



Structural defect from the superficial lateral canthal tendon in two adolescent female patients: a case series

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The lateral canthal tendon (LCT) is essential in maintaining eyelid tension and position. It comprises both deep and superficial limbs, the latter anchoring to the periosteum and lateral orbital thickening through the orbital retaining ligament and raphe of orbicular oculi muscle. Disruption of this structure can lead to functional eyelid instability in older patients and is often overlooked in younger patients. The authors present two adolescent female patients with chronic ocular discomfort—including dry eye sensation and eyelid fatigue—despite having no prior facial trauma or surgery. In the first case, a 15-year-old exhibited mild ptosis (marginal reflex distance [MRD] 1, 2 mm), reduced levator function (6 mm), and moderate bilateral fish-mouthing with marked lid laxity and eversion. Intraoperatively, both superficial LCTs were found completely ruptured with orbital fat herniation. In the second case, a 16-year-old girl with a long-standing history of allergic conjunctivitis, habitual eye rubbing, and over five years of colored contact lens use, showed preserved eyelid position (MRD1, 5 mm; levator function test, 12 mm) and a positive canthal tilt. However, mild bilateral fish-mouthing was noted clinically. Surgical findings confirmed bilateral attenuation and partial detachment of the superficial LCT, more pronounced on the left side.

Keywords: eyelid laxity; fish-mouthing; lateral canthal tendon; lower lid eversion; superficial LCT rupture

Introduction

The lateral canthal tendon (LCT) complex stabilizes the outer eyelid angle and plays a critical role in eyelid contouring and blink mechanics. Anatomically, it consists of a deep component inserted into Whitnall's tubercle on the lateral orbital rim, a superficial component blended with the periosteum, and a lateral orbital thickening. The deep tendon provides fixed anchoring, whereas the superficial tendon distributes blink tension laterally.

Disruption of this system can result in fish mouthing, lid laxity, or dry eye-like symptoms due to inefficient blinking [1]. In particular, the superficial LCT provides essential lateral tension and can be independently compromised, leading to functional

blink deficiency, even if the deep LCT remains intact.

Most reported cases of LCT instability have occurred in older adults, typically after lower eyelid blepharoplasty or trauma [2]. Patients with LCT laxity may develop lid malposition secondary to aging or acquired causes and often present with symptoms such as epiphora, ocular irritation, photophobia, and ocular fatigue. However, isolated superficial tendon defects are extremely rare and often remain undiagnosed in younger individuals without prior surgery or trauma.

The authors present the cases of two adolescent female patients with isolated superficial LCT defects that were confirmed intraoperatively.

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Case report

Case 1 presentation

A 15-year-old female visited our clinic with a history of bilateral ocular fatigue, dryness, and sensation of eye heaviness, especially during study sessions. She frequently used artificial tears and reported difficulty in concentrating because of ocular discomfort. Headaches, typically frontal or temporal, were also reported, which worsened after reading or prolonged screen use. Her medical history was unremarkable with no prior facial trauma, surgery, or allergic eye disease. The patient denied habitual eye rubbing. Upon examination, her visual acuity was 20/20 in both eyes. At rest, her upper eyelids appeared symmetrical with mild ptosis and no ectropion. Marginal reflex distance (MRD) 1 measured 2 mm bilaterally, indicating mild ptosis. The levator function was mildly reduced by 6 mm in both eyes (Fig. 1).

