Once the medial canthal ligament is completely avulsed during oculoplastic surgery, abnormal contours of the eye may present, along with functional abnormalities such as epiphora and ectropion. Disruption of the medial canthal ligament can lead to medial telecanthal deformities, including shortened palpebra, obtuse-angled medial canthi with infraplacement, increased intercanthal distance, and an absent naso-orbital valley. For these reasons, the normal shape of the medial canthus is a very important aesthetic and functional determinant of the eyes.

Disruption of the medial canthal ligament may result from canthal trauma, cancer resection, and some craniofacial fractures. The meticulous reduction and stabilization of the ligament attachment remains key to successfully repairing the normal appearance of the eye, but there are a number of obstacles, including inadequate bone fixation due to complex anatomy, damages to the bone, and scarred, thickened, or inelastic tissue. A variety of devices and surgical techniques have been described for reattaching the ligament to the bones. Here, we describe the successful application of microscrew and microplate fixation for medial canthoplasty in a series of 38 patients.
Thirty-eight patients (38 eyes) presenting to the authors’ clinic with delayed medial canthal ligament disruption were selected for inclusion in this series. All patients had unilateral medial telecanthal deformity resulting from trauma or postoperative complications.

The distances from each patient’s two medical canthi to the median line were preoperatively measured and the difference between the two numbers was recorded as the displacement distance (ie, by how much the affected medical canthus laterally was displaced).

Microscrew Fixation

If the patient’s anatomy allows, single disruption of the medial canthal ligament can be managed with titanium screw fixation. In our series, 31 eyes were eligible for this type of correction. Before local anesthesia, the normal position of the medial canthus was marked with a marking pen directly on the skin. For the purpose of achieving a symmetric outcome on the contralateral side, overreduction of about 1 mm was most often required. Along the medial canthus, past the “normal position” marked preoperatively, a reverse Y-shaped incision was made. (Upon closure, this incision will transform into a reverse V-shape, just as with a “Y-V” flap. This approach is always employed as part of a canthoplasty procedure, in order to provide sufficient exposure through a covert incision.) With full dissection around the canthus, any scarred tissues under the canthal skin were removed because the resultant tension would cause stretching or pulling of the tissue attachment.

Subsequent subperiosteal dissection provided the surgeon with exposure to the anterior lacrimal crest area. A self-tapping titanium microscrew was propelled into the solid bone on the posterior aspect of the anterior lacrimal crest at the estimated attachment position of the medial canthal ligament, without a predrilled hole. A screw with a low-profile head was selected to avoid gliding of the wire (Figure 1A).
A 3-0 wire suture was wound tightly around the screw
neck and a 3-0 wire suture was passed twice through the
stump of the medial canthal ligament to set it. Traction was
applied to the wire to confirm that it was pulling on the
medial canthus. The wire was twisted and tightened until the
canthus was firmly secured. The positioning of the canthus
was again inspected from outside the skin, to reconfirm its
correct location. The twisted wire was clipped short and
tucked deeply into the soft tissue behind the anterior lacrimal
crest. The skin and soft tissue were closed with separate 6-0
silk sutures. The wound was dressed with erythromycin opht-
thalmic ointment and bandaged.

**Microplate Fixation**

If the medial orbital rim was fractured or absent, a tita-
nium microplate with three or four holes was required
to assist with wire attachment. Across the fragile area,
with the medial orbital rim acting as a bridge, a malle-
able microplate was fixed deeply behind the rim, into
the nearby solid and stable bone, with two or three
screws (Figure 1B). A wire suture was passed first
through the stump of the medial canthal ligament and
then through the plate hole overlying the bone at an
appropriate position. Care was taken to ensure that the
plate was placed behind the anterior lacrimal crest, so
that the plate would not be visible or palpable postop-
eratively (Figure 1C). The remainder of the operation
proceeded as described above.

**Autologous Fascia Lata Graft**

If a patient’s soft tissue has suffered severe loss from
trauma or prior surgeries, it can be difficult to attach the
medial canthus to the anterior lacrimal crest. Three
patients in our series presented with recurrent cases of
medial telecanthal deformity; in all three of these patients,
fascia lata was found to be a good substitute.

In this technique, a small piece of autologous fascia lata
graft (approximately 20 × 15 mm) was harvested through
a stab incision, which was approximately 100 to 150 mm
above the knee joint. The incision was closed directly with
a 5-0 nylon suture. The harvested graft was immediately
soaked in saline water. After being cleaned and trimmed
to fit the operative site, the graft was sutured to the tissue
under the medial canthus on one end and fixed to the wire
on the other end (Figure 1D). The remainder of the operation
proceeded as described above.

