INTRODUCTION

The suborbicularis oculi fat is designated by the acronym ***SOOF.*** The SOOF is located just inferior to the inferior orbital rim and consists of subcutaneous fat & connective tissue lying beneath the orbicularis muscle in the lower lid and extending into the midfacial soft tissues. (1)

The SOOF plays an important role in the aging process as with age, there is gradual gravitational descent of the orbicularis oculi muscle, the SOOF & its continuum, the cheek fat pad and the midfacial soft tissues. This contributes to the double convexity and tear trough deformity (nasojugal fold) noted with age. (2)

Rejuvenation of the lower eyelid complex should be based on the principle that the contour changes characteristic of aging involve not only prolapse of the orbital fat , but also descent of the cheek tissues, resulting in accentuation of the orbital rim and tear trough groove. (3)

Although the necessity of preserving fat and repositioning the soft tissues of the midface has been widely accepted, there is wide disagreement among authors as to the best approach and surgical technique. (3)

Many techniques have been described in literature to improve nasojugal deformity, also, known as tear trough deformity. (4)

Repositioning (raising) the SOOF helps to elevate the overlying tissues, which in turn helps to elevate the lower eyelid tissues, because they are a continuum. [5]

Using the suborbicularis oculi fat (SOOF) lift as an adjuvant procedure in patients with chronic facial palsy adds to the functional and cosmetic rehabilitation of patients with chronic facial palsy. [5]

Also, elevating the lateral suborbicularis oculi fat (SOOF) by resuspending the orbitomalar ligament was effective in supporting the lateral cheek when used as an adjunct to a lateral tarsal strip procedure in the treatment of severe or recurrent lower eyelid ectropion. This technique resulted in recruitment of anterior lamella and allowed for good lower eyelid repositioning. [6]

AIM OF THE WORK

The aim of this study is to determine the least disrupting approach for SOOF elevation when indicated, thus, the most sight saving one.

Chapter 1
LOWER EYELID AND MIDFACIAL ANATOMY

Lower Eyelid Anatomy:

Surface Anatomy:

The appearance of the eye is largely determined by the shape of the palpebral fissure and its position relative to the globe. This aperture between the upper and lower eyelid margins measures 28-30 mm horizontally and 10-12 mm vertically. The upper lid covers up to 2 mm of the upper cornea, with the lower lid typically crossing at the level of the lower corneoscleral limbus. The point of maximum lid margin concavity differs in the two lids: in the upper lid it is medial to the pupil and in the lower it is lateral. (7)

The lateral canthal angle is formed by the lateral commissure and is generally positioned approximately 2 mm superior to the medial canthal angle, giving the eyelid a slightly upward lateral inclination to the palpebral fissure (canthal tilt) (Fig. 1). The position of the lateral canthus, however, varies according to age, family traits, race and sex. (8)

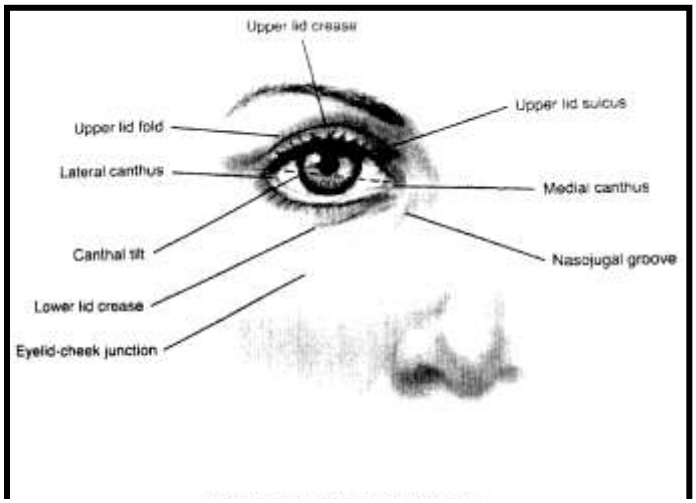

Figure (1): Normal eyelid surface anatomy. [8]

