

Outcome of strabismus surgery in adults: A prospective study.

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Abstract:

Aims and objectives: To study the outcome of strabismus surgery in adult patients.

Methods: This was a prospective observational study that included subjects with strabismus aged 16 to 41 years. A detailed ocular examination including visual acuity assessment, refraction, strabismus work-up and examination of anterior segment and posterior segment with a dilated fundus examination was done pre-operatively. The pre-operative and post-operative best corrected visual acuity, stereopsis, binocular fusion status and ocular alignment were assessed and compared.

Results: A total number of 50 participants were included in this study. The mean age of all 50 patients was 25.60 ± 7.86 years. 42 (84.0%) patients had exotropia and 8 (16.0%) patients had esotropia. Although there was no significant improvement in the visual acuity postoperatively ($P = 0.182$), the improvement in the binocular fusion status ($P = 0.000$) and stereopsis ($P = 0.018$) postoperatively was statistically significant.

Conclusion: In our study we concluded that strabismus surgery in adults achieves a great surgical success rate (96%). Surgery not only eliminates the abnormal ocular alignment but also confers a benefit of improved binocular fusion and gain of stereopsis. Adults who underwent strabismus surgery had no improvement in best corrected visual acuity. Surgical success provides good cosmesis giving a great satisfaction to the patients in social and psychological aspect also.

Key words: Strabismus, Stereopsis, Binocular fusion, Orthophoria.

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I. Introduction:

Binocular vision is the hallmark of the human race. This requires constant and controlled activity of the appropriate eye muscles to maintain fixation of the two retinas on the concerned objects. It also requires the accommodational mechanism to maintain a clear view, even as the object moves closer or further. [1]

Strabismus or abnormal ocular alignment, is one of the most common eye problems encountered in the ophthalmology outpatient department. Strabismus is not just a cosmetic blemish but also has a myriad of effects of its own such as disruption of binocular vision and stereopsis apart from causing a negative impact on the patient's self-esteem and interpersonal relationships. [2]

The misalignment may manifest in any field of gaze, may be constant or intermittent, and may occur at distant or near fixation or both. Strabismus affects between 2% and 5% of the preschool population and is an important cause of visual and psychological disability. [3,4,5,6] Although a study from southern India has shown a lower prevalence of 0.7%. [7]

Psychosocial difficulties relating to socially noticeable strabismus are not just a problem for school children but also for teenagers and adults. Correction of strabismus in the older teenager or adult may offer them improvement in psychosocial functioning. [8] Strabismic adults have been shown to have social and psychological issues directly related to their condition, which impact all aspects of their lives: education, social relationships, employment prospects, and self-esteem. [9,10,11,12]

The negative attitude towards patients with strabismus has been shown by Paysee et al to begin as early as age 5.75 years. Women with strabismus were less likely to be recommended for a job despite having identical qualifications to women with orthophoria. [13]

Adults with socially noticeable strabismus have been known to experience psychosocial difficulties as a result of their abnormal eye position. [14] Strabismus in adults may be associated with diplopia, abnormal head posture, impaired stereopsis and negative psychosocial effects, which may negatively affect daily living and quality of life. [15] Many adult patients with strabismus are under the misconception that nothing can be done to correct the problem or that treatment is associated with a high degree of risk. [16]

There are very few studies on adult strabismus surgery regarding the outcome in aspect of vision improvement, gain of stereopsis and binocular single vision. The purpose of our study was to find whether

strabismus surgery in adults is really beneficial for improving visual outcome, stereopsis and binocular single vision or is it just a cosmetic gain.

II. Methods

This was a prospective observational study that included subjects with strabismus aged 16–41 years. The inclusion criteria for subjects included in this study were age ≥ 16 year and best corrected visual acuity ≤ 0.47 in LOGMAR. Subjects were recruited from ophthalmology department of a tertiary hospital in Imphal west, Manipur. Subjects included in this study had good general health and normal ocular surfaces, with no ocular pathology and did not have any previous ocular surgery.

