Paraskevas Kontoes

State of the art in Blepharoplasty

From Surgery to the Avoidance of Complications

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Paraskevas Kontoes
Plastic Aesthetic and Laser Surgery Department
Hygeia Hospital and DrK Medical Group
Athens, Greece

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Foreword

It is an honor and great privilege to write this foreword on *State of the Art in Blepharoplasty* by Dr. Paraskevas Kontoes.

Dr. Kontoes is a renowned educator, a forward thinker, and an internationally recognized leader in aesthetic plastic surgery. He is the past president of the European Society for Laser Aesthetic Surgery (ESLAS), past ex-co member of the Hellenic Society of Plastic Reconstructive and Aesthetic Surgery, and the current Chairman of the Education Council at the International Society of Aesthetic Plastic Surgery (ISAPS).

I have known Vakis for many years and have always been very impressed with his surgical skills, his outstanding teaching abilities, and his relentless creative innovative mind. He has distinguished himself not only in his native country Greece but throughout the world.

The eyelid has many different meanings for different cultures. If the eyes are "the window of the soul," then the eyelids are "the curtains." Patients are usually very happy and motivated after successful blepharoplasty, but it can be one of the most challenging procedures we perform due to the complex and sophisticated anatomy and its close relationship with the eye and the entire face.

Over the years, plastic and reconstructive surgeons have focused on the surgery of the eyelids in trauma, cancer, burns, congenital deformities of the optic cavity and skull, and aesthetics.

Dr. Kontoes has assembled eight very important chapters in his excellent compendium on blepharoplasty – it starts with the anatomical review of the periorbital region, followed by the history of the many techniques in blepharoplasty, a dedicated chapter on laser assisted blepharoplasty based on his large knowledge and experience of laser procedures, an entire chapter detailing the techniques in blepharoplasty and his own innovations, and a complete review of the many complications often seen after this complex operation. The final chapter deals with a philosophical approach to blepharoplasty which was my favorite; it summarizes Dr. Kontoes' extensive knowledge and experience in the field.

Congratulations to Dr. Paraskevas Kontoes for this landmark contribution to aesthetic plastic surgery, a must-have to the novice and also to the experienced cosmetic surgeons that specialize in aesthetic and reconstructive surgery of the eyelids.

Salt Lake City, Utah, USA — Renato Saltz

Preface

It was a great pleasure and honor, to accept Springer's proposal to compose a book on blepharoplasty and the innovations I have added to the conventional technique over the last years of my aesthetic plastic surgery practice. After completing my plastic surgery training in the USA, Greece, Brazil, and the UK, I established my practice in Athens in 1994. Aesthetic surgery rapidly involved a significant proportion of my interests, and in 1996, a comprehensive set up of Laser technology was added to my practice aiming to offer my patients a wide spectrum of treatments in an effort to address the different manifestations of aging of the face and body.

During these first steps in the aesthetic practice, Lasers triggered my interest, and soon I started attending educational events worldwide, to enrich and update my knowledge in the field.

Laser blepharoplasty started gradually prevailing over the conventional technique and soon the benefits of it were obvious both to me, my clinic staff, and my patients.

By the years, several drawbacks in the use of Lasers in blepharoplasty became necessary; however, nowadays I am convinced that the implementation of this technology in blepharoplasty is unparalled and its use in certain surgical steps of the technique is precious both for better final outcome and for diminishing complication rates.

The increasing interest of the plastic surgeons whom I was coming in contact with, by presenting the technique around the globe, being invited to numerous educational events, together with my observations on the rate and kind of the complications that can occur following blepharoplasty techniques on aesthetic surgery patients, were the main reasons which encouraged me to immerse in the periorbital rejuvenation approaches in an effort to better understand and share with my colleagues the different modalities that could help in upgrading and increasing the postoperative satisfaction rate both for surgeons and patients, after blepharoplasty operations.

The capping stone of these efforts was the collection of this experience and the concentration on all these steps that should be undertaken during blepharoplasty aesthetic surgery in order to achieve the best results possible and avoid complications. Sharing these issues with my colleagues worldwide, I thought that accepting Springer's proposal for composing this compendium *State of the Art in Blepharoplasty: From Surgery to the Avoidance of Complications* would offer an

easier way for all those interested in this operation, to reach the ultimate performance during their practice in aesthetic periorbital surgery.

I hope I meet the expectations of the readers by this writing, help in clarifying their uncertainties, and show them tips and tricks on how to reach the perfect result possible for their patients.

I wish to cordially thank all my respected teachers who led my steps during this unparalleled trip in the dream of aesthetic surgery and all those colleagues who till now contribute to the endless process of my knowledge enrichment with their inputs to our specialty. Moreover, I also wish to express my gratitude to my family and friends who encouraged and supported me in carrying out this writing. Because as Isaac Newton said: "***If I have seen further than others, it is by standing upon the shoulders of giants***."

Athens, Greece Paraskevas Kontoes, M.D., Ph.D.

Contents

Anatomy of the Periorbital Region

1

1.1 The Bony Structure of the Orbit

The *orbit* is the cavity or socket of the skull in which the eye and its appendages are situated. "Orbit" can refer to the bony socket [1], or it can also be used to imply the contents [2].

The bony margins of the orbital canal in humans do not derive from a single bone, but a mosaic of seven embryologically distinct structures: the zygomatic bone laterally, the sphenoid bone, with its lesser wing forming the optic canal and its greater wing forming the lateral posterior portion of the bony orbital process, the maxillary bone inferiorly and medially, which, along with the lacrimal and ethmoid bones, forms the medial wall of the orbital canal.

The roof (superior wall) is formed primarily by the orbital plate frontal bone and also the lesser wing of sphenoid near the apex of the orbit. The orbital surface presents medially by trochlear fovea and laterally by lacrimal fossa.

The floor (inferior wall) is formed by the orbital surface of maxilla, the orbital surface of zygomatic bone, and the minute orbital process of palatine bone. Medially, near the orbital margin, is located the groove for nasolacrimal duct. Near the middle of the floor is located the infraorbital groove which leads to the infraorbital foramen. The floor is separated from the lateral wall by inferior orbital fissure, which connects the orbit to pterygopalatine and infratemporal fossa.

The medial wall is formed primarily by the orbital plate of ethmoid, as well as contributions from the frontal process of maxilla, the lacrimal bone, and a small part of the body of the sphenoid. It is the thinnest wall of the orbit, evidenced by pneumatized ethmoidal cells.

The lateral wall is formed by the frontal process of zygomatic and more posteriorly by the orbital plate of the greater wing of sphenoid. The bones meet at the zygomaticosphenoid suture.

The base, which opens in the face, has four borders. The following bones take part in their formation (Fig.1.1):

P. Kontoes, *State of the art in Blepharoplasty*,
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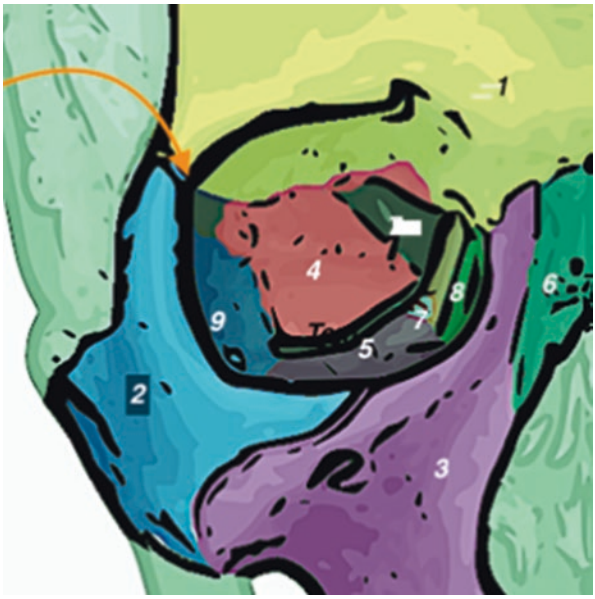

Fig. 1.1 *1* Frontal bone, *2* Zygomatic bone, *3* Maxilla, *4* Sphenoid bone, *5* Ethmoid bone, *6* Nasal bone (not part of orbit), *7* Palatine bone, *8* Lacrimal bone

1. Superior margin: frontal bone and sphenoid
2. Inferior margin: maxilla, palatine, and zygomatic
3. Medial margin: ethmoid, lacrimal bone, and maxillary bone
4. Lateral margin: zygomatic and sphenoid

Tip

The upper lateral part of the orbital rim consisted from the zygomatic bone is involved in the several canthopexy techniques as the point of the periosteal suture suspension, for the support of the lower eyelid (*see arrow in* Fig. 1.1)

1.2 The Muscular Extraocular and Palpebral Anatomy

1.2.1 The Extraocular Muscles

The *extraocular muscles* are the six muscles that control movement of the eye and one muscle that controls eyelid elevation (levator palpebrae) (Table 1.1) . The extraocular muscles are supplied mainly by the branches of the ophthalmic artery. In the table below, the innervation, insertion, and action in neutral position of each extraocular muscle are described [3].

Table 1.1 Extra ocular muscles

Muscle	Innervation	Insertion	Neutral position
Superior rectus	Oculomotor nerve (superior branch)	Eye (anterior, superior surface)	*Elevation* Incyclotorsion Adduction
Inferior rectus	Oculomotor nerve (inferior branch)	Eye (anterior, inferior surface)	*Depression* Extorsion Adduction
Lateral rectus	Abducens nerve	Eye (anterior, lateral surface)	*Abduction*
Medial rectus	Oculomotor nerve (inferior branch)	Eye (anterior, medial surface)	*Adduction*
Superior oblique	Trochlear nerve	Eye (posterior, superior, lateral surface)	*Intorsion* Depression Abduction
Inferior oblique	Oculomotor nerve (inferior branch)	Eye (posterior, inferior, lateral surface)	*Extorsion* Elevation Abduction
Levator palpebrae superioris	Oculomotor nerve	Tarsal plate of upper eyelid	Retracts and elevates eyelid

Tip

In upper blepharoplasty procedures, attention should be focused in avoiding damage of the levator muscle aponeurosis, which anatomically is located partially behind the septum and the retroseptal fat and partially under the superior part of the pretarsal portion of the orbicularis oculi muscle. Damage to this muscle, or its innervation, can cause ptosis, the drooping of the eyelid.

In lower transconjunctival blepharoplasty, attention has to be focused in the posterior lamella at the inferior border of the capsulopalpebral fascia and the retractor system, in an effort to avoid damage of the inferior oblique muscle and scarring formation of the tissues.

1.2.2 The Orbicularis Oculi Muscle (OOM)

The orbicularis oculi muscle lies directly underneath the surface of the skin, around the eyes. Its function is to close the eyelid and to help in the passing and draining of tears through the punctum, canaliculi, and lacrimal sac, all parts of the tear drainage system.

The orbicularis oculi muscle is composed of *three parts: the orbital portion, the palpebral portion, and the lacrimal portion* (Fig. 1.2). The orbital portion overlies the orbital rim, closes the eyelids firmly, and is controlled by voluntary action. The palpebral portion overlies the eyelids, closes the eyelids gently in involuntary or reflex blinking. The palpebral portion is divided into three parts: the pretarsal portion, the preseptal portion, and the ciliary portion. The lacrimal portion compresses the lacrimal sac, which receives tears from the lacrimal ducts and conveys them into the nasolacrimal duct.

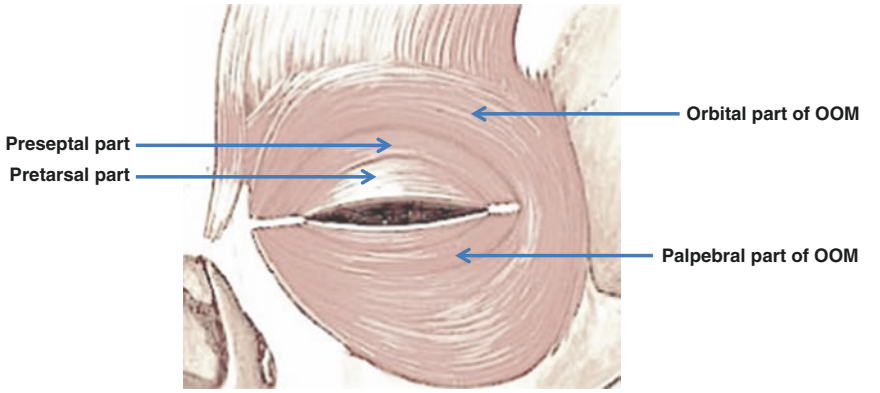

Fig. 1.2 Orbital and palpebral parts of orbicularis oculi muscle. Palpebral part is subdivided into preseptal and pretarsal parts

The OOM is innervated by the temporal and zygomatic branches of the facial nerve (cranial nerve VII). Its blood supply comes from the branches of the ophthalmic artery

Tip
*The OOM is greatly involved in the blepharoplasty procedures. Its firm attachment with the overlying eyelid skin reflects any procedure undertaken on the muscle (*i.e. *contraction, dissection, etc.) to the skin, and thus to the texture and aesthetic improvement of the periorbital region.*

1.3 The Vascular Palpebral Anatomy

Branches of the internal and external carotid arteries supply the eyelids. The ophthalmic artery branches off the internal carotid artery and supplies different parts of the eyelid. At the inner part of the upper eyelid, the ophthalmic artery splits into two and traverses outward to supply both the upper and the lower eyelids. The branch that supplies the lower eyelid is in fact a branch that arises from the superior marginal vessel (that supplies the upper eyelid). *The superior and inferior marginal vessels that arise from the ophthalmic artery together form the marginal arcade.* This arcade is prone to injury and bleeding during blepharoplasty.

The marginal arcade arteries are located at the front of the tarsus, 4 mm from the upper eyelid and 2 mm from the lower eyelid margin each. The superior marginal arcade gives rise to a peripheral arcade that runs in front of the Muller muscle, giving it a superficial plane and making it prone to injury during eyelid surgery.

Another branch of the internal carotid artery is the lacrimal artery that passes through the orbital septum along each eyelid and ultimately joins the marginal arcade.

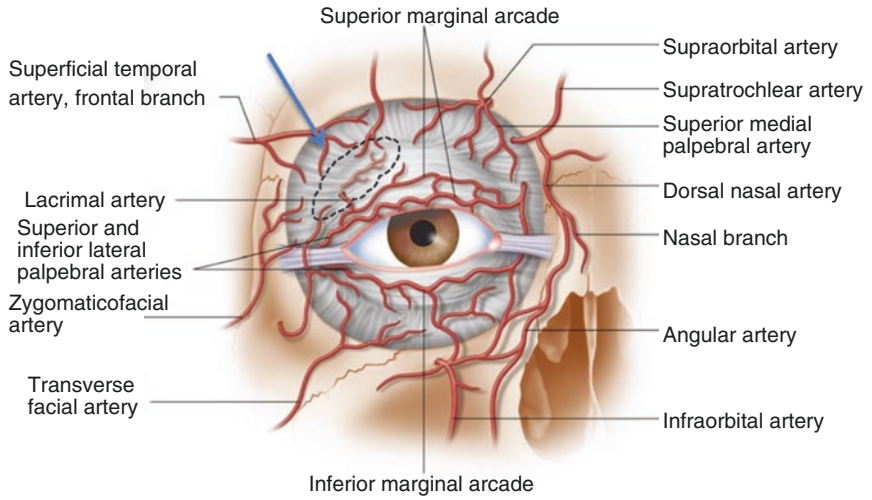

Fig. 1.3 The blood supply of the eyelids (Adapted from: *Master Techniques in Blepharoplasty and Periorbital Rejuvenation, Surgical Anatomy of the Forehead, Eyelids, and Midface for the Aesthetic Surgeon*. Authors: Kevin S. Tan, Sang-Rog Oh, Ayelet Priel, Bobby S. Korn, Don O. Kikkawa, with permission from Springer)

While the above described the branches of the internal carotid artery, the external carotid artery supplies the eyelids as branches of the facial artery, infraorbital artery, and the superficial temporal artery. Each of these pride branches that anastomose with other arteries on the face. For example, the branch of the superficial temporal artery that supplies the eyelids joins with the zygomatic branch and transverse facial branch.

Tip

The frontal branch of the superficial temporal artery and its sub-branches are the most prone to bleed during upper blepharoplasty dissection, and especially when the submuscular tunneling is performed for the single-suture traction technique via the upper blepharoplasty incision (*see arrow in* Fig.1.3) *More details in the relevant chapter*

1.4 The Innervation of the Eyelids

The eyelids obtain motor and sensory innervation.

The motor innervation is achieved by the facial nerve, the oculomotor nerve, and several sympathetic nerve fibers.

The facial nerve provides innervation to the obicularis oculi, frontalis, procerus, and corrugator supercilii muscles. The temporal and zygomatic branches of the facial nerve supply the obicularis oculi muscle. The facial nerve also supplies the corrugator supercilii and the procerus.

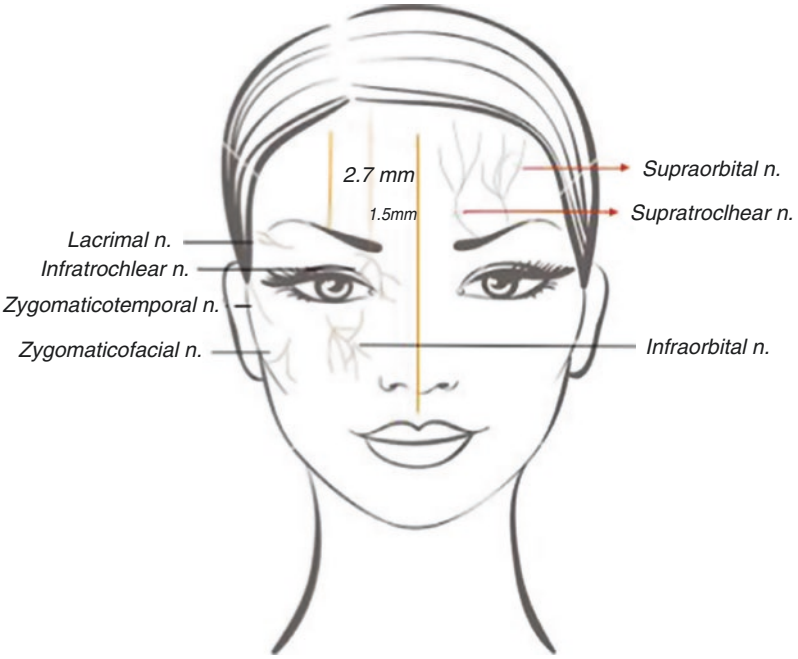

Fig. 1.4 Sensory nerves of the eyelids. Lines and distances in mm show the location and excursion of supraorbital and supratrochlear nerves. This helps in avoiding injury during surgery in this region

The oculomotor nerve with the superior branch innervates the main upper eyelid retractor and the levator palpebrae superioris. Sympathetic fibers contribute to upper eyelid retraction by innervation of the superior tarsal muscle (Müller's muscle). Sympathetic fibers innervate the inferior tarsal muscle, contributing to lower lid retraction.

The trigeminal nerve supplies somatosensory innervation to the eyelid via its ophthalmic (V1) and maxillary (V2) branches. Terminal branches of the ophthalmic division supply the upper eyelid as the lacrimal, supraorbital, and supratrochlear nerves (lateral to medial), and the medial aspect of both upper and lower lids as the infratrochlear nerve. Terminal branches of the maxillary division supply the lower eyelid as the zygomaticofacial and infraorbital nerves. The zygomatic facial nerve supplies the lateral lower lid, and the infraorbital nerve supplies the lower eyelid (Fig. 1.4).

1.5 The "Aging" and "Aesthetic" Palpebral Anatomy

Aging is a dynamic process, starting right after birth and systematically affects all functions and anatomical structures of the human body.

The same happens with the orbit and the structures which compose it such as bony skeleton, muscles, fat, skin, etc.

1.5.1 How Does the Orbit Age?

According to Bryan Mendelson and Chin-Ho Wong [4], the orbital aperture increases with age, in both area and width. Resorption is, however, uneven and site-specific. The superomedial and inferolateral aspects of the orbital rim, in particular, recede more, although the changes occur at different rates. The inferolateral orbital rim changes manifest earlier, by middle age, whereas in the superomedial quadrant, recession may be noted only in old age. The inferomedial quadrant of the orbit also has a tendency to recede in old age, especially in males. In contrast, the central part of the superior and inferior orbital rims is more stable, with little if any resorption occurring with age (Figs. 1.5 and 1.6).

The resorption of the facial skeleton results into the periosteum retrusion, altering the position of the outer surfaces of the bones. Accordingly, the location of the attachments of facial ligaments and muscles through the periosteum also moves. As a result, these structures may lose the mechanical advantage of their effect on the tissues they act upon.

The areas most affected by reduced skeletal prominence correspond to those areas of the face that manifest the most prominent symptoms of aging. In the medial aspect of the upper lid, the brow position is noted to ascend paradoxically with aging, exaggerating the drooped look of the lateral brow. The medial orbital fat pad also becomes more prominent with age, possibly associated with the recession of the superomedial orbital rim. The midcheek manifests the most complex soft tissue changes with aging. The development of the tear-trough deformity, malar mounds, and prominent nasolabial fold and groove may to a significant degree be attributed to the loss of projection of the maxilla with aging (Fig. 1.7).

These changes are easily noticed on an aging face as in Figs.1.8, 1.9 and 1.10

In the youthful face, malar fat overlies the malar prominence, providing a triangular shaped appearance to the midface, with the point of the triangle at the chin.

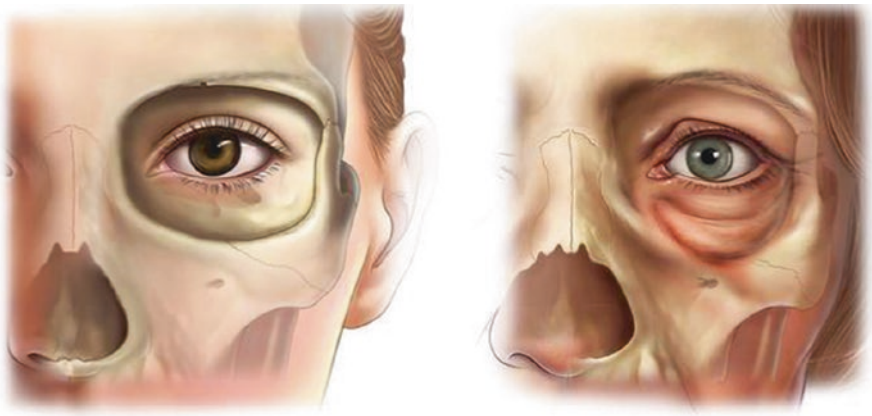

Fig. 1.5 The superomedial and inferolateral aspects of the orbit have the greatest tendency to resorb. This contributes to the stigmata of periorbital aging such as increased prominence of the medial fat pad, elevation of the medial brow, and lengthening of the lid cheek junction (Adapted from: Bryan Mendelson and Chin-Ho Wong [4], with permission from Springer)

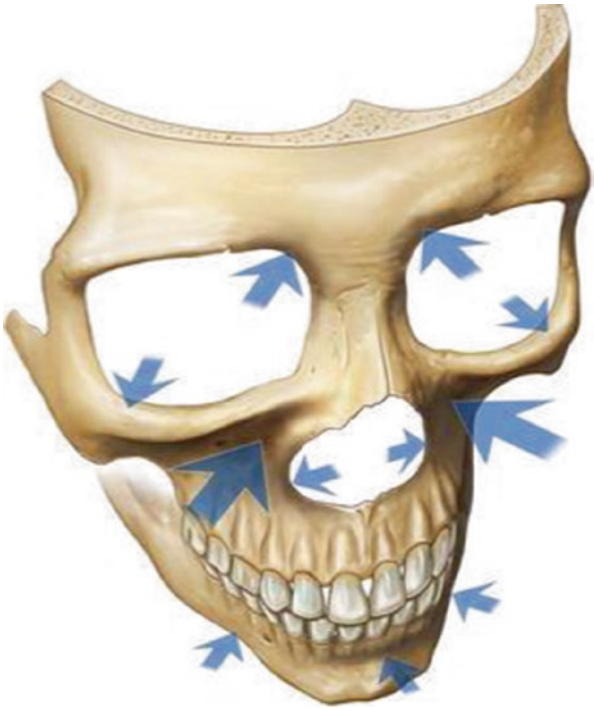

Fig. 1.6 *Arrows* indicate the areas of the facial skeleton susceptible to resorption with aging. The size of the arrow correlates with the amount of resorption (Adapted from: Bryan Mendelson, Chin-Ho Wong [4], with permission from Springer)

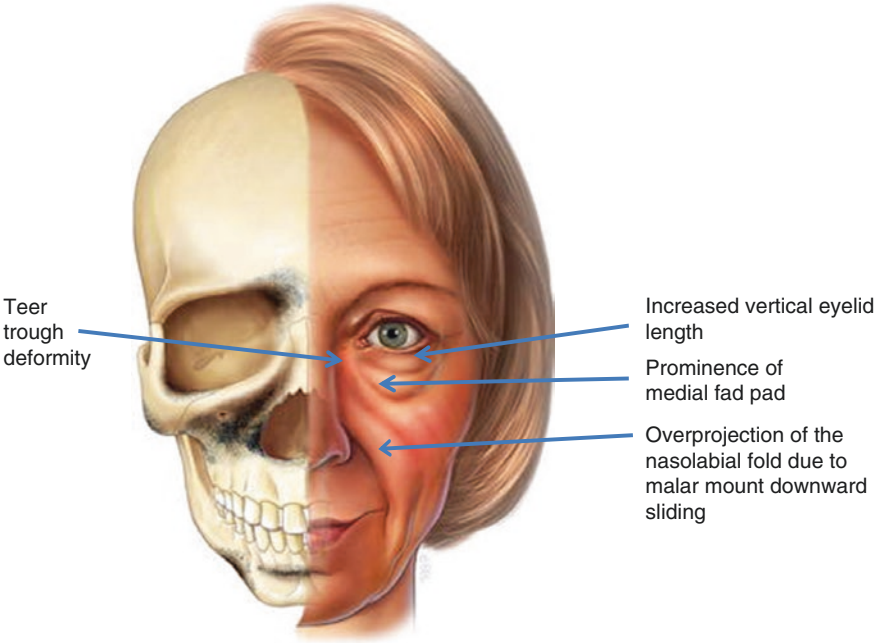

Fig. 1.7 The *darker areas on the left side of the figure* are those of the greatest bone loss. The stigmata of aging, manifested by the facial soft tissues, corresponds with the areas of weakened skeletal support (Modified from: Bryan Mendelson and Chin-Ho Wong [4], with permission from Springer)

Fig. 1.8 *Black line* Sliding of the malar fat pad and prominence of the nasolabial fold; *blue line* increased vertical eyelid crease; *red line* prominence of medial fat pad; *yellow line* jowl formation

With age, the malar fat pad slides downward, emptying the inferior orbital rim, contributing to the formation and overprojection of the nasolabial fold. The length of the vertical eyelid crease increases. Ptosis is also evident in the brow and the lower face with the formation of the jowl.

Therefore, the aging process of the orbit affects all the anatomical surrounding tissues involved, such as bony skeleton with its gradual resorption, malar fat pad sliding, and atrophy, creating hollowing and prominence of folds and muscle laxity resulting in fat pad protrusion and skin texture deterioration with wrinkling, folding, atrophy, and aesthetic disorders.

Tip

Modern blepharoplasty imposes that all of the above features of aging must be considered prior to the operation. Blepharoplasty nowadays is not strictly a reduction technique but should incorporate restoring of deflated tissues, atrophied fat and muscle laxity with different approaches and devices.

Fig. 1.9 *Black line* double convexity of youth and triple convexity of age; *orange line* malar fat pad of youth supporting zygomatic region and slided malar pad of age overprojecting nasolabial fold and creating the triple convexity; *blue line* inconspicuous nasolabial fold of youth and prominent NLF of age; *yellow line* absence of jowl in youth and jowl formation of age

Fig. 1.10 Short vertical eyelid crease of youth (18 years) and increased vertical eyelid of age (45 years)

1.5.2 Lines, Grooves and Folds of the Periorbital Region Induced by Aging

All the above aging procedures, with the associated effects on the tissues which surround the orbit , create wrinkling and grooving of the periorbital region, which, indeed, is the main complaint of the patients regarding their appearance.

These dynamic lines and grooves are a result of the anatomical changes of the bones, fat, and muscles, and are mainly created due to the gravity symptoms and bone resorption which affect the aged tissues of the orbit.

Definitions of these lines and grooves vary in literature; however, the point is to differentiate each one of them and clinically diagnose what they exactly represent and how treatment modalities can be addressed.

The lines and grooves created in the periorbital region mainly are the following (Fig. 1.12):

1. *Palpebral line:* This is the line across the palpebral fissure connecting the lateral and medial canthus of the eylelid. It is present in youth as an anatomical element, but changes with aging due to the progressive laxity of the lower eyelid.
2. *Tear trough (nasojugal fold):* The nasojugal fold was defined initially by Duke-Elder and Wybar in 1961 as "running downwards and outwards from the inner canthus, the junction of the loose tissue of the lower lid with the denser structure of the cheek, marking the line along which the fascia is anchored to the periosteum between the muscles of the lid (orbicularis oculi) and those of the upper lip." [5] Flowers subsequently renamed this sulcus the "tear trough deformity" in 1969, given the observation that tears will track along this groove [6].
   In everyday practice and in simpler wording, the tear trough or nasojugal fold is the depression of the medial lower eyelid just lateral to the anterior lacrimal crest and limited in its inferior aspect by the inferior orbital rim. Important role in the formation of the tear trough is played by the orbicularis-retaining ligament which arises from the inferior orbital rim and ends at the junction of the palpebral and orbital portions of the orbicularis oculi muscle.
   - It is a bilaminar membrane separating the preseptal and prezygomatic spaces. It suspends the superficial and deep fat pads in the infraorbital area. Central laxity of the orbicularis-retaining ligament allows the lower eyelid fat to descend into the upper cheek, creating the "V" deformity at the lid–cheek junction [7, 8] (Figs. 1.11 and 1.12).
3. *Palpebromalar groove:* This groove is the extension of the tear trough depression laterally. Many authors use this groove as the landmark of the "lid–cheek" junction, despite the fact that Val Lambros has pointed out that the eyelid skin is different from the cheek skin and that the position of the skin in this zone is relatively stable as we age; however, most authors have continued to use the visible groove originally described by Loeb to delineate the location where the lid meets the cheek. The causes are similar with those of the tear trough formation, although there is no orbicularis insertion and no tear trough ligament (Fig. 1.12).