After satisfactory blepharoplasty, the lateral canthal angle should continue to be superior to the medial canthal angle. The lower eyelid margin should remain tangential to the inferior limbus. If the lateral canthal angle is inferiorly displaced, the patient manifests round eye. If the lower eyelid margin is inferiorly displaced, the patient demonstrates lower eyelid retraction and scleral show. [9]

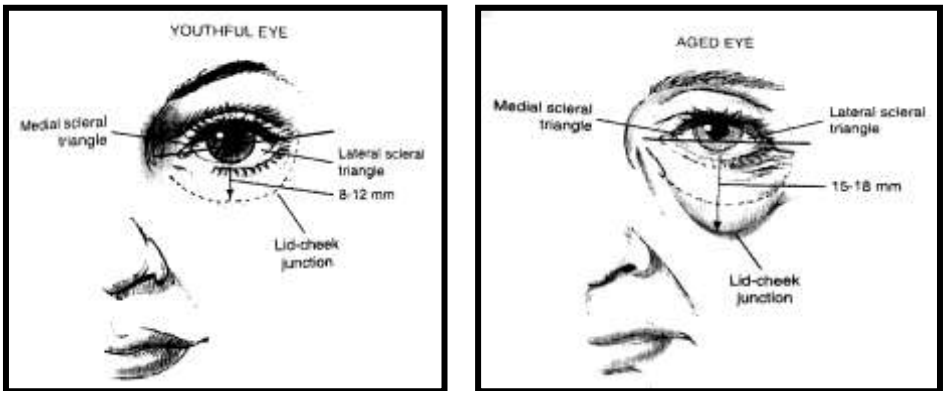

Figure (2): Canthal position in youthful eye &aged eye. [8]

The eyelid is a bilamellar structure consisting of an anterior lamella and a posterior lamella. The anterior lamella consists of skin and orbicularis oculi muscle; the posterior lamella includes the tarsoligamentous sling, which comprises the tarsal plate, the medial and lateral canthal tendons, along with the capsulopalpebral fascia and conjunctiva. The septum originates at the arcus marginalis along the orbital rim and separates the two lamellae. (10)

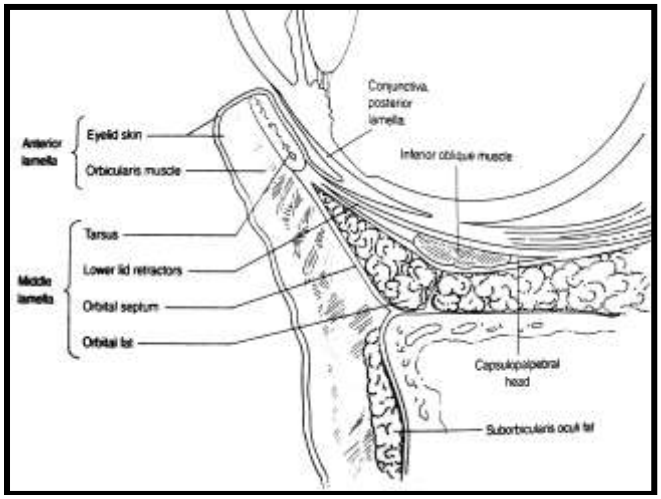

Figure (3): Lower eyelid anatomy. (1)

Skin:

The eyelid skin is the thinnest in the body and unique in having no subcutaneous fat layer. Because the thin skin of the eyelids is subjected to constant movement with each blink, the laxity that often occurs with age is not unexpected leading to the characteristic fine wrinkles that appear with age in the mobile preseptal skin. (1)

In both the upper and lower eyelids, the pretarsal tissues are normally firmly attached to the underlying tissues, whereas the preseptal tissues are more loosely attached, creating potential spaces for fluid accumulation. The upper eyelid crease approximates the attachments of the levator apponeurosis to the pretarsal orbicularis bundles and skin. (1)

In the lower eyelid, fibrous bands from the capsulopalpebral fascia also pass through the orbicularis muscle and insert into the skin to create the infratarsal skin crease. This extends as an oblique line 5 mm from the lid margin medially and 7 mm laterally, that is less well defined than its counterpart in the upper lid and becomes less visible as aging progresses. (7)

