■ ***Original article***

Effect of monocular surgery for large-angle horizontal deviation in adults

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Abstract

Background: Surgical success rate of strabismus is variable.

Objective: To evaluate the outcome of monocular strabismus surgery for adults with large-angle deviation.

Subjects and methods: This study was that of a retrospective interventional case series. A total of 48 consecutive adult patients with large-angle socially-noticeable strabismus underwent clinical evaluation for squint surgery. They were divided into 2 groups of which 28 had exotropia while 20 had esotropia with deviation ranging from 40 to 80 prism diopters (PD). Visual acuity measurement (V/A), cycloplegic refraction and orthoptic evaluation were done in all cases along with detailed anterior segment evaluation. Fundus examination was carried out with indirect ophthalmoscope and slit-lamp bio-microscopy with + 90 D lens. For each case, a repeat evaluation was done after a six-week interval. The surgical procedure was monocular recession and resection carried out under peri-bulbar anesthesia by the same surgeon. Post-operative visual acuity, fusion, stereopsis and ocular alignment were noted in all cases during follow up visits.

Results: Successful ocular alignment (< 10 PD) was achieved in 40 patients while binocularity was noted in 3. Forty patients were happy with the cosmetic outcome and psychosocial rehabilitation. No statistically significant improvement was noted in visual acuity and binocular function. Successful alignment was related to pre-operative deviation of less than 30 degrees.

Conclusion: Monocular surgery under peri-bulbar anesthesia is a useful procedure for large-angle horizontal strabismus.

Key words: strabismus, exotropia, esotropia, fusion, binocularity

Introduction

Along with cosmesis, adults undergoing strabismus surgery benefit from other factors affecting vision such as recovery of fusion, stereopsis, expanded field of vision in esotropia, elimination of torticollis, better psychosocial functioning and enhanced job opportunities (Beauchamp et al 2005). Factors adversely affecting recovery of stereopsis are visual acuity (V/A) < 6/18 due to any cause, onset of strabismus before visual maturity and duration of misalignment. Earlier, surgery was considered beneficial for stereopsis provided patients had good visual acuity and resulted in surgical alignment. Subsequent reports (Baker 2002, Mills et al 2004) indicated recovery of some fusion (Mets et al 2003) and stereopsis even in those who had had a strabismus onset before visual maturity. Furthermore, recent research suggests that a horizontal deviation < 4 PD will enable macular function (< 100 arc-sec) whereas large-angle (5 - 10 PD) may just be sufficient for binocularity (Leske & Holmes 2004). Various publications have reported a surgical success rate of 30 % to 80 %. This study aims to evaluate the success rate of monocular horizontal strabismus surgery for large-angle deviations. So, we here undertook monocular resection and recession procedure in order to evaluate its effect and limitations in cases of large-angle deviations.

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Subjects and methods

The study was conducted in Lumbini Eye Institute from June 2006 to July 2009 and in Birtamode Eye hospital from March 2010 to July 2010. The patients with constant deviations starting from 40 PD to 80 PD were included. All patients were over 16 years of age. Informed consents were obtained from the patients . V/A was estimated with Snellen's chart, stereopsis measured with Titmus test and fusion with Worth-four-dot test (WFD). Angle deviations were measured with Hirschberg test, prism cover test and modified Krimsky test for near and distance. Detailed ocular examinations were performed with indirect ophthalmoscope and slit-lamp biomicroscope with + 90 D lens. Cycloplegic refraction was carried out.

The parameters of the study were age of the patients, pre and post operative V/A, , angle of deviation , binocular function, extra-ocular movements and re-operative requirement. Surgery was planned according to the measured deviations following Marshall parks formula and was performed by a single surgeon under peri-bulbar anesthesia.

The main outcome aimed at was ocular alignment within 10 PD. The influencing factors (age of onset, V/A, binocular function and amount of deviation) for surgical outcome were measured. Patients having restrictive and myogenic disorders (thyroid dysfunction, Myasthenia gravis) were excluded in this study.

Results

Among the subjects of the study group, 18 case of exotropia had deviation ranging from 40 to 60 PD and 13 cases of esotropia had similar deviations. Seventeen cases had deviations larger than 60 PD; of them 10 had exotropia and 7 had esotropia. The mean value of deviation among the study group was 55 ± 8.6 PD (Table 1). The duration of deviation ranged from 10 to 30 years with a mean value of 20 ± 8 years. The V/A among the study group ranged from 6/6 to PL with a mean value of 3/60.

