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Institutionen för Klinisk Neurovetenskap

**Accommodation – Clinical and theoretical
investigations**

AKADEMISK AVHANDLING

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ABSTRACT

Background: Accommodative insufficiency (AI) is a relatively common visual anomaly in children and young adults with an estimated prevalence of about 5%. Patients with AI usually suffer from blur, headaches and asthenopia associated with near work. The two most important treatment regimes for AI are plus lens reading additions (PLRA) and orthoptic exercises with the aim of normalising the accommodative system. The stimulus for the accommodative system is blur, which is an even-error signal, i.e., the blur gives the magnitude of the accommodation, but lacks the directional information; therefore, it is dependent on other cues to know if the accommodation needs to be increased or reduced. The main directional cues for the accommodative system are thought to be chromatic aberration (CA) and spherical aberration (SA). Recently there has been a large interest in the use of contact lenses to correct aberrations in order to create an improved image quality or create a near addition.

Aims: The purpose was to evaluate the outcome of AI treatment, to investigate the effect on accommodation response when manipulating the directional cues to accommodation and to study the effect on accommodation when using a multifocal contact lens.

Material and Methods: 46 children between 7-18 years of age, diagnosed with AI were dissipating in study I and II where they were treated with PLRA (+1.00 or +2.00D) or orthoptic exercise. In study III and IV, a normal group of 40 subjects were included (age 21 to 35) and 5 AI patients (age 10 to 18). They had their aberration and accommodation measured with and without accommodative cues present, and also with a multifocal contact lens which gives a near reading addition.

Results: The result showed that there was no significant difference between the two treatment methods for AI patients. Further, there was a significant difference between the PLRA given, which indicates that the PLRA should not be of the higher strength. The accommodative response was not affected when the accommodative cues was eliminated or decreased. The multifocal contact lens was not able to relax the accommodation in young normal subjects and neither on AI subjects.

Discussion: Results of our study and others have shown that vision therapy (PLRA and/or orthoptic exercises) can improve the time characteristic and magnitude of accommodation response with a persistent result. The PLRA of +1.00D is preferred to allow comfortable vision at near and at the same time exercise and stimulated the accommodative system rather than completely relieved. The SA and CA were showed to not be a strong directional cue for the accommodation which indicates that there are other cues more important for directional information. Since the multifocal contact lens was not able to relax the accommodation for neither of the subjects it is therefore unlikely that subjects with AI can be effectively treated with such lens.

Conclusion: Based of the finding in the studies I would like to recommend that AI subjects can be treated with either +1.00D reading addition or orthoptic exercise, however, multifocal contact lenses should not be used for the treatment purpose of AI subjects.

Keywords: Accommodative insufficiency, Plus lens reading addition, Spherical flipper treatment, Spherical and Chromatic aberration, Spherical aberration controlled contact lens.

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