ORIGINAL ARTICLE

DYNAMICS OF LOWER LID MALPOSITIONS

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ABSTRACT: Lower lid malpositions form amongst the most common lid malpositions encountered in ophthalmic practice. The bilaminar structure of the eye lid is central to the understanding of the mechanism of development, identification and management of these malpositions. Lid entropion and ectropion develop due to a disparity in the functioning of the anterior and posterior lid lamellae. The previous thought of simple single procedures like in-turning procedures for ectropion and out-turning procedures for entropion are no longer in vogue and should no longer be practiced. Customized Lid Surgery based on a detail clinical evaluation including special tests for various components of the malposition complex is necessary for effective management and a good surgical outcome for lid malpositions. We discuss the dynamics of the occurrence and the concepts behind the management of lower eye lid malpositions.

KEYWORDS: Lower lid malposition, Ectropion, Entropion, Dynamics lid malposition.

KEYMESSAGE: Identifying the specific anatomical defects in the pathogenesis of each individual case will help us chose the appropriate procedure for each individual case of lower lid malpositions.

INTRODUCTION: The opposite conditions of entropion and ectropion are caused by similar pathogenesis and can be treated by similar principles[1]. The eyelid is a bilamellar structure, with differential forces acting on the anterior and the posterior lamellae, resulting in entropion and ectropion. The main aim of correcting lid malpositions is to identify the specific anatomical defects and to restore the normal anatomy by customized eyelid surgery[2].

BACKGROUND:

SURGICAL ANATOMY: It is important to understand the surgical anatomy of the eyelid to understand the pathophysiology of lower lid malpositions.[2,3,4] Eyelid is a bilamellar structure (Image 1). The anterior lamella consists of the skin, subcutaneous tissue orbicularis oculi muscle and the orbital septum superiorly. The posterior lamella consists of the tarsal plate, inferior retractors of the lid and the conjunctiva. The vertical stability to the lid is given by the balance of the forces by the protractors and the retractors of the lid along with gravity.[2] The protractors of the lid are the pretarsal and the preseptal orbicularis muscle and the retractors of the lower lid are the capsulopalpebral fascia and the inferior tarsal muscle. Surgery on the lower lid retractors has revolutionized the surgical management of lower lid malpositions. Horizontal eyelid stability is provided by the firm tarsal plates and the medial and the lateral canthal tendons anchoring the lid to the orbital walls (Fig. 3). Bick proposed that the lower lid becomes unstable if there is inappropriate contact between the globe and the lid (orbito-palpebral disparity).[2,5]

CLASSIFICATION: Lid malpositions can be classified into congenital, involutional, cicatricial types common to entropion and ectropion and specific types including, acute spastic entropion, paralytic and mechanical ectropion.[6]

Congenital entropion is due to dysgenesis of the inferior retractors and paucity of tissues in the posterior lamella resulting in secondary overaction of the orbicularis oculi.[2] Congenital ectropion is due to vertical deficiency of the anterior lamellae as in congenital icthyosis.[2] Acute spastic entropion is due to forcible contracture of the orbicularis muscle. Paralytic ectropion is due to loss of orbicularis oculi muscle tone which results in lower lid laxity. Cicatircial lid malpositions are due to imbalances of forces secondary to length dissociation between the anterior and posterior lamella,[1] with anterior lamellar contracture resulting in cicatricial ectropion and posterior lamellar contracture resulting in cicatricial entropion.

PRINCIPLES OF LID MALPOSITION DEVELOPMENT: Involutional lid malpositions are due to imbalances in the forces acting on the eyelids.[2] Recent understanding of the mechanisms has changed our concept of lid malpositions and has revolutionalised the choice of surgical procedures.[2,7] It is imperative to identify the specific anatomical defects causing lid malposition and correct them by Customized lid surgery rather than doing a single common surgical procedure (inverting surgery for ectropion and everting surgery for entropion).

