PERIORBITAL SURGERY AND ENDOSCOPIC FOREHEAD LIFT

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Upper Eyelid Blepharoplasty
Upper Eyelid Blepharoplasty

The eyelids have a protective function. They prevent the eye from drying out by covering (part of) the cornea and by spreading the tear film across the cornea. The lower eyelid is mainly static in its function, whereas the upper eyelid plays a major role in actively spreading the tears as they are secreted by the lacrimal gland.

The upper eyelid crease is formed by the attachments of the levator muscle fibers into the skin in front of the tarsal plate. The lateral canthus is approximately 2 mm higher than the medial one. The rim of the upper eyelid is normally positioned 1 – 2 mm below the upper limbus. One should always be aware of the horizontal position of the upper eyelid and note any asymmetry present before surgery. Levator muscle weakness could disguise the problem of skin laxity, therefore leading to a suboptimal result.

In the medial aspect of the upper eyelid one can often find a distinct bulging. This is mainly due to prolapsed intraorbital fat resulting from weakness of the medial orbital septum. Make sure to mark this, since this should be addressed separately during surgery.

The position of the eyebrow should be taken into account as brow ptosis can result in an overestimation of the true amount of skin excess in the upper eyelid. When indicated, consider repositioning the eyebrow first before proceeding with an upper eyelid blepharoplasty.
Step 2

Marking the Incisions After Analyzing the Skin Excess

Markings can be made in either an upstanding or supine position, using a waterproof marker pen with a fine tip. Note the amount and location of skin excess, as well as the way in which the subdermal volume is dispersed.

Inferior Limit of Upper Eyelid Incision

The lower incision is slightly curved and follows the shape of the eyeball. The tarsal crease in the upper eyelid can be used as a guide. Make sure to leave at least 7–8 mm between this caudal incision and the rim of the upper eyelid.

Intraoperative Assessment of Skin Excess

Ask the patient to keep their eyes closed. Grasp the skin using a non-toothed forceps and pull it down towards the lower incision marking. Be careful not to overdo this in the medial aspect of the eyelid. If needed, use a Burrow’s triangle there (see Fig. 9, p. 10).
Superior Limit of Upper Eyelid Incision

While the aim is to resect as much as skin as possible, in reality there is a functional limit to what should be resected. It is advised to restrict the skin reduction by leaving a margin of at least 7 mm between the cranial border of the incision and the eyebrow.

Lateral Skin Excess

Usually, the skin excess is more in the lateral section of the upper eyelid. This can be addressed by guiding the incision upwards at an angle of about 45 degrees. Preferably, try to limit its length as much as possible in order to reduce the more obvious part of the scar as much as possible. The scar should not extend beyond the lateral orbital wall.

Again, if these conditions cannot be met, then consider performing an additional (lateral) browlift.

Medial Skin Excess

In case of medial skin excess, a Burrow's triangle can be added to prevent a ‘dog ear’ from forming above the medial canthus. Fishtail designs have also been described.
Local Infiltration Anesthesia

A common combination is: Lidocaine 1% with Adrenaline 1:200,000. For reasons of comfort consider adding 1cc Sodium-bicarbonate to 9 cc of the above, thus reducing the acidity of the injected fluid and making the injection less painful. Use for instance a 24-Gauge needle and infiltrate from lateral to medial, using already infiltrated skin to reintroduce the needle.

Incision of Skin

Make sure to meticulously follow the lines as marked before the procedure. Putting the skin under some light traction may facilitate this.

Undermining of Skin

The skin can be undermined in a subdermal plane while resecting, using either scissors, a knife or monopolar diathermia. Most surgeons take a strip of orbicularis oculi muscle at this stage, in order to reduce the volume and create a fold in the upper eyelid.

In principle though, it is probably best to leave it untouched as much as possible, keeping its function in mind. One could leave this decision depending on the volume of the upper eyelid, which should be noted during the preoperative examination in the upright position.

Step 3
Infiltration

Step 4
Incision

Step 5
Resection of Skin
Step 6

Resection of Excess Orbital Fat If Indicated

Fat compartments of the upper eyelid.

Upper Eyelid Fat Compartments

The orbital septum gives access to two fat compartments in the upper eyelid. Typically, the fat in the lateral pocket is more yellowish than the one seen in the medial pocket.

In the laterocranial part lies the lacrimal gland (Fig. 13, colored in green) just inside the supraorbital rim. Be careful not to harm this important gland.

