Autogenous Fascia Augmentation of a Partially Extirpated Muscle With a Subperiosteal Medial Orbitotomy Approach

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**Introduction:** Endoscopic sinus surgery can result in serious extraocular muscle dysfunction. The medial rectus muscle is more frequently affected than other extraocular muscles. **Methods:** A transconjunctival subperiosteal medial orbitotomy was successful in retrieving a partially extirpated medial rectus muscle after endoscopic sinus surgery. **Results:** A previous attempt to localize this muscle by conventional surgery with extensive exploration was unsuccessful. A Hummelsheim procedure was also abandoned after a rupture of the nasal aspect of the inferior rectus muscle occurred. **Conclusion:** The approach we describe allowed adequate visualization of the posterior orbital content, as well as adequate space for suture placement. (J AAPOS 1997; 1:138-42)

Diplopia is a well-recognized rare complication of intranasal sinus surgery and is related to direct or indirect injury to the extraocular muscle, its nerve, or vascular supply. During the past decade, endoscopic sinus surgery has become an increasingly popular treatment for chronic sinus disease. Medial rectus muscle injury has been reported because of inadvertent orbital entry of the endo-scopic surgical instrument though the lamina papyracea and periorbita. Inferior rectus and superior oblique dysfunction has also been reported. Diplopia can be transient when it is related to edema or minor trauma to the periorbital region. However, constant diplopia with marked limitation of duction may occur as a result of direct extraocular muscle trauma.

We report a patient with a partially extirpated medial rectus muscle after endoscopic sinus surgery. The patient had intractable diplopia. Improved ocular alignment was obtained by recovery of the proximal portion of the medial rectus muscle with use of a transconjunctival subperiosteal medial orbitotomy approach combined with temporalis fascia augmentation to restore integrity between the muscle and sclera.

**CASE REPORT**

A 60-year-old otherwise healthy man underwent endoscopic sinus surgery through the right and left nostrils for chronic sinusitis. On the first postoperative day the patient had horizontal diplopia, exotropia, and inability to adduct the left globe. Computed tomographic scanning showed that a large segment of the medial rectus muscle was missing. The proximal part of the medial rectus had retracted into the orbit close to the optic nerve. Ten days after the sinus surgery, the patient underwent extensive surgical exploration through a limbal approach in an attempt to retrieve the proximal segment of the medial rectus muscle. Because this attempt was unsuccessful after 3 hours of exploration, the muscle was considered irretrievable. At that time, the surgeon decided to proceed with a nasal partial transposition of the superior and inferior rectus muscles. Because the inferior rectus muscle was split, the nasal aspect of the muscle ruptured. The ruptured segment was sutured together, and the transposition procedure was abandoned.

The distal portion of the transected medial rectus muscle was still attached at the insertion. The unattached end of this distal portion was sutured to the periorbita to act as a mechanical leash.

After surgery the patient demonstrated persistent horizontal and vertical diplopia. He was able to fuse in a small area in the left gaze with a chin-up position. A trial of prism glasses was unsuccessful.

When first examined by us, the patient demonstrated 20 degrees of right face turn and 5-degree chin-up position to fuse with his eyes in moderate left and slightly downward gaze. His uncorrected visual acuity was 20/20 in each eye at distance.
Prism cover testing revealed 14 prism diopters of exotropia and 12 prism diopters of right hypertropia in the primary position at distance and near. The exotropia increased markedly in progressive right gaze and was slightly reduced in left gaze. The right hypertropia measured 4 prism diopters less in left gaze than in right gaze. Ductions revealed inability to adduct the left globe past the vertical midline. In addition, there was mild limitation of abduction and moderate limitation of upward rotation of the left globe. Clinically, the patient demonstrated a moderate floating adduction saccadic movement of the left eye (Figure 1).

Each pupil was 4.0 mm in size and reacted well to light and accommodation. Slit-lamp examination results were unremarkable. Dilated funduscopic examination showed a
central 0.2 disc diameter cup in the right eye and a 0.3 disc diameter cup in the left eye. Intraocular pressure measured 24.0 mm Hg in each eye, by applanation tonometry. Cycloplegic retinoscopy results were OD +0.25 +0.50 × 180 degrees; OS +0.25 +0.25 × 180 degrees.

Dynamic high-resolution magnetic resonance imaging (MRI), with use of a surface coil, was performed. The test demonstrated that a 20.0 mm segment of the middle portion of the medial rectus muscle was missing. The proximal segment of the muscle showed increased diameter on attempted adduction, indicating that this portion of the muscle was still capable of contracting (Figures 2 and 3). An iris fluorescence angiogram showed marked delay in filling of the radial iris blood vessels in all areas, except the superior quadrant of the left iris.

Surgical approach and postoperative course

Because of the persistent exotropia in the primary position and the profound inability to adduct the left globe past the vertical midline, the patient elected to proceed with further strabismus surgery in an attempt to achieve better alignment. A standard limbal conjunctival peritomy was fashioned. The insertional segment of the remaining medial rectus muscle was isolated, and surrounding scar tissue removed in the area where the muscle had been sutured to the periosteum. Further dissection was continued posteriorly. However, the proximal segment of the medial rectus muscle could not be visualized through this conventional approach.