INVOLUTIONAL LID CHANGES: Involutional changes occur in each of the eyelid structures. The eyelid skin becomes thin, atrophic and lax. The ligaments (medial and lateral canthal tendons) become thin and atrophic causing horizontal laxity. Inferior retractor dehiscence/ laxity is seen in both involutional ectropion and entropion (Jones) causing vertical instability.[5] Sisler has demonstrated that patients with entropion usually have more hypertrophy of orbicularis oculi muscle while in ectropion there are more ischaemic and atrophic changes.[3] Lamellar dissociation in entropion is due to loss of fibres of preseptal orbicularis oculi to the orbital septum resulting in the vertical migration of the preseptal orbicularis over the pretarsal orbicularis.[6] Tarsal plate in entropion demonstrates significant thinning and buckles inwards (Sisler). Tarsal plate in ectropion shows age-normal or larger than normal tarsal plate (secondary inflammatory hypertrophy) which may mechanically overcome the decreased orbicularis tone in conjunction with canthal laxity.[2] Orbitopalpebral disparity[3] results in loss of orbital volume as in age related enophthalmos due to orbital fat atrophy-in entropion (lid buckles inwards) & in ectropion (lid falls outwards). Similar changes in upper lid seen results in involutional ptosis.

PATHOPHYSIOLOGY: According to Jones[8,9] in involutional entropion, lamellar dissociation comes first, followed by inferior retractor dehisence and lid laxity, while in involutional ectropion horizontal lid laxity comes first, followed by inferior retractor dehisence and lamellar dissociation.

Involutional entropion (Image 2) of the lower lid previously called as senile entropion is the most common lid malposition. This should be differentiated from trichiasis wherein the eyelashes are turned inwards but the lid margin is in normal position. It maybe partial or complete, intermittent or constant and symptomatic or asymptomatic. It is due to horizontal laxity of the tarso ligamental sling (medial and lateral canthal tendons) with age, vertical instability due

to dehiscence or disinsertion of the capsulopalpebral fascia and the inferior retractors of the lower lid, preseptal orbicularis overriding the pretarsal orbicularis muscle, age related enophthalmos due to orbital fat atrophy (Bick's Orbito palpebral disparity) and pressure of the upper lid on closure resulting in the lower border of the tarsus of the lower lid to rotate outwards resulting in entropion.[2,3,5,6]

In involutional ectropion (Image 3), there is significant laxity of the tarsal ligaments, atrophy of the skin and orbicularis muscle, inferior retractor dehisence resulting in larger than normal tarsal plate falling outwards. It begins as a medial ectropion resulting in epiphora, eye rubbing aided by gravity results in total ectropion of the lower lid with conjunctival hypertrophy.[2,3,5,6]

Both ectropion and entropion can be corrected by transposition of the lower lid retractors.[1] It is imperative to recognise inferior retractor dehiscence (Image 4) by observing a white line below the tarsal plate representing the detached inferior retractors, deep inferior fornix, lower lid placed at a slightly higher position and lack of movement of the lower lid on downgaze.[10] Retractor surgery wherein the posteriorly directed forces corrects the vertical lid stability has revolutionalised lid malposition surgery.

CLINICAL EVALUATION: Clinical evaluation[7,4,1] includes identification of the specific anatomical defects, assessment of the severity of the condition, involvement of the cornea and conjunctiva and assessment of the orbicularis oculi muscle tone. A complete ophthalmic examination is done including observing the face for any involutional changes. Lid margins may appear like a gothic arch in entropion and like a roman arch in ectropion. Lid crease formed by the translamellar attachments of the orbicularis muscle fibres offers the best protection from entropion. The position of the eyelashes, meibomian gland orifices, posterior lid margin, conjunctiva and lacrimal patency is assessed in all cases.

Special Tests[9,3,2,6,11]:

1. Squeeze Test – In intermittent entropion, ask the patient to squeeze his eyes on looking down. After this manuevere, inspection usually reveals a rotated lid margin with the eyelashes touching the globe in the primary position.
2. Reverse Ptosis – With the patient looking on downgaze, the lower lid will not be as low as on the unaffected side
3. Medial Canthal Laxity (Image 5) – Medial canthal tendon laxity is tested by migration of the lacrimal punctum laterally on lateral traction over the lid or > 5mm displacement lateral to the nasal limbus
4. Lateral Canthal Laxity – Lateral canthal tendon laxity is tested by displacement of the lateral canthus medially on medial traction. Rounding of the sharp lateral canthus suggests marked laxity
5. Distraction Test (Image.6) - tested by pulling the lower lid away from the globe. Abnormal if the distance from the posterior lid margin and the globe is > 6mm.(normal 2-4 mm)
6. Snap Back Test (Image.7) – tests horizontal lower lid laxity. This pinch test involves pulling the lower lid and releasing it. Normally the lid returns back to its normal position without a

blink, If HLL laxity exists the eyelid hangs below its normal position even after a blink. If lower lid returns quickly it is normal, if there is a slow return it indicates mild laxity, incomplete return unless the patient blinks indicates moderate laxity and incomplete return even after a blink indicates severe laxity.