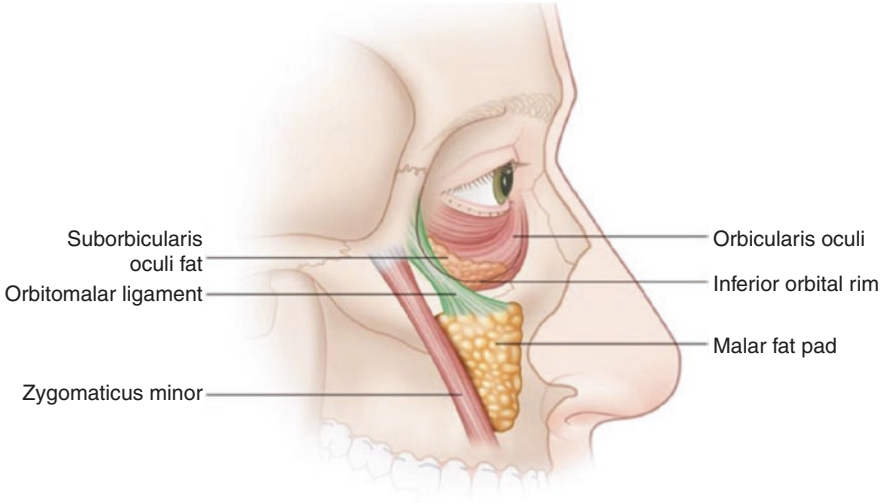

Fig. 1.11 Anatomical considerations of SOOF, orbitomalar ligament, malar fat pad, and OOM (Adapted from: *Master Techniques in Blepharoplasty and Periorbital Rejuvenation, Surgical Anatomy of the Forehead, Eyelids, and Midface for the Aesthetic Surgeon*. Authors: Kevin S. Tan, Sang-Rog Oh, Ayelet Priel, Bobby S. Korn, Don O. Kikkawa, with permission from Springer)

Fig. 1.12 *White line* palpebral line, *red line* tear trough or nasojugal fold; *blue line* palpebromalar groove; *yellow line* mediojugal fold. Observe the connection of the palpebromalar and mediojugal folds to form a "Y" shape, the tail of which forms the tear trough

4. *Mediojugal fold (midcheek groove)* The mediojugal fold is an oblique line extending toward the bottom and outside of the downward and inward sliding vector linked to the laxity of the tissue.
   The internal portions of the palpebromalar and the mediojugal folds connect into an angle forming a "Y" shape creating the tear trough (Fig. 1.12).
   Finally, differential diagnosis, among the most prominent and annoying for the patient, aging manifestations of the periorbital region, such as festoons, tear trough and "fat bags" is of utmost importance for the plastic surgeon, in order different treatment modalities to be addressed for the correction of them. It is quite frequent that these three entities are confused and this misleads the surgeon in taking the correct decision for treatment. Festoons and lower eyelid "fat bags" are more prone to confusion due to their anatomic neigbouring. The three main differences between festoons and lower eyelid fat bags are focused on the etiology, location and consistence of these manifestations (Table 1.2, Fig. 1.13).

Table 1.2 Differences between festoons and "fat-bags"

Festoons	Eyelid fat bags
Etiology: a result of sun-damaged skin on the lower eyelid and on the cheek affected by underlying contrasting muscle forces by aging	*Etiology:* age-related fat protruding through the skin in the lower eyelid region, or genetic predisposition in younger age
Location: primarily cheek region and /or partially eyelid	*Location:* Strictly lower eyelid region
Consistence: soft, movable	*Consistence:* Firmer, less movable, more prominent in upwards looking

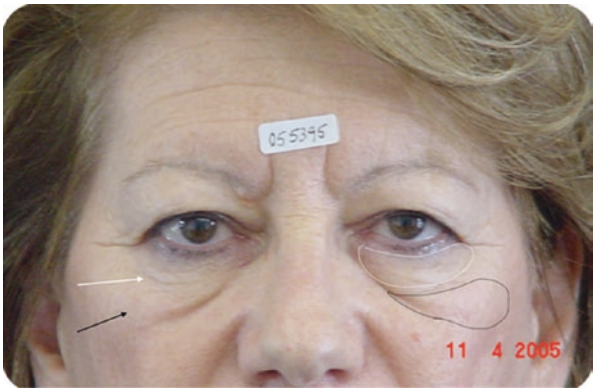

Fig. 1.13 *Black line* indicates the location of the festoon (primarily cheek region and/or partially lower eyelid) and *white line* the location of the "fat bags" (strictly lower eyelid region). *Black* and *white arrows* show the location on the opposite half of the patient's face. Festoons are a result of sun-damaged skin on the lower eyelid and on the cheek, affected by underlying contrasting muscle forces by aging, while fat bags derive fromage-related fat protruding through the skin in the lower eyelid region, or genetic predisposition in younger age. The festoons are soft and movable in consistency in the contrary with fat bags which are firmer, less movable, and more prominent in upwards looking

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History of Techniques

2

2.1 The Classic Blepharoplasty

Blepharoplasty is one of the most commonly performed procedures in aesthetic plastic surgery. The term comes from the Greek words "blepharo" (eyelid) and "plasso" (to form).

Various techniques and approaches have been advocated through the years, and the literature is replete with published reports. These approaches include variances in skin incisions (cold steel, laser, radiofrequency), the transconjunctival approach, fat excision, fat transposition, lacrimal gland suspension, canthopexy, skin flaps, skin–muscle flaps, additional chemical peels, and laser skin resurfacing. No operation or standard combination of operations meets the needs of every patient. Equipment costs and marketing methods, unfortunately, also play a role in the decisions of surgeons and patients.

Traditional blepharoplasty has often involved the excision of lax skin and muscle, and in the past excessive removal of fat, leaving patients with hollow orbits and an appearance that accelerates the aging process. Modern methods of periorbital rejuvenation are more conservative, involving limited resection of the affected soft tissue from the eye to restore a youthful appearance.

The basic surgical steps in traditional blepharoplasty consist of redundant skin excision of the upper and lower eyelids, excision of orbicularis oculi muscle excess, retroseptal fat excision, and several canthopexy and canthoplasty techniques depending on the patients' indications.

2.1.1 Quick Literature Review and the Recent Trends in Classic Blepharoplasty

Blepharoplasty was originally described by Karl Ferdinand Von Grafe in 1818 to describe a case of eyelid reconstruction he performed in 1809.

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In 1913, *American Encyclopedia of Ophthalmology* defined blepharoplasty as the reformation, replacement, readjustment, or transplantation of eyelid tissues. The surgeons have recognized cosmetic indications only since twentieth century. This change followed the development of improved operative techniques, better surgical results, and control of sepsis.

In 1920, Suzanne Noel, a Parisian surgeon wrote a book on cosmetic eyelid surgery. She mentioned the importance of preoperative planning using photographs. In 1924, Julian Bourguet was the first to describe the transconjunctival approach for the removal of the restroseptal fat. In 1929, he described the removal of fat from the two separate compartments of the upper eyelid. In the 1950s, Castanares described the detailed anatomy of the eyelids and pointed out the importance of orbicularis resection in blepharoplasty and its contribution to better aesthetic results [1].

In the past, surgeons were very aggressive with eyelid tissues resection, a fact that contributed to unpleasant results in patients who were followed up after years. The creation of hollow eyes and "amputated eyelids" was very common.

The recent trend in blepharoplasty is the maintenance of "fullness" of the eyelids with concomitant correction of the "heaviness," which is actually the main concern of the majority of patients. This can be achieved by detailed preoperative clinical examination, conservative tissue dissection and excision, always in discussion with the patients, and explanation of the aesthetic anatomy and expectations.

2.2 Innovations of the Blepharoplasty Technique

Despite the enormous evolution of techniques in aesthetic surgery in the last two decades, the blepharoplasty techniques which are described in the past have not changed excessively, at least regarding the basic steps of the classic operation, as described earlier. The widely accepted fact of the conservative excision of eyelid structures (skin, muscle, fat) is the most important development of the technique in the recent years, together with the evolution of the technology devices that have importantly invaded the field of aesthetic blepharoplasty. The laser technology and other devices (radiofrequency, etc.), if wisely used, contribute to less tissue damage and offer quicker postoperative downtime and minimization of complications.

2.2.1 Removing or Restoring Periorbital Tissues?

The main controversy of this issue is the eyelid fat, while segments of the eyelid skin and the orbicularis oculi muscle can conservatively or more aggressively removed, depending on the patient's indications.

The decision of fat removal or fat repositioning is based on what the eyelids look like. If there is a large volume of fat, it may be completely excised or

partially excised with repositioning or not. In cases where there is mild-to-moderate extra fat with a hollowing beneath it, moving the fat to the hollowed area is appropriate. In general, my opinion is that we should not insist in belonging strictly to the group of the "fat preservers" or the "fat excisors." Each patient has different indications, and the appropriate decision should be taken prior to surgery. In Fig. 2.1, a patient with extremely protruding fat compartments of the lower eyelid is shown. Preserving the whole amount of fat in this patient by septorrhaphy and tightening of the orbicularis muscle could result in compression of the eye-globe or other complications. On the contrary, conservative excision of fat and fat repositioning, in combination, or each of them separately, could offer a very good result to the patient.

Fig. 2.1 Excessive lower eyelid fat protrusion. Conservative removal of fat and/or fat repositioning is indicated, instead of complete fat preservation

Tip

My advice regarding the fat compartment surgery in blepharoplasty is that not every patient has to be treated in the same manner.

Basically, the fat of the upper and lower eyelids can be removed conservatively, or reduced thermally (laser evaporation, radiofrequency, electrocautery), or repositioned, or even completely preserved. This is decided in accordance with indications of each patient.

Always treat carefully the upper medial fat compartment of the upper eyelid and the lateral eyelid compartment of the lower eyelid, as this is the most common postoperative complaint of patients who return with fat protrusion at these points, after surgery. The anatomy and tissue structure at these regions make surgeons very precautious, frequently resulting in inadequate fat excision (see related Sects. 4.3.3 and 4.4.2*,* Chaps. 6 and 7 *for details).*

2.3 Introduction of Lasers in Blepharoplasty

Laser-assisted blepharoplasty was first performed by Baker in 1980 [2]. His conclusions were that this is a very promising technique. Since then several drawbacks took place regarding the full use of lasers in blepharoplasty.

The most common laser device used for blepharoplasty is the CO_2 laser, providing bloodless surgery and contractive properties. However, the heat conduction induced by the emission of the laser beam is an issue that has to be seriously considered. The three most important properties of the laser are concentrated in the possibility of using it as a cutting tool, a cautery, and a blunt dissection device at the same time.

We started using laser for blepharoplasty back in 1997 [3]. The laser at that time was used also for resurfacing of the periorbital skin in its ablating mode. The use of the carbon dioxide laser has offered some unique advantages with the procedure: relatively bloodless surgical fields, reduced ecchymosis, contractive properties to tissues, and skin resurfacing. However, regarding skin resurfacing, it comes together with prolonged erythema, possible pigmentary changes, synechiae, and rarely scarring when used for skin incisions in not appropriate manner, something very frustrating for the patient. Among the dark skin types, the incidence of such side effects can be higher. Patients were very stressed with the prolonged pigmentary changes, and despite the fact that most frequently they resolve spontaneously, further treatments with other devices were incorporated to accelerate the procedure [4] (Fig. 2.2).

The carbon dioxide laser, however, is an excellent tool for other surgical steps during blepharoplasty.

Despite the above findings, after years of experience performing periorbital surgery with several other incisional devices including cold steel, radiofrequency, Ellman's cautery, I still prefer the CO_2 laser when performing certain surgical procedures, especially for the upper eyelids and lower eyelid transconjunctival blepharoplasty [3, 4].

I have abandoned skin incisions with laser, and this will be presented more in detail in Chaps. 4, 6, and 7.

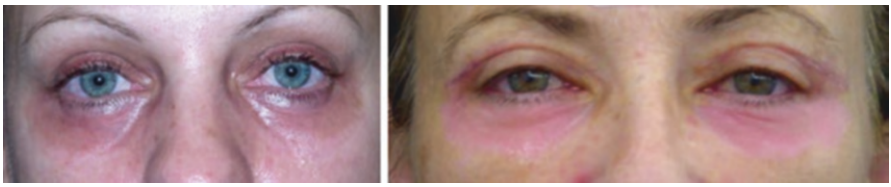

Fig. 2.2 Postinflammatory hyperpigmentation (*L*) and erythema (*R*), following laser skin resurfacing. Although they can resolve spontaneously, they are very stressful to the patient and prolong the postop downtime

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Past and Present in Laser-Assisted Blepharoplasty

3

Observations on patients' recovery after application of CO_2 laser in blepharoplasty made us conduct a study, and an evaluation scale for the scar was created (Table 3.1).

A questionnaire was given to two groups of blepharoplasty patients that underwent incision by scalpel and laser (80 patients of similar skin type in each group). The results are shown in Table 3.2.

The vast majority of the patients who had undergone a conventional incision evaluated the result of the scar as excellent or good, and scar revision was performed in only one case. On the contrary, only half of the patients with laser skin incisions were satisfied with the outcome of their scar. The main concern of this group was dehiscence and/or hyperpigmentation of the scar. More than 20% required scar revision, which was performed for the vast majority at the lateral edge of the incision and lateral to the lateral canthus skin. This occurred because the approximated edges of the incision had a coagulated zone of tissue due to the charring effect of the laser beam with its concomitant effects on tissue viability attributable to the heat conduction induced by the laser. Of course, this fact could be attributed to laser parameters and specific laser technology; however, several different protocols used gave us the same impression.

Table 3.1 Scale for patient evaluation of upper eyelid scar quality

Excellent	Patient completely satisfied; does not notice scar
Good	Patient satisfied; notices scar or slight hyperpigmentation
Average	Patient concerned; makeup coverage necessary; revision not required
Poor	Patient dissatisfied; revision required

Table 3.2 Scar quality of upper eyelid incisions according to patients' subjective evaluation

	Excellent %	Good %	Average %	Poor/correction %
Conventional incision	60	35	3.75	1,25
Laser incision	22.5	28.75	27.5	21,25

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On the other hand, the location of corrections at the lateral part of the lateral canthus is due to the different thickness and quality of skin in that anatomical region, compared with the skin of the intraorbital part of the eyelid.

Following these observations, we discontinued the use of laser for skin incisions, and since 2002 have been performed only by blade.

3.1 Laser-Assisted Upper Blepharoplasty

The detailed technique will be presented in Chap. 4; however, some attention has to be focused on what was applied in the past and what is applied nowadays, regarding the use of laser in different surgical steps.

As previously described, the use of laser for skin incision was abandoned.

Despite the fact that it is an excellent tool for bloodless incisions, very fast, precise, and user-friendly in the operating theater, we should not avoid to point out that the heat conduction induced by laser during surgery plays a significant role in the healing process of the scar. The CO_2 laser produces a zone of irreversible thermal injury (coagulation zone) along the wound edge, an observation that has been correlated with the well-recognized delay in the rate of laser wound healing, postoperative wound dehiscence, and less satisfying scarring (Fig. 3.1).

Therefore, skin incisions should be performed by blade. However, once the initial incisions have been completed, the use of the laser to perform the remainder of the dissection is widely applied.

The dissection of the skin flap that in the past used to be performed easily, fast, and safely with laser has also been abandoned for the same reasons with those observed in skin incisions. The laser beam produces high temperatures during this maneuver, which affects mainly the edges of the skin incision, rather than the underlying tissues. In view of avoiding delayed healing and scarring, sharp instruments are used nowadays for the dissection of the skin flap, instead of laser (Fig. 3.2).

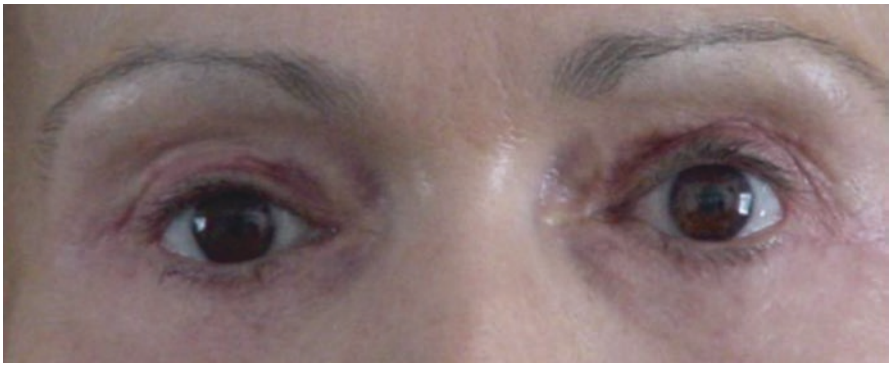

Fig. 3.1 Poor quality of scarring following laser incisions in upper blepharoplasty by other surgeon, more prominent in (*L*) upper eyelid. Patient underwent revision of scar with cold steel scar excision and resuturing

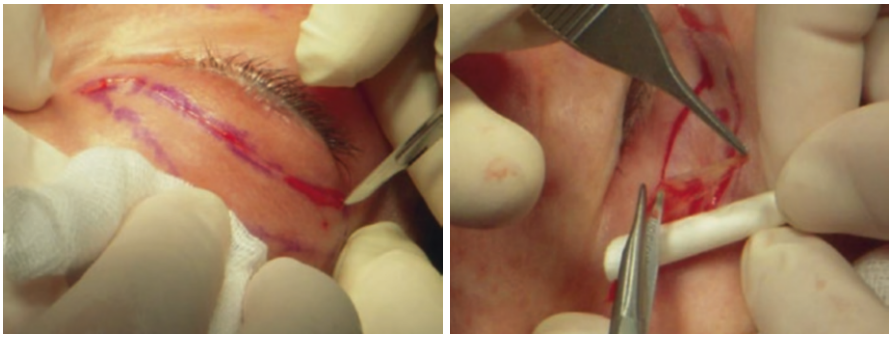

Fig. 3.2 Incision of upper eyelid skin with cold steel and dissection of skin flap with scissors

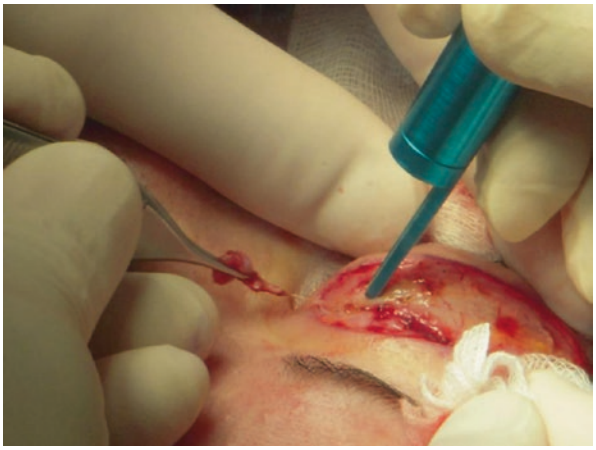

Fig. 3.3 Orbicularis oculi muscle (OOM) strip excision with laser in bloodless plane. Notice the underlying septum on which the skin and suture line create firm adhesion to define the eyelid crease postoperatively

In the past, a very important step of our blepharoplasty procedure was a strip excision of the preseptal part of the orbicularis oculi muscle along the vector of the skin incision of the upper eyelid, in order to create a better definition of the upper eyelid crease postoperatively. This was performed with laser in a bloodless and fast manner (Fig. 3.3). No suturing of the OOM was necessary. The newly formed eyelid crease, due to the adhesion of the skin suture line, with the underlying exposed septum following the excision of the muscle strip, was very well defined. The results were excellent, and the patients' satisfaction very high (Fig. 3.4).

In the last years, having adapted our philosophy of maximum tissue conservation during the periorbital region surgery, we have switched to OOM contraction with laser-defocused beam rather than excising the muscle strip, as in the past. This tightening effect of the laser beam on the muscle creates a controlled "scarring" and not only a dehydration due to water evaporation from the high temperature, and has

Fig. 3.4 Intraoperative view of the OOM after the strip excision and the excellent definition of the upper eyelid crease 6 years after surgery

Fig. 3.5 OOM contraction with a defocused laser beam results in excellent definition of the eyelid crease without any strip excision: intraoperative view

proved to be equally or highly effective, compared to the muscle strip excision. Long-lasting results have been observed, and the maneuver has become a standard step during upper blepharoplasty surgery (Fig. 3.5).

In summary, the two important amendments in the upper laser blepharoplasty technique comparing the past and the present procedure are as follows:

- The skin incision and the skin flap dissection are preferably now performed with the scalpel instead of laser.
- The OOM contraction is performed with a defocused laser beam instead of the excision of the muscle strip, which was applied in the past.

The remainder dissection and fat excision are still performed with laser in bloodless, precise, and safe manner.

3.2 Laser-Assisted Lower Blepharoplasty

My trend is to approach the lower lid via a transconjuctival incision and retroseptal dissection, which minimize the potential complications induced by the open technique, such as postoperative lower eyelid ectropion, scleral show, and frequently visual scar. Additionally, the rounded look of the eye in the lateral canthal region

Fig. 3.6 Transconjunctival incision with retroseptal dissection and direct access to the orbital fat

that sometimes occurs after a skin incision of the lower lid also is avoided. Furthermore, it is pleasing to the patient if only one incision (the upper eyelid incision) is present postoperatively (Fig. 3.6).

The problem with the skin laxity of the lower eyelid, which, according to several authors and a general unjustified belief, cannot be adequately addressed with a transconjunctival approach, has been completely revised by introducing two simple maneuvers:

(a) The contraction of the posterior wall of the OOM with a defocused laser beam via the transconjunctival incision.
(b) The single-suture traction technique (SSTT) involving the traction of the lower lateral retinaculum (limb) of the canthal ligament and its anchoring on the periosteum of the orbital rim, along a vector, depending on the patient's indications and needs.

These two procedures will be described in detail in Chap. 4.

The transconjunctival technique, via a retroseptal approach, has increased the patients' satisfaction and has excessively diminished the potential complications following lower blepharoplasty.

Therefore, the main and most important novelty between the past and present in lower blepharoplasty is the introduction of the transconjunctival approach and the use of laser for this procedure.

Moreover, the addition of the two previously mentioned maneuvers makes the transconjunctival approach more popular and efficient.

In the case that an open technique is required, like in patients with exaggerated skin laxity of the lower eyelid, or festoons and other severe aging manifestations, the laser plays again an active role in the procedure. Following conventional skin incision, the laser has proven an excellent tool for the remainder of tissue dissection, or for the contraction of the orbital septum, if removal of fat is not an indication. Septum

tightening with laser creates a very efficient and longer-than-expected contraction, which enhances the final outcome. If fat is to be removed in the lower open blepharoplasty, laser is again an excellent tool for bloodless and quick procedure.

3.3 Laser Skin Resurfacing of the Periorbital Region

As with the use of laser for skin incisions, laser skin resurfacing was initially applied extensively. Both the upper and lower eyelids were resurfaced with the carbon dioxide laser in many cases. The advantages of the technique became evident. Surface irregularities, fine wrinkles (especially those medial to the lateral canthus), and mild skin excess were treated. However, re-epithelialization requires 5–7 days, and post laser erythema lasts for many weeks.

Furthermore, postinflammatory hyperpigmentation can be very troublesome, and it usually lasts for months when it occurs.

Both prolonged erythema and hyperpigmentation generally resolve on their own. The use of nonablative light sources (intense pulsed light) can accelerate this procedure.[3] Mediterranean skin types usually are of type III or IV (according to the Fitzpatrick classification). Among such patients, pigmentary disorders after laser skin resurfacing occur more frequently. Although the results of the procedure are very satisfying to the patients, the downtime of a laser resurfacing procedure and the need for makeup application on a daily basis over a prolonged period become very stressful even for the most informed and cooperative patients (Fig. 3.7).

Blepharoplasty is not considered a major operation by many patients, and they expect an early return to their everyday activities. Laser-assisted blepharoplasty has importantly contributed to this issue.

Carbon dioxide laser skin resurfacing, however, despite its unique advantages, does not contribute to this perspective. In an attempt to avoid the long postoperative downtime for patients in whom a lower lid skin incision is not an indication, the SSTT has been added to the operation, since 2003.

This procedure applies a traction on the lower eyelid skin instead of the contraction that laser induces with all of the above sequelae, with results on skin redraping equal to the laser, but in addition, with no pigmentary changes and long downtime and, moreover, securing the lower eyelid from future laxity manifestations, ectropion, scleral show, etc.

Fig. 3.7 Patient with post laser resurfacing erythema (*L*). Use of local agents and avoidance of sun exposure completely resolved erythema 4 weeks post op (*R*). Nonablative light sources for the acceleration of the procedure were not used in this patient

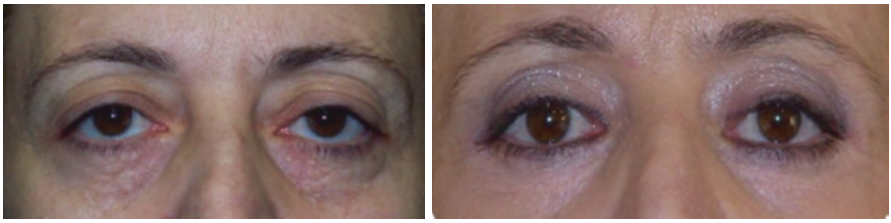

Fig. 3.8 Patient with excessive syringoma formation on both lower eyelids, treated with CO_2 laser skin resurfacing (*L*). Result of the treatment 3 months postoperatively (*R*). Notice the excellent outcome, despite the prolonged pigmentary changes of the skin, which occured and extended the downtime period. High patient satisfaction downgraded the prolonged healing period

The CO_2 laser skin resurfacing is also a contraindication in cases of active bacterial, viral, or fungal infections, oral isotretinoin use within the previous 6 months tendency for keloid or hypertrophic scar formation, despite the fact that in the eyelid region this possibility is almost zero, and finally in uncooperative patients with unrealistic expectations.

However, we should not avoid to mention that in some cases with specific problems in the lower or upper eyelids, the use of CO_2 laser skin resurfacing is the one and only safe, controlled, efficient, and reliable method of treatment (Fig. 3.8). In these cases, patients have to be informed prior to treatment on the possibility of post laser erythema, hyperpigmentation, and prolonged downtime.

In conclusion, laser skin resurfacing of the periorbital region which was applied in most of my patients in the past has been abandoned as a routine method, and is limited to specific indications where it is really very effective. The present routinely procedure applied instead, is the SSTT which offers equal and in most cases superior results, combined with the fact of absence of any pigmentary complications and prolonged downtime.

Step-by-Step Updated Blepharoplasty Technique

4

4.1 Where, When, and Why Laser

In the previous chapter, I have described enough evidence regarding the use, controversies, indications, contraindications, advantages, and disadvantages of the laser technology in blepharoplasty.

I summarize my personal views in the following lists to make the understanding of my perspective for this procedure easier. The aim is to show the unparalleled effect of the laser technology in specific steps of the operation compared to the conventional technique, and also to justify the unique efficiency of the technology which cannot be achieved with other conventional instrumentation or technology in terms of controlled thermal effect, low complication rates, patients' and surgeon's satisfaction.

4.1.1 Where Laser

In upper blepharoplasty

- *In the OOM contraction for improved upper eyelid crease postop*
- *Bloodless dissection of tissues specially in fat excision*

In lower blepharoplasty

- *Bloodless, precise, and safe transconjunctival incision*
- *Bloodless dissection and fat excision*
- *Contraction of posterior wall of OOM for overlying eyelid skin texture enhancement*

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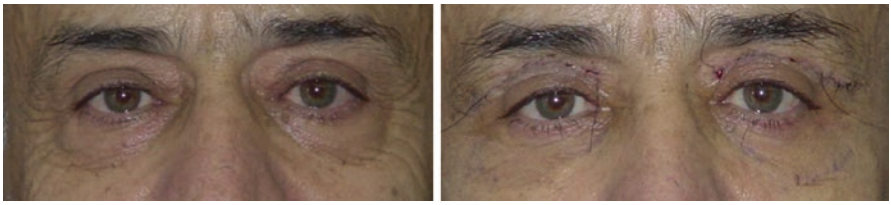

Fig. 4.1 (*L*) Patient before surgery for upper and lower blepharoplasty. (*R*) Patient 5 days after surgery with a transconjunctival lower blepharoplasty approach. Skin laxity of upper and lower eyelids dramatically corrected. Fat protrusion of lower eyelids treated with minimal fat excision. OOM contracted in defocused laser beam in upper and lower eyelids. Observe the sutures of the upper eyelids still in place. Suture removal takes place in 5 days postop. As shown, patient admitted with no ecchymosis, obvious edema, or other postoperative signs on the fifth postop day

4.1.2 When Laser

In upper and lower blepharoplasty

- *When the surgeon is experienced, familiar, and understands the laser tissue interactions for safe and efficient surgery*
- *When the conventional procedure with scalpel is not the indication; multiple skin lesions, patients in anticoagulant therapies, or ablative properties are indicated* (Fig. 3.8)
- *Because it is proved to be the most suitable technology when a transconjunctival approach is the indication*

4.1.3 Why Laser

In upper and lower blepharoplasty

- *Because the bloodless surgical plane minimizes ecchymosis, edema, and reduces downtime to minimum* (Fig. 4.1)
- *Because the contractive properties on selected tissues, with minimal heat conduction and tissue damage, offer excellent final outcome*

4.2 Conventional and Laser Blepharoplasty: Comparison of Techniques

In the previous modules, several referrals to the advantages and disadvantages of the conventional and the laser-assisted technique have been advocated. All these views and opinions are a conclusion of the experience and personal observations of the surgeons who had the opportunity to apply both techniques in patients.

There is no doubt that the laser-assisted technique offers plenty of advantages compared to the conventional one as previously stated.

A lot of controversies have been raised, however, to justify whether one or the other is better for the patient in terms of reduced downtime period.

Biesman and colleagues [1] have performed the only prospective, multicenter, double-blind study to evaluate this issue. Surgeons who were experienced in both

laser-assisted and traditional techniques performed blepharoplasty procedures on patients using laser on one side and scalpel on the other. The side treated with laser was randomly selected and the patients were blinded to the surgeon's choice. Patients were clinically examined 1, 2, and 4 weeks postoperatively. Assessment of results was performed by a questionnaire given to patients and by evaluation of photographs by an experienced, masked observer. Two weeks after surgery, there was no significant difference in the amount of swelling, discoloration, or wound appearance, according to this study. The surgeons, however, preferred performing surgery with the laser when possible due to the improved intraoperative hemostasis.