In two cases cataract surgery was undertaken and in one case tatooing was done on a later date, after 6 weeks. Surgical success was achieved in 39 cases (81.25 %). Forty cases were happy with the cosmetic results which was maintained at 12 months follow-up. No patients showed any drift during the six-month follow-up, after which 6 cases of esotropia showed a drift towards exotropia of an average of 6 PD but no eso drift was noted during one year follow-up. Nine cases in our study fell outside our objective criteria of successful alignment. Two cases had consecutive esotropia and four cases had under-corrected exotropia and 3 cases were of under-corrected esotropia. These patients (18.75 %) underwent reoperations after 6 months of initial correction. They were within 10 PD after reoperation. Some post-operative abduction deficit was noted in 20 percent of cases. None of them had any symptomatic complaints. They included 4 cases from the failure group and the rest were from the success group.

Table 1
Ddemographic details of the patients

Demography	N= 48
Age	28 ± 7.6
Sex	
Male	27
Female	21
Diagnosis	
Exotropia	28
Esotropia	20
Angle of deviation, pre-op	55 ± 8.6 PD
V/A, pre-op	6/18
Duration of strabismus	20 ± 8 yrs

Table 2
Surgical outcome

Para–meters	Success group			Failure group	P value
	N=39			N=9	0.12
Exo–tropia	28			6	
Eso–tropia	20			3	
Bino cularity	preoperative N = 4		Post operative	N=8	0.63
Visual acuity	3/60		6/60		

Table 3
Amount of deviation in reoperation group

Pre-op deviation PD	Post-op deviation PD
XT 70	XT 20
XT 80	XT 20
XT 70	XT 15
XT 60	ET 15
XT 40	ET 15
XT 75	XT 15
ET 60	ET 15
ET 40	ET 20
ET 40	ET 15

In our study, no significant difference was noted in pre-operative V/A and stereopsis. Binocularity was present in one case of exotropia with good vision and three cases of esotropia with good vision. Post-operatively, three cases of exotropia and five cases of esotropia had binocularity with good vision, which shows an improvement in binocular vision of 7.1 % among the exotropia group and 10 % among the esotropia group. Two cases had a conjunctival wound dehiscence as a complication (4%). The main early post-operative features showed redness and ptosis which improved during 2-week follow-up in all cases. No patients presented with any major residual limitation in ocular movements.

Discussion

The definition of a successful outcome depends entirely on the criteria used for such success. Many define satisfactory alignment as within 8 to 10 PD while some extend the criteria to 15 PD. Velez (1984) reported a 40 % success rate (15 PD) for correction of large angle exodeviation (50 PD or greater in amblyopic eyes with a unilateral procedure). This improved to 80 % when combined with weakening of the inferior and superior obliques. Schwartz and Calhoun (1980) reported 77 % success rate in a series of 22 patients with XT. In another study by Currie et al (2003) 77 % of the cases had measured within 10 PD orthophoria, and if success was defined as within 15 PD of orthophoria then the success rate increased to 85 %.

In our study, among all 48 cases with pre-operative deviation up to 60 PD, residual deviations more than 10 PD were noted in 9 cases. Success was defined as within 10 PD in our series and 81.25 % of the patients were happy with the cosmetic results. The majority of longstanding cases had no prior binocularity though quite a few demonstrated that after realignment. As most of the cases were between 20 to 30 years and with a long duration of having strabismus, the outcome in V/A and stereopsis was expected to be less. The results showed statistically insignificant improvement in stereopsis and V/A. In a study by Fatima et al (2009), true stereopsis was noted after 6 weeks among 33 % of cases with long standing large-angle deviations. This study highlights the fact that the majority of patients with good vision with non-fusing large-angle chronic strabismus can regain fusion and stereopsis after successful visual alignment. Here in our study, most of the cases had poor vision during presentation and as a result not much improvement in binocularity was expected beforehand.

Our study shows that though monocular surgery can successfully treat strabismus with up to 65 PD, the chance of improvement in stereopsis as well as V/A still mainly depends on pre-operative binocularity, duration of strabismus and age of onset, which altogether definitely affects the outcome for binocular functions post-operatively. Here, few cases had good pre-operative stereopsis with good V/A and as a result very few had binocular improvement. On the other hand, the duration of strabismus was very long and the age of onset in most cases was before visual maturity too. These factors definitely adversely affected the binocular function post-operatively, even with very successful ocular alignment.

In present study, the success rate has been recorded as 81 % which correlates well with many other studies (Schwartz et al 1980). Nearly 19 % of the cases in our study required reoperation and these cases had either pre-operative large-angle deviations or had developed consecutive deviations after surgery. It has been noted in our study that deviations up to 65 PD have been well corrected with monocular 2 muscle procedures.

The limitation of this study is that most of the patients were functionally compromised and as a result secondary outcome factors could not be elaborated upon. As most of the cases had poor binocularity and V/A during presentation and no single patient was from the pediatric age group, the prognosis for

stereopsis and fusion as well as for vision was already poor. So this study could not highlight much on factors beyond cosmesis.

Conclusion

Monocular surgery for horizontal strabismus in adults is an effective method to correct large-angle deviations of up to 65 PD and can be considered as the initial procedure in such cases.

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