**Temporalis Fascia for the Management of Medial Rectus Damage Secondary to Endoscopic Sinus Surgery: A Case Report**

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**Abstract**

**Purpose:** To report a challenging case of medial rectus (MR) damage secondary to endoscopic sinus surgery (ESS).

**Methods:** A 37-year-old woman presented with diplopia, exotropia, and adduction deficit of the right eye due to the right MR injury secondary to ESS.

**Results:** As a stepwise approach, she respectively underwent repairing of the damaged MR plus ipsilateral lateral rectus recession, half-tendon vertical rectus transposition to the MR insertion, and eventually nasal globe fixation with temporalis fascia that ultimately provided a single vision in the primary position with orthophoria.

**Conclusions:** Re-establishment of an acceptable field of a single binocular vision in the context of iatrogenic MR injury is challenging and often requires multiple step-wise operations. Temporalis fascia is a safe and strong autogenous material, which can be used for globe fixation in this setting.

**Keywords:** Endoscopic sinus surgery, Globe fixation, Half-tendon vertical rectus transposition, Medial rectus injury, Temporalis fascia

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**INTRODUCTION**

Endoscopic sinus surgery (ESS) is a standard procedure for the diagnosis and management of paranasal sinus disorders. Due to the proximity of the sinuses and the orbital contents, ESS has a risk of orbital complications that include orbital hemorrhage/emphysema, damage to the lacrimal drainage system, strabismus, and optic nerve injury.1 In this setting, extraocular muscle (EOM) injury is the most common cause of strabismus and diplopia.2 The most commonly damaged EOM during ESS is the medial rectus (MR) followed by the inferior rectus, superior and inferior oblique, superior rectus, and levator palpebral superioris.3 Strabismus as an ESS complication can be from a trivial to catastrophic damage to the EOMs. Herein, we present a challenging case with strabismus secondary to ESS and describe a difficult step-by-step approach to achieving an acceptable result.

**CASE REPORT**

A 37-year-old female underwent ESS for recurrent sinusitis by an otolaryngologist. Two weeks later, she was referred to our clinic because of diplopia and eye deviation. Her vision was 20/20 in both eyes. There was no relative afferent pupillary defect. She had a V-pattern right exotropia of 90 prism diopter (PD) and right hypotropia (RHOT) of 15 PD in the primary gaze. The right eye could not pass from the extreme lateral gaze to midline (adduction limitation of −6 units),4 but the vertical gaze was normal [Figure 1a]. The force generation test showed no power for the right MR. The forced duction
Bagheri, et al.: Management of medial rectus damage after endoscopic sinus surgery

The test was mildly restricted in inward rotation but was free in outward rotation. Orbital computed tomography (CT) scan showed the right medial orbital wall fracture and transected right MR without muscle entrapment. Magnetic resonance imaging (MRI) confirmed the CT scan findings [Figure 2].

The patient underwent MR exploration through a limbal incision of the conjunctiva. The damaged part of the muscle was noted 8 mm behind the insertion of the MR and extended posteriorly for about 8 mm. A few muscle fibers in the inferior part of the MR preserved the continuity between the muscle’s proximal and distal portions. The destructed portion of the MR was resected (about 8 mm), and the cut ends were anastomosed using a 6-0 vicryl suture (Ethicon, Inc., Somerville, NJ, USA). The right lateral rectus (LR) was also recessed 10 mm at the same session. On the 1st postoperative day examination, she was orthotropic in the primary position and had a limitation of −4 in adduction and −2 in the abduction of the right eye. During the next 2 months, the exotropia returned to 60 PD, and the limitation of ocular motility became −5 units in adduction and −1 unit in abduction in the right eye.

As the next step, she underwent injection of 10-unit botulinum toxin A (Dysport; Ipsen Biopharm Ltd, Wrexham, UK) in the right LR that made her orthotropic for only 1 month. Two months later, the angle of exotropia and hypotropia increased again to 60 PD and 8 PD, respectively, in the primary position, and the V-pattern returned [Figure 1b].

As the second operation, 6 months after first surgery, the right LR was disinserted and reattached to the lateral orbital wall combined with half-tendon vertical rectus transposition to the MR insertion with respect to the spiral of Tillaux. The transposed muscles were also resected of 6 mm. One year after the latest surgery, the angle of exotropia was 25 PD in the primary position and RHOT was 8 PD. The ocular motility was limited −4 units in adduction and −2 units in the abduction. The patient had a binocular fusion with a 15° face turn to the left [Figure 1c].

She then underwent the third operation, which was a globe fixation procedure with homologous deep temporalis fascia. A free fascial strip was harvested from the right temporalis muscle surface, 6 cm long and 6 mm in wide. The strip was bifurcated to create Y-shaped configuration [Figure 3]. A modified Lynch (7-mm vertical skin incision) 10 mm nasal to the medial canthus down to the periosteum was made. Then, a medial bulbar peritomy was performed. The uncut end of the fascial strip was sutured to the periosteum anterior to the medial orbital rim with a 5-0 prolene suture (Ethicon, Somerville, NJ, USA). Then, a Wright needle was passed through the medial peritomy (below the lacrimal drainage system) into the skin incision, and the lower arm of the bifurcated fascia strip was drawn back to the inferior border of the MR insertion. The same maneuver was performed for the upper arm to pull the upper arm of the fascia strip to the superior border of the MR insertion [Figure 3]. Then, the arms of the fascia strip were sutured to the sclera at the superior and inferior borders of the MR insertion using a 4-0 mersilene suture (Ethicon, Somerville, NJ, USA) while the globe was held at extreme adduction. An 8-0 vicryl suture (Ethicon, Inc., Somerville, NJ, USA) was used to close the conjunctiva and a 6-0 prolene sutures (Ethicon, Somerville, NJ, USA) for closing the skin incision. After the operation, the patient was orthotropic in the

