



IMPROVEMENT IN STEREOPSIS FOLLOWING SURGICAL CORRECTION OF INTERMITTENT EXOTROPIA

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ABSTRACT

BACKGROUND: Exodeviation or divergent squint occurs as a result of certain obstacles to development or maintenance of binocular vision. Intermittent exotropia is an exodeviation intermittently controlled by fusional mechanisms. Unlike a pure phoria, intermittent exotropia spontaneously breaks down into a manifest exotropia. The aim of the study is to evaluate stereopsis improvement in intermittent exotropia after surgical correction.

METHODS: The prospective study was conducted in 30 IXT patients reporting to Paediatric Ophthalmology department. Preoperative angle of deviation was measured for all patients with intermittent exotropia. Binocular function was measured using Worth four dot test for distance and near. Stereopsis was measured using Randot Stereotest for distance, and Titmus fly test for near. They underwent unilateral recession/resection or bilateral recession and were followed up at first and sixth month postoperatively.

RESULTS: In present study distance stereopsis was present in 30% pre-operatively. At post-op 1 month distance stereopsis is present in 46.6% and at post-op 6 months it is present in 56.6% which shows improvement in distance stereopsis at 1 month and 6 months post-operatively.

Near stereopsis in 43.3% of patients demonstrated 60 arc sec or better of stereopsis at 1 month and 63.3% at 6 months as compared to 23.3% preoperatively.

CONCLUSION: There is a significant improvement in both near and distant stereoacuity postoperatively in X(T); however, the achievement of normal level depends upon the preoperative sensory status of the patient.

The percentage of cases showing improvement in near Stereopsis was greater than the percentage of cases showing improvement in distance Stereopsis after surgical correction of intermittent exotropia.

KEYWORDS :

INTRODUCTION

Intermittent exotropia [X(T)] affects nearly 1% of the general population.¹ It begins as an exophoria which progresses to X(T) and then may deteriorate into a constant exodeviation in up to 75% of cases.² Although progression is common, not all cases are progressive and some may remain stable or may even improve.^{3,4,5} There are various opinions regarding the appropriate timing of surgery in a patient with X(T). Early surgery is fraught with the risk of consecutive esotropia, which in the visually immature child of less than five years of age can lead to amblyopia.⁶ On the other hand undue delay can lead to suppression and loss of binocularity even after surgical correction.⁷

Measurement of distance stereoacuity has previously been used to assess severity of intermittent exotropia and to monitor for deterioration.⁸⁻¹⁰ Deterioration in stereoacuity has been suggested as a possible indicator of need for surgery in patients with intermittent exotropia and distance stereoacuity has been used as an outcome measure following surgical intervention.¹⁰⁻¹²

Using Distance Randot for measuring distance stereoacuity Based on previous data, stereoacuity was more frequently degraded when measured using the Distance Randot, and we therefore suggested that the Distance Randot appeared to be more sensitive to minimal disruption of binocularity.¹⁹

In the present study, we investigated whether distance stereoacuity measured using Distance Randot and Titmus fly test for near stereoacuity improved following surgery for intermittent exotropia. The aim of the study is to evaluate stereopsis improvement in intermittent exotropia after surgical correction.

MATERIALS AND METHODS:

This is a Prospective Observational Study done in 30 IXT patients reporting to Paediatric Ophthalmology department in Tertiary Eye care center in Visakhapatnam from March 2017 to February 2018. The present study was initiated after institutional ethics committee approval and written informed consent from the

patients. The aim of the study is to evaluate stereopsis improvement in intermittent exotropia after surgical correction.

Deterioration of control of deviation, diminution of distance stereoacuity, Patients of three to thirty five years were included in the study. Preoperative angle of deviation was measured for all patients with intermittent exotropia. Binocular function was measured using Worth four dot test for distance and near. Stereopsis was measured using Randot Stereotest for distance, and Titmus fly test for near. They underwent unilateral recession/resection or bilateral recession and were followed up at first and sixth month postoperatively.

Visual acuity was measured without correction, with pin hole, and with spectacle correction. Refraction under full cycloplegia was done. Angle of deviation was measured both for 6mts and for near (33cms) and in case of spectacles both with and without them by Hirschberg test and prism cover test with loose prisms. Binocular function was assessed by Worth four dot test and stereopsis was measured using Randot Stereotest for distance, Titmus fly test (Titmus Optical company, Chicago, Illinois) was done for stereopsis pre and post-operatively. Dilated fundus examination was done to rule out fundus pathology.

