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Case Report Open Access

Equatorial Loop Myopexy in "Sagging Eye" Syndrome: A Case Report

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Abstract

Objective: The origin of acute comitant esotropia, associated with sudden diplopia at distance fixation and binocular single vision for near is unclear. The recent hypothesis that considers divergence paralysis esotropia (DPE) as a mechanical (and not neurological) disease, also called "sagging eye syndrome" (SES) allows a modification of the surgical approach.

Methods: We report a SES case treated with a bilateral lateral rectus muscles sclera fixation at a 10 mm distance from the original insertion.

Results: The day after surgery, and for up to a 6 month follow-up period, the patient remained orthotropic at distance fixation, while fusion was preserved at near fixation.

Conclusion: Equatorial loop myopexy in bilateral sagging eye syndrome is a rapid and safe surgical approach with satisfactory clinical results.

Keywords: Divergence paralysis esotropia; Magnetic resonance imaging; Myopexy

Introduction

Divergence paralysis esotropia (DPE) is normally considered as a neurological entity [1]. Over the last two decades new hypothesis for its pathogenesis have been proposed. One of these considers DPE as a consequence of progressive, age-related, generalized orbital connective tissue degeneration, in the absence of neurological diseases [2,3]. The degeneration of the lateral rectus (LR)-superior rectus (SR) band has been postulated to cause inferior sag of the LR pulley, resulting in esotropia or cyclovertical strabismus.

High-resolution magnetic resonance imaging (MRI) has demonstrated inferior lateral rectus (LR) muscle displacement. Therefore, in the absence of high myopia, DPE in elderly patients has been classified as a variant of heavy eye syndrome, labeled as “sagging eye syndrome” (SES).

We identified a patient with DPE with inferior displacement of both lateral rectus muscles on imaging. To correct the anatomic deformity, we performed scleral loop myopexy of both lateral rectus muscles 10 mm posterior to the insertion, near the equator of the globe, to fixate the posterior muscle bellies into their proper temporal location.

Case Report

A 76-year-old man presented acute comitant esotropia (ET) at distance fixation associated with diplopia in the distance only for two years, unrelieved by head posture or gaze position, with no diplopia at near. No ocular or orbital surgery had been performed before, nor was there a history of head, orbital or bulbar trauma. On examination, visual acuity was 20/20 in each eye. An alternate base-out prism cover test showed a 30 PD (prism diopters) esotropia in primary position at distance fixation. The size of the deviation was the same in both left and right duction. Orthophoria was present at near fixation and stereopsis was maintained (TNO stereotest). Abduction deficits were not clinically noticeable. No supraduction deficits or vertical diplopia were present. Convergence amplitudes measured with prism bars were 20 PD for near and 19 PD for distance, while divergence amplitudes were reduced (9 PD for near and 5 PD for distance). Horizontal saccadic velocity was clinically normal. Forced duction test showed no restriction to passive abduction. Axial length measurements were OD 23.5 mm in the right eye and 23.7 mm in the left eye. Blood tests were negative for viral antibodies, thyroid hormones and auto-antibodies and anti-acetylcholine receptor antibodies. A brain and orbital high-resolution magnetic resonance imaging (MRI) was prescribed in order to exclude a stroke or a mass lesion of the brain also involving putative divergence centre [1], multiple sclerosis, and subdural haematoma as cause of divergence paralysis esotropia. The brain MRI was negative, while coronal orbital sections showed an inferior lateral rectus muscle displacement shifting into the temporocaudal quadrant. Clinical evidence and MRI imaging suggest that strabismus was caused by a degeneration of a connective tissue ligament, the lateral rectus-superior rectus (LR-SR) band, permitting inferior slippage of the lateral rectus muscle and its pulley [2,3]. Muscle surgery was performed to normalize the path of the LR with scleral fixation sutures. Under general anaesthesia, the deviant course of the LR muscle was confirmed, although its insertion was found at normal position. A third of the upper portion of both lateral recti muscles

belly was fixed to the sclera with a non-absorbable suture (mersilene 4.0) at a 10 mm distance from the original insertion. We passed the suture through the muscle belly and the sclera creating a loop then three single knots were performed (Figures 1-3). The day after surgery and six months postoperatively a satisfactory improvement was noticed, with complete correction of spontaneous diplopia at distance fixation in every gaze position. Only with cover-uncover test a residual esophoria of 6 PD for distance can be elicited, inducing homonymous diplopia. No ocular motility restrictions in abduction were clinically evident. Stereopsis was preserved. A brain and orbital high-resolution MRI was repeated one month after surgery. Post surgical coronal orbital high-resolution MRI sections showed normalization of the path of the LR (Figures 4 and 5).