However, other authors [2] believe that laser-assisted transconjunctival lower blepharoplasty is full-value alternative to the conventional transcutaneous lower blepharoplasty, requires shorter operating time and causes less bleeding, less patient discomfort, and less postoperative downtime.

My point of view is that the introduction of technology in aesthetic surgery, on this occasion the CO_2 laser, can produce results closely and strongly related to its lege artis implementation (i.e. laser parameters, duration of tissue exposure to heat, precise surgical manipulations, etc.) in combination with other small but efficient additions in surgical procedures (i.e. anesthetic solutions, respect of tissue during surgery, postoperative care, etc.) which in our hands have proved to be very beneficial to our patients, both regarding the final outcome and the postoperative downtime [3].

4.3 Step-by-Step Upper Blepharoplasty

4.3.1 Marking, Globe Protection, and Local Anesthesia

Marking is a very important part of the operation. I believe that this step of the procedure, provided it is performed meticulously and correctly, guarantees one half of the high-standard final outcome. It has always to be performed with a good and fluid-proof marker, as during surgery tissue fluids, local anesthesia, and surgeons' manipulation can distort the marked lines. This, taking into account the intraoperative edema of the tissue, can result in nonprecise dissection and resection. Marking should be done with the patient in upright position.

In upper blepharoplasty, the key point line is the existing upper eyelid crease, which should not be violated and should be rejuvenated and defined postoperatively. This crease is located 8–9 mm above the ciliary line in women and 7–8 mm in men. The upper part of the incision should be located at a point of 10 mm below the inferior border of the eyebrow, always bearing in mind that in female patients, in most cases, eyebrow shapes vary for cosmetic reasons (epilation, hair removal, alteration of the eyebrow line, permanent tattoo, etc.). In these cases, the upper part of the incision should be located at a point, which will be selected after requesting the patient to open and close the eye and judging the correct location by evaluating the borders of the orbital rim and the existing skin laxity of the upper eyelid. The fullness of the upper eyelid, related to skin remainder tissue, should in general be achieved by preserving a vertical eyelid height of 19–20 mm postoperatively. The distance of the eyelid margin to the brow cilia defines the eyelid height.

The upper part of the incision line should extend from the medial to the lateral canthus. To avoid medial webbing, we draw a gentle upturn of the medial incision,

and laterally we extend the line approximately 5 mm above the medial canthus, upturning again.

The connection of the upturning lines of the incision laterally and medially is very important. The lateral upturning line, if marked correctly, will induce an upward lift of the lateral canthal area, and the medial one will help in avoiding medial incision webbing of the epicanthal folds, which is very annoying for the patient (Fig. 4.2).

The three points to start with marking of the inferior incision line are a, c, e, and of the superior incision line, point f (Fig. 4.3).

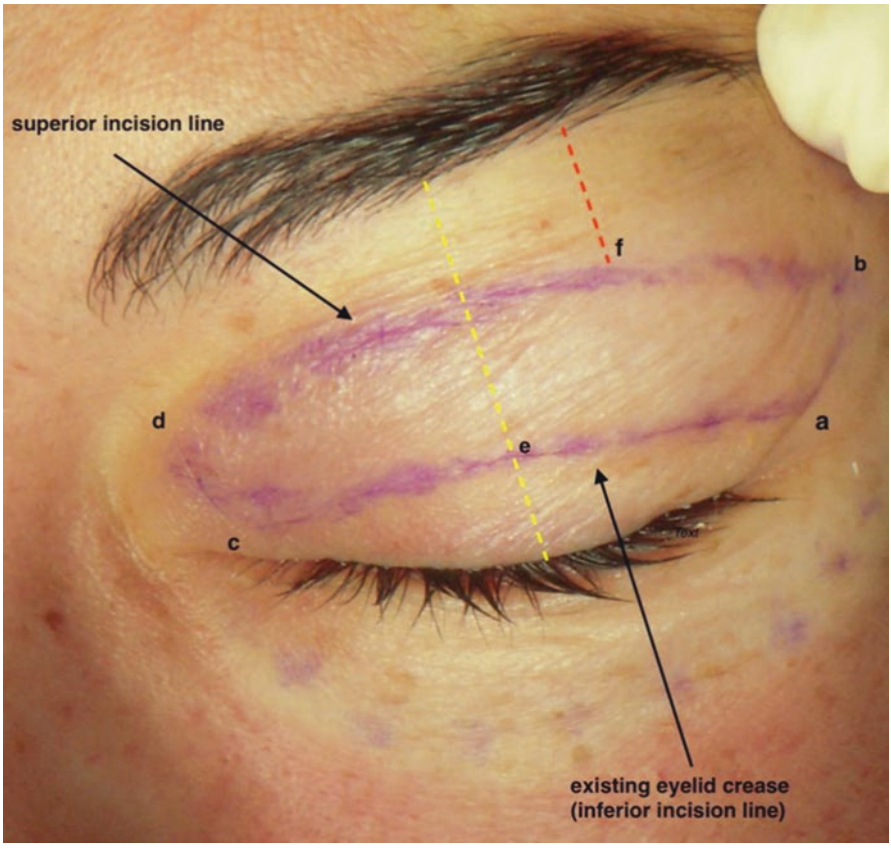

Fig. 4.2 The inferior (existing eyelid crease) and superior location of the upper eyelid incision is shown. The *yellow line* indicates the upper eyelid vertical height and the *red* the distance of the superior incision line to the eyebrow cilia at the level of the lateral limbus of the eyelid. This line may vary depending on the eyebrow shape and cilia border, but approximately should be 10 mm (point *f*). Points *a*, *b*, *c,* and *d* show the upturning lines' location. Point *a* is the end point of the existing eyelid crease when the eyelid is open, located approximately 6 mm above the ciliary line. Point *b* is located approximately 6 mm above the lateral canthus. Point *c* is the medial end of the existing eyelid crease with the eyelid open. Point *d* should always be located in the eyelid-bearing skin and not in the adjacent nasal skin to avoid medial incision webbing of the epicanthal folds. Point *e* indicates the eyelid crease at the level of the midpupillary line

The three points of the inferior line are then connected to form the eyelid crease corresponding to the inferior incision line. The superior marking is then completed by drawing a gentle line parallel to the inferior one and connecting points b and d (Fig. 4.4).

The protection of the eye globe with eye shields is also a very important step of the operation. I adapted eye globe protection from the very beginning of my

Fig. 4.3 Key points a, c, and e are marked, as described above, along the eyelid crease

Fig. 4.4 Final appearance of upper eyelid marking. Notice the inferior and superior lines located in the existing crease and 10 mm below the eyebrow cilia, respectively. The upturn lines ab and cd, as described in Fig. 4.2, are also shown

Tip

When marking, attention should be focused on existing asymmetry between the eyelid folds of the two upper eyelids. In this case, marking should be performed in the manner that symmetry should be achieved postoperatively, by removing different amounts of skin and/or muscles from each eyelid.

blepharoplasty procedures, when laser was not yet in practice, to secure the globe from accidental injury. In laser, blepharoplasty is a very essential step since laser beam can accidentally produce irreversible damage to the cornea. Eye shields are lubricated with eye ointment prior to insertion in the orbit (Fig. 4.5)

Infiltration of the upper eyelid skin with anesthetic solution is then performed. Patient, prior to the local anesthetic infiltration, can be sedated by the anesthesiologist and administered perioperative antibiotic protection.

I use a solution of 15 cc of lidocaine 2%, 5 cc of Bupivacaine hydrochloride 0,25%, and 1 cc of epinephrine in 250 cc of normal saline.

Infiltration is performed in a subdermal plane, avoiding puncturing of the marginal vascular arcade (see Fig. 1.3) and deep tissues, to minimize risks of hematoma and bruising. Moreover, subdermal administration of the anesthetic solution contributes to easy and safe hydrodissection. Anesthetic solution must stay for 7–10 min before incision to achieve maximum vasoconstriction. I am using the *single-puncture technique* for infiltration to minimize damage of the marginal vascular arcade and risks of bruising and hematoma (Fig. 4.6).

Fig. 4.5 Metallic eye shields for globe protection

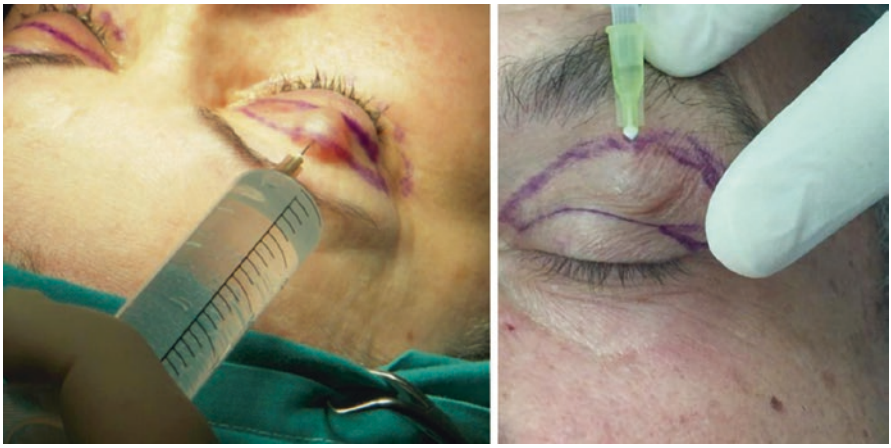

Fig. 4.6 (*L*) Infiltration with the single-puncture technique, avoiding marginal vascular arcade puncture. (*R*) Solution bulge is gently squeezed with finger during injection, to equally disperse in the tissue. Infiltration plane is under the skin and over the orbicularis oculi muscle

4.3.2 Incision and Dissection

Following infiltration and leaving adequate time for vasoconstriction, skin-only incision is performed with cold steel along the premarked lines.

The skin flap is then dissected and excised with scissors starting from the lateral canthal area and moving toward the medial canthus. The initial dissection at point b (as shown in Fig. 4.2) can be performed with cold steel for easier detachment. Scissors can be used following elevation of this part of the skin flap (Figs. 4.7 and 4.8)

At the point of skin detachment in the lateral canthal area, attention should be focused to avoid bleeding from the branches of the lateral palpebral artery and the marginal arcade. Usually, a gentle blunt cauterization of the area located at the angle created by the inferior incision line and the lateral upturning line will secure hemostasis at this point.

4.3.3 The Fat Compartments and Orbicularis Oculi Muscle Surgical Management

When the skin flap is excised, the underlying orbicularis muscle is exposed along the surgical plane.

If fat from the compartments of the upper eyelids is to be removed, applying mild pressure on the globe, we visualize the location of the fat compartments, and we proceed to a gentle, accurate, and bloodless incision with the laser. This incision, which includes orbicularis muscle and septum en block should be done at the upper part of the skin incision to avoid injury of the levator aponeurosis, which is present posterior to the orbicularis muscle along the lower incision in the eyelid crease.

Fig. 4.7 Skin flap elevation starts using cold steel at the area of the lateral canthus for easier detachment

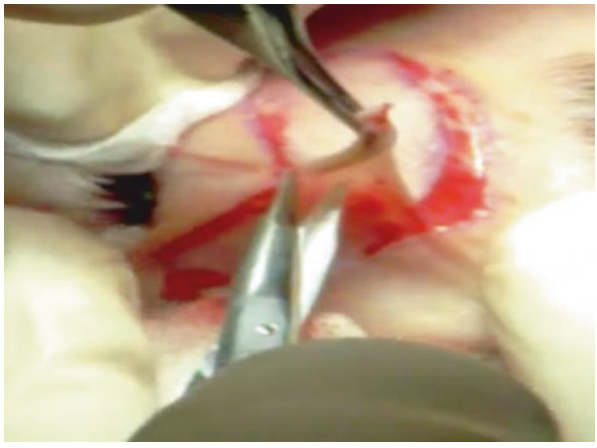

Fig. 4.8 Scissors are used for the dissection and excision of the skin flap

Attention should be paid to avoid over-resection of fat pads, which will, by time, create hollow eyes and unnatural look. Laser creates high temperature at the site of the incision; so, there is no need of clumping the fat to be removed as in the conventional fat removal. However, I advise that vessels present at the incision site are better to be cauterized with diathermy, as after a certain dimension of diameter, laser

heat conduction will not be enough to coagulate, and bleeding can occur. Usually, vessels of more than 1 mm of diameter are advisable to be cauterized to avoid risk of bleeding.

The central upper eyelid fat pad, termed also as preaponeurotic, is yellow in color (Fig. 4.9) due to decreased content of fibrotic tissue compared to the medial fat pad which is white in color due to increased amount of fibrotic tissue. The central fat pad is less vascularized compared to the medial one and serves as a landmark of the underlying levator muscle and levator aponeurosis. It is surrounded by a connective tissue capsule, which easily breaks with blunt dissection using the laser handpiece tip.

The medial (nasal) fat pad of the upper eyelid is a tricky point to achieve correct dissection and removal, if required (Fig. 4.10). Anatomically, it can be located due to its herniation through the weakened orbital septum and can be easily identified with an inward pressure of the eye globe. Gentle laser incision

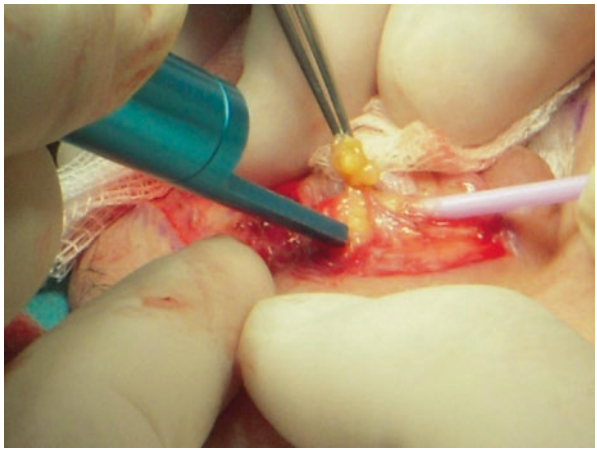

Fig. 4.9 The central upper eyelid fat pad is *yellow* in color and serves as the landmark of the underlying levator muscle and aponeurosis. The connective tissue capsule surrounding it has been broken with the laser handpiece tip and the fat is exposed. Incision of muscle and septum is located along the upper part of the skin incision to avoid injury of the levator aponeurosis

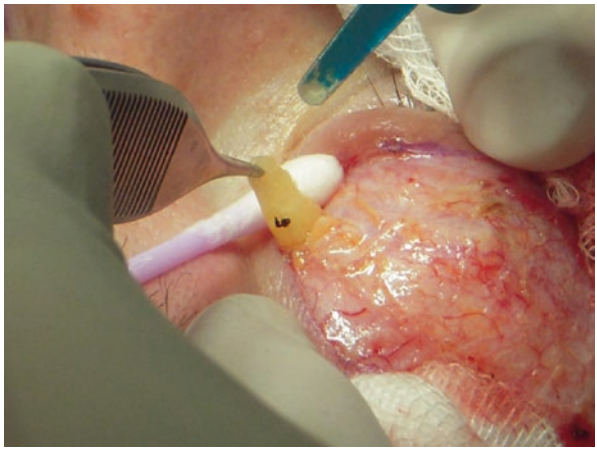

Fig. 4.10 Medial fat pad of the upper eyelid. Notice the *whiter* color compared to the central fat pad in Fig. 4.9. The incision of the septum is located in the upper part of the skin incision to avoid injury of the levator aponeurosis which is present posterior to the orbicularis muscle at the lower part of the skin incision

of the septum will allow extrusion through the incision. It is white in color and very well vascularized by the medial palpebral artery arcade. This requires secured blood vessels' coagulation prior to removal, to avoid bleeding, which can be very difficult to be controlled if the remnant of the fat pad is retracted in its anatomical position.

Always recalling that in our postoperative final result, "fullness" but not "heaviness" of the upper eyelid is the important target, we must consider the supine position of our patients during surgery as a factor of gravity effect of the entire content of the orbit including the fat compartments. This effect that creates a false impression of fat protrusion during surgery has to be encountered as a very important point in order to calculate the correct amount of fat to be removed, and can be addressed by gentle but adequate pressure of the eye globe prior to fat removal. Very often, surgeons trying to avoid over-resection of fat, especially in patients with excessive fat content of the upper eyelids, proceed to a very conservative removal, underestimating this effect. As a consequence, the under-resection of fat in these cases results in postoperatively noticed residual fat, a complication more frequently observed in the medial fat pad of the upper eyelid and very annoying for the patient.

Tip

Development of experience by increasing the numbers of blepharoplasty cases will minimize the complication of residual fat postoperatively. However, a good preoperative assessment and marking of the fat pad following gentle pressure with the patient in the upright position will address this frequent problem also in younger and less experienced surgeons. The drawing should demarcate the bulging of the fat pad, and this manipulation can be simulated during surgery with a trick, which I used to apply in my early years of practice.

The marked skin over the fat pad protrusion of the excised skin flap is cut around with scissors, and this skin piece is placed over the bulging of the septum produced by the pressure on the eye globe just prior to the septum incision. This will simulate the preoperative manipulation and offer more precise fat removal.

Following fat removal, the preseptal part of the orbicularis muscle management of the upper eyelid is required.

As shown in Fig. 4.11, excision of muscle strip is limited only in very specific cases nowadays, with laser-defocused beam muscle contraction technique to have almost entirely substituted the resection of the muscle strip.

The CO_2 laser in cutting mode is used. The power usually selected for cutting purposes is 7–8 W in continuous mode. The laser handpiece is placed at a distance of 10–15 cm far from the upper eyelid surgical plane, and with a gentle and harmonic painting movement the muscle is contracted. The effect is really impressive and accurate. The open wound is generously contracted, and the superior and inferior incision lines are brought closer. The contraction stops just after the surgeon

Fig. 4.11 Skin flap, strip of orbicularis muscle, central and medial fat pad excised in upper blepharoplasty. Orbicularis strip excision nowadays has been limited to very specific cases with excessive muscle chalasis and folding, where laser contraction would require longer exposure of the muscle to the laser beam, resulting in charring and excessive coagulation and necrosis

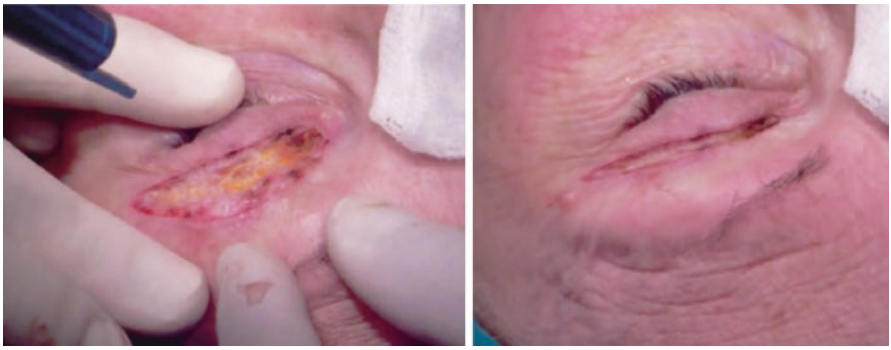

Fig. 4.12 Orbicularis muscle is contracted with CO_2 laser-defocused beam in a distance of 10–15 cm aprproximately (*L*). Notice the approximation of wound edges following contraction and the definition of the upper eyelid crease (*R*)

notices that there is no more contractive effect on the tissue; otherwise, overheating of the muscle can result in charring. This controlled scarring of the muscle has proved to be an excellent manipulation, which offers superb definition of the eyelid crease postoperatively (Fig. 4.12).

4.3.4 Wound Closure and Dressings

Final step of the upper eyelid blepharoplasty is the wound closure and the dressings. Several different stitching techniques and sutures have been reported in the literature.

In my practice, I use two different prolene sutures, 5/0 and 6/0, for the wound closure. The skin laterally to the lateral canthus area of the incision is closed with the 6/0 prolene suture in interrupted mode. First suture is placed to approximate point a (Fig. 4.2) of the inferior incision line to the point of the superior line identified by imaging a vertical line toward the eyebrow cilia. This suture serves also as a lifting procedure of the lower part of the eyelid incision. The remaining interrupted sutures are placed afterward toward the lateral canthus till the line is completely approximated.

For the closure of the remaining incision, the 5/0 prolene suture is used in a subcuticular mode starting from the inner canthal area and ending adjacent to the point of the first interrupted suture described above (Fig. 4.13).

Alternatively, the remaining incision can be sutured with the same 6/0 prolene suture, in an over and over external mode, with very minimal needle skin bites (Fig. 4.14)**.**

The meticulous suturing of the upper eyelid incision is a very important procedure despite the underestimation of this step of the operation by some surgeons. Inconspicuous incision lines are a must in upper blepharoplasty, and patients get very concerned if the incisions are visible and misplaced. Dressing of the eyelids is limited to the application of Steri Strips along the suture line. Suture removal is taking place 5 days postoperatively (Fig. 4.15)

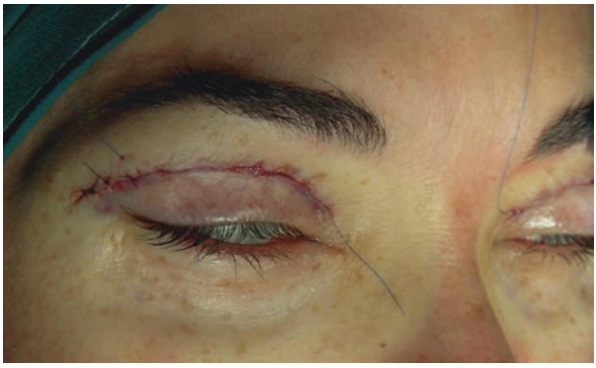

Fig. 4.13 Interrupted wound closure lateral to the lateral canthal area and subcuticular closure of the remaining incision line

Fig. 4.14 Upper eyelid incision line sutured in an over and over mode. (*L*) The lateral part of the incision sutured with interrupted sutures (*R*)

Fig. 4.15 Eyelid dressing following blepharoplasty

4.4 Step-by-Step Lower Blepharoplasty

4.4.1 The Transconjunctival Incision and Dissection

The transconjunctival approach to the lower eyelid orbital fat can be achieved with two different procedures: the preseptal and the retroseptal (Fig. 4.16). The retroseptal approach is the most popular, safe, and faster one. This approach allows access to the orbital fat through an incision in the conjunctiva, lid retractors, and capsulopalpebral fascia. Skin, orbicularis muscle, and septum of the lower eyelid remain intact, minimizing the risk of eyelid retraction postoperatively.

I have found that retroseptal approach is very efficient in excising fat of the lower eyelid and much easier than the preseptal one. The difference is that with the restroseptal approach, fat repositioning cannot be achieved compared to the preseptal one, but this is something that does not make it superior to the retroseptal.

The retroseptal approach is performed with an incision located 4–5 mm below the inferior tarsal border at the level of the lower conjunctival vascular arcade (Fig. 4.17).

There are two options of transconjunctival fat access. Many surgeons prefer to make two separate incisions in the conjunctiva: one over the medial fat pad and one over the central and the lateral. I have found this approach useful and with less tissue injury; however, the single continuous conjunctiva incision offers better exposure during surgery, and moreover the possibility of using the defocused laser beam to contract the exposed posterior wall of the orbicularis muscle, for correction of the overlying eyelid

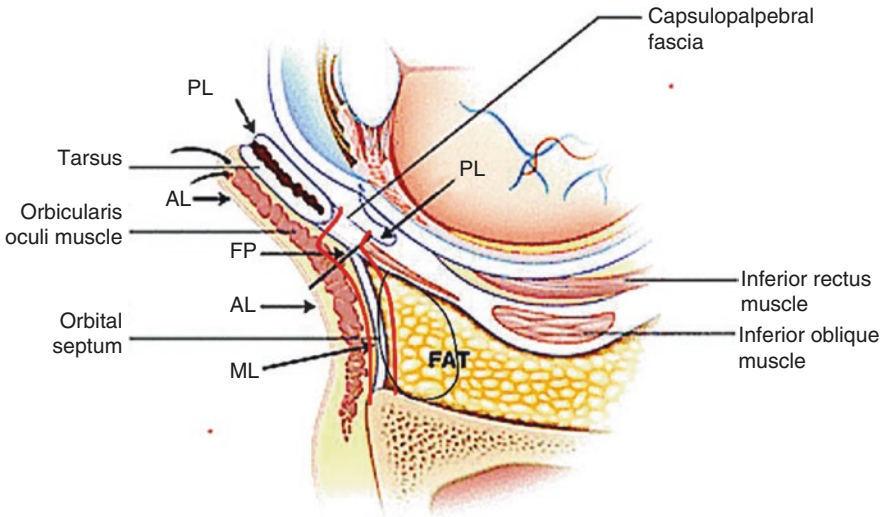

Fig. 4.16 Location of preseptal and retroseptal transconjunctival incisions(*in red lines*). The inferior oblique muscle and its anatomical relation with the capsulopalpebral fascia are shown. Dissection of the anterior part of the medial fat pad (Approx. Represented by the *gray circle*) minimizes the risk of inferior oblique muscle injury. *AL* the anterior lamella, *PL* the posterior lamella. *FP* the fusion point of the lower lid retractors and orbital septum. *ML* the middle lamella. The FP is very critical for the placement of the preseptal or postseptal incisions during surgery (Adapted with modification from: Master Techniques in Blepharoplasty and Periorbital Rejuvenation, Surgical Anatomy of the Forehead, Eyelids, and Midface for the Aesthetic Surgeon Authors: Kevin S. Tan, Sang-Rog Oh, Ayelet Priel, Bobby S. Korn, Don O. Kikkawa, with permission of Springer)

skin texture (Fig. 4.18). Some authors have reported that the risk of inferior oblique muscle injury during fat excision with separate conjunctival incisions is minimized.

My point of view is that the single continuous conjunctiva incision does not significantly increase this risk, provided that the anatomy of the area is well understood. The intact small bridge of conjunctiva in the separate incisions approach over the muscle is not enough to protect injury if the anatomy is not understood.

The inferior oblique muscle separates the central and medial fat pads, and the superficial attachment of the muscle to the arcuate expansion of the capsulopalpebral fascia separates the central and lateral fat pads. More care should therefore be provided during the dissection of the medial fat pad which is difficult to be identified, more fibrotic and less prolapsing, to avoid injury of the inferior oblique muscle, which originates just lateral to the ostium of the nasolacrimal canal and lies in the posterior part of the fat compartment. However, knowing the anatomy and accepting that only the anterior part of the medial fat pad should be removed, if required, the risk of the inferior oblique muscle injury is minimized since this fat pad is a single pad anteriorly, but only posteriorly is divided by the origin of the inferior oblique muscle, where injury can occur (Fig. 4.19).

Transconjunctival blepharoplasty, originally, is an ideal indication for patients with minimal skin laxity of the lower eyelid. This is not directly related to the age of the patients but to the amount of periorbital aging, which is individualized and

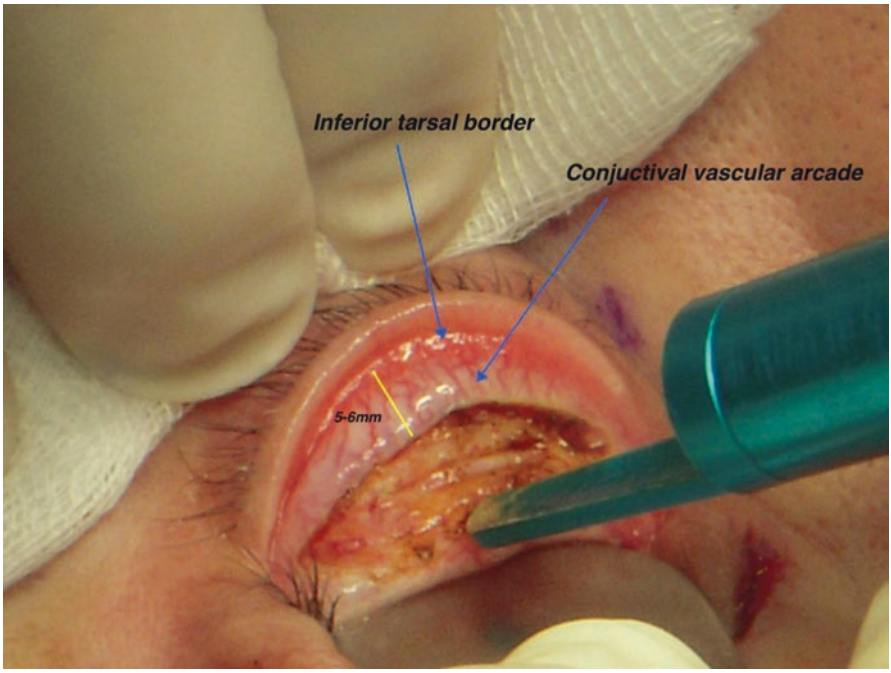

Fig. 4.17 Transconjunctival laser incision. The inferior tarsal border and the conjunctival vascular arcade are shown. The location of the incision is at 4–5 mm below the inferior border of the tarsal plate

depends on several extrinsic (sun damage, environmental conditions, life habits, emotional conditions, etc.) and/or intrinsic factors (DNA, heredity, etc.).

We have found that in many younger patients, lower eyelid skin laxity and texture are more severe than in older ones, and on the contrary older patients who are expected to suffer from extended skin laxity present with milder skin texture aging symptoms.

With the addition of laser tightening of the posterior surface of the orbicularis muscle, laser skin resurfacing of the lower eyelid in the past and single-suture traction technique nowadays, the indications of transconjunctival blepharoplasty have been extended to patients with almost any kind of skin aging manifestations of the lower eyelid (Fig. 4.20).

4.4.2 The Fat Compartments and Orbicularis Oculi Muscle Surgical Management

Marking of the lower eyelid skin for a transconjunctival approach is not necessary. I have found though that dotted marking of the line which is formed by the inferior part of the fat pockets and the arcus marginalis of the orbit on the skin might be helpful during surgery to assess the amount of fat to be removed. This line is very prominent with the patient in upright position and less obvious in the supine position during surgery. Simulation of the upright position with gentle pressure of the globe during surgery offers a manner of calculation for the fat to be removed (Fig. 4.21).