Step 7

Excision of Fat

Even though an eyelid with a youthful appearance usually contains more subcutaneous fat than at a later age, in some cases of uneven distribution resection of fat still is indicated. A thorough preoperative evaluation is paramount in order to determine where and how much fat should be resected. The medial (= white) fat compartment often houses the biggest bulk, but be careful not to overresect. This will inevitably lead to hollowing of the upper eyelid, which results in a very unnatural appearance and should be prevented.

Hemostasis

Meticulous hemostasis is of the utmost importance. It will improve the postoperative appearance and will keep recovery time to the bare minimum. Reducing the risk of postoperative hemorrhage will also limit the risk of a retro-bulbous hematoma. This most feared of complications could, if neglected, lead to optic nerve compression and blindness.
Closure of Skin

The skin is preferably closed using an intradermal continuous suture. A monofilament thread like Prolene 6/0 is best suited due to its sliding characteristics, making it both easy to apply as well as to remove. A small needle (for instance a P3 cutting needle) will help in achieving a precise approximation of the skin layers.

Volume Restoration of the Upper Eyelid by Lipofilling

Manifestation of aging is basically related to changes that occur on three levels:

- Reduction of skin laxity,
- Caudal migration of subdermal tissue and
- Progressive atrophia of (sub)dermal tissue.

This last factor leads to loss of volume in the face. Especially when (too much) fat has been resected in the course of a previous upper eyelid surgery, over time, an indentation appears in the medial one-third of the upper eyelid, which is referred to as ‘A-line deformity’ (Fig. 17). Restoration of the natural curvature of such a depleted upper eyelid can be achieved by adding volume via fat injection, which can result in a youthful and more natural appearance.

Harvesting of Fat

Fat harvesting is done by liposuction. Possible donor areas include the abdomen (Fig. 18), the thighs and the medial aspect of the knees. Recent evolutions in harvesting cannulas (smaller but more holes) have resulted in fat consisting of smaller particles, which is claimed to have a higher revascularisation rate due to the increased surface area.
Processing of Fat

Coleman* advocated spinning the fat in a centrifuge for 3–5 minutes (Fig. 19). Alternatively, one can leave the fat to settle for a period of 15–30 minutes, during which the separation of fat and other substances occurs as a natural process. It is claimed that due to this, stem cells collect in a separate (white) layer on top of the fat. Including this fraction rich in stem cells when transferring the harvested fat into smaller injection syringes (Fig. 20), is believed to add to the regenerative effect of the method.

Injection of Fat

Harvesting the fat by multiple-hole cannulas makes it more liquid-like. This renders the fat easily injectable by means of smaller-gauge needles, which makes the procedure more refined. Defects can be corrected to a higher degree of precision. Typically, the medial aspect of the upper eyelid is filled in the submuscular/preseptal space with 1 to maximum 2cc of this liquefied fat (Fig. 21). By injecting small drops are discharged along the course of multiple tunnels at the target area (Fig. 22).

Lower Eyelid Blepharoplasty
Step 1

Analyzing the Aging Lower Eyelid

The texture of skin around the orbit makes that the aging process of the face often first becomes apparent in this area. Where the changes with age in the constantly moving upper eyelid are mainly due to increased skin laxity, those in the lower eyelids are more related to the relaxing of suspension structures, as they are more static in their function. The purpose of the lower eyelids is to protect the lower half of the globe, which makes it very important to position them properly and under the correct tension.

In order to be able to translate the patients’ demands into a surgical procedure that suits them best, a thorough understanding of the anatomical key structures of the lower eyelid and of their changes during the aging process is mandatory.

The subcutaneous changes show on the outside. Loss of tension in the support structures of the lower eyelid, like in the infraorbital septum, results in protrusion of the intraorbital fat over the edge of the infraorbital rim. This is reflected by the malar bags, which so often are the reason of discontent.

Several structures are in place to support and maintain the position of the lower eyelid:
- the tarsal plate
- the canthal ligaments
- the orbicularis oculi muscle

The tarsal plate is integrated into the ligamentous suspensory system of the lower eyelid. Both, the tension of this suspensory system as well as the position of the canthal attachments is essential in determining the position of the (lower) eyelid.
Ectropion

The outward sagging of the lower eyelid is referred to as ‘ectropion’. Commonly, this occurs in the lateral aspect of the lower eyelid, but is observed medially as well. Causes for this finding could lie in the lower eyelid itself (increased laxity of canthal ligaments or the orbicularis muscle), or in the surrounding tissues. Ectropion is a dreaded complication after lower eyelid blepharoplasty, usually due to an over-enthusiastic resection of skin or a misjudgment of the suspensory capacity of the lower eyelid. In this situation, the protective function of the cornea is impaired, which can lead to reduced vision.