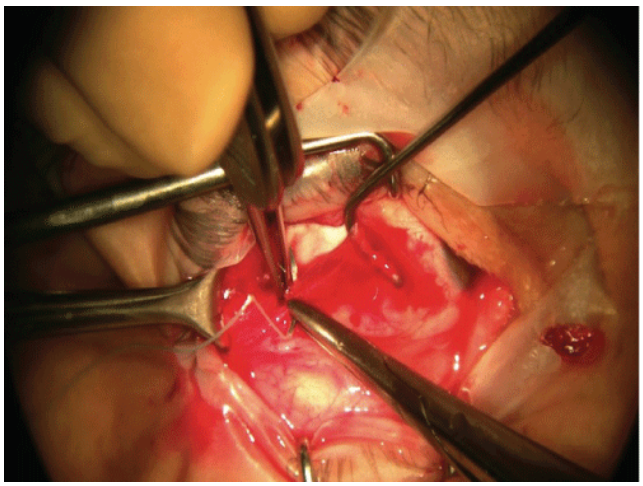

Figure 1: 1/3 of lateral rectus muscle belly was fixed to the sclera at 10 mm from the original insertion.

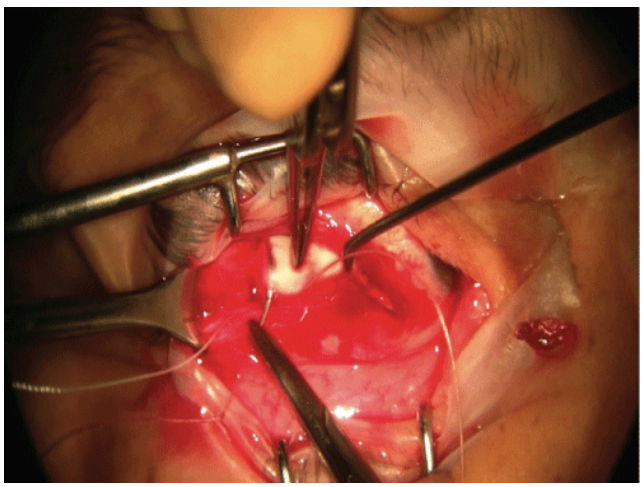

Figure 2: 1/3 of lateral rectus muscle belly was fixed to the sclera at 10 mm from the original insertion.

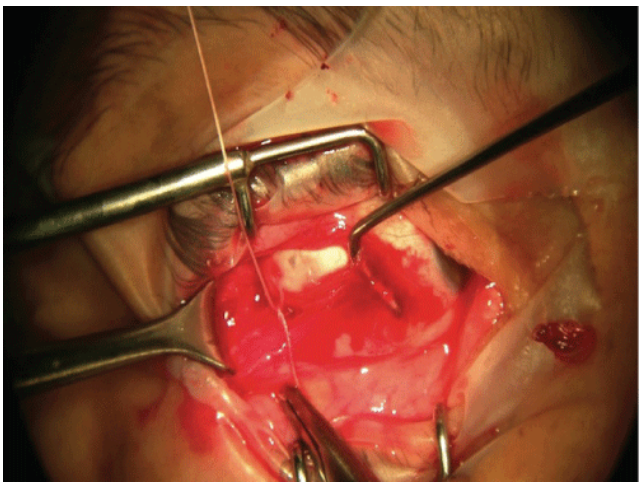

Figure 3: The suture creates a loop, then three single knots were performed.

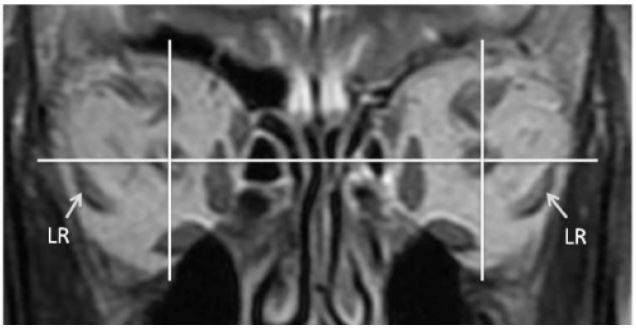

Figure 4: Pre surgical high-resolution orbital coronal sections MRI.

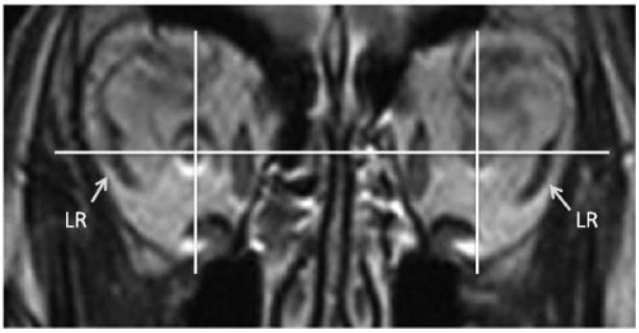

Figure 5: Post surgical high-resolution orbital coronal sections MRI.

