

Evaluation of alignment of the visual axis and its psychosocial effects before and after surgery in concomitant horizontal strabismus - A prospective interventional study

¹Nirwan Laxmi, Junior Resident, Department of Ophthalmology, Indira Gandhi Government Medical College, Nagpur, Maharashtra 440018, India.

²Chauhan Ravi, Professor and Head, Department of Ophthalmology, Indira Gandhi Government Medical College, Nagpur, Maharashtra 440018, India.

Corresponding Author: Nirwan Laxmi, Junior Resident, Department of Ophthalmology, Indira Gandhi Government Medical College, Nagpur, Maharashtra 440018, India.

How to citation this article: Nirwan Laxmi, Chauhan Ravi, “Evaluation of alignment of the visual axis and its psychosocial effects before and after surgery in concomitant horizontal strabismus - A prospective interventional study IJMACR- March - 2023, Volume – 6, Issue - 2, P. No. 743 – 749.

Open Access Article: © 2023, Nirwan Laxmi, et al. This is an open access journal and article distributed under the terms of the creative commons attribution license (<http://creativecommons.org/licenses/by/4.0>). Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Aim: To evaluate the visual axis alignment, to assess the psychosocial aspect and the effect of amblyopia following horizontal strabismus surgery in patients with horizontal concomitant strabismus

Materials and methods: A total of 45 patients satisfying the inclusion criteria were studied for 2 years at a tertiary care medical Centre. A detailed general history was taken, including clinical examinations involving visual acuity assessment, head posture, slit lamp biomicroscopy examination, squint evaluation and refraction under full cycloplegia. All the participants were asked AS-20 questionnaire pre-operatively and 1 month post-surgery follow up. Strabismus surgery was performed by a single surgeon by either resection or recession or both under peribulbar or general

anaesthesia. These patients were then followed up after 1 week, 4 weeks, 3 months and 6 months post-surgery and a complete orthoptic assessment was performed. Final measurement of deviation was documented by same method and also the post-operative alignment of the visual axis was done

Results: The mean IPD was 55.9 ± 4.3mm. 60% of the study subjects had exotropia and 40% had esotropia. 83.3% cases had normal Worth 4 dot test, 10% had LE suppression and 33% had RE suppression. 83.3% had perceived stereopsis. 16.6% did not perceive stereopsis and 5% had severe amblyopia with very low vision. 73.3% cases had no post-operative complications and 6 patients had under correction while 2 cases had tenous prolapse. The most common deviation was between 30-50 PD, with 23.3% having pre-operative

deviation between 31-40 PD and 26.6% having pre-operative deviation between 41-50 PD. 20% had angle of deviation between 20-30 PD. 16.7% had deviation more than 60 PD. The mean pre-operative angle of deviation was 47.03 PD. The mean pre-operative angle of deviation was 47.03 PD and the mean post-operative angle of deviation (6th month) was 8.1PD. There was statistically significant difference between the two means

Conclusion: Strabismus surgery to restore ocular alignment has a significant effect on patients' self-esteem and self-confidence in patients with childhood-onset strabismus

Keywords: Visual axis alignment, strabismus surgery, psychosocial effect, angle of deviation.

Introduction

About 4% of adults have the ocular condition strabismus, which is relatively prevalent in adults¹. This prevalent childhood oculomotor disorder manifests as a deviation when binocular vision is impaired². One eye may spin continuously or sporadically inward or outward (esotropia, exotropia, hyper tropia, or hypotropia), upward or downward (hypotropia), or both (in cyclotropia) (excyclotropia)^{3,4}. For those who are impacted, the misalignment of the pupil entrance can lead to double vision, narrowed visual fields, and a variety of psychosocial challenges⁵. Ocular alignment and physical look play a significant role in the typical socialization process⁶. People may experience stigmatization if a bodily flaw like strabismus is noticeable to others^{7,8}. Psychological difficulties are frequently exacerbated by the mannerisms the afflicted people frequently exhibit, such as avoiding eye contact⁸. The precise cause of strabismus is unknown, but it is frequently attributed to refractive, sensory (organic),

anatomical (motor), and innervational causes^{3,9}. It can also develop as a result of other medical conditions, too⁹. Children around the world have a frequency of strabismus ranging from 0.14% to 5.65%. Low birth weight and prematurity, neuro developmental disorders¹⁰, refractive error¹¹, anisometropia¹², cranial nerve palsy¹³, older maternal age at the time of labor¹⁴, maternal smoking¹⁴, assisted delivery (forceps or caesarean section), and more have all been linked to it.