**Figure 1:** Clinical photographs of the patient. (a) Presentation with a large angle V-pattern right exotropia and hypotropia. (b) Partial recurrence of V-pattern exotropia and hypotropia after the initial surgery and subsequent botulinum toxin injection in the right lateral rectus (LR). (c) Significant improvement of alignment after the half-tendon vertical rectus transposition to the medial rectus muscle combined with the LR disinsertion. (d) After globe fixation with temporalis fascia, she was orthotropic, V-pattern was resolved, and there were reasonable movements to the sides.

**Figure 2:** Orbital imaging: Axial (a) and coronal (b) computed tomography scan demonstrate the right medial rectus (MR) injury and medial orbital wall fracture. Axial T1 (c) and coronal T2 (d) magnetic resonance imaging of the orbit demonstrate the location of the right MR muscle injury in its middle third.
primary position, but the ocular motility was −2 units limited in adduction and abduction. She had a single binocular field of 40° at the primary position. Further, she had a normal binocular field in the upward and downward gazes [Figure 1d]. This condition was stable in a 1-year follow-up. Between the operations, she used single eye occlusion, which changed to segmental occlusion at final examination.

**Discussion**

ESS is a frequently used technique that facilitates the diagnosis and treatment of paranasal sinus disorders. Surgery on the ethmoid sinus has an even higher risk of orbital violation, due to the fragility of the lamina papyracea. MR is the most vulnerable muscle in this setting although involvement of all EOMs (except LR) has been reported. The range of injury to the EOM can be from a simple muscle hematoma to more destructive injuries, such as muscle entrapment in the breached orbital wall, damage to the muscle nerves or vasculature, minimal to substantial muscle contusion, and muscle transection. Orbital imaging is helpful in this setting to evaluate the site, type, and extent of the damage of the EOM, as well as adjacent orbital tissues.

Minimal EOM injury without strabismus or with small-angle strabismus may improve without any intervention. Botulinum toxin (for the weakening of the antagonist’s muscle) may be adequate during the recovery phase in the presence of an injured muscle nerve with intact muscle fibers. Muscle entrapment into the orbital wall fracture requires muscle release in addition to repair of the fracture, particularly in the presence of a significant enophthalmos or ocular motility restriction. A severely damaged EOM often should be repaired immediately with or without the weakening of the antagonist’s muscle. If the function of the repaired muscle significantly improves over 6 months, persistent strabismus can be managed by strengthening the involved muscle with or without further weakening of the antagonist muscle. Muscle transposition and muscle union techniques are useful in the cases of nonretrievable or nonfunctional muscle.

In the present case, the MR was severely injured during the ESS. The absence of force generation in damaged MR was demonstrated with the clinical examinations. Orbital imaging confirmed that the MR was transected at the middle third. Interestingly, during the operation, few intact muscle fibers were observed that provided a guide to find and retrieve the more proximal part of the transected muscle. The spared fibers were in the inferior part of the injured muscle, explaining the hypotropia. Some authors recommended a multiplanar MRI to detect any intact fibers in a transected muscle. We could not identify any spared muscle fibers in this patient’s orbital MRI and CT. This might indicate surgical observation’s role in making the final surgical plan and the fact that findings of imaging may sometimes be misleading. We repaired the injured MR without reconstructing the fractured medial orbital wall since there were no signs of the MR entrapment or enophthalmos.

In the present case, the function of the MR muscle was never recovered; thus, after each intervention including weakening of the LR (i.e., recession, botulinum toxin injection, and disinsertion) and half-tendon vertical muscle transposition, the exotropia recurred. Residual or recurrent exotropia after the transposition surgery in such cases is not uncommon and can be related to the natural tendency of the globe to drift outward in these patients.

As the last option, the patient underwent a globe fixation procedure using autologous temporalis fascia. In the literature, the globe fixation for the management of an injured MR during ESS has been performed in the patients who had concurrently vertical rectus muscle injury, but it rarely has been employed after transposition surgery. Various materials have been described for globe fixation including silicone tubes, fascia lata, periosteal flap, nonabsorbable sutures, and titanium T plate.

We used the temporalis fascia for globe fixation because our periosteal flap, nonabsorbable sutures, and titanium T plate. Described for globe fixation including silicone tubes, fascia lata, periosteal flap, nonabsorbable sutures, and titanium T plate. These materials have been reported to be effective in many cases.

In conclusion, the iatrogenic MR injury during ESS can be a challenging complication, and re-establishing an acceptable
field of single binocular vision often warrants stepwise management. Temporalis fascia is a safe and strong autogenous material, which can be used for globe fixation in this setting. Our patient ultimately achieved orthotropia in the primary position as well as a single binocular field of 20° on each side, however. The normal ocular ductions were never recovered.

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Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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