According to Kim et al. [3], patients with mild ptosis and fair

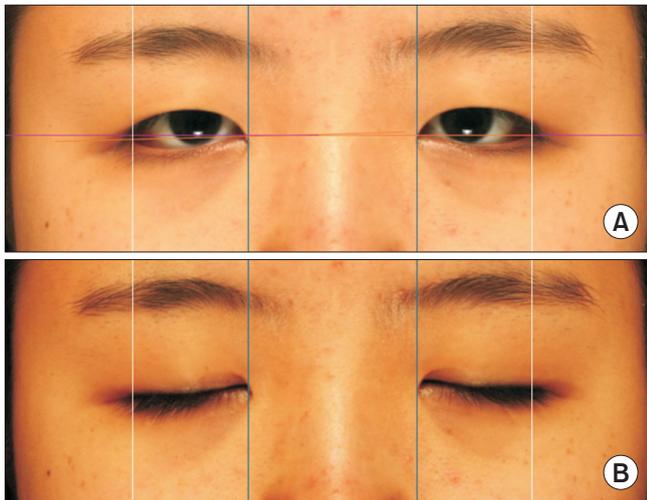


Fig. 1. Preoperative frontal photographs of the patient showing subtle bilateral lateral canthal laxity. (A) Preoperative photograph with eyes gently open in a relaxed state. (B) Preoperative photograph with eyes gently closed in a relaxed state. This preoperative image illustrates various reference lines used to analyze eyelid and canthal positioning in the patient. Blue vertical lines: these lines pass through the medial canthi and are used as facial symmetry references. White vertical lines: these represent the lateral canthal lines, extended vertically from the outer corners of the eyes (lateral canthi). Purple horizontal line: this horizontal reference line connects the medial canthi of both eyes and defines the intercanthal baseline. It provides a measurement axis for intercanthal distance, which in this patient was approximately 25 mm (right)/26 mm (left). Orange oblique lines: these lines connect the medial and lateral canthi of each eye and are used to calculate the canthal tilt. In this case, the left eye showed a neutral canthal tilt of 0° , indicating a neutral canthal tilt while the right eye demonstrated a negative tilt of -4° , indicating a negative canthal tilt.

levator function may benefit from posterior approach techniques, such as conjunctiva-Müller muscle resection. However, in this case, the patient's symptoms were predominantly due to lateral canthal laxity rather than aponeurotic ptosis. Dynamic testing revealed moderate bilateral fish-mouthing—a small lateral gap appeared during forceful closure, and a snap-back test confirmed significant lid laxity with bilateral overt lower eyelid eversion. However, no frank eyelid malposition, retraction, or lagophthalmos was observed (Fig. 1).

The preoperative assessment suggested subclinical lateral canthal instability, which was suspected to originate anatomically. Diagnostic surgical exploration was planned to evaluate the LCT integrity.

Surgical procedure

The following preoperative image shows the surgical design of Case 1: an incision line was drawn laterally to the edge of the pretarsal skin, just before the lateral canthus (Fig. 2). This design made it easier to reach the area where the tendon needed to be located and repaired. Through this incision, the skin, orbicularis oculi muscle, and middle connective tissue were carefully opened individually. After passing through these layers, we were able to clearly see the superficial LCT, which is a fused form of the orbicularis muscle raphe, the lateral orbital thickening inferiorly, and the orbital-retaining ligament, which was either repositioned or repaired to help restore normal support at the outer corner of the eyelid.

Intraoperative findings

Under local anesthesia and sedation, lateral canthal incisions were made bilaterally. Upon dissection, both eyes showed complete rupture of the superficial LCT at the periosteal attachment. The expected fibrous band between the tarsus and the



Fig. 2. Preoperative design photograph. The incision line extends laterally to the most distal end of the pretarsal skin, just medial to the lateral canthus. This approach allowed controlled dissection through the skin, muscle, fibromuscular connective tissue, and lateral orbital retaining ligament to expose the superficial lateral canthal tendon.

lateral orbital rim was absent and replaced by a plane of loose areolar tissue and protruding orbital fat (Fig. 3).

The deep LCT remained intact and attached to Whitnall's tubercle in both eyes, providing basic structural support. However, the absence of the superficial limb explains the moderate fish-mouthing observed clinically. There were no signs of scarring, inflammation, or trauma. These findings confirmed a rare case of bilateral isolated superficial LCT rupture in a young nonsurgical patient. These findings may explain the patient's bilateral blink inefficiency and chronic ocular fatigue. This image pair confirmed that bilateral superficial tendon rupture was the anatomical substrate of the patient's symptoms, reinforcing the importance of a detailed exploration.

In contrast, the control patient (Fig. 4) showed well-preserved anatomy, with clearly defined superficial LCTs, intact lateral retinaculum, and no fat prolapse. These comparative images highlight the functional and structural significance of superficial tendons in lateral canthal support.

