

## Periorbital Rejuvenation Combining Fat Grafting and Blepharoplasties

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**Abstract.** Most surgical techniques intended to rejuvenate the midface do not address the palpebro-malar junction. With the advent of lipostructure, it appeared possible to perform at the same time surgery of the upper and lower eyelid and fat grafting. The technical method and instruments are described. The results are more natural than with a standard blepharoplasty because fat grafting restores a more youthful three-dimensional appearance.

**Key words:** Facial aging—Lipostructure—Fat grafts Eyelid surgery—Blepharoplasty

### Introduction

Since the early days of aesthetic facial surgery, improving the eyelid region has been an obsession, as this is one of the telltale areas of aging.

As far as the upper eyelid region is concerned, most patients arrive saying, “Doctor, I have too much skin on my upper eyelids. Please get rid of it for me!” The various surgical techniques that have been developed have tried to remove this excess skin by means or methods of varying sophistication. Certain authors have focused on the level of the incision or the amount of skin to be removed, while others have described techniques refining the location and extent of the palpebral fold [1].

Later, when the first frontal coronal lifts were performed [2–5], interest focused more on how much the scalp should be tightened and where to tighten it,

than on analyzing the characteristics of youth. With the more subtle and refined endoscopic frontal lifts, authors [6–8] became more interested in trying to keep as natural a look as possible, but at that time, we only had in mind the movements of the eyebrows and the eyelids in a two-plane geometrical space. Endoscopic experts then improved our knowledge of functional anatomy [9,10], and interest turned to understanding the processes that produce an aged look.

In the lower eyelid region the situation is similar: “Please get rid of these bags under my eyes and pull my skin like this,” and the patients invariably pull the skin of their temples upward. All the techniques described up to now thus tell us how to remove the excess skin and how to tighten it, without obtaining an ectropion, and how to remove the excess fat bulging through the skin. The paper by Raoul Loeb [11] and the later article by Sam Hamra [12] are landmarks because they allowed us to realise that preserving fat could be important. The description of the first mid face-lift by Tessier [13] did not focus on the importance of the palpebro-malar junction, but it was a historic landmark in that it considered the middle third of the face as a unit, including the lower eyelid region.

Laser resurfacing was, for a while, very much in fashion and seemed very promising, but in the long run many plastic surgeons stopped using it because of its tendency to bleach the skin and also because of the risks of ectropion.

The very detailed and precise description of micro fat grafting (lipostructure) by Sydney Coleman [14] marked the start of a new era because it has given us the possibility to restore reliably many of the characteristics of youth. He described in 1994 [15] the way he treats the periorbital region, and so did Fagien in the upper eyelid [16] and Lambros in the mid face [17] with micro fat grafts. Erol improves the mid face with a tissue cocktail [18]. When you compare two pictures



**Fig. 1.** Two pictures taken 30 years apart, in the same position.

of the same patient taken 30 years apart, you will notice the following (Fig. 1).

#### *In the Upper Eyelid Region*

A downward slant of the tail of the eyebrow due to a loss of skin elasticity in the temporal region and also due to a loss of volume of the entire frontal region, caused by modifications in the shape of the calvarium as well as a decrease in the thickness of the soft tissue layers. As a result, it seems that there is too much skin in the lateral part of the upper eyelid and the patient has a hooded appearance. Some patients tend to get rid of this excess skin lying on their eyelashes by elevating their eyebrows, thereby accentuating the hollowness (Fig. 2).

This impression of excess skin is enhanced even more by significant fat resorption occurring mostly in the lateral compartment of the upper eyelid and eyebrow fat in the fatty layer of Charpy or ROOF. The inner upper eyelid fat compartment, which resembles more the type of fat encountered inside the extraocular cone, is less prone to reabsorption; the upper eyelid skin, therefore, is deflated in its lateral two thirds and is also deprived of the vascularization induced by the presence of youthful fat. As a result, it is pushed downward by the weight of the eyebrow. As the inner fat compartment resists the aging process better, it is almost always possible to see hollowness in the region of the pulley of the grand oblique muscle that separates the two fat compartments in the upper eyelid.