7. Intercanthal Line (ICL)[1] – it is the shortest distance between the medial and the lateral canthus on the globe. It should be compared with the equatorial line (EL) between the two canthi. Normally the ICL is equal to the EL. In lateral ectropion ICL is below EL (Image 8) and ICL is elevated to the EL by elevation of the lateral canthus (Image 9) by lateral tarsal sling.

SURGERY[8,5,7,9,12]: Surgical planning is done by assessment of the lid malpositions, evaluation of the anterior and posterior lamella, evaluation of the lid laxity in vertical, horizontal and sagittal directions, evaluation of the intercanthal line, orbicularis muscle tone and evaluation of the lid margin and punctum.

CUSTOMISED ENTROPION SURGERY:

1. **Correction of inferior retractor weakness:** Modified Jones Procedure (retractor plication) - more so in recurrences.
2. **Prevention of translamellar orbicularis migration.**
   Temporary methods: Taping, Quickert - Rathbun sutures, Everting sutures of Feldstein.
   Permanant methods: Weiss procedure (full thickness lid incision with everting sutures)
3. **Correction of horizontal lid laxity:**
   Quickert procedure (Weiss procedure with horizontal lid shortening).
   Combined with Lateral Tarsal Strip procedure.
4. **Combined blepharoplasty approach**.

CUSTOMISED ECTROPION SURGERY:

1. Lacrimal Puntal Procedures: 1/2/3 snip procedures.
2. Shortening of the lateral canthal tendon: Lateral Tarsal Strip procedure.
3. Shortening of the medial canthal tendon: Medial Canthal plication/ Medial canthal angle resection.
4. Correction of Horizontal lid laxity: Full thickness resection/Lazy-T procedure/Khunt-Syzmanowski's Procedure.
5. Posterior Lamellar shortening: Tarsoconjunctival resection (Medial Spindle Procedure).
6. Anterior lamellar lengthening: Z Plasty (linear scars)/ Add skin (flaps/grafts).

CONCLUSION: Lower eyelid malpositions are common experiences in ophthalmic practice. The occurrence of these can be explained effectively by the bilaminar nature of the lower lid and the imbalance between the anterior and posterior lamellae leading to ectropion and entropion. A detailed clinical evaluation in necessary for proper decision making so as to perform Customized Eye Lid Corrective Surgeries to achieve good surgical outcomes. A sound knowledge of the surgical anatomy and the mechanisms of development of eye lid malpositions will help to effectively manage the same to achieve good surgical outcomes.

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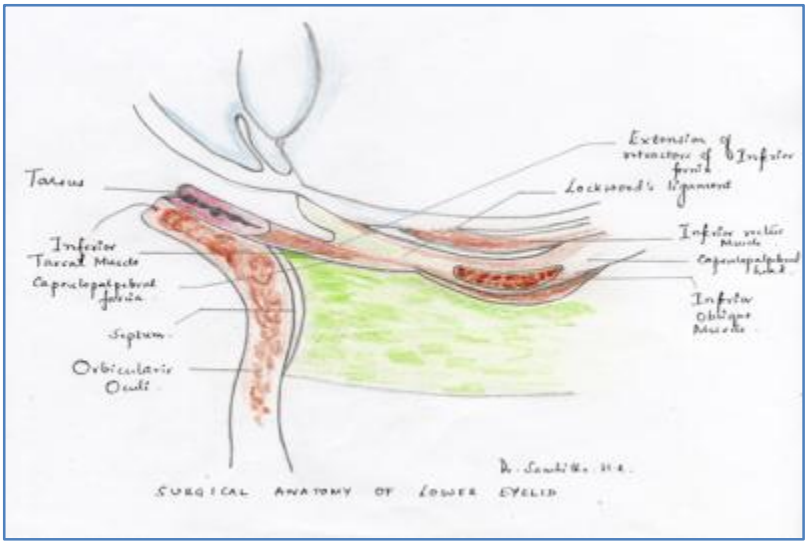