Discussion

Acute comitant esotropia with binocular single vision for near can be found both in myopes, as described by von Graefe and

Bielschowsky, and in young emmetropes or low hypermetropes, as described by Burian and Franceschetti [4]. DPE is usually considered as a neurological disorder and the presence of normal electro-oculographically determined saccadic velocities may help distinguish it from a bilateral deficit of the abducens [5]. DPE shares with Burian-Franceschetti's acute comitant esotropia, often caused by brain tumour, the reduction of divergence fusion amplitudes [6], so that they could probably be considered the same entity. Sagging eye syndrome seems to represent a variant in elderly people. The main signs that differentiate SES and deficit of abducens are the normal ocular motility, the stability of the angle of deviation in both left and right ductions and the normal horizontal saccadic velocity. MRI is also pathognomonic because it shows lower slippage of the lateral rectus muscle.

Many surgical approaches have been described [2,7-12] for esotropia with incomitance among distance and near in DPE (Table 1).

The recent hypothesis that considers DPE as a mechanical (and not neurological) disease, also called "sagging eye syndrome," allows a modification of the surgical approach. Accordingly, some patients with clinical signs and symptoms of DPE, as demonstrated by coronal section of orbital MRI, evidence an inferior displacement of LR muscle probably due to age-related orbital connective tissues degeneration, with no variations in its original insertion. It has been supposed that bilateral inferior displacement of LR may induce a mechanical divergence paralysis esotropia (DPE), characterized by orthophoria or asymptomatic esophoria of no more than 10Δ at 33 cm, with symptomatic distance esotropia (ET), and normal saccadic velocities in adduction and abduction. Asymmetrical inferior shift of the LR pulley has been postulated to induce cyclovertical strabismus (CVS), and may result in hypotropia with excyclotropia; it is important to differentiate this from controlateral oblique superior palsy, characterized by an excyclotropia of the hypertropic eye [2,3]. Sagging eye syndrome is similar in its pathogenesis to "heavy eye syndrome" in which, however, an association with high myopia, profound esotropia, and hypotropia is always present [2]. In axial myopia, inferior lateral rectus displacement is also combined with medial rectus inferior displacement, an enlarged, irregular staphylomatous globe which could also be involved in the appearance of profound esotropia. One of the surgical approaches described to correct heavy eye syndrome is an equatorial loop myopexy associated with medial rectus recession and lateral rectus resection [13]. Rutar et al. [2] and Durnian et al. [9] have only suggested in SES cases a loop of silicone between the superior and lateral rectus muscle bellies to suspend the lateral rectus muscle, a tecnique that has been described however in "heavy eye" syndrome. Based on MRI, in such cases of bilateral SES or mechanic DPE a bilateral lateral rectus muscles scleral fixation at 10 mm distance from original insertion seems to be sufficient in order to normalize the pathological path of LR. The goal of this surgery is to correct the body muscle slippage in order to eliminate the esotropia coming from the "disfunction" of the slipped lateral rectus muscle. We have fixed only one-third of the lateral rectus muscle with a loop miopexy because by involving the entire body muscle, we would have performed a muscle transposition. At the same time, the loop miopexy allows the muscle fibers to contract without changing the insertion, this is the reason why it differs from the classical retroequatorial miopexy. Equatorial loop myopexy in bilateral sagging eye syndrome is a rapid and safe surgical approach with satisfactory clinical results. Further follow-up will be necessary to assess the incidence of recurrence beyond six months.

Reference	Title	Surgical procedures
Hoover et al. 1993 [8]	Results of a single lateral rectus resection for divergence and partial sixth nerve paralysis	Monolateral LR resection
Lim et al. 1995 [5]	Saccadic velocity analysis in patients with divergence paralysis	Bilateral LR resection
Bothun et al. 2005 [11]	Bilateral medial rectus muscle recession for divergence insufficiency pattern esotropia	Bilateral MR recession
Thacker et al. 2005 [10]	Lateral rectus resections in divergence palsy: results of long-term follow-up	Bilateral LR resection with adjustable sutures
Mittelman 2011 [12]	Surgical management of adult onset age-related distance esotropia	Bilateral MR recession with adjustable sutures
Chaudhuri et al. 2012 [7]	Medial rectus recession is as effective as lateral rectus resection in divergence paralysis esotropia	Bilateral or monolateral LR resection / bilateral MR recession

Table 1: Summary of articles reporting surgical treatments of esotropia with incomitance among distance and near in DPE (LR: Lateral Rectus; MR: Medial Rectus).

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