Ectropion is a commonly encountered eyelid malposition. It is characterized by rotation of lid margin outwards resulting in its fall away from the globe. It involves the lower lid more commonly than the upper lid. There is decreased resilience increased laxity of periocular tissues due to age related microinfarction and secondary atrophy. This inadequate support and effect of gravity causes more pronounced stretching of the lower lid increasing the burden on suspensory canthal tendons and resulting in ectropion. To make things worse, the constant wiping and rubbing of eyes irritated by the epiphora, further aggravates the condition. The inferior conjunctiva frequently gets exposed and becomes inflamed and keratinized. (Figure 1) Upper lid ectropion on the other hand usually arises due to cicatricial changes of the anterior lamella (Figure 2).

Pathogenesis of lower eyelid ectropion usually involves one or more of the following mechanisms:

- Horizontal lid laxity
- Medial canthal tendon laxity
- Punctal malposition
- Vertical tightness of the skin
- Paresis of orbicularis (7th nerve palsy) causing paralytic ectropion
- Lower lid retractors disinsertion

The occurrence of involutional ectropion due to interplay of multiple factors necessitates individualized approach so that laxity of each component of the lid tendon complex can be corrected. In this article we shall discuss the applied anatomy, clinical examination methods to identify the structure at fault, and the possible surgical solutions.

**Applied Anatomy**

The eyelids consist of an anterior lamella of skin and orbicularis and posterior lamella of tarsus and conjunctiva.

The orbicularis oculi, a subcutaneous muscle, is divided into orbital and palpebral portions with the palpebral portion further divided into preseptal and pretarsal parts. The pretarsal muscle is attached laterally to the Whitnall’s tubercle; medially it forms two heads that pass superficial and deep to the canaliculi. The anterior pretarsal orbicularis muscle forms the anterior crus of medial canthal tendon and inserts into the frontal process of the maxillary bone. The posterior pretarsal orbicularis inserts into the posterior lacrimal crest (Horner’s muscle). A strip of pretarsal orbicularis at the lid margin is called the Riolan’s muscle that forms the gray line of the lid margin.

The preseptal part forms the horizontal raphae and inserts medially into the anterior crus of medial canthal tendon. Jones muscle forms the deep insertion of the preseptal orbicularis into the lacrimal diaphragm of the tear sac.
The orbital portion attaches medially to the medial canthal tendon (MCT), the frontal bone and inferioromedial orbital margin. It completes an ellipse around the orbit to reach the lateral canthal tendon.

The orbital septum is a fibrous sheath beneath the orbicularis muscle that confines the orbital fat. It is formed at the orbital rim and inserts medially at the posterior lacrimal crest and laterally, just anterior to the Whitnall’s tubercle. There are two fat pads in the upper lid and three in the lower lid. The nasal fat pad is separated posteriorly from the medial fat pad by inferior oblique muscle.

The tarsi form the skeleton of the eyelids. They are 25mm in length, 1mm in thickness, and 10mm and 4mm in height vertically in upper and lower lids respectively.

The levator palpebrae superioris (LPS) originates above the annulus of zinn in the periorbita, extends anteriorly for 40mm and becomes the Whitnall’s ligament. The LPS tendon fans out medially and laterally to the orbital retinacula it also, inserts into the skin and tarsus. The Muller’s muscle forms at the terminal striated muscle fibres of the LPS. It lies posterior to LPS and inserts to the superior border of the tarsus.

Though there are no discrete structures in the lower lid analogous to the retractors of the upper lid, the capsulopalpebral fascia along with the inferior rectus and the inferior oblique muscles, acts as the lower lid retractor and stabilises the lower lid by counteracting the pretarsal and preseptal portions of orbicularis muscle.