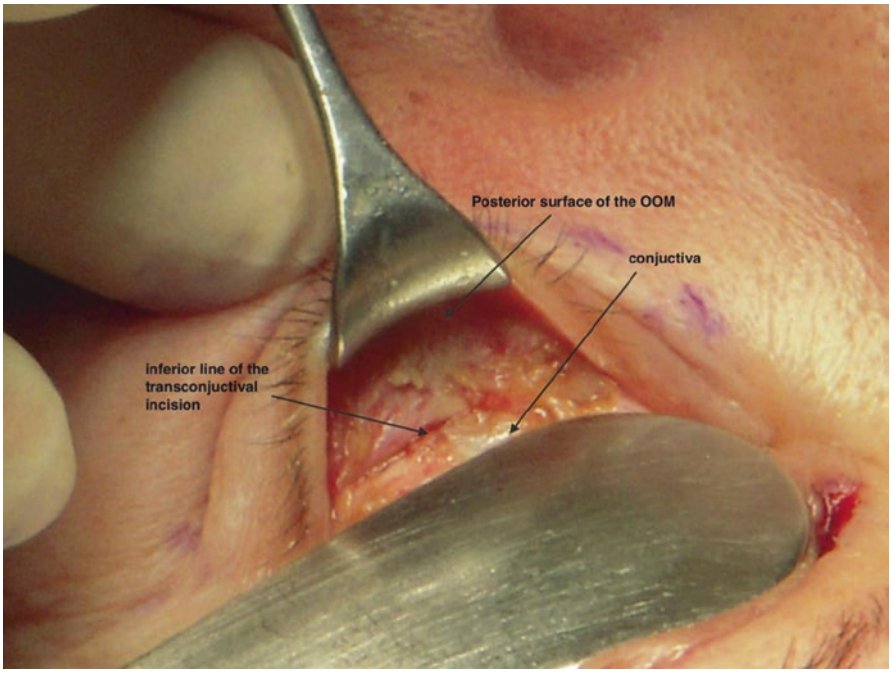

Fig. 4.18 The posterior surface of the orbicularis oculi muscle (OOM) is extensively exposed following a single continuous incision, offering easy access for contraction with laser-defocused beam. The inferior line of the transconjunctival incision and the conjunctiva are shown. The metallic plate serves as a protective barrier of the eye globe, the conjunctiva, and the surrounding anatomical structures

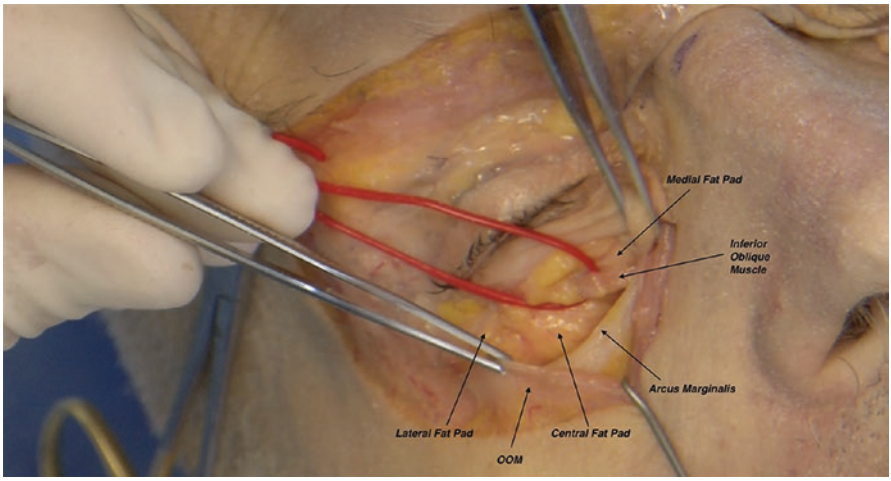

Fig. 4.19 Inferior Oblique Muscle (IOM) and surrounding structures on a cadaver dissection IOM marked with red rubber, Lateral,central, medial fat pads, and their relation to the muscle are shown

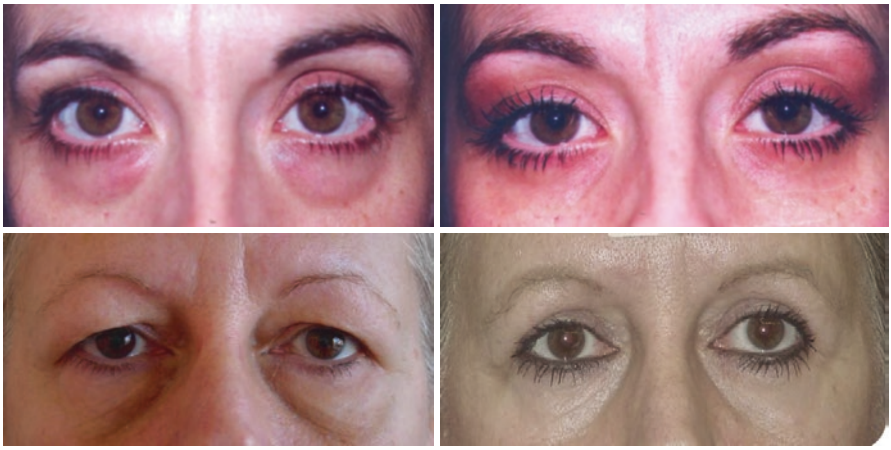

Fig. 4.20 *Up*. Young patient preop and postop pictures after a transconjunctival blepharoplasty with fat excision only. Lower eyelid skin texture minimally affected by aging. *Down*. Older patient with excessive skin laxity of upper and lower eyelids with fat protrusion, preop and postop pictures after upper and lower transconjunctival blepharoplasty combined with OOM laser tightening and SSTT

Fig. 4.21 Marking the line formed by the inferior part of the fat pad and the arcus marginalis in the lower eyelid

Local anesthesia infiltration With the patient in supine position on the operating table, local anesthesia with the same solution used for upper blepharoplasty is infiltrated.

The eye globe is protected with the metallic plate, and the syringe needle is directed through the conjunctiva to the lower eyelid retractors and the capsulopalpebral fascia in the fat compartments. A slight resistance in the needle insertion at the initial puncture which is relieved by gently introducing the needle deeper in the tissues indicates the correct insertion in the fat pads. The solution is gently infiltrated at this plane. An approximate amount of 3–5 cc of the solution is adequate to anesthetize the whole surgical plane. Care should be taken not to infiltrate the solution in the conjunctiva, as this will result in chemosis, which is very annoying for the patient and can take long to resolve. The needle is then retracted sharply to avoid accidental injury of the conjunctiva, and massaging of the infiltrated area is performed leaving the infiltrated solution to sit for at least 7 min for maximal vasoconstriction (Figs. 4.22, 4.23, and 4.24)

Transconjunctival incision is then performed with the CO_2 laser at 4–5 mm below the inferior border of the tarsal plate. The laser beam should be applied steadily in a crescent direction parallel to the tarsal plate inferior border, and laser handpiece should move gently but sharply, securing same depth of incision at each pass and minimal heat conduction. Depending on the laser power settings (6–8 Watts, continuous mode) 3–4 cutting passes are enough to reach the fat pockets. The fat pad capsule is then incised with the laser and the fat pops out in our surgical plane. The amount of pressure applied on the eye globe with the metallic protective plate is creating more or less fat prolapse. Coagulation of the visualized prominent fat vessels is required prior to fat removal, either with diathermy or with laser-defocused beam.

The fat is then pulled gently with forceps, moved on the eyelid retractor, to protect the underlying tissue from the laser beam, and excised in small portions, cutting with the laser, always controlling the amount to be removed by checking the fat pad prolapse on the lower eyelid skin, with repeated eye globe pressure, to avoid overresection (Fig. 4.25).

Fig. 4.22 Needle insertion through the conjunctiva for local anesthesia infiltration. Observe the initial resistance at the puncture point due to the adherent lower lid retractors and capsulopalpebral fascia prior to entering the fat compartments

Fig. 4.23 Needle has passed through conjunctiva, lower eyelid retractors, and capsulopalpebral fascia into the fat pads, relieving the initial resistance. Gentle infiltration is performed at this plane with 3–5 cc of solution

Fig. 4.24 Gentle massage of the infiltrated lower eyelid is applied, and the solution sits for 7 min prior to incision for maximum vasoconstriction

Fig. 4.25 Fat is exposed from fat pad and trimmed with laser. Removal should be performed in small portions to avoid over-resection

When fat excision is completed, a final check is performed by redraping the lower eyelid skin with fingers, repositioning the residual fat in the fat pockets, and gently pushing the eye globe to simulate upright position of patient.

If this check is satisfactory, we proceed to the next step, the orbicularis oculi muscle posterior wall contraction with the laser.

This procedure has been published by Seckel et al. [4] in 2000, combined with lower eyelid laser skin resurfacing to address the skin texture of the lower eyelid skin. We have been applying laser skin resurfacing in our lower blepharoplasty patients from 1999 [5]. From 2002 and following our observations, mainly regarding the postoperative course of patients who underwent laser resurfacing of the lower eyelid skin, we switched to skin traction with the single-suture traction technique rather than skin contraction with laser resurfacing. We published our results in 2007 and advocated that pigmentary complications of skin resurfacing and prolonged downtime were important reasons that made us abandon it as a routine method. The tightening of the posterior surface of the orbicularis muscle through the transconjunctival incision with CO_2 laser was since then combined with the traction of the lower eyelid skin with the SSTT, instead of laser skin resurfacing contraction [6].

The orbicularis muscle anatomically has a firm and direct connection with the overlying lower eyelid skin, and any effect on the muscle's redraping or contraction reflects also to the skin. Therefore, tightening the posterior surface of the muscle with laser, the overlying skin of the lower eyelid also redrapes and, in combination with the traction of the lower lateral retinaculum of the canthal tendon, with the SSTT, the final outcome in the rejuvenation of the lower eyelid skin is enforced. More details on this technique in Chap. 5.

The contraction of the muscle is performed with the carbon dioxide laser in defocused beam mode and in the same manner as in the upper blepharoplasty. Using the lower eyelid retractor, the posterior surface of the muscle is exposed. The globe and the surrounding tissues are protected with the metallic plate, and the muscle is irradiated with laser from a distance of 5–10 cm in a painting mode. The contraction is apparent and continues up to the point that no more contraction is observed (Fig. 4.26).

The same procedure has also been used in transcutaneous (open) blepharoplasty, applying the defocused beam on the posterior surface of the orbicularis muscle on the elevated myocutaneous flap. The contraction of the muscle in these cases results in removal of less skin amount and lower risk of related postoperative complications (Fig. 4.27)

Blepharoplasty usually is a very rewarding operation for both the patient and the surgeon. All surgeons strive to get the best results with as little scar visibility as possible, and with the least amount of patient discomfort, complications, and downtime.

The use of the carbon dioxide laser has offered some unique advantages with the procedure: relatively bloodless surgical fields and laser skin resurfacing in the past.

However, it comes together with prolonged erythema, possible pigmentary changes, synechiae (Fig. 4.28), and even hypopigmentation, as a result of deeper

Fig. 4.26 Posterior surface of orbicularis muscle contracted and tightened with defocused laser beam

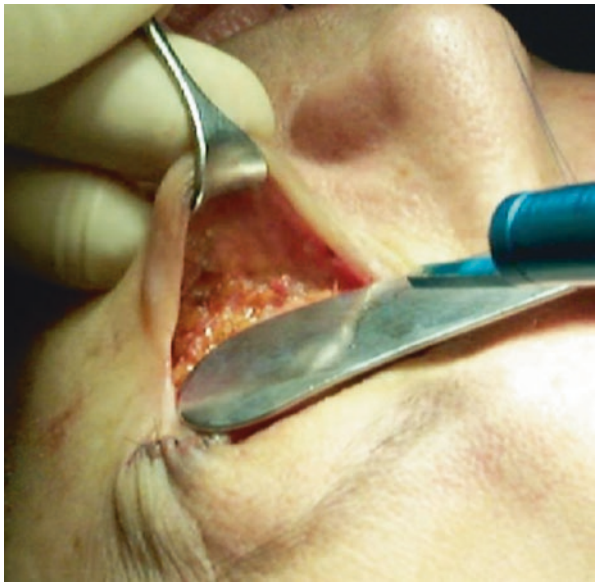

Fig. 4.27 Orbicularis muscle contraction and tightening in open lower eyelid blepharoplasty with defocused laser beam

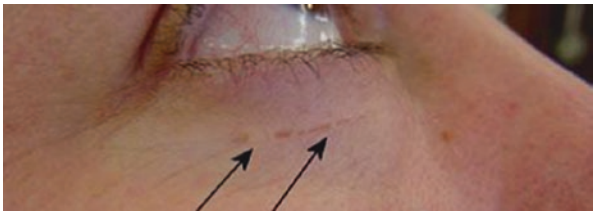

Fig. 4.28 Synechiae (*arrows*) of the lower lid skin after laser skin resurfacing performed elsewhere. This is a result of postoperative folding due to edema where the two resurfaced shoulders of the fold create an adhesion from the healing process and the re-epithelialization procedure

laser penetration in the skin, which could be very frustrating for the patient. Among the darker skin types (Fitzpatrick III and higher), the incidence of such side effects can be higher.

Application of the inferior lateral retinaculum plication (SSTT), together with laser contraction of the posterior wall of the orbicularis oculi muscle using a defocused beam, has achieved lower lid tightening (skin traction) with no resort to laser skin resurfacing (skin contraction) and similar or higher results. Moreover, prevention of future lower eyelid retraction, scleral show, or laxity is achieved (see Chap. 5).

It is my belief that in terms of lower lid skin tightening, the results achieved by the two methods are relatively similar, but the skin traction method is a simple and easy-to-perform procedure without any downtime for the patient. With this method, patients' satisfaction rates are extremely high. The time until return to everyday activities was significantly shorter in the skin traction group than in the laser skin-resurfacing group. The main reason for this difference was the re-epithelialization period (lasting 5–7 days) and the prolonged erythema or hyperpigmentation occasionally lasting 4–6 weeks, which required makeup coverage in all cases. The youthful appearance of the lateral canthal area and the elimination of scleral show, following the traction (SSTT) technique, added to patient satisfaction.

I have noticed that the results of this combined blepharoplasty operation (with all the previously described modifications and add-ons) are very satisfying, long-lasting, and not transient in nature. I have tried to keep side effects and patient downtime as low as possible, and the patients' satisfaction is very high (Fig. 4.29).

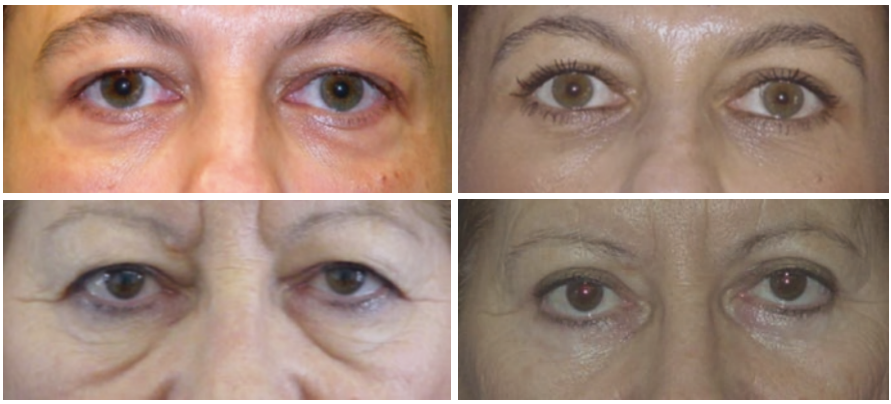

Fig. 4.29 Upper and lower transconjunctival blepharoplasty long-term results. Both patients underwent OOM laser contraction and SSTT. Results after 6 and 7 years respectively

4.5 Surgical Tips and Tricks of the Technique

To make it easier for reading, provided that detailed clinical history of the patient during consultation, clinical evaluation, and decision-making as well as preoperative photography are accomplished, I prefer to summarize tips and tricks of the technique in separate tables for upper and lower blepharoplasty. For details of each tip or trick, refer to the relevant text of this book (Tables 4.1 and 4.2).

Table 4.1 Upper Blepharoplasty

Marking–Protection	Mark incision lines with patient in upright position. Your marking is very essential. Make it with the appropriate marker Re-mark eyelid incision lines after prepping for visible markings during surgery Protect eye globe with metallic eyeshield prior to anesthetic infiltration
Local anesthesia infiltration	Use the single puncture infiltration technique to avoid bleeding and postop bruising Infiltrate in subcutaneous plane for hydrodissection Massage and leave solution to sit for 7 min for maximum vasoconstriction
Incision	Use cold steel for skin incisions, not laser or other devices
Dissection	Use blade and scissors for skin flap detachment, elevation, and removal, not laser Use laser for the rest of the dissection
Fat compartments	Use laser for fat compartment surgery Incise muscle and septum at the superior part of your incision to avoid injury of levator muscle and aponeurosis Conservative but required fat excision Medial fat pad to be addressed carefully to avoid over- or under-resection Achieve fullness but not heaviness of the eyelid
Orbicularis oculi Muscle	Contract the surface of the orbicularis oculi muscle with laser-defocused beam as the final step of the dissection to achieve definition of upper eyelid crease
Sutures	6/0 nonabsorbable interrupted at the temporal part of the incision 5/0 subcuticular or 6/0 over and over for the rest of the incision
Dressings and postop care	Steri Strips in the operating theater Ice packs right after surgery and for 48 h Antibiotic/anti-inflammatory drops treatment for 4 days Natural tears gel if required for 1 week See patient on the second postop day and remove sutures on the fifth Follow-up patient at 1, 3, 6 months if not otherwise required and take postop pictures

Table 4.2 Lower blepharoplasty

Marking	Mark the line formed by the inferior border of the fat pockets and the arcus marginalis of the orbital rim on the skin
Local anesthesia infiltration	Inject 3–5 cc of solution through the conjunctiva Massage and leave to sit for 7 min
Incision	Use the laser sharply and precisely for single continuous transconjunctival incision, and do 3–4 passes to reach the fat pads
Dissection	No specific tissue dissection needed
Fat compartments	Excise fat in small portions from all three fat compartments, and continuously judge the amount left behind Special care to the medial fat pad (whiter color, more fibrotic, tricky to be identified) and attention to avoid accidental inferior oblique muscle injury Good coagulation at every step of fat removal
Orbicularis oculi muscle	Contract and tighten the posterior surface of the OOM with laser-defocused beam
SSTT	Perform SSTT via the upper blepharoplasty incision, after completing fat removal and OOM contraction as the final step of the procedure
Dressings and postop care	No sutures required Apply Steri Strips with adequate compression of the lower eyelid Ice packs right after surgery Antibiotic/anti-inflammatory drops treatment for 4 days Natural tears gel if required for 1 week Instruct patient to avoid downward traction of the lower eyelid for any reason and to use ice packs for 48 h See patient on the second and fifth postop days Follow-up patient at 1,3,6 months if not otherwise required and take postop pictures

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2. Brychta P, Franců M, Koupil J, Ludikovský K. Our experience with transconjunctival, laser-assisted lower blepharoplasty. Acta Chir Plast. 2000;42(4):118–23.
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The Single-Suture Traction Technique

5

Canthopexy is not a novelty. It refers to a less invasive procedure compared to that of canthoplasty, and it is designed to reinforce the existing canthal tendon and the surrounding structures by surgical suturing without removing it from its normal attachment. It has been used widely for both reconstructive and aesthetic reasons. Access to the canthal ligament can be achieved through the lower eyelid, the upper eyelid skin incision, or a small separate incision [1–3].

In our series, no extra incision was performed other than the upper eyelid incision, and the scope added to the previously published studies was the suspension of the lower eyelid in different vectors, so that this traction in combination with OOM contraction would enhance the appearance and skin texture of the lower eyelid (Fig. 5.1).

Because dissection of tissue is minimal, local hemorrhage, ecchymosis, and edema are avoided. No lysis of the lateral retinaculum or other procedures in the orbital rim area are necessary. A permanent suture is used to secure the canthal ligament to the periosteum of the lateral orbital rim. This superolateral movement of the lateral canthal ligament tightens the lower eyelid skin (skin traction) in a different and superior manner than that of laser skin resurfacing (skin contraction).

5.1 Anatomy of the Lateral Canthal Ligament

Also called the lateral canthal tendon, the lateral canthal ligament is comprised of a superior crux from the superior tarsus and an inferior crux from the inferior tarsus (Fig. 5.2). The superior and inferior crux of the lateral canthal tendons fuse at the lateral border of the tarsal plates to join the lateral retinaculum, a condensation of several anatomical structures that inserts onto the lateral orbital tubercle of Whitnall. This tubercle is located 2–4 mm posterior to the lateral orbital rim, 10–12 mm inferior to the frontozygomatic suture, and at the level of the lateral commissure. The lateral retinaculum consists of fibers from the lateral horn of the levator aponeurosis, Lockwood's ligament, check ligaments of the lateral rectus muscle, fibers of the

P. Kontoes, *State of the art in Blepharoplasty*,
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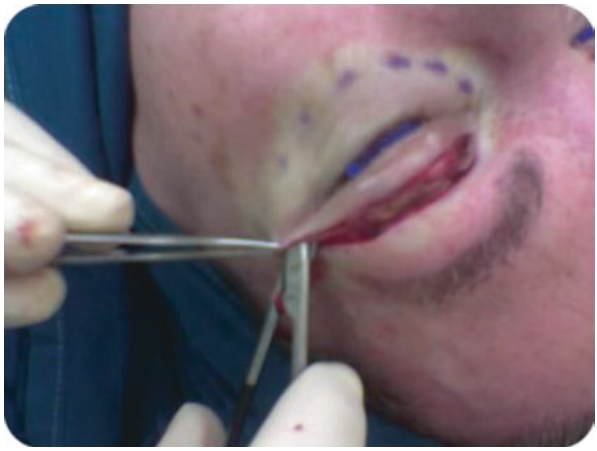

Fig. 5.1 The upper blepharoplasty incision is used for the SSTT procedure. Blunt dissection is performed in suborbicularis plane, toward the attachment of the inferior crux of the ligament to the tarsal plate

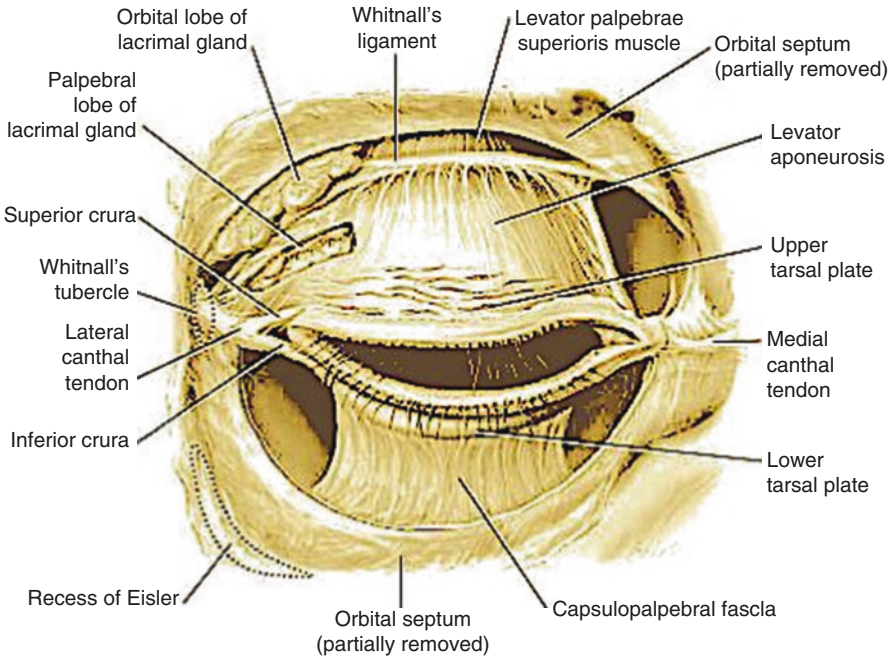

Fig. 5.2 Anatomy of the lateral canthal tendon and related structures

suspensory ligaments of the lacrimal gland, and some deep fibers of the pretarsal orbicularis oculi muscle. In the space between the lateral retinaculum and the more anteriorally placed orbital septum is sometimes found a small fat pad, Eisler's pocket [4].

The lateral canthus is positioned approximately 2 mm higher than the medial canthus.

The lateral canthal ligament is a clinically important anatomical structure. The inferior crux of the canthal ligament is used for the canthopexy techniques, by plication and anchoring on the periosteum of the orbital rim.

5.2 The Technique

The single-suture traction technique is performed as the final step of the operation when the patient undergoes upper and lower blepharoplasty. In many cases, this technique is applied also in patients who only require upper or lower blepharoplasty alone. In upper blepharoplasty patients, the existing blepharoplasty incision serves as the approach point for the identification of the inferior crux of the lateral canthal tendon. In lower blepharoplasty patients who also require this maneuver, an extra small incision at the lateral part of the upper eyelid crease above the lateral canthus is needed. Through this incision, and in submuscular plane, a tunneling toward the inferior crux of the lateral canthal ligament will offer identification of this anatomical element. Incision is not necessary to exceed 1 cm in length, and is carefully placed in the upper eyelid crease to avoid visible postoperative scar (Fig. 5.3).

The SSTT can also be applied during open (transcutaneous) blepharoplasty of the lower eyelid with the same procedure as in the transconjunctival technique (Fig. 5.4).

The procedure starts with blunt scissors dissection and tunneling under the OOM segment, which is present at the temporal part of the upper blepharoplasty incision. Care should be taken to avoid bleeding of the lateral palpebral artery and the vessels of the proximal part of its vascular arcade which are located at this point. Although difficult to avoid puncturing branches of this vascular component, upward direction

Fig. 5.3 A short incision of 1 cm in length is placed in the lateral part of the upper eyelid crease above the canthus for the SSTT to be executed in patients who only require lower eyelid transconjunctival blepharoplasty. (*L*) Incision in graphic, (*R*) incision intraoperatively with 6/0 nonabsorbable suture already passed through the inferior crux of the lateral canthal tendon

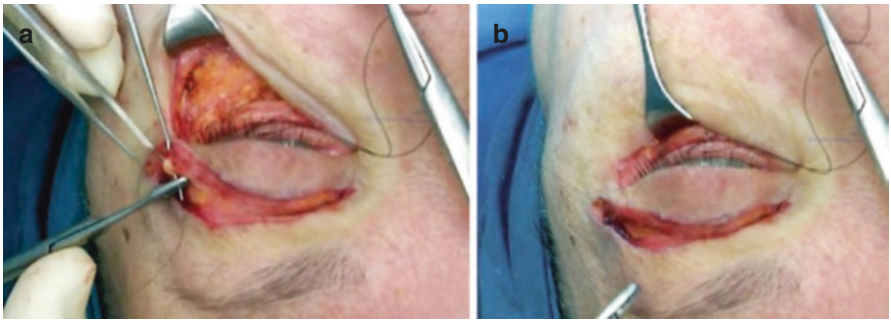

Fig. 5.4 Lower transcutaneous blepharoplasty. Intraoperative view of SSTT applied via the upper blepharoplasty incision. (**a**) Lower limb (inferior crux) of canthal tendon identified. 6/0 prolene suture placed through. (**b**) Suture anchored on the periosteum and knot tightened

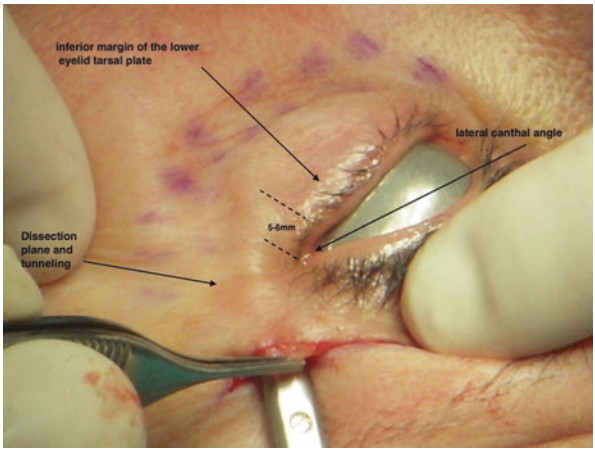

Fig. 5.5 Scissors directed from the muscle entry point toward the canthal angle inferior to the inferior margin of the tarsal plate 5–6 mm toward the eyelid, to complete the tunneling through which the inferior crux of the canthal tendon will be plicated

of the scissors when the muscle is perforated minimizes this risk. In case of bleeding, blunt coagulation of this area is enough to stop it (Fig. 5.5).

The scissors are then directed in a vector connecting the initial point where the muscle is perforated to the canthal angle at the fusion of the upper and lower eyelid points and slightly inferior to the inferior margin of the lower eyelid tarsal plate, the dissection extending 5–6 mm parallel to it under the lower eyelid skin (Figs. 5.1 and 5.6).

Once the dissection and the tunneling are completed, the initial entry point of the muscle is gently enlarged with scissors, for easier access of the instruments.

The created muscle opening is held apart with single tooth retractors, and a fine-toothed forceps is inserted in the dissected plane and in a direction toward the canthal angle, with the forceps limbs closed. When the forceps reach the inferior point of the canthal angle, the limbs are left open. As this is a blind procedure, the

Fig. 5.6 OOM has been opened at the lateral part of the upper eyelid incision and tunneling completed. The entry point of the muscle is gently dilated for easier access of the instruments

identification and grabbing of the inferior canthal crux has to be done gently to avoid serious damage of this connective tissue fibrotic anatomical element. After an effort to pinch the crux is done by closing the forceps limbs, gentle traction is applied to identify that the correct anatomical feature is pulled. In this case, the upward and lateral pull will allow the lower eyelid only to move toward the same vector. On the contrary, full movement of the canthal angle shows that both crura are grabbed in the forceps and that the manipulation has to be repeated.

I have found that this manipulation is unpredictable. Sometimes I have achieved to grab the crux with one and only attempt; sometimes I need to repeat it three to four times. This is directly related to the correct dissection and tunneling, something that will also contribute to less tissue discomfort and quick procedure (Fig. 5.7).

The inferior crux of the canthal tendon is identified and pulled through the tunnel holding the forceps with the dominant hand. When it is visualized, with gentle outward pulling, another fine-toothed forceps is used with the nondominant hand to hold the crux. The crux anatomically looks like a whitish jelly component, quite resistant, but attention has to be paid not to damage it by excessive pulling or pinching with the forceps.