Scleral Show

Typically, the lowest point of the lower eyelid margin is located at the level of the limbus. When this point is located more laterally, there is more exposure of the sclera of the eye, hence the term ‘scleral show’. This can be the result of, for instance, increased lower eyelid laxity due to aging, but may also stem from a malposition of the lateral canthal ligament or a shortage of skin in the lateral aspect of the lower eyelid.

When present, one should consider taking extra measures to restore positional and functional balance during the procedure.
Step 2

Markings and Infiltration Anesthesia

**Markings**
The typical incision for access to the lower eyelid runs approximately 1–2 mm below the eyelashes. It extends into the lateral canthal region at an angle following the natural skin lines, therefore providing an opportunity to correct any excess of skin without causing a ‘dog ear’ at the end of the procedure.

**Infiltration Anesthesia**
Infiltration should include not only local and regional blockage of the infraorbital nerve, but also that of the zygomatical branch of the trigeminal nerve. This nerve provides sensation to the lateral aspect of the orbital region as shown in the illustrations.

6 Subciliary incision line.

7 Infiltration of zygomatical branch.

8 Sensory nerves in the periorbital region.
Step 3

Incision of the Lower Eyelid

The sequence of dissecting into the lower eyelid could be as follows:

1. Canthal incision by use of a knife. This incision should be made at an angle with the lateral orbital wall, following the wrinkles that usually fan from there into the temporal area. The precise location of this lateral component is therefore different in every case. The incision then continues a few millimeters under the cilia as far as or just beyond the level of the limbus (Fig. 9).

2. Subcutaneous dissection by use of scissors, creating a tunnel above the level of the muscle (Fig. 10).

3. Tilt the scissors and cut the skin while following the subciliary incision line (Fig. 11).

4. Submuscular, preseptal dissection (Fig. 12).

5. Transmuscular cut, providing instant access to the preseptal layer (Fig. 13).

6. Preseptal dissection towards the arcus marginalis. Make sure to use a 'von Langenbeck' retractor to lift the soft tissues away from the infraorbital septum, which makes it easier to dissect in the right plane (Fig. 14).
Periorbital Surgery and Endoscopic Forehead Lift

Step 4

Correction of Protruding Infraorbital Fat

The most common methods for correcting protruding infraorbital fat are:

1. **Tightening of the infraorbital septum:** The caudal edge of the loosened septum is reattached to the arcus marginalis by means of a running suture, thus restoring it to its original position and tension (Fig. 16).

2. **Fat resection via a subciliary incision:** Good exposure of the infraorbital region can be obtained by using this access. Usually, resection of fat is mainly confined to the medial compartment. The advantage of this approach is that it provides a good way to resect any skin excess that might be present at the same time. Disadvantage of fat resection is the potential risk of a ‘hollow-eye appearance’ in the long term (Fig. 17).

3. **Fat resection via a transconjunctival approach:** The most obvious advantage of this approach is the prevention of a visible scar, thus making it an option to consider mainly in the absence of skin excess in the lower eyelid. Apart from that, another advantage is that the orbicularis oculi muscle is left alone, therefore reducing the risk of limiting its function, which is sometimes seen after using the external subciliary approach. Main disadvantage is that this procedure needs to be performed under sedation or general anesthesia in order to prevent discomfort for the patient, considering the proximity of the cornea (Figs. 18, 19).

4. **Lipofilling:** Recent evolution in facial plastic surgery has added another aspect to rejuvenation, which is in direct contrast to the techniques described under point 2 and 3, namely the restoration of volume. While fat injections might not be able to completely replace other methods of periorbital rejuvenation, they can certainly act as an adjunct to them, like for instance when filling the tear trough.
Dr. Hamra presented the following technique of arcus marginalis release and subsequent fat distribution in 1995* as part of his composite face lift theory. The principle consists of preserving the fat and redistributing it over the infraorbital rim in order to camouflage the rim.

1. Preseptal dissection towards the arcus marginalis (Fig. 20).

2. Dissect over the inferior rim of the orbit (arcus marginalis) down into the cheek in a supraperiosteal plane, creating a small pocket. This also releases the subcutaneous skin adhesions to this rim, which adds to the correction of the malar bags (Fig. 21).

