

# Surgical Outcome Of Incomitant Exotropia In Patients With Partial Third Nerve Palsy

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## Abstract

### Aim

Exotropia secondary to oculomotor nerve palsy is one of the most common conditions encountered in clinical practice. In recent past various surgical modalities like lateral rectus deactivation, globe fixation, superior oblique transposition etc has been described for total 3<sup>rd</sup> nerve palsy. However if the 3<sup>rd</sup> nerve is only paretic and significant medial rectus muscle function is present the eye may be aligned in primary position with horizontal recti resection/recession, supraplacement of horizontal muscle and superior oblique weakening.

### Material and methods

We present the result of strabismus surgery in 21 consecutive patients with partial 3<sup>rd</sup> nerve palsy with partly functional medial rectus muscles.

### Results

21 patients with partial third nerve palsy underwent different procedure depending on the angle of strabismus and residual muscle function. The age of surgery ranged from 3 to 45 years. Lateral rectus recession and medial rectus resection were performed in 16 patients with mild to moderate (-1 to -3) medial rectus muscle paresis. Six patients with associated limited vertical deviation underwent one half to one muscle tendon width superior transposition to correct hypotropia simultaneously. In two cases horizontal muscle were transfixed to the level of superior rectus muscle. All these patients attained post operative alignment with in 10PD in primary position but exotropic shift in angle of deviation observed in most of cases. In one case of isolated inferior division of oculomotor nerve palsy superior rectus recession was done with lateral rectus recession, satisfactory post operative result was not obtained. In two cases superior oblique weakening were done to correct significant vertical deviation with A pattern, no significant change in post operative angle was noted in primary gaze but pattern abolished. Superior oblique was transposed to MR insertion in one patient, post operatively hypertropia occurred and sustained till last follow up.

### Conclusion

Patients with partial third nerve palsy achieve reasonable cosmesis with recess/resect procedure of horizontal muscle by judicious selection of surgical technique. It is easier to perform and preservation of residual motility of functional muscle is more acceptable to the patient than other newer technique which necessitate acceptance of limited motility of the involved eye.

## Introduction

Exotropia secondary to oculomotor nerve palsy is one of the most common conditions encountered in clinical practice, either in total or partial form<sup>1</sup>. Patients with partial palsy of the oculomotor nerve can be divided in to two categories; those with isolated muscle involvement and those with multiple muscle involvement.

Management of each patient varies according to differences in the extent of paresis and recovery. If the third nerve is only paretic and significant medial rectus muscle function is present, the eye may be aligned in the primary position with a large recession of the lateral rectus muscle and resection of the medial rectus muscle<sup>2</sup>.

## Material and methods

After obtaining institutional review board approval, the computer data base retrieval system at the medical record section was used to search all patients who underwent surgery for partial third nerve palsy from January 2004 to December 2009. 21 consecutive patients comprising 13 males and 8 females form the cohort of this study.

All patients underwent complete ophthalmic examination including best corrected visual acuity using snellen's chart, Cambridge single and crowding cards, sheriden-gardner charts and the hundreds and thousands test as appropriate for the age of the patient, slit lamp biomicroscopy, refraction including full cycloplegic refraction in children, dynamic refraction in adults, fundus examination and ocular motility evaluation.

Ocular deviation was measured by alternate prism cover test both near (33cms) and distance (6 meters) using fixation target with full optical correction. Neutralising prisms were placed on the eye with third nerve palsy to measure the primary deviation, which formed the target angle for surgery. Forced duction test was performed pre operatively in cooperative patients and was done intra operatively for uncooperative patients in order to verify the restrictions. The active force generation test, in order to assess medial rectus muscle function was also performed. Ductions and versions were quantified on a four point scale of -1 to -5 as follows; mild limitation= -1, moderate limitation= -2, severe

limitation= -3, no adduction beyond mid line= -4 and no adduction movement per se= -5.

All the patients had measurement of deviation at day one, one month and six months after surgery as well as during their last follow up visit. Post operatively ocular deviations were measured by placing prisms in front of the operated eye. Based on the surgical procedure undertaken, patients were divided in to three subgroups;

**Group 1:** Horizontal muscle (LR and MR), recession and resection combined with or without upward displacement done in 17 patients, while in one patient only LR recession was done and in one patient LR recession was combined with displacement of the MR to the SR.

**Group 2:** Superior oblique muscle surgery with or without other muscle surgery was done in 3 patients. In one patient superior oblique was transposed to MR insertion combined with LR recession. In one patient SO tenectomy was done and one patient underwent SO tenotomy only.

**Group 3:** Superior rectus recession combined with lateral rectus recession in one patient.

In this study, grouping has been based on the surgical procedure performed. Small to moderate angle exotropia respond well to recession of LR and resection of MR only. In presence of significant vertical deviation, recession and resection of LR and MR has to be combined with upward displacement of

the muscle (group 1). In selected cases according to the globe position and angle of horizontal and vertical deviation, surgery of superior oblique brings good results. Lastly specific muscle involvement due to third nerve palsy can have a bearing on the surgical procedure chosen (group 3). In one case weakening of the over acting ipsilateral SR was done in addition to LR recession.