The skin loses its elasticity, and the adherence between the tarsus and the skin tends to loosen; as a result, great care is necessary in searching for a slight ptosis that could be revealed by the operation.



**Fig. 2.** With aging some patients tend to elevate their eyebrows to counteract the skin excess.

#### *In the Lower Eyelid Region*

The slight downward migration of the lateral part of the lower eyelid is due to a loss of support of the malar fat pad (Fig. 3). This loss of a supporting pillar is a major element in the aging of the lower eyelid and must be dealt with if rejuvenation of the patient's face, and not only the eyelids, is what is really wanted. The face should be considered as a whole and not made of separate bits and parts that can be repaired without any relationship to the others (eye-



**Fig. 3.** A moderate ectropion due to a loss of a support from the malar fat pad.



**Fig. 4.** Attachment of the zygomaticocutaneous ligament.

brow for the upper eyelid and malar area for the lower eyelid region).

This loss of support is due to a loss of thickness in the sub-orbicularis orbital fat pad (SOOF) [19], as well as a loss of volume in the malar fat pad and its downward migration. These two events produce a tear-trough deformity that circles the aging lower eyelid.

As, simultaneously, the orbicularis oculi muscle loses some of its tone and the septum orbital weakens, they give way to a protrusion of the three fat bags in the lower eyelid.

Thus, descending from the ciliary margin, you will notice the aging, thin, inelastic skin covering the tarsus, the bulge of the protruding intraorbital fat, and then the furrows marking the cutaneous insertions of the orbicularis retaining ligament (tear-trough deformity)

and the zygomaticocutaneous ligaments. This has recently been described by Mendelson and co-workers [20,21] (Fig. 4) after the description of a fascial system by Pessa [22] and explains the black eye anatomy. Between these two ligaments there is atrophy of the fibrous fat lying close to the malar bone in the posterior aspect of the prezygomatic space. Descending still further, there is fat situated just above the nasolabial fold caused by another retaining ligament [23].

## Treatment

### *Patient Markings*

These markings are made in the room before any preop medication. The patient is in a sitting position



**Fig. 5.** Markings on the eyebrow and upper eyelid region, and 0.3 cc of fat put on the skin to show the volume that it represents.

and we make use of the pictures taken at the first visit and the old scanned pictures. Great precision is necessary when evaluating the volume dissymetries and making the patient aware of them. Sometimes, it is very useful to use a mirror to fully understand what the patient actually sees and what he wants; I usually mark in red the areas that need reduction, and in black the ones to increase. At this stage I never try to mark the eventual excess skin in the upper eyelids because, after the frontal lift and lipostructure, the need for skin resection will be completely different or nonexistent.

In the upper eyelids and eyebrow region I mark a line, which is just above the upper eyelid crease, and an upper line that is 1.5 cm above the eyebrow; this is the area in which we want to recreate a pleasant, young upward shape (Fig. 5).

In the lower eyelid region, I first delineate the exact spot at which you can see the change of fat thickness at the transition zone to the malar fat pad. I then draw a line following the lower limit of the tarsus to the lateral canthus; between these two lines, fat will be grafted deep to the orbicularis oculi muscle just in front of the orbital rim in order to correct the hollowed area of the tear-trough deformity (Fig. 6).

Then, depending on the skeletonization of the malar region, the area to be reshaped is delineated in continuity, moving toward the canine fossa.

#### *Fat Harvesting*

This is done at the beginning of the operation in a prone or supine position if the patient is very thin. We only inject a small amount of local anesthetic at the site of the stab incision made for the insertion of the suction cannula. Nothing is injected into the region we intend to take fat from, because it does not usually bleed, and, furthermore, this could lead to a false



**Fig. 6.** Markings in the lower eyelid: entrance point of the cannula.

evaluation of the volume obtained. For the lower palpebral region, I find that the inner part of the knee has the most suitable fat quality: it is less fibrous in nature, more supple, and the tissue particles obtained are smaller. In this location, and for the lower eyelid, I suction fat tissue with a special thin cannula of 1.5 mm diameter or with a multiperforated cannula allowing only tiny particules of fatty tissue to be aspirated. It takes a little more time, but it is more suitable for this special destination. As in all fat-obtaining processes, the most important thing is to avoid damaging the adipocytes. To do so you should



**Fig. 7.** Cannula used for eyelid fat grafting: 1 mm in diameter.

not pull the plunger more than 1 cm away from the fat coming into the syringe. You should also leave some air inside so that there is not too much depression, which could kill the cells by vaporizing them.