IMAGE 1: Surgical Anatomy of the Lower Eye Lid

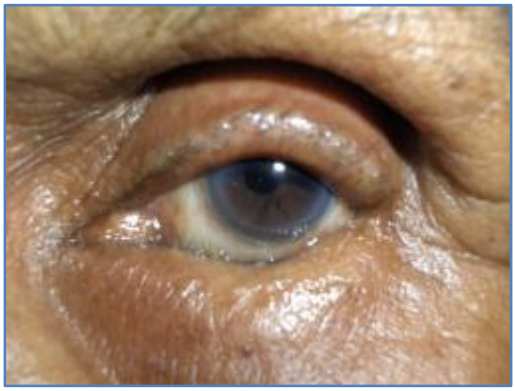

IMAGE 2: Involutional Entropion

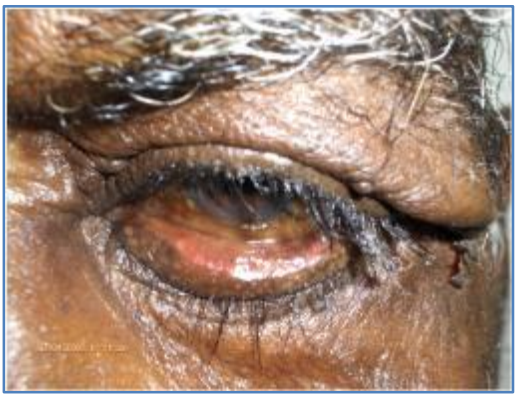

IMAGE 3: Involutional Ectropion

IMAGE 4: Inferior Retractor Dehiscence

IMAGE 5: Medial Canthal Tendon Laxity

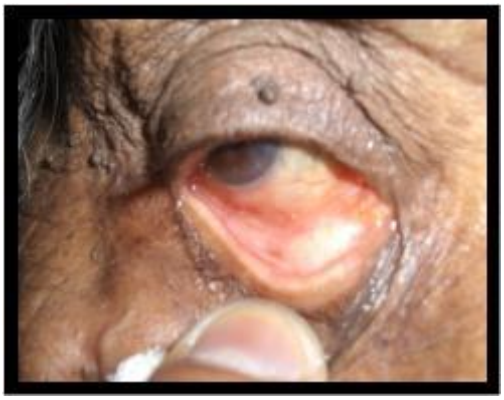

IMAGE 6: Distraction Test

IMAGE 7: Snap Back Test

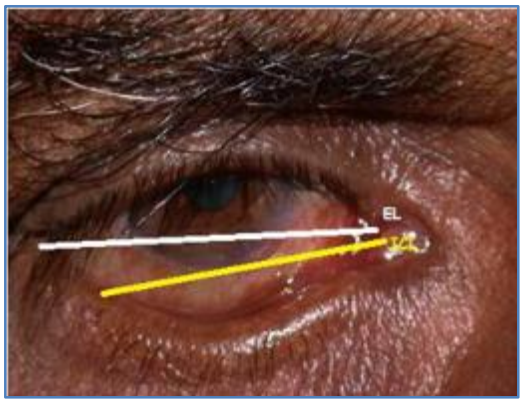

IMAGE 8: ICL below EL

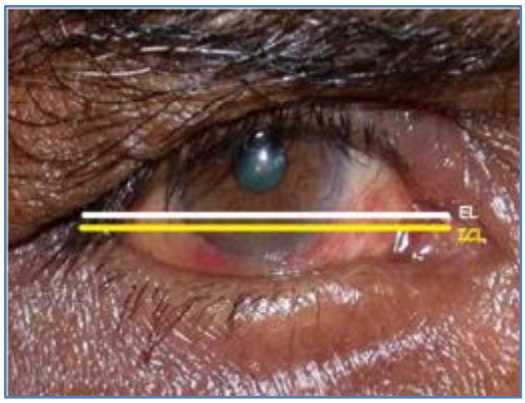

IMAGE 9: ICL near EL after LTS

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