Orbicularis Oculi Muscle:

The orbicularis oculi muscle is the main protractor of the eyelid. Contraction of this muscle, innervated by cranial nerve VII, narrows the palpebral fissure. Specific portions of this muscle also constitute the lacrimal pump. (1)

The orbicularis muscle is divided into *pretarsal, preseptal,* and *orbital* parts (Fig. 4)

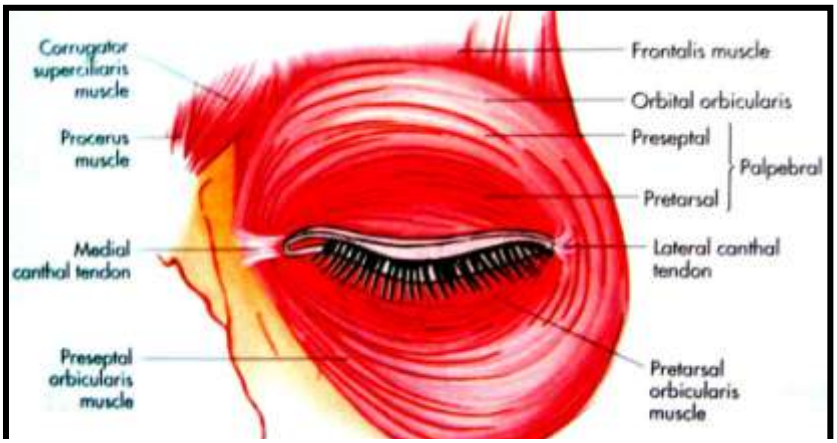

Figure (4): Orbicularis oculi muscle. (11)

These divisions are both anatomic and physiologic. The palpebral (pretarsal and preseptal) parts are more involved in involuntary eyelid movements (blink), whereas the orbital portion is primarily involved in forced eye closure (winking and blepharospasm). (1)

The pretarsal part is supported by its close adherence to the tarsal plates and the preseptal part is more mobile overlying the orbital septum in both upper and lower lids. (7)

The pretarsal parts of the upper and lower eyelid orbicularis arise from deep origins at the posterior lacrimal crest and superficial origins at the anterior limb of the medial canthal tendon. The deep head of the pretarsal muscle (Horner's tensor tarsi), a localized bundle of pretarsal orbicularis, encircles both canaliculi to facilitate tear drainage. The upper and lower eyelid segments of the

pretarsal orbicularis fuse in the lateral canthal area to become the lateral canthal tendon (Fig.5) [1]

The preseptal orbicularis muscles have deep origins from the fascia around the lacrimal sac and the posterior lacrimal crest. Superficial origins arise from the anterior limb of the medial canthal tendon. Laterally, the preseptal muscles form the lateral palpebral raphe overlying the lateral orbital rim. The orbital portions of the orbicularis muscle arise from the anterior limb of the medial canthal tendon and the surrounding periosteum. These fibers course over the zygoma, covering the elevator muscles of the lip (Fig.5). [1]

