

Outcome of surgical treatment of monocular elevation deficiency

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Abstract

Objective: To assess the outcome of surgical treatment in patients with monocular elevation deficiency.

Methods: This prospective study included 36 patients of monocular elevation deficiency surgically treated from January 2006 to June 2009, at a tertiary care eye hospital in Rawalpindi, Pakistan. Corrected visual acuity, refractive error, ocular examination, orthoptic assessment and ptosis evaluation were recorded. Strabismus surgery was performed according to the results of forced duction test (FDT). Ptosis surgery, if required, was performed after the strabismus surgery. Patients having any restrictive cause or previous strabismus surgery were excluded. The study conformed to all local laws and was compliant with the principles of the Declaration of Helsinki and had the approval of the Hospital Ethics Committee.

Results: The 36 patients were treated surgically and completed the required follow-up. The forced duction test was positive for inferior rectus (IR) of the involved eye in 20 of the 36 eyes (55.55%). Twelve patients had inferior rectus recession with or without one horizontal muscle recession or resection, 12 had Knapp procedure correcting for any horizontal deviation if present, 10 had inferior rectus recession followed by Knapp surgery, with or without recession or resection of horizontal recti, 1 patient had horizontal correction only, while one patient had ptosis correction only without squint surgery. Of the 36 patients, 33 had post-operative (PO) hypotropia within 10 prism diopters (PD). Three patients developed consecutive hypertropia.

Conclusion: Careful pre-operative evaluation can lead to satisfactory cosmetic improvement after surgery in monocular elevation deficiency. The forced duction test should be performed in both eyes so that any associated oblique muscle laxity (OML) can be noted.

Keywords: Monocular deficiency, Strabismus, Squint (JPMA 62: 355; 2012).

Introduction

Monocular elevation deficiency (MED) refers to the limitation of elevation of the affected eye in adduction, abduction and from primary position. Previously known as double elevator palsy, this condition may be associated with ptosis and co-existent horizontal deviation. Both paretic and restrictive causes have been found on FDT and saccadic velocity measurements. The unilateral elevation deficit may also have supranuclear aetiology.^{1,2} Focal thickening of IR observed on magnetic resonance imaging has also been considered as a cause of restricted gaze.³ A limited number of studies have been published on the management of MED.⁴ We come across a large number of such patients in our hospital. The paucity of data regarding MED in published literature from our part of the world prompted the present study.

Methods

The prospective study included 36 patients of monocular elevation deficiency surgically treated over a period of three-and-a-half years, from January 2006 to June 2009, at a tertiary care eye hospital in Rawalpindi. Inclusion

criteria for the study comprised diagnosed cases of MED opting for surgical intervention and the measurement of post-operative (PO) ocular deviation at 8 weeks. Patients having any restrictive cause or previous strabismus surgery and those not completing PO follow-up ocular examination were excluded from the study.

History of complaints, best corrected visual acuity and refractive error were recorded in the patients. Cycloplegic refraction were carried out in children using 1% cyclopentolate eye drops. Refraction in adults were done using an automated refractor. Anterior segment examination on slit lamp, fundus examination, orthoptic assessment and ptosis evaluation were carried out. The possibility of multiple surgeries were explained to the patient and the relatives. Pre-operative FDT was performed on both eyes under general anaesthesia in all cases after which surgery was performed.

Statistical analysis was done using SPSS version 14. Informed consent was obtained from all the study participants. The study and data collection conformed to all local laws and were compliant with the principles of the Declaration of Helsinki and had the approval of the Hospital

Ethics Committee.

Results

Out of the 36 MED patients, 17 (47%) were male and 19 (53%) were female. Age range was between 15 and 32 years (mean 11.91 ± 6.74). Eighteen (50%) patients had MED in the right eye and 18 (50%) had it in the left eye.

Hypotropia in the involved eye was recorded between 4 and 50 PD (mean PD 11.91 ± 6.74). Of the study population, 25 (69.4%) had associated exotropia (mean PD 24.84 ± 20.05) and 7 (19.4%) patients had esotropia (mean PD 15.28 ± 7.22), while 4 (11.1%) patients had no horizontal deviation. Twenty eight (77.77%) patients had

procedure for the correction of horizontal deviation, if present, 10 had IR recession followed by Knapp surgery, with or without recession or resection of horizontal recti. One patient with large exotropia had adjustable squint surgery for horizontal correction only as his FDT was negative with pre-operative hypotropia being within 10 PD. Thirteen patients had ptosis correction surgery once. Ptosis surgeries were performed more than once in 6 patients; due to exposure keratitis related complications (n=2), and under correction or moderate-to-severe jaw winking phenomenon requiring levator dis-insertion followed by frontalis sling surgery(n=4).

Thirty three (91.7%) patients had hypotropia within

Table-1: Initial and post operative hypotropia in different surgical procedures.