The remaining fat harvesting is done in the usual locations in which the fat is resistant to diet: saddle bags, love handles, abdomen, buttocks, and the back, if the patient is very thin.

You should plan to gather an amount that is the double of what you intend to graft, not because of reabsorption, which is actually rare, but because after centrifugation the usable amount is usually half of the harvest. The other half is blood, oil, and cells damaged by the traumatic aspiration.

The 10-cc syringes full of fat are then put into a centrifuge for 3 min at 3000 rpm. This allows the useful part (the intact fat particles) to be separated from the useless parts: the oil that is produced by the damaged cells, and blood. From experience we know that in overweight patients the quality of the take is not very good because their large cells are filled with lipids, and, in contrast, in very thin patients, the proportion of usable cells for the same volume of fat tissue is higher.

### *Frontal Lift*

This should be done prior to any fat grafting, as the remodeling to be done can only be appreciated after proper repositioning of the facial structures.

In almost every case, we perform an endoscopic frontal or temporal face-lift through one lateral incision and two para-median ones, if we want to weaken the corrugator or procerus muscles.

Naturally, the upper orbital rim periosteum should be released to allow upward movement of the tail of the eyebrow. The fixation of the upward mobilization

is secured by a screw inserted into the calvarium or by resorbable stitches to the temporal aponeurosis if the anterior extent of the muscle allows it.

### *Fat Grafting in the Upper Eyelid Region*

Very rarely do we remove the most nasal compartment of upper eyelid fat, which most of the time shows more because it does not decrease, unlike the fat resorption of the middle compartment.

The cannulas used in the periorbital region are malleable, rather pointed at their end, but, of course, not as sharp as a needle, and their diameter is 0.3 mm (Fig. 7). They are malleable so that they can be bent in order to follow the orbital curvature of any patient. They are sharper than the usual cannulas so as to be very easy to insert into the exact location where very small particles of fatty tissue are to be grafted, and their diameter is a little smaller than those used for the harvesting, although this does not diminish the take of the grafts. The syringes are 1 cc syringes with Luer Lock adapters. A new syringe must be used for each cc grafted. The plunger of a new syringe glides very easily and, as a result, when applying gentle pressure with the base of your thumb you will be able to be precise enough to graft particles of fat of 0.01 cc. In doing so, each grafted particle of fat will “take” and there is no risk of creating visible lumps.

You should think of the task as reshaping an anatomical region rather than an anatomical structure. This is because that which has shrunk away is the entire periorbital region and not just the part of the eyelid fat that is above the fold. The area to be reshaped therefore extends from the eyelid fold to at least 1 cm above the eyebrow, going upward to the lateral part of it. The fat should be deposited in all the layers from the bone to just underneath the orbicularis oculi muscle, taking care to deposit the very small particles of fatty tissue

evenly. No fat is grafted between the muscle and the skin because it is not a normal location for fat and any irregularity would show. The fat grafting is done very gently when pulling away the cannula by applying a very light pressure with the base of your thumb on the plunger. In this way, you are very precise in depositing a very regular layer of tiny particles of viable fat tissue. This fat grafting should not be done in the previously undermined plane of the frontal lift where it would not “take” because of the lack of recipient vascularized tissue, but in the scalp, over the galea aponeurosis.