The capsulopalpebral fascia is formed by the capsulopalpebral head of inferior rectus muscle. The first fibres of inferior tarsal muscle begin just beyond this origin and a few fascial strands extend from inferior rectus muscle through the orbital fat to the periorbita of the floor. The capsulopalpebral head splits around and fuses with the sheath of the inferior oblique muscle. The two heads fuse to form Lockwood’s ligament (analogous to Whitnall’s ligament) anterior to the inferior oblique muscle.

The capsulopalpebral fascia lies anterior to Lockwood’s ligament. Its superior portion sends strands to the inferior fornix and becomes Tenon’s fascia, extending on to the globe and the inferior part fuses with the orbital septum. The capsulopalpebral fascia fuses with the orbital septum 5mm below the inferior tarsal border. The fusion of inferior tarsal muscle, capsulopalpebral fascia and orbital septum inserts into the anterior and inferior surface and base of tarsus. The lower lid crease, present 2-3mm below the lid margin and 5-6mm laterally, is formed by fibres extending from capsulopalpebral fascia to the eyelid skin through the orbicularis (Figure 3).

The lateral retinaculum is formed by the lateral horn of levator aponeurosis, lateral canthal tendon (LCT), inferior suspensory ligament (Lockwood’s), Whitnall’s ligament and check ligaments of the lateral rectus muscle. It inserts into the lateral orbital tubercle.

The medial retinaculum, is attached to the periorbita just behind the posterior lacrimal crest, and is formed by the medial end of the Lockwood’s ligament, medial horn of levator aponeurosis, check ligaments of the medial rectus muscle, Whitnall’s ligament, deep heads of pretarsal orbicularis, and orbital septum.

**Classification of Ectropion**

A. Congenital

B. Acquired
   - Involutional
   - Cicatricial
   - Mechanical
   - Paralytic

**Preoperative Evaluation**
Complete ocular history with specific history of facial palsy, lid trauma, and previous lid surgery should be taken. Specific examination includes tests for horizontal and vertical lid laxity, integrity of the canthal tendons, orbicularis muscle tone, and changes in the overlying skin.

Watering due to ectropion, needs to be differentiated from that due to other causes which if not addressed will result in an unsatisfied patient. Some of the causes of watering are as follows:

- Hyperlacrimary states as in irritation to ocular surface: reflex tearing as in dry eye, inflammation within the eye, aberrant regeneration after Bell’s palsy, ocular allergy
- Insufficient outflow: malposition of puncta, obstruction along lacrimal drainage system, lacrimal pump failure

The lids, conjunctiva, cornea and anterior chamber are examined for any signs of inflammation.

A Schirmer’s test are carried out to rule out dry eye. Adjunctive tests like syringing, probing, dye disappearance test, Jones test are carried out to confirm that there is no lacrimal passage obstruction.

**Eyelid laxity**

*The pinch test:* effectively determines the amount of lid laxity\(^5\). If the lid can be pulled more than 6 mm away from the globe, the lid is lax. If the medial and lateral canthal tendons are lax as well, the lid can be pulled away up to 20-25 mm.

*Snap back test:* In normal eye lids, if downward traction is applied to the lower lid and then released the lid reverts back to its normal position, without the aid of a blink. When laxity is present, lid is not apposed to the globe and only a blink will restore the position of the lid. (Figure 4)

*Normal:* The lid returns to its position immediately on release

*Grade 1:* approximately 2-3 sec

*Grade 2:* 4-5 sec

*Grade 3:* >5 sec but returns to position on blinking

*Grade 4:* continues to hang down

*Grading according to the time taken by the lid to revert to its normal position*

**Inferior lid retractor laxity**

Retractor weakness can be demonstrated by observing the lower lid as the patient looks down. Reduction in inferior movement on downgaze and a deep inferior fornix occurs due to laxity or loss of retractor attachment in this area. The resting lower lid position may be raised, and a horizontal infratarsal red band may appear on the conjunctival surface that corresponds to the defect in the retractors and is due to orbicularis muscle now being directly visible through the conjunctiva. The edge of the retractors may be seen directly below this band.

