Medial rectus muscle loss: Is immediate lateral rectus disinsertion a solution? A case report with review of the literature

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Abstract

Purpose: To report a case of medial rectus (MR) muscle loss during the strabismus surgery with a late successful management and review of the literature.

Methods: The left MR was lost during resection in a 14-year-old girl who had undergone strabismus surgery elsewhere. The surgeon disinserted the antagonist lateral rectus (LR) muscle in the same session following unsuccessful attempts to retrieve the lost muscle. She was referred to our clinic two months later with a large angle exotropia and a complete lack of adduction. We performed a half-tendon transposition of vertical rectus muscles to the MR insertion and attached the residual fibers of the LR to the orbital periosteum.

Results: She was orthotropic after the surgery and remained stable until 6 months with a significant improvement of the adduction.

Conclusions: Simultaneous LR disinsertion is not a solution for MR loss. Half-tendon transposition of the vertical recti to the original insertion of the lost MR and periosteal fixation of the LR are good options as a second-stage operation in patients with MR loss during strabismus surgery.

Keywords: Strabismus surgery; Medial rectus muscle; Muscle loss; Muscle transposition

Introduction

Medial rectus (MR) muscle is the largest extraocular muscle which is probably related to its specific functions including the continuous tonic convergence.1 MR is the most commonly lost muscle in strabismus surgery. MR loss has also been reported in other surgeries including retinal detachment repair, endoscopic lacrimal, or sinus procedures and orbital trauma repair.2–4 There is no intermuscular septum between the MR and the oblique muscles which makes the surgically lost MR difficult to retrieve.5

There are three general approaches to manage this condition including retrieval of the lost muscle,6–14 transposition of the vertical recti to the MR insertion,15–19 and anchoring the globe to the nasal orbital wall.11,20 Herein, the authors report a case of MR loss during the strabismus surgery, followed by successful second stage management with a review of the literature.

Case report

A 14-year-old girl with a history of longstanding left exotropia underwent strabismus surgery elsewhere. She had a history of cerebral palsy and mental retardation as well as several orthopedic corrective operations on the lower extremities. The surgery included 8 mm resection of MR, and MR was lost during the resection. The surgeon failed to
retrieve the muscle and decided to disinsert the lateral rectus (LR) in the same session to maintain the eye straight in the primary position. The patient was referred to our clinic after two months. Ocular examination was difficult because of her mental retardation. Her vision was at least counting fingers at 6 m, with a minimal refractive error in both eyes. She had a left exotropia of 90 PD, and the left eye was locked in the extreme lateral gaze with a complete limitation of adduction (Fig. 1A–C). She also showed a 2 mm exophthalmos in her left eye measured by Hertel exophthalmometry.

Slit-lamp examination revealed nasal and temporal conjunctival scars in the left eye. Other ocular examinations including intraocular pressure, pupillary exam, anterior segment and posterior segment examinations in both eyes were within normal limits.

In CT scanning, the medial and lateral recti were irregular, stretched back, and humped in the posterior orbital space, but it seemed that a thin band connected both muscles to the sclera (Fig. 2).

The day after referral, she underwent surgery under general anesthesia. Forced duction test showed slightly increased resistance to adduction. The attempts to explore the lost MR failed. The lateral conjunctival scars were released, and the remaining fibers of the LR were found attached to the sclera 14 mm behind the limbus. These fibers were secured with sutures, disinserted, and attached to the periosteum of the lateral orbital wall, and subsequently, the forced duction test became negative. Then the nasal halves of the superior rectus (SR) and inferior rectus (IR) muscles were transposed and attached to the original insertion of the MR, 5.5 mm behind the nasal limbus to respect the spiral of Tillaux (Fig. 3).

The day after surgery, she was orthophoric with equal limitations in adduction and abduction of the left eye demonstrating a significant improvement of the adduction, and she remained stable after six months of follow-up. Exophthalmos also improved after surgery (Fig. 1D–F).

Discussion

Management of a lost muscle is a challenge for any strabismus surgeon, especially when the lost muscle is MR, and it occurs during a large resection.15,21,22 The chance of success is even less when the second surgery is performed after a few weeks of the first surgery due to the contracture which happens in both lost muscle and its antagonist.15

Lost muscle retrieval via transnasal or transorbital approaches has been advocated by many authors.6–14 They believe that if the functional imaging confirms the contractility of the proximal muscle stump even after a long period of time, muscle retrieval can still be successful to re-establish the muscle function, especially in its field of action.6,9,11 They also believe that the chance of anterior segment ischemia is lower with these techniques.8

Fig. 1. Clinical photography of the patient; A-C) Primary position and side gazes before surgery. D-F) Primary position and side gazes 6 months after surgery.

Fig. 2. Axial CT scan of the orbit showing both horizontal recti muscles attached to the globe; while exploration showed that medial rectus (MR) was lost and lateral rectus (LR) attached in a recessed position.

Fig. 3. Surgical photography of the left eye demonstrating half tendon of the vertical recti transposed to the medial rectus insertion respecting the spiral of Tillaux (thick arrow); also lateral rectus (LR) is sutured, detached, and ready to be attached to the orbital periosteum (thin arrow).
This approach has the additional advantage that could be performed by a single surgeon who is familiar with both strabismus and orbital surgeries. However, the recovered muscle may be tightened, traumatized or shortened, and a debating issue would be determining where the retrieved muscle should be attached to the globe. Some authors placed the recovered muscle in a recessed position, or applied adjustable sutures. However, many patients remained under- or over-corrected after the surgery and required reoperation.

Other complications of the muscle retrieval techniques include adherence syndrome, hemorrhage, enophthalmos, emphysema, and damage to the other orbital tissues including the optic nerve. The alternative approach to managing an iatrogenic lost muscle is the vertical rectus muscle transposition with either partial or full tendon techniques. These approaches could be considered when the proximal part of the lost muscle can not be retrieved, and also in patients with longstanding muscle loss, the involvement of the nerve bundle of the muscle, and lack of the muscle contractility in dynamic MRI.

Anterior segment ischemia is a major concern in muscle transposition surgeries, especially with one or two already transected muscles. In the present case, we performed a half tendon transposition to reduce the risk of this complication. Nevertheless, there is evidence in the literature showing that the anterior segment ischemia may not be as devastating as it was previously thought. Sari et al. reported a patient with a traumatic transection of two rectus muscles, with a subsequent weakening surgery on the antagonist muscles. However, anterior segment ischemia did not develop in this patient despite involving the four recti muscles.

The efficacy of transposition surgery to improve the limitations of ocular movement is controversial. Some authors believe that the single binocular field of vision is not significantly expanded following the muscle transposition, whereas the other investigators demonstrated that transposition could improve the eye movement in the field of action of the lost muscle, as we observed a significant improvement after transposition confirms this theory. In conclusion, we believe that the late half-tendon transposition of the vertical recti to the MR insertion is a safe and effective procedure when the lost MR is not retrievable. Although the extreme weakening of the antagonist LR per se is not adequate, it may be a good combination with vertical muscles transposition. Generally, when muscle loss occurs during strabismus surgery, it is usually best to try to recover the muscle at the time of the original procedure. If the muscle was not retrieved with gentle dissection at the time of the original procedure, the best plan may be to consider closing. Successful recovery may require an experienced orbital surgeon at a separate surgical session, and if a second procedure required, it might be performed relatively soon after the initial procedure. If the muscle could not be retrieved, transposition of the vertical recti to the MR insertion might be helpful to re-establish the primary gaze alignment.

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