![Figure 2](image1.png)

**Figure 2.** (A) A 42-year-old man presented for correction of medial telecanthal deformity. (B) Three months after surgery with microscrew only.

![Figure 3](image2.png)

**Figure 3.** (A) A 33-year-old man presented for correction of medial telecanthal deformity. (B) Eight months after surgery with microscrew only.
The mean age of the 38 patients in our series was 38.3 years (range, 13 to 56 years). They presented for correction at a mean time of 10.8 months (range, six to 14 months) after the appearance of the deformity. The median follow-up period was 13 months (range, nine to 18 months). All of the postoperative data reported here were taken at each patient’s final follow-up visit.

In all patients, the Y-shaped medial canthal incision permitted wide intraoperative exposure across the anterior lacrimal crest, even beyond the posterior lacrimal crest. The scars were well hidden and well tolerated by most patients. None of the patients required removal of the plates or screws. No other problems (such as infection, hematoma, or temperature sensitivity) were encountered in the follow-up period. Thirty-four of 38 patients obtained a stable, satisfactory contour of the medial canthus. The initial deformity recurred in four cases, approximately three months postoperatively. Of these, three were corrected with satisfactory results.

In terms of technique, 31 patients were corrected with microscrews only. We classified these cases into three groups according to the lateral displacement distance measured preoperatively. The patients in group 1 had a displacement distance between 4 and 6 mm (seven patients); group 2, between 7 and 9 mm (20 patients); and group 3, more than 9 mm (four patients). Postoperative lateral displacement measurements showed that the displacement distance was less than or equal to 2 mm in 27 patients, about 3 mm in one patient, and about 5 mm in the remaining three patients. All patients with more than 2 mm of displacement (n = 4) were originally in group 3, with the greatest preoperative displacement distance. The three patients with approximately 5 mm of postoperative displacement accepted further adjustment through the same approach. One patient repeated the original procedure and the other two were corrected with additional fascia lata graft. These patients were satisfied with their subsequent outcomes and their final displacement distance was less than 3 mm. Clinical photos of two of these patients can be seen in Figures 2 and 3.

Four of the 38 patients were found to have fractures or defects of the medial orbital rim by preoperative computed tomography (CT). These four underwent reconstruction with microplates. Their respective displacement distances were 5 mm, 6 mm, 8 mm, and 10 mm preoperatively and 2 mm, 1 mm, 3 mm, and 5 mm postoperatively. As a result of excessive prior operations, the final patient elected to have no further correction, despite a persistent asymmetric appearance.

Three of the 38 patients who had previously undergone microscrew fixation had recurrent deformities. Due to severe tissue loss, fascia lata grafts were transplanted to the medial canthus of each of these patients. The postoperative displacement distances were 6 mm, 8 mm, and 9 mm and 2 mm, 3 mm, 3 mm postoperatively. Only one patient had an unsightly scar in the medial canthal area (Figure 4).

The majority (84.2%) of the patients were successfully corrected, with a difference in the canthal distance between their two eyes of less than or equal to 2 mm. For comparison, 60.5% of our patients had a preoperative difference of 7 to 9 mm.

RESULTS

The mean age of the 38 patients in our series was 38.3 years (range, 13 to 56 years). They presented for correction at a mean time of 10.8 months (range, six to 14 months) after the appearance of the deformity. The median follow-up period was 13 months (range, nine to 18 months). All of the postoperative data reported here were taken at each patient’s final follow-up visit.

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DISCUSSION

As a tripartite structure, the medial canthal ligament attaches to the tarsi of the eyelids, providing a hinge for the eyelids and maintaining the normal angular shape of the eye. The medial canthus also assists the lacrimal pump mechanism, maintains the shape of the palpebral fissure, and prevents dystopia. The most common presentation of medial telecanthal deformity results from injuries to the midface, with subsequent facial disfigurement having distressing physical and psychological consequences for the patient. Unilateral facial trauma occurs frequently, making the asymmetry even more evident.

Without traction from the attachment of the medial canthal ligament, the sharp-angled canthus turns to an obtuse angle, accompanied by infraplacement, a shortened palpebra, an increased intercanthal distance, and a

Figure 4. (A) A 39-year-old man presented for correction of medial telecanthal deformity. (B) One year after surgery with microplate fixation and fascia lata.
disfigured naso-orbital valley. The key to restoring the normal appearance of the eye is reduction of the medial canthal ligament.