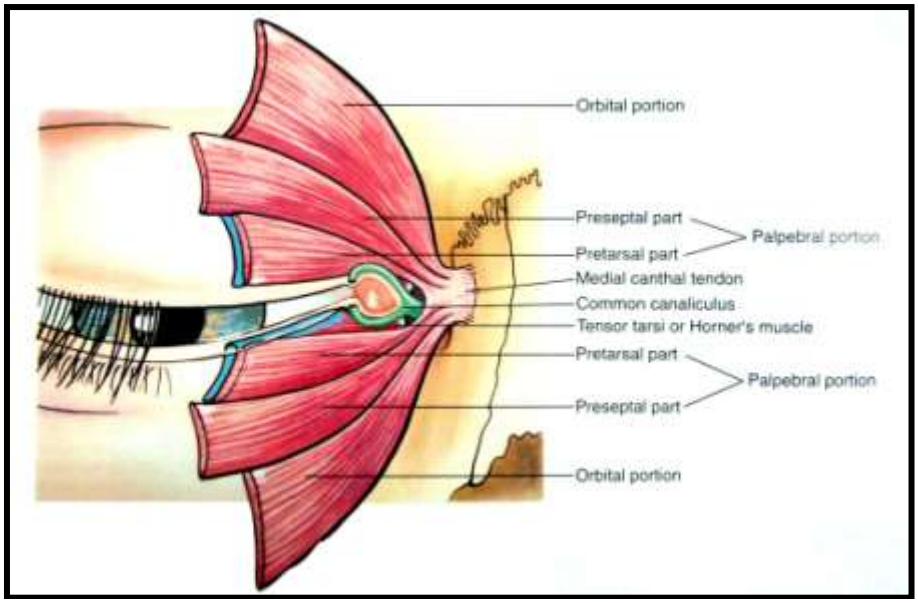

Figure (5): Orbicularis oculi muscle: pretarsal, preseptal and orbital portions. The deep head of the pretarsal part is termed the tensor tarsi or Horner's ms. [12]

At the junction of the lower lid with the cheek, the orbicularis oculi muscle is attached to the orbital rim at the junction of the palpebral part above and the orbital part below. This is a direct muscle attachment medially, from the anterior lacrimal crest to approximately the level of the medial limbus. This tight attachment is largely responsible for the appearance of the nasojugal groove. Lateral to this point, the attachment is continued indirectly through a fibrous connection known as the orbicularis retaining ligament, as far as the lateral canthal region (fig. 6). [13]

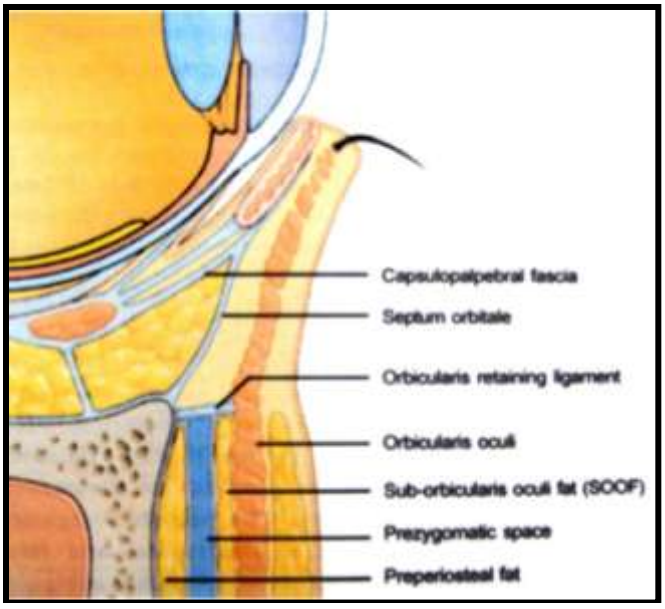

Figure (6): Schematic representation of the orbicularis retaining ligament. [7]

This ligament spans from the periosteum just outside the orbital rim to the fascia on the under-surface of the orbicularis. It can be considered to be a specific part of the 'periorbital septum' and has also been described as the

'orbitomalar ligament'. The location of the attachment to the orbicularis correlates with the position of the palpebromalar groove, which appears on the surface of the overlying skin with aging. In the lateral canthal region, the orbicularis retaining ligament expands and merges with a dense fibrous condensation between the superficial and deep fascia lateral to the lateral commissure known as the lateral orbital thickening. [13]

Innervation of Orbicularis Oculi Muscle:

The motor innervation to orbicularis oculi muscle is quite diffuse with contributions from multiple branches of the facial nerve, including the frontal, zygomatic, and buccal branches (Fig.7). [10]

Cadaveric dissection reveals a diffuse network of nerves innervating the orbicularis oculi muscle. Proper lateral canthal anchoring and the preservation of the medial buccal branch innervation are important in avoiding lower lid malposition and potential problems with eyelid closure following lower lid blepharoplasy. [10]