Strabismus frequently has a negative impact on a person's self-worth, self-confidence, and interpersonal relationships in adults and adolescents, according to a number of studies^{6,15}. In one study, strabismus was found to negatively influence self-image in 69% of affected adults and 70% of affected teenagers¹⁵. This research used a self-reporting grid to assess psychosocial effects. The Postgraduate Institute Health Questionnaire was used by Menon and colleagues¹⁶ to record the psychosocial challenges that people with strabismus face in this age group. The goal of strabismus surgery is to realign the eyes in order to improve binocular fields, correct diplopia, restore binocular vision, or restore the eyes to their natural alignment⁵. However, strabismus surgery has frequently been characterized as solely cosmetic^{17,18} if a patient does not have preoperative diplopia symptoms or the potential for binocular vision. Contrary to cosmetic surgery, the purpose of strabismus surgery is to restore the eyes' natural alignment rather than to improve a person's appearance. Additionally, the categorization as purely cosmetic completely ignores any potential psychological advantages of strabismus correction. Hence, the aim of this study was to evaluate the visual axis alignment, to assess psychosocial effects and effects of amblyopia before and after horizontal

strabismus surgery in patients with horizontal concomitant strabismus.

Methodology

This study was conducted on 45 patients for 2 years duration at Indira Gandhi Government Medical College and Hospital, Nagpur in Maharashtra after obtaining ethical committee approval for patients satisfying the inclusion criteria. A detailed general history was taken, including clinical examinations involving visual acuity assessment, head posture, slit lamp bio micro scopy examination, squint evaluation and refraction under full cycloplegia. All the participants were asked AS-20 questionnaire pre-operatively and 1 month post-surgery follow up. Strabismus surgery was performed by a single surgeon by either resection or recession or both under peribulbar or general anaesthesia. These patients were then followed up after 1 week, 4 weeks, 3 month and 6 month post-surgery and a complete orthoptic assessment was performed. Final measurement of deviation was documented by same method and also the post-operative alignment of the visual axis was done.

Inclusion criteria

- Patients of age more than or equal to 5 years.
- Patients with concomitant esotropia who require surgery.
- Patients with concomitant exotropia who require surgery.
- Patients with intermittent horizontal strabismus.

Exclusion criteria

- Patients less than 5 years of age.
- Patients with paralytic strabismus.
- Cases with restricted eye movements.
- Any other coexisting ocular disease apart from refractive error and amblyopia.
- Cases with oblique muscle involvement.

Concomitant horizontal strabismus with associated syndromes.

Results

The mean age of the subjects were 20.3 years, 60% of them were females. Students were the most commonly effected group (66.6%). 10% of the subjects received orthoptic treatment. 33.3% of the subjects had NICU admission. 6.7% had a history of preterm birth and 90% of them had no significant birth history. The mean IPD was 55.9+ 4.3mm. 60% of the study subjects had exotropia and 40% had esotropia. 83.3% cases had normal worth 4 dot test, 10% had LE suppression and 33% had RE suppression. Outward/ inward duration of eyes was the most common clinical presentation (93.3%).

Qualitative assessment for stereopsis examination was done by Synoptophore. 83.3% had perceived stereopsis. 16.6% did not perceive stereopsis and 5% had severe amblyopia with very low vision. All the re-surgical cases were successful. There were no intra-operative complications noticed.

73.3% cases had no post operative complications and 6 patients had under correction while 2 cases had tenon's prolapse. The most common deviation was between 30-50 PD, with 23.3% having pre-operative deviation between 31-40 PD and 26.6% having pre-operative deviation between 41-50 PD. 20% had angle of deviation between 20-30 PD. 16.7% had deviation more than 60 PD. The mean pre-operative angle of deviation was 47.03 PD.

The mean pre-operative angle of deviation was 47.03 PD and the mean post-operative angle of deviation (6th month) was 8.1PD. There was statistically significant difference between the two means

Table 1: Association between pre-operative and post-operative angle of deviation

Deviation	Mean	SD	P value	't' test
PBCT-Preoperative	47.03	14.70	0.000	
PBCT-Post-operative	8.13	9.57		
Synoptophore-Preoperative	46.06	13.8	<0.000	2.04
Synoptophore-Postoperative	7.3	8.7		

Table 2: Preoperative AS-20 Questionnaire scale in patients with successful surgical outcome (n=21) and with residual deviation (n=4)

Scale	Pre-operative		Post-operative		P value
	Mean	SD	Mean	SD	
Successful surgical outcome					
Psychosocial subscale	43.2	19.9	90.5	10.6	<0.001*
Functional subscale	69.5	14.6	90.7	8.6	<0.001*
Overall score	55.05	13.7	90.6	9.2	<0.001*
Residual deviation					
Psychosocial subscale	25.6	9.8	70	17.4	0.004
Functional subscale	36.8	17.7	73.1	13.4	0.01
Overall score	31.3	3.9	71.5	14.7	0.001