**Medial canthal tendon (MCT) laxity** (Figure 5)

The lateral excursion of the inferior punctum is measured by pulling the lid laterally. The punctum lies lateral to the caruncle at rest and should not be displaced more than 1-2mm with lateral lid traction. If pulling on the medial canthus allows the punctum to get stretched, upto the limbus (mild), upto the pupil (moderate), beyond the temporal pupillary border (severe), laxity is present. In the presence of MCT laxity, horizontal lid laxity should be reassessed after MCT tightening.

**Lateral canthal tendon laxity** (Figure 6)

The lateral canthal angle should be evaluated with the lid at rest. It should have an acute angular contour and should lie 1-2mm medial to the lateral orbital rim. A rounded appearance of the canthus indicates laxity. The lateral part of the lid if pulled medially should not result in more than 1-2mm movement of the lateral canthal angle, in absence of laxity (Table 1).
Position of the lacrimal puncta
Punctum alone can be everted or the whole lid maybe everted. In fact the whole lid may look as if turned inside out, this is known as tarsal ectropion.

In a normal lid the inferior punctum is directed posteriorly against the globe and should not be visible without pulling the lid downward. Direction of the punctum away from the globe is the earliest sign of medial lid ectropion and can be graded as follows

**Mild:** Puncta not apposed to the globe on looking up.

**Moderate:** Puncta not apposed to the globe even in primary gaze (Figure 7).

**Severe:** Palpebral conjunctiva and fornix are exposed (Figure 8).

If the palpebral conjunctiva is exposed for long, it becomes keratinized and also the punctum may get obliterated. In these cases the lid margin and punctual repositioning may be combined with the punctoplasty and canaliculoplasty for complete functional rehabilitation.

**Cicatricial skin changes**
Vertical shortening of the anterior lamella like signs of repair of lid laceration or scar of excision of tumour can be looked for.

**Orbicularis muscle weakness**
Facial nerve must be examined to note ectropion due to paralysis of 7th nerve. Lagophthalmos and reduced force of contraction on forced eyelid closure demonstrate orbicularis muscle weakness. Other signs of facial palsy are brow ptosis, loss of forehead wrinkles, absent nasolabial fold and drooping of the angle of the mouth.

**Lid masses**
The lid margin may be physically displaced from the globe by mass lesions on the lid.

**Management of Ectropion**

**Congenital ectropion:** Ectropion can occur in premature infants transiently due to orbicularis slippage/ lamellar slippage. This results in acute eversion of the lids. This can be treated by manual repositioning and inversion of the eyelid with topical antibiotics and lubricating agents.

**Congenital ectropion:** is rare and is due to shortage of skin, an increase in lid length or a combination of both. It is seen with Down’s syndrome, blepharophimosis syndrome or may be idiopathic. Treatment consists of conservative management with lubricants in mild cases. In severe cases skin grafting is necessary to avoid corneal scarring.

**Acquired Ectropion**

- **The surgical techniques for correction of lower lid involutional ectropion** without MCT laxity are
  - **Mild:** Lateral canthal suture plication
  - **Mild to moderate:** Full thickness lid wedge resection
  - **Moderate:** Lateral tarsal strip (LTS)
  - **Marked:** Double wedge resection with lateral tarsal strip
  - **Extreme:** Temporalis muscle transfer

- **The surgical techniques for correcting lower lid medial ectropion** are
  - **Mild:** Retrocanalicuicular resection
  - **Moderate:** Lazy-T
• **Marked:** Medial canthal tendon plication plus Lazy T

• **Extreme:** Temporalis fascial sling

LTS is often combined with medial spindle procedure for treatment of involutional ectropion. However, it can be used alone in patients who show good pre-operative lid and punctal apposition against the globe on performing a lateral pinch and twist test (The lateral lower lid is held by thumb and index finger, pulled laterally and inturned). Omitting a medial spindle in this group does not reduce the effectiveness of surgery, regardless of heterogeneity in other measures of ectropion severity.