Case 2 presentation

A 16-year-old girl presented with chronic bilateral ocular itching, habitual eye rubbing, and occasional tearing. She had a known history of seasonal allergic conjunctivitis with 5 years of experience wearing colored contact lenses, but had no history of facial trauma or prior eyelid surgery. Her chief complaints included periocular discomfort and sensation of lid looseness, particularly during allergic flare-ups and prolonged visual activity. On clinical examination, MRD1 was 5 mm bilaterally, with good levator function (12 mm). The canthal tilt was positive on both sides (+12° right, +10° left), yet the left eye exhibited a shorter intercanthal length (25 mm right, 24 mm left), smaller tilt angle, and a more downward lateral lower lid contour. Subtle fish mouthing was noted on gentle eyelid closure, which was more prominent on the left, along with a mild lateral flare and delayed lower lid return (Fig. 5).

The intraoperative findings revealed bilateral partial rupture and thinning of the superficial LCT. The detachment was more

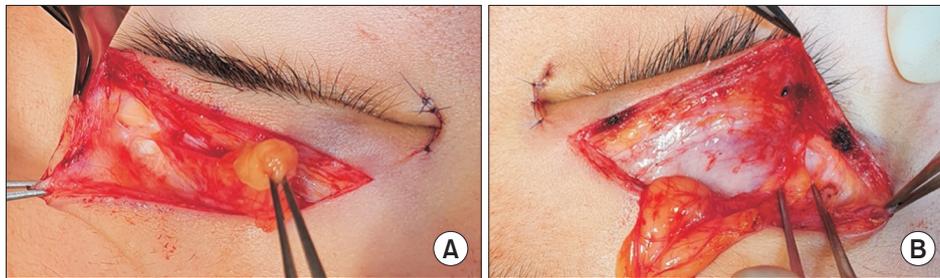


Fig. 3. Intraoperative photographs of bilateral superficial lateral canthal tendon in a 15-year-old female. (A) Left eye: dissection of the lateral canthal region reveals a complete absence of the superficial lateral canthal tendon. Instead of the expected fibrous band inserting into the periosteum, the space is occupied by herniated orbital fat and loose connective tissue. The tarsal plate margin appears unsupported laterally, confirming structural dehiscence. (B) Right eye: similar findings are observed on the contralateral side. The superficial tendon is again completely deficient, and the orbital fat prolapse is even more prominent. The area normally occupied by the lateral retinaculum is thinned and lacks tensile integrity.



Fig. 4. Intraoperative photographs in a 38-year old male who has relatively healthy lateral canthal anatomy (control patient). Intraoperative views of the lateral canthal region with normal eyelid tension and no history of ocular discomfort or surgical intervention. In both eyes, the superficial lateral canthal tendon is clearly visualized as a dense fibrous structure extending from the lateral tarsal plate to the periosteum of the lateral orbital rim, blending seamlessly into the lateral orbital thickening. The orbital fat is well-contained, and the lateral retinaculum appears taut and intact. There is no evidence of herniation or structural dissociation between anterior and posterior lamellae. (A) Right eyelid, (B) left eyelid.

pronounced on the left side, with visible loosening of the periosteal connection and attenuation of the fibrous tissue. The deep limbs of the LCT remained intact on both sides. These findings suggest a structural weakening of the lateral canthal support, which is likely associated with chronic mechanical stress and allergic inflammation (Fig. 6).



Fig. 5. Preoperative frontal photographs of a 16-year-old female patient with a history of allergic conjunctivitis and habitual eye rubbing. (A) With eyes open in a relaxed state, canthal tilt was positive bilaterally ($+12^\circ$ right, $+10^\circ$ left), but the left eye showed a shorter lateral canthal length, more rounded appearance, and a more downward contour of the lower lid, suggesting relatively weakened lateral support. (B) During gentle forced eyelid closure, bilateral fish-mouthing is visible, more prominent on the left, indicating greater lower lid laxity on that side. Note: blue (medial vertical), white (lateral vertical), purple (intercanthal horizontal), and orange (canthal tilt) reference lines are based on the same anatomical criteria described in Fig. 1.

Discussion

This case series highlights two rare instances of superficial LCT disruption in adolescent females with no history of obvious trauma or eyelid surgery and who did not wear contact lenses. Although the LCT is a well-recognized structure in oculoplastic anatomy, its superficial limb is frequently underappreciated in clinical evaluation and imaging. Anatomical studies have described it as part of the lateral retinaculum, contributing significantly to lateral eyelid tension and blink function [4]. Disruption of this structure laterally compromises eyelid closure, resulting in an evaporative dry eye, blink inefficiency, and ocular fatigue [3].

