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آموزش مهارت های کاربردی در تدوین و چاپ مقاله
Surgical Treatment of Heavy Eye Syndrome: Report of Two Cases

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Purpose: To report the clinical features and surgical outcomes of two patients with heavy eye syndrome who underwent partial Jensen’s procedure.

Case Report: A 21-year-old man and a 24-year-old woman with high myopia (-18 and -8 diopters, respectively), high axial length (27.5 and 24.6 mm), progressive esotropia (40 and 50 prism diopṭers), hypotropia (5 and 2 prism diopṭers), abduction limitation, and inferior displacement of the lateral rectus on computed tomography were diagnosed with heavy eye syndrome and underwent partial Jensen’s procedure. The technique consisted of splitting the lateral and superior recti from their insertion up to the equator and uniting their superior and temporal halves respectively, with non-absorbable sutures without scleral fixation. Two months postoperatively, esotropia was reduced to 10 prism diopters in case #1 and to 25 prism diopṭers in case #2; limitation of abduction was also considerably diminished.

Conclusion: Patients with heavy eye syndrome, large angle esotropia and limitation of abduction, may benefit from partial Jensen’s procedure which is a simple and safe surgical option.

Key words: Heavy Eye Syndrome; Jensen’s Procedure

INTRODUCTION

Heavy eye syndrome, also known as progressive esotropia fixus, occurs in highly myopic patients (spherical equivalent more than -6 diopters)1 with large angle esotropia and hypotropia.2,3 It is caused by conversion of lateral rectus muscle function from abduction to infraduction leading to impaired abduction and supraduction.2 It is believed that the condition occurs secondary to a dislocated muscle pulley system or mechanical limitation of muscle motion due to contact between a protruding posterior pole (myopic cone) and orbital apex.4 Imaging techniques have revealed abnormal extraocular muscle position in these patients; the lateral rectus is displaced inferiorly and the superior rectus is shifted nasally which is due to superior, posterior and lateral protrusion of the myopic cone.5

Multiple surgical techniques have been proposed for treatment of this condition but each entails certain disadvantages. For instance, large bilateral medial rectus recession and bilateral lateral rectus resection,6 does not address the underlying pathophysiology and may aggravate the deviation.7 Fixing the lateral rectus in its physiologic meridian at the equator harbors the risk of scleral perforation especially in highly myopic globes with thin sclera.7 Other alternatives include Yamada’s surgical technique, hemitranspositions of the superior rectus and lateral rectus muscles;5 and partial Jensen’s procedure,5 both of which seem to be better
strategies for management. Herein, we present the clinical features of two patients with heavy eye syndrome and report the outcomes of partial Jensen’s procedure in this setting.

**CASE REPORTS**

Table 1 summarizes clinical characteristics of 2 patients with pathologic high myopia and acquired progressive large angle esotropia. Both eyes of these patients had unremarkable anterior segment examinations and normal intraocular pressure but changes in fundus compatible with pathologic axial myopia. Figures 1-4 show primary positions in both patients, and right and left versions in case #1. Coronal computed tomography (CT) images in both cases revealed nasal and inferior displacement of the superior and lateral rectus muscles, respectively (Figures 5 and 6).

**Surgical Technique**

Partial Jensen’s procedure was performed under general anesthesia in both patients. Forced duction test preoperatively showed bilateral restriction in abduction and supraduction in both cases. After performing superior and temporal limbal peritomy and dissecting the superior and lateral recti, the muscles were split in half from their insertions up to the equator by a sharp muscle hook. The temporal half of the superior rectus was united with the superior half of the lateral rectus by a non-absorbable polybutylate coated polyester suture (5-0 Ethibond, Johnson & Johnson, St-Stevens-Woluwe, Belgium) just posterior to the equator without any attachment to the sclera. The operation was performed bilaterally in case #1 and unilaterally in case #2.

![Figure 1](image1.png) Case #1 with eyes in primary position.

![Figure 2](image2.png) Case #1, right gaze reveals right lateral rectus underaction.

![Figure 3](image3.png) Case #1, left gaze shows left lateral rectus underaction.

![Figure 4](image4.png) Case #2 with eyes in primary position; note the large angle esotropia in the left eye.

![Figure 5](image5.png) Coronal CT-scan in case #1 demonstrates inferior displacement of the right lateral rectus and nasal displacement of the right superior rectus.

![Figure 6](image6.png) Coronal CT-scan in case #2 reveals inferior displacement of the lateral rectus and nasal displacement of the superior rectus on the left side.
Table 1 Clinical characteristic of the patients

