

Evaluation of the Therapeutic Effect of Patching in Intermittent Exotropia

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Abstract

Purpose: To assess the therapeutic significance of patching, in patients of intermittent exotropia in relation to control of deviation, absolute measurements and stereopsis.

Material and Methods: This prospective study was carried out in the Strabismus and Paediatric ophthalmology clinic of a tertiary care hospital. Seventeen patients underwent patching of the dominant eye or alternate occlusion in case of no ocular preference, for a duration of 6 hours / day. Objective Prism cover test measurements, stereopsis evaluation and three point control of deviation scoring were done before and after the 6 months duration. Paired samples t test and Stuart-Maxwell marginal homogeneity test were employed for analysis.

Results: The mean near and distance deviation was 20.35 +/- 4.663 S.D and 21.18 +/- 6.885 S.D improving to 13.82 +/- 5.065 S.D and 19.49 +/- 5.478 S.D respectively ($p < 0.001$). Angle of strabismus showed a positive trend and decline for near as well as distance measurements with conversion of exotropia subtypes into pseudo divergence excess. Improvement in stereopsis was noted with fine stereopsis of 60 sec seen in 14 patients (82.35%) post patching as against 9 patients (52.94%) before starting the treatment ($p = 0.03$). Control grading showed a significant improvement with 11 patients (64.70%) attaining a score of 1, whereas before the start of patching the majority i.e 10 patients (58.82%) had a control score of 3. ($p = 0.004$)

Conclusion: Patching induces improvement in degree of control, stereopsis and reduction in angle of deviation.

Exotropia is the misaligned state of the visual axes wherein the eyes have a tendency to drift outwards. Intermittent exotropia, the most common exodeviation affects 1% of the population less than 11 years of age¹. Intermittent exodeviation usually begins in the first year of life. Amblyopia is rare, as the patient maintains binocular fusion during straight periods and facultative suppression while deviated^{2,3}. Quite unlike esotropia, stereopsis is preserved until late⁴. Since intermittent exotropia has been propounded as a progressive condition in literature, it is imperative that treatment be prompt and decisive to prevent conversion to constant deviation⁵. Unfortunately, no clear consensus occurs here. The assessment of control, which has been defined as the amount of time spent in the deviated state and the promptness of fusion after dissociation guides the clinician in this decision⁴. Control can be assessed in the office setting or by a combination of parental enquiry related to dissociation frequency and objective office evaluation^{6,7}. Observation is often recommended as a mainstay of treatment, for deviations less than 20 prism dioptres (Pd) with frequent assessments of control and deviation.

As surgical overcorrection with a consecutive esotropia can result in rapid onset of amblyopia and loss of stereoacuity, the preferred practice pattern is to postpone any surgical intervention beyond 4 years of age. Arguably the patient cooperation and reliability of clinical measurements also improves with this approach. Often, however it is observed that parent anxiety and concerns multiply in this period of wait and watch. Observation of the deviation for >50% of waking hours and poor control on cover testing are generally considered to be the indications for surgical intervention⁸.

The purpose of our study was to evaluate the efficacy of patching of the dominant eye or alternate eye occlusion, in case of equal dominance, in altering the natural course of intermittent exotropia.

Methods

This prospective study was conducted in the Strabismus and Paediatric Ophthalmology Clinic of a Tertiary care Hospital. The study design was approved by the institutional ethics committee and informed consent was sought from the parents. Patients with intermittent exotropia and visual acuity of at least 6/9 (20/25), in age group of 4 to 12 years were included in this study. Patients with amblyopia, concurrent ocular pathology, A and V patterns, constant exodeviation, previous ocular surgery, neurological and medical abnormalities were excluded. Large angle deviation (>30Pd) were also not included in our study. After ethics approval, 20 patients were enrolled and advised patching. The study was completed by 17 patients.

Basic exodeviation was defined as the near -distance disparity of less than 10 prism dioptres. Convergence insufficiency was diagnosed in patients when near deviation exceeded distance by 10 prism dioptres and pseudo divergence excess was defined as a larger exotropia at distance in comparison to near, which increases to within 10 prism dioptres of distance measurement after 30 minutes of monocular occlusion. Both groups were subjected to Prism cover test measurements both for 6 metre distance and 1/3rd metre, stereopsis (distance Randot stereotest) and exotropia control scoring. Control

scoring was done using the intermittent exotropia control scale as described by Mohny et al⁹.

