Surgical tips on the lateral tarsal strip

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The lateral tarsal strip (LTS) is a useful oculoplastic procedure that shortens the lower lid without distorting the lateral canthal angle or causing horizontal phimosis of the palpebral aperture.¹⁻³ The tarsal strip is superolaterally placed just inside the lateral orbital rim, which elevates and straightens the lower lid giving a youthful appearance. The procedure is increasingly replacing other methods of eyelid shortening for ectropion, entropion and other conditions.¹⁻²⁰

Historical perspective

Horizontal lid tightening can be achieved by full-thickness lid resection, lateral or medial canthal tendon plication and the lateral tarsal strip.^{1-3,16,21-38}

Full-thickness lid resection

Records show that 188 years ago McAdam horizontally shortened the lower lid for ectropion by excising a full-thickness wedge of tissue then repairing the lid.²⁸ Others used a full-thickness base-up triangle or an inverted pentagonal wedge. The tissue was initially excised from the central part of the lid, until it became apparent that the sutures would result in less corneal irritation if the tissue was excised from the lateral part of the lower lid, especially if the cut end of the tarsus was sutured directly onto the lateral orbital rim.^{6,29,39}

Two commonly performed operations for involutional ectropion are Byron Smith's modification of the Kuhnt-Szymanowski procedure that shortens the lid between its middle and lateral third,³⁰ and the lazy-T correction of medial ectropion⁴⁰ where a medial pentagon is excised. For entropion, the Quickert procedure shortens the lid between the middle and lateral third.⁴¹ These methods of correcting horizontal lid laxity in ectropion and entropion are relatively easy and have therefore remained in use over many years.

Lateral canthal and medial canthal tendon laxity

Small degrees of lateral canthal tendon laxity have been corrected by a lateral canthal tendon tuck³³ or suspension suture,³⁴ the latter using a 4.0 or 5.0 braided polyester suspension suture to

shorten the tendon during blepharoplasty in order to reduce canthal displacement and inferior scleral show. Both the tuck and the suspension sutures are suitable only for mild horizontal laxity.

Medial canthal tendon laxity has been addressed by excision or plication of the tendon medial to the lower punctum, anchoring the tissue to either the anterior periosteum or posterior lacrimal crest.²¹⁻²⁷

Evolution of the lateral tarsal strip

In 1953 Kirby¹⁰ described an operation that is the direct forerunner of the lateral tarsal strip. He shortened the lid at the lateral canthus in order to maintain the lateral canthal angle and prevent horizontal phimosis by fashioning a pedunculated tongue of tarsal tissue 5-6 mm long (after removing the lid margin conjunctiva and skin) which he passed through a tunnel to the periosteum at the lateral orbital rim. He applied this technique to lid shortening in entropion. It was a technique remarkably similar to the lateral tarsal strip we know.

Tenzel⁴² described a lateral canthal sling operation in 1969 for patients with lower lid laxity associated with an anophthalmic socket. A new lower lateral canthal tendon was created from the lateral tarsus by excising the surrounding skin, conjunctiva and lid margin, which was then placed through a surgical button-hole in the upper lateral canthal tendon and attached to the temporal periosteum. Two 5.0 wire or 4.0 silk sutures were used to attach the tarsal sling to the periosteum. Later, in 1977, Tenzel *et al.*³² extended the use of the lateral canthal sling to the correction of involutional ectropion by using a 6.0 Prolene suture in the tarsal sling and a mattress suture to reform the lateral angle and close the deep tissue, which was previously not done.

The lateral tarsal strip (LTS) operation in common use was originally described by Anderson and Gordy in 1979¹ for the treatment of paralytic or involutional upper and lower eyelid laxity, lateral canthal tendon laxity and eyelid malposition. The sling and the strip have many similarities since both shorten the lower lid whilst maintaining a sharp lateral canthal angle. However, the lateral tarsal strip is a simpler procedure than the lateral canthal sling since the strip does not have to be put through a

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pre-prepared button-hole in the upper limb of the lateral canthal tendon but can be sutured directly to the lateral orbital rim. In 1989 Jordan and Anderson³ simplified the LTS further (enhanced lateral tarsal strip) for patients with a tight anterior lamella and little horizontal laxity by fashioning a 2–3 mm tarsal strip without splitting the lid or removing the anterior lamella. The amount of shortening with a LTS is titrated according to the amount of lid laxity and can range from 3–5 mm to approximately 12 mm. A similar LTS-type procedure may be applied to the upper lid if that requires simultaneous horizontal shortening.¹

Other surgeons have modified Anderson's LTS technique: Weber *et al.*³⁶ suggested electrosurgical de-epithelialisation of the conjunctival epithelium on the strip, while Liu³⁸ excised the redundant lateral lid as in a Bick procedure and attached the small tarsal remnant to the rim without actually fashioning a strip. Others have included a periosteal strip to reinforce the posterior lamella of the tarsal strip in entropion repair,⁴³ which is rarely needed.

