

Research Article

Correlation of Patient Symptoms with Accommodation Problem in School Children

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ABSTRACT

The purpose of the study was to determine correlation of symptoms with accommodation problem in school children. A prospective study of 60 subjects was included. Informed Consent was taken from both parents and children. All children underwent the following base line examination like, visual acuity, refraction, extra ocular motility and cover test. Questionnaire was administered during the examination. The subjective symptoms at near point of accommodation, convergence, accommodative facility and dynamic retinoscopy were done. The study has shown that there was a good positive correlation between subjective symptoms and near point of accommodation and convergence ($r = 0.69$ and 0.96) but subjective symptoms and lag of accommodation has shown negative correlation ($r = -0.96$). Whereas there was an average negative correlation between subjective symptoms and accommodative facility ($r = -0.157$). The p value was found to be statistically significant (0.001). In routine clinical practice measuring of accommodation plays a significant role, especially in young children who are suffering from asthenopic symptoms. It is mandatory to perform accommodation measurements, so that appropriate correction can be given accordingly.

Key Words: Accommodation, Subjective Symptoms, School Children

INTRODUCTION

The human eye has an extremely facile focusing adjustment, which allows for clear vision for objects at various distances. This extreme focusing adjustment can be done by a process called "Accommodation". Accommodation refers to the process whereby changes in the dioptric power of the crystalline lens can occur, so that an in-focus retinal image of object of regard is obtained and maintained at the high-resolution fovea. The amplitude of accommodation represents the maximal accommodative level, or closest near focusing response, that can be produced with maximal voluntary effort in the fully corrected eye. The amplitude of accommodation measurement is important to treat accommodative anomalies like accommodative insufficiency, ill-sustained accommodation, accommodative inertia, paralysis of accommodation and accommodative excess. The accommodative system in young people is usually quite flexible and resistant to fatigue. The ability to accommodate deteriorates slowly with age and insufficient accommodative ability becomes a manifest problem (i.e. presbyopia), which requires optical aid (Duane 1912, Koretz & Handelman, 1988), approximately at the fifth decade of life. Duane's data has been the basis of an age-amplitude formula to predict the amplitude of accommodation (AA) vs. age (Hofstetter, 1950) and this age-amplitude formula is still being used today. However, to predict the amplitude of

accommodation at a young age by using Duane's data has shown that it gives over-optimistic predictions of accommodative function (Sterner *et al.*, 2004).

MATERIALS AND METHODS

Children from randomly chosen secondary level schools in Hyderabad were invited to participate. Subjects included students from various schools of Hyderabad between the age group of 10 – 15 years. The examination took place at school, and informed consent was obtained from both the parents and school children. All of the children were examined during school hours. The institutional review board of L.V. Prasad eye Institute has approved the study. A total of 60 subjects ranging in age group of 10-15 years (with mean of 12.07 years ± 1.517) were included in the study. There were 28% males and 71% females.

Exclusion Criteria:

Students with binocular anomalies, ocular pathology and if the refractive error was found to be greater than ± 3.00 D spherical or cylinder more than 1.00 D were excluded from the study. A more detailed demographical representation is given by Sterner (Sterner *et al.* 2004), was taken into consideration in our study. To avoid bias, the interviews were highly structured and standardized. Questionnaire

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Questionnaire used in our study is similar to Bertil Sterner study (Bertil Sterner et.al 2006).The first examination started with an oral questionnaire to investigate if the child had any subjective symptoms when reading. Each question was fully explained to ensure complete understanding. The related questions were:

- (1) Headache: Do you get headache when you read or study?
- (2) Asthenopic: Do you feel tiredness in the eyes when you read or study?
- (3) Floating text: Do you see the words appear to float on the page, swim, jump, or wiggile when you read or study?
- (4) Facility Problems: Do you have difficulties in quickly changing focus from the board and the book?

The answers were recorded as either yes or no.

Clinical procedure:

A detailed history was recorded regarding the amount of near work, followed by the history; each child has undergone preliminary examination which included visual acuity, refraction, cover test and extra ocular motility examination. Visual acuity was recorded (both for distance and near) by using the Log MAR chart at a distance of 6 meter and 40 cm. A non cycloplegic static retinoscopic refraction was performed, and this was followed by subjective refraction using contra lateral fogging method for distance correction. Cover test performed to determine the tropias or phorias. Though some children were unable to read properly, still they were able to identify the different letters on the chart. The amplitude of accommodation was measured with Donder s push up with RAF-ruler (Royal Air –Force) method.

Accommodative amplitude

The amplitude of accommodation was measured by using the Donder s push up method with the RAF near point rule, a rod with movable target with metric as well as dioptric markings. The child wore distance correction placed in a trial frame, and the examiner placed one end of the ruler on the child's forehead. The child was required to read a line of letters that corresponded in size to 1.0 VA at distance. The target was slowly moved towards the child along the ruler until the child reported blurring. The distance from the point to the spectacle plane was then recorded in diopter. Measurements were made monocularly as well as binocularly. All measurements were repeated three times and the average result was recorded.

Accommodative facility

Accommodative facility is a measure of the ability of the eye to alter its accommodative status, ability to smoothly and efficiently change the amount of accommodation. It is commonly measured in cycles per minute (CPM).The child wore distance correction placed in the trial frame; the target was kept at 40 cm (letters of 20/20 or 20/40 range) and a flipper of +/- 2.00D was used. The Patient was informed that after placing the lenses, his/her focusing system will be affected and that one pair causes the system to relax and other causes the system to work. The child was asked to look at the target through one pair of lenses and clear it up. When the target became clear, the child immediately reported “clear”, and then lenses were flipped. After every flip the child should report “clear”. Going from minus to plus and back to minus was one cycle. It was done for one minute. Results were recorded in cycles per minute.

