



Combining Partial-tendon Knapps Procedure with Posterior Tenectomy of Superior Oblique in a Case of Inferior Oblique Palsy

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Abstract

Introduction: Isolated inferior oblique palsy is one of the rarest among extra ocular muscle palsies. In addition to posing a diagnostic challenge, multiple surgical techniques have been described in its surgical treatment.

Case Report: A 23-year old female presented with unilateral right eye hypotropia and diminished vision. Following detailed evaluation, she was diagnosed with right eye inferior oblique palsy with A pattern exotropia and strabismic amblyopia. We performed a combined surgical procedure involving a partial Knapp's procedure with augmentation (using superior halves of medial and lateral recti), LR recession (using inferior half of split LR) and posterior tenectomy of superior oblique (PTSO), which resulted in a satisfactory postoperative outcome.

Conclusion: IO palsy is a rare condition, which requires to be differentiated from neurological causes, Brown syndrome and skew deviation. Both exotropia and hypotropia have been corrected in the same procedure, using split halves of only two horizontal recti muscles, thus preventing possibility of anterior segment ischemia. This combination, along with LR recession, for exotropia and PTSO, produces satisfactory alignment.

Keywords: Inferior Oblique Palsy; Split Tendon Knapp's Procedure; Posterior Tenectomy of Superior Oblique; A-Pattern Exotropia; Right Hypotropia

Introduction

Isolated inferior oblique palsy (IOP) is among the rarest of all extra ocular muscle palsies. Clinical features of isolated IOP include hypotropia and limited elevation in adduction of the affected eye, with absence of restriction on forced duction testing (FDT) [1]. The inferior oblique muscle is innervated by the inferior branch of oculomotor nerve, which also innervates the inferior rectus (IR), medial rectus and pupillary sphincter (parasympathetic). Due to

its relative rarity, few reports of isolated IOP are available. Furthermore, lesions involving primary superior oblique overaction, skew deviation and heterotopic muscle pulley, exhibit symptomatic similarity to IOP and hence require to be ruled out.

Surgical management involves posterior tenectomy of superior oblique or contralateral superior rectus recession. Knapp's procedure is a vertical rectus transposition procedure described for treatment of hypotropia resulting from various causes.

We report a case of congenital isolated IO palsy with exotropia managed by a combination of partial tendon Knapp’s procedure with augmentation using split superior halves of medial and lateral recti (MR and LR); along with posterior tenectomy of superior oblique (PTSO) (for correction of secondary overaction of superior oblique) and correction of exotropia by recession of the inferior half of LR, resulting in a good postoperative outcome and satisfactory alignment.

Case Report

A 23-year old lady presented to strabismus outpatient department with complaints of downward and outward deviation of her right eye along with defective vision since childhood. Her best corrected vision was 6/12(-3.0D @15°), N8 and 6/6(-0.5 D @180°), N6 in her right and left eyes respectively. Anterior and posterior segment evaluations were normal, with 10 degrees of objective incyclotorsion seen in right eye. Ocular motility evaluation showed marked limitation of levelevation (Grade -4), with superior oblique overaction (Grade +3). She was seen to have right eye suppression for both distance and near, when measured using Worth Four Dot Test (WFDT). Hirschberg corneal reflex revealed 15 degrees of right hypotropia and exotropia, amounting to 40 prism dioptres (pd) of right hypotropia with 16 PD exotropia for distance and near in primary position on prism bar cover test. Exotropia was greater when measured in downgaze (16 PD hypotropia with 20 PD exotropia) than in upgaze (60 PD hypotropia with 10 PD exotropia), suggestive of an A pattern. Bielschowsky 3 step test showed left hypertropia increasing on left gaze and left head tilt, suggestive of right inferior oblique paresis. No difference in ocular deviation was noted in supine and sitting positions, ruling out an ocular tilt reaction (OTR).

After obtaining written informed consent, patient was posted for surgical correction. Forced duction test done on table at the beginning of procedure showed no restriction to levelevation, ruling out restriction. To correct both hypotropia and exotropia in a single procedure, we decided to split MR and LR as far back as possible and use their superior and inferior halves to correct vertical and horizontal components of the strabismus respectively. Following adequate dissection via a direct limbal conjunctival approach ex-

tending to superotemporal quadrant, superior oblique (SO) was exposed. After isolating posterior two third of the fibres, a block of 8 mm length was excised, to weaken depression. MR and LR were hooked, isolated and after separation from surrounding attachments, they were split along their respective lengths as posteriorly as was possible. After securing the split muscle ends at the insertion with cut ends of 2 double armed 6-0 vicryl sutures the superior halves of split MR and LR were disinserted and transposed adjacent to SR insertion; with additional muscle to muscle augmentation sutures tied 8mm behind the SR insertion(using nonabsorbable polyester 5-0) on either side, to augment effect of transposition. Inferior half of right LR muscle was then recessed by 8 mm, to correct the exotropia and conjunctiva was closed. Figure 1 shows a schematic representation of intraoperative procedure.