Indications

Ectropion, entropion and horizontal lid laxity

The LTS is commonly used in the correction of involutional ectropion with or without excision of a medial spindle (diamond) of tarsoconjunctiva,^{4–8} lagophthalmos in paralytic ectropion, lid laxity in mild post-enucleation socket syndrome and the lax eyelid syndrome.⁹ It may be used to correct cicatricial ectropion when combined with a free skin graft. It is increasingly being used in the correction of horizontal laxity associated with involutional entropion.^{10–13}

Other uses

The LTS is also used for repair of the lateral canthotomy in the swinging eyelid flap for orbital floor implants,¹⁴ orbital decompression,^{15,16} lower lid transcutaneous or transconjunctival blepharoplasty^{17,18} and SOOF (sub-orbicularis oculi fat pad) lift.¹⁹

Coexistent medial canthal tendon laxity

Coexistent medial canthal tendon laxity should be corrected at the same time by stabilising the medial canthal tendon, either by plication or resection and posterior fixation, to prevent the punctum being pulled laterally out of the tear lake when the lid is shortened.^{20–27}

LTS surgical steps

The LTS procedure consists of the following steps (Figs. 1,2):

1. Lateral canthal incision

(a) *Skin-orbicularis* Mark in ink the 5–10 mm incision along a horizontal crease (smile line). Use a blade or Colorado needle to incise skin-orbicularis and expose the superficial fascia overlying the periosteum or the periosteum of the lateral orbital rim but do not cut through the periosteum to the bone.

(b) *Lower limb lateral canthotomy and cantholysis* Use straight blunt scissors to divide the lower limb of the lateral canthal tendon in an inferolateral direction (sparing the upper limb), then divide the inferomedial fibres (cantholysis) to mobilise the lid. A 6.0 black silk traction suture through the grey line just medial to the planned length of tarsal strip helps suspend the lid and prevent damage to the tarsal strip by excessive manipulation.

2. Fashion the tarsal strip

(a) *Grey line split* Use a blade to split the lateral lid at the grey line along the desired length to be shortened.

(b) *Separate anterior and posterior lamellae* The assistant then holds the anterior lamella of skin and muscle with a skin hook to enable cautery to the marginal artery at the lower border of the tarsal plate.

(c) *Excise mucocutaneous junction* Use straight sharp scissors to trim the upper margin of the strip.

(d) *Remove tarsoconjunctiva* De-epithelialise with light bipolar cautery or the side of the Colorado needle then scrape off with a blade.

(e) *Check length of strip* Pull strip in a superolateral direction and decide whether the end requires trimming to enable the strip to fit snugly just within the orbital rim. It may otherwise form a swelling anterior to the rim.

(f) *Small blepharoplasty* Use straight sharp scissors to remove a very small sliver of skin and lash line anterior to the strip, cutting as horizontally as possible.

3. Secure the tarsal strip

(a) *Non-absorbable suture, e.g. 5.0 Ethibond or Prolene* Use a double-ended suture with a half-circle needle or bend the needle to increase its curvature to assist placement at the lateral rim. Pass both needles through the medial end of the strip from posterior to anterior and make a loop to secure the suture on the anterior surface of the strip. Pass the two needles through the superficial fascia and/or zygomatic periosteum just inside the orbital rim at a level above the horizontal canthal line; this will overlap the upper limb of the lateral canthal tendon and should be a very strong suture. Tighten the suture to check that the strip tucks inside the rim and is not forming a lump on the outer rim – the suture will emerge on the outside the rim. Do not tie it yet but place the ends on a bulldog. In

Fig. 1. Diagrammatic sequence of steps in the lateral tarsal strip (LTS): (i) skin-orbicularis incision, (ii) periosteum of lateral orbital rim exposed, (iii) lateral canthotomy and cantholysis, (iv) double-ended permanent 5.0 suture placed in tarsal strip, (v) suture looped and strip pulled superolaterally, (vi) suture passed through periosteum just inside orbital rim, (vii) strip knot tied on rim and angle suture (6.0 Vicryl) secured, (viii) orbicularis closed with two 6.0 Vicryl buried purse-string sutures, (ix) wound is now self-sealing, (x) 8.0 Vicryl interrupted sutures close the skin.

general, the strip needs trimming only if it is longer than 5 mm or the tip has been damaged by excessive manipulation.