Patients were followed up at three months postoperatively. At each visit, angle of deviation, binocular function and stereopsis were assessed. A criterion for successful surgery was orthotropia ± 10 PD. Primary end point was the percentage of patients with successful surgical outcome. Secondary end points were the visual acuity without correction, with pinhole and with spectacle correction, the refraction under full cycloplegia, the angle of deviation both for distance and near and in case of spectacles both with and without them by Hirschberg test and prism cover test with loose prisms, the binocular function by Worth four dot test and stereopsis by Randot stereotest for distance and Titmus fly test for near.

In the Worth 4-dot test, a red glass is worn in front of one eye and a green glass in front of the other. The standard Worth 4-dot flashlight project onto patient. The test was performed separately for distance

and near vision. In fusion response, the patient would report four dots in distance and near. In suppression response, the patient would report two or three dots in distance and near. In monofixation response, the patient would report two or three dots in distance and four dots in near. Binocular vision was improved if the following conditions were encountered: conversion of suppression to fusion or monofixation response in Worth 4-dot test at one or six months after surgery

Statistical Analysis: Data was analyzed by Graph Pad Prism software version 6.0. Data was summarized by percentages for categorical data. The association between the variables was done by chi-square test for categorical data. All p-values less than 0.05 were considered as statistically significant.

SURGICAL PROCEDURE:



The surgeries were performed by using surgical tables from kenneth wright. The selection of the surgical procedure was made randomly by the operating surgeon, 2 underwent lateral rectus recession and 28 underwent unilateral lateral rectus recession and medial rectus resection (RR).

RESULTS:

In the present study total number of participants were 30, out of which 16 were male and 14 were female. 15 study participants were operated for RE and 15 for LE

Table-1: Comparison of BSV(Distance) at Pre-op, Post-op at 1 month and 6 months.

BSV Distance	Pre Op	Post Op 1 Month	Post Op 6 Month	Total	P-value
Alternate Suppression	5	0	0	5	0.042
LE Suppression	5	3	3	11	
Present	14	22	22	58	
RE Suppression	6	5	5	16	
Total	30	30	30	90	

Table-11: the association between Age (in years) and Stereopsis Near

Age (in years)	Absent	800 SEC/ARC	40 SEC/ARC	60 SEC/ARC	140 SEC/ARC	80 SEC/ARC	200 SEC/ARC	2000 SEC/ARC	Total	P Value
3 to 10	0	0	3	0	3	3	2	0	11	0.022
11 to 20	5	2	3	1	1	0	0	0	12	
21 to 35	5	0	0	0	1	0	0	1	7	
Total	10	2	6	1	5	3	2	1	30	

DISCUSSION

The X(T) almost always affects distance stereoacuity more than near stereoacuity as the manifestation of deviation is more and earlier for distance. Distance stereoacuity in patients with X(T) was found to be deteriorated and surgical realignment led to improvement in distance stereoacuity.¹³ At six months postoperatively distance stereoacuity of patients improved in present study. Diminished near stereoacuity is thus an indicator of more advanced effect of prolonged X(T) on binocular vision. Hence a more aggressive approach in managing these patients is needed and may yield better functional outcome.

In present study, even near stereoacuity was found to be significantly poor in X(T) patients preoperatively. Surgical realignment led to significant improvement in near stereoacuity. Also, this suggests that near stereoacuity measurement definitely has got a role in monitoring the progression of patients with X(T), at

Table-2: Comparison of BSV(Near) at Pre-op, Post-op at 1 month and 6 months.

BSV Near	Pre Op	Post Op 1 Month	Post Op 6 Month	Total	P-value
LE Suppression	5	0	0	5	0.0002
Present	20	30	30	80	
RE Suppression	5	0	0	5	
Total	30	30	30	90	

Table-3: Comparison of stereopsis(Near) at Pre-op, Post-op at 1 month and 6 months.