Table 3: Comparison of postoperative deviation during follow up(n=30)

Deviation	Central	Not central	Mean	SD
1 week	13	17	14.3	8.4
4 weeks	18	12	16.9	8.8
3 months	18	12	16.9	8.8
6 months	18	12	16.9	8.8

Table 4: Pre-operative and post operative visual acuity in patients with amblyopia (n=5)

Pre-operative	Right eye- V/A		Left eye- V/A		Stereoscopic evaluation (Synoptophore)
	UCV A	BCV A	UCV A	BCV A	
	6/9	6/6	FCCF	NI	Absent
	6/9	6/6	1/60	NI	Absent
	HMC F	NI	6/6		Absent
	6/9	6/6	2/60	NI	Absent
	HMC F	NI	6/6		Absent

Table 5:

Post-operative	Right eye- V/A		Left eye-V/A		Stereoscopic evaluation (Synoptophore)
	UCVA	BCVA	UCV A	BCV A	
	6/9	6/6	3/60	NI	Absent
	6/9	6/6	4/60	NI	Absent
	HMCF	NI	6/6		Absent
	6/9	6/6	2/60	NI	Absent
	1/60	NI	6/6		Absent

Discussion

The mean age in our study was 20.03 ± 8.9 years. Lau FH et al¹⁹ showed that mean age at surgery was 31.2 years. 60% of the study population were females. Sameen A et al²⁰ found the similar prevalence with females accounting for majority of the population (22/39). The most common clinical presentation was outward/ inward deviation of eyes (93.3%), which indicates that patients are more aware about mal-alignment of eyes, leading to facing difficulties about the same. There is less awareness about the management of strabismus since only 10% of the study subjects had taken orthoptic treatment. Majority of the study subjects did not present with any significant antenatal and birth history. 60% of the subjects had exotropia and 40% had esotropia. Jackson et al²¹ also found that 67.4% of subjects had exotropia Tatiana Millan et al also encountered 48 patients with exotropia and 44 patients with esotropia. Majority of the cases had normal worth 4 dot test (86.7%) while 10% had LE suppression and 3.3% had RE suppression on worth 4 dot test. There were 24 successful cases while 6 cases had residual deviation post-surgery. Tatiana Millan et al²² also found that in esotropia group 59% had successful surgical outcome and 40% had residual deviation, where as in exotropia group, 75% had successful surgical outcome and 19% had residual deviation. Out of 12 exotropia patients, 8 (73%) had successful surgical outcome and 4(26%) had residual deviation. The mean pre-operative angle of deviation was 47.03PD and the mean post operative angle of deviation (6th month) follow up was 8.1PD. Sucheda K et al²³ also found the similar results with the mean pre-operative angle of deviation to be 44.9PD and post operatively it reduced to 6PD. In patients with successful surgical outcome for psychosocial subscale

mean pre-operative value was 39.3, while post operative value was 90.3. For functional subscale, pre-operatively mean was 60.1 while post operative mean was 89.7. In patients with residual deviation for psychosocial subscale, pre-operative value was 25.6, while mean post-operative value (6th month) follow up was 70. For functional subscale, the mean preoperative score was 36.8 while mean post operative score was 73.1. Parikshit et al²⁴ also found the similar results where out of 521 patients, 92.8% expressed satisfactions after surgery at 1 week follow up and 93.9% at 6th week follow up in patients with successful outcome. All the resurgical cases were successful. 73.3% of the subjects had no complications. 20% had under correction and 6.7% had tenous prolapse. Similar to our study, Tatiana et al²²¹ found no complications in any of the study subjects. In our study 5 subjects with severe amblyopia did not perceive stereopsis pre-operatively and stereopsis did not change significantly after horizontal strabismus surgery in amblyopic patients. In our study, although the amblyopia did not got corrected but patients were satisfied by surgical procedures. Eshagi et al²⁵ also found that longer duration of strabismus prior surgery was associated with poorer final stereopsis.

Conclusion

In 80% of patients, surgical correction led to the restoration of the visual axis, and in 10% of patients, bilateral surgery led to even more repair of the visual axis. For the vast majority of patients, strabismus surgery significantly improves psycho logical adjustment and patient evaluations of their own appearance. At a time when healthcare professionals are in favour of rationing or "demand management," it is advantageous to demonstrate that strabismus surgery provides significant benefits to psychological and

physical performance. Adult strabismus patients commonly delay surgical correction. Poorer stereopsis is caused by long-term strabismus.