Intermittent Exotropia Control Scale

- 5 = Constant exotropia
- 4 = Exotropia > 50% of the exam before dissociation
- 3 = Exotropia < 50% of the exam before dissociation
- 2 = No exotropia unless dissociated, recovers in > 5 seconds
- 1 = No exotropia unless dissociated, recovers in 1-5 seconds
- 0 = No exotropia unless dissociated, recovers in < 1 second (phoria)

The test protocol was stereopsis evaluation followed by control assessment. We assessed the control of deviation, both for near and distance. Next, the Prism cover test was done and control assessment was performed again. At the conclusion of the examination a third control assessment was done. The mean of the triple control scores (averaged for near as well as distance) was taken for analysis. The patients were advised patching of the dominant eye or alternate occlusion in case of no fixation preference for 6 hours per day for a period of 6 months. Paired samples t test and Stuart-Maxwell marginal homogeneity test were employed for analysis.

Results

The mean age of our study cohort was 8.21+/- S.D 2.123. Out of the seventeen patients 8 were males (47.1%) and 9 were females (52.9%). At the outset, the mean near and distance deviation was 20.35 +/- 4.663 S.D and 21.18+/- 6.885 S.D . After patching there was a statistically significant decrease in the near(p<0.001) as compared to the distance deviations(p=0.008) (table 1). The effect of patching on the type of form conversion of squint from pseudo divergence excess and convergence insufficiency is summarised in table 2 which was statistically significant. Stereopsis and control grading also showed significant improvement as summarized in tables 3 and 4.

Table 1. Impact of patching on angle of deviation

DEVIATION IN PRISM DIOPTRIS (PD)		Mean	Std. Deviation	p-value
NEAR	NEAR_Pre PATCHING	20.35	4.663	<0.001
	NEAR_Post PATCHING	13.82	5.065	
DISTANCE	DISTANCE_Pre-PATCHING	21.18	6.885	0.008
	DISTANCE_Post-PATCHING	19.59	5.478	

Table 2. Intermittent exotropia subtype conversion

	BASIC	PSEUDO DIVERGENCE EXCESS	CONVERGENCE INSUFFICIENCY	Prob>Chi ² (£)
EXOTROPIA SUBTYPE PRE PATCHING	10	4	3	0.0821
EXOTROPIA SUBTYPE POST PATCHING	9	7	1	0.0821

£ Asymptotic test, Stuart Maxwell test

Table 3. Effect of patching on stereopsis

	FINE < 60 SEC	MODERATE >60, < 200 SEC	COARSE > 200 SEC	Prob>Chi ² (β)
STEREOPSIS PRE PATCHING	9	6	2	0.0302
STEREOPSIS POST PATCHING	14	3	0	0.0302

β Asymptotic test, Stuart Maxwell test

Table 4. Effect of patching on control of squint

CONTROL GRADING	CONTROL PRE PATCHING	CONTROL POST PATCHING	Prob > Chi 2
1 ST	0	11	Symmetry(Asymptotic) 0.0045 Marginal Homogeneity (Stuart Maxwell) 0.0015
2 ND	4	4	
3 RD	10	2	
4 TH	3	0	
5 TH	0	0	

Discussion

The management of intermittent exotropia is complex. The severity and duration of fusion disruptive exo deviated state, usually influences the clinician regarding treatment decisions. The natural history of intermittent exotropia is not clearly defined and it is mostly considered to be a progressive disorder. As per Von Noorden, over a follow up duration of 3.5 years, 75% of 51 untreated patients deteriorated while 16 % showed improvement and 9% exhibited no change¹⁰.

Mostly small angles (<20 pd are observed with orthoptic interventions, with the aim of delaying or altogether avoiding a surgical intervention. In our study, we included patients with exodeviations of upto 30 PD, in an attempt to assess the therapeutic benefit of patching in this grey area. Our results show a decrease in total deviation both for near as well as distance after patching for 6 months. These results are in concordance with those of Suh et al, who also reported a statistically significant reduction in angle, more so for near (p <0.001) than for distance (p =0.005)¹¹.

