Effect of inferior oblique recession in cases of superior oblique palsy

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ABSTRACT

Purpose: To evaluate inferior oblique (IO) recession as a primary surgical procedure for treatment of superior oblique palsy.

Setting: Mansoura Ophthalmic Center, Mansoura University, Mansoura, Egypt.

Methods: Prospective, interventional study comprised 25 patients diagnosed as superior oblique palsy. Complaint was assessed preoperatively & postoperatively e.g. Abnormal head posture (AHP), diplopia & cosmetically unaccepted vertical deviation. Vertical deviation (VD) in primary position by alternate prism-cover test was measured preoperatively, at 1 week, 3 months and 6 months postoperatively. Inferior oblique overaction was assessed preoperatively & postoperatively. All patients underwent IO recession as a primary surgery for treatment of SOP. Successful outcome was defined as hypertropia of 5 prism diopters (PD) or less in primary position.

Results: The study comprised 25 patients who underwent IO recession for treatment of SOP. the median age at the time of surgery was 16 years (range 2 to 50 years) comprising 12 males (48%) and 13 females (52%). AHP was found in 21 patients (84%) preoperatively which was improved in 17 patients & was residual in 4 patients postoperatively. Postoperative grades +2 or more IOOA was considered residual IOOA which was found in 4 patients. Hypotropia in adduction was documented as IO underaction which was found in 1 patient. Postoperatively, the median preoperative hypertropia in primary position decreased significantly **(P=≤0.001*)**. There was overcorrection in one patient. The successful outcome was found in 84% (21 of 25 patients).

Conclusion: Single standardized, nongraded recession of ipsilateral IO was effective in reducing vertical deviation in primary position in cases of SOP & improving AHP without creation of new symptoms.

Keywords: Superior Oblique palsy, inferior oblique recession, secondary inferior oblique overaction

INTRODUCTION

Superior oblique palsy (SOP) is the most common isolated cranial nerve palsy. It can be congenital or acquired[1-4]. Treatment is mainly surgical due to limited use of prisms & unfruitful studies of botulinum toxin injection for long term improvement[4]. Diplopia, torticollis, unaccepted vertical and torsional deviations are indications for surgery. Abnormal head posture is the main indication for surgical treatment in young children under the age of 5 years to avoid progressive facial asymmetry[5,6]. Most studies reported successful outcomes with inferior oblique muscle surgery to be the most frequent operated muscle[5, 6].

This study was done to evaluate the inferior oblique recession as a primary surgical procedure for treatment of superior oblique palsy. We evaluated its effect on vertical deviation in primary position in cases diagnosed with superior oblique palsy and its efficacy on improving the abnormal head posture.

PATIENTS & METHODS

Prospective, interventional study included patients diagnosed as superior oblique palsy who were in need for surgical treatment at Mansoura Ophthalmic Center, Mansoura, Egypt from December 2018 to February 2021.

The following were exclusion criteria: Nystagmus, associated other paralytic strabismus, associated horizontal strabismus, other motility disorders e.g. dissociated vertical deviation & previous strabismus surgery.

Age, gender, etiology and laterality were recorded for each patient. Complaint e.g. abnormal head posture (AHP) was assessed preoperatively & postoperatively. Inferior oblique overaction was graded from a scale of 0 to +4 & assessed preoperatively & postoperatively. Vertical deviation (VD) measurement in primary position by alternate prism-cover test was performed preoperatively, at 1 week, 3 months and 6 months postoperatively.

Superior oblique palsy (SOP) was diagnosed as hypertropia (HT) which increased in adduction and on ipsilateral head tilt.

Successful outcome was defined as straight ocular alignment within ≤ 5 prism diopters (PD) with improvement of symptoms initially prompted the patient to seek medical care without creation of new symptoms.

Surgical Technique

All patients underwent inferior oblique (IO) recession which was performed by the same surgeon & under general anesthesia. A locking fixation forceps was placed to the inferior temporal conjunctiva to rotate the eye superonasally. An incision was made in the inferior temporal fornix through the conjunctiva & Tenon capsule down to bare sclera. The IO muscle was hooked & partially isolated after dissection of its Tenon's capsule and fascial attachments then engaged between 2 muscle hooks. The IO was then clamped across its entire width using small straight hemostat clamp adjacent to the insertion then carefully detached from the globe close to the insertion. A 6-0 double-armed vicryl suture was placed in the edge of the muscle with locking bite on each pole of the muscle then IO is re-attached to the sclera 2mm from temporal edge of inferior rectus muscle & 3mm behind the IR insertion.

Statistical analysis:

Statistical analysis data was done by SPSS software (version 21.0, SPSS, Inc.). Qualitative data were described using number and percent. Continuous variables were presented as median (Min-Max) for non-normally distributed data. Qualitative data were compared using chi-square test. Quantitative non-parametric data were compared using Friedman test. A P value less than 0.05 was considered statistically significant.

