

REFRACTIVE ACCOMMODATIVE ESOTROPIA;

Management and results

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ABSTRACT... Purpose: To determine the efficacy of all time wear of full cycloplegic correction in the management of refractive accommodative esotropia. **Design:** Descriptive study using non-probability purposive sampling technique. **Setting:** Ophthalmology OPD and Department of Nishtar Hospital, Multan. **Period:** Oct 2009 to Sep 2010. **Material and Methods:** All children with accommodative esotropia associated with hyperopia were included in the study. The features studied were ocular alignment, association of anisometropia with strabismus and amblyopia, improvement in deviation of squint after amblyopia therapy and full cycloplegic hyperopic correction and regain of binocular single vision and requirement for surgery in patients with accommodative esotropia with hyperopia. **Results:** Forty four children with refractive accommodative esotropia were identified. Cycloplegic refraction was done for all patients and full cycloplegic correction was given. At presentation 36.4% of children were amblyopic in either eye and most of them had anisometropic hypermetropia. The esotropia was present in more hypermetropic eye. 63.6% of the patients became straight with glasses only and another 25% became straight after amblyopia therapy. Fusion with gross stereopsis was demonstrated in 75% of patients. Cycloplegic refraction remained stable throughout the follow up period. None of these patients was able to discontinue glasses and maintain alignment. Surgery was required in only 11.4% of total patients. **Conclusions:** Most children with refractive accommodative esotropia have an excellent outcome in term of visual acuity, ocular alignment and binocular single vision with the glasses. Full cycloplegic correction and amblyopia therapy resulted in marked reduction in the deviation of squint and improvement in visual acuity of the amblyopic eye as compared with the prevalence at presentation. The degree of hyperopia remains unchanged with poor prospect for discontinuing glasses wear.

Key words: Hyperopia, Esotropia, Amblyopia, Binocular single vision

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INTRODUCTION

Esotropia is defined as the manifest inward deviation of the visual axis. The refractive accommodative esotropia is one of the most common forms of childhood strabismus¹. Two main mechanism contributing to refractive accommodative esotropia are uncorrected hyperopia and insufficient fusional divergence². A third cause may be anisometropia greater than or equal to 1 dioptre especially in patients having lower hyperopia³.

Esotropia results when the obligatory accommodative convergence that accompanies reflexive accommodation is insufficiently opposed by fusional divergence⁴. The decreased ability to fuse slightly dissimilar retinal images combined with excessive accommodation causes esotropia⁵. So the accommodative convergence /accommodation ratio

is normal in these patients and esotropia is just a physiological response to excessive hyperopia usually between +4.00 and +7.00D⁶.

The relation between hyperopia and esotropia is well described. A number of articles have documented increasing hyperopia before the onset of esotropia^{7,8}. It is also seen that the amount of hyperopia remains unchanged or changes very slowly with poor prospect for discontinuing glass wear^{1,9}.

Raab reported that the majority of his patients with accommodative esotropia continued to require glasses to control their esotropia into their adolescent years¹⁰. Repka and coworkers also postulated that accommodative esotropes wearing their full hyperopia correction are less likely to undergo emmetropization¹¹.

The deviation (esotropia) usually presents at about the age of 2.5 years with a range of 6 months to 7 years³. Management consists of careful assessment of visual acuity, measurement of deviation, cycloplegic refraction, fundus examination and binocular status.

Treatment consists of correction of full amount of hyperopia as determined under cycloplegic refraction with atropine or cyclopentolate. With full hyperopic correction in place, no accommodative convergence is stimulated, so no deviation results and only a modest amount of accommodation is needed for near fixation¹². A good number of patients can be managed with the use of proper glasses alone and improvement in visual acuity and binocular single vision can be achieved with early recognition of the disease and timely intervention¹³. All the patients are advised for all time wear of glasses.

Many patients of refractive accommodative esotropia also present with amblyopia or develop amblyopia during follow up. Amblyopia is a developmental defect of spatial visual processing that occurs in the central visual pathways of the eye¹⁴. It is the main cause of visual defects in children. It is estimated that amblyopia affect between 1-4% of the world's population¹⁵. It develops during the sensitive period of visual maturation, which continue until about 8 years of age¹⁶. Most cases of amblyopia are associated with strabismus usually esotropia in infancy or early childhood¹⁷. Recent research also demonstrates that refractive anomalies are the leading cause of amblyopia¹⁸. Refractive correction and occlusion therapy with patching of sound eye is the mainstay of treatment of amblyopia¹⁹.

