby side, in order to determine the pulling vector.

The Mirror Facelift achieves a dual plan and dual vector mid-face lift by mobilizing the malar fat pads in the superficial and deep planes:

- We slide the fat compartments upwards again with a reduction in the lid-cheek distance^{1,2} without opening the lower eyelid. The other subperiosteal or supraperiosteal facelift²⁵⁻³² accompanied by an infraciliary incision to resect excess eyelid skin. The fat compartment flap slides upwards and resumes its position on the maxillo-malar bone margin.
- The SMAS is treated as well as the skin flap with a traction parallel to each skeletal axis.
- By respecting the 2 traction axis, the vertical one for the fat column, and oblique for the cutaneous and musculo-aponevrotic tissues, we faithfully reproduce the result of the preoperative mirror position, without ever cutting any tissue from the lower eyelid.

Postoperative

The fact that the lower eyelids were not incised allows for a short postoperative recovery with minimal facial edema.

Our study on 152 patients shows a satisfaction index (4.34 and 4.62/5) by the patients over a year of

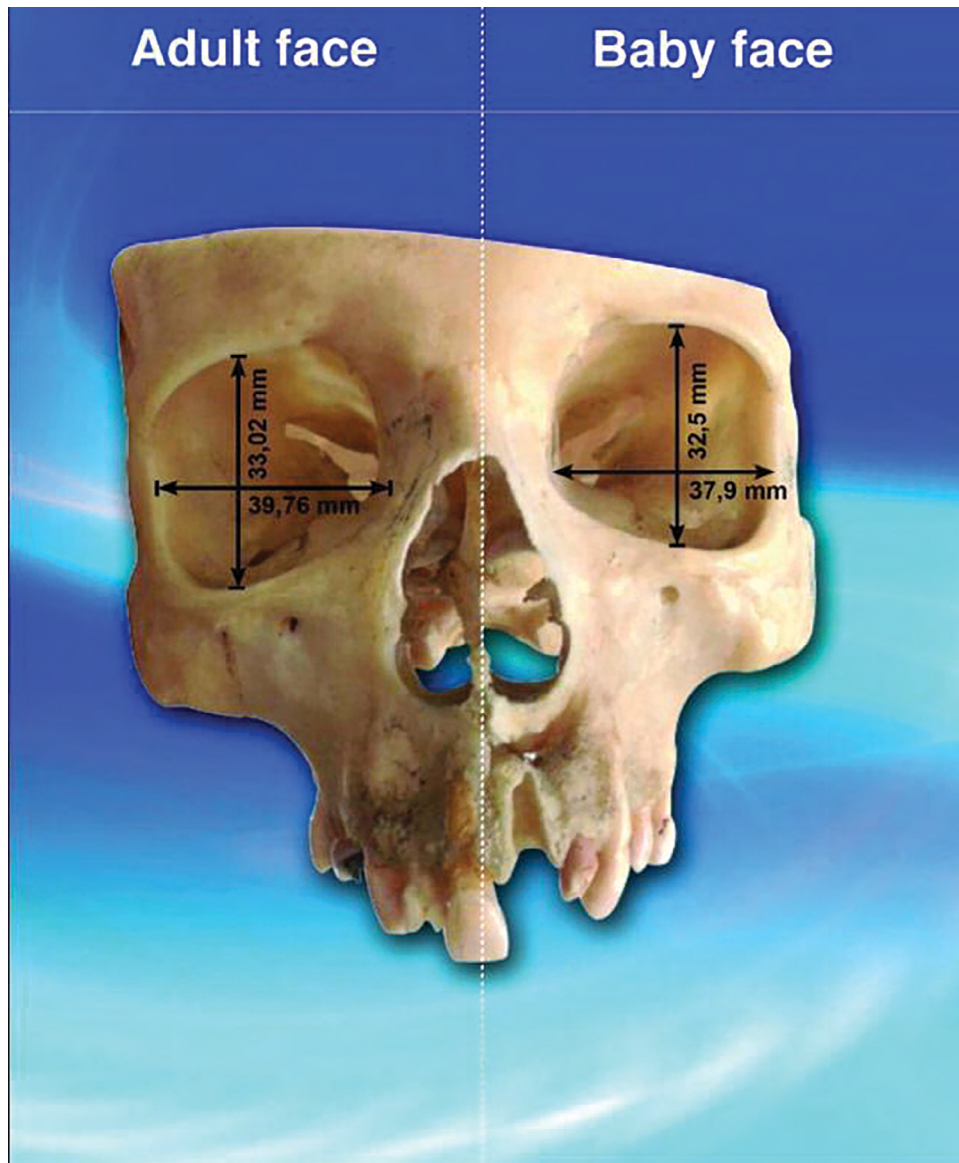


Fig. 6. Skeletal study of the face, 2 hemi-faces: (1) Strong hemi-face (adult face): the orbital cavity is wider and lower, the cheekbone is lower, the distance between the cheek and the nasal orifice is larger. (2) Weak hemi-face (baby face): the orbital cavity is smaller and higher with a higher cheekbone, the distance between the cheek and the nasal orifice is shorter.

postoperative period, which approves the good result over the time.