RESULTS

The study enrolled 25 patients who diagnosed as superior oblique palsy & underwent IO recession as a primary surgery. the median age at the time of surgery was 16 years (range 2 to 50 years) comprising 12 males (48%) and 13 females (52%).

20 (80%) patients were diagnosed as congenital SOP. 4 patients (16%) had a clear history of trauma (traumatic SOP) & one patient developed iatrogenic SOP following a surgery for Brown syndrome. 7 patients (28%) were diagnosed as bilateral SOP. The median age at the time of surgery in congenital SOP was 10.5 years (range 2 to 50 years) while in acquired SOP was 29 years (range 8 to 38 years) with no statistically significant difference (P = 0.303).

AHP was found in 21 (84%) patients preoperatively which was improved in 17 patients & was residual in 4 patients postoperatively in which second intervention was needed.

12% (3 patients) complained of preoperative diplopia which improved postoperatively in all patients.

Cosmetically unaccepted vertical deviation was documented in only one patient.

IOOA was graded by observing the angle of the adducting eye with the horizontal line on lateral gaze to the opposite side on a scale from 0 (no overaction) to +4 (maximum increase in adduction). Postoperative grades +2 or more IOOA was considered residual IOOA & hypotropia in adduction was documented as IO under-action. Preoperative & postoperative frequency of grades of IO action among the patients was shown in **table 1**.

Table (1): Preoperative & postoperative frequency of grades of IO action among patients who diagnosed as SOP & underwent IO recession.

Preoperative	Postoperative			
	No IOOA	**+1 IOOA**	**Residual IOOA**	**IO underaction**
No IOOA (n=1)	0	0	0	1
+1 IOOA (n=5)	4	1	0	0
+2 IOOA (n=8)	5	3	0	0
+3 IOOA (n=9)	0	7	2	0
+4 IOOA (n=2)	0	0	2	0
Total (n=25)	9	11	4	1

Residual IOOA was found in 4 (16%) of the patients in which AHP was still found & second intervention was needed. IO underaction was found in 1 patient.

Postoperatively, the median preoperative hypertropia in primary position decreased significantly (Table 2, figure 1). There was overcorrection in one patient.

The successful outcome by reduction of hypertropia in primary position to 5 PD or less without creation of new symptoms was found in 84% (21 of 25 patients). One patient had large HT (20 PD) in primary position which was reduced to 8 PD postoperatively & the patient was still complaining of AHP & second intervention was needed.

We also categorized our patients by congenital and acquired SOP. The successful outcome was found in 85% (17 of 20) in the congenital group and 80% (4 of 5) in the acquired group, with no statistical significant difference (P = 0.785).

Table (2): Follow up of vertical deviation in prism diopters (PD) among patients who diagnosed as SOP & underwent IO recession

Time	**Median (Minimum – Maximum)**	**χ^2[3]**	**P value**
Preoperative	8 (0 - 20)	63.160	**<0.001***
One week	4 (-2 - 8)		
3 months	2 (-2 - 8)		
6 months	1 (-2 - 8)		