The main benefits of amblyopia therapy include improved stereoptic appreciation and realignment of strabismic eyes with attainment of improved visual acuity. Surgical correction is reserved for patients who fail to regain fusion with glasses or remain significantly undercorrected despite full time glass

wear¹.

MATERIAL AND METHODS

All children with accommodative esotropia associated with hyperopia were included in this descriptive study using non-probability purposive sampling technique. The features studied were ocular alignment, association of anisometropia with strabismus and amblyopia, improvement in deviation of squint after amblyopia therapy & full cycloplegic hyperopic correction, regain of binocular single vision and requirement for surgery in patients with accommodative esotropia with hyperopia.

RESULTS

We studied 44 cases of refractive accommodative esotropia. Twenty five (57%) were male and nineteen (43%) were female. The age ranged from 02 years to 15 years. Mean age was 7.17 ± 2.07 years. Twenty three (52.3%) were less than 04 years, while 21 (47.7%) were of school going age i.e 04-15 years.

In 11 (25%) patients the esotropia appeared between 1-2 years of age, in 22 (50%) it was noted between 2-3 years, while deviation appeared between 3-4 years in 10 (22.7%) of patients. Only 1 (2.3%) patient was above the age of 05 years. As shown in table-I.

Age (years)	No. of patients	%age
1-2	11	25.0
2-3	22	50.0
3-4	10	22.7
≥ 5	01	02.3

Table-I. Age at onset of deviation (n = 44)

We were able to record VA properly in 26 (59%) while in remaining 18 (41%) patients VA was estimated by central, steady maintained (CSM) and other methods because these patients were too young for accurate VA measurement. Out of 26 (59%), nine (34.6%) had

VA 6/9 or better at least in one eye on presentation. Ten (38.5%) had VA between 6/12-6/18 and 7(26.9%) showed VA less than 6/18 in both eyes. As shown in table-II.

Visual acuity	No. of patients	%age
6/9 or better	09	34.6
6/12 - 6/18	10	38.5
<6/18	07	26.9

Table-II. Visual acuity at presentation

After full cycloplegia with atropine, retinoscopy was done and amount of hypermetropia was determined. Fifteen (34%) patients were having hypermetropia less than 5D, while 29 (66%) showed hypermetropia more than 5D. As shown in Fig-1.

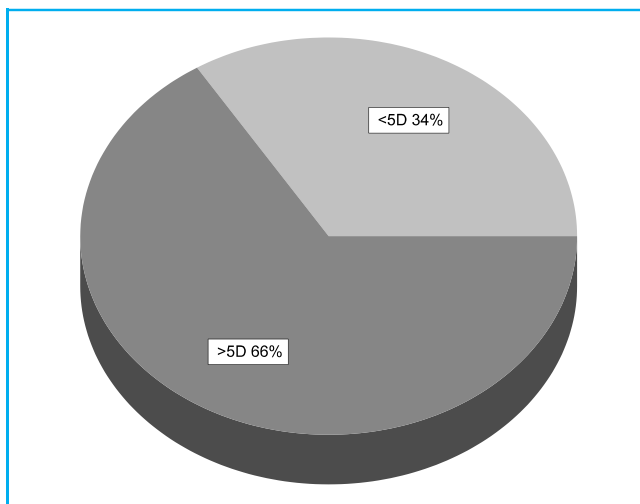


Fig-1. Break up of hypermetropia

Isometric hypermetropia was present in 28 (63.6%) patients while 16 (36.4%) had anisometric hypermetropia. As shown in Fig-2.

The best corrected VA was taken after full cycloplegic correction i.e. with glasses in place. Sixteen (36.4%) showed unocular amblyopia. Most of the patients of unocular amblyopia presented with unocular

esotropia, and also showed anisometropia. The amblyopia therapy was given by standard method of occlusion of sound eye for most of the waking hours. After amblyopia therapy we were able to improve VA upto 6/9 or better in 8 (50%) patients, while 3 (18.7%) improved VA upto 6/12 -6/18, improvement in VA was estimated in 4 (25%) patients by the observation of alternation of squint. Only 1 (6.3%) improved to 6/36. Most probably it was due to poor compliance.