(b) *Angle suture* Reform the lateral canthal angle with a buried 6.0 Vicryl suture taking tiny bites through the grey line of the lower and upper lid. The lateral canthus can now be pulled laterally by the tarsal strip suture.

(c) *Tighten and tie the permanent tarsal strip suture* Secure and cut the suture ends 2–3 mm long.

4. Close the orbicularis and skin in two layers

(a) *Bury permanent suture* Close the orbicularis with two purse-string 6.0 Vicryl sutures on a half-circle needle, lifting the orbicularis whilst suturing to ensure that the ends of the permanent suture have not been caught in the orbicularis layer.

Fig. 2. Fashioning the tarsal strip: (a) grey line split, (b) anterior and posterior lamellae separated, (c) mucocutaneous margin excised, (d) tarsoconjunctival epithelium removed, (e) strip fashioned, (f) small blepharoplasty to include strip lash roots.

(b) *Close the skin with 8.0 Vicryl* The orbicularis sutures ensure that there is no tension on the skin wound; therefore interrupted 8.0 Vicryl sutures are adequate. These are barely visible and do not have to be removed after surgery.

Post-operative management and per-operative corneal exposure

Eye padding is not indicated unless there is concern about corneal per-operative exposure. Systemic antibiotics are used only if the surgery has for some reason been prolonged, for instance for teaching or bilateral surgery. Topical antibiotics t.d.s. are recommended for 2 weeks, with the patient clearly warned not to pull the lid down which could lead to dehiscence of the tarsal strip.

Advantages of the LTS over other techniques

The main advantages of the LTS over other techniques are (1) cosmetic and (2) rapid rehabilitation.

Cosmetic advantages

The LTS avoids the potential complications of intra-lid shortening by shortening the lower eyelid laterally, maintaining an anatomically correct configuration of the lateral canthal angle whilst avoiding the horizontal phimosis and lid notching that can be seen when the lid is shortened by wedge excision. The control of the horizontal palpebral aperture and the straight lower lid contour preserves a youthful look.

Rapid rehabilitation

The small lateral canthal incision and absorbable 8.0 Vicryl skin sutures make the LTS a minimally invasive procedure that contributes to the easy post-operative management. The patient does not have to be seen in the clinic at the customary 1 and 2 weeks as for a wedge excision but may wait 2 or 3 weeks before the first visit. If all is well they can then theoretically be discharged, which makes the procedure very attractive for elderly patients who cannot easily get to the clinic for frequent visits.

Avoiding complications

The LTS operation is very simple to perform and there need be few complications if the surgical steps and tips are noted. It is advisable to use only 1–1.5 ml local anaesthesia with adrenaline 1:80 000 to maintain the normal anatomical landmarks and reduce the risk of haematoma.

Clinical series using the LTS have reported good results with few complications (5–8%).³⁷ The complications include granuloma formation and suture extrusion, suture abscess and lateral canthal dehiscence.

Rim discomfort is more commonly reported. These complications can largely be avoided if specific rules are adhered to:

Granuloma and suture extrusion Avoid these by burying the permanent suture with the orbicularis closure, ensuring the Ethibond/Prolene knot remains in the post-orbicularis space.

Suture abscess Ensure that the permanent suture is completely buried and that there is no exposure of its ends to either the conjunctival or skin surface. This will also abolish the dead space around the suture, a potential focus of infection.

Lateral canthal dehiscence. Use the 6.0 Vicryl to suture the lateral angle and stop the lower and upper lid margins from slipping. This also prevents the tarsal strip becoming exposed even if it detaches from the rim internally. Avoid dehiscence by instructing the patient NOT to pull the lid down to instil post-operative drops or ointment as they normally would. Aim to reduce lateral canthal tension in the first 2–3 weeks after surgery.

Orbital rim tenderness Varying degrees of rim tenderness are reported in up to 25% patients and lasting 2–6 weeks. To prevent severe tenderness, avoid cutting the periosteum at the rim and try not to pass the suture right down onto the bone but through the periosteum tangentially (ensuring that the two bites are into firm tissue). Do not overtighten the lid using the LTS.

In summary, horizontal tightening of the lower lid is an integral part of all involutional ectropion and most involutional entropion surgery as well as other less common operations. It can be achieved by shortening the lid with a full-thickness wedge excision, lateral canthal tendon plication or the lateral tarsal strip. The lateral tarsal strip is a versatile oculoplastic procedure for which these surgical tips may help prevent complications.

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