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TO STUDY THE SURGICAL OUTCOMES OF VARIOUS STRABISMUS SURGICAL TECHNIQUES IN A TERTIARY CARE CENTRE IN WESTERN MAHARASHTRA.

Ophthalmology

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ABSTRACT

Introduction: This study was conducted to assess surgical outcomes of various strabismus surgical techniques in a tertiary care center in western Maharashtra.

Results: Mean age of the study subjects were 18.71 yrs. Among the 64 cases 36 (56.3%) were male and 28 (43.8%) were female. 37 (57.26%) cases had bilateral disease. Most common type of strabismus in the study participants was exotropia(64.1%), followed by esotropia (32.8%) and then Paralytic (3.1%). Pre-op deviation was most common (26.6%) in the range of 31-40PD followed by 20-30D. Mean pre-operative deviation was 45.32 and mean post-operative deviation was 5.75. The difference was statistically significant indicating that there was significant improvement in the deviation after the surgery. 76.6% of the cases under went recess and resect procedure. About one third (69%) of the cases achieved orthophoria at 6 weeks follow up. Second surgery was advised in 7.81% cases. There was an improvement of 81% in the vision after the strabismus surgery ($p<0.001$).

Discussion: In our study unlike the other studies we had taken up patients for surgical intervention from a varied range of age group and fortunately found that the outcomes were good even if the surgery was done after the age of 10 years. Conclusion: Surgical success rate of strabismus surgery was 92.2% and revealed that not only was there an improvement statistically but also significant improvement in the visual acuity after the surgery. The high rate of successful surgery was related to a preoperative deviation less than 30 PD.

KEYWORDS

strabismus, squint, surgery.

INTRODUCTION

Strabismus refers to ocular misalignment, which may be caused by abnormalities in binocular vision or by abnormalities of neuromuscular control of ocular motility. Strabismus may lead to amblyopia, impaired stereopsis, diplopia, altered cosmesis, and affect social standing. Strabismus in childhood is relatively common and therefore has a significant impact on ophthalmological service.

The recommended time to assess strabismus in children under five years old is between ages 3 and 6 months.[1]

The prevalence of strabismus worldwide is reported to vary from 1.3% to 5.7% of all children[2] although a study from southern India has shown a lower prevalence of 0.7%[3]. The prevalence of strabismus has been reported from 3-4%. Esotropia is the most common strabismus of childhood.

Strabismus may lead to a failure to develop binocular vision, and amblyopia, either of which may prevent an individual pursuing certain occupations. The appearance of ocular misalignment may interfere with social and psychological development with potentially serious effects for all patients with strabismus.

Timely diagnosis and appropriate treatment of children with strabismus can reduce the prevalence of amblyopia and ocular misalignment in later childhood and adult life. Correction of strabismus has been reported to improve motor coordination.

Interventions for the treatment of strabismus include optical manipulation with corrective glasses and occasionally prisms. Surgery on extra ocular muscles may be employed to realign the eyes. Rarely botulinum toxin injections to specific extra ocular muscles are used to correct the deviation. Penalisation of the non-amblyopic eye with occlusion therapy or cycloplegic medication may be used in children with strabismus who also have amblyopia. The aim of management is to optimise the best corrected visual acuity (BCVA) of both eyes, maintain normal binocular fusion and improve appearance. Clinical benefits of realignment include: improved cosmesis, potential re-establishment of binocular fusion, elimination of diplopia, expansion of visual field, improvement of head posture, and psychosocial well - being.

Surgical correction can produce satisfactory outcomes in the early postoperative stages; however, in order to produce consistent orthophoria, more than one operation is often required.

The success rate of BLR varies from 41% to 83%[4], whereas that of RR varies from 32.3% to 85.1%.[5]

The aim of strabismus surgery is primarily to correct ocular misalignment and to keep both eyes aligned in nine positions of gaze with free ocular movements. However, in some patients that goal may not be achieved by surgical intervention and strabismus surgery itself may be the reason for ocular misalignment and restrictive ocular motility problems.

The purpose of the present study is to evaluate the baseline characteristics, surgical management and clinical outcomes of patients requiring strabismus surgery at tertiary care hospital.