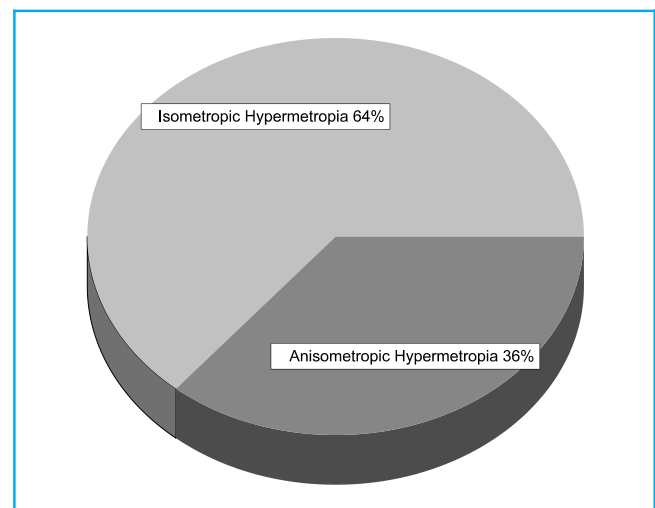


Fig-2. Type of hypermetropia

Twenty eight (63.6%) patients were given full cycloplegic correction and their esotropia was corrected with glasses alone. Another eleven (25%) patients also became straight with glasses and amblyopia therapy. Five (11.4%) patients showed very little improvement even after full cycloplegic correction and intensive amblyopia therapy. As shown in table-III.

Modality of treatment	No. of patients	%age
Straight with glasses	28	63.8
Improved with glasses and amblyopia therapy after 3 months	11	25.0
Not improved with glasses and amblyopia therapy after 3 months	05	11.4

Table-III. Management and outcome

The improvement in BSV in the form of fusion and gross stereopsis was noted in 33 (75%) patients. 7 (15.9%) patients showed no improvement in BSV. In 4 (9.1%) patients we were not able to comment on BSV due to poor cooperation. As shown in Fig-3.

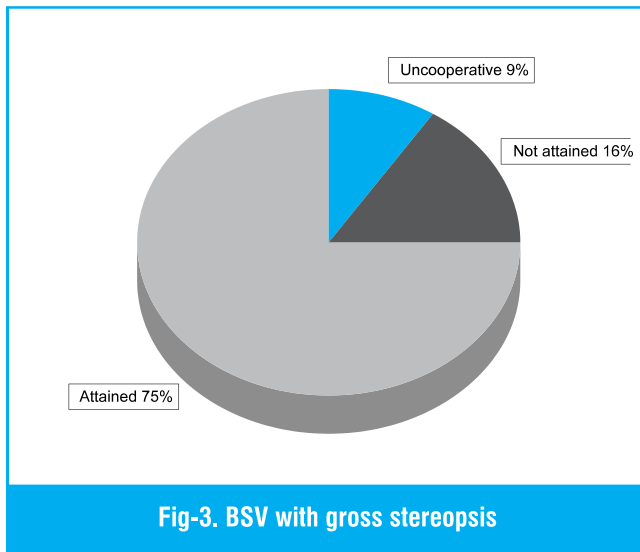


Fig-3. BSV with gross stereopsis

DISCUSSION

Our study of 44 cases of Refractive accommodative esotropia (RAE) confirms many features, causes and association of the disease. Our results showed that age at presentation of a child with amblyopia, the amount of refractive error (hypermetropia) and anisometropia correlate strongly with the management and outcome of refractive accommodative esotropia. However many patients presented at a later age with amblyopia, uncorrected hypermetropia associated with esotropia and subnormal VA. The male to female ratio was 57:43. For the 4(9.1%) patients, who were above the age of 9 years, presented with dense amblyopia in either eye. These patients showed poor improvement inspite of full cycloplegic correction and amblyopia therapy. It is interesting to note that the deviation was noted much earlier by the parents but they presented very late.

In majority of the patients i.e. 75% esotropia was noted between 1-3 years of age. In another 22.7% it was observed before the age of 5 years. Most of the parents

knew about the illness of their children much before they consult any ophthalmologist. The reasons for delay were poor socioeconomic conditions and lack of public health education.

All patients with hypermetropia associated with esotropia were included in our study. Twenty 21 (47.7%) of the patients showed unilateral squint while it was alternate in 23 (52.3%) of the patients. The esotropia was between 20-40^Δ in 36% and >40^Δ was present in 64% of the cases. Cycloplegic refraction was done and full cycloplegic correction was given to all patients. 63.6% of our patients needed glasses only and their deviation was well controlled. In another 25% ocular alignment was achieved with glasses and after amblyopia therapy. So the majority of our patients i.e. 88.6% showed improvement regarding VA and ocular alignment with glasses and after amblyopia therapy.

Our findings that glasses are the mainstay of treatment of refractive accommodative esotropia agree with many previous studies¹. Von Noorden and Avilla found that only 1 out of 30 showed functional deterioration requiring surgery²⁰. Other studies also reflect the major role of glasses to correct hyperopia and amblyopia therapy²¹. Our findings agree with Von Noorden, Avilla and we see that glasses are the mainstay of treatment of patients with refractive accommodative esotropia and surgery is indicated in very few patients i.e. only 11.4% in our study.