On the other hand, we can correlate our subjective findings to Divaris et al² in 2018, objective findings over 115 patients based on the lid-cheek distance, the shortening of lid-cheek distance is the best parameter that has been used to assess the success of the procedure postoperatively and to assess the stability of the results over time and position. The lid-cheek distance (the distance between mid-pupil and lid-cheek junction) has been measured preoperatively, and would be evaluated postoperatively in different positions and over time (3 and 12 months, postoperatively) to find the shortening of this distance and its stability over the time and

positions in the same short length. The preoperative lid-cheek distance average was 17 mm, 3 months postoperatively average would be 10 mm and 11 mm a year postoperatively in the 3 different positions.

This published result confirms the subjective study: short lid-cheek distance means a high position of fat compartment, and this is better for the patient and the result.

In the surgical technique, resorbable sutures are used. The fixation of the fat compartments provides results that remain stable over time and give a very high satisfaction after a year because the detachment is done in the 2 planes.

The explanation of this result over time is multiple; the deep (sub-periosteal) and superficial (subcutaneous)

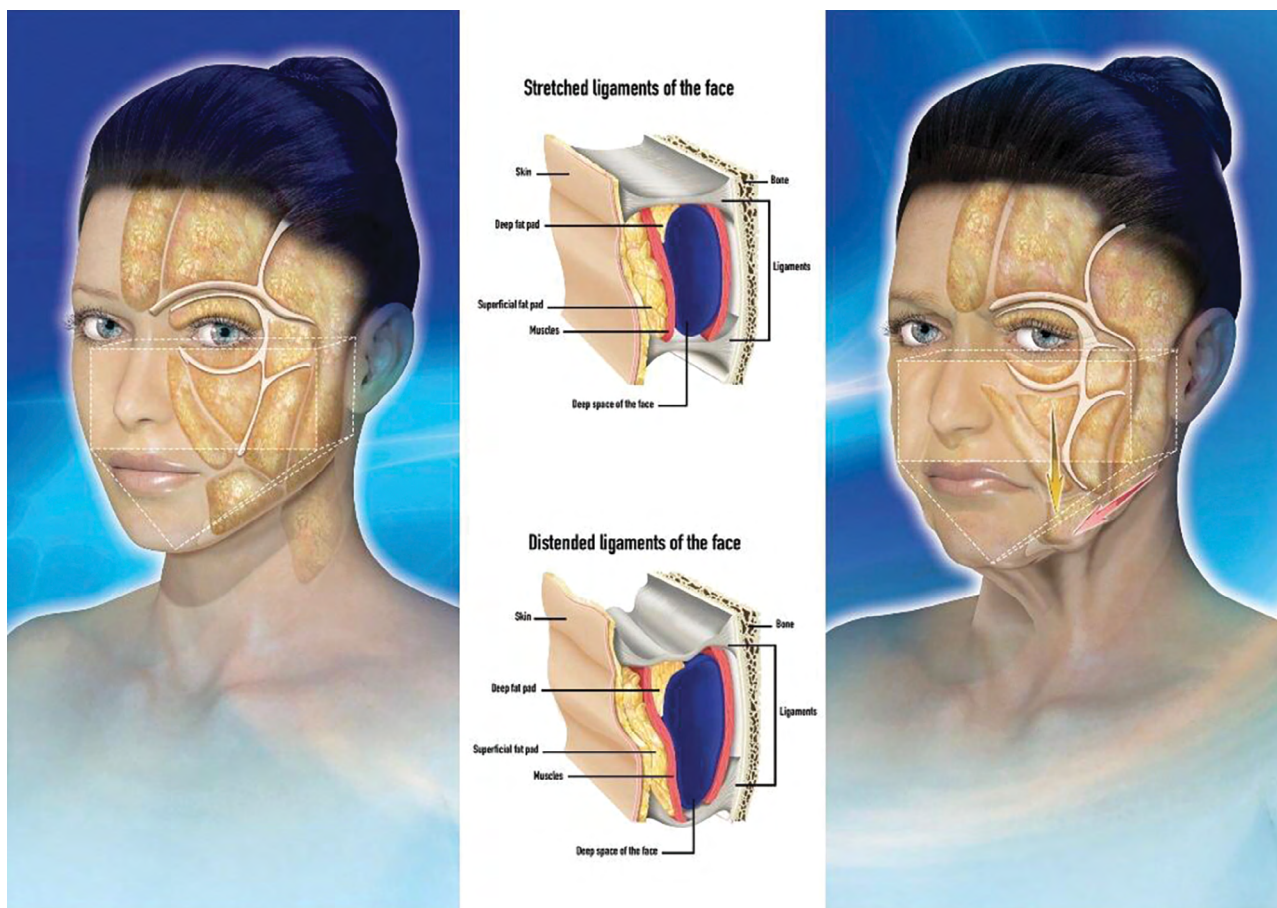


Fig. 7. The different fat compartments are separated by septa. During the aging process, we observe the redistribution of volume from the upper to the middle, then to the lower fat compartments. The fixity role will be affected by the volume variation secondary to the adipose tissue compression during each muscle contraction, leading to their elongation, most often associated with a fatty melt.

release leads to biplane adhesion and fixation to obtain a rapid and optimal stability. For this, we have been using resorbable suture since 2012. The second point is that the mobilization of the fats pads that have been released from the skin is fundamental.

Skin is very heavy, representing about 8% of body weight, and is proportionally more important in the face, and thus it is the main cause of relapse caused by gravity pulling the middle third of the face downwards.