Holding the visualized crux with the forceps, ask your nurse to hand you the needle holder in your dominant hand, with a nonabsorbable monofilament 6/0 suture, which is passed through the crux, with an adequately strong bite, and the crux is now in the suture, ready to be directed and plicated to the required vector (Figs. 5.8a–d and 5.9a, b).

Prior to anchoring the suture to the periosteum of the orbital rim, a final check of the suture-holding capacity is performed by gentle movement, and the vector of traction is decided. This vector depends on the lower eyelid preoperative evaluation and the amount of skin and tarsal laxity.

In most cases, the vector of traction is in a 35–45° angle created by the line connecting the medial to the lateral canthus and its vertical (Fig. 5.10a, b).

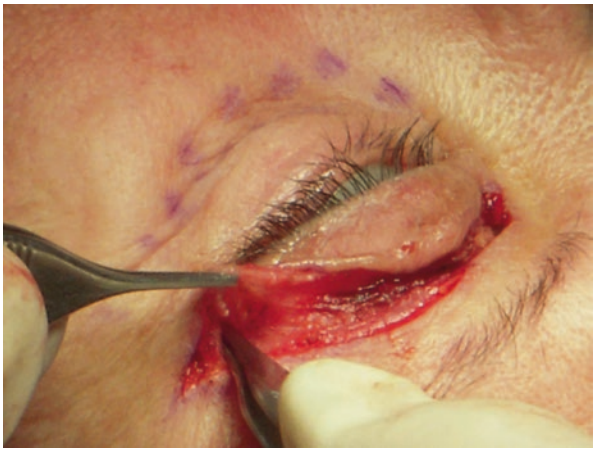

Fig. 5.7 Fine-toothed forceps are introduced in the predissected plane and directed toward the canthal angle to grab and pull the inferior crux of the canthal tendon. The limbs of the forceps are closed to facilitate insertion along the tunnel and are left free to open just over the anatomical position of the crux

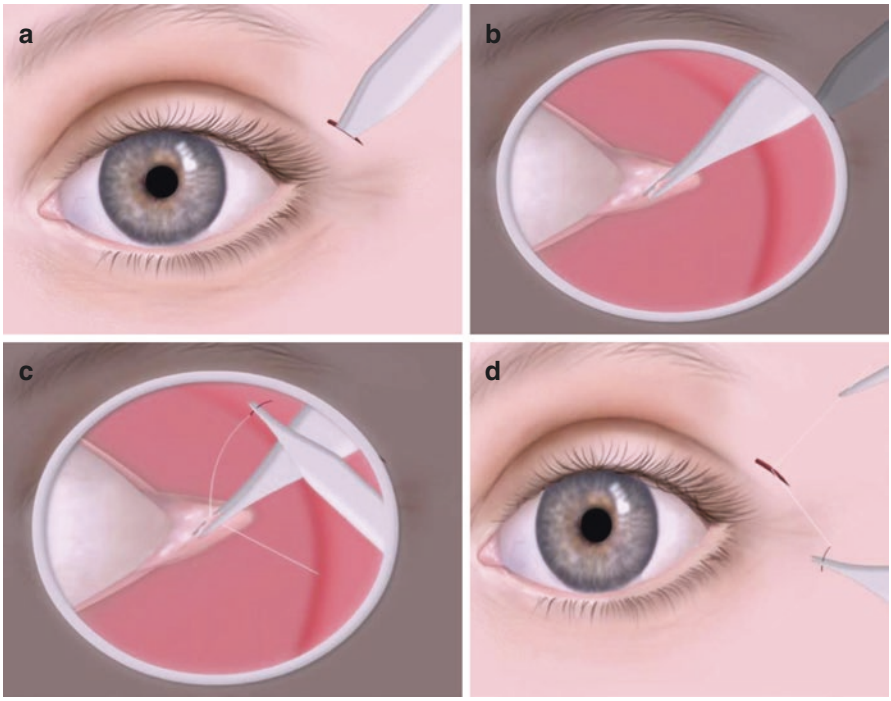

Fig. 5.8 (**a**–**d**) Graphic animation of inferior crux of the lateral canthal tendon plication. (**a**) Forceps inserted in the predissected tunnel. (**b**) Pinch of the inferior limb of the tendon. (**c**) 6/0 Suture passed through the crux. (**d**) Anchoring on the periosteum of the orbital rim and traction to the desired vector

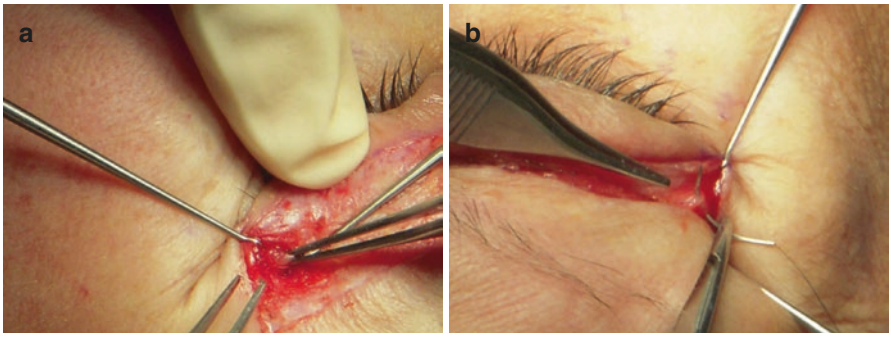

Fig. 5.9 (**a**) Intraoperative view. The inferior crux is grabbed and pulled with the fine-toothed forceps to be visualized through the dissection plane. Notice the whitish jelly appearance of it. Another fine-toothed forceps is ready to hold it before the suture is passed through the crux. (**b**) Needle is passed through the inferior crux of the lateral canthal ligament with a strong and sharp bite, of a 6/0 nonabsorbable monofilament suture

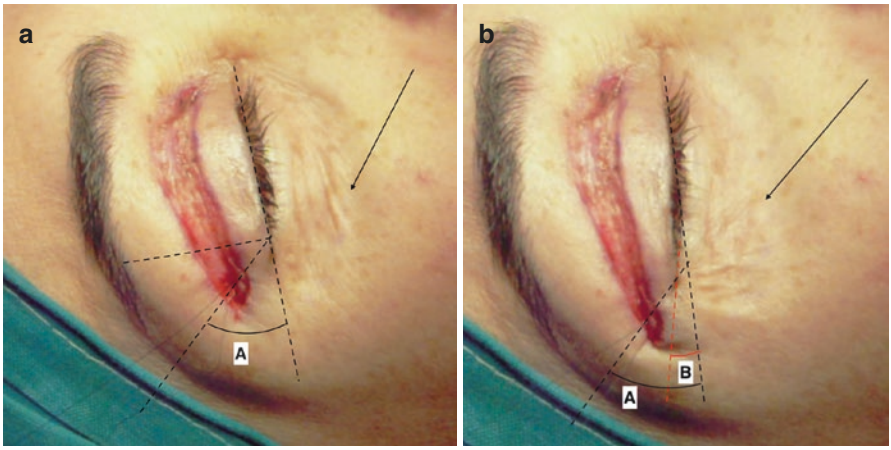

Fig. 5.10 (**a**) Intraoperative view of lower eyelid before traction and with suture in place, but not tightened. Vector of traction in most cases is at an angle of 35°–45°. *Angle A* is formed by the line connecting the medial to the lateral canthus and its vertical. The *arrow* shows the lower eyelid skin wrinkling due to the aging process. (**b**) Intraoperative view of lower eyelid with traction applied but without suture anchoring on the periosteum of the orbital rim. Interesting to observe the following points: *Angle A* reduced compared to the one before traction; *angle B* is newly formed after traction and shows the upward movement of the lateral canthus in relation to the line connecting the medial and lateral canthus; *black arrow* shows the correction of skin wrinkling due to the upward traction of the inferior crux, compared to the picture (**a**)

Basic considerations prior to securing the suture knot on the periosteum are as follows:

- Avoidance of lateral eyelid region dislocation and unnatural look
- Excessive traction, which can lead to the loss of lower eyelid tarsal plate contact with the sclera
- Asymmetric traction of the two eyelids

Fig. 5.11 The needle is inserted in deep plane to involve all structures down to the periosteum of the orbital rim. An upward movement of the needle after insertion and prior to pulling it out of the tissue secures correct plane of insertion

Provided these points have been considered, the needle is inserted deep in the muscle and underlying structures, at the desired point of vector, on the orbital rim scratching the bone to secure periosteum involvement, and the knot is gradually tied. After needle insertion and before passing it through the tissue, an upward movement with the needle holder ensures strong and stable position and correct plane of insertion. If the upward movement is loose, the needle is removed and reinserted in a deeper plane to involve an en block bite of all the structures down to the periosteum (Fig. 5.11).

Tying the knot of the suture is quite challenging. This knot is actually acting like a splint at this point. It holds the plicated tissue in a newly formed position till the healing process is completed and adhesion is produced, most likely 2–3 weeks after surgery. The suture, after this period of time, has no pulling or holding effect, since the newly formed fibrotic tissue is supporting the new position of the lateral canthus. It is not correct to believe that the suture should always be completely tightened when the knot is placed, as in normal suturing procedures. The loop of the knot can be loose, provided that the pulling effect will be the desired one and the lower eyelid will have been repositioned to the appropriate position.

I have found that in the majority of patients, the loop of the knot stays loose, and the action is completed when I have moved the lateral canthus at the desired position. It is also important to point out that, moving the loop downward to secure it, the tying of the knot stops at this certain point, where I see the lateral canthus gradually moving upward and reaching the desired position (Figs. 5.10a, b and 5.12).

Complete tightening of the suture very often leads to an unnatural postoperative look and overdisplaced lateral canthus, a very annoying complication for the patients. Removal of the suture and new traction, within maximum 1 week after surgery, protect from permanent displacement of the lateral canthal angle.

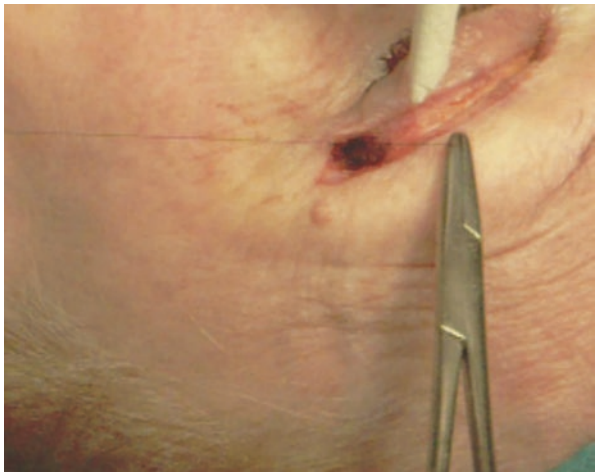

Fig. 5.12 The knot is gradually tightened always observing the amount of lower eyelid traction. The knot loop may stay loose, provided that the desired amount of traction has been achieved

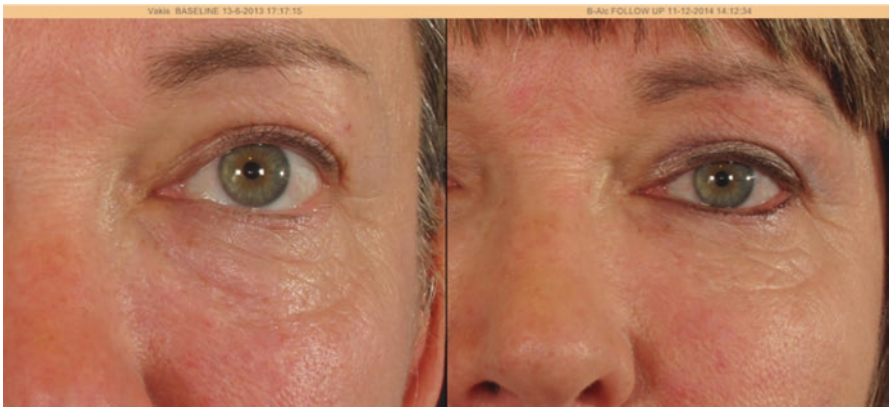

Fig. 5.13 Before and after pictures of a patient with SSTT of the lower eyelid as a part of a minimal upper blepharoplasty procedure. Observe the correction of lateral scleral show, the youthful "almond-shaped" look of the eye postoperatively, and the adequate correction of the lower eyelid skin sagging and texture

Following completion of the SSTT, skin closure of the upper eyelid incision is performed.

I believe that the SSTT is an excellent tool for the correction of lower eyelid aging manifestations and more particularly for the scleral show induced by the progressive gravity effect on the lower eyelid and the skin texture damage by aging (Fig. 5.13).

SSTT is also very effective in the correction of lower eyelid postoperative complications. These properties will be discussed in Chap. 6.

Table 5.1 The single-suture traction technique (SSTT)

Incision	Use the existing upper blepharoplasty incision In patients with lower blepharoplasty only, make an extra 8–10 mm incision along the upper eyelid crease, above the canthus. Place the incision correctly in the exsisting eyelid crease
Dissection	Create a submuscular plane toward the lateral canthal angle and proceed to tunneling Secure hemostasis Extend the dissection 5–6 mm in the lower eyelid anatomic unit Enlarge the opening of the muscle for easier access
Inferior crux of lateral canthal ligament management	Use toothed forceps to identify and pull the inferior crux of the canthal tendon Avoid injury of crux Visualize the crux Securely pass a 6/0 nonabsorbable monofilament suture through it Check stability of the suture with gentle pull Secure that only the inferior crux is perforated with suture
Suspension	Pull at 35°–45° toward the orbital rim Insert needle to secure en block involvement of tissue down to the periosteum of the orbital rim Progressively tie the knot Not necessary to completely tighten the knot; a loose loop is also enough to create traction Secure the knot Suture the upper eyelid incision

Patients should be instructed to avoid rubbing and traction on the operated area for 1 week. Ice packs for 48 h reduce the risk of bruising and swelling

5.3 Tips and Tricks of the Technique

As in other chapters, I prefer to summarize the tips and the tricks of this very useful technique, for easier reading and overview. For details, refer to the relevant text of this book (Table 5.1).

Suggested Reading

1. Fagien S. Advanced rejuvenative upper blepharoplasty: enhancing aesthetics of the upper periorbita. Plast Reconstr Surg. 2002;110:278–91. PubMedCrossRef.
2. Jacobs S. Prophylactic lateral canthopexy in lower blepharoplasties. Arch Facial Plast Surg. 2003;5:267–71. PubMedCrossRef.
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Most Common Complications in Blepharoplasty and How to Avoid Them

6

6.1 Preoperative Assessment

Preoperative assessment is the cornerstone in preventing complications in blepharoplasty. It should be performed precisely and in all means to completely understand the patients' desires, clinical history, and psychological status. The orbit and the eyelids are the prominent anatomical regions of the face, the first areas to look at when you communicate to people. Therefore, attention should be paid to avoid all these factors that can lead to an unlucky result, which will make the patient suffer for life.

In the initial assessment, patients are encouraged to express their desires and concerns regarding the aesthetic appearance and functional features of their eyelids. I use to ask my patients to stand in front of a mirror to help them explain what they are bothered from their appearance. If they have difficulty in demonstrating what they would like to be changed in their eyelids and periorbital area, I promote discussion or present alternatives, until clear agreement occurs; otherwise, I avoid surgery with them. It is very important to identify patients' concerns and realistic expectations before taking a decision for surgery.

Unrealistic expectations of patients may vary a lot. I have consulted patients who in their initial assessment expressed desires for full emptiness of the upper eyelid or absence of eyelid fold, patients with normal lower eyelids who would like correction of skin pigment disorders with a blepharoplasty, operated patients with good postoperative outcome who wish further correction, patients who consider aesthetic surgery as a commodity or lifestyle trend and demand return to their everyday activities next day or the day after surgery, or others who have scheduled events or travels and want their blepharoplasty operation just prior to these activities. Heavy smokers also who deny to limit this habit for a certain period of time before and after operation are prone to prolonged healing process, edema, and bruising, and should be handled accordingly.

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However, it is very important for the surgeon to identify which of those unrealistic patients can be educated and convinced for the operation under the specified instructions, and who cannot.

I have found that an approximate proportion of 70% of unrealistic patients are finally convinced to my instructions and postoperative course, proceeding to surgery in full confidence, compared to the 30%, who deny compliance, and I decide to avoid surgery with them.

Once patient's concerns and realistic expectations are identified and agreed, a full clinical history and examination of the eyes and eyelids should follow.

The clinical history should investigate underlying hypertension, diabetes, coagulation disorders, keloid or hypertrophic formation, allergies, cardiac, or thyroid problems. Medication treatments are also an important issue to be clarified. Patients taking aspirin or other anticoagulants should discontinue use for 5–10 days. The use of carbon dioxide laser dramatically reduces the risk of intraoperative bleeding, and I have operated patients under such treatments who stopped the use for 3–5 days preoperatively with no increased incidence of bleeding. Patients who are in administration of vitamin E, hormones, contraceptives, or herbal medications should stop them, if possible, up to 2 weeks preoperatively, as in some of them who disclosed these treatments after surgery, I have noticed prolonged postop edema formation and increased bruising risk.

Clinical examination should exclude problems with strabismus, orbital, or eyelid asymmetry, difference of palpebral fissure aperture, exophthalmos, concomitant eyelid lesions, brow ptosis and asymmetry, true ptosis, lid retraction, inferior scleral show, lid laxity, dry eye syndrome, conjunctivitis, or allergic diseases of the eye and eyelids. Some of these manifestations such as eyelid asymmetry, different palpebral aperture, and exophthalmos, if existing, may be magnified after blepharoplasty, and patients should be informed (Figs. 6.1, 6.2, 6.3, 6.4, 6.5, and 6.6).

In decision-making for the technique to be performed, determination of skin and muscle laxity, fat prolapses, wrinkling of lower eyelid, existence of festoons or malar pads, and of course ethnic facial features should be importantly considered. The open or transconjunctival laser technique should also be decided according to the clinical evaluation of the lower eyelid, since in the upper eyelid, the use of laser, as described in previous chapters, is considered as of great value.

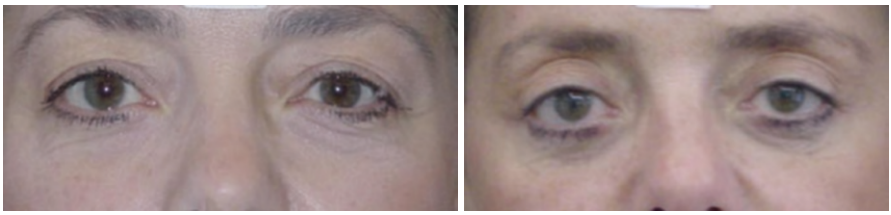


Fig. 6.1 Patient with asymmetric palpebral fissure aperture and lesion located on the ciliary line of the (*L*) upper eyelid. Blepharoplasty was combined with (*L*) eyelid lesion wedge excision and (*R*) lower eyelid traction with SSTT to achieve better symmetry

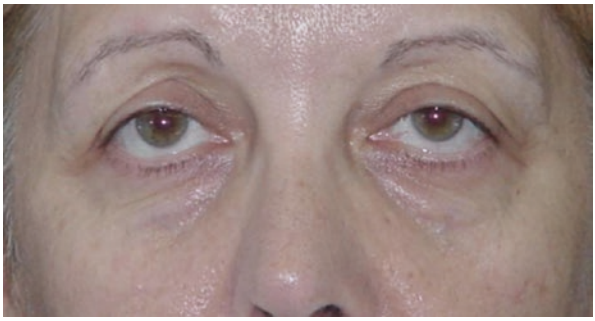


Fig. 6.2 Patient with prominent bilateral scleral show candidate for SSTT

Fig. 6.3 Patient with asymmetric eyelid fissure aperture due to true ptosis of (*R*) upper eyelid. This patient had undergone an ENT surgery for an acoustic neuroma, which resulted in a Horner's syndrome-like complication

Fig. 6.4 Excessive (*R*) upper eyelid ptosis and mild (*L*) upper eyelid ptosis with concomitant bilateral sclera show. These cases should mainly aim for the functional upper eyelid height on both sides and the absence of the upper eyelids' crease

Finally, the application of the SSTT for canthal support alone or in combination with improvement of the lower eyelid skin texture and correction of the canthal angle has to be decided.

Following detailed clinical history and preoperative anatomical issues assessment prior to surgery, photographic documentation is required. Photos are taken in

Fig. 6.5 Patient with a postoperative (*R*) eyelid scleral show, asymmetry of the upper eyelid height, and ptosis due to damage of the (*R*) upper eyelid levator aponeurosis. Management of complications in such cases needs careful decisions for the timing of the correction pampering of the patients and avoiding early postop corrective surgery, due to their impatience

Fig. 6.6 Preoperative view of patient with upper eyelid asymmetry. Different amounts of skin excision and OOM contraction are required for the achievement of postop symmetry

face and profile views. I have found that most patients forget their preoperative appearance soon after the first days of surgery. Some of them are coming back in the clinic, with a range of complaints regarding the amount of correction achieved post-operatively. Photographic documentation has proved to be of utmost importance as an "antidote" to these kinds of complaints, together with the preoperative notes and informed consent.

6.2 Intraoperative and Perioperative Complications

It is within the responsibility of the surgeon to inform the patient for the unlikely potential risk of complications, the rate, and the postop management. Many patients are very well "educated" and informed by the wide use of Internet sites and other social media. They visit the office for consultation inquiring information for specific complications and their management. Reassurance and explanation of how these risks can be prevented are very important.

The gravity of a given complication might be different between the patient and the surgeon, and the postoperative management of them can range from reassurance to surgical correction if needed.

The prevention is therefore the very essential step of the procedure.

6.2.1 Minor and Intermediate Complications

Hemorrhage control during surgery Intraoperative manipulations during surgery are closely related to the early postoperative complications. At this point, I would like to mention that some of these complications should rather been defined as expected side effects rather than real complications (i.e., bruising, edema).

In both upper and lower blepharoplasty, intraoperative care for reduced risk of bleeding with wise and precise use of diathermy for vessel coagulation, at every single surgical step of dissection, or the use of CO_2 laser for dissection as described in previous chapters, prevents from postoperative early side effects like bruising. Moreover, gentle manipulation of tissues during surgery reduces excessive trauma and damage together with the risk of prolonged postoperative edema and healing process.

I have found that patients who undergo the procedure under local anesthesia, but with intraoperative i.v. sedation, are less prone to postop bruising and edema. Sedation reduces intraoperative patients' stress and consequently stress hormones' release from the adrenal glands. Adrenaline, cortisol, and norepinephrine, the three most important stress hormones, can affect the tissue response during surgery, and sedation significantly contributes in reducing this effect. Similarly, peros administration of bromazepam, diazepam, or lorazepam in patients who do not prefer i.v. sedation can offer analogous effect.

Right after surgery is completed, ice water compresses are applied on the eyelids, and I advise my patients to continue using it for 48 h postop. Ice packs and frozen masks have proved to be quite heavy and increase the risk of injuring the very delicate operated area, so I discourage their use. Small-sized balloons filled with cold water are also very effective and more versatile in postop prevention of bruising and edema onset.

Excessive bruising and ecchymosis can occur in patients who do not comply with the surgeon's postop instructions. Exercise, raise of blood pressure with workout or other activities, restless sleep, or heavy food and alcohol intake in the first week postoperatively are also significant etiological reasons (Fig. 6.7)

Overcorrection in upper blepharoplasty As I have described in Chap. 4, Sect. 4.3.1, the correct marking of the skin prior to surgery is a very important step to prevent aesthetic and functional postoperative complications. The minimum distances of incision from the brow cilia border and the ciliary line (existing upper eyelid crease) have to be strictly followed. This will prevent postoperative lagophthalmos and consequent conjunctivitis or keratitis. Transient lagophthalmos can occur for 24–72 h postop due to a range of edema

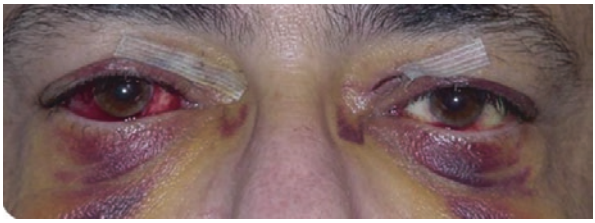


Fig. 6.7 Patient with severe ecchymosis of the lower eyelids and periorbital skin. Chymosis of the conjunctiva is also observed. (*L*) Upper eyelid incision with dehiscence in the medial aspect. Patient presented in the clinic 8 days postoperatively and disclosed alcohol intake followed by severe vomiting on the fifth postoperative day, right after the suture removal

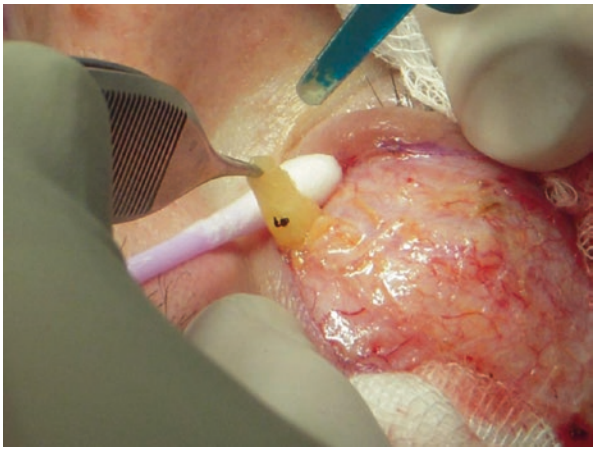


Fig. 6.8 Wet cotton bud used as a backstop right behind the fat before removal with laser

of the upper eyelid, induced intraoperatively and postoperatively. If observed, patient should be reassured and advised to use the prescribed lubricating and antibiotic eye preparations.

Orbicularis oculi muscle resection in upper blepharoplasty has been substituted by defocused CO_2 laser beam contraction, and potential overcorrection is avoided. In cases that resection has been decided, particular attention should be focused to avoid injury of the levator muscle aponeurosis, which lies posteriorly to the inferior part of the preseptal portion of the OOM in the upper eyelid.

Excessive trauma to the levator, levator aponeurosis, or pre-aponeurotic fat pad can result in upper eyelid scleral show, eyelid retraction, and lagophthalmos. Although this complication is very rare, trauma can be induced by cautery overuse at the above areas or excessive laser heat conduction during fat removal. I always use a wet cotton bud behind the prolapsed fat, when removing it, to avoid heat and laser power affect of the underlying structures (Fig. 6.8).

Fig. 6.9 Heavy upper eyelids with extensive dermochalasis, lateral hooding, and fat prolapse (**a**) converted to upper eyelids with fullness, defined eyelid crease, and natural look. (**b**) Patient before and 4 years after surgery. Postoperative picture (**b**) shows the conservative skin and fat removal which resulted in a very pleasant and natural-looking postoperative outcome

Over resection of fat from the upper eyelid retroseptal fat pads is a very annoying and difficult-to-correct complication for the patients.

I have discussed the concept of heaviness, fullness, and emptiness of the upper eyelid in Sects. 2.1.1, 2.2.1 and 4.3.3. The modern trend of maximum tissue conservation in blepharoplasty should always be considered seriously during surgery and in combined balance with necessary tissue removal. The hollow eye "syndrome" observed in aged patients who had undergone overresection of fat in the upper eyelids in the past should be strictly avoided in modern blepharoplasty, which must aim to fullness but not heaviness of the eyelids as a final outcome (Figs. 6.9 and 6.10)

My advice, in aiming to prevent and avoid complications as a result of fat overresection from the upper eyelid fat pads, is to excise fat in small portions, continuously evaluating the residual amount by applying pressure on the eye globe with fingers, prior to each attempt of fat removal. In patients with minimal need of fat resection, controlled vaporization of fat with the CO_2 laser-defocused beam prevents from excessive resection.

Finally, under-resection of fat should also be considered as a complication, especially in the medial fat pad of the upper eyelid. Residual amount of fat at this point results in annoying for the patient, postoperative bulging, many of them complaining and seeking surgical intervention for correction. For details, see Sects. 4.3.3 and 4.5 (Fig. 6.11)

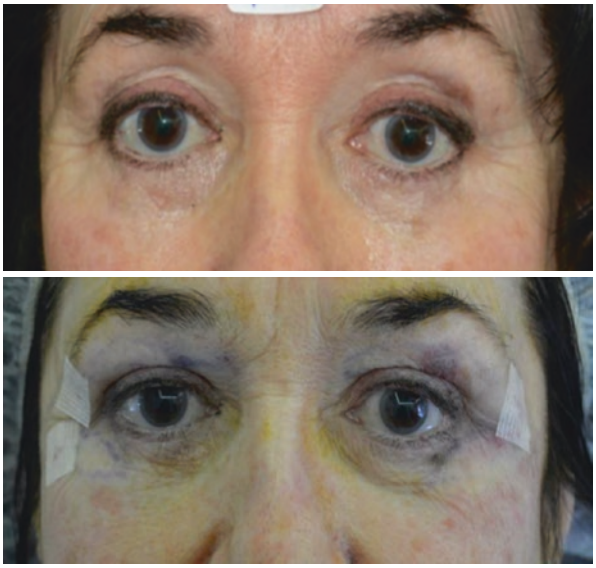


Fig. 6.10 (**a**, **b**) Patient operated elsewhere in younger age, presented with upper eyelid hollowness due to excessive fat and skin removal. Lower eyelid scleral show is also present following bilateral retraction of the lower eyelids. Notice the upper eyelid crease unnaturally raised high due to the over-resection of fat, retraction, adhesion, and scarring, involving the eyelid structures and levator aponeurosis. In picture (**b**), fat transfer to the upper and lower eyelids has restored the fullness and crease formation of the upper eyelid and corrected the scleral show in lower eyelids. Fat transfer to the eyelids is a tricky but very promising procedure, providing surgeons with a very efficient tool for hollowed eyelids correction

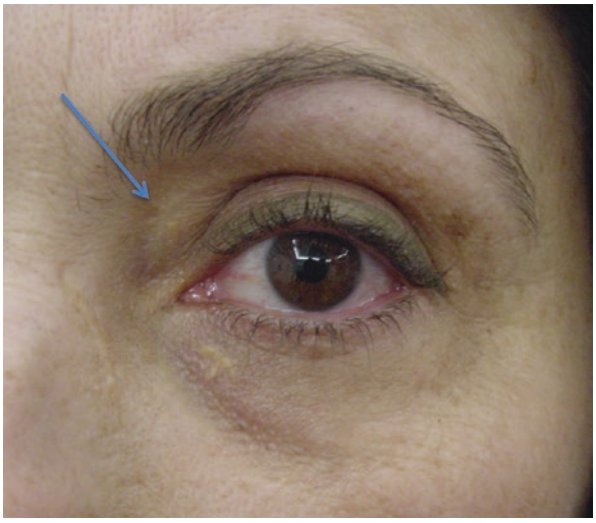


Fig. 6.11 Patient with residual fat in the medial fat pad of the upper eyelid following upper blepharoplasty. This patient presented in our clinic complaining for the residual fat and excessive deepening of the upper eyelid crease following blepharoplasty elsewhere. Further minimal fat excision and fat transfer of the upper eyelid were performed to correct the complication

Over correction in lower blepharoplasty The CO_2 laser transconjunctival approach for lower eyelid blepharoplasty with the addition of the OOM posterior surface contraction with laser-defocused beam together with the application of the SSTT, as extensively described in Sect. 4.4.2 and Chap. 5, has dramatically reduced the risk and complication rate of over-resection in the lower eyelid. Moreover, the extended indications of this technique to patients with more excessive skin laxity and wrinkling, which in the past required transcutaneous skin excision, have minimized complications like webbing or rounding of the lateral canthal angle, lower eyelid retraction, scleral show, and ectropion.