Subjects under the age of 16 years were excluded from this study. Subjects with Paralytic strabismus, Sensory strabismus, Thyroid eye disorders, History of any previous strabismus surgery were excluded from this study. Subjects with systemic diseases such as diabetes or those under medication were also excluded from this study as these factors could alter visual function measurements.

All patients underwent a detailed ocular examination including visual acuity assessment, refraction, strabismus work-up and examination of anterior segment and posterior segment with a dilated fundus examination pre-operatively.

Visual Acuity – was measured by using LOGMAR scale. Worth Four Dot Test was performed in each patient to rule out suppression in the strabismic eye. Stereopsis was measured with the Titmus Stereo test. Amount of deviation was measured by Alternate Prism Cover Test (APCT).

Detailed ocular examination was performed with indirect ophthalmoscopy, slit lamp biomicroscopy and cycloplegic refraction after pupil dilation with cyclopentolate 1.0% drops followed by tropicamide 1.0% drops and cyclopentolate 1.0% drops instilled at a 5 minutes interval.

Ethics committee approval was obtained from the institute's review board at medical group hospitals. Informed consent was obtained from all participants after explanation of the nature and possible consequences of the study, and the research followed the Schedule Y format and ICMR guidelines.

Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences version 22.0 software (SPSS Inc, Chicago, IL, US). Demographic information and ocular measurements were compared between groups using the Paired Samples T Test/Chi-squared test/ Fisher Exact Test. $P < 0.05$ was considered statistically significant.

III. Results:

A total of 50 subjects were included in this study, 42 patients being exotropic and 8 esotropic (Figure 1).

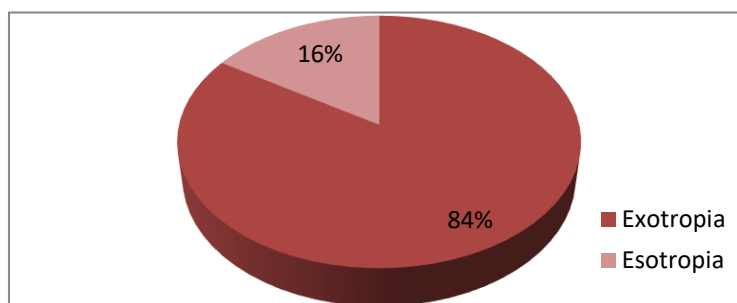


Figure 1: Distribution of patients according to type of strabismus

The mean age was 25.60 ± 7.86 years. There was female predominance (31 patients) and 19 patients were male. Out of 42 exotropia patients, 26 (61.9%) were female and 16 (38.1%) were male, while out of 8 exotropia patients, 5 (62.5%) and 3 (37.5%) were female and male respectively (figure 2).

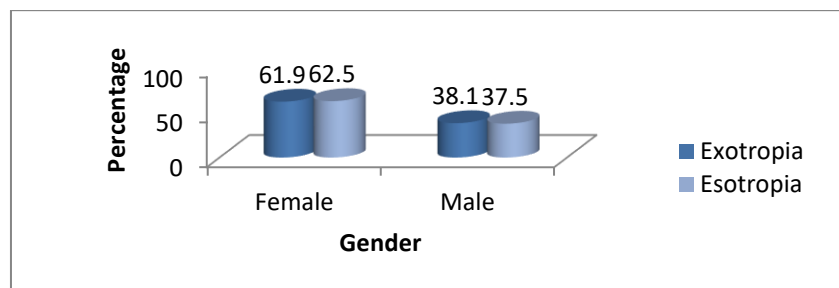


Figure 2 - Gender distribution of patients studied

Preoperatively , 45 patients had logmar value of 0 and postoperatively 46 patients had logmar of 0. Only 2 patients had improvement of visual acuity, one patient improved from 0.30 to 0.10 and another patient improved from 0.10 to 0.0. It was observed that there is no significant improvement in the visual acuity postoperatively ($P = 0.182$) as shown in figure 3.