The normal attachment of the medial canthal ligament corresponds to the three limbs of the ligament. The anterior limb is the strongest and is attached to the anterior lacrimal crest; it continues into the periosteum of the nasal bones. The superior limb is fixed to the medial orbital rim several millimeters above the anterior limb. The posterior limb is attached to the posterior lacrimal crest. The normal and symmetric contour of the eye depends on the reduction of the medial canthal ligament both horizontally and vertically. However, as part of the lacrimal bone, the posterior lacrimal crest is quite delicate, making it difficult to affix the medial canthus and achieve a symmetric naso-orbital valley.9,10

Multiple procedures have been suggested for the management of medial telecanthal deformity. The placement of gut or silk sutures has been shown to be less than ideal.1 The technique of drilling two vertical holes and inserting steel wire was abandoned as a result of surgical difficulties, trauma to nasal mucosal vessels, and recurrent infection.3 As for the transnasal medial canthopexy, the procedure is technically difficult, necessitates wide exposure (sufficient to allow transverse passage of a wire through a bony fenestration deep within the orbit), and requires dissection and protection of the contralateral orbit. It is therefore more suitable for bilateral than unilateral medial canthopexy.5,5

In this series, the posterior aspect of the solid anterior lacrimal crest was chosen for the medial canthus attachment, which is useful in restoring the naso-orbital valley. As shown, our results were positive. When a lack of adequate bone limited the medial canthal ligament reduction in proper position, placement of a titanium plate facilitated suitable reattachment of the ligament. These improvements to the technique prevent the complications mentioned with other approaches and provide an excellent mechanism for ipsilateral medial canthal repair without complex naso-orbital fractures.

The small medial canthal incision approach described in this article is advantageous in that it allows for correction under direct vision while minimizing facial scarring and reducing operative time. The coronal approach introduced in some articles seems a bit complex and time-consuming for unilateral cases without craniomaxillofacial fractures.4,11

Thanks to its long-term durability, fascia lata has seen widespread application in facial plastic surgery. Fascia lata grafts are easily collected, associated with minimal morbidity, prevent inflammatory responses associated with allografts, and achieve a permanent effect by retaining cellular viability. Its safety and low-risk postoperative complications also render it ideal for application in cases of severe soft tissue absence in the medial canthal area. Our clinical evaluation upheld that this approach to reestablishing normal soft tissue contour offered a consistent and marked improvement.12,13

Damage to the lacrimal drainage system is a frequent complication of injuries to the periorbital region. It is challenging to repair a delayed lacrimal laceration; often, anastomosis is attempted before reduction of the medial canthal ligament, but the results are usually unsatisfactory. Anastomosis is difficult because of the increasing distance from the midline nasal to medial canthus and the need for retaining the anterior lacrimal crest. For this reason, the sutures should be placed beforehand and the knots should be tied after the ligament reduction. The single flap (rather than a reverse H-shaped one) is suggested for decreasing the tension. In some cases, the results will be satisfying. In others, the lacrimal sac may be excised directly, if dacryocystorhinostomy is possible. Among the 38 patients in our series, dacryocystorhinostomy was performed on eight. Seven of these were successfully irrigated without tearing, but the final patient kept tearing without purulent material reflux from the puncta.

We believe that several factors are essential for cosmetically satisfactory outcomes with this technique. Overreduction is important and necessary, especially with regard to vertical distance (as in the naso-orbital valley), which is more difficult to achieve. It is also important to remove the scarred tissues under the medial canthal skin, to avoid recurrence. The bone must be stable enough for screw insertion and the screw itself must be inserted tightly to obtain a precise, secure reduction. The end of twisted wire must be tucked deeply into soft tissue.

**CONCLUSIONS**

Failure to restore the medial canthal ligament may result in functional and cosmetic deformities that are extremely difficult to correct secondarily. Every effort should be made to restore preinjury intercanthal distance, symmetric canthal position, and normal soft tissue contour in the medial canthal area. Based on the outcomes obtained in this series of 38 patients, the authors’ titanium microscrew and microplate approach is shown to be an excellent choice for correcting medial telecanthal deformity. The technique, when applied in appropriate cases, achieves optimal anatomic outcomes while minimizing facial incisions.

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