

Centrality of Hirschberg Reflex in Young Emmetropic Population of Pakistan

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ABSTRACT

Purpose: To find out the Centrality of Hirschberg reflex in young emmetropic females and to correlate it with asthenopia.

Study Design: Cross-sectional study

Place and Duration of Study: Outpatients department of Khalid Eye Hospital, Karachi, from January to December 2019.

Methods: Six hundred young emmetropic females 10 to 25 years of age were included. We performed the Hirschberg test and Jackson cross cylinder to assess the astigmatism and observed near point of convergence to find out convergence insufficiency.

Results: Out of 600 young emmetropic females only one hundred and ninety had a central Hirschberg corneal reflex along with an astigmatism of 0.25 to 0.50 which was observed in one hundred and sixty five patients. One hundred and twenty five had a receded near point of convergence.

Conclusion: Acentrality of Hirschberg can be a cause of asthenopia among young emmetropic females.

Key Words: Asthenopia, Astigmatism, Emmetropia, Hirschberg corneal reflex.

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INTRODUCTION

There are a number of methods available for assessing the ocular alignment and can be grouped into four basic types; Hirschberg test, cover tests, dissimilar image test, dissimilar target test.¹

The Hirschberg light reflex method is based on the contention that 1 mm of deviation of the corneal light reflection corresponds to approximately 7°, or 15Δ, of ocular deviation of the visual axis. Therefore, a light reflex at the pupillary margin is about 2 mm from the

pupillary center (with a 4-mm pupil), which corresponds to 15°, or roughly 30Δ, of deviation. A reflex at the mid-iris region is about 4 mm from the pupillary center, which is around 30°, or 60Δ, of deviation; similarly, a reflex at the limbus is about 45°, or 90Δ, of deviation.²

The angle kappa, which is made by the visual axis and the anatomical pupillary axis of the eye, can have an effect on the corneal light reflex measurements. If the fovea is temporal to the pupillary axis, which is normally the case, the corneal light reflection will be slightly nasal to the center of the cornea. This is termed positive angle kappa and simulates exodeviation. If the fovea is nasal to the pupillary axis, the corneal light reflection will be slightly temporal to the center of the cornea. This is called negative angle kappa and simulates esodeviation. An angle kappa does not affect the cover tests.

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Convergence insufficiency incidence has no major change with growing age up to the age of sixty years but increases significantly thereafter. Augmented visual stress of school work and prolonged periods of reading aggravate symptoms in older children. The most common presentation encountered by a clinician is that of a high school or college student who develops symptoms when unwarranted demands are placed on the visual system during long periods of studying. Lack of sleep, illness, and anxiety are also known to exacerbate the problem.³

Rarely, any previous research was done to focus exclusively on emmetropic young female population. The purpose of this observational study was to check the Hirschberg reflex in young emmetropic females and to shed light on the non-refractive causes of ocular discomfort.

METHODS

This observational study was conducted at Khalid Eye Hospital, Karachi, from January 2019 to December 2019. It included six hundred emmetropic females between the ages of 10 to 25 years having gross visual acuity of 6/6 on Snellen chart. The main complaint in this study group were headache, blurring of vision and double vision while reading. Patients having refractive error, previous history of spectacles, history of excessive screen usage more than five hours a day, late night sleep habits, gross media opacity, or history of glaucoma were excluded from the study. A questionnaire/proforma was designed to record demographics, reason of visit in hospital, Hirschberg test finding, visual acuity, subjective refraction, Jackson cross cylinder test, slit lamp ocular examination, extraocular movement along with near point of convergence and accommodation. Main outcome measures were acentrality of Hirschberg light reflex, hidden minor astigmatism and receding near point of convergence. All recruited patients were informed about the study and study approval was obtained by the Ethical Review Committee. Data was analyzed through SPSS version 20 and frequency for age, and variables were obtained.

RESULTS

This observational study showed that four hundred ten (68.3%) out of six hundred females had non-central corneal light reflex, where as one hundred and ninety (31.7%) had a central reflex (p value < 0.005). Out of

four hundred ten females having non central reflex three hundred fifty (85.3%) had corneal reflex on the nasal side of cornea, where as sixty (14.7%) females had corneal reflex in the temporal side of cornea (p value < 0.005). Astigmatism of 0.25 to 0.50 was observed in one hundred and sixty five (27.5%) patients. Near point of convergence was more than 20 mm in one hundred and twenty five (20.8%) patients.

DISCUSSION

Young female patients usually complain of tiredness, headache and blurred vision in the absence of any significant refractive error. The hidden causes of these symptoms in this age group could be convergence insufficiency, forcibly compensated phorias, muscle weakness and minor astigmatism which could be responsible for ocular discomfort in emmetropic population.^{4,5}

The miscellany in the reported standards of the convergence insufficiency in literature may be due to disparity in target populations, age groups, and facilities for visual assessment, interpupillary distances and geographical factors affecting the results. Scheiman and colleagues suggested that refractive errors are not the only reason for causing abnormal near point of convergence. There are many other causes like phoria, tropias, injuries, trauma and psychological implications.^{6,7} In this study we observed 20.8% patients had remote near point of convergence more than 20 mm, which could also be the major contributor of symptoms of asthenopia in this considerably emmetropic study group. It is not improbable that anemia can be casually related to convergence insufficiency in view of the frequency of various degrees of hypochromic anaemia in women of this age group. In many cases the onset of symptoms was a sequel to a hemorrhage or menstrual pathology causing anaemia. These situations must provide additional cause for a latent muscular imbalance to become manifest or for insufficiency to appear where no imbalance previously existed.⁸

Jonejo et al reported central Hirschberg reflex in 17% of patients and also they reported high prevalence of non central corneal reflex in females.⁹ In our study, central Hirschberg was seen in 31% of cases although this study included only female patients. Hikmatullah reported high incidence of convergence insufficiency in young females.¹⁰ Sidra reported high frequency of exophoria in convergence insufficiency patients

mostly in females.¹¹ Another study showed that individuals of 18 to 31 years with visual status of 6/9 to 6/6 found asthenopia in emmetropes.¹² Saba also reported a relationship between asthenopia and convergence insufficiency.⁷

In latent strabismus especially in exophoria, usual symptoms are headache, aching eyes, intermittent blurring of prints while reading and occasional diplopia.¹³ A study found Astigmatism to be the most frequent cause of asthenopia. Female patients were more prone than male patients to complain of asthenopia, at the same time high school students were more likely than primary school children to complain of asthenopia.¹⁴

Limitation of this study was that it was a small scale study and not a true reflection of the whole population. However, it has highlighted the various hidden causes of symptoms of asthenopia in young emmetropic females.

CONCLUSION

Majority (85%) of non-central corneal reflex population having corneal reflection on the nasal side of the cornea, which also could be the possible cause of difficulty in near work or symptoms of asthenopia.

Ethical Approval

The study was approved by the Institutional review board/ Ethical review board. (ERL-01-20)

Conflict of Interest

Authors declared no conflict of interest.

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Author's Designation and Contribution

Zeeshan Kamil; Consultant Ophthalmologist: *Examiner, Manuscript writer.*

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