Accommodative lag

The difference between the accommodative stimulus and the accommodative response is called the lead or lag of accommodation, measured by using dynamic retinoscopy. The fixation distance is selected in such a way that it represents the patient's preferred near working distance. The retinoscopic observation is made at the same position. The patient is asked to fixate fine print (located in the plane of the retinoscope). Lenses were rapidly interposed in front of the eye that is being examined and the motion of reflex was estimated until neutrality is achieved. Each lens was removed before accommodative response occurs.

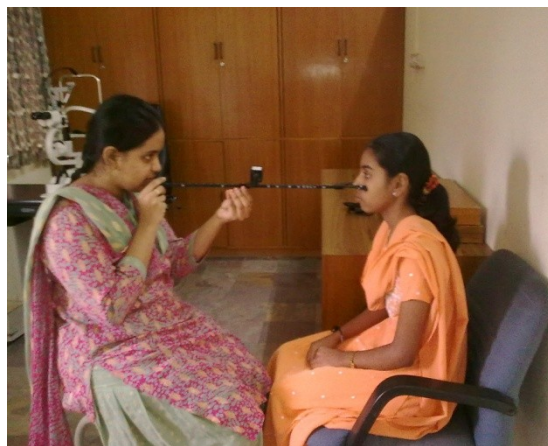


Figure 1: Shows amplitude of accommodation measuring by using RAF (Royal Air Force) Ruler

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Analysis

The data was entered in excel sheet and analyzed in SPSS 11.0 software. In this study Paired‘t’ test was used to find the differences between the two observations i.e., Subjective symptoms and accommodative parameters - accommodative lag and near point of accommodation show high positive correlation with each other. The difference between observations was 0.001. The test statistic is‘t ‘with n-1 degrees of freedom was used in this our study. A Rank correlation coefficient measures the correspondence between two rankings and assesses its significance. Rank correlation is the study of relationships between different rankings on the same set of items. An increasing rank correlation coefficient implies increasing agreement between rankings. The coefficient is inside the interval, i.e. [-1, 1] are the values, if the disagreement between the two rankings is perfect; one ranking is the reverse of the other then the grade is considered as -1. If the rankings are completely independent then grade will be taken as zero. If the agreement between the two rankings is perfect; the two rankings are the same and the grade is considered as one.

RESULTS

Sixty subjects ranging in age group of 10-15 years (with mean of 12.07 years \pm 1.517) were included in the study. 28% boys and 71% girls were recruited. The questionnaire was given a score on a scale of 1 to 5. The mean value was 2.62 with a standard deviation of 0.708. The mean value of near point of accommodation was 14.16diopter and the standard deviation of 4.66 with range 4 to 20 diopter. The mean value of near point of convergence was 9.88 cm with standard deviation of 5.234 with range from 7 to 20 cm. The mean value of accommodative facility was 5.23 cm/min with standard deviation of 1.544 values was in a range of 2 to 8 centimeter/minute. The mean value of Accommodative lag measurement was 2.08 diopter in the right eye and 2.03 diopter in the left eye with a standard deviation of 0.927 respectively. Good correlation was found between the near point of accommodation and subjective symptoms, the accommodative value was found to be low and it indicates a high score. Whereas poor correlation was found between accommodative facility Vs subjective symptoms and the score was $r = -0.157$. Finally there was an average correlation between the accommodative lag Vs subjective symptoms.

Table 1: Correlation between Score and Accommodative parameters

Paired Samples Correlations

	N	Correlation	Sig.
Pair 1 ques_point & npa	60	.069	.599
Pair 2 ques_point & npc	60	.096	.466
Pair 3 ques_point & facility	60	-.157	.231
Pair 4 ques_point & dynamic_ret_OD	60	-.096	.467

Table 2: Significance value with Paired‘t’ test

Parameters	Mean	Sig (2-tailed)
Score – NPA	-11.5433	0.000
Score – Acc facility	-7.2600	0.002
Score – Acc lag	0.54833	0.001

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DISCUSSION

The aim of the present study was to evaluate possible relations between near work problems and accommodative dysfunction. A questionnaire for identifying subjective symptoms related to accommodation was used in this study. The questionnaire contained four different questions related to four different symptoms, according to previous studies (Daum 1983, Hoffman & Rousey 1980, Hennessey *et al.*, 1984) the subjective symptoms were most frequently related to an accommodative dysfunction.

Our study clearly revealed a relationship between accommodation and subjective symptoms. The most frequent symptoms were asthenopia and headache. In a previous study (Sterner *et al.*, 1999) these symptoms were also present in children having an impaired accommodative facility. Another study has shown that children had relief from their symptoms after facility training. Treatment for accommodative dysfunction has been described in several studies (Hoffman, 1982, Duam 1983, Weisz 1983, Bobier & Sivak, 1983; cooper *et al.*, 1987, Russell & wick 1993, Sterner *et al.*, 1999, Ciuffreda 2002) Accommodative dysfunction treatment is an effective therapy for slow accommodative responses and may eliminate both the poor objective values and the subjective symptoms of the patients.

There was a good positive correlation found between near point of accommodation and subjective symptoms in our study. And poor correlation found between accommodative facility and subjective symptoms. One of the possible biases could be the inability of the subject to understand the test, as the test is totally subjective in nature or the subject may give correct reply just to please the examiner. Since subjective symptoms are common among school children, routine screening should be implemented. Authors recommend screening even though it is difficult to implement. At least we should inform schools and care givers about this possible relationship. At least an eye examination should be offered to those with symptoms at near work. Then there is a fair bit of chance for the correction of the accommodation if timely eye examination is performed. By this study it can be concluded that there exists a correlation between symptoms and accommodative insufficiency. Hence testing of accommodation should be done in routine clinical practice.

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