## Results

21 patients with partial 3<sup>rd</sup> nerve palsy underwent different procedure depending on the residual muscle function and the angle of strabismus. The mean age at surgery in this study was 23.09 years with a range of 2 to 70 years. The male patients were 13(61.91%) and the female patients were 8(38.09%). RE was involved in 16(76.19%) cases and LE was in 5(23.81%) cases. The best corrected visual acuity ranged from 6/6 to 2/60 in the affected eye. The pre operative ocular deviation varied from 10PD to large angle exotropia >50PD in primary position with 13 cases with hypotropia of 4PD to 30PD. One patient had hypertropia of 20PD. 13(61.91%) patients had evidence of binocular single vision at near with chin up position when tested with worth 4 dot test. All others had suppression at near and distance. All patients preferred fixation with non paretic eye. After first day to six months of post operative follow up, residual horizontal deviation ranged

from 0 to 35PD of exotropia and residual vertical deviation ranged from 4PD to 35PD of hypotropia. Post operatively no patients in any group gained BSV; only those patients who had BSV pre operatively maintained it after surgery with improvement in chin up position. The BCVA also did not improved beyond the pre operative level in any of the patients.

## Discussion

The surgical management of exotropia resulting 3<sup>rd</sup> nerve paralysis presents a formidable challenge to the strabismologist. Since the oculomotor nerve controls the function of four extra ocular muscles, the management of each patient also varies according to differences of extent of paresis and recovery. Lesion of oculomotor nerves may be located anywhere from the nuclei to the terminus of the nerves in the extra ocular muscles<sup>3</sup>. Lesions at different sites result in various extra ocular muscles afflictions. Past clinical practice indicates that appropriate surgical procedure should be selected according to severity of oculomotor nerve palsy. It is important to carry out detailed pre operative examination and to plan reasonable surgical design. Hence the goal of the surgery in these patients is to achieve a straight eye in primary posit

Successful alignment of eyes with oculomotor nerve paralysis has been described following different surgical modalities. The procedure of choice is determined by the angle of deviation,

GROUP 1 TABLE 1

No	Age/sex	MR function	Pre operative deviation	Surgical procedure	Post operative deviation	Post operative deviation	Post operative deviation
					Day 1	1 month	6 months
1	23/F	-3	>50PD XT	14mm LR recession+ 12 mm MR resection	10PD XT	25PD XT	25PD XT
2	20/M	-1	40PD XT+ 25PD hypo	8mm LR recession+ 5 mm MR resection with 5mm upshift	20PDXT+ 20PD hypo	20PDXT+ 20PD hypo	20PDXT+ 20PD hypo
3	70/ F	-3	>50PD XT+6PD hypo	10mm LR recession+ 8 mm MR resection	8PD hypo	8PD hypo	25PD XT+ 10PD hypo
4	6/M	-2	40PD XT	7mm LR recession+ 5mm MR resection	8PD ET	6PD XT	15PD XT
5	44/F	-1	35PD XT+15PD hypo	7mm LR recession+ 4mm MR resection with upshift	10PD XT	10PD XT + 4PD hypo	12PD XT + 6PD hypo
6	28 / F	-3	>50PD XT+10PD hypo	8+4mm LR recession(hangback) + 7mm MR resection	10PD XT + 10PD hypo	15 PD XT+10PD hypo	20PD XT+10PD hypo
7	34/M	-2	35PD XT	7mm LR recession+ 4mm MR resection	ORTHO	8PD XT	15PD XT
8	6 /M	-1	20PD XT	10mm LR recession	ORTHO	5PD XT	10PD XT
9	26 /F	-3	35PD XT+4PD hypo	8mm LR recession+ 6 mm MR resection	10PD ET + 4PD hypo	5PD ET	12PD XT
10	4/F	-2	>50PD XT+35PD hypo	9mm LR recession with one muscle width upshift + 6mm MR resection transfixed to SR	15PD XT + 10PD hypo	20PD XT+25PD hypo	30PD XT+25PD hypo
11	9/M	-3	40PD XT+18PD hypo	8mm LR recession+ 6 mm MR resection with half muscle width upshift	12PD XT+ 10PD hypo	20PD XT+ 10PD hypo	20PD XT+ 10PD hypo
12	28 / M	-2	>50PD XT+ 15PD hypo	8mm LR recession+ 6 mm MR resection with full muscle width upshift	15PD XT+ 8PD hypo	25PD XT+ 8PD HYPO	30PD XT+ 12PD HYPO
13	4 / F	-2	30PD XT+25PD hypo	9mm LR recession and displaced to SR	20PD XT+ 10PD hypo	20PD XT+ 10PD hypo	25PD XT+ 12PD hypo
14	27/ M	-2	35PD XT	7.5mm LR recession+ 4mm MR resection	6PD ET	6PD ET	ORTHO
15	30/ M	-1	30PD XT	5mm LR recession+ 4 mm MR resection	ORTHO	ORTHO	8PD XT
16	29/ F	-3	20PD XT	8mm LR recession	6PD XT	8PD XT	10PD XT
17	40 /M	-2	>50PD XT+12PD hypo	10mm LR recession+ 7 mm MR resection	25PD XT + 12PD hypo	25PD XT + 12PD hypo	25PD XT + 12PD hypo