|                          | Case 1                      | Case 2                      |
|--------------------------|----------------------------|-----------------------------|
| Age (years)              | 21                         | 24                          |
| Sex                      | Male                       | Female                      |
| Uncorrected visual acuity|                            |                             |
| OD                       | CF at 3 meters             | 20/200                      |
| OS                       | CF at 3 meters             |                             |
| Refraction (diopters)    | -17.5 - 2.5 ×90            | -6 - 4.25 ×180              |
| OD                       | -17.5 - 1.75 ×110          |                             |
| OS                       |                             | -6 - 4.25 ×5                |
| Spherical equivalent (diopters) |                   |                             |
| OD                       | -18.75                     | -8                          |
| OS                       | -18.25                     | -8                          |
| Best-corrected visual acuity|                        |                             |
| OD                       | 20/100                     | 20/60                       |
| OS                       | 20/100                     | 20/200                      |
| Fixation                 | Alternate                  | Right eye                   |
| Deviation (prism diopters) |                         |                             |
| Esotropia (Far)          | 40                         | 50                          |
| Esotropia (Near)         | 40                         | 55                          |
| Hypotropia (Far & Near)  | 5                          | 2                           |
| Ductions (-4 to +4)      |                            |                             |
| Abduction                |                            |                             |
| OD                       | -2                         | -1                          |
| OS                       | -2                         | -2                          |
| Adduction                |                            |                             |
| OD                       | +2                         | +1                          |
| OS                       | Normal                     | +2                          |
| Supraduction             |                            |                             |
| OD                       | -1                         | -1                          |
| OS                       | -1                         | -1                          |
| Infrauction              |                            |                             |
| OD                       | Normal                     | Normal                      |
| OS                       | Normal                     | Normal                      |
| Pattern of deviation     | None                       | V (mild)                    |
| Near point of convergence (cm) | 8                         | 6                           |
| Stereopsis               | None                       | None                        |
| Axial length (mm)        |                            |                             |
| OD                       | 27.51                      | 24.63                       |
| OS                       | 27.27                      | 24.61                       |

OD, right eye; OS, left eye; CF counting fingers.

Case #1 was nearly orthophoric the day after the operation. Two months postoperatively, residual esotropia of 10-12 prism diopter (PD), and hypotropia of 3 PD for both far and near was achieved. Abduction was improved in both eyes but remained slightly restricted (-1). Overall, the patient was satisfied with the result.

Case #2 had 14 PD esotropia and 2 PD hypotropia in her left eye for far and near, one day postoperatively. Two months later, esotropia increased to 25 PD for far and to 20 PD for near but hypotropia did not change. Mild restriction (-1) in abduction in the left eye also persisted in this case.

DISCUSSION

High axial myopia, acquired large angle esotropia, limited abduction, and displacement of the lateral and superior rectus muscles in these two patients are compatible with findings reported characteristics of heavy eye syndrome.1-8 According to a large study reporting 35 patients with high myopia and strabismus by Krzizok et al,7 15 cases had abnormal rectus muscle anatomy which was confirmed during surgery. Rowe and Noonan4 emphasized axial elongation and alteration in the direction of the lateral and superior recti as etiologic factors for this syndrome. Venkatesh et al8 stressed the role of mitochondrial myopathy, while Rutar and Demer2 believed that the condition might be due to orbital connective tissue degeneration associated with aging.

As mentioned earlier, multiple surgical methods have been recommended for the management of patients with heavy eye syndrome. Bagheri et al6 reported satisfactory results by performing bilateral large medial rectus resection and lateral rectus resection on two cases with more than -20 diopters (D) myopia and

OD, right eye; OS, left eye; CF counting fingers.
more than 90 PD esotropia. This technique may provide good results in earlier stages of disease with smaller deviation and mild abduction restriction. In advanced cases with lateral rectus displacement, however, this procedure may even worsen the condition. In such cases, lateral rectus muscle fixation in its physiologic meridian at the equator (guide pulley) is a better method. Nonetheless, suturing the sclera in a highly myopic eye is not free of risks. Rowe and Noonan operated on one case by placing a non-absorbable suture immediately posterior to the equator and opposing half of the superior and lateral rectus muscles without any scleral suture, muscle splitting, and medial rectus recession. They achieved good results up to one year follow-up.

Larsen et al reported a 53-year-old woman with high myopia (21 D), acquired esotropia (50 PD) and hypotropia (30 PD) together with restricted abduction and elevation (−4) in her right eye. They performed medial and inferior rectus recession; however, the deviation returned to the previous amount two months later. The second operation was a partial Jensen’s procedure. Using a Stevens hook, they split the lateral rectus and superior rectus muscles in half from their insertions up to the equator and tied them together with a 5-0 Dacron suture. The result was excellent 9 months postoperatively. Using the same technique, we performed a partial Jensen’s procedure for both patients described herein. Similar to the case reported by Larsen et al, our patients also had severe esodeviation and lateral rectus muscle restriction. Case #1 had a satisfying result postoperatively. In case #2, however, unacceptable deviation remained and she was scheduled for left medial rectus recession 6 months after the first procedure.

In our patients we performed a modified Jensen’s procedure, we did not recess the ipsilateral medial rectus or resect the lateral rectus. Therefore, 25 PD reduction in esotropia in these patients achieved only by repositioning of the lateral rectus muscle may be considered as a satisfying result. In addition, using this technique, the medial rectus muscle can be preserved for further interventions and the arterial supply of the eye is preserved. One may suggest performing ipsilateral medial rectus recession simultaneously to avoid residual esotropia. However, since the effect of partial Jensen’s technique is unpredictable, such combined surgery carries the risk of overcorrection as reported by Rowe and Noonan. Their patient had 70 PD esotropia preoperatively which changed to 30 PD esotropia after surgery and underwent another surgery for advancing the medial rectus to its original insertion.

In conclusion, among procedures suggested for management of advanced heavy eye syndrome, we recommend partial Jensen’s technique which is relatively simple and safe. Nonetheless, larger studies comparing different methods are warranted.

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