Recent years have seen a lot of research oriented at evaluation of orthoptic interventions in the management of intermittent exotropia. Asadi et al evaluated the effect of a cocktail of orthoptic interventions including prism exercises, pencil push-ups, 3D tests and dominant eye occlusion on intermittent exotropia in 74 patients and reported a success rate of 88.3% of patients in basic type, all patients in Convergence insufficiency type and 88.8% in Divergence excess group¹².

Recent results published by Bang et al also show that objective measurements of near and distance exotropia decrease after patching of the fixating eye or alternate patching in cases of equal fixation preference, for three hours per day for more than 6 months.(p< 0.001))¹³. Berg et al in their study cohort of 29 patients, who had a marked fixation preference of one eye and underwent patching of the dominant eye, also reported significant reduction of exotropia. Exo-deviation was seen to decrease from 21+/-

8 prism diopters to 9+/- 8 prism diopters for distance and from 8 +/- 11 prism diopters to 2 +/-4 dioptries for near in the successful group. This series of patients with a mean follow up of 66 months showed the utility of patching as a stand alone treatment modality¹⁴. Similar conclusions were drawn by many other authors, providing clear evidence of benefit of patching. This exciting prospect of altering the measured deviation, orthoptically, is definitely going to alter the preferred practice pattern in intermittent exotropia. Many patients who were followed up after the conclusion of the study did show deterioration of the control after stopping, however the parents were willing to restart occlusion and were happy to continue. The level of motivation in the parents is probably the most important determining factor in the success of patching in improving the course of intermittent exotropia.

We noted a form conversion in our study cohort, with conversion of basic types into pseudo divergence excess types and convergence insufficiency types into basic type exodeviation. None of our patients reported any diplopia. In consistency with findings of Suh et al, who found that 32% of patients with basic type converted to pseudo divergence excess and notably 69% of convergence insufficiency type patients transformed into basic type¹¹. Their results even showed conversion of two convergence insufficiency patients into divergence excess. Asadi et al combined patching with other orthoptic interventions and found a significant reduction in both near and distance deviations in all three subtypes of intermittent exotropia¹².

Our study group showed significant improvement in stereopsis. Fine stereopsis of 60 sec of arc was seen in 14 of our patients (82.35%) post-patching as against 9 patients (52.94%) before the commencement of the intervention. Alkhamous et al demonstrated a success rate of 94% in stereopsis grade improvement with 17 cases out of eighteen improving to normal stereoacuity after a 50% of waking hours occlusion for 4 months. Their results of control grade improvement were also promising, however they could not demonstrate statistically significant decline

in angle of strabismus. This was probably because they defined success as a reduction in deviation angle by 50%¹⁵. Shin et al showed that patients with good compliance to part time occlusion showed better stereopsis than the ones in the poor compliance group¹⁶.

Chia et al, in their retrospective review of 287 patients of intermittent exotropia found that near control remained the same in 65% and worsened in 22% patients over a 5 year follow up¹⁷. As evident by our results, control of deviation scoring improves greatly with patching, especially for near ($p=0.0015$). The control grade of 1 was not seen pre-patching in any of our patients, however eleven of them (64.70%) attained this grade of control at the end. Freeman and Isenberg found that patching converted all patients to hetero or orthophoria, at least temporarily¹⁸. The results of Bang et al delineate a practical benefit of patching in influencing surgical results since success rate was 77.7% in the group which showed improved control with patching as against 50% in the non responsive group¹³.

Figuera and Hing also concluded that preoperative occlusion improved the surgical correction per millimeter of horizontal muscle recession¹⁹.

The limitations of our study was the short follow up duration and the lack of a comparison or control group. The effect of the age of the subject as well as the angle of strabismus on the therapeutic effect of patching was not statistically analysed. In theory it is difficult to judge the level of compliance, and this might present as a confounding factor, especially while assessing the success or failure of the intervention.

Patching of the dominant eye or alternate occlusion, in case of no fixation preference seems to promote the induction of tenacious proximal fusion in the patients. This is evident by the type conversion seen in our study. Stimulation of tenacious proximal fusion may be postulated to be the reason for the stimulation of better control and overall improvement in the tendency to exodeviate. This is a worthwhile option, with a low risk benefit ratio and we hope that our endeavor to evaluate the therapeutic effect of patching in intermittent exotropia has contributed evidence in favour of patching as a modality of treatment.

Disclosures

The authors declare that there is no conflict of interest.

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