

Surgical Management of Strabismus in Thyroid Ophthalmopathy

Vidhya Chandran, Kanika Gupta

Pediatric Ophthalmology and Strabismus Dept, Sankara Eye Hospitals, Bangalore, India

Abstract

Thyroid eye disease (TED) is an autoimmune condition with acute inflammatory and chronic fibrotic phase with various manifestations. Strabismus is one of the common clinical presentation affecting the quality of life. Besides medical and optical management in acute stages, surgical management resides as an option to provide broader binocular single field of vision and improve the quality of life. In this case, we have done Inferior rectus recession (fixed sutures) and contralateral superior rectus recession on adjustable sutures to give binocular vision.

Delhi J Ophthalmol 2020;30:57-59; Doi <http://dx.doi.org/10.7869/djo.528>

Keywords: Thyroid ophthalmopathy inferior rectus recession, adjustable sutures, superior recuts.

Introduction

Thyroid eye disease (TED) is a complex orbital inflammatory disease which can be sight threatening, debilitating and disfiguring. The incidence of TED is 16 per 100,000 females and 2.9 per 100,000 males.^{1,2} Eye movement restriction (40%) is third most common sign following eyelid retraction (90%) and exophthalmos (60%).³ Inferior rectus is commonly affected followed by medial and superior rectus.

This case discussion emphasizes on the indication, time, plan of strabismus correction and the outcome in TED.

Case Report

60 years old male presented with binocular diplopia, insidious in onset and gradually progressing over 3-4 months. He was a known case of hypertension controlled on medication.

On examination best corrected visual acuity (BCVA) was 6/6 (OU). Patient had chin up head posture. Extraocular movements (EOM) showed limitation of elevation -4 and abduction -2 in the right eye (RE) and normal ductions and versions in left eye (LE). Prism bar cover test revealed 25pd (prism dioptres) left hypertropia (L/R) with a flick esotropia in primary gaze, 40pd L/R in up gaze, flick L/R in downgaze, 25-30pd L/R with 12pd esotropia (ET) in dextroversion and 20pdL/R in levoversion. There was a non-axial proptosis in the RE with Hertel's exophthalmometer measuring

22mm and 17mm in RE and LE respectively. Resistance to retropulsion was present in RE. Pupil reactions were normal in both eyes. Intraocular pressure was 20 and 16 in RE and LE respectively. Colour vision was normal in both eyes. Fundus examination was normal.

Patient was advised CT scan orbit and thyroid profile. CT scan showed enlarged Inferior rectus (IR) > medial rectus (MR) > lateral rectus (MR- 7.7mm, LR - 5.7mm, SR - 4.1mm and IR 10.3mm) causing optic nerve crowding at the orbital apex in RE.

He was diagnosed with RE Thyroid related orbitopathy. He was referred to endocrinologist and reviewed. Patient was started on intermittent steroid therapy for 3 months. Monocular occlusion was advised for the troublesome diplopia he had.

On 6 months follow up, exophthalmos reduced (Hertel showing 20mm RE) with persistent diplopia. Patient was lost to follow up for one year.

On review after one year, patient had persistent diplopia without proptosis. On examination, EOM in RE showed limited elevation -3 and abduction -1. There was 25-30pd L/R with 8-9pd ET in primary gaze, 30-35pdL/R with 10pd ET in dextroversion, 25pd L/R with flick ET in levoversion, 35-40pd L/R with 8pd ET in up gaze and 6pd L/R with 7pd ET in downgaze. The near deviation was 25 pd L/R with flick ET (Figure 1).



Figure 1: showing the chin up posture with limitation of elevation and abduction in Right eye



Figure 2: postoperative 6 month pictures showing improved elevation with orthophoria in primary gaze.

The measurements were stable on two consecutive visits 3 months apart and thyroid profile was normal. Then the squint surgery was planned under general anaesthesia.

Intraoperatively, Forced duction test (FDT) revealed a tight IR. After IR was disinserted, FDT was repeated. It showed tight MR as well. RE IR recession 5mm (as decided by relaxed muscle positioning technique) with one half tendon nasalisation using 5-0 ethibond sutures was done. Medial rectus recession of 3mm (again decided by relaxed muscle positioning technique) was done. LE SR was recessed by 5mm with adjustable suture.