3. The septum is incised at the level of the arcus marginalis, which releases the fat from the compartments (Fig. 22).

4. The infraorbital fat is moved over the rim, downwards into the supraperiosteal pocket. This maneuver involves that the skin adhesions are also released, facilitating mobilization of the malar bags (Fig. 23).

5. By moving the intraorbital fat down and subcutaneous tissues of the cheek upwards on top of the fat, a double layer coverage of the infraorbital rim is obtained. The skin is then closed with an intradermal running suture, usually combined with tightening of the muscle in a sling (Fig. 24).

The orbicularis oculi muscle plays a vital role in the suspensory mechanisms of the lower eyelid. Its function and position should therefore be taken into consideration in every lower eyelid procedure. Often, suspending the lateral muscle segment at the lateral orbital rim is the first step in those operations that aim to reinforce the active support mechanism in the lower eyelid (Fig. 25).

Step 5a
Suspension of the Lower Eyelid (I)
Tightening of the Orbicularis Oculi Muscle: Muscular Sling

Muscular suspension.

Step 5b
Suspension of the Lower Eyelid (II)
Tightening of the Lateral Canthal Ligament: Canthopexy

In case of increased laxity of the lower eyelid, a tightening of the lateral canthal ligament should be considered. Make sure that the traction suture is placed through the ligament in continuation with the tarsal plate and that it is moved into the correct position and direction, since the origin of the ligaments lies on the medial aspect of the lateral orbital wall. Denying to acknowledge this detail results in reduced protection and may thus precipitate damage to the cornea.
Step 5c

Suspension of the Lower Eyelid (III)
Repositioning of the Lateral Canthal Ligament: Canthopexy

The position in which the lateral canthal attachment is placed is essential for the position and thus the outer aspect and balance of the eyelids. On average, the lateral canthus is positioned at the level of the lower limbus of the iris, which is 1–2 mm higher than the medial canthus. During surgery this position can be adjusted according to demand. A protruding eye might need a 1-2mm higher positioned lateral canthus to achieve a proper lower eyelid position.

It is important to make sure that the canthal ligament is fixed to the inside of the lateral orbital wall. This means that the suture should really pass through the bone for the ligament to end up in the right position (Figs. 27, 28).

27
Underlying anatomy, transosseous fixation.

28
Intraoperative view of the transosseous fixation of the lateral canthal ligament.
**Step 6**

**Skin Excision and Closure**

The amount of skin that can or should be excised in a lower eyelid correction is often subject of debate. The minimum amount of skin that is required in the lower eyelid can be determined by asking patients to open their mouth while looking upwards at the same time. If the eyelid is properly supported, then the skin that is loosely overlapping the cranial wound edges in this position should be safe to resect. Usually, the majority of this surplus will be located in the lateral part of the lower eyelid.

29. Defining the amount of skin resection with open mouth and eyes rotated upwards.

30. Lateral skin resection only.

31. Put no tension on the skin when resecting.

32. Continuous running suture for wound closure.
3 Browlift
The eyebrows (together with the eyelashes) form a protective barrier for the eye by preventing, for instance, sweat, dust or other debris to drop down into the orbital area and thus possibly into the eye itself. They also play an important role in non-verbal communication, where specific movements of the eyebrows can vividly enhance emotions like anger or surprise.

There is a wide range of natural as well as gender-related variation in the position of the eyebrow:

- The medial part of the eyebrow is usually located at, or slightly above the level of the supraorbital rim.
- The apex of the eyebrow is located at the level of the lateral limbus.
- In men, the lateral aspect of the eyebrow mostly sits on the supraorbital rim, while in women it is positioned (on average) 1–3 mm higher.
- The lateral part of the brow normally ends at a level 2–3 mm higher than that of the medial part.

This variation demonstrates that in each case the proper brow position should be assessed on a case-to-case basis.

Brow ptosis is confirmed when the brow is located caudally to the supraorbital rim (Fig. 1). Ptosis is mostly found in the lateral aspect of the brow, but medial ptosis does occur. Often, this is associated with hyperactivity of the muscles in the glabella region. An intimate knowledge of the anatomy in this area is a must in order to achieve a suitable solution in each case (Fig. 2).

When dealing with the brow position, one must be aware of the site and course of the sensitive nerves located in this area in order to prevent any iatrogenic damage to motor or sensory nerves (Fig. 3).

