

## ORIGINAL ARTICLE

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

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**Abstract**

**Introduction:** Patients with nystagmus and head turn are traditionally treated by recession and resection of the rectus muscles as described by Kestenbaum and Anderson. **Methods:** We present a case series of patients with nystagmus and anomalous head position (AHP) who underwent plication – only surgery of the horizontal rectus muscles from March 1, 2014, to June 1, 2015. **Results:** Plication amounts ranged from 5mm to 7.5 mm on the medial rectus and 7–12 mm on the lateral rectus. Average pre-operative horizontal AHP was 22.5° and post-operative AHP 2.5° (paired Student t-test P = 0.034) and only one patient required a second surgery. **Discussion:** We found AHP can be effectively treated with plication – only surgery.

**Introduction**

Treatment of anomalous head position (AHP) in patients with nystagmus was first reported by Kestenbaum and Anderson over half a century ago.<sup>[1,2]</sup> 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 mms.<sup>[3]</sup> Nelson *et al.* subsequently increased these measurements to improve post-operative AHP position, leading to the commonly referred to as “augmented modified Kestenbaum procedure.”<sup>[4]</sup>

AHP frequently presents with both horizontal, vertical, and rotational components.<sup>[5]</sup> 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.<sup>[5]</sup> 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.<sup>[7,8]</sup>

**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.<sup>[8]</sup>

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 diopters and post-operative 7.5 diopters (paired Student *t*-test *P* = 0.455). Vertical heterotropia was a mean pre-operative 2.0 diopters and post-operative 1.0 diopters (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



**Figure 1:** Pre- and post-operative photos of case 3 (primary 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 Kestenbaum and Anderson procedures, reoperations and residual AHP or heterotropias are common.<sup>[5,6]</sup> 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.<sup>[9]</sup> Similarly, Nelson *et al.* found that 8 of 10 patients were not fully corrected.<sup>[4]</sup> 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.<sup>[10]</sup> 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

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

Visual acuity (VA) is the best corrected visual acuity (BCVA) measured with both eyes open. NA: Not available; PD: Prism diopters; 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.

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