**Full thickness wedge resection:** A full thickness lid incision is made perpendicular to the lid margin and extended to the lower border of the tarsal plate. The cut edges are overlapped to assess the amount to be resected and the required amount is excised from the medial part of the lid incision. The base of the resection is brought to an angle near the inferior fornix, in the shape of a pentagon. The tarsal plate edges are approximated using 6-0 vicryl. The marginal sutures are passed through the gray line and lash line using 6-0 silk, left long and wound edge is left everted. The skin is closed with interrupted silk sutures. The skin sutures are removed after one week and the lid margin sutures are removed on day 10 (Figure 9-11).

Horizontal lid shortening can be combined with a blepharoplasty (Kuhnt-Szymanowski procedure- Smith’s) wherein a subciliary incision is made and skin flap is made from a lateral triangle, and lid is shortened under the flap. It is used when there is excess of lower lid skin in addition to generalized horizontal laxity. Precise closure is required to prevent a lid notch.

The original Kuhnt-Szymanowski procedure involved splitting the lid using an incision along the grey line. This lead to loss of eyelashes and is now seldom used.

Some disadvantages of lid resection procedures are:

• It does not correct the underlying physiological abnormality
• Causes lid notching
• Causes lid shortening
• Causes loss of meibomian gland secretion

**Lateral tarsal strip** (Figure 12)

The LCT is exposed with a horizontal incision extending laterally from the lateral canthal angle. The inferior arm of LCT is transected with a vertical incision through full thickness lower lid at the lateral canthal angle. The lid margin is pulled laterally and notched at a point where it is in direct apposition to the globe and a triangular portion of the lower lid is resected, sparing the tarsus. A horizontal mattress suture using 5-0 prolene is used to anchor the tarsus to the periosteum just inside the lateral orbital rim in an outward direction. An additional 6-0 vicryl suture is used to secure the lateral most aspects of the upper and lower lid margin to maintain a sharp lateral canthal angle.

In an alternative method, a block of anterior lamella of the lateral lid is excised, leaving only a strip of tarsus and conjunctiva. A 5mm stab incision is made at the desired site of insertion. The tarsal strip is then led up beneath the periosteal incision and secured beneath the periosteum with a non absorbable suture. The overlying muscle and skin are then closed.

The canthal strengthening procedures correct the underlying physiological abnormality and avoid the complications of lid notching, lid deformation and loss of glandular secretions.

In these procedures, the canthal tendon can be anchored to the periosteum of the orbital rim (medial or lateral). While stabilizing the medial canthus, care must be taken to avoid bunching of the lower canaliculus by inadvertent passing of the suture through the canaliculus (Figure 13 & 14).

**Medial canthal plication**
A Bowman’s probe is passed into the lower canaliculus (Figure 15) and a subciliary incision beginning 3mm lateral to the inferior punctum is extended medially, sweeping superiority above the level of MCT. The pretarsal orbicularis and MCT are exposed and a mattress suture of 4-0 prolene is pulled through the nasal edge of tarsus and overlying orbicularis and then through the periosteum under the insertion of the superficial arm of MCT.

**Medial spindle procedure**

If punctal eversion is present but no significant horizontal lid laxity exists and the MCT is normal, a vertical shortening of the posterior lamella corrects the localized medial lid ectropion. A canalicular probe is passed into the inferior canaliculus, an ellipse (‘spindle’) consisting of conjunctiva and the lower lid retractors, centered on the punctum with superior aspect of the ellipse located near the inferior aspect of ampulla, measuring 6-8 mm horizontally and 3-5 mm vertically, is excised en bloc. The inferior edge is secured to the superior edge using a 5-0 chromic suture in a mattress fashion. The needles are then passed through the inferior fornix out through the full thickness lid to a point 10-12mm below the lid margin. The chromic suture is allowed to dissolve on its own (Figure 16 &17).