In both cases, the intraoperative findings confirmed isolated superficial LCT defects: complete bilateral rupture in one case and bilateral partial attenuation in the other. Despite the absence of prior trauma or surgery, both patients exhibited symptoms such as dry eye sensation, fish mouthing, and lower lid laxity. These cases underscore that superficial LCT integrity plays a functionally important role even in the absence of dramatic eyelid malposition. This aligns with previous reports that minor anatomical defects in blink mechanics can produce disproportionately large symptomatic consequences [5]. The bilateral involvement observed in both patients raises the possibility of an underlying congenital predisposition or developmental insufficiency of the tendon formation. Although no systemic connective tissue disorder was clinically evident, such factors could not be definitively excluded without further genetic or histological analyses.

Beyond the mechanisms already discussed, structural facial factors such as a heavy midface or a negative vector eyelid relationship may contribute to the weakening of the lateral canthal complex. In the first case (Fig. 1), the patient exhibited flat malar bones and a wide midface with clinically evident facial heavi-

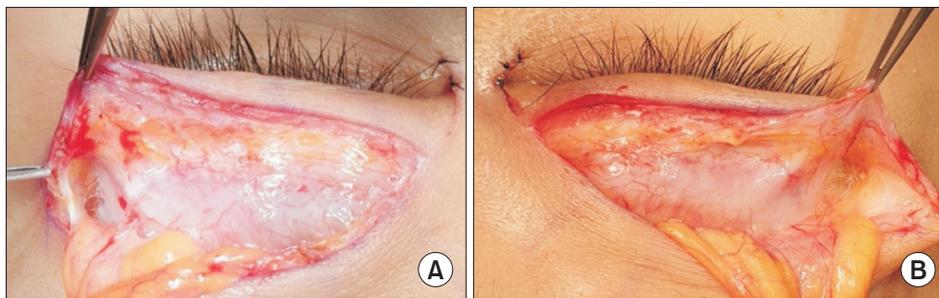


Fig. 6. Intraoperative photographs of the same patient, showing the lateral canthal tendon region bilaterally. (A) Left eye: partial rupture and thinning of the superficial lateral canthal tendon with visible periosteal detachment and slight orbital fat exposure, consistent with the more severe preoperative findings on this side. (B) Right eye: superficial tendon is attenuated but relatively preserved, with less prominent tissue detachment. The deep limb was intact in both eyes.

ness, which could increase the gravitational pull on the lower lid and strain the lateral canthal support. In the second case (Fig. 5), although no formal measurement was performed, visual inspection revealed a protruding globe with a negative globe-to-skeletal rim relationship, consistent with descriptions of the negative vector eyelid anatomy [6]. These features can contribute to and/or exacerbate the lateral canthal laxity and tissue weakening in the outer corner of the eye. This is due to the increased downward pull on the face and surrounding tissues, which can strain the lateral canthal ligaments and surrounding structures.

Importantly, this study emphasizes the need to consider the anatomical causes of dry eye symptoms in young patients who do not respond to conventional management. Subclinical blink impairment due to tendon laxity should be suspected when tear film dysfunction persists despite lubrication or anti-allergy treatment. Early surgical exploration may confirm the diagnosis and guide the appropriate intervention.

Conclusion

In conclusion, isolated disruption of the superficial LCT can occur even in young, nonsurgical patients and may manifest as lower lid laxity, fish mouthing, or chronic ocular fatigue. These two cases, one with complete bilateral rupture and the other with partial detachment, demonstrate that even subtle anatomical defects in the lateral canthal support can have meaningful functional consequences. Mild eyelid asymmetry, dynamic lid instability, and unexplained dry eye symptoms in adolescent patients should be carefully evaluated anatomically, particularly in the context of habitual eye rubbing or allergic conjunctivitis. Anatomical awareness, dynamic blink assessment, and targeted surgical exploration are essential for identifying rare but clinically impactful defects.

Based on these findings, the authors believe that further in-

vestigations are warranted to objectively elucidate the underlying causes of such structural defects. This should include comprehensive preoperative ophthalmic assessments of blink and tear function as well as morphometric analysis of the mid- and lower-facial anatomy, which may contribute to lower eyelid and lateral canthal instability.

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None.

Conflicts of interest

The authors have nothing to disclose.

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