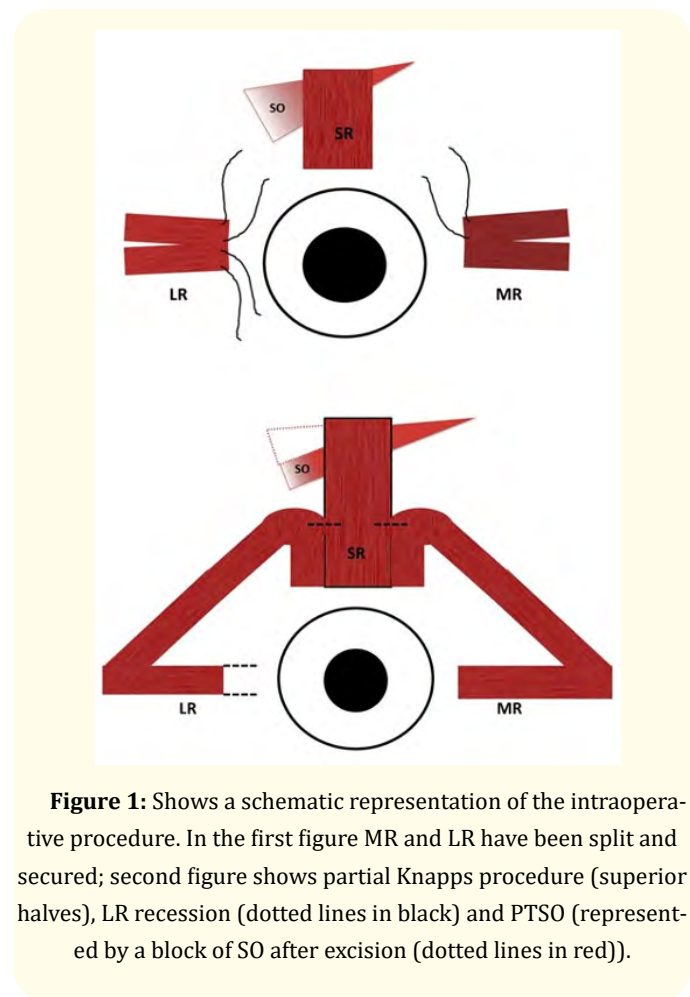


Figure 1: Shows a schematic representation of the intraoperative procedure. In the first figure MR and LR have been split and secured; second figure shows partial Knapps procedure (superior halves), LR recession (dotted lines in black) and PTSO (represented by a block of SO after excision (dotted lines in red)).

On first postoperative day, she was well-aligned with 3pd of right hypotropia in primary gaze, with collapse of A pattern. Figure 2 shows preoperative and postoperative alignment of eyes in the preoperative and postoperative periods. Figure 3 shows 9 gaze photographs of preoperative and postoperative ocular deviations. This orthoptic alignment remained stable over a one-year period.

Discussion and Conclusion

Congenital IO palsy has been known to occur following embryological trauma that partially spares the Edinger-Westphal nucleus [2]. Acquired causes include direct/isolated damage to IO, following orbital [3] or palpebral plastic surgery isolated injury from perforating terminal artery occlusion or autoimmune diseases like myasthenia gravis [4].

Being a relatively rare entity, it should be differentiated from more common differentials such as Brown syndrome and skew deviation. Brown syndrome usually has a positive forced duction test due to a tight superior oblique tendon sheath and produces a V pattern. Skew deviation, often associated with lesions in brainstem, cerebellum or vestibular system, presents with incyclotorsion of the hypertropic eye and excyclotorsion of the hypotropic eye [5]; whereas IO palsy produces incyclotorsion of the hypotropic eye and a negative OTR.

Various approaches to surgical management have been described in literature. The main ones include posterior tenectomy of superior oblique muscle and contralateral SR recession, similar to surgical methods described by Kutschke and Scott [6] and Pollard [7]. Success rates between 60% to 100% have been reported among various authors for the above procedure.

Partial tendon Knapp's procedure involves splitting of horizontal recti, MR and LR, into superior and inferior halves, accompanied by transposition of only superior halves to SR; thus effectively correcting hypotropia, while preserving anterior ciliary circulation and preventing the possibility of developing anterior segment ischemia. Results of partial tendon Knapp's procedure have been described as being comparable to those produced by full tendon transposition or augmented Knapps's procedure by Ocak, *et al.* [8]. Inferior halves of LR and MR may be used to correct horizontal deviation by a combination of conventional recession or resection procedures. We have reported a similar case of large angle hypertropia caused due to blow out fracture followed by traumatic paresis which continued to persist after release of IR and orbital floor repair. In this case, superior and inferior halves have been used to correct horizontal and vertical deviations respectively, resulting in successful orthoptic alignment and recovery of binocularity [9].



Figure 2: Preoperative (A) and postoperative (B) alignment in all 9 gazes. Postoperative photos show decrease in hypotropia.

RE HYPO 30 PD RE XT 10 PD	RE HYPO 60 PD RE XT 10 PD	RE HYPO 65 PD RE XT 10 PD	0	RE HYPO 15 PD	RE HYPO 25 PD
RE HYPO 25 PD RE XT 16 PD	RE HYPO 40 PD RE XT 16 PD	RE HYPO 50 PD RE XT 16 PD	0	RE HYPO 3 PD	0
RE HYPO 14 PD RE XT 20 PD	RE HYPO 16 PD RE XT 20 PD	RE HYPO 20 PD RE XT 20 PD	0	0	RE HYPO 3 PD

Figure 3: Preoperative (A) and postoperative (B) ocular deviation measured by prism cover test in all 9 gazes. Postoperative photos show decrease in hypotropia and collapse of A pattern.

In our patient, we had to deal with dual problems of isolated IO palsy and 'A' pattern exotropia for which the above approach was adopted. Partial Knapp's procedure consisting of transposition of superior halves of medial and lateral recti to the SR with augmentation was performed to address hypotropia. IO palsy was treated with posterior tenectomy of superior oblique. Additionally, exotropia was addressed with recession of inferior half of LR, thus combining all the above elements into a single surgery.

Due to uncommonness of this condition, there is very limited literature available on management of isolated inferior oblique paresis. This approach of using split halves of a single muscle in correcting different aspects of the deviation maybe employed, as per surgeon's discretion; specifically in cases with combined of horizontal and vertical components. This procedure also provides an added advantage of not compromising vascular supply to the anterior chamber.

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