The aim of the study was to observe the surgical outcomes of various strabismus surgical techniques in a tertiary care center in western Maharashtra.

The objectives of the study were:

1. To explore the surgical outcomes of various strabismus surgery.
2. To analyze the residual deviation after surgery.
3. To understand causes of poor outcomes, if any.

The type of study was prospective descriptive study. The study area was a tertiary eye care centre in Pimpri, Pune. The study period was August-2016 to September-2018. The study population were strabismus patients attending outpatient department (OPD) for investigation and treatment.

The inclusion and exclusion criteria were adhered to. All patients presenting with strabismus were examined and at an average the number of patients taken up for strabismus surgery was 104. Data collection was done for sixteen months, and the final number of patients in our study was 64 . Sample technique was consecutive samples

The inclusion criteria consisted of-

1. Patients with horizontal strabismus.

2. Patients with vertical strabismus.
3. Patients with horizontal strabismus along with vertical component.

The exclusion criteria consisted of-

1. Patients with neurological diseases such as brain tumors and stroke.
2. Patients with systemic disease and thyroid disease.
3. Patients with strabismus as a result of trauma.
4. Patients with accommodative strabismus
5. Patients with nystagmus.
6. Patients with history of any strabismus surgical procedure and residual deviation.

Ethics committee clearance was obtained before starting the study.

Written and informed consent was taken from all patients before enrolling them in the study. The purpose of the study, the advantages and the risks involved were explained to the patients and their relatives in a language that would be understood by them .

After a detailed strabismus work-up, the patients included in the study were diagnosed to have either horizontal or vertical strabismus or horizontal strabismus with a vertical component. Patients were explained about the study after which a written and informed consent was taken about their participation in the study.

The following protocol was followed for each patient.

A detailed strabismus work up of all patients was performed in our outpatient department by qualified ophthalmologist.

Data was entered in an excel sheet and analysed a using software Epi-info, quantitative variables was expressed in terms of means, standard deviations (Sds), and qualitative in terms of proportion and percentage (%).

RESULTS

This study was conducted among 64 cases to assess surgical outcomes of various strabismus surgical techniques in a tertiary care center in western Maharashtra.

Mean age of study subjects was 18.71$\pm$12.88yrs & range of 0.5-70 years and most of them were in age group of 11-20yrs.

Among the 64 cases 36 were male and 28 were female. Male to female ratio was 1.28:1.

37 cases has bilateral disease. 10 cases has only right wye affected and in 17 cases has left eye affected.

Most common (64.1%) strabismus in study participants was exotropia, followed by Estropia (32.8%) and Paralytic (3.1%).

49 cases had combined recession-resection surgery, 6 cases had combined recession-transposition surgery, 4 cases had only recession, 2 cases had combined recession-resection-transposition surgery, 2 cases had Knapp procedure, and 1 case had combined resection-transposition surgery.

Pre-op deviation was most common in range of 31-40PD followed by 20-30D.

Mean pre-operative deviation was 45.32 and mean post-operative deviation was 5.75. The difference is statistically significant indicating that there is significant improvement in deviation after surgery.
Post-operative deviation is shown in Table 1.

The mean values of deviation were : Pre-operative – 45.32, immediate post-operative – 5.77, one week post-operative – 4.77, 6 week post operative – 4.03. The p value calculated by ANOVA test was found to be 0.0001.

Only 10.9% cases had restrictive strabismus and remaining 57 had normal.

Among the cases, 61% were operated in right eye, 37% were in left eye and 2% were operated in both eye.

Among bilateral strabismus cases 73% had right eye surgery.

Mean value of deviation before, post op and 6week follow up among cases. There was significant decrease in mean deviation at 6week follow up ($p<0.05$ at 95% CI) Second surgery was advised in 7.81% cases.

There was 81% improvement in vision after squint surgery among cases which was statistically highly significant with $p<0.001$.

DISCUSSION [Table 2]

As with other binocular vision disorders, the primary therapeutic goal for those with strabismus is comfortable, single, clear, normal binocular vision at all distances and directions of gaze.