Once you have completed the restoration of the shape of the eyelid and eyebrow region, you must consider a skin resection and make an evaluation of the eventual amount of skin to be resected. This is done by pinching the upper eyelid skin with forceps, or by assessing the amount of excess skin, as is done when performing an abdominoplasty [24]. We always remove more skin in the lateral part of the eyelid; only skin is resected, with the muscle left intact for volumetric reasons and also because we want to create a fuller eyelid, not an operated hollowed eyelid. Furthermore, as we have just grafted fat underneath the muscle, every particle should be left intact. Fat resection in the inner part of the eyelid can be done in a conservative manner if it is absolutely necessary, and it can be done through the conjunctiva as described by Januszkiewicz and Nahai [25]. Excess fat in the lateral compartment should not be resected but can be translocated toward the orbital rim. Laser skin treatment can be done at the end of the procedure, and this does not impair the take of the fatty tissue.

#### *Fat Grafting in the Lower Eyelid Region*

Patients with Baggy Eyelids and Tear-Trough Deformity. In this situation we always begin by treating the fat herniation first. I value the fat sliding procedure described by Sam Hamra [12], but I think that if I did it, it would not be possible to perform the lipostructure without disturbing the newly translocated fat, and I also feel that usually, in order to reshape the lower eyelid and malar region, more fat than the quantity that can be slid is necessary.

For this reason, before fat grafting, I always perform a transconjunctival standard blepharoplasty, resecting the excess fat flush to the orbital rim—it is below this level that we will improve the thickness of the SOOF with micro fat grafting. We never make subcutaneous or submuscular eyelid dissection first because there is no need for skin resection in most cases, and secondly, after such undermining it would not be possible to perform fat grafting. If, after the completion of the operation there is still notable excess skin, a very conservative skin pinch resection can be performed, or light laser resurfacing. But in fact there is a genuine upward pushing action due to the restoration of the malar pillar, which reduces the apparent excess of skin. The delicate and sophisti-



**Fig. 8.** Cannula underneath the orbicularis oculi muscle, in the SOOF layer.

cated techniques of canthopexies [26,27] are, in my opinion, less necessary than before, unless the patient wants a very different slant in the palpebral fissure.

The main purpose of fat grafting is to correct the tear-trough deformity and to move the transition zone between the eyelid and the malar area upward. Our goal is also to restore the youthful projection of the malar eminence, in subtle continuity with a shorter lower eyelid.

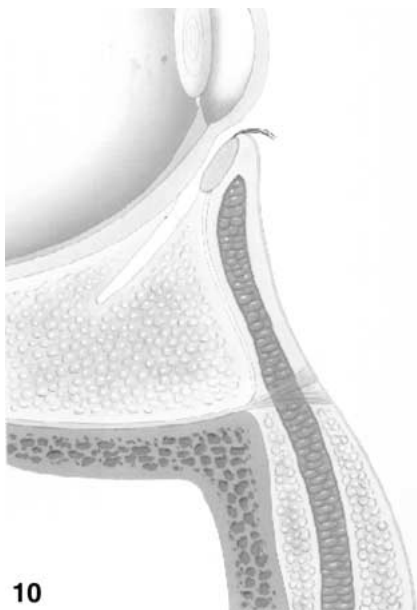
If a face lift is to be done we usually begin by doing the lipostructure, including the lower eyelid, and then we perform the face lift on an already reshaped face.

Since we started using lipostructure for the mid face region, we have abandoned the mid face lifting we used to do because we think that, in our experience, it did not sufficiently improve the key transition zone between the malar eminence and the lower eyelid. Even the more sophisticated mid face rejuvenation techniques with sculptural effects [28,29] use fat grafting or dermo fat graft to improve this area.

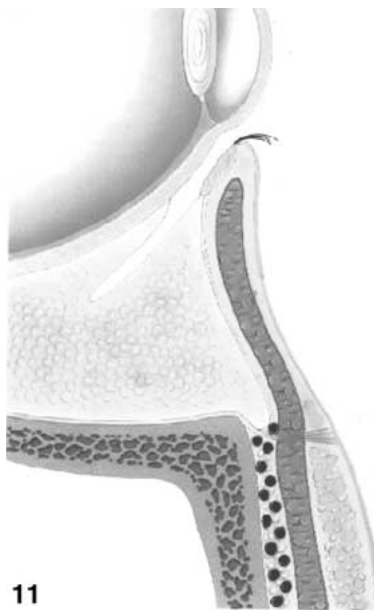
The cannula used to graft fat in the lower eyelid is finer: It is 19 gauge, and the syringe is 1 cc. The fat comes from the inner part of the knee, harvested with a multiperforated cannula. The holes of this multiperforated cannula are of the same diameter as the 19-gauge cannula that will be used to deposit fat. So, there will not be any pressure trauma when pushing the fat through the very small cannula used for the lower eyelid region. The volume usually harvested for this region is 4 cc. After centrifugation, this will give 2 cc of pure fat that will be used exclusively for cor-