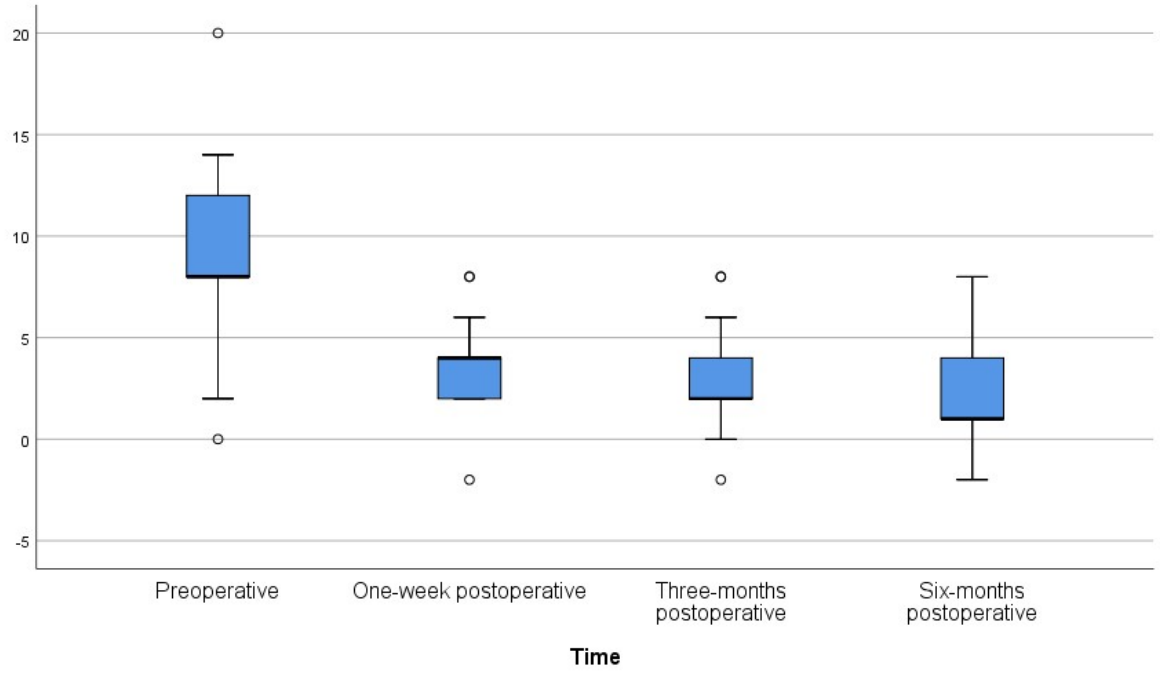

Figure (1): Boxplot for vertical deviation in primary position over time

The successful outcome by reduction of hypertropia in primary position to 5 PD or less without creation of new symptoms was found in 84% (21 of 25 patients). One patient had large HT (20 PD) in primary position which was reduced to 8 PD postoperatively & the patient was still complaining of AHP & second intervention was needed.

We also categorized our patients by congenital and acquired SOP. The successful outcome was found in 85% (17 of 20) in the congenital group and 80% (4 of 5) in the acquired group, with no statistically significant association (Phi (φ)=0.055, P = 0.785).

DISCUSSION

IO weakening procedures are commonly used as surgical treatments for SOP. They have been reported as being effective in reducing vertical deviation & AHP without creation of new symptoms as iatrogenic Brown syndrome resulting from SO tuck[6-8].

The current study is different from previous series as it was a prospective interventional study which shows a successful outcome for treatment of SOP in reducing the vertical deviation, correction of IO overaction and improvement of symptoms initially prompted the patient to seek medical care without creation of new symptoms.

Studies that discussed the effect of isolated weakening procedures on the ipsilateral IO muscle e.g. disinsertion, myectomy and recession, have shown that these procedures are safe and effective in the treatment of SOP[6, 9]. Ghazawy et al documented similar effects of both IO myectomy and IO anterior transposition in treatment of SOP[10]. Mataftsi et al and Morad et al reported that IO recession was associated with 88% recovery rate in their study[8,11]. Other authors have reported lower rates of reducing vertical deviation and improving AHP[12]. Nejad et al reported that IO recession resulted in undercorrection in 75% of cases with large hypertropia more than 20 PD[13]. Toosi & von Noorden divided the patients according to preoperative measurements of vertical deviation (VD). They reported that the change in VD was significantly higher in the group with the preoperative greater deviation[14] . In our study, the reduction in VD was significant & similar in either small or large preoperative VD. Potential causes for poor outcome of IO weakening surgery may include anatomical abnormalities, intraoperative missing part of the IO muscle or severe superior oblique under-action[6,13,15].

Parks suggested in 1971 surgical technique for IO recession. It was documented that reattachment of the anterior end of the cut end of IO at a point 3 mm behind the IR insertion and 2 mm from the lateral border of the IR was known as 8 mm IO recession which was actually equal to a 10-mm recession[16] then Parks in 1985 described a graded recession based on the degree of IO overaction. It was reported that 14-mm recession is reattachment of the anterior end of the cut end of IO close to the scleral exit of the inferotemporal vortex vein[17].

Yoo et al divided the patients according to the degree of IOOA; patients who had IOOA ≤ +2 underwent a 10 mm IO recession & patients who had IOOA > +2 underwent a 14 mm IO recession. They concluded that graded IO recession had a self-grading effect[18]. In the present study, 10 mm IO recession was done to all grades of IOOA & was effective in normalization of IOOA in 84% of the patients with improvement of AHP[18].

Diagnosis of congenital SOP is usually established in adult life[19]. Haugen & Nepstad reported that 37.0% of the patients with congenital SOP in their cohort study had their first surgical intervention for strabismus after the age of 40 years[20]. In this study, 35% (7/20) of patients diagnosed as congenital SOP had their first surgical intervention for strabismus after the age of 25 years.

Strengths of the study are the prospective study design and the fact that all the patients were operated in a standardized procedure by the same surgeon. However, the follow-up time (6 months) is relatively short & the relatively low number of patients may considered a limitation.

CONCLUSION

Single standardized, nongraded recession of ipsilateral IO was effective in reducing vertical deviation & improving AHP without creation of new symptoms.

Disclosures

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No financial support was received for this submission.

DATA AVAILABILITY

All data are included in this article.

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Ethics declarations

Conflict of interest

Ghada A. Hassan, Rasha E. Magdi, Manal Kasem, Derek Sprunger, Ibrahim T. El-Adawe. all authors have no conflicts of interest that are directly relevant to the content of this review.

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