The most predominant type of strabismus in our study was esotropia with 80% of the cases. Similar results were reported in a study by Minnesota on 627 children, and also by Rasht on 291 strabismus children that said esotropia (76%) was more common than exotropia (24%)[6,7]. On the contrary, Najafi[8] in Tehran, in his study found out that exotropia(61.5%) a was more prevalent than esotropia(33.6%).

In present study 76.6% patient were underwent recess + resect surgery and most commonly recessed muscle was medial rectus while lateral rectus being the most commonly resected one.

With early detection, the prognosis of strabismus is excellent. Thus, it is extremely important to know when to refer a child to an ophthalmologist. With timely diagnosis and administration of proper treatment before the ages of 6 years the outcome for children diagnosed with strabismus have been positive. Unfortunately, however, once a child reaches the age of 8 to 10 years, treatment of strabismus is not that successful in restoring stereopsis though cosmesis may be achieved. In present study maximum cases underwent surgery after the age of 10yrs and it was found that there were no unsuccessful events after 6 weeks of follow up. Cases showed improved vision and orthoporia at 6 weeks of follow up.

In cases of congenital strabismus or those that develop in infancy, it may lead to amblyopia, in which the input from the deviated eye is ignored by the brain. Despite a therapy for amblyopia, poor stereo-acuity may occur. The occurrence of strabismus is most of the times a cosmetic problem as well. A study showed that about 85% of adult patients with strabismus "reported that they had problems with work, school, and sports because of their strabismus". The same study showed about 70% said that strabismus "had a negative effect on their self-image". After surgical correction, strabismus can recur, so a second surgical intervention may sometimes be required to make the eyes orthophoric.

Sometimes, in cases with larger deviations of more than 60 PDs, it becomes difficult to align the eyes visually by operating upon one eye only. It is at this stage, a second surgery is required upon the fixing eye or a binocular strabismus surgery is needed which concerns more than two horizontal rectus muscles.

Yang et al[9] reported that BLR showed a better success rate than RR (60.75% vs 43.40%) after an average of 3 years follow-up in their study comprising of 50 cases; however, Wang et al[10] stated that RR was more effective than BLR (85.1% vs 65.8% success rate).Now in our study the most common procedure carried out was RR and success rate was quite high with only 8% of the cases requiring a second surgical intervention. There also was a significant improvement by 81% in the binocular vision post-surgery which is of a high statistical significance. Scott and colleagues defined the accuracy of a squint surgery as a residual deviation of 10 PDs or less. Based upon this concept outcome of surgery was categorized as : good moderate and poor correction at 6weeks follow up period.

Many scientific studies have reported success rates of strabismus surgery ranging from 30% to 80%[11,12]. In the present study the surgical success rate (<10 PD deviation at 6 weeks follow up period) was 92.2%. The present study however did not include the surgeon factor in the analyses process. However, the study from Eastern Virginia medical school showed no statistical significance between residents and attending physicians in strabismus surgical success rate (58% and 69% respectively).[11]

Preoperative deviations less than 30 prism diopters were the predictors of a good result in the present study. Trigler L. and Siatkowski RM[20] found that deviations that were less than 30 prism diopters were more associated with very few horizontal re-surgeries in cases of infantile esotropia.

Why did the younger age and presenting angle deviations influence the surgical success rate?

Amblyopia may lead to the affection of the ocular alignment post-surgery. Amblyopia had to be treated in the younger age group, the before surgery, but in case of the older age group, there were patients with amblyopia who underwent surgical intervention for cosmetic reasons.

The Krimsky' s method for the evaluation of angle deviation is much less accurate than that of the alternate prism cover test as it is difficult to appreciate differences of 5 prism diopters, as reported by Choi RY and Kushner BJ. From this we can conclude that, the accuracy in measuring the deviation of the eye in cases with amblyopia and patients with impaired visual may be affected.

Large angle deviations measurements may be less accurate than the small angle deviations.

In cases where there were large angle deviation, the authors went in for a greater millimeters of handling extraocular muscles in their surgery, which may have lead to the violation of the muscle pulleys, orbital fat in resection and cause errors in curved and linear measurements along the sclera in recession technique.

