
How I Do It

A Targeted Problem and Its Solution

Medial Canthal Ligament Reattachment in Skull Base Surgery and Trauma

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INTRODUCTION

The medial and lateral canthal ligaments represent fibrous condensations of tissue anchoring the tarsal plates to the medial and lateral orbital rims. The medial canthal ligament extends anteriorly to the anterior lacrimal crest, posteriorly to the posterior lacrimal crest, and superiorly along the frontal process of the maxilla and the frontal bone.¹ The medial canthal ligament's multiplanar and multidirectional attachments give rise to the delicate three-dimensional contour of the medial canthus and serve as integral components of the lacrimal pump. Ideal restoration of the aesthetic form of the medial canthal region would recreate the three-dimensional attachment of the medial canthal ligament. A number of techniques have been described for canthal ligament attachment including the use of transnasal wires, microplates, and simple suture fixation.²⁻⁵ All available techniques resuspend the canthal ligament along the net vector of pull superoposteriorly. Proper vector estimation and subsequent pull execution may be technically difficult to achieve.

Bone anchor systems have provided for effective long-term biomechanical stability in extremity tendon reattachment to bone as applied in the field of orthopedic surgery.⁶⁻⁸ Osseous screw fixation appears to be well suited to any of a number of clinical situations in which it is desirable to anchor soft tissue to bone, such as bladder suspension to the pelvis or periosteal attachment to the frontal bone in endoscopic brow lifting.^{9,10} The author has previously reported the utility of the bone anchor system to assist with canthal reattachment during external approaches for optic nerve decompression.¹¹

This report outlines a simple, effective, and expeditious technique for medial canthal reattachment in skull base surgery and trauma using a prethreaded bone anchor system.

TECHNIQUE

The Mitek mini bone anchor system consists of an introducer preloaded with a single anchor (5.4 mm long, 1.8 mm in diameter) through the head of which is prethreaded a double-armed suture (Fig. 1). After severe naso-orbitoethmoid fractures with complete medial canthal detachment or in facial disassembly during skull base surgery, the optimal position for bone anchor placement is determined. The hole for screw placement is positioned within the central portion of the lacrimal fossa. If no lacrimal fossa is evident as a consequence of bone loss or removal, the screw hole (drilled using the Mitek system drill bit and drill guide under good irrigation) is placed within a rigidly fixated medial orbital wall bone graft at a point corresponding to the contralateral central lacrimal fossa position. Then the bone anchor is placed within the drilled hole using the provided introducer system and a mallet (Fig. 2). One of the double-armed needles is passed through the anterior portion of the canthal ligament; the second needle is passed through the posterior portion of the canthal ligament and the suture tied securely with a minimum of five knots (Fig. 3). At this point, both needles are passed through the soft tissue overlying the ascending process of the maxilla as it attaches to the frontal bone. In this way, all three attachments of the native canthal lig-

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Fig. 1. Mitek mini bone anchor with prethreaded suture. Once introduced into drilled medial orbital wall hole, the feet of the anchor engage the intranasal aspect of the bone.



Fig. 2. Following tumor extirpation using the subcranial approach, the frontonasal segment is rigidly fixated with preadapted mini plates. Bilateral Mitek bone anchors have been introduced.

ament are replicated (anterior lacrimal crest, posterior lacrimal crest, and ascending process of maxilla).

DISCUSSION

Medial canthal ligament reattachment using the above-described technique has been successfully performed in a total of 22 patients, 16 after transfacial approaches to the skull base (7 bilateral), and 6 after severe naso-orbitoethmoid fractures (2 bilateral). No adverse outcomes have been noted to date (Figs. 4–7). Long-term

stability of the canthal ligament placement has been noted in each case (follow-up, 6 mo–3 y).

Canthal reattachment using a single stainless steel screw afterloaded with a suture and the use of the Mitek anchor have been reported previously in a few patients.^{12,13} However, both methods relied, once again, on a single vector of attachment, resulting in an unnatural appearance of the medial canthal region. The key to replicating the delicate three-dimensional contour of the medial canthus lies in addressing all three vectors of attach-



Fig. 3. The anterior attachment of the medial canthal ligament has been replicated. The remaining two vectors are replicated in a similar fashion.

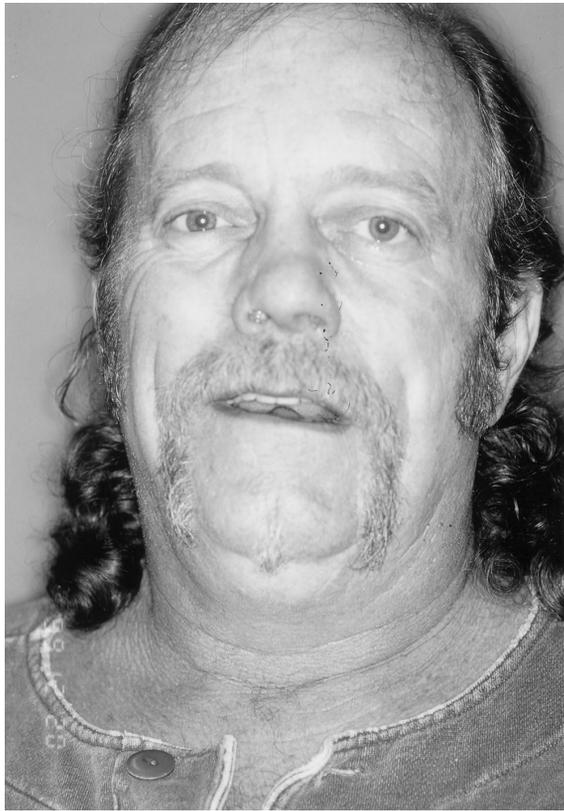


Fig. 4. Preoperative appearance of patient shown in Figures 2 and 3.