After 1 year, in the anti-mirror position, we note a stability of the fat compartments and a natural result (Fig. 8). [see Figure, Supplemental Digital Content 1, which displays a 69-year-old woman presenting a weak right hemi-face (baby face) and a strong left hemi-face (adult face), <http://links.lww.com/PRSGO/B337>] [see Figure, Supplemental Digital Content 2, which displays a 69-year-old woman presenting a weak right hemi-face (baby face) and a strong left hemi-face (adult face) a year postoperatively, <http://links.lww.com/PRSGO/B338>] [see Figure, Supplemental Digital Content 3, which displays a 63-year-old woman presenting a weak left hemi-face (baby face) and a strong right hemi-face (adult face), <http://links.lww.com/PRSGO/B339>]

CONCLUSIONS

The Mirror Face Lift is an additional therapeutic weapon in the arsenal of facelifts that we propose. We reserve it for men and women with a wide lower third of the face with an excess of fat due to a ptosis and downward fat migration and with pronounced jowls.

The Mirror Face Lift is a concept, a technique, and a tool, adapted to patient care and patient treatment in the following 3 ways:

- Preoperatively: during the consultation, the mirror position with picture taking allows us to analyze the rise of the soft tissues on the bone skeleton. It offers us a simulation of the postoperative result and helps to simplify the patient-doctor dialogue, as well as to analyze whether or not to perform a complementary fat-filling intra-operatively.
- Operatively: for a natural result, we operate each side differently to respect the anatomy of the patient.
- Postoperatively: the natural result obtained is consistent with the preoperative analysis. During postoperative consultations, we analyze the patients both sitting and lying down. The almost identical result obtained comforts the patients in their choice of the proposed technique.



Fig. 8. The anti-mirror position, head flexed forward, where all the signs of aging are accentuated. The ambition of the MFL is to obtain a stable positioning of the soft tissue on the original position.

