Rectus muscle plication in the treatment of anomalous head position associated with nystagmus

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Introduction

Treatment of anomalous head position (AHP) in patients with nystagmus was first reported by Kestenbaum and Anderson over half a century ago. Since then the technique has been modified several times to improve outcomes and, in particular, decrease long-term under-correction. In 1973, Parks reported the “classic maximum” four-rectus muscle surgery involving resections and recessions amounts of 5 mm, 6 mm, 7 mm, and 8 mm. Nelson et al. subsequently increased these measurements to improve post-operative AHP position, leading to the commonly referred to as “augmented modified Kestenbaum procedure.”

AHP frequently presents with both horizontal, vertical, and rotational components. Hence, the correction of AHP often involves multiple muscles and repeat surgeries, placing patients at risk for anterior segment ischemia. While numerous procedures have been proposed for the treatment of nystagmus with and without AHP, none of these techniques incorporate plication. The benefits of plication include less invasive surgery, which is reversible immediately after surgery and decreases the risk of anterior segment ischemia and intraoperatively lost muscles.

Materials and Methods

A retrospective review was performed of all consecutive patients treated by a single surgeon Federico G. Velez (FGV) with horizontal rectus muscle plication for the treatment of nystagmus with AHP between March 1, 2014, and June 1, 2015, at Stein Eye Institute. This study was approved by the University of California, Los Angeles Institutional Review Board as a retrospective chart review with full compliance with HIPAA regulations and written consent was given for all published images. The study adhered to the Tenets of the Declaration of Helsinki.

Patients underwent a complete ophthalmic clinical examination, including visual acuity at a distance (20 feet) and near (1 foot), strabismus measurements by cover testing, and ocular versions. Head tilt was estimated in degrees preoperatively and postoperatively. In all cases, rectus muscle plication was performed as previously reported with muscle body to sclera plication.
Comparison of pre- and post-operative mean visual acuity, head turn, and tropias were analyzed using paired Student t-tests.

Results

Four patients underwent rectus muscle plication – only surgery for AHP in the setting of nystagmus between March 1, 2014, and June 1, 2015. Patients ranged in age from 2 to 8 years of age [Table 1]. Every patient had a reported cause for nystagmus in their medical and ocular history. AHP had been measured and stable for at least 2 visits before surgery. Mean follow-up after surgery was 312 months (range 6–18 months).

Average pre-operative horizontal AHP was 22.5° and post-operative AHP 2.5° (paired Student t-test P = 0.034). Pre-operative horizontal heterotropia was a mean 4.0 dipters and post-operative 7.5 dipters (paired Student t-test P = 0.455). Vertical heterotropia was a mean pre-operative 2.0 dipters and post-operative 1.0 dipters (paired Student t-test P = 0.650). Binocular visual acuity improved in one patient and no patient had a loss in visual acuity.

Surgery, as detailed in Table 1, was combined medial rectus and contralateral lateral rectus plication. Two patients had more complex strabismus patterns requiring inferior oblique anterior transposition as well. Plication amounts ranged from 5 to 7.5 mm on the medial rectus and 7–12 mm on the lateral rectus.

Three of four patients had a resolution of AHP after the first surgery [Figure 1]. The fourth patient (Case 2) had improvement, but not resolution, and subsequently underwent a second surgery for the residual head turn and a new-onset exotropia. The reoperation was a left lateral rectus recession of 6 mm and right medial rectus plication of 5 mm. At 15-month follow-up after the second operation, the patient had no residual AHP or strabismus. Overall, there were no intraoperative complications, slipped muscles, or post-operative concern for anterior segment ischemia.

Discussion

Treatment of AHP is a difficult problem and despite the numerous modifications made to the original Keestenbaum and Anderson procedures, reoperations and residual AHP or heterotopias are common.[6] To the best of our knowledge, this is the first report detailing the use of plication – only surgery for the treatment of AHP associated with nystagmus. All four patients underwent plication of a single medial and lateral rectus muscle without resections or recessions. Mitchell et al. reported that 6 of 10 patients in one series had residual AHP.[9] Similarly, Nelson et al. found that 8 of 10 patients were not fully corrected.[4] In our series, only one patient required a second surgery to resolve AHP.

Schild et al. reported on 42 patients who underwent horizontal rectus muscle tucking for the treatment of AHP with nystagmus.[10] In their study, every patient underwent tucking on two horizontal rectus muscles and recession on two horizontal rectus muscles, all in equivalent amounts. Success, as defined as an AHP <10° (pre-operative median 30°), was achieved in 72% of patients at the final examination. In our study, patients underwent plication – only surgery of the horizontal rectus muscles and we varied the amount between the horizontal and lateral rectus muscles to account for any existing strabismus. We found plication alone can effectively correct up to 30° of the head turn. Interestingly, the only patient who required repeat surgery had the smallest initial plication amounts. The treatment of this patient also demonstrated the ability to recess a previously plicated muscle or re-plicate a previously plicated muscle.

Table 1: Patient demographics and surgical history

<table>
<thead>
<tr>
<th>Patient</th>
<th>Demographics</th>
<th>Pre-operative</th>
<th>Surgery performed</th>
<th>Post-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age Gender PMH Ocular Hx</td>
<td>VA AHP (degrees) Tropia (PD)</td>
<td></td>
<td>VA AHP Tropia Follow-up (months)</td>
</tr>
<tr>
<td>1</td>
<td>2 Female Congenital cataract Cataract extraction secondary IOL</td>
<td>CSM 30 Right ET 4 LHT 10</td>
<td>RLR plication 11.5 mm LMR plication 7.5 mm</td>
<td>20/50 Straight Ortho 18</td>
</tr>
<tr>
<td>2</td>
<td>8 Male Prematurity epilepsy asthma ROP amblyopia OS myopia astigmatism</td>
<td>20/40 15 Left Ortho</td>
<td>RMR plication 5 mm LLR plication 7 mm</td>
<td>20/30 10 Left LXT 15 6</td>
</tr>
<tr>
<td>3</td>
<td>8 Male Oculocutaneous albinism Hyperopia astigmatism</td>
<td>20/100 20 Left 10 Up 12 ET</td>
<td>RMR plication 6.25 mm LLR plication 12 mm</td>
<td>20/100 Straight 15 ET 12</td>
</tr>
<tr>
<td>4</td>
<td>6 Male Oculocutaneous albinism Myopia astigmatism</td>
<td>20/80 25 Left 10 Down Ortho</td>
<td>RMR plication 7.5 mm LLR plication 10 mm</td>
<td>20/80 Straight RHT 4 12</td>
</tr>
</tbody>
</table>

Visual acuity (VA) is the best corrected visual acuity (BCVA) measured with both eyes open. NA: Not available; PD: Prism dipters; RMR: Right medial rectus; LML: Left medial rectus; RLL: Right lateral rectus; LLL: Left lateral rectus; IOAT: Inferior oblique anterior transposition; SR: Superior rectus. AHP: Anomalous head position.
Patients with AHP are at risk for regression with time and while we found excellent initial results for plication, further long-term analysis is needed. Our study is limited by small sample size and short follow-up time; however, all patients had at least 3 months of follow-up and at least three post-operative visits with stabilization of AHP in at least the final two visits. We hope this study encourages further discussion and research in this area.

References


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