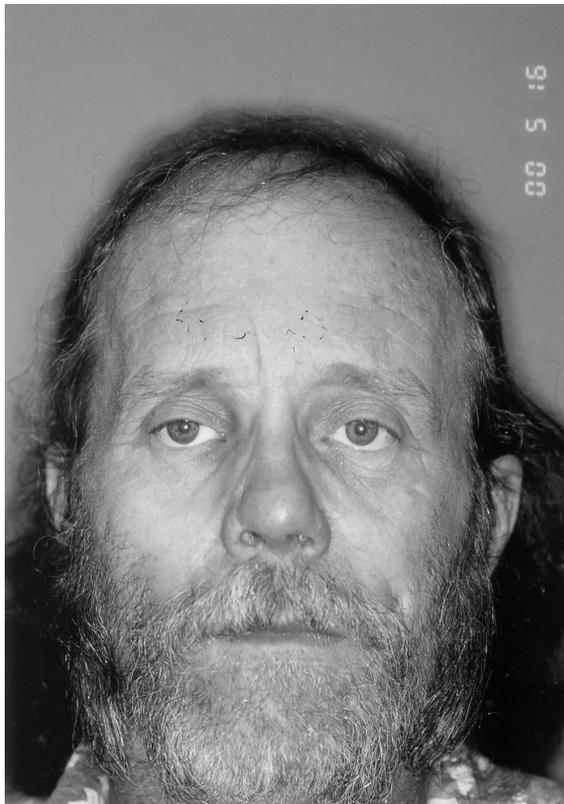


Fig. 5. Postoperative appearance of patient after subcranial approach for removal of a large tumor of the sphenoid sinus and base of anterior cranial fossa.

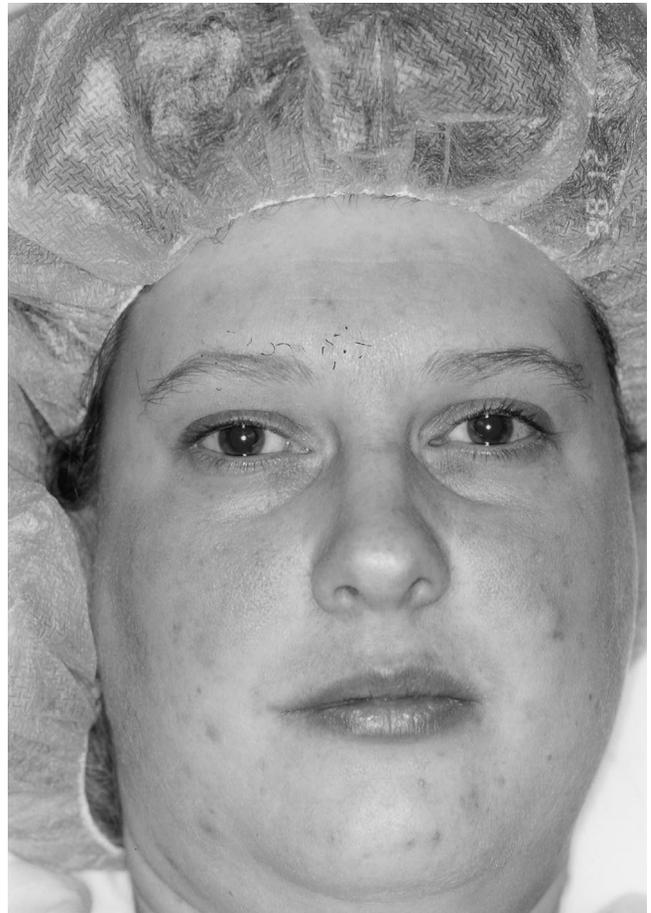


Fig. 6. Preoperative appearance of patient undergoing naso-orbital disassembly with unilateral maxillotomy for removal of a large sphenoid sinus tumor.

ment. The technique described above allows the surgeon to more closely approximate the native ligament attachments. The use of the Mitek anchor system for canthal reattachment after severe traumatic disruption has been previously unreported. It appears well suited for this purpose, as long as a stable, rigidly fixated bone graft is used for medial orbital wall reconstruction in cases of severe comminution.

The Mitek bone anchor system appears to represent a reasonable alternative to conventional techniques of medial canthal ligament reattachment in skull base surgery and trauma, allowing for a more anatomical three-dimensional reconstruction to be performed.

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Fig. 7. Postoperative appearance of patient shown in Figure 6.

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