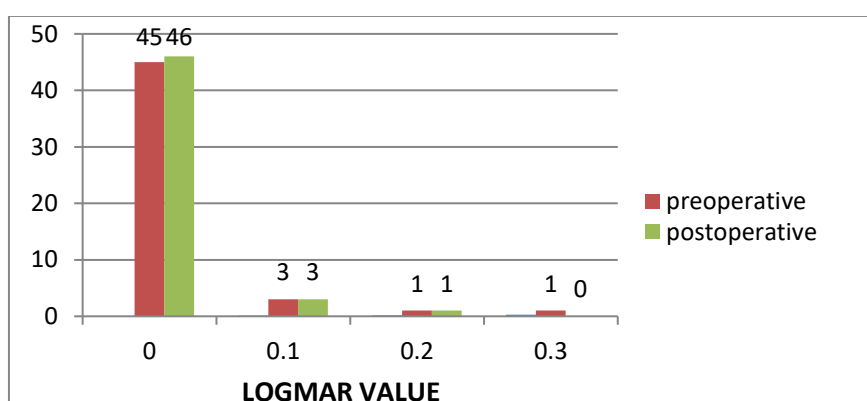


Figure 3: Visual outcome of patients.

The mean angle of deviation preoperatively was 44.6 PD. Post-operatively 48 (96%) patients had <10 PD angle of deviation and 2 patients had deviation of >10 PD . Binocular fusion was absent in 42 patient preoperatively. Post- operatively 46 (92%) patient gained binocular fusion as shown in (table 1).

		No of patients	
		Preoperative	Postoperative
Angle of deviation in PD	< 10 PD	0	48
	11 – 40 PD	16	2
	> 40 PD	34	0
Binocular fusion	Present	8	46
	Absent	42	4

Table 1: Angle of deviation and binocular fusion status of the patients.

Stereopsis was absent in 16 patient preoperatively. Postoperatively 13 patients had gained stereopsis from no stereopsis preoperatively, 3 patients improved from gross stereopsis, 10 patients improved from 400° arc of seconds to fine stereopsis, 2 patients improved from 200° arc of seconds to fine stereopsis and overall 35 (70.0%) patients showed improvement in stereopsis (figure 4).

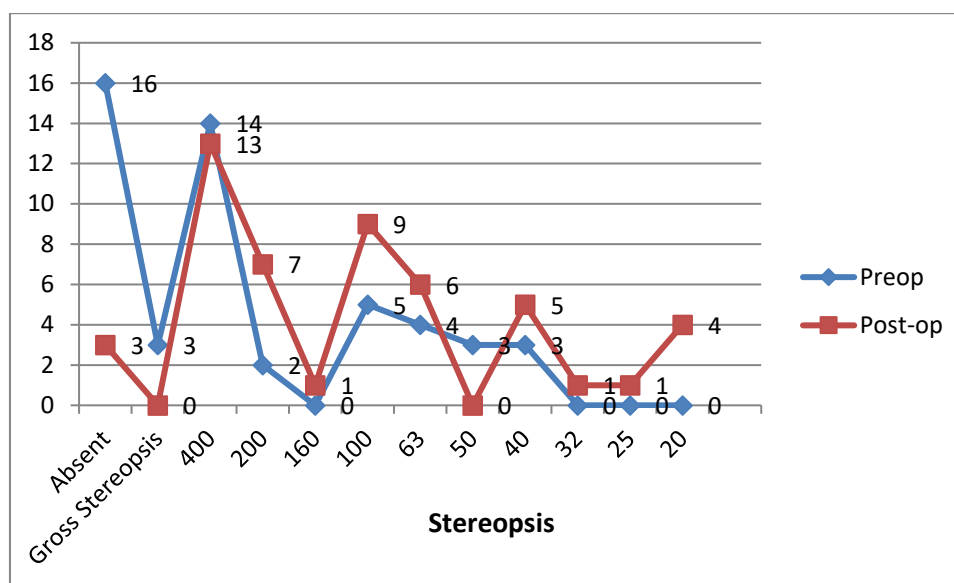


Figure 4 : Distribution of stereopsis among the patients studied.