**Fig. 9.** Markings for upper eyelid, lower eyelid, tear trough, and malar area.



**Fig. 10.** Youthful eyelid.



**Fig. 11.** Where to graft fat: underneath the muscle.

recting the tear-trough. For the malar eminence, which is always improved at the same time in order to get a nice natural curvature of the mid face, we use fat from the saddlebags or the abdomen that can be harvested with bigger cannulas.

First, I correct the upper part of the malar area in the subtarsus part of the lower eyelid. I no longer graft fat into the subcutaneous layer because it is an area in which the least irregularity would show and there has never been much fat there. Fat resorption occurs mainly in the suborbicularis layer, so the graft is done underneath the orbicularis oculi muscle.

I pretunnelize the zone between the tarsus and the transition zone in order to prepare the recipient zone in which I will, very gently, and as evenly as possible,

deposit tiny particles of fat. The 1-mm stab incision is situated in the region of the crow's feet and, with the cannula disconnected from the syringe; I do 20 to 30 passes underneath the orbicularis, in the SOOF, to prepare the lipostructure. I usually do only one incision and I do not crisscross from another entrance site.

I then take the 1-cc syringe with a content of 0.4 cc of fat harvested from the inner part of the knee and I deposit this fat, as regularly as possible, from the upper lateral incision to the inner part of the eyelid, and from the lower border of the tarsus to the lower end of the tear-trough (Fig. 8). You can actually see the hollowness of this region disappear. If a hematoma develops, do not panic; just stop the lipostructure, apply gentle pressure, and return at the end of the procedure.



**Fig. 12.** Lipostructure in upper and lower eyelid regions, without any surgery.



**Fig. 13.** Upper eyelid lipostructure, for enophthalmia, lower eyelid, and malar lipostructure.

If, at the end of the lipostructure (combined or not with conjunctival baggy eyelid treatment), you think that there is excess skin, it can be treated by means of a pinch excision just below the eyelashes. A standard blepharoplasty with submuscular undermining should not be performed under any circumstances, as the fat would not take in a dissected plane.

Having done the correction of this region, you must continue the lipostructure in continuity to the mid and lower malar region in order to rejuvenate the whole mid face. Through the same crow's feet stab incision (Fig. 9), and still obliquely, with no obligation to try to crisscross your paths, you will graft a total amount of 6 to 15 cc of fat into all the layers, from the bone to the under surface of the skin below the lower limit of the orbicularis.

If the inner part of the tear-trough is very deep and shallow, another stab incision can be made along its axis. You will then graft minute particles of fat into this particular region, being very careful not to overcorrect and bevel the sides.

Patients without Baggy Eyelids but with Tear-Trough Deformity. In this situation the goal is to restore a normal thickness of fat in front of the orbital rim which sometimes shows through the skin and could be mistaken for fat protrusion (Figs. 10, 11). I do not think that this is really due to a downward migration of the malar fat pad but to a selective, genetically programmed fat resorption as can be seen in other parts of the body. It is also interesting to observe that this fat thinning occurs almost exactly behind the surface of the orbicularis oculi muscle, as





**Fig. 14.** Transconjunctival blepharoplasty, lower eyelid and malar lipostructure.



**Fig. 15.** Endoscopic frontal lift, lower blepharoplasty, lipostructure of lower eyelid and of the malar region.

if its repeated contractions could, in the long term, lead to fat thinning.

The procedure is exactly the same, but without the conjunctival approach.