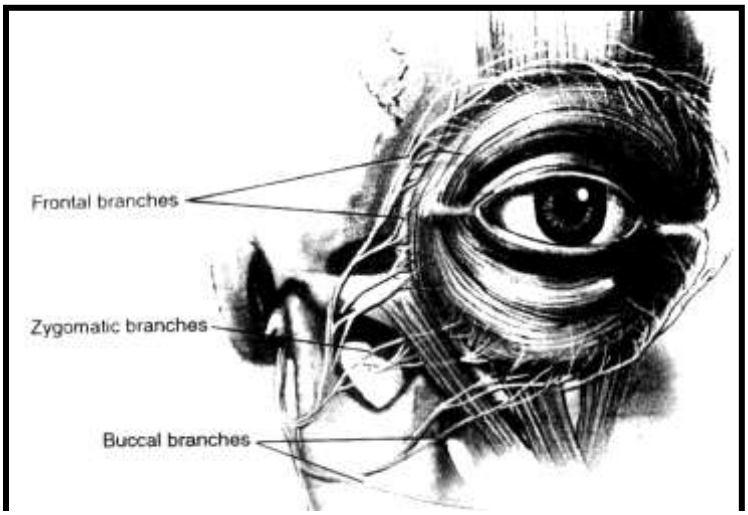

Figure (7): Innervation of the orbicularis oculi with contributions from the frontal, zygomatic and buccal branches. (10)

Tarsoligamentous sling:

The tarsi are firm dense plates of connective tissue that serve as the skeleton of the eyelids. The upper eyelid tarsal plates measures 10-12 mm vertically in the center of the eyelid and 30 mm horizontally; the maximum lower eyelid tarsal plate measurement is 4 mm or less vertically in the center of the eyelid and 28 mm horizontally. Both tarsal plates are usually 1 mm thick and taper at the medial and lateral ends. (1)

Attachments to the upper lid tarsal plate include the pretarsal orbicularis and the levator aponeurosis on the anterior surface, Müller's muscle on the superior border, and conjunctiva on the posterior surface. Attachments to

the lowerlid tarsal plate include the pretarsal orbicularis, capsulopalpebral fascia and conjunctiva. [8]

The tarsal plates have rigid attachments to the periosteum of the orbital rim medially and laterally by the medial and lateral canthal tendons and retinacular support structures. The canthal ligaments are the fibrous extensions of the tarsal plates whereas the canthal tendons represent the true insertion of the deep heads of the orbicularis oculi muscle to the bone, thereby constituting a true tendon. [8]

Medial canthus:

The medial canthus involves the integration of the pretarsal and the preseptal orbicularis oculi, the septum orbital, the medial end of Lockwood's ligament, the medial horn of the levator aponeurosis and the check ligament of the medial rectus muscle. The precise anatomical arrangement of the various components is debated, but in practice they are not individually identified at operation. These structures attach to the medial orbital wall via the medial canthal tendon, which is intimately associated with the lacrimal sac. [7]

The pretarsal orbicularis muscle inserts medially by a superficial head and a deep head (Fig. 8). The superficial head from each lid blends with the fibrous continuation of the tarsal plates to form the anterior part of the medial canthal tendon. The deep head from each lid is also known

as the pars lacrimalis, or Horner's muscle. Its fibers begin at the medial end of the tarsal plates and insert into the posterior lacrimal crest just behind the lacrimal sac. The preseptal muscle also inserts medially by a superficial head and a deep head. The superficial head from each lid inserts into the upper and lower borders of the medial canthal tendon. The deep heads insert into the fascia overlying the lacrimal sac and the medial orbital wall above and below Horner's muscle. Closing the eyelids leads to traction on the deep heads which pulls the lacrimal sac fascia laterally, producing a negative internal pressure. (7)

The medial canthal tendon inserts into the frontal process of the maxilla in a tripartite manner: anterior and posterior horizontal elements and a vertical element (Fig.9). The anterior horizontal insertion point is onto the anterior lacrimal crest, level with the upper part of the lacrimal sac. The posterior part leaves the deep surface just before the anterior lacrimal crest and inserts into the posterior lacrimal crest behind the sac. The tendon has a definite inferior margin but the superior border blends with the periosteum having vertically oriented fibers that insert into an ill-defined portion of the medial orbital rim at or close to the nasofrontal suture. This vertical component of the medial canthal tendon is thought to be responsible for suspension and fixation of the medial canthus, while the horizontal components are relatively weak and contribute little to medial canthal stability. (7)