Fat over-resection of the lower eyelid should be prevented as in upper blepharoplasty to avoid hollowness of the eye. Preventive measures similarly apply as for the upper blepharoplasty. Removal of fat in portions and continuous evaluation of residual fat are more demanding in lower blepharoplasty. Vaporization of fat with laser is also a preventive method in patients who require minimal fat excision. Under-resection of lateral fat pad of lower eyelid should also be avoided, as described in Sect. 4.4.2

Despite the fact that it is a very rare complication, particular attention should be drawn in avoiding inferior oblique muscle injury during fat excision of the lower eyelid. Tips and tricks to identify and avoid the injury of the muscle are described in Sect. 4.4.1.

Scarring formation of the posterior lamella (retractors, tarsus, and conjunctiva) postoperatively can lead to lower eyelid retraction and excessive trauma to this area with unnecessary manipulations or laser heat conduction should be avoided. Retraction of the lower eyelid can also occur by scarring in the middle lamella (orbital septum), and manipulations in this area should also be gentle and precautious.

The risks of lower eyelid retraction are significantly reduced with the transconjunctival approach and the avoidance of aggressive dissection. This is because a single and en block incision through the conjunctiva eyelid retractors and capsulopalpebral fascia visualizes the fat compartments with no further dissection.

In open blepharoplasty, the rounding of the lateral canthal angle, a very annoying and unnatural-looking complication, should also be avoided. Apart from the fact that the cicatrization of the medial and posterior lamellae is an important reason for this complication, another reason is the close approximation of the upper and lower skin incisions in blepharoplasty. The scar formation and wound-healing contraction procedure occurring at this point create two opposite traction forces which result in the rounding formation of the canthal angle. A skin flap of at least 5 mm should separate the upper and lower eyelid incision at the lateral canthal angle to release bidirectional contraction of the area and reduce the risk of webbing and rounding (Fig. 6.12a, b).

Incisions and scars considerations The eyelid skin has an excellent healing capacity, probably the most forgiving than any other part of the body. Its extended blood supply and minimal skin thickness are two of the most important reasons.

However, the eyelid skin incisions should never be underestimated in terms of precise and meticulous management.

Fig. 6.12 (**a**) Bilateral canthal angle rounding of a patient operated elsewhere. *Arrows* show the close proximity of upper and lower eyelid incisions resulting in bidirectional traction of the canthal angle by the healing process contraction. A minimum distance of 5 mm between the upper and lower eyelid incisions should allow the intermediate skin flap to act as a relaxing bridge to these contracture forces. Lower eyelid retraction is also apparent on this patient due to excessive skin amount removed, with the consequent scleral show bilaterally. Patient was corrected using the SSTT (see also Fig. 7.10a, b, Sect. 7.3). (**b**) Intraoperative view of upper and open lower blepharoplasty patient. *Arrow* shows the minimum 5 mm distance of upper and lower eyelid incision, to avoid lateral canthal angle rounding

I have never noticed a hypertrophic or keloid scar on the eyelids of my patients, but importantly, occasional widening and hypopigmentation of the incision line has been observed. Patients with darker skin types may be more prone to this complication. In female patients, the makeup camouflage can make this minor problem invisible. However, we should not rely on such solutions, and specific measures must be taken during surgery for improving the postoperative scar quality.

Skin closure of upper eyelid incision should not incorporate any subcutaneous absorbable sutures as the risk of reaction and wound dehiscence is very high. Moreover, there is no need of such suturing since the precise skin closure is enough for uneventful healing process. Prolene suture is ideal for skin closure, and different options of placement are described in Sect. 4.3.4.

However, more important than the type of the monofilament nonabsorbable suture to be used for closure is the correct placement of the initial incision, which

should follow the existing eyelid crease, in order to avoid asymmetry and scarring.

In my blepharoplasty series, I can hardly remember any patient who underwent upper eyelid scar revision of the upper eyelid incision. In patients in whom CO_2 laser was used for skin incisions, in the past, the risk of scar abnormalities was higher due to the reasons I have described in Chap. 3. Despite the fact that sutures were removed in a later time (7–8 days) than those that had incisions with steel blade, (5 days) still the quality of scar was inferior. It is advisable that use of laser for skin incisions should be avoided.

A quite common complication of the upper eyelid scars is the epidermoid cysts, which can appear along the incision line postoperatively. They are called epidermal inclusion cysts and refer specifically to an epidermoid cyst that is the result of the implantation of epidermal elements in the dermis. Unroofing and evacuating the cyst gently with nontoothed forceps provide treatment in such cases.

Redness of the scar for the first 2 months is an expected healing process consequence, and the patients should be informed during the initial consultation.

Wound dehiscence in upper eyelid scars has occasionally been observed in patients with low compliance to surgeon's instructions, restless sleepers, or following injury of the eyelid postoperatively. If dehiscence is serious, surgical correction is necessary. Minor dehiscence can be treated conservatively with Steri Strip support and local eye ointments to speed up the healing process.

Finally, postinflammatory hyperpigmentation can occur occasionally in darker skin type patients, specially if laser has been used for skin incisions.

In conclusion, upper eyelid skin incision and scarabnormalities are not frequent complications, provided that correct placement of initial incision and meticulous closure are performed.

In lower eyelid transconjunctival incision, no sutures are required, as the healing process is very fast and uneventful. In less than 72 h, the incision is completely healed, provided that no traction or injury has occurred in the mean time.

Granulomas can rarely develop along the transconjunctival incision, in the early postoperative stage. I have seen it in two patients who underwent excision of the granuloma with fine scissors after anesthetizing the conjunctiva with local anesthetic eyedrops (Fig. 6.13a–c). This most frequently occurs in patients who do not comply with the postoperative instructions, applying tension on the incision for several reasons such as insertion of contact lenses or excessive wound traction in their effort to apply hydrating or antibiotic agents in the postop period in the eye. Occasionally, granulomas can develop on incisions where excessive postop edema prevents firm contact of the incision edges in the first 24–48 h after surgery, where almost complete sealing of the transconjunctival incision is achieved. This incomplete contact of the wound edges can lead to progressive granuloma formation, which is realized by the patient only some weeks after, due to foreign body symptomatology on the conjunctiva.

In open blepharoplasty procedures, where transcutaneous skin incisions are performed, same management as in the upper blepharoplasty will ensure uneventful healing. Amount of skin excision and correct placement of incision are of utmost importance. Lower eyelid postoperative retraction is directly related to the two above factors.

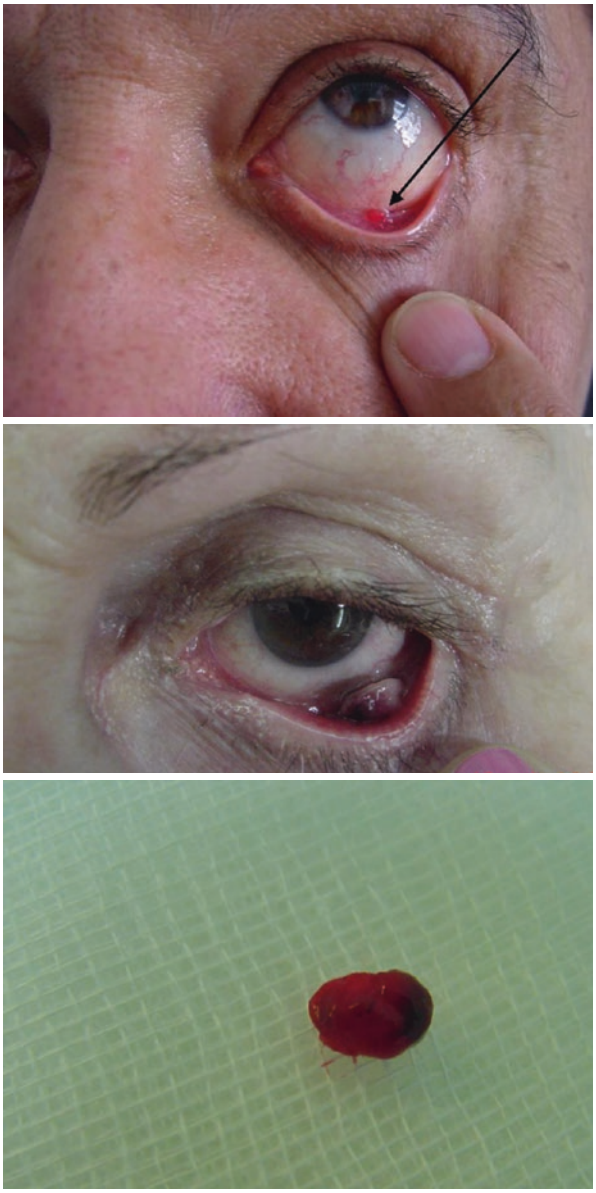


Fig. 6.13 (**a**) *Arrow* shows granuloma formation in the midline of the lower eyelid transconjunctival incision in patient, 4 weeks postoperatively. Granuloma was excised with fine scissors under eyedrops local anesthesia. (**b**) Patient with larger granuloma on the transconjunctival incision, 3 weeks postoperatively. (**c**) Granuloma excised under local anesthetic drops, anesthesia in the office

The lateral, downturning limb of the lower eyelid incision should be placed in existing crow's feet wrinkles to secure inconspicuous scar postoperatively. The subciliary part of the incision must be placed in closest proximity with the ciliary line; otherwise, it will be visible and annoying for the patient. At the lateral canthal angle, as previously described, the minimum distance between the upper and the lower eyelid incisions should not be less than 4–5 mm, to avoid webbing and/or rounding of the canthus (Fig. 6.12).

The skin/muscle amount to be removed from the lower eyelid in open blepharoplasty has to be calculated very precisely. In patients with excessive fat pads, the lower eyelid skin is partially expanded by the bulging of the fat with years. Dissection and removal of postseptal fat creates a concavity, which the myocutaneous flap of the lower eyelid has to redrape, moving from the preoperative stage of convexity. Postoperative flap contraction and underlying tissue adhesions in this concavity create forces which can affect the symmetry of the lower eyelid tarsus and ciliary border (retraction).

Most of my lower open blepharoplasty patients are operated under local anesthesia. Prior to skin removal, I carefully redrape the flap using my forceps, and ask the patient to open the mouth and look superiorly moving the frontalis muscle upward and opening the upper eyelids. These two movements simulate the maximum contraction that the skin flap can undergo postoperatively, and it is a safe method to provide the amount of skin and muscle to be removed from the lower eyelid.

Closure of the lower blepharoplasty incision is done with interrupted sutures 6/0 prolene both for the lateral and the subciliary part. I prefer to cut the sutures long than usual during this procedure, and secure them under Steri Stripin order to prevent annoying of eyelid closure or injury of the conjunctiva. Sutures are removed on the fifth postoperative day

6.2.1.1 Aggressive LSR During Surgery

Adequate knowledge of laser tissue interaction can prevent complications from aggressive laser skin resurfacing (LSR).

The skin of the upper and lower eyelid is very thin and contracts easily with superficial laser skin resurfacing, in low laser power settings. One pass with the laser in the scan mode is enough to contract the skin. In the lower eyelid, the laser skin contraction is complimented by the SSTT which is applying traction on the resurfaced skin, contributing to higher standard results in the correction of skin texture.

Even in lower power settings I have occasionally observed transient ectropion and scleral show which spontaneously resolve after some days. This is due to the vaporization of the superficial layers of the skin and the water absorption by the high temperature induced from the laser beam, resulting in skin contraction and retraction of the lower eyelid (Fig. 6.14).

Postoperative instructions for intensive hydration of the resurfaced area with emollient agents can reduce this risk. Use of dressings, which allow postresurfacing exudation fluid drainage and protect skin from direct exposure to the environment, can also be of important help. Several pharmaceutical agents (including silver sulfadiazine and hyaluronic acid) and occlusive dressings promote wound healing after laser skin resurfacing [4].

However, the main preventive measure for this complication is the conservative skin resurfacing with specific and safe laser settings (Fig. 6.15).

Fig. 6.14 Transient post laser resurfacing scleral show and ectropion on lower eyelids of a patient who underwent LSR of lower eyelids only and no blepharoplasty. Patient presented with this complication on the third postoperative day, and symptoms resolved completely on the tenth postoperative day. Laser settings were minimally higher than the indicated ones, following full patient's informed consent, due to the fact that no further correction was decided for the lower eyelids other than LSR and in an attempt to achieve the maximum of the results on skin texture

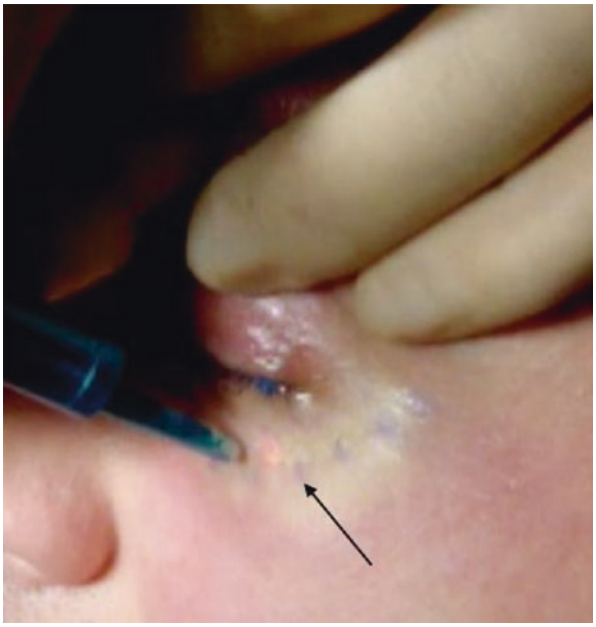


Fig. 6.15 Conservative lower eyelid laser skin resurfacing prevents from postoperative lower eyelid skin retraction scleral show and ectropion. Despite the fact that this complication resolves spontaneously within 7–10 days postop, it is very annoying for the patient and needs treatment with antibiotic eyedrops and natural tear lubricating agents to prevent from dry eye syndrome and conjunctivitis

Permanent complications from aggressive skin resurfacing of the eyelids include scarring, hypopigmentation, and very rarely lower eyelid retraction due to the induced scarring (see Sect. 6.3).

6.2.2 Major Complications

6.2.2.1 Dry Eye Syndrome

Dry eye syndrome, also known as keratoconjunctivitis sicca (KCS), or simply *dry eyes*, is an eye disease in which tear film evaporation is high or tear production is low.

According to the National Health Service (NHS), UK, approximately between 17 and 30% of people have dry eyes at some time in their life.

Dry eye symptoms are common following blepharoplasty, and the risk for developing these conditions may increase with intraoperative canthopexy, postoperative temporary lagophthalmos, concurrent upper and lower blepharoplasty, and transcutaneous approaches violating the orbicularis oculi muscle. Patients with a preoperative history of dry eyes, eyelid laxity, scleral show, or hormone treatments may be at greater risk for developing dry eyes following surgery.

Further analysis of this complication is described in Sect. 7.3.1

6.2.2.2 Retrobulbar Hematoma and Vision Loss Following Orbital Hemorrhage

Deep orbital hemorrhage with vision loss is a very rare but existing complication of eyelid surgery.

The incidence following cosmetic blepharoplasty is estimated to be 1 in 2000 to 1 in 25,000, with the incidence of orbital hemorrhage resulting in permanent visual loss in 1:10,000 (0.01%) [1]

Orbital hemorrhage usually occurs within the first 24 h following surgery but can appear up to a week after surgery. Therefore, it is recommended that operating surgeons should remain readily available to their patients for at least 24 h after surgery in the event of excessive postoperative bleeding.

Incision of the orbital septum and manipulation of orbital fat are likely prerequisites for blindness resulting from postoperative orbital hemorrhage. Hemorrhage within the orbit may result from traction on orbital fat, resection of orbital fat with unidentified intraoperative bleeding, or posterior extension of wound hemorrhage that often results from delayed bleeding in patients with poorly controlled systemic hypertension. Vision loss may ensue from microvascular compression that leads to ischemic optic neuropathy. It has also been postulated that a tense orbit may exceed the mean arterial pressure of the ophthalmic artery or central retinal artery resulting in central retinal artery occlusion. With prompt treatment, vision loss can be reversible after retrobulbar hemorrhage [2].

The risk of postoperative orbital hemorrhage can be limited through very strict and meticulous attention to intraoperative hemostasis. Carbon dioxide lasers may help seal small blood vessels during dissection and limit the amount of deep orbital traction required by conventional clamping and cutting techniques as described in previous chapters.

Identification, recognition, and rapid reaction are the key points for the reverse of this very serious complication. Proptosis of the globe, decreased movement, and increased orbital tension, with associated bleeding, are the clinical signs to be considered. The patient will also have asymmetrical pain and decreased vision. If suspicious that an orbital hemorrhage has occurred, laser eye protectors (metallic scleral contact lenses) block vision and must be removed to assess the visual acuity. Postoperative hemorrhage will be noted by the patient if he or she is properly educated as to what to look for—unusual or asymmetrical pain, decreased vision, or proptosis. Patients must be taught to check their vision, one eye at a time [3].

Detailed evaluation of patient's symptoms, in suspicion of potential orbital hemorrhage, is a very essential action to be taken, prior to any effort for readmission and surgical investigation and exploration of the operated area. My experience, in one of my patients, during all these years of performing blepharoplasties, showed that the readmission of the patient and exploration of the operated sight, as a result of a postoperative hematoma in the left eye 6 h following a blepharoplasty, which alerted me for a possibility of a retrobulbar bleeding, failed the recognition of the symptomatology, and proved to be nothing more than a superficial blood collection in the superficial layers of the lower eyelid with no extention to the fat pads and the retrobulbar cavity. However, the patient's stress and discomfort following one more admission and surgical exploration were very high, despite the happy outcome and final aesthetic result.

6.3 Early and Late Complications

6.3.1 Erythema and Edema

Erythema and edema are the most common adverse effects in the early postoperative period, experienced by patients who undergo laser skin resurfacing. Edema is a normal result of laser and heat injury to the eyelid skin, and resolves soon after surgery. Cold compresses fright after surgery, and for 48 h postoperatively dramatically reduces the risk of prolonged edema.

Erythema is also a very common adverse effect following laser skin resurfacing, and it originally resolves spontaneously (Fig. 6.16). Prolonged erythema for more than 1–2 months may be a sign of more aggressive laser resurfacing. If erythema persists for more than 2–3 months, this might be due to an extensive residual

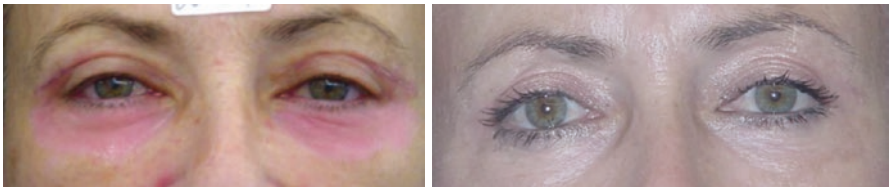


Fig. 6.16 (**a**) Patient with edema and erythema in the early postop period. (**b**) Patient 2 months postop with no residual signs of edema or erythema

thermal injury to the dermis from high laser power settings and aggressive skin rubbing intraoperatively to remove partially desiccated tissue after each laser pass.

In both cases, erythema will resolve but it might take longer period; however, skin protection from sun exposure and hydration is very important. In many cases of prolonged erythema, intensive pulsed light devices have shown to significantly accelerate the period that erythema resolves, following treatments to our patients [5].

Focal areas of persistent erythema may signify impeding scar formation and should be aggressively treated with topical corticosteroids. Some times, erythema might be a reaction to contact sensitization to local agents used during the postop period. If allergic reaction to these compounds is suspected, they should be discontinued.

In general, erythema and edema following eyelid laser skin resurfacing are very frequent and disturbing to the patient. All patients should be aware of these complications, and informed consent must have been signed. The high-standards final outcome of LSR has to be pointed out, but always in combination with the adverse effects which can occur.

6.3.2 Hyperpigmentation

Laser skin resurfacing of the eyelids can lead to postinflammatory hyperpigmentation. It occurs mostly after the period of erythema (30–45 days postop) and can last for months. Darker skin types, Fitzpatrick scale IV–VI, are more prone to hyperpigmentation following laser skin resurfacing (Fig. 6.17). Overall, in 35% of patients who undergo laser skin resurfacing, hyperpigmentation occurs as an adverse effect.

In my practice, the incidence of hyperpigmentation has significantly been reduced with preventive IPL treatment to patients who are prone to this adverse effect, and before the onset of it, at the stage of erythema.

Treatment of hyperpigmentation mainly consisted of application of compounds consisted of hydroquinone in combination with kojic or glycolic acid, hydrating agents, and corticosteroids. The treatment should be intensive in order to avoid worsening of the hyperpigmentation, and patients should be aware of the mild side effects of this treatment, such as contact dermatitis, irritation, itching, or erythema formation. The use of sun blocks is mandatory during the treatment.

Fig. 6.17 Postinflammatory hyperpigmentation 2 months postoperatively in patient who underwent lower eyelid skin resurfacing

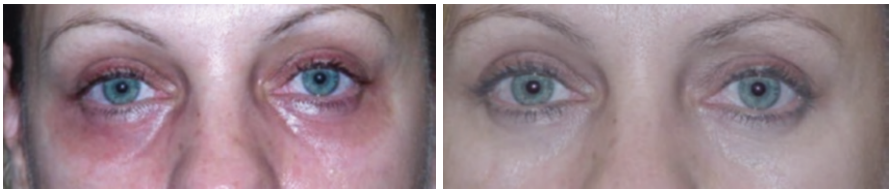


Fig. 6.18 (**a**) Patient with postinflammatory hyperpigmentation (PIH) after upper and lower blepharoplasties in combination with lower eyelid laser skin resurfacing, 1 month postop. (**b**) Patient 6 months postop with completely resolved symptoms of PIH. Local hydroquinone compounds in combination with IPL treatments were used. IPL treatments were applied in an interval of 3 weeks

Preventive measures preoperatively, such as application of hydroquinone, tretinoin, or glycolic acid preparations, have not proved to reduce incidence of post laser resurfacing hyperpigmentation despite their enthusiastic introduction in the early period of CO_2 laser skin resurfacing applications.

Hyperpigmentation following laser skin resurfacing of the eyelids is an annoying side effect for the patient, but in most cases, following either local or IPL treatments, resolves with time.

Prolonged hyperpigmentation is a frequently encountered side effect of laser skin resurfacing. We have found intense pulsed light to be effective in the treatment of erythema and hyperpigmentation resulting from laser skin resurfacing in the periorbital area [5].

Prevention has also significantly been achieved with IPL treatments at the early onset of the complication (Fig. 6.18a, b)

6.3.3 Residual Eyelid Fat PostOperatively

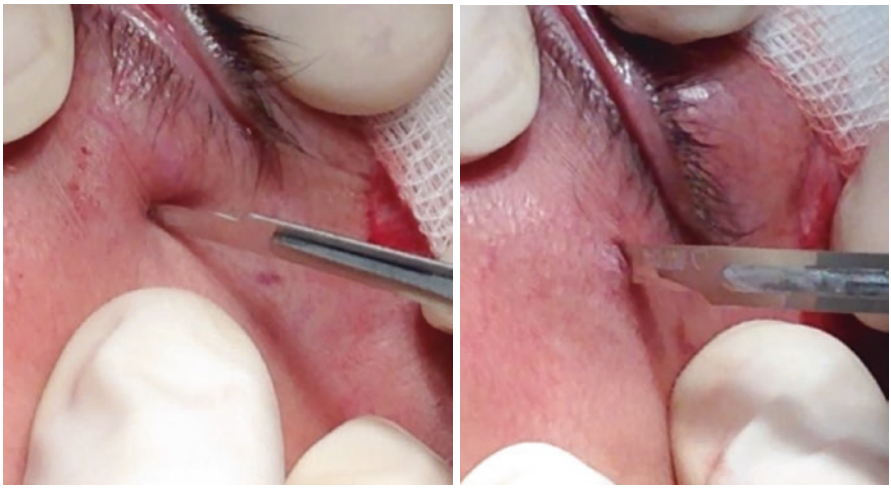
This is a complication resulting after undersection of fat during surgery and in patients where fat resection is indicated. Most common points of residual fat is the medial fat pad of the upper eyelid and the lateral fat pad of the lower eyelid. This residual fat is obvious when looking at the patient and without any manipulation of the eyelids, like application of pressure or upward and downward movement of the globe. This is the reason which brings the patient to the office with this kind of complaint. The precise fat pad management as described in Sect. 4.3.3 will prevent from the onset of this complication.

However, in the unlikely situation that this occurs, surgical intervention and additional fat resection are required to solve the problem.

In all of the patients who required this correction, I have applied the transdermal fat correction, avoiding long incisions and reducing dramatically the postoperative downtime.

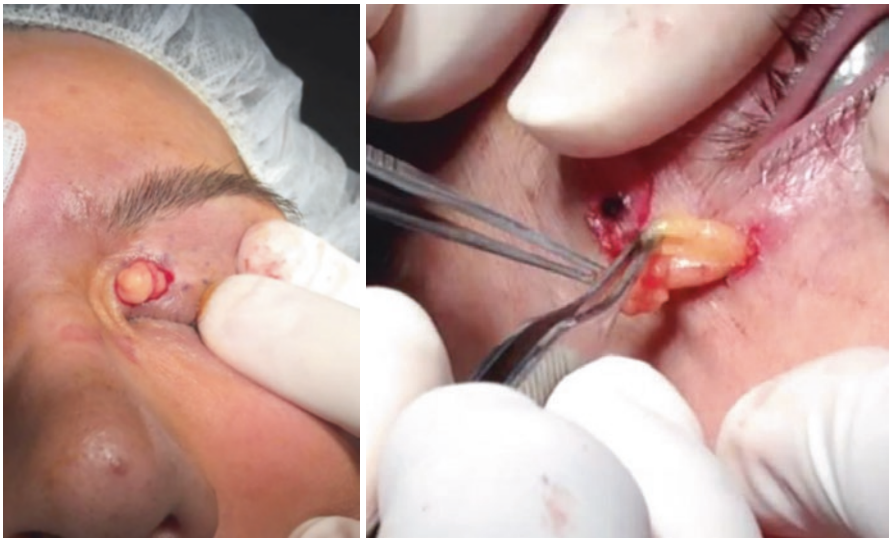
The technique consisted of precise localization of the fat to be resected by applying pressure to the globe and marking the protruding fat (Figs. 6.19 and 6.20). Local anesthesia is then injected and let to sit for 10 min for maximum vasoconstriction.

Figs. 6.19 and 6.20 *Arrows* show the localization of the residual fat to be resected in upper and lower eyelids, prior to anesthesia injection



Figs. 6.21 and 6.22 Stab incision over the localized fat to be resected through the skin and orbicularis oculi muscle down to the fat

A stab incision over the protruding fat under permanent pressure of the globe is then conducted all the way down to the fat pad, and through the skin and the orbicularis oculi muscle (Figs. 6.21 and 6.22).



Figs. 6.23 and 6.24 Fat protruding from the stab incisions of the upper and lower eyelids

In most cases, the fat is easily identified popping out from the stab incision both in the upper and the lower eyelids (Figs. 6.23 and 6.24).

The fat is then trimmed and let to retract back to its position. In some patients who decide to have this correction long time after the initial operation, postoperative adhesions can make the identification of the fat to be resected more difficult, and in very rare cases the stab incision has to be extended, and dissection with blunt scissors might be necessary.

When the fat is trimmed, application of pressure over the wound and cold compresses will reduce the edema and potential minimal bleeding. If stab incision is only used, no sutures are required, and Steri-Strip application will result in excellent wound healing and inconspicuous scar.

6.3.4 Skin Under-Resection

Skin excision in upper and lower blepharoplasty is a very important step of the operation. The introduction of laser has minimized complications related to over-resection of skin in lower blepharoplasty, using the transconjunctival incision, as previously described in detail in Chaps. 3 and 4.

To my experience complaining patients for skin under-resection and aesthetically unsatisfactory results due to excess of remaining skin after a blepharoplasty are mainly focusing on the upper eyelid appearance and precisely on the lateral hooding that might occur in such cases.

In the lower eyelid, mild skin excess after a blepharoplasty is rather not annoying for the patient and can be addressed with different nonsurgical methods if present. Moreover, it is more understanding and acceptable by the patient that conservative skin excision of

the lower eyelid, if transconjunctival incision has not been applied, is a necessary measure to minimize major complications such as scleral show, ectropion, etc.

Many patients have unreal expectations from a blepharoplasty operation, and this is something that has to be seriously considered by the surgeon in the preoperative consultation in order to explain precisely the correct steps to be undertaken. The terms heaviness, fullness, and emptiness, as described in Chap. 4, have to be extensively explained to the patient in order to avoid postoperative complaints.

The limit between the over-resection and under-resection of skin is difficult to be determined. There are several tricks to define the precise amount of skin to be excised and points that have to be considered during surgery to achieve this. The most common and efficient one is the skin "pinch test" with nontoothed forceps, with the eyelids of the patient closed. This will ensure appropriate skin excision and avoidance of lagophthalmos or other complications postoperatively. The upper and lower parts of the incision are then marked at the point of the forceps edges (see Sect. 4.3.1).