The present study showed improvement of binocular function by an increment in the number of cases showing improved vision at 6 weeks follow up.

In cases following huge recessions restricted ocular movements are an occasional clinical problem. Most of the authors strongly recommend not to exceed a 7 mm recession on the medial rectus and not exceeding an 8 mm recession on lateral rectus muscle in order to avoid restricted ocular movements.

In this study 15(13.4%) subjects underwent >7mm recession on medial rectus muscle(range 5-11mm) and 5 cases underwent >8mm recession on lateral rectus muscle (range 5-9mm) but none of them had suffered a post-operative limitation in their ocular movements.

The limitations of this study are small sample size with mixed cases of exotropia, esotropia and paralytic strabismus with multiple surgical approaches.

No focus was given to a particular surgical approach so the need for further study for validation and generalization of study findings remains.
Relatively short duration of follow-up.

CONCLUSION

Surgical success rate of strabismus surgery was 92.2% and revealed that not only was there an improvement statistically but also significant improvement in the visual acuity after the surgery. The high rate of successful surgery was related to a preoperative deviation less than 30 PD.

Post-operative follow up at 6 weeks revealed that there were significant reduction in deviation and it highly significant on the statistics part as well.

Most of the cases involving recesses and resects of the medial and lateral rectus had no complication and there were no restrictions of the extra ocular motility.

Also in our study unlike the other studies we had taken up patients for surgical intervention from a varied range of age group and fortunately found that the outcomes were good even if the surgery was done after the age of 10 years.

Table 1: Deviation during post op, 1week and 6week follow up

Deviation (In PD)	Post op deviation	1week follow up deviation	6week follow up deviation
Orthophoric (No deviation)	39(60.9%)	41(64.1%)	44(68.8%)
Good(0-10)	16(25%)	16(25%)	15(23.4%)
Moderate(11-20)	4(6.3%)	2(3.1%)	1(1.6%)
Poor(>20)	5(7.8%)	5(7.8%)	4(6.3%)

Table 2: Comparitive analysis of different studies on strabismus surgery

Author	Country	Number of eyes	Follow-up	Journal	Year	Outcome
Kampanartsanyakorn S et al	Thailand	304	3-12 months	J Med Assoc Thai	2005	62.0% for esotropia and 57.0% for exotropia
Peters ER and Archer SM	USA	8	-	Am Orthopt J	2007	87.5%
Lau FH	England	24	15.8 months	Eye (Lond)	2010	88.2%
Gogate P et al	India	529	6 weeks	Strabismus	2010	61.7% Esotropia and 55.7% Exotropia
Ganguly et al	Nepal	48	6 weeks	Nepal J Ophthalmol	2011	83.3%
Mitchell L et al	USA	26	12.7 months	J AAPOS	2012	77%
Reza BM et al	Iran	685	-	Guoji Yanke Zazhi (Int eye Sci)	2013	73%
Yang M et al	China	1228	7.8 months	Medicine (Baltimore)	2016	80.5%
Yang M et al	China	25	-	PLoS ONE	2016	77.5%
Ntizahuvye S et al	Uganda	34	-	Journal of Ophthalmology of Eastern Central and Southern Africa	2017	73.53%
Present study	India	64	6 weeks		2018	92.2%



Figure 1. Pre-operative picture showing Left Eye 55-60 PD XT for distance and near.

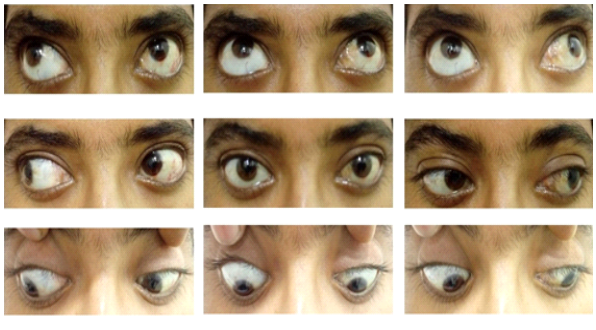

Figure 2 Post-operative picture after Left Eye LR Recess of 8.5mm + MR Resect of 6 mm was done.

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