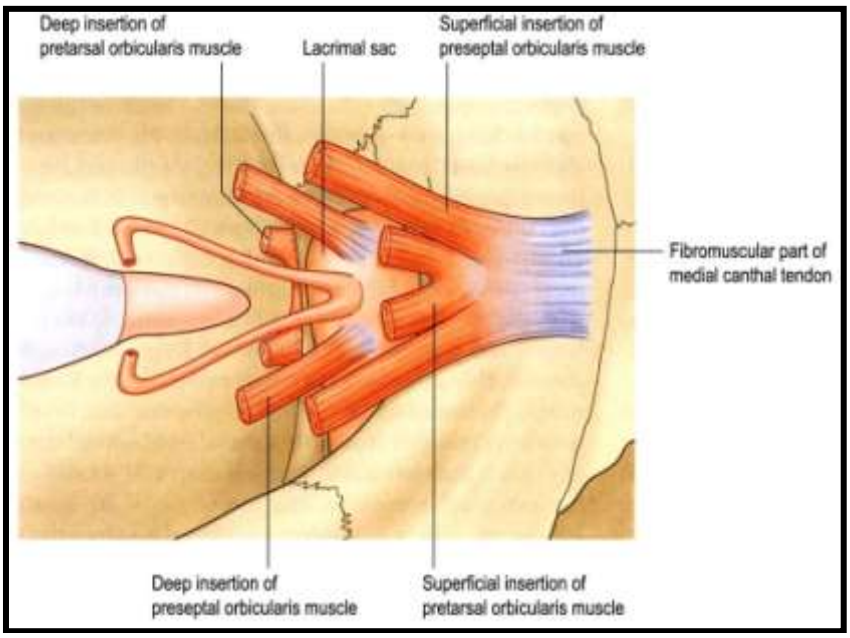

Figure (8): Medial canthus. [7]

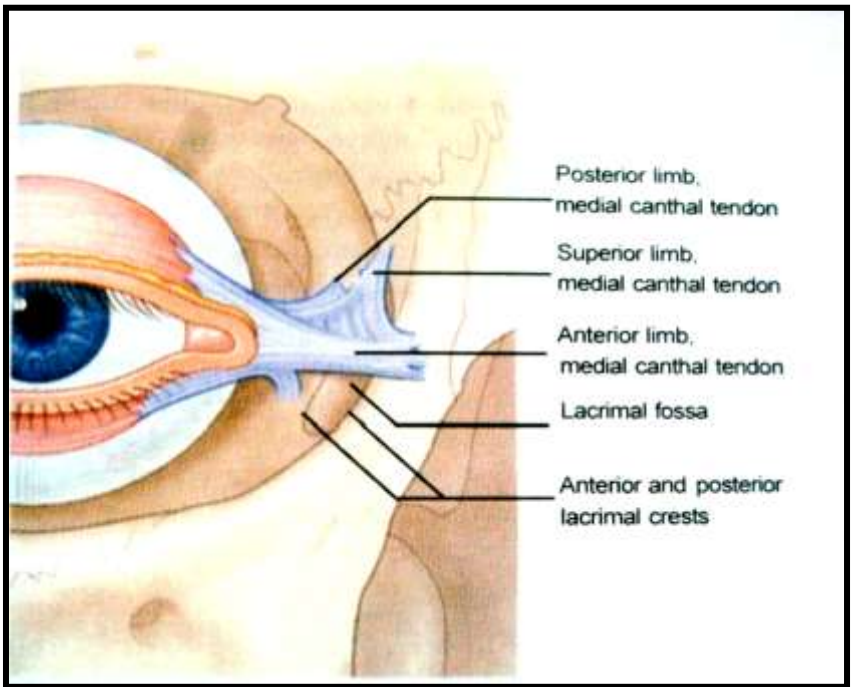

Figure (9): Medial canthus tendon insertion. [7]