Muscle Union Procedure With Medial Rectus Recession for Unilateral Abducens Palsy

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ABSTRACT
Five patients underwent a muscle union procedure with medial rectus recession. The mean preoperative esotropia in the primary position was 51.0 ± 20.1 prism diopeters (PD) (range: 20 to 75 PD). The mean follow-up period was 6.2 ± 2.1 months (range: 3 to 8 months). The mean decrease in esotropia in the primary position was 49.0 ± 18.0 PD (range: 18 PD to 63 PD). The mean postoperative angle in the primary position was 1.6 ± 5.9 PD esotropia (range: 2 PD exotropia to 12 PD esotropia). There was no change in vertical deviation. Satisfactory ocular alignment was achieved using the loop muscle union procedure with weakening of the antagonist muscle. This could be considered an option for a transposition procedures in patients with abducens palsy who have a large-angle esotropia or significant residual deviation after conventional surgery. [J Pediatr Ophthalmol Strabismus 2013;50:e11-e14.]

INTRODUCTION
For large-angle esotropia, full tendon transposition augmented with posterior fixations1-3 or posterior intermuscular suture4 is considered the best procedure available. Although this procedure increases the effect of the transpositions, a rare but potentially serious complication is anterior segment ischemia. The anterior ciliary vessels from the vertical rectus muscles are believed to play the most significant role in this complication.5

We report our experience performing simple loop muscle unions in patients with abducens palsy. We used a suture to approximate the vertical rectus and lateral rectus muscles with recession of the medial rectus muscle for large-angle esotropia or residual esotropia that persisted despite conventional surgery.

REPORT
A retrospective review of a group of patients with abducens palsy who underwent a simple loop muscle union procedure that used a suture to approximate the vertical rectus and lateral rectus muscles combined with recession of the medial rectus muscle. Patients who underwent treatment from 2010 to 2012 were included. This study was approved by the Institutional Review Board of Samsung Medical Center. The research was performed in compliance with the tenets of the Declaration of Helsinki.

At the initial visit, all patients underwent a full ophthalmologic assessment, including visual acuity testing, refraction, evaluation of ocular alignment and motility, slit-lamp biomicroscopy, and fundus examination. Ideally, measurements of ocular alignment were obtained using prism alternate cover testing at 6 m fixation and 33 cm fixation. However, when this proved impossible because of poor visual acuity, the Krimsky test at 33 cm fixation was used. For fixation, a 6/9 visual acuity symbol was used. All tests for ocular alignment were performed by a single examiner (SYO).

The muscles were approached using an approximately 120-degree limbal incision. The lateral rectus, superior rectus, and inferior rectus muscles were isolated separately. Approximately one-third to half of each muscle belly was sutured between the lateral rectus and superior rectus muscles and between the

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lateral rectus and inferior rectus muscles. A 5-0 non-absorbable suture was placed 10 mm posterior to the muscle insertions without muscle splitting and was tied (Figure 1). The nasal anterior ciliary artery of the vertical rectus muscles was preserved in all cases. After the first sutures were placed, the second sutures were placed 8 mm posterior to the insertion. There was no scleral fixation. Conjunctival wounds were routinely closed with 8-0 polyglactin. In addition, conventional recession surgery of the medial rectus muscle was performed in three patients who had not previously undergone this procedure. In one patient who had undergone a Hummelsheim operation, we dissected the previously transposed vertical rectus muscles and sutured between the lateral rectus muscle and the previously transposed vertical rectus muscles at a point 10 and 8 mm posterior to their insertions, respectively.

RESULTS

Five patients with unilateral abducens palsy underwent simple loop muscle union procedures with or without recession on the antagonist muscle. Data for all five patients included in the study are summarized in Tables 1 and 2. Figure 2 demonstrates a representative case.

The mean patient age was 26.2 ± 12.1 years (range: 7 to 36 years) and the mean duration of muscle palsy was 3.7 ± 2.6 years (range: 1.5 to 8 years). Etiologies included brain tumor (n = 3) and traumatic abducens palsy (n = 2). Passive forced duction test revealed restricted abduction in three of five cases. Two of the five patients had preoperative diplopia and significant head turn. Among the three patients without preoperative double vision, two had decreased vision in one eye from exposure keratopathy and the third patient had suppression in one eye. The mean preop-
The mean amount of recession of the medial rectus muscle was 7.2 ± 0.3 mm (range: 7.0 to 7.5 mm). There were no surgical complications recorded. The mean follow-up period was 6.2 ± 2.1 months (range: 3 to 8 months).

For the two patients with preoperative diplopia, one reported that double vision disappeared immediately after the operation and the other stated that the diplopia disappeared 2 months postoperatively. The preoperative head turn in the two patients disappeared. The mean decrease in esotropia in the primary position was 49.0 ± 18.0 PD (range: 18 to 63 PD). The mean postoperative angle in the primary position was 1.6 ± 5.9 PD esotropia (range: 2 PD exotropia to 12 PD esotropia). There was no change in vertical deviation. There were no cases of anterior segment ischemia. Two patients developed a transient mild increase in intraocular pressure of the operated eye at postoperative day 1, which resolved within 1 week. All patients were satisfied with their ocular alignment during the follow-up period.

**DISCUSSION**

The loop muscle union procedure could be regarded as a modification of the Jensen operation, in which the temporal halves of the vertical rectus muscles are connected with the affected lateral rectus muscle using nonabsorbable sutures. The major difference from the original Jensen operation is that we did not split the vertical rectus muscles, and we made a connection between the lateral rectus and vertical rectus muscles using nonabsorbable sutures. Because this does not require muscle splitting or dissection of the vertical muscles from their insertions, our procedure causes less bleeding and takes less time to perform than other types of transposition surgeries. This technique could also minimize the risk of anterior segment ischemia.

The results of our study showed satisfactory results for patients with abducens palsy who have large-angle esotropia and minimal or no strength of the agonist muscle. This technique was also effective in a patient with residual esotropia despite recession surgery of the antagonist muscle and a Hummelsheim operation. Diplopia resolved in both patients with preoperative diplopia.

In terms of complications, there were no cases...
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of anterior segment ischemia. There was a transient increase in intraocular pressure in two cases. The intraocular pressure increased immediately after surgery postoperatively and continuously decreased to a normal level before discontinuation of steroid eye drops. We suggest that this increase might have been caused by mechanical pressure from the tightened muscles. In both cases, intraocular pressure normalized within a week without any treatment.

Interestingly, it may be possible to modify the effect of the surgery on the deviation by changing the location of the muscle union. Although we did not investigate this effect in our study, we think that performing a union more than 10 mm from the original insertions could lead to a smaller amount of change in deviation. This could be applied in patients with a smaller angle of esotropia. Further study is needed to investigate this effect.

This study has several limitations. It was a retrospective study and statistical analysis could not be performed due to the small number of patients. In addition, we did not measure the effect of the muscle union procedure alone. Three patients underwent a muscle union procedure combined with medial rectus recession, one had previously undergone medial rectus recession, and the other previously experienced a Hummelsheim operation. Other limitations include selection bias and potential observational bias of the postoperative results.

Satisfactory ocular alignment was achieved in all five patients using the loop muscle union procedure with a weakening procedure of the antagonist muscle. Our procedure could be considered an option for transposition of muscles in patients with abducens palsy who have large-angle esotropia or a significant residual angle after conventional surgery.

REFERENCES