### Complications and Secondary Corrections

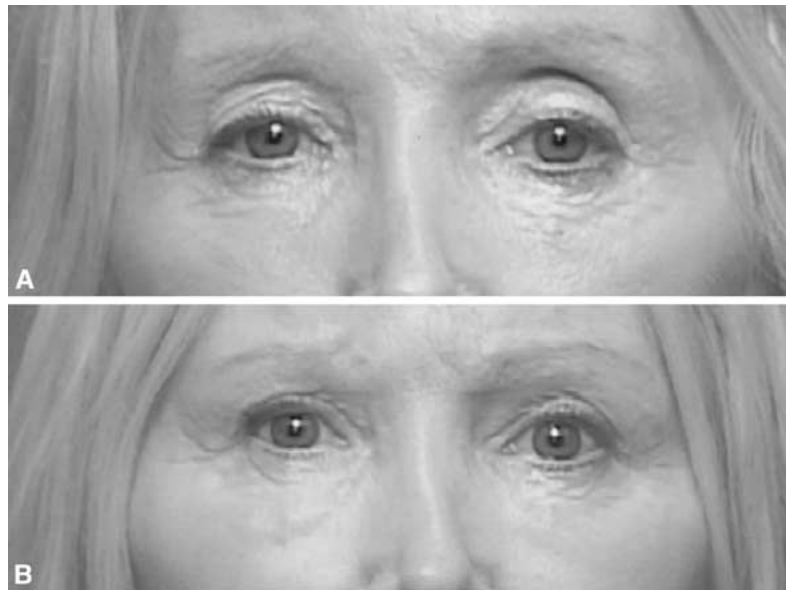
#### *In the Upper Eyelid*

In the upper eyelid and eyebrow it has occasionally been necessary to make secondary corrections because, in my early days, I was a little inhibited and did not graft enough. You should graft at least 2.5 cc

in order to obtain an improvement. To avoid skin irregularities, graft between the bone and the muscle, not above it.

#### *In the Lower Eyelid*

When I began performing periorbital lipostructure I inadvertently grafted fat inside the septum. This resulted in increased puffiness in the lower eyelid, very different from the result expected by both patient and surgeon. At that time I used to make my stab incision and graft from below the orbit. The movement of the cannula was thus upward. My mistake was to enter the septum and to graft fat inside the lower eyelid bags.



**Fig. 16.** Lipostructure of eyebrow and upper eyelid.

Treatment was very simple: through a transconjunctival incision I found the grafted fat, a little redder than usual, and resected the excess.

In order to avoid this I decided that I should graft fat in front of the orbicularis to avoid entering the septum orbital, and do it from a lateral stab incision in the canthal region. In most cases it was very encouraging, provided that care was taken to distribute the grafted fat particles very evenly, because the problem that resulted from going in from below did not occur any more.

But in five cases (1%), the patients complained of very small irregularities underneath the skin, mostly visible on tangential views, but disturbing for both patient and surgeon. I treated them with diluted injections of steroids and, in one case, by a direct excision.

On one occasion a patient developed a subcutaneous infection treated by conservative debridement, without sequelae, and the patient was ultimately satisfied.

Since I started spreading the fat particles underneath the orbicularis oculi muscle, with the aim of filling this region in continuity with the malar region and with the canine fossa below, the only imperfections that I have been faced with are

1. A slight edema at the inferior limit of the orbicularis oculi muscle like that sometimes observed after standard blepharoplasties. These edema are difficult to treat, as we all know.
2. An incomplete take of the grafts, mostly in elderly people, leading to a repeat lipostructure, under local anesthetic in most cases. Under pressure, fat embolisms leading to visual impairment have been reported after fat injection. I do not think that the risk is the same when you gently graft the fat when pulling back a blunt cannula. Extra care is nev-

ertheless necessary in the glabella region and in the vicinity of the angular vein.

## Conclusion

Since I first performed lipostructure in 1998, all my blepharoplasty patients have had a combination of fat grafting and surgery. I intend to continue, doing my best to improve the results (Fig. 12–16) and, now that I have had the opportunity to monitor patients 4 years after surgery, I am confident about the long-term results.

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