IV. Discussion:

A total number of 50 adults patients with strabismus were studied. Out of them 42(84.0%) patients were having exotropia and 8(16.0%) patients were having esotropia. The mean age of exotropic patients was 25.93 ± 8.45 years and of esotropic patients was 23.88 ± 3.18 years. The mean age of all 50 patients was 25.60 ± 7.86 years. The maximum patients were in age group 20 - 30 years. **Tubing K et al^[17]** also suggested that the incidence of strabismus decreases with increase in the age of patients. **Shrestha S et al^[18]** also observed a mean age of 21.025 years with 31(62.0%) and 19 (38.0%) patients female and male respectively. **Zhang MS et al^[15]** also observed higher incidence of strabismus in females (58.0%) as compared to males (42.0%). The reason for the higher incidence in females may be due to the fact that females tend to be more conscious cosmetically.

It was observed that there was no significant improvement in the visual acuity postoperatively ($P = 0.182$). **AL-Wadaani FA et al^[19]** also found no improvement of visual acuity in 67% of the patients studied. **Bandhopadhyay R et al^[20]** also observed that BCVA did not improve beyond the preoperative level in any of the patients studied. The improvement in visual acuity of 2 patients in our study is most probably due to better ocular alignment postoperatively.

The mean angle of deviation preoperatively was 44.6 PD. Post-operatively 48 (96%) patients had <10 PD angle of deviation & 2 patients had deviation of >10 PD. Surgical success was defined as post-operative deviation of <10 PD. 96% patients achieved surgical success. It can be observed that there significant improvement in the angle of deviation postoperatively ($P = 0.000$). **Sharma AK et al^[21]** also had 93% success, the ocular deviation after surgery reduced significantly, which is comparable to our study. **Sharma AK et al^[21]** also observed successful outcome in 40(66.66%) patients having less than 10 PD of residual strabismus post-operatively. **Bandhopadhyay R et al^[20]** observed 90% surgical success. Out of 10 adults operated post-operative residual deviation was <10 PD deviation in 9 patients and >10 PD deviation in 1 patient.

Binocular fusion was absent in 42 patient preoperatively. 38 (76.0%) of patients gained binocular vision postoperatively. The P value was 0.000. **Mets MB et al^[22]** also observed improvement in the binocularity on their study. **Sharma AK et al^[21]** also observed gain of binocular fusion in 39.3% of exotropes and 17.9% of esotropes post-operatively. Binocular fusion was absent in all the patients pre-operatively. **Koc F et al^[23]** concluded from there study that restoration of binocular vision is possible in almost half of the adults with a long-term history of strabismus. **Kushner BJ et al^[24]** concluded regardless of the type of deviation present preoperatively, the duration of strabismus, or the depth of amblyopia in the deviating eye (if present), the vast majority of patients developed binocularity after successful strabismus surgery.

35 (70.0%) patients showed improvement in stereopsis. A significant P value of 0.018 was observed. **Mets MB et al^[22]** also observed 51.0% of improvement in stereopsis excluding the patient who were having preoperative stereopsis of 40° arc of seconds which is very much comparable to our study. **Fatima T et al^[25]** also observed recovery of fusion and stereopsis in long standing cases of strabismic adults with good vision. **Sharma AK et al^[21]** also observed gain of stereopsis in both esotropic and exotropic patients following strabismus surgery. **Morris RJ et al^[26]** achieved stereopsis of 200 seconds of arc or better in 50% of the subjects.

Preoperatively orthophoria was present in only 4(8%) patients. Post-operatively 48(96%) patients achieved orthophoria. **Currie ZI et al**^[27] has orthophoria or deviation of <10 PD in 77% of the patients, which is comparable to our study. **Sharma AK et al**^[21] also achieved orthophoria in 25% of patients post-operatively and concluded that horizontal and bilateral strabismus has good surgical outcome with improved cosmetic acceptance.

V. Conclusion:

In our study we concluded that strabismus surgery in adults achieves a great surgical success rate (96%). Surgery not only eliminates the abnormal ocular alignment but also confers a benefit of improved binocular fusion & gain of stereopsis. Adults who underwent strabismus surgery had no improvement in best corrected visual acuity. Surgical success provides good cosmesis giving a great satisfaction to the patients in social and psychological aspect.

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Limitations:The limitation of our study was that the sample size was small. A study with larger number of patients would provide detailed factors for gaining surgical success.

Conflicts of interest : There are no Conflicts of interest.

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