The brow is attached to the lateral aspect of the supraorbital rim by means of strong ligamentous attachments to ensure a stable position. Mobilizing the brow in a subperiosteal approach requires a release of these lateral attachments (Fig. 4).
Step 2a

Methods of Browlift (I): Excision of Skin (Direct Browlift, Coronal Browlift)

1. **Direct excision of skin of the forehead**: Main indication is the elderly patient with already marked skin creases in the forehead. Disadvantage (besides the scars) is the limited stability of the result and the inevitable concomitant damage to the supraorbital nerve (Fig. 5).

2. **Classic, coronal lift**: Total mobilization of the forehead via a scar in the hair-bearing skin. Excellent exposure, although at the cost of a sizable scar. The drawbacks inherent to the method involve that the hairline is raised if the incision is made in the hair-bearing skin. This can be prevented by positioning the scar at the level of the hairline. A second disadvantage is the numbness of the hair-bearing skin posterior to the incision line (Fig. 6) that will inevitably result from cutting the supraorbital nerve.
3. **Transpalpebral lift**: The brow can be approached during an upper eyelid blepharoplasty, which saves an extra scar. This method, however, is limited to the lateral half of the brow due to the location of the supraorbital nerve. Stable peristomal fixation is often difficult, resulting in less predictable results in the long term (Fig. 7).

4. **The Fogli browlift**: for a long time, temporal lifting was considered a variation of the type-1 approach (direct excision of skin), in that it offers the advantage of concealing the scar within the hair-bearing skin, but with the drawback that its efficacy is limited to the lateral aspect of the eyebrow. However, Dr. Fogli* developed another approach in this area when publishing a review of 270 cases of temporal lift in 2003. Employing this technique gives access to the lateral orbital region via a temporal incision, just within the hairline (Fig. 8).

1. Scissors are used to undermine down to the level of 1 cm caudal to the hairline (green area, see Fig. 8) in a subgaleal plane. At the level of the temporal crest though, this dissection proceeds below the periostal layer in order to release the attachments.

2. Halfway between the hairline and the eyebrow, the tip of the scissors is used to penetrate the galeal plane (Figs. 8, 9), after which dissection proceeds caudally in the subcutaneous plane. In this way, the frontal branch of the facial nerve is spared. Dissection is carried all the way down to the zygoma via the supraorbital rim and the lateral orbital wall, in order to mobilise the tissues extensively.

3. Then, the galea is elevated, doubled up on itself, and sutured to the temporal fascia in order to achieve permanent fixation at a higher position (Fig. 10).

**Step 2c**

**Methods of Browlift (III): The Endoscopic Forehead Lift**

5. **Endoscopic forehead lift:** The endoscope was introduced into browlifting by Ramirez in 1995**. Access to the subperiosteal plane is obtained via three longitudinal incisions just within the hairline (Fig. 11). A blunt-tipped elevator is used to raise the first 3 to 4 cm of the forehead, while following this subperiosteal plane in a caudal direction (Fig. 12). It is wise to stop at this point, since it is very easy to inadvertently perforate the periosteal layer due to the curvature of the frontal bone. The endoscope is now introduced to proceed with the dissection under direct vision (Fig. 13). In this way, the periosteal layer is mobilized up to the level of the supraorbital rim and down to the lateral aspect of the orbit and zygoma, gradually freeing the lateral attachments of the brow (see Fig. 4).

Once dissection arrives at the supraorbital rim, the muscles of the glabella region should come into view. When marked interglabellar frowns are present it is an option to cut the corrugator, procerus and depressor supercilii muscles at this stage, although care should be taken not to harm the nerves. Cutting and weakening these muscles reduces downward traction of the eyebrow. The adjunctive use of botox is indicated at this point in that it mainly contributes to lifting the medial aspect of the eyebrow by blocking the muscles that pull it downward.
Fixation can be achieved by a variety of methods. Based on the authors experience, the use of both absorbable hooks or uni-cortical screws have been shown to work well. In case of the screws, the wounds are closed with staples, while pulling up the skin behind the screws with maximal tension. The screws are then easily removed in an outpatient setting after two weeks. In case of using the absorbable hooks, the skin is lifted and pinned down in the desired location. Expect the hooks to disappear over the course of 6 to 12 months.

6. Botox injections: Medial browptosis is often caused by overactive depressor muscles. With the use of Botox, the caudal pull of these muscles can be reduced, usually resulting in a considerable elevation of the medial aspect of the eyebrow.