**GROUP 2 TABLE 2**

No	Age/sex	MR function	Pre operative deviation	Surgical procedure	Post operative deviation	Post operative deviation	Post operative deviation
					Day 1	1 month	6 months
1	6years/ M	-1	20PD XT+ 25PD hypo	SO tenectomy	20PD XT+ 12PD HYPO	20PD XT+ 12PD HYPO	20PD XT+ 12PD HYPO
2	8years/ M	-2	10PD XT with 12 PD hypo in up gaze and pp, 40 PD XT in downgaze	SO tenotomy	10PD HYPO	10PD HYPO	10PD HYPO
3	2years/ M	-4	>50PD XT+20PD hypo	SO transposed to MR + 10mm LR recession	16PD XT+ 8PD HYPER	16PD XT+ 8PD HYPER	20PD XT+ 10PD HYPER

**GROUP 3 TABLE 3**

No	Age/sex	MR function	Pre operative deviation	Surgical procedure	Post operative deviation	Post operative deviation	Post operative deviation
					Day 1	1 month	6 months
1	41years/ M	-2	25PD XT+ 25PD HYPER	9mm LR recession+ 5mm SR recession	10PD HYPER	10PD XT+ 10PD HYPER	15PD XT+ 15PD HYPER

associated vertical deviation and function of the medial rectus in selected cases. In presence of significant residual medial rectus muscle function, the eyes may be aligned in primary position with a large recession of the lateral rectus muscle combined with resections of the medial rectus<sup>4,5</sup>. But in the absence of medial rectus function, the horizontal muscle surgery will at best create only a temporary improvement of eye position. In our series of cases in 16 patients LR recession and MR resection were performed in patients with mild to moderate (-1 to -3) medial rectus paresis. 6 patients associated with limited vertical deviation underwent one half to one muscle tendon width superior transposition to correct the hypotropia simultaneously. In two cases horizontal muscle were transfixed to the level of superior rectus muscle to achieve simultaneous correction of significant vertical and horizontal deviation. Same surgical procedure was used as for concomitant strabismus, but with a greater amount of recession and resection. All these patients attain post operative deviation aligned to within 10 PD in primary position. But an exotropic shift in the angle of deviation was observed in most of these cases in long term follow up specifically in cases in which pre operative medial rectus function was moderate (-2 to -3). The conventional procedure for correction of the horizontal strabismus in total third nerve palsy is supramaximal horizontal muscle surgery<sup>6,7</sup>. Up shift (supraplacement) of their tendon by approximately 1mm for each 2PD hypotropia in primary

position also has been performed<sup>8</sup>. But by themselves these modalities have been found to be generally inadequate. Several additional procedures have been advocated like anchoring the eye ball to medial palpebral ligament<sup>9</sup>, lateral rectus deactivation<sup>10</sup> and superior oblique transposition for total third nerve palsy in which medial rectus is totally dead. However if the medial rectus is functional, these procedures can't be performed.

Superior oblique transposition on the medial aspect of globe with LR recession was done in one patient. Tenotomy of the superior oblique tendon removes a source of abduction and its reinsertion medially stabilizes the eye. This procedure gives better results<sup>9,11</sup>. However hypertropia has been noted in some cases in those reports and in our own experience in past as well. Another disadvantage with this procedure is that the superior oblique muscle should remain healthy. In this series of cases we had performed superior oblique tendon transposition in one case that had large angle hypotropia associated with large angle exotropia. Post operatively hypertropia sustained till last follow up. One case had a significant vertical deviation of 20PD of hypotropia with 10PD exotropia in primary gaze associated with A pattern, only posterior superior oblique tenotomy was done in the involved eye, no significant change in the post operative angle of deviation was noted in primary gaze but the pattern abolished to a certain extent.

In one case of isolated inferior division of oculomotor nerve palsy, superior rectus muscle was recessed combined with lateral rectus recession instead of transposition of inferior oblique. Satisfactory post operative result was not obtained.

### **Conclusion**

We feel though the surgical correction of strabismus in third nerve paralysis is one of the most formidable challenges in the field of strabismus, can be satisfactorily managed by judicious selection of the surgical technique. Our surgical results show that an appropriate surgical procedure according to the muscle involved can successfully achieve acceptable eye alignment.

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