The decision was made to approach the proximal segment of the medial rectus muscle through an anterior medial orbitotomy. Access to the medial orbital wall, just behind the lacrimal outflow system, was made through a conjunctival incision at the lateral border of the caruncle. Blunt dissection was carried posteriorly along the medial orbital wall through the subperiosteal space to the fracture site by using a periosteal elevator. Two malleable retractors were inserted to separate billowing orbital fat from the medial rectus muscle.

The proximal end of the muscle was identified at the fracture site after dissection through a dense layer of scar tissue. This end was then removed from the fracture site.

An autogenous piece of temporalis fascia was then harvested from the patient's scalp. This graft was sutured to the edge of the freed proximal segment of the medial rectus muscle with a nonabsorbable suture (6-0 Novafil; Sherwood-Davis & Geck, St. Louis) (Figure 4). The nonsutured end of the temporalis fascia was then passed through a fenestration in Tenon's capsule toward the globe. This edge of the temporalis fascia was isolated through the previously created limbal conjunctival incision. The temporalis fascia was sutured to the sclera 6.0 mm posterior to the limbus after the length of the temporalis fascia had been fashioned and adjusted to maintain the globe in the apparent primary position (Figure 5). The conjunctival flap was closed.

After surgery, the patient could fuse with a small right face turn and was aligned near the primary position with ability to rotate the left globe about 10 degrees past the midline into the adducted field (Figure 6). He has been observed for more than 1 1/2 years since the surgery and has maintained that alignment.

DISCUSSION

A summary of previously reported cases of damaged medial rectus muscles after nonendoscopic and endo-
FIG. 6. Clinical appearance of patient 1 year after surgery. Note improved alignment in primary position and minimal adduction ability.

TABLE 1. Previous cases of damaged medial rectus muscles after sinus surgery

<table>
<thead>
<tr>
<th>Author</th>
<th>Initial surgery</th>
<th>Strabismus surgery</th>
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<tbody>
<tr>
<td>Mark and Kenndell (1979)</td>
<td>Patient 1: Transnasal ethmoidectomy</td>
<td>Ipsilateral lateral rectus recession 7.00 mm, transposition of superior and inferior recti to medial rectus insertion</td>
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<td>Patient 2: Nasal polypectomy and Caldwell-Luc procedure</td>
<td>July 1976, ipsilateral lateral rectus recession 8.00 mm, Medial rectus resection 10.00 mm</td>
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<td></td>
<td></td>
<td>September 1976, transposition of superior and inferior recti to medial rectus insertion</td>
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<tr>
<td>Flynn et al. (1979)</td>
<td>Patient 1: Nasal polypectomy and anterior ethmoidectomy</td>
<td>Ipsilateral lateral rectus recession 10.00 mm and traction suture to anchor globe in adduction position for 3 weeks</td>
</tr>
<tr>
<td></td>
<td>Patient 2: Nasal polypectomy and anterior ethmoidectomy</td>
<td>Ipsilateral lateral rectus recession 8.00 mm, Medial rectus resection to 10.00 mm</td>
</tr>
<tr>
<td>Buus et al. (1990)</td>
<td>Patient 1: Intranasal ethmoidectomy</td>
<td>Transposition of superior and inferior recti to medial rectus insertion</td>
</tr>
<tr>
<td></td>
<td>Patient 2: Endoscopic ethmoidectomy</td>
<td>Ipsilateral lateral rectus recession 9.00 mm, Medial rectus resection 8.00 mm</td>
</tr>
<tr>
<td>Eitzen and Elsas (1991)</td>
<td>Patient 1: Endoscopic ethmoidectomy</td>
<td>None (patient had small, well-controlled deviation)</td>
</tr>
<tr>
<td></td>
<td>Patient 2: Endoscopic ethmoidectomy and polypectomy</td>
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Endoscopic sinus surgery is shown in Table 1 with the corrective extraocular muscle surgery. It is obvious that the majority needed a transposition procedure or a recession-resection procedure to correct the deviation, depending on the severity of the damage to the medial rectus muscle. Our patient had several problems: a large central section of the muscle was excised, the distal segment of the muscle was small and nonfunctioning, and a previously attempted vertical rectus muscle transposition had failed. An iris fluorescein angiogram demonstrated that the anterior segment circulation was compromised. These factors seemed to limit the surgical options to a further attempt at vertical rectus muscle transposition with preservation of the anterior ciliary vessels, or as chosen, a further attempt to retrieve the proximal segment of the medial rectus muscle.

An anterior medial orbitotomy approach provided excellent visualization of this portion of the muscle. Conceivably, recovery of a "lost" completely intact medial rectus muscle would be easier through this approach. In the largest reported series of 25 patients with confirmed lost rectus muscle, the medial rectus was the most common (10 of 25) and had the lowest retrieval rate (1 of 10), necessitating transposition procedures. Recently, a transnasal endoscopic approach to the medial rectus muscle was described by McKeown et al. The procedure
was described as a cadaver study but not in an actual patient with a lost medial rectus muscle. The innovative approach deserves further study. However, it seems that an endoscopic approach is surgically difficult and provides a very limited field of view and working space, which makes identification and suture placement in the muscle more difficult. Using a medial orbitotomy approach, we were able to achieve adequate exposure to identify the muscle and to place sutures at its borders with ease.

We hope that this surgical approach will provide the surgeon with another option to localize and retrieve a traumatized or lost medial rectus muscle.

References