Surgery		Initial hypotropia	Residual hypotropia
IR recession +/- horizontal correction	Mean (PD)	19.66 ± 13.68	3.7500 ± 3.04
	N	12	12
knapp+/-horizontal correction	Mean (PD)	29.41 ± 15.38	3.75 ± 2.86
	N	12	12
IR recession +Knapp later +/-horizontal correction	Mean (PD)	35.3 ± 13.54	3.14 ± 2.03
	N	10	7
horizontal correction only	Mean (PD)	8.00 ± 0.0	8.00 ± 0.0
	N	1	1
no squint surgery, ptosis correction only	Mean (PD)	5.00 ± 0.0	5.00 ± 0.0
	N	1	1
Total	Mean (PD)	26.33 ± 15.91	3.78 ± 2.73
	N	33	33

IR= Inferior rectus, PD= prism diopters.

Table-2: Postoperative outcome in number of patients undergoing different procedures.

		Number of patients undergoing different surgical procedures					Total
		IR recession +/- horizontal correction	Knapp+/-horizontal correction	IR recession +knapp later +/-horizontal correction	Horizontal correction only	Ptosis surgery only	
Post-op	Patients with hypotropia within 10 PD	12	12	7	1	1	33 (91.7%)
	Patients having consecutive hypertropia	0	0	3	0	0	3 (8.3%)
Total	12 (33.33%)	12 (33.33%)	10(27.77%)	1(2.77%)	1 (2.77%)	36(100%)	

IR= inferior rectus, PD= prism dioptres.

ptosis, 5 (13.88%) patients had pseudo ptosis and no ptosis was seen in 2(5.55%) patients. Eighteen (50%) patients had associated jaw winking phenomenon.

Surgery was done for the treatment of either MED (in 17 patients) or ptosis (in 1 patient) or both (in 18 patients). The FDT, carried out under general anaesthesia, were positive for IR of the involved eye in 20 (55.55%) and negative in 16 (44.44%) patients. Space occupying lesion (SOL) was observed in the uninvolved eye of 2 patients. Twelve patients had IR recession with or without one horizontal muscle recession or resection, 12 had Knapp

10 PD, PO (range 0-10 PD, mean 3.78 ± 2.73) (Table-1). Three (8.3%) patients who developed consecutive hypertropia were among the 10 patients who had IR recession followed later by Knapp procedure (Table-2). The group of patients showing the least mean residual hypotropia were also the one treated by IR recession followed by Knapp procedure adjusting for any horizontal deviation. No signs of anterior segment ischaemia were seen in any patient.

Discussion

Patients of MED have been treated with augmented

surgical procedures to reduce re-operations⁵ and modifications in Knapp procedure for correcting horizontal deviations.^{6,7} Our cases were treated according to the results of FDT by recession of IR, or Knapp procedure adjusting for any horizontal deviation where required. The IR restriction were found in lesser percentage of patients (55.55%) as compared to other reports citing 82%,⁸ 70%,⁹ and 73.3%.¹⁰ The mean pre-operative hypotropia were decreased from 29.2 $\pm$ 3.5 PD (range, 16-45 PD) to 2.6 $\pm$ 2.8 PD (range, 0-6 PD) in a study of 13 patients.¹¹ In our study, 33 patients were treated within 10 PD of residual hypotropia (range 0-10 PD, mean 3.78 $\pm$ SD 2.73) with good cosmetic and orthoptic results. Transposition procedure enhances the effect of a recessed muscle⁴ also seen among 3 patients who developed consecutive hypertropia after IR recession and were followed up by Knapp procedure. Despite the reversal of Knapp procedure in early PO period, consecutive hypertropia were not corrected. These patients were, however, satisfied with the cosmetic improvement and did not require surgery for the minimal hypertropia.

The SOL were found in the uninvolved eye of 2 patients. This has been reported earlier.¹² It has been proposed that fixation preference for the eye with SOL may have led to a tight IR muscle in the non-preferred eye or there could have been a congenital association between tight IR muscle and SOL in the other eye. The report of initial 22 patients regarding association of ptosis and MED have been published as the non-interventional part of the present study.¹³ Almost similar percentage of MED patients had associated ptosis (77.77% compared to 72.72%) and pseudo ptosis (13.88% compared to 18.18%) as the study advanced. Pseudo ptosis is corrected by extraocular muscle surgery while true ptosis is managed with specific ptosis surgery.¹⁴ Bells phenomenon is usually preserved in MED patients.¹⁵ In the present study, however, 2 patients required under-correction when signs of exposure keratitis were observed after initial optimal correction of ptosis. Limitation of our study is the sample size which is statistically quite low.

Conclusion

Multiple surgeries may be required and should be explained to patients and relatives. Surgical treatment after a good pre-operative evaluation, including FDT, leads to satisfactory cosmetic improvement. Consecutive hypertropia may occur when Knapp procedure follows previous IR recession, which, in turn, may be a challenge to treat. The SOL in the contralateral eye may contribute to MED. Therefore, FDT should be performed and documented in both eyes.

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