The visual acuity was good in 9 (34.6%) patients (6/9 or better), between 6/12 to 6/18 in 10(38.5%) patients and another 7(26.9%) patients showed VA <6/24. In remaining 18 (41%) VA could not be recorded properly due to poor cooperation. In these patients vision was estimated by central steady maintained (CSM) method. Lack of alternate fixation and a strong unilateral objection to occlusion were considered diagnostic of amblyopia in the younger age group. The subnormal vision is reported to be less than 6/12²².

We studied all patients of hypermetropia associated with esotropia. Retinoscopy was done after full cycloplegia and amount of hypermetropia determined. Majority of the patients 29 (66%) had significant hypermetropia i.e above 5D, while it was less than 5D in rest of the 15 (34%) patients.

Our 28 (63.6%) patients showed isometric hypermetropia while 16 (36.4%) presented with anisometric hypermetropia. Among the anisometric patients, majority i.e. 15 (93.8%) had a difference of 1-2D between the two eyes. It was also found that in most of the patients, the deviating eye was more hypermetropic.

The relation between hypermetropia and esotropia is well described. A number of articles have documented increasing hypermetropia before the onset of esotropia^{7,8}.

This is also emphasised by Abrahamson et.al in a study of 57 cases, where patients with esotropia had a pronounced hypermetropia. They also noted that hypermetropia increases in the deviating eye²². This relation of esotropia to hypermetropia has also been reported by Duke Elder²³.

In our study many patients presented with amblyopia or develop amblyopia during follow up. It was present in 36.4% of the patients on initial examination. Moreover most of our patients who presented with amblyopia also had anisometropia, significant or insignificant, and the deviating eye was more hypermetropic.

Amblyopia, a preventable, malady, affects 1-4% of the world population¹⁵. Most cases of amblyopia are associated with strabismus usually esotropia in infancy or early childhood¹⁷.

Recent research also demonstrates that refractive anomalies are the leading cause of amblyopia and

among them abnormal level of hyperopia (over +3.5D in one or more meridian) is the most frequent anomaly¹⁸. Anisometropia is another significant risk factor for developing amblyopia^{1,24}. This is in accordance with our study of 44 cases of refractive accommodative esotropia. Treatment of amblyopic patients was done with standard occlusion therapy of the better eye according to the age i.e one week for every year of age. We decided to terminate occlusion therapy if there was no improvement on three consecutive monthly follow-ups in the presence of compliance and occlusion²⁵.

We treated 16 patients of amblyopia, out of 16, majority i.e 68.7% showed a maintained improvement in visual acuity to better than 6/12 in amblyopic eye and their esotropia was also well controlled at the last follow up. 25% patients also showed significant improvement in visual acuity and ocular alignment. While 6.3% showed poor improvement.

Our results of amblyopia therapy agree with many studies^{1,19}. Most amblyopic children benefit visually from amblyopia therapy provided they present early and are compliant with occlusion and glasses.

The functional value of stereopsis in everyday life may be in question²⁶, the presence of Binocular single vision (BSV) with fusion undoubtedly contributes to maintain ocular alignment²⁷. A very high proportion of our patients (75%) showed fusion with demonstrable BSV which compares well with other studies¹.

In a study of risk factors for abnormal binocular vision it was concluded that duration of eye misalignment is the primary risk factor for adverse binocular vision outcomes after successful treatment of children with accommodative esotropia²⁸. Our 11.4% patients showed¹⁷ no stereopsis on the last follow up inspite of full cycloplegic correction and amblyopia therapy. All these patients presented very late with suppression and dense amblyopia in either eye. As our results were

achieved without any surgery, we find no evidence to support Gobin's claim that 50% of children with RAE may not have BSV and fusion is restored in many of these within one week of surgery²⁹. Our findings also contradict with Tomac S who concluded after study of 20 cases of RAE that prognosis is not favourable for restoration of normal stereopsis in these patients³⁰.

CONCLUSIONS

It is concluded from the study that presentation of childhood squint is late in this area although the parents note the disease earlier. Concomitant esotropia associated with hyperopia is the most common type of childhood squint. Hypermetropia is the commonest refractive error responsible for esotropia in children. Anisometropia is a common associated cause of strabismus and amblyopia. A good number of patients can be managed with proper glasses and amblyopia therapy.

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**If you must break the law, do it to seize power:
in all other cases observe it.**

Julius Caesar