Another point, simple to say but important to apply, is the effort to be taken during prepping of the eyelids prior to surgery, not to remove or erase the marked lines of the incision. To my experience, random skin incision is a very risky step and should be avoided, considering that with the local anesthesia infiltration, the anatomy is seriously distorted and mistakes can be irreversible. The lines of the incision on the upper eyelid should be redrawn if not definitely recognized prior to skin incision.

The supine position of the patient is another factor, which distorts the appearance of the upper eyelid compared to the upright position. This is why assessment of eyelid tissues, fat compartments, and muscle excess should always be done with the patient in the upright position; marking and key points should follow, and decisions for surgical steps should be taken only at this stage.

Skin under resection of upper eyelids usually occurs due to wrong assessment preoperatively, or, in many cases, due to mistaken marking or erasing by prepping or other maneuvers, of the marked lines just prior to the incision. As stated above, prepping products and infiltration fluid, together with the surgeons' maneuvers on the eyelid skin, act as erasers of the marked lines. At this point, the already injected anesthesia has distorted the upper eyelid, and the swelling will mislead the surgeon to a potential wrong-placed incision, which is difficult to be corrected. Important role will be played by the relocation and remarking of the upper eyelid incision lines prior to any effort for skin incision.

Under resection of the upper eyelid, skin becomes obvious 4–6 weeks postoperatively when swelling and micro-edema have completely subsided, and patients are more likely to start complaining at this stage. In patients where upper eyelid skin under resection is unilateral, the problem becomes more obvious, and correction in most of them is necessary (Fig. 6.25).

Correction of under-resected skin can be managed either with skin contraction with laser or radiofrequency if available, or with further skin excision of the eyelid, which in most cases is permanent and more efficient. Sometimes, patients prefer the first option to avoid longer downtime due to postoperative swelling, possible ecchymosis, sutures, dressings, etc., even if minimal erythema from laser treatments or nonpermanent results with radiofrequency devices cannot guarantee the final and long-term outcome.

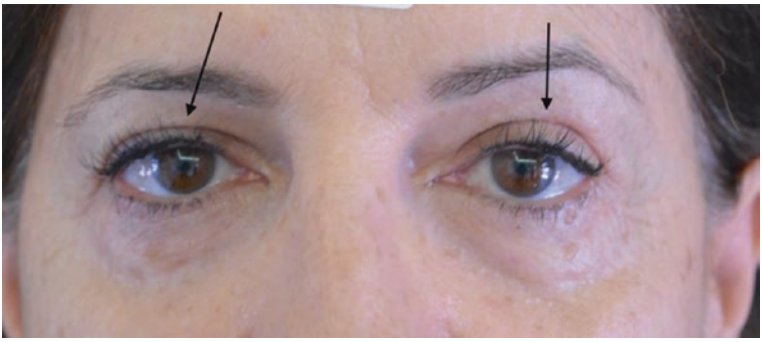


Fig. 6.25 Patient 6 months postoperatively with an upper eyelid blepharoplasty operated elsewhere. The surgeon underestimated her complaints and refused correction. Patient visited our clinic with this upper eyelid unilateral skin under-resection on the (*R*) side. The skin excess was treated with excision under local anesthesia

6.4 Patients' Compliance and Postop Instructions

As in every medical and surgical procedure, the postoperative instructions to the patient are considered as a very important part of the operation. Moreover, the patients' compliance can be considered as an even more important part.

Practical advices, instructions for avoidance of specific medications, of exercise, and other necessary postoperative actions have been described separately in the previous chapters. However, it is advisable that specific effort and supervision have to be taken in order to convince patients with minimal compliance attitude to follow the postop instructions.

The first effort should start during the preoperative consultation, where the surgeon has to be able to detect the patient's future compliance. A detailed description of the undesirable effects in the opposite case has to be transferred to the patient.

In our clinic, apart from the informed consent that the patient signs prior to surgery, the postoperative instructions are not only mentioned during the consultation, but also given in written by the staff and signed by the patient. These instructions contain a list of the following:

- Medication to be avoided before and after surgery
- Actions to be taken if the patient is under specific medical treatment in cooperation with his general practitioner
- Instructions to quit or reduce smoking habits in smokers, exercise, everyday activities to be avoided, time frame of traveling, or social activities participation, and detailed program of postop follow-up appointments

A telephone call in the meanwhile period of the appointments to discuss the postoperative course is regularly organized from the clinic staff. Patients have also available a telephone number to call in case of emergency at any time.

Follow-up visits are scheduled on days 3, 5, 7 15, and 30 postop if the course is uneventful. Long-term visits are also organized 3, 6, and 12 months postop. In our series of patients, a high proportion of them are also willing to attend 2, 4, and 6 years follow-up after reminder calls from the clinic staff which are automatically and regularly appearing in the patients' computer data, provided by our clinic.

Compliance to the above postoperative schedule is achieved following organized and supervised effort of the staff in a proportion of 68% according to our data.

To our experience, patient's compliance to postop instruction has proved to be an excellent tool both for practical reasons such as minimization of complications and scientific ones for the long-term evaluation of our services. Moreover, this continuous contact with our patients affects interestingly high the rate of other treatments or procedures undertaken by our operated patients in the clinic, postoperatively.

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Suggested Reading

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How to Treat and Correct Complications

7

7.1 The Patient's Management After a Complication

Blepharoplasty is one of the most successful and gratifying operations in facial plastic surgery. Although blepharoplasty operation has a high rate of success, surgeons must always be alert and avoid complacency in their surgical technique. Patients are often unaware of the complexities of eyelid surgery; so thorough patient information and inclusion in management decisions is essential. Even the most skilled aesthetic eyelid surgeon will encounter surgical complications at some point during his career. The experienced surgeon recognizes that many complications can be minimized with thoughtful preoperative planning and careful, meticulous and precise surgical technique. Nonetheless, complications can occur with the best techniques in the best of hands.

The patients' management after a complication is a very important issue and has to be dealt with care and understanding. Early identification and diagnosis of the problem will significantly enhance the final outcome. Therefore, no compromises are allowed, and symptoms should always be considered seriously and precisely.

Patients should be aware of the existing problem right after the diagnosis of a complication is definite by the surgeon. This is more important in patients who appear with relatively more severe complications such as hematomas, dry eye syndrome, lagophthalmos, ectropion, lower eyelid retraction, etc.

Minor complications which are proved to be resolving spontaneously should also include patients' awareness and information to avoid undesirable upset and stress in the postoperative period. Reassurance in such cases and instructions for treatments or other measures will help in faster solution of the problem. Most frequent minor to intermediate complications include

- *Hematoma-ecchymosis-bruising*
- *Conjunctival chymosis*
- *Dry eye syndrome—epiphora*
- *Levator muscle impairment—ptosis*

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- *Post CO2 laser resurfacing erythema and hyperpigmentation*
- *Scarring-rounding*
- *Scleral show*
- *Residual fat protrusion*
- *Infection*

Major complications that can lead to long-term problems and need more specific care and evaluation are as follows:

- *Retrobulbar hematoma and vision loss*
- *Severe ectropion*
- *Lower eyelid retraction*
- *Lagophthalmos*

7.2 Decision-Making and Timing of Correction

It is more than important, the timing of correction, for any of the above complications to be decided in sobriety and composure, with no sentimental affect to the surgeon's decision from the justified pressure of the patient for solution of the problem in the shortest time frame possible. Patients with any kind of complications can develop very serious psychological effects, for several reasons, such as professional, social, personal, etc., which are directly associated to their appearance and the expected long downtime ahead. Detailed explanation of the measures that have to be applied for the correction of a complication should be discussed with them and the possibility of an inadequate or failed final outcome revealed, if inappropriate decisions related to the above mentioned facts are to be taken.

I have found that the majority of patients that presented with, most commonly, minor complications overexaggerate the situation, pressing for quick and accelerated treatment. Dedication of time, pampering, and explanation of anatomical and physiological factors that have contributed to the complication, together with appropriate layout of its management, have proved to be very helpful in increasing the patient's compliance to my decisions and time frame of the correction.

Complications which do not need any further surgical intervention for their resolution, such as excessive postoperative edema, bruising, minor hematomas, ecchymosis, mild chemosis, or dry eyes have to be addressed as soon as they are diagnosed with appropriate medical treatment or other procedures which can be helpful. The use of low-level laser treatments (LLTT), light treatments, lymphatic drainage massage treatments, etc. can adequately improve the postoperative course of the patients who present with prolonged edema, bruises, minor hematomas, post laser erythema, or hyperpigmentation and significantly reduce the patients' discomfort and impatience. Closer and more frequent follow-up is also an important factor to keep the patient reassured and relaxed.

Complications that will potentially need further surgical intervention in the future have to be initially addressed with conservative treatments, which will

improve the postoperative early surgical sequelae of the tissues involved. These include minor or major scleral show, ectropion, lower eyelid retraction, and lagophthalmos. On the contrary, early incision dehiscence due to trauma, incorrect intraoperative wound closure, or patients' incompliance to postoperative instructions in the first week following surgery has to be corrected when diagnosed, with wound debridement and resuturing. Late scar dehiscence needs to be addressed differently and at a later stage, with scar revision.

Surgical correction of persisting lagophthalmos, scleral show, ectropion, or lower eyelid retraction has to take place at later postoperative stages, depending on the evaluation of the tissue's postoperative course and quality. To my experience, shortening of the postoperative interval of the correction, due to patients' impatience, has mostly led to unlucky and unfavorable results which create a new vicious circle with unpredictable effects both to the patient's psychology and to the tissue itself to be recorrected.

7.3 Correction of Complications

Depending on the kind of complication, appropriate measures should be undertaken to address them, as stated above. Patient should be informed of what he might consider as a complication than a common postoperative effect in the first postoperative days and reassured. In the existence of a complication, the surgeon has to frankly announce and explain to the patient the plan of treatment. Most common complications and their treatment are described below.

7.3.1 Conservative and Nonsurgical Management of Complications

7.3.1.1 Postoperative Bruising, Ecchymosis, and Edema

Although these side effects are very common and expected, following a blepharoplasty operation, many patients become very stressed when they appear and despite the fact that they have been aware of such sequelae. Postoperative edema usually worsens during the initial 24–48 h after surgery. The degree of swelling is often directly related to surgical factors such as ecchymosis, excessive cauterization, extensive tissue manipulation or excision, and dissection in the lateral canthal area resulting in lymphatic disruption. Therefore, measures to avoid such intraoperative manipulations should be taken in order to reduce the incidence of severe edema. Moreover, ice water compresses right after surgery and continuous use for 72 h reduce the possibility of severe edema and bruising.

If, even though, the onset of severe and bruises cannot be avoided, either medication or other treatments can help to delay further deterioration and resolve the problem faster.

Use of Arnica orally or locally has been claimed to help, and some patients ask for this even without mentioning them the treatment.

Light treatments with low-emission diode (LED) high-intensity phototherapy devices, emitting in red and near-infrared spectrum, have also proved to help in wound healing and as anti-inflammatory tools. Everyday treatments postoperatively during the first week help in accelerating edema and partial bruising resolve. Low-level laser therapy with devices emitting in the same spectrum as LED provide the same results.

Massage-induced lymphatic drainage is also very helpful. Special exercises instructed to the patients using their fingers and applying smooth and efficient pressure periodically on the affected area have also been advocated in our practice in such cases.

Treatments start right after diagnosis of severe or annoying edema in the first follow-up visit of the patient.

7.3.1.2 Conjunctival Chemosis

Chemosis of the eye is a medical condition, in which the conjunctiva of the eye becomes swollen. The condition is mainly caused by the exudation of the small capillaries of the eye, presenting an abnormal permeability. Chemosis occurs when the eye has been irritated, representing however a nonspecific sign. The conjunctiva will appear as if having liquid in it. The inflammation of the conjunctiva leads to an overall gelatinous appearance. The degree of the swelling varies from one patient to the other and, sometimes, it can become so inflamed that the patient will have difficulties closing the eye (completely or partially). Due to the inflammation, the eyeball might appear as if moved from its original position (it should also be noted that the eyeball is not covered by the excess fluid) (Fig. 7.1).

The cause of conjunctival chemosis is multifactorial, and includes exposure, periorbital edema, postoperative lymphatic dysfunction, mechanical injury during surgery or pharmaceutical agents. It appears intraoperatively or in the first postoperative week, with an average duration of 4 weeks, depending on the mechanism which caused it.

Authors have classified chemosis in four different types as follows [1]:

1. Acute mild chemosis with complete lid closure
2. Acute severe chemosis that prohibits complete lid closure (chemosis-induced lagophthalmos)

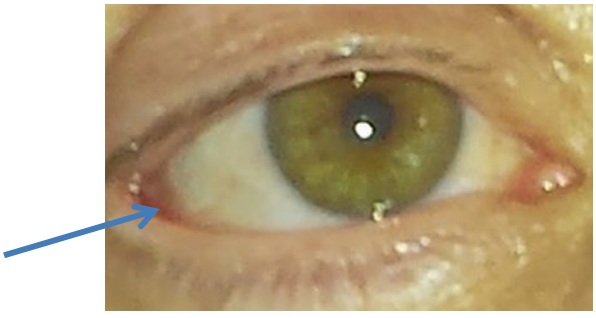

Fig. 7.1 Conjunctival chemosis

3. Subchronic chemosis that persists longer than 3 weeks and
4. Chemosis associated with lower lid malposition

In most cases, chemosis resolves spontaneously with the use of local lubricating and anti-inflammatory agents.

Transconjunctival incision can be a triggering factor of chemosis formation, particularly if not performed accurately and precisely. Transconjunctival infiltration of local anesthetic solution in lower blepharoplasty in a superficial plane under the conjunctiva might also cause chemosis due to dispersion of fluid under the conjunctiva. In both cases, the effect is temporal and resolves with local treatment in due course.

Surgical procedures for fluid drainage with conjunctivectomy or temporary tarsorrhaphy have also been reported, but in very rare cases. Prevention of chemosis-triggering factors during surgery is the most appropriate and important procedure to avoid this complication.

7.3.1.3 Dry Eye Syndrome and Epiphora

This quite common complication following a blepharoplasty operation can be triggered by several factors such as intraoperative canthopexy, postoperative temporary lagophthalmos, concurrent upper and lower blepharoplasty, and transcutaneous approaches violating the orbicularis oculi muscle.

Patients may experience dry eyes within the first few weeks after surgery. Persistent dry eye can occur and, in some cases, can be due to a preexisting problem or a surgical complication.

Some factors that can make it more likely to develop dry eyes after an upper eyelid blepharoplasty include thyroid problems, bulging eyelids, prior history of dry eyes, poor eyelid skin tone, weak eyelid ligaments, certain autoimmune diseases, defects in the tear duct pathways, as well as removal of too much eyelid skin during surgery, or significant postoperative swelling.

When these factors can be identified preoperatively, measures can be taken to avoid or reduce the risk of permanent dry eye. Depending on the nature of the problem, a conservative eyelid skin removal may be needed. In other patients, special lid-tightening procedures, such as SSTT, can be performed in addition to eyelid surgery to avoid problems. In some cases where there is a high risk of developing dry eyes, complete avoidance of blepharoplasty surgery may be advised.

Treatment of dry eye early on after a blepharoplasty includes the application of natural tears or medical eyedrops as well as lubricating ointments to keep the eyes moist. If dry eye persists for more than a few weeks despite topical treatment, special care and ophthalmological evaluation should be undertaken.

While permanent dry eye after eyelid surgery can be prevented in many instances, dry eye syndrome is a risk of surgery. Patients should be aware of all the risks of surgery, even when they are low.

In our series, we have noticed a low evidence of dry eye syndrome after blepharoplasty surgery, due to meticulous preoperative patients' assessment and continuous efforts for precise surgery and avoidance of tissue damage during the operation. However, in 17% of patients, despite all the appropriate measures, dry eye

symptoms have developed following blepharoplasty, which in the vast majority were transient and quickly resolved after local treatment.

Treatment of dry eye syndrome should be initiated right after patients complain of dryness of the eyes and include the following.

1. Lubricant treatments

   Mild-to-moderate cases of dry eye syndrome can usually be treated using lubricant eye treatments that consist of a range of drops, gels, and ointments.

   These lubricants are often called artificial tears, because they replace the missing water in the tear film. However, they do not contain the antibodies, vitamins, and nutrients found in normal tears that are essential for eye health. Eye ointments can also be used to help lubricate the eyes and keep them moist overnight, as tears can evaporate during sleep time if the eyelids are not completely closed. These ointments tend to be used overnight because they can cause blurred vision.
2. Anti-inflammatory treatments

The underlying problem with long-term dry eye syndrome is inflammation in and around the eye.

Corticosteroids are powerful anti-inflammatory medications that can be given as eyedrops or ointments in severe cases of dry eye syndrome and with cautious use due to their side effects (cataract, raise of eye pressure, etc.).

In severe cases, most unlikely to my experience, occlusive patches, contact eye lenses, and lipid and hormonal treatments have been used.

Epiphora is an excessive tearing condition of the eyes caused by a reflex tear secretion due to several factors. The eyelid blinking dysfunction after blepharoplasty is a common side effect due to postoperative swelling of the eyelid tissues. This dysfunction interferes with the tear pump mechanism.

The swelling can also cause the puncta to turn inward or evert by swelling or tissue contraction caused by incision lines or laser resurfacing, which also causes epiphora.

Lagophthalmos also can increase reflex tear secretion, due to primary dryness of the eyes, leading to relative epiphora.

Epiphora, if present, following a blepharoplasty operation and caused by the above reasons, is transient and resolves with edema reduction by time.

However, measures have to be taken during surgery not to damage important anatomical structures which can lead to very persistent and difficult-to-correct epiphora. Damage to the lacrimal outflow system can occur if the incision line is carried too medially and too close to the horizontal midline. The punctum is a useful landmark for the upper lid and lower lid incision. For an upper lid blepharoplasty, ending the incision just lateral to the punctum avoids medial canthal webbing as well as lacrimal system injury. Incisions should be at least 4–5 mm above the punctum to avoid the canaliculus. In the lower lid blepharoplasty, the medial part of the lower eyelid incision should stop lateral to the punctum, both in the transconjunctival and the subciliary type of incision.

Mild and transient epiphora has very rarely been noticed in some of our patients as a reflex tear secretion developed due to dry eye syndrome after blepharoplasty operations, and in all cases resolved spontaneously with eye lubrication, after diagnosis.

7.3.1.4 Levator Muscle Ptosis

Levator muscle and levator aponeurosis are two anatomical features that should be protected from injury during upper blepharoplasty operation.

Symptoms similar to ptosis, but not due to levator muscle or aponeurosis injury, can occur on the next postoperative day in several patients. However, this is a result of the consequent edema of the eyelid and the muscle itself, and the experienced surgeon who has identified and preserved the levator muscle and aponeurosis will not be alarmed.

As described in Sect. 4.3.3, the levator muscle and its aponeurosis is the plane where the upper blepharoplasty fat removal is performed. To avoid any injury, incision to the septum should be performed high up toward the upper part of the skin incision, and the levator elements should be identified before fat removal, as the pulling of the freed fat pad upward can bring together the superficial part of the levator aponeurosis. Gentle detachment of the aponeurosis is required with a q-tip and not sharp instruments at this stage. The excision of the fat pad with CO_2 laser should also provide protection of the underlying aponeurosis with a backstop which in most cases is a cotton pad or q-tip Fig. 7.2. The same protection measures, as for the levator aponeurosis in upper blepharoplasty, also apply in the lower eyelid transconjunctival or subciliary approach, to protect the inferior oblique muscle injury.

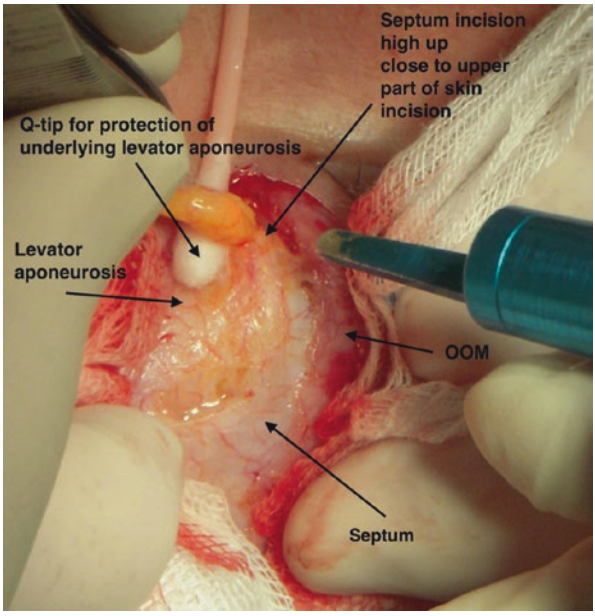

Fig. 7.2 Upper laser blepharoplasty and fat removal of the medial fat pad. Anatomical structures are indicated with arrows. Orbicularis oculi muscle (OOM) is partially excised in this case than contracted with CO_2 laser. Medial fat pad is freed and pulled before excision. The laser blunt handpiece tip is used to gently detach the underlying levator aponeurosis from the fat, and a q-tip is used as a backstop to protect injury of the aponeurosis and underlying tissues (Muller's muscle, conjunctiva, and globe) from the laser beam transmitted energy

A simple method for less experienced surgeons to identify aponeurosis versus septum is with the septum grasped with forceps to ask the patient to look up. The grasped septum will not move, whereas the levator aponeurosis will.

If ptosis symptoms are not improved within 1–2 weeks postoperatively, when swelling of the tissues is almost resolved, then a potential levator muscle injury and impairment might be present. In the majority of cases, a 3 months follow-up should be allowed before repair, as in this time period ptosis is usually resolved. Most authors prefer the Fasanella-Servat technique for ptosis repair at this time frame, as it is quick, quite predictable, and needs no anterior wound reopening, avoiding several side effects such as scar abnormalities, overcorrection, etc.

I have found, after so many cases of blepharoplasty operations, that the risk of permanent levator muscle impairment, with need of repair, is very low and directly related to the extended knowledge of the local anatomy, the precise and meticulous surgery steps at every stage of the upper blepharoplasty technique. Moreover, the bloodless surgical plane provided both by the correct local anesthetic infiltration and the use of CO_2 laser allow distinguished observation and identification of the anatomical structures, protecting the surgeon from contingent unpredictable manipulations during surgery of the upper eyelid.

7.3.1.5 Erythema and Hyperpigmentation

These two complications are very common if CO_2 laser skin resurfacing of the eyelid-surrounding skin is performed in combination with the laser-assisted blepharoplasty operation. The introduction of the single-suture traction technique (SSTT), as described in Chap. 5, has in most cases substituted the laser skin contraction with the skin traction applied, when this technique is incorporated in blepharoplasty.

However, there are still a lot of fans of the conventional laser skin resurfacing technique, and moreover, in specific cases, the application of laser resurfacing in blepharoplasty cannot be avoided, or the SSTT cannot address problems like skin lesions of the lower eyelid, such as syringomas, milia, acquired irregularities, etc.

The erythema lasts for an average of 3 months in women, but makeup camouflage 7–10 days after treatment can cover it. Men seem to have more resisting skin, and the erythema lasts 60–70% as long compared to female patients. Pronounced or prolonged erythema is relatively uncommon and can be treated with topical 1% hydrocortisone cream or intense pulsed light treatments as analytically described in Sects. 6.3.1 and 6.3.2. Treatment with local agents or IPL devices should start when epithelialization is completed (Fig. 7.3a–c).

Hyperpigmentation as a post laser resurfacing side effect is in most cases the next step after the erythema formation mainly due to sun exposure or postinflammatory melanosome and melanocytes activity after treatment (postinflammatory hyperpigmentation—PIH). It presents gradually at average 4–6 weeks after the erythema onset. Treatment includes bleaching agents application locally and use of intense pulsed light devices, in an interval of 3–4 weeks between treatments.

7.3.1.6 Infection

Postoperative eyelid infections are very uncommon, following blepharoplasty operations, due to the extensive vascularization of the periorbital region. The infection rate after blepharoplasty has been estimated to be <0,4%.

Fig. 7.3 (**a**–**c**) Patient's pictures, with dates, show: (**a**) erythema induced following laser-assisted upper and lower blepharoplasty persisting 6 weeks postop, (**b**) erythema converted to hyperpigmentation 2 weeks following first picture, (**c**) final outcome with excellent results 1 year postoperatively. Patient was treated with IPL devices during the recovery period.

Laser skin resurfacing can trigger herpes infections in patients with previous history, and prophylactic antiviral medication should be administered prior and after treatment. Antiviral agents are administered 3–5 days before and after laser resurfacing.

Several other bacterial infections have occasionally been reported in the literature, which are treated with broad-spectrum local or systematic antibiotics.

7.3.2 Surgical Management of Complications

7.3.2.1 Scarring-Rounding

Eyelid skin healing is better than almost any other skin healing on the body. However, external eyelid incisions should be placed symmetrically and closed meticulously to avoid asymmetry and scarring as described in Sect. 4.3.1.

I have found that very rarely, incision lines may look hypertrophied, even in keloid-forming patients. CO_2 laser should conservatively be used for skin incisions

in fair skin type patients, and in darker skin types, it should be avoided due to increased risk of scar hypertrophy and dyspigmentation (Fig. 3.1, Sect. 3.1).

The incision line is normally slightly thick and red for 4–6 weeks postoperatively in most patients. Silicon gel agents, locally, have been applied 1 week postop and for 1 month period as a prophylactic treatment, with very good feedback on the scar quality to our patients. Topical or injected steroids are not used, as to my experience, true keloids of the eyelid skin have never been noticed.

Late-stage scar dehiscence has been noticed in several patients, with consequent hypopigmentation, a complication relatively annoying, particularly in male patients where makeup camouflage cannot be used. However, the correct placement of the incision line preoperatively along the existing upper eyelid crease will minimize the exposure of the hypopigmented and dehiscenced scar, being obvious only when patient closes the eyes.

Scar revision should be considered in these cases only following 3–4 months postoperatively, when the skin and surrounding tissues will have completely healed and returned to normal. Excision of scar and resuturing with prolene, subcuticular, or over-and-over continuous suture will resolve the problem.

In rare cases and in very dark skin types, scar hyperpigmentation can be apparent, and the patient has to compromise, since revision of the scar can lead to the same problem again.

In lower eyelid, scar abnormalities can produce more serious problems. Scar contraction can lead to cicatricial ectropion and retraction of the lower eyelid, scleral show, and rounding of the lateral canthal area (Figs. 7.4, 7.5, 7.6 and 7.7).

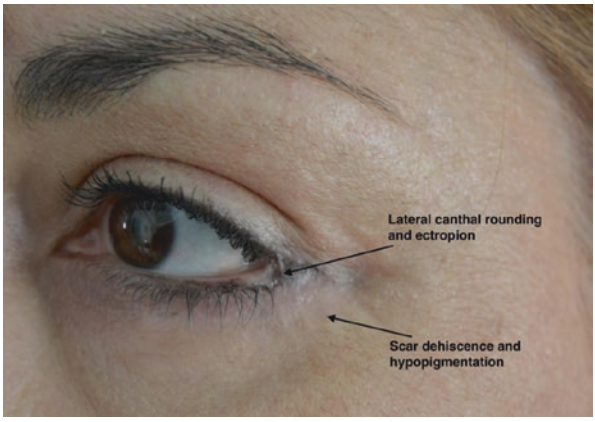

Fig. 7.4 Patient operated elsewhere, presented in our clinic 6 months postoperatively with lower eyelid scar dehiscence and hypopigmentation, rounding of the lateral canthal area, and mild ectropion and scleral show. Patient was operated for scar revision with single-suture traction technique as a supportive suspension tool for correction

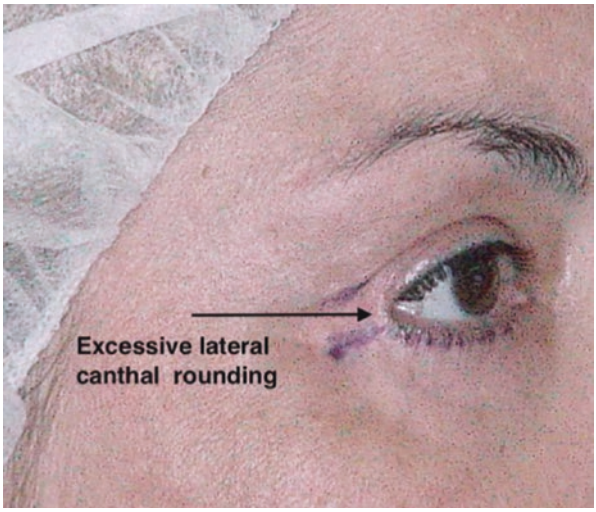

Fig. 7.5 Patient operated elsewhere presented with lateral canthal rounding due to inappropriate placement of incision lines and excess proximity of upper and lower blepharoplasty incisions preoperatively

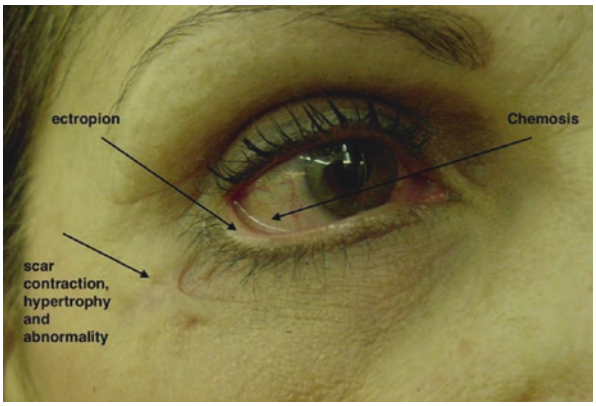

Fig. 7.6 Severe ectropion, scar contracture, and hypertrophy in patient operated elsewhere, with one revision following primary blepharoplasty by the same surgeon. Mild conjunctival chemosis is also apparent. Scar hypertrophy due to scar dehiscence and spontaneous healing caused further contraction and ectropion (See Sect. 7.2 for management of this complication)

Scar revision in lower eyelid requires precise evaluation and diagnosis of the consequences created. Lack of skin tissue should incorporate skin grafting for minimal postop tension, with or without canthopexy for further support.

Rounding of the lateral canthal angle has in most cases been corrected with the SSTT by enhancing the lateral eyelid fissure anatomy, applying traction on the inferior lateral retinaculum of the canthal ligament. In more severe cases, release of the angle and canthoplasty might be required.