**Byron Smith lazy-T procedure**

This involves a full thickness eye lid resection as well as an excision and closure of a medial spindle of conjunctiva. Initially a vertical full thickness incision is made 2mm temporal to the punctum of the lower lid in the tarsal plate, followed by an incision horizontally in the posterior lamella. Capsulopalpebral fascia and edge of tarsus are resected and sutured with 6-0 vicryl. A full thickness section of eyelid is resected after overlapping the edges. Once the final lid sutures are placed in position, they take the configuration of a T lying on its side.

**Safdarjung suture**

The authors studied the results of lower eyelid suspension using 5-0 polypropylene suture for the treatment of involutional and paralytic punctal ectropion. The technique had earlier been reported using 6-0 polypropylene in young patients with anomalous anterior displacement of MPL causing punctal ectropion. A 5-0 polypropylene suture was passed in the pre-tarsal plane between the attachments of the lateral and medial canthal tendons near their insertion at the orbital rim. A 90% anatomical success was achieved at 1 year follow up (Figure 18-22).

**Tarsal eversion:** using posterior conjunctival approach, the retractors are approached and re-inserted onto the lower border of the tarsus. A full thickness suture bite can be taken that comes out through the skin. The inversion suture creates a cicatrix that resolves the attendant overriding component in ectropion.

**Lamellar dissociation:** For lamellar dissociation, inverting sutures are passed which create a cicatricial barrier and prevents future slippage of the posterior lamella over the anterior lamella.

**Temporalis muscle transfer**

This is performed in extreme, recurrent, involutional ectropion. It is also used to correct paralytic ectropion. A lateral scalp incision overlying the mid portion of the temporalis muscle is made, a 10mm strip of the muscle is marked. The muscle is elevated off the cranial vault, a tunnel is made in a submuscular plane lateral to the lateral canthal region, extending just beneath the cilia superficial to the tarsal plate as far as the MCT and anchored to it.

**Cicatricial ectropion**

A local cicatrix or a generalized cicatrix can produce upper or lower lid ectropion. Correction of a cicatricial ectropion requires lengthening of the cutaneous surface and correction of any associated factors—resection of subcutaneous cicatrix or horizontal lid lengthening.

For localized scar causing ectropion, a Z plasty is a preferred technique. Here, a vertical incision is made over the scarred area and two extensions are taken from the edges of the incision angulated at 60 degrees. Flaps are raised, transposed and sutured back. For longer scars, multiple Zs can be fashioned in series. Each Z increases the length of the wound by 30% and redirects it.
For generalized scarring and shortage of skin, skin replacement is indicated with a local transposition flap or a free flap (Figure 23-26).

**Mechanical ectropion:** Masses near the lid margin causing the ectropion should be excised. Excision should be as vertical as possible and it is important to avoid scar formation/skin shortening.

**Paralytic ectropion:** Management involves giving support to the lower lid or strengthening of the lower lid.

Support can be given medially, laterally or to the lower lid as a whole (Figure 27 & 28).

A medial canthoplasty/ tarsorrhaphy may be done avoiding the punctum.

Lateral canthus can be elevated to a higher level and sutured to periosteum of the lateral orbital rim/ a lateral tarsorrhaphy maybe done.

In long standing cases associated with cheek ptosis, a cheek lift/ mid face lift may be necessary.

**Conclusion**

Ectropion is a commonly encountered lid malposition in the clinical practice. The underlying factor may vary in each case and an appropriate identification of the type of ectropion and the factor responsible for its occurrence are important in choosing the correct surgical intervention. A combination of procedures may at times be employed for achieving a complete functional rehabilitation. Nonsurgical treatments like injection of hyaluronic acid gel, though, minimally invasive and safe technique that improves cicatricial ectropion, has limited use due to poor cosmetic results and is reserved only for patients who decline surgery or are poor surgical candidates.14

**References**