Ebaa Sabri, FRCS

Cabinet Medicale, 1
84 rue de l'Université
75007 Paris, France

E-mail: emsabri@yahoo.com

REFERENCES

- Divaris M, Blugerman G, Paul MD. Face expressive lifting (FEL): un original surgical concept combined with bipolar radiofrequency. *Eur J Plast Surg.* 2014;37:69–76.
- Divaris M, Sabri E, Cancemi G, et al. LCL (Locked cheek lift) Three dimensional cheek lift and inferior palpebral rejuvenation. *Aesth Plast Surg.* 2018;42:825–838.
- Rohrich RJ, Pessa JE. The fat compartments of the face: anatomy and clinical implications for cosmetic surgery. *Plast Reconstr Surg.* 2007;119:2219–2227; discussion 2228.
- Rohrich RJ, Pessa JE, Ristow B. The youthful cheek and the deep medial fat compartment. *Plast Reconstr Surg.* 2008;121:2107–2112.
- Bailey L, Collie FM, White RP Jr. Long term soft tissue changes after orthognathic surgery. *Int J Adult Orthod Orthognath Surg.* 1996;11:7–18.
- Bartlett S, Grossman R, Whitaker LA. Age related changes of the cranio-facial skeleton: an anthropometric and histologic analysis. *Plast Reconstr Surg.* 1992;92:592–800.
- Pessa JE, Zadoo VP, Mutimer KL, et al. Relative maxillary rétro-sion as a natural consequence of aging combining skeletal and soft-tissue changes into an integrated model of midfacial aging. *Past Reconstr Surg.* 1998;102:205–212.
- Shaw RB Jr, Kahn DM. Aging on the mid face bony elements tridimensionnal compute tomographic study. *Plast Reconstr Surg.* 2007;119:675–681.
- Mendelson BC, Hartley W, Scott M, et al. Age related changes of the orbit and mid cheek and the implications for facial rejuvenation. *Asth Plast. Surg.* 2007;31:419–425.
- Kahn DM, Shaw RB Jr. Aging of the bony orbit a three dimensional computed tomographic study. *Asth Plast. Surg.* 2008;28: 258–264.
- Kermi A. Reconstructions faciales à partir d'images tridimensionnelles de crânes humains par recalage et modèle déformable pour l'identification de personnes. Mathematics [math]. TélécomParisTech, 2008. English.
- Rhine JS. Coming to terms with facial reproduction. *J Forensic Sci.* 1990;35:960–963.
- Divaris M. Paroi médiale de l'orbite. Anthropologie, morphologie, evolution. Museum histoire naturelle – Musée de l'homme: Tome 1 et 2. 1994.
- Catalina-Herrera CJ. Morphometric study of the orbit's base in male and female skulls of spaniards. *Bull Assoc Anat (Nancy).* 1988;72:5–7.
- Forbes G. Computed tomography of the orbit. *Radiol Clin North Am.* 1982;20:37–49.
- Ledouble. Traité de la variation des os de la face. Paris: Vigot Frères; 1906:471.
- Schultz AH. The size of the orbit and of the eye in primates. *Am J Phys Anthropol Philadelphie.* 1940;26:389–408.
- Weissman R. Surgical anatomy of the orbit. *A Laryngol Clin North Am.* 1988;21:1–12.

19. Ing E, Safarpour A, Ing T, et al. Ocular adnexal asymmetry in models: a magazine photograph analyses. *Can J Ophthalmol*. 2006;41:175–182.
20. Gawlikowska Sika A. Analysis of variation of orbital openings in contemporary skulls. *Ann Acad Med Stetin*. 2013;59:78–80.
21. Olu I, et al. Orbital radiographic anatomy. *Vestn Renty Radiol Mag*. 2015;35–11.
22. Owsley JQ, Roberts CL. Some anatomical observations on mid-face aging and long-term results of surgical treatment. *Plast Reconstr Surg*. 2008;121:258–268.
23. Lambros V. Observations on periorbital and midface aging. *Plast Reconstr Surg*. 2007;120:1367–1376; discussion 1377.
24. Gierloff M, Stöhring C, Buder T, et al. Aging changes of the mid-facial fat compartments: a computed tomographic study. *Plast Reconstr Surg*. 2012;129:263–273.
25. Le Louarn C, Buthiau D, Buis J. The face recurve concept: medical and surgical applications. *Aesthet Plast Surg*. 2007;31:219–231.
26. Besins T. The, “R.A.R.E.” technique: the renaissance of the aging face and neck. *Aesthet Plast Surg*. 2004;28:127–142.
27. Owsley JQ Jr, Zweifler M. Midface lift of the malar fat pad: technical advances. *Plast Reconstr Surg*. 2002;110:674–685; discussion 686.
28. Paul MD, Calvert JW, Evans GR. The evolution of the mid-face lift in aesthetic plastic surgery. *Plast Reconstr Surg*. 2006;117:1809–1827.
29. Patrocinio LG, Patrocinio TG, Patrocinio JA. Subperiosteal mid-face-lift. *Facial Plast Surg*. 2013;29:206–213.
30. Raminrez OM. High tech facelift. *Aesthet Plast Surg*. 1998;22:318–328.
31. Hachach-Haram N, Kirkpatrick WN. Midface-lifting: evolution, indications, and technique. *Facial Plast Surg*. 2013;29:289–294.
32. De la Plaza R, Valiente E, Arroyo JM. Supraperiosteal lifting of the upper two thirds of the face. *Br Plast Surg*. 1991;44:325–332.