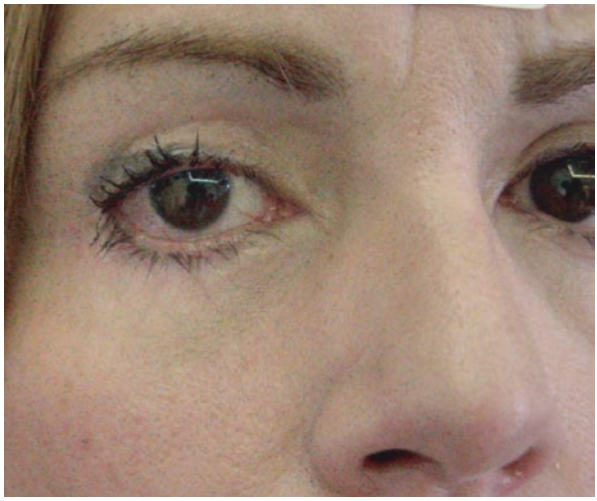

Fig. 7.7 Scleral show due to lower eyelid excess skin excision and scar contraction. Patient previously operated elsewhere was corrected with SSTT

To my experience, dehiscenced scars in the lower eyelid, with more than 2 mm widening, and lack of residual skin laxity postoperatively, should always be addressed in combination with the SSTT to avoid side effects of scar contraction and recurrency postoperatively. Securing the lateral canthal ligament will eliminate recurrencies and other side effects.

In some cases, like in the patient of Fig. 7.6, upward lift of the inferior flap remaining following freeing up of the lower eyelid from the scar tissue and dissection of the subcutaneous fibrotic tissue, in combination with SSTT, can avoid skin grafting, which might induce side effects such as scarring, discoloration, and obvious demarcations. Detailed technique is described under the severe ectropion correction section below.

Finally, transconjunctival incisions can very rarely present with granuloma formation, which should be removed immediately after observation, under direct excision and following local anesthetic drops administration (Fig. 6.12)

7.3.2.2 Residual Fat Protrusion

A rare but very annoying complication, resulting after inadequate fat excision of the upper and lower eyelid fat pads. Most common location of this complication is the medial fat pad of the upper eyelid and the lateral fat pad of the lower eyelid (Figs. 6.10 and 6.18)

I have found that this residual fat pad is very easy to be removed with a transdermal stab incision and direct access of the fat pad.

The timing of correction should not be earlier than 3 months after primary surgery, when the postop edema has resolved and the surrounding tissues have adequately returned to normal. Patients' impatience and pressure should not contribute to earlier correction procedure, as this most probably will end in insufficient fat removal due to postop fibrosis, excess bleeding, and patient's discomfort.

Detailed description of the transdermal residual fat removal technique can be found in Sect. 6.3.3.

7.3.2.3 Lagophthalmos

The word origin comes from the Greek words "Lagós" = hare, rabbit and "ophthalmos"= eye, meaning the incomplete closure of the eye, similar to the way that, according to literature, the hare is sleeping during the night.

Lagophthalmos is a result of either excess skin excision of the upper eyelid or injury and contraction of the levator muscle, the levator aponeurosis, or the preaponeurotic fat pad during upper blepharoplasty. The incidence of lagophthalmos is much higher in cases where upper eyelid true ptosis is corrected than in aesthetic blepharoplasty cases (Fig. 7.8).

Mild postoperative lagophthalmos can commonly occur in upper blepharoplasty patients, due to postop edema, pretarsal orbicularis muscle dysfunction, or myoapraxia and paralysis due to local anesthetics. It is temporary and resolves within 3 days to 1 week postop.

However, in cases of pure lack of skin lagophthalmos, the side effects of this complication are more serious. Inability of eyelid closure can lead to dry eye syndrome, keratitis, and keratoconjunctivitis. Epiphora can also occur as a reflex tearing effect to eye dryness.

Correction of lagophthalmos should be decided not earlier than 6–8 weeks for the postop sequelae to have subsided and the tissue to have returned almost to normal. In the meantime, the patient has to be treated with eye lubricant agents, natural tear drops, and use of protective eye lenses, so that any side effect that can occur due to the eyeball exposure will be minimized.

A very interesting point is the recognition and identification of excessive skin excision of the upper eyelid and the potential onset of lagophthalmos intraoperatively. If the surgeon is in doubt that mild lagophthalmos present during surgery is due to local intraoperative swelling, edema, or anatomy distortion by the injected local anesthetic solution or due to pure skin lack after overcorrection, it is wise to preserve the excised skin and use it 1 week postoperatively as a full-thickness skin graft to correct the problem if still present. In the opposite condition that the intraoperative lagophthalmos is diagnosed to have been caused by excess skin removal, the grafting has to be performed intraoperatively at the same session, to protect the patients from any undesirable side effects of the lagophthalmos.

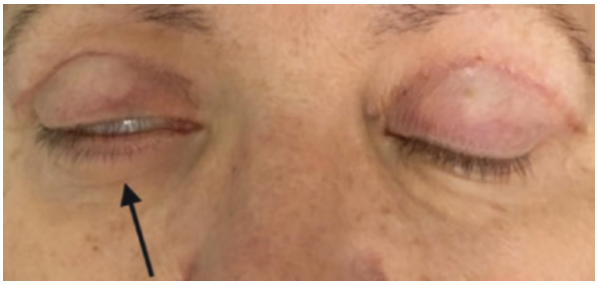

Fig. 7.8 Lagophthalmos on patient operated elsewhere and presented in our clinic 10 days postoperatively. The lagophthalmos was resolved spontaneously after 1 week. Lubricants and natural tear drops were prescribed to protect the eye from dryness

Late-stage corrections of lagophthalmos can be performed from 6–8 weeks postoperatively onward, and the most appropriate skin location to be used as skin graft donor site is the postauricular skin. The skin graft has to be placed in the upper eyelid crease so that it can be hidden in the supratarsal fold of the eyelid postoperatively. However, the final result will never be similar to a primary conservative upper eyelid blepharoplasty and will take time before the skin graft will blend and become less conspicuous postoperatively.

Upper eyelid retraction after lagophthalmos is not only due to lack of skin in the area but also to the tissue scarring and fibrosis and the incorporation of the orbital septum to the deeper eyelid tissues. It is therefore wise that before skin grafting, freeing up of the septum from the deeper tissues and the fibrosis has to be performed. This surgical step requires precise and meticulous manipulation of the tissues, with extended priority to the protection of the underlying levator muscle and aponeurosis from damage or injury.

Finally, congenital lagophthalmos has been reported mainly due to incomplete embryological development of the eyelids or congenital skin lesions. In these cases, lagophthalmos is caused by the abnormal eyelid anatomy and needs to be corrected with local flaps or other reconstructive methods (Fig. 7.9a–c).

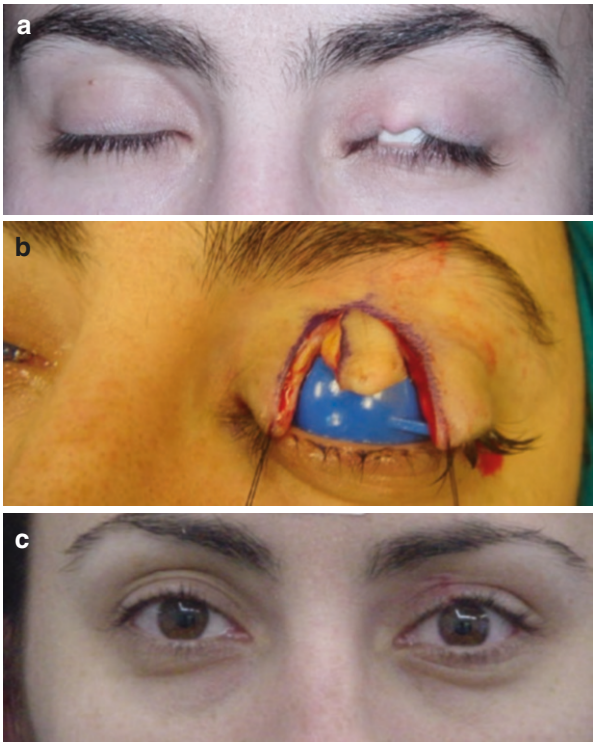

Fig. 7.9 (**a**–**c**) Congenital lagophthalmos in young patient due to incomplete embryological development and anatomical impairment of upper eyelid. Full eyelid thickness excision and direct closure to correct the defect and reconstruct the lagophthalmos were performed

7.3.2.4 Lower Eyelid Retraction, Scleral Show, Ectropion

Scarring formation of the posterior lamella (retractors, tarsus, and conjunctiva) postoperatively, can lead to lower eyelid retraction, and excessive trauma to this area with unnecessary manipulations or laser heat conduction during surgery should be avoided. Retraction of the lower eyelid can also occur by scarring in the middle lamella (orbital septum), and manipulations in this area should also be gentle and precautious.

As a result of this scarring and lower eyelid retraction, complications such as scleral show and/or ectropion can occur. Overcorrection of the lower eyelid skin and orbicularis oculi muscle is also directly related to these complications, and particular care should be taken to avoid it.

The risks of lower eyelid retraction are significantly reduced with the transconjunctival approach and the avoidance of aggressive dissection. This is because a single and en block incision through the conjunctival eyelid retractors and capsulopalpebral fascia visualizes the fat compartments with no further dissection.

Scleral show is an anatomical condition in which the scleral area is visibly exaggerated due to constitutional, evolutive, or endocrine etiology, but can also occur after surgery as described above, and is considered one of the most complex blepharoplasty complications. (see also Sect. 6.2)

Ectropion has its origin in the Greek word "ektrepein" which means to "turn out," and represents the condition where due to postoperative excess scarring of the lamellae or over-resection of the skin, the eyelid margin is retracted and everted from the normal anatomical position.

Despite the fact that some authors believe that scleral show is the first stage of an ectropion, these two conditions should not be confused. The main difference between scleral show and ectropion is that in ectropion there is eversion of the eyelid margin and exposure of the fornix, while in scleral show there is not. Moreover, in ectropion, epiphora with excessive tearing due to lack of contact of the scleral conjunctiva with the lid is present, while in scleral show there is no lack of such contact, and epiphora, if rarely occurs, is mild.

The scleral show, as a complication of lower blepharoplasty operation, is a very annoying outcome for the patient, and needs careful and precise management. Temporary scleral show can occur after a blepharoplasty due to postoperative edema or skin contraction after laser resurfacing. In these cases, scleral show resolves spontaneously within maximum 2 weeks (Fig. 6.13)

However, if the condition is a result of lower eyelid retraction due to scarring formation in the posterior and middle lamellae, or skin and orbicularis muscle overcorrection, further surgical measures should be implemented for correction. The timing of the revision has to be carefully decided to avoid further undesirable side effects to the patient. Scar adhesions in the posterior and middle lamellae should be left to complete and assisted to soften with time and local treatments, prior to any further surgery. The same applies if overcorrection of skin and muscle has been performed intraoperatively.

To my experience, early surgical measures to correct the scleral show deformity can only help to temporarily alleviate the condition rather than permanently correcting it. And this because in most cases the adhesion formation in the lamellae will continue with time till their final stage and the eyelid will retract again despite the

early correction. The same applies when excessive skin and muscle have been removed during surgery, which at the early postoperative stage induce contractive conditions on the eyelid margin and dislocate it from the normal anatomical position. My final observations in these types of complications led me to the conclusion that perfect timing for permanent correction of eyelid contraction side effects such as scleral show and ectropion should be decided minimum 3 months after the primary operation. In the mean time, local treatments for lower eyelid tissue softening with hydration, massaging, LLLT or LED devices, and temporary canthopexy under local anesthesia in the office can help to reduce the patient's symptoms, distress, and psychological affect. Steri Strip suspension is also another method, which can help in, temporarily, relocating the anatomical position of the eyelid during the early postoperative period.

Surgical methods of scleral show correction depend on the underlying reason of the complication. If the problem is due to scarring in the middle or posterior lamella, and if ectropion is also present, more extended procedure should be advocated incorporating the precise and meticulous dissection of adhesions in these surgical planes, with particular attention to avoid injury of the inferior oblique muscle. The grading of the complication can be assessed by the "three fingers test" as described by several authors [2]. If upward movement of the lower eyelid with one finger merely corrects the scleral show, a horizontal tightening with a SSTT will most probably resolve the problem (Fig. 7.10a, b) If a second finger is required to correct the central part of the retracted eyelid, then a more extended operation should probably be considered with dissection of adhesions or a posterior lamellar graft. If skin shortage is obvious, a full thickness skin graft may be required for correction. Prior

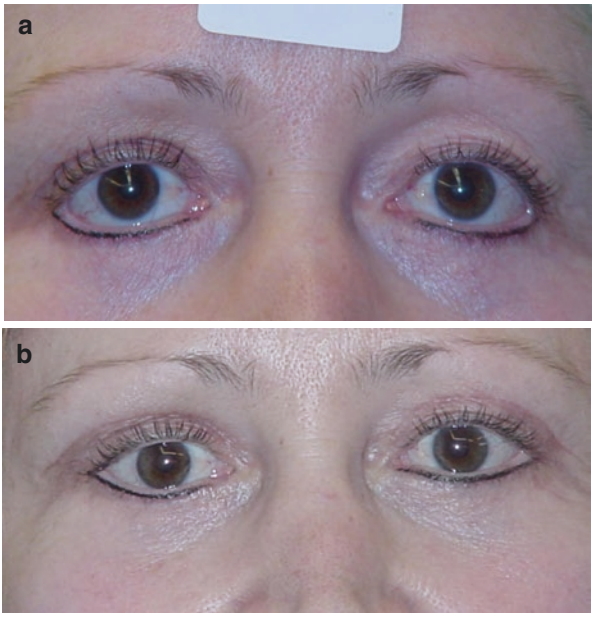

Fig. 7.10 (**a**, **b**): (**a**) Patient operated elsewhere with severe scleral show deformity in both lower eyelids 6 months postoperatively. Skin amount of lower eyelids permitted correction only with SSTT as described in Sect. 5.2 (**b**) final long-term result of the patient one and a half year after correction, with excellent lower eyelid support and aesthetic outcome

to skin grafting and at the same surgical stage, freeing up of adhesions and fibrosis is necessary to be performed.

In ectropion complication cases, the above basic surgical steps also apply for the correction of the problem. Timing of correction is also a very important issue and should be seriously decided according to the progress of the problem. Adequate softening and relaxation of the skin, muscle, and underlying tissues with time should be allowed, the average period of correction to be again considered around 3 months after the primary operation. Meanwhile, preventive measures for protection of the eye from dryness or other manifestations should be implemented. Canthopexy with the SSTT can also alleviate symptoms prior to final corrective surgery.

In ectropion cases where lack of skin is present with or without underlying lamellae adhesions, an extended dissection and freeing up of the contracted and fibrotic tissues should always be performed. The remaining defect should be considered for reconstruction only after the relocation and correction of the eyelid margin with canthopexy, canthoplasty, or other procedures to avoid recurrence of retraction postoperatively. Skin grafts can be used for the closure of this defect. Alternatively, superolateral advancement of the flap created by the release of the eyelid from the lower eyelid skin and muscle can be performed.

To my experience, in patients who have been operated for such a complication, the superolateral advancement and suspension of the inferior edge of the defect on the periosteum of the zygomatic bone offer excellent support and protection from recurrence. Moreover, this technique has, by far, much better aesthetic outcome compared to skin grafts at this very prominent aesthetic unit of the face (Fig. 7.11a, b).

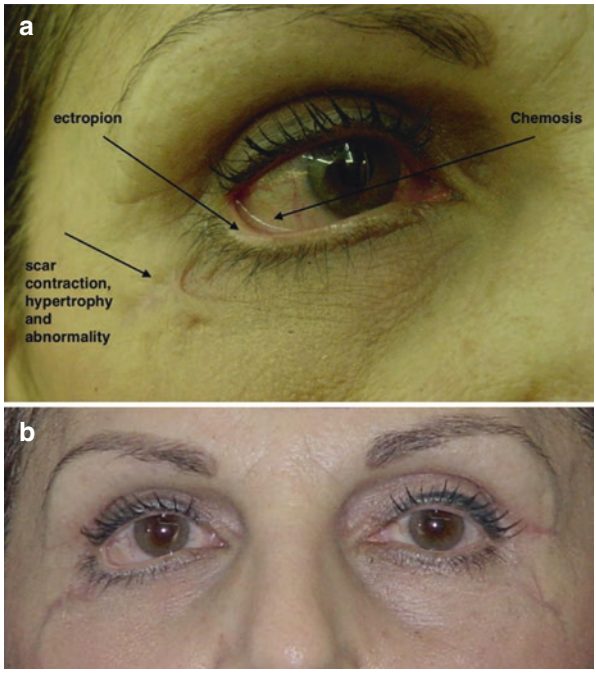

Fig. 7.11 (**a**, **b**) This patient presented in our clinic having been operated elsewhere for primary blepharoplasty and one revision surgery due to postoperative scleral show of the right eye. The unsuccessful revision surgery ended with an ectropion complication, conjunctiva chemosis, and hypertrophic contractive abnormality of the external scar. (**a**) These postoperative complications are indicated with *arrows*. (**b**) The excessive eyelid distortion is shown from front side. Notice the misplacement of the right lower eyelid skin incision which is contracted resulting in eyelid retraction. The patient was taken to theater for correction 4 months after her revision surgery

The suspension of the flap is achieved using prolene 4/0 permanent sutures, and the sutures are placed 1–2 cm below the margin of the inferior edge of the created defect, performing a full thickness subcutaneous bite including the upper part of the SMAS layers at that point. The flap is then advanced along the desired vector to create excess skin amount and is then anchored down to the periosteum of the zygomatic bone. Three or four sutures are placed in the same manner for stronger suspension (Figs. 7.12 and 7.13).

Prior to the advancement of the flap and following the release of the eyelid margin from the contracted eyelid skin, dissection of the underlying adhesions and fibrotic tissue is performed in order to completely free up the surrounding tissues. Once this is done, in most cases, the defect is surprisingly enlarged due to the release of the eyelid from the contracted tissues. The next step is the SSTT to support the lateral canthal area as described in previous chapters. The incision for the SSTT is placed in the upper eyelid crease at its lateral part (Fig. 7.13a, b)

Following advancement of the flap, the defect is adequately reduced in size, and extra amount of skin is created enough to close the remaining incision directly and with no tension (Figs. 7.14 and 7.15a, b)

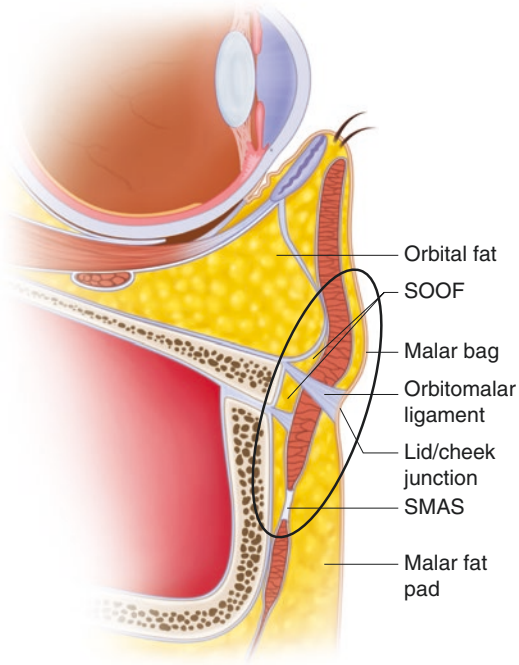

Fig. 7.12 Diagram shows the anatomical structures of the lower eyelid and zygomatic region, and the black oval shape line shows the part of the flap which is advanced upward and supported by suspension on the periosteum of the zygomatic bone. Orbitomalar ligament can be dissected if adequate flap advancement is not achievable. Flap is advanced in a superolateral vector to equally distribute the advancing tissue toward the defect and reduce its size

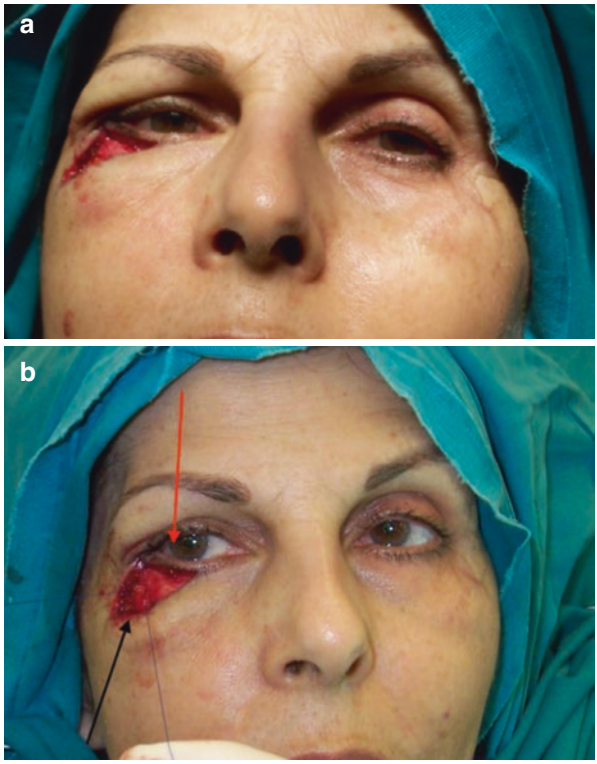

Fig. 7.13 (**a**, **b**): (**a**) The scar is released and the eye lid margin is freed up from the underlying fibrotic tissue and adhesions. The eyelid returns to its normal mobility and the SSTT is applied to support the lateral canthal area, secure the eyelid repair, and reconstitute the horizontal vector of the eyelid margin. (*red arrow* in **b**) (**b**) The prolene 4/0 permanent nonabsorbable suture is passed through the inferior edge of the defect on a subcutaneous plane, in order to advance the flap superolaterally (*black arrow*)

This combined technique of superolateral advancement of flap and SSTT has proved to be an excellent tool for the correction of severe and medium-severity ectropion complications after blepharoplasty, offering long-term, stable, and superior aesthetic results, with very low incidence of recurrence. Depending on the grade of severity of the complication, mild overcorrection of the eyelid with this technique will anticipate any gravity effects on the operated tissues postoperatively. Overcorrection will resolve within 3–4 weeks after surgery, with the eyelid returning to its normal and symmetric position, similar to the nonoperated side (Fig. 7.16a–d).

7.4 The Contribution of SSTT in the Correction of Lower Eyelid Complications and Other Lower Eyelid Manifestations

The introduction of the SSTT in my practice from 2004 was initially decided as a method to reduce the post-CO_2 laser resurfacing side effects and prolonged downtime of the patients by substituting the lower eyelid laser skin contraction with a superolateral traction, which was proved to be equally effective to the resurfacing properties of the laser, but with no side effects such as erythema, hyperpigmentation, delayed healing, etc.

Fig. 7.14 Flap is advanced and defect reduced in size. Extra skin amount created is used for direct closure of the eyelid subciliary incision and remaining defect, with a superolateral vector advancement

With time, it turned to be an excellent tool for lower eyelid suspension, enhancement of the eye shape, and security of the potential lower eyelid blepharoplasty side effects, nowadays being routinely applied to all our blepharoplasty patients.

The SSTT, simple and quick as a procedure, can be applied as a monotherapy in patients complaining of acquired scleral show due to aging, or eyelid laxity which is distorting the aesthetic appearance of the eyes, with a short 1 cm incision in the upper eyelid crease, even if a complete blepharoplasty procedure is not required (Fig. 7.17).

The SSTT, moreover, proved to be a very essential tool in the correction of lower eyelid post blepharoplasty complications, such as scleral show, ectropion, and eyelid retraction. Its role in the correction of these complications has been appreciated by the fact that it can be accomplished without excessive open surgical planes like in the traditional canthopexy, either using the existing upper eyelid blepharoplasty incision or by performing a minimal one in the crease of the upper eyelid, if so indicated.

In the previous chapters, SSTT is analytically described both as an adjuvant technique for the improvement of the aesthetic blepharoplasty functional and aesthetic outcome, and as one appropriate and efficient method for the correction of blepharoplasty complications. It has a short learning curve and its application can easily be introduced in everyday practice.

Fig. 7.15 (**a**, **b**) Defect and subciliary incision are closed directly with no tension using the excess skin amount created by the superolateral flap advancement. *Orange arrow* in (**b**) indicates the upper eyelid skin incision through which the SSTT is implemented. Mild overcorrection of the eyelid with this technique is advisable, in order to anticipate gravity effect on the operated tissues

It is impressive how this technique expanded its application to several other clinical entities observed in the eyelid region. The number of patients, who nowadays seek solution for minor aesthetic lower eyelid aging manifestations such as mild lid laxity, acquired scleral show, or skin texture problems, asking for this simple procedure only, is steadily increasing. Patients are informed that it cannot substitute the original blepharoplasty technique and cannot offer equal aesthetic results, but the very short downtime, the office-based procedure, and the improvement of the eyelid shape and skin texture, which are obvious right after the procedure, are very important reasons that contribute to its popularity among them.

The SSTT is also very effective in correcting congenital eyelid shape distortions, such as lateral canthal negative tilt, a condition that is frequently observed in many patients. It affects the aesthetic look of the orbital region and the self-esteem of the patients. A simple procedure such as the SSTT can easily correct this problem and allow them to return to their everyday activities very quickly (Fig. 7.18).

Fig. 7.16 (**a**–**d**) Patient before the correction and after 6 months, 1 year, and 3 years postoperatively. Symmetry and stable results have been achieved. Scar is well healed and merely inconspicuous

Finally, SSTT has also played a very supportive role in patients who had unlucky outcomes following blepharoplasty operations and moreover suffered further side effects and downtime trying to correct them with no good results. The direct effectiveness of the technique and the accurate change of the appearance of the distorted eyelid, right after this minor operation, made them extremely happy and grateful (Fig. 7.19).

Fig. 7.17 Patient before and after SSTT only, performed via an upper eyelid short incision, located in the upper eyelid crease, for the correction of the acquired skin laxity and scleral show due to aging. Observe the reduced vertical palpebral distance indicated with the arrows and the youthful look of the eyelid postoperatively

Fig. 7.18 Young patient with excessive congenital negative tilt of the lateral canthal area bilaterally, before and after correction with the SSTT. The incision is placed in the crease of the upper eyelid and is completely hidden by the supratarsal fold. Overcorrection in certain patients is desirable to avoid postoperative gravity effect on the canthal area

Fig. 7.19 Patient operated elsewhere for lower blepharoplasty and 2 months later for the correction of the scleral show and ectropion, with unfavorable results. Four months after the first corrective surgery, the patient underwent an SSTT correction of the scleral show and ectropion in our office. In the lower picture, patient is shown right after completion of the procedure with excellent support and symmetry of both eyelids

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Philosophical Approach of Ignorance and Its Implementation in Aesthetic Surgery—Epilogue

8

Socrates was a Greek philosopher and the main source of Western thought. Little is known of his life except what was recorded by his students, especially Plato.

Socrates believed that philosophy should achieve practical results for the greater well-being of society. He attempted to establish an ethical system based on human reason rather than theological doctrine. He pointed out that human choice was motivated by the desire for happiness. Ultimate wisdom comes from knowing oneself. The more a person knows, the greater his or her ability to reason and make choices that will bring true happiness through knowledge.

In Plato's writings, "*I know that I know nothing*" (Ancient Greek: ἓν οἶδα ὅτι οὐδὲν οἶδα, *hen oída hoti oudén oída*; Latin: *scio me nihil scire* or *scio me nescire*) is a well-known saying which is attributed to the Greek philosopher Socrates, who was Plato's teacher.

Socrates insisted on the wondrous way of the honest assumption of ignorance, which can turn into the beginning of true knowledge.

When an individual experiences this critical point without fear and without expectations, it seems that something very important is starting to happen in and around his or her life, gradually transforming into the microcosmic unit of existence and always seeking the timely Socratic teaching, founded in ancient Greece 2500 years ago, from the great Master of Greek and all humanity, philosopher Socrates.

According to this philosophy, the problem is the incumbent and established ignorance, which, according to Plato, is represented by the following types: simple, dual, maximum, and sophistic.

Simple ignorance is present when one ignores something, but at the same time has a notion that ignores it.

Dual is the ignorance when one ignores something and at the same time has no perception that ignores it.

Maximum is that state of ignorance when someone ignores one thing, has felt the oblivious, but insists on views and opinions, without wanting to escape from his ignorance or abandon it.

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Sophistic, finally, is the ignorance when one ignores something, but, with various speculations, unjustified opinions, and arbitrary conclusions, tries to cover and hide his ignorance.

This distinction corresponds to human types who develop depending on traits within the society. The maximum and sophistic forms of ignorance, unfortunately, today, are the most widespread in our society.

Moreover, another very important term, which can be advocated together with these two types of ignorance, is sciolism. The definition of the word is "the superficial show of knowledge and learning,", in other words, the partial or half knowledge, which undoubtedly is much worse than ignorance.

The second form of ignorance, the dual one, is mainly due to incorporated, negative conditions of existence of human societies. These individuals are usually well-intentioned; possibilities for knowledge and learning are there, but finally not exploited, despite the impression to the contrary. This potential for more knowledge is not exploited due to social or financial reasons, lack of opportunities for higher training, and occasionally self-reassurance.

The first form, the simple, is the "blessed" ignorance. It is the starting point of the Socratic philosophy and encouragement for enrollment into true knowledge. It is the moment where the individual understands its situation and exclaims: "what I know is that I know nothing.". These individuals are excellent candidates for unique opportunity of advanced knowledge and continuous education.

It is indeed very obvious, how this philosophy, apart from our everyday life, should also be applied to our aesthetic surgery practice. Acquisition of knowledge and education is the golden standard, which will eradicate sciolism (partial knowledge) and minimize maximum and sophistic ignorance, which can lead to unsuccessful results to our patients.

Moreover, the acceptance and understanding of simple and dual ignorance conditions in our life will encourage intensive and continuous training and education which will undoubtedly improve surgical skills, decision-making, and final outcomes in the everyday aesthetic surgery practice.

If we know what we know, and also know what we do not know, it is very likely to seek and require more education or training. Further enrollment in acquisition of experience will minimize the complication rate in the every day aesthetic surgery practice and create happy patients. Moreover, it will establish a higher standard of mutual trust between surgeons and patients, a very effective prerequisite for the long-term recognition and consistency of aesthetic surgery as a top specialty in the community.