References

1. Coats DK, Stager DR, Beauchamp GR. Reasons for delay of surgical intervention in adult Strabismus. *Arch Ophthalmol* 2005; 123:497-9.
2. Goldstein H, Henderson M, Goldberg ID, et al. Perinatal factors associated with strabismus in Negro children. *Am J Public Health Nations Health* 1967; 57:217-228.
3. Rutstein RP, Cogen MS, Cotter SA, et al. Care of the Patient with Strabismus: Esotropia and Exotropia. In: Rutstein RP (ed). *Optometric Clinical Practice Guideline*. U.S.A.: American Optometric Association; 2011, pp.21-22.
4. Raab EL, Aaby AA, Bloom JN, et al. Pediatric ophthalmology and strabismus. In: Veen B (ed). *Basic and clinical science course*. 6. San Francisco: American Academy of Ophthalmology; 2011-2012, pp.1-485
5. Olitsky SE, Sudesh S, Graziano A, et al. The negative psychosocial impact of strabismus in adults. *JAAPOS* 1999; 3:209-11.
6. Paysee EA, Steele EA, Brady McCreery KM, et al. Age of the emergence of negative attitudes toward strabismus. *JAAPOS* 2001; 5:361-6.
7. Satterfield D, Keltner JL, Morrison TL. Psychosocial aspects of strabismus study. *Arch Ophthalmol* 1993; 111:1100-5.
8. Burke JP, Leach CM, Davis H. Psychosocial implications of strabismus surgery in adults. *J Pediatr Ophthalmol Strabismus* 1997; 34:159-64
9. Geta K and Bejiga A. Knowledge, attitude and practice towards strabismus in Cheha District, Central Ethiopia. *Ethiop J Health Dev* 2011; 25: 212-215.
10. Taylor RH. *Guidelines for the Management of Strabismus in Childhood*. London: The Royal College of Ophthalmologists; 2012, pp.1-40.
11. Robaei D, Kifley A and Mitchell P. Factors associated with a previous diagnosis of strabismus in a population-based sample of 12-year-old Australian children. *Am J Ophthalmol* 2006; 142: 1085-1087.
12. Azonobi I, Adido J, Olatunji F, et al. Risk factors of strabismus in southwestern Nigeria. *Pak J Ophthalmol* 2009; 25: 129-135.
13. Pathai S, Cumberland PM and Rahi JS. Prevalence of and early-life influences on childhood strabismus: findings from the Millennium Cohort Study. *Arch Pediatr Adolesc Med* 2010; 164: 250-257.
14. Oystreck DT and Lyons CJ. Comitant strabismus: perspectives, present and future. *Saudi J Ophthalmol* 2012; 26: 265-270.
15. Beauchamp GR, Black BC, Coats DK, et al. The management of strabismus in adults-111. The effects of disability. *JAAPOS* 2005;9: 455-9.
16. Weitz R. *The Sociology of Health, Illness and Healthcare: A Critical Approach*. 3rd ed. Belmont (CA): Wadsworth Publishing Co.; 2003. p. 175.
17. Lipton EL. Remarks on the psychological aspect of strabismus. *Sight-Saving Rev* 1971; 33:129-38.
18. Menon V, Saha J, Tandon R, et al. Study of the psychological aspects of strabismus. *J Pediatr Ophthalmol Strabismus* 2002; 39: 203-8.
19. Lau FH, Fan DS, Yip WW, Yu CB, Lam DS. Surgical outcome of single-staged three horizontal muscles squint surgery for extra-large angle exotropia. *Eye (Lond)*. 2010 Jul;24(7):1171-6.
20. Junejo SA, Ansari MA. Outcome of monocular surgery for horizontal strabismus in Hyderabad. *Clin Ophthalmol*. 2010 Apr 26; 4:269-73

21. Jackson S, Harrad RA, Morris M, Rumsey N. The psychosocial benefits of corrective surgery for adults with strabismus. *Br J Ophthalmol*. 2006 Jul;90(7):883-8.
22. Tatiana Millan, Keila Monteiro de Carvalho, Nilza Minguini: Results of monocular surgery under peri bulbar anesthesia for large angle horizontal strabismus. *Clinics* 2009; 64 (4):303-308.
23. Suchada Kampantart sanya koran Thaman on Surachat kumtonekul, Dhaivadee Dulayajinda, Ming kwan, Sasima Tongsae: The outcome of horizontal strabismus surgery and influencing factor of the surgical success
24. Gogate PM, Rishikeshi N, Taras S, Aghor M, Deshpande MD. Clinical audit of horizontal strabismus surgery in children in Maharashtra, India. *Strabismus*. 2010Mar;18(1):13-7.
25. Eshaghi M, Arabi A, Banaie S, Shahraki T, Eshaghi S, Esfandiari H. Predictive factors of stereopsis outcomes following strabismus surgery. *Ther Adv Ophthalmol*. 2021 Mar 24; 13:25158414211003001.