Stereopsis Near	Pre Op	Post Op 1 Month	Post Op 6 Month	Total	P-value
Absent	10	1	0	11	<0.0001
2000 SEC/ARC	1	1	1	3	
800 SEC/ARC	2	7	1	10	
400 SEC/ARC	0	2	1	3	
200 SEC/ARC	2	0	7	9	
140 SEC/ARC	5	2	1	8	
80 SEC/ARC	3	4	0	7	
60 SEC/ARC	1	1	1	3	
40 SEC/ARC	6	12	18	36	
Total	30	30	30	90	

Table-4: Comparison of stereopsis (Distance) at Pre-op, Post-op at 1 month and 6 months

Stereopsis Distance	Pre Op	Post Op 1 Month	Post Op 6 Month	Total	P-value
Absent	21	16	13	50	0.056
400 A	3	1	1	5	
400 B	1	3	3	7	
200 A	1	3	0	4	
200 B	4	2	3	9	
100 A	0	2	1	3	
100 B	0	3	3	6	
60 A	0	0	2	2	
60 B	0	0	4	4	
Total	30	30	30	90	

Table-5: the association between Age (in years) and Stereopsis Distance

Age (in years)	Absent	200 B	400 B	400 A	200 A	Total	P-value
3 to 10	3	4	1	2	1	11	0.037
11 to 20	11	0	0	1	0	12	
21 to 35	7	0	0	0	0	7	
Total	21	4	1	3	1	30	

least in the absence of instrument for distance stereoacuity measurement.

Binocular vision was improved in 20 of 34 patients (58.8%) in a study done by Dima Andalib¹⁴ et al. In present study BSV was present in 14 (46.6%) patients preoperatively. At 6 months post-operatively it was improved in 22 (73.3%) patients.

In a study done by Xueliang Feng¹⁵ et al, among 53 patients, the percentage of distance stereoscopic improvement was 49% after 2 weeks and 77% after 6 weeks compared to 13% preoperatively. In a study done by Pradeep Sharma¹⁶ et al, Preoperatively only three out of 31 cases (9%) demonstrated fine distance stereoacuity of 200 sec of arc. Postoperatively 12 cases (39%) with X(T) were able to demonstrate this level of distance stereoacuity. Of 31 patients distance stereoacuity improved in 27 (87.1%), Preoperatively 25 X(T)

patients (80.7%) had near stereoacuity poorer than 40 sec of arc and at six months, only 13 (42) patients had near stereoacuity poorer than 40 sec of arc.

In present study distance stereopsis was present in 30% preoperatively. At post-op 1 month distance stereopsis is present in 46.6% and at post-op 6 months it is present in 56.6% which shows improvement in distance stereopsis at 1 month and 6 months postoperatively.

Near stereopsis in 43.3% of patients demonstrated 60 arc sec or better of stereopsis at 1 month and 63.3% at 6 months as compared to 23.3% preoperatively.

In a study done by Reshu Malhotra¹⁷ 70% of patients demonstrated 60 arc sec or better of stereopsis at 1 week & 1 month and 72.22% at 3 months as compared to 60% preoperatively.

Wu et al reported 74% patients with X(T) as having better or equal to 60 seconds of arc after one year of follow-up.^[18]

Noha et al reported the long term sensory outcomes in 90% X(T) patients. 45% patients had 60 seconds or better arc stereopsis after 10 years.^[19]

Study	Post-op stereopsis	P value
Pradeep Sharma et al ¹⁶	Postoperatively at six months, significant improvement in stereoacuity was observed both at near and distance	(P < 0.05)
Wendy E Adams et al ²⁰	Improvement in distance stereoacuity post operatively Near stereoacuity measured with Frisby and Preschool Randot remained unchanged pre- and post- operatively (median 60 arcsec and 80 arcsec respectively).	(P=0.004)
Feng X ¹⁵	Six weeks postoperatively, randot stereograms –improvement in distance stereopsis. No statistically significant differences in near stereopsis postoperatively	(P < .05) (P > .05)
present study	Improvement in distance stereopsis Improvement in near stereopsis	(P=0.037) (P=0.022)

CONCLUSIONS

There is a significant improvement in both near and distant stereoacuity postoperatively in X (T); however, the achievement of normal level depends upon the preoperative sensory status of the patient. The percentage of cases showing improvement in near Stereopsis was greater than the percentage of cases showing improvement in distance Stereopsis after surgical correction of intermittent exotropia. Patients with intermittent exotropia have good near stereoacuity preoperatively and postoperatively. Even if surgery is postponed until adolescence, distance stereopsis can still be recovered. Surgical intervention can restore central fusion and stereoacuity in patients with intermittent exotropia

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