On the day of adjustment (first postoperative day) the eyes had orthophoria. Expecting the late overcorrection, SR was advanced by 1.5 mm. Cover test revealed 4 mm L/R. On follow up visit after 6 months⁶, patient was orthophoric in primary gaze with flick right hypertropia in down gaze with no complaints of diplopia for reading and primary gaze (Figure 2). On recent one year follow-up visit also, the phoria was the same.

Discussion

Thyroid eye disease is characterised by inflammation and fibrosis of extraocular muscles and orbital tissues leading to strabismus. Strabismus surgery is required in 4% - 7% of patients diagnosed with TED.^{4,5} Strabismus surgery should be planned when the disease is inactive, after orbital decompression surgery if at all required and the measurements remained stable for atleast 6 months.

Management of strabismus in patients with thyroid-related eye disease can be challenging. The inflammatory changes results in alterations to the muscle anatomy and physiology as well as iatrogenic alterations preceding surgical intervention. Therefore, the response to conventional surgical doses in strabismus surgery is not predictable.⁶ Recession of restricted muscle is the recommended surgical procedure. Success rate of deviation based on conventional nomograms in TED vary between 38% and 82%.^{7,8}

Various procedures described in literature are as follows- Duction based surgeries or relaxed muscle position technique- that involves recessing the most restricted muscle to a point where the muscle lies after disinsertion with the eye centrally placed. The success rate varies from 66% to 90%.⁹

Adjustable suture technique- have been addressed for more precise alignment in immediate postoperative period and allows for adjustment for unpredictable outcome.

Semi adjustable suture technique- Kushner reported 100% success in abolishing muscle slippage¹⁰ with this technique.

Postoperative drift (over correction) in patients with TED with IR recession is a known phenomenon and is more common with adjustable sutures on inferior rectus.¹¹ Various hypotheses based on the anatomical position of the inferior rectus have been proposed. One explanation given by Sharma and Reinecke is Bell's phenomenon, which produces repeated contraction of the inferior rectus, predisposing it to shifts resulting in overcorrection.¹² In those who underwent reoperation, slippage was not seen, but instead a scarring of Lockwood's ligament and the capsulopalpebral head, causing a slackening of the inferior rectus, was present. Keeping this in mind, some authors advocate slight under correction at the initial surgery.

The hypothesis of slippage and scar elongation has led on to the debate as to the use of absorbable versus non absorbable sutures, and adjustable suture versus fixed suture surgery. It is felt that the use of absorbable and adjustable sutures of inferior rectus impedes anchorage of the muscle to the sclera, which can result in slippage, scar elongation, and therefore overcorrection.¹³

Considering all these factors, we have decided on recession of the inferior rectus using a nonabsorbable suture and using relaxed muscle positioning technique for assessing the amount of recession and fixed suture surgery, while recessing the contralateral superior-rectus muscle on an adjustable suture technique in the same sitting, to attain the target correction. This also had the added benefit of reducing the amount of surgery on each of the vertical muscles thus limiting the amount of surgically-induced lid retraction.

When recessing a vertical muscle, it should be sagittalisied, that is moved in a nasal direction by half an insertion width in order to reduce the 'A' or 'V' pattern induced by weakening its adducting power. Care must be taken in a combined procedure with medial rectus recession for the associated esotropia, as this can exacerbate an A pattern. Keeping this in mind, in this case we have done half tendon nasalization of inferior rectus to reduce the A pattern induced by weakening the inferior rectus and medial rectus.

Combining Contralateral SR recession with adjustable suture helped in adjusting for unpredictable results. Patient on follow up visit was free of diplopia in primary and down gaze with no lid palpebral changes.

Conclusion

Strabismus in TED has debilitating sequela. Surgical planning should be based on pre and intraoperative assessment due to unpredictable outcomes to the standard nomograms. Of all mentioned techniques, IR recession and contralateral SR recession on adjustable sutures promises the better outcome.

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Cite This Article as: Chandran V, Gupta K. Surgical Management of Strabismus in Thyroid Ophthalmopathy.

Acknowledgments: Nil

Conflict of interest: None declared

Source of Funding: None

Date of Submission: 18 December 2018

Date of Acceptance: 30 August 2019

Address for correspondence

Vidhya Chandran MS, FPOS

Sankara Eye Hospitals,

Bangalore, India

Email id: dr.optho.vidhya@gmail.com



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