COMPARISON OF ACCOMMODATIVE FUNCTIONS IN DOMINANT AND NON-DOMINANT EYE

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ABSTRACT

PURPOSE: *To compare the accommodative functions involving Accommodative amplitude (AA), accommodative facility (AF) and accommodative response (AR) of dominant and non-dominant eye.*

METHODS: *A comparative cross-sectional study was performed at COAVS, KEMU Lahore from September to December 2021 on 71 students to compare the functions of accommodation in dominant and non-dominant eye. Ocular dominance was assessed by DOLMAN METHOD. AA was determined by pushup method by measuring it monocular with help of RAF ruler. AF assessment was done monocular with ±2 flippers. AR was evaluated by MEM retinoscopy.*

RESULTS: *Mean age was 21.94 ± 2.66 years. Results revealed that the percentage of right eye dominant student was 80.3%, while left eyewas 19.7%. The sum value(SD) for AF, AA and AR of the dominant eye was11.04cycles per minute,15.15D and 0.80D respectively. The mean value (SD) of AF, AA and AR of non-dominant eye was 10.09 cycles per minute,15.91D and 0.76D respectively. The mean difference in AF, AA and AR of both eyes was0.95cycles per minute,0.76D and 0.04D respectively. This data proved that there was no significant difference among accommodative functions in non-dominant and dominant eye (P>0.05).*

CONCLUSION: *Accommodationfacility, amplitude of accommodation and lag of accommodation in dominant eye was higher than non-dominant eye. However, this differencewas not statistically significant.Hence, it is not an important clinical factor to be considered while determining the effect of ocular dominance on accommodative functions.*

KEYWORDS: *Dominant eye, Non-dominant eye, Amplitude of accommodation, Accommodation response, Accommodation facility.*

INTRODUCTION

Eye dominance refers to the preference to use one eye more than the fellow eye to accomplish a task. However, the dominant eye revealed can be task dependent especially when the tasks are as diverse as instructing the observer to sight a target through a ring, or to report which half-image is perceived more of during binocular rivalry stimulation. Conventionally, the former task is said to reveal motor eye dominance while the latter task reveals sensory eye dominance. While the consensus is that the motor and sensory-dominant eye could be different in some observers, the reason for it is still unclear and has not been much researched. This review mainly focuses on advances made in recent studies of sensory eye dominance. It reviews studies conducted to quantify and relate sensory eye dominance to other visual functions, in particular to stereopsis, as well as studies conducted to explore its plasticity. It is recognized that sensory eye dominance in observers with clinically normal vision shares some similarity with amblyopia at least at the behavioral level, in that both exhibit an imbalance of interocular inhibition. Furthermore, sensory eye dominance is probably manifested at multiple sites along the visual pathway, perhaps including the level of ocular dominance columns. But future studies with high-resolution brain imaging approaches are required to confirm this speculation in the human visual system.

Acuity dominancy is defined as the utilization of that

eye which possess sharp and finest visual image.[5] Previous reports indicate that the frequency of right and left ocular dominance has been seen in two third and one third of population respectively.[2] Dominant eye is more myopic in anisometropic patients as compared to non-dominant eye. With an increase in degree of anisotropic myopia, the probability of dominant eye to possess greater myopic refractive error increases, hence the axial length of dominant eye is longer.[7-8]

Anterior segment parameters are also affected by ocular dominance.[2] Accommodation is the adjustment of optical system by varying crystalline lens shape and power resulting in change in focal length of eye. In accommodation, the ciliary muscles and pupil contracts, optical axis converge for seeing objects at near distance.[10] Clinical evaluation of accommodative functions includes the assessment of AA, AF and AR.[11]

Accommodative facility refers to the speed with which accommodation can be engaged and disengaged. Accommodative facility is defined as the measurement of eye's ability to change its focus from certain distance to another over the course of minute.[14]

Visual acuity[17] but few studies have founded the association of ocular dominance with accommodative function. The purpose of this research is to associate the accommodative functions in dominant and non-dominant eye.

METHODS

A comparative cross sectional study was conducted among the students of COAVS, Mayo Hospital Lahore from September to December 2021. The sample size was 71. Data was collected by using a self-designed Proforma which includes personal information and tests that were essential for comparing accommodative functions of dominant and non-dominant eye. Participants who fulfilled the inclusion and exclusion criteria were included in this study. Ocular dominancy was assessed by using DOLMAN METHOD. AA was determined by pushup method by measuring it monocularly with help of RAF ruler. AF assessment was done monocularly with ±2 flippers. AR was evaluated by MEM retinoscopy. For data analysis we used SPSS version 25. Mann-Whitney u test was applied on data, and results were obtained. The research protocol was approved by the Ethical Review Board of COAVS.

Table: Mean (SD) of accommodative functions

Accommodative Functions	Mean value (Dominant eye)	Mean value (Non-dominant eye)	Mean difference Mean (SD)	P-value (dominant eye)	P-value (Non-dominant eye)
Amplitude of accommodation(D)	15.15	15.91	0.76	0.351	0.292
Accommodative facility(cpm)	11.04	10.09	0.95	0.658	0.437
Accommodation lag/lead(D)	0.80	0.76	0.04	0.466	0.309

RESULTS

Out of 71 students 35.2% were male and 64% were female. Mean age was 21.94 ± 2.66 years. Results revealed that the percentage of right eye dominant student was 80.3%, while left eye was 19.7%. The sum value (SD) for AF, AA and AR of the dominant eye was 11.04 cycles per minute,15.15D and 0.80D respectively. The mean value (SD) of AF, AA and AR of non-dominant eye was 10.09 cycles per minute, 15.91D and 0.76D respectively. The mean difference in AF, AA and AR of both eyes was 0.95 cycles per minute, 0.76D and 0.04D respectively. This data proved that there was no significant difference among accommodative functions in non-dominant and dominant eye ($P>0.05$).

DISCUSSION

During comparative cross sectional study, seventy-one students (between the ages of 15 to 35) of COAVS, mayo hospital Lahore were selected. Out of seventy-one students twenty-five students were male and forty-eight students were female. Traditionally within the clinical literature, ocular dominance has been assessed using the sighting dominance test e.g., the hole-in-the-card test and the Worth-4-dot test in clinical practice. These tests give only a qualitative measure. Right eye was dominant in 57 individuals and left eye was dominant in 14 students. Out of 100%, 80%students were right eye dominant and 19.5% were left eye dominant. This showed that majority of human population is right eye dominant and minority is left eye dominant. This result seems to support the statement that the frequency of right and left ocular dominance has been seen in two third and one third of the population respectively.[2]

The main outcome of the study is that the AA and AF of dominant eye were higher in magnitude than non-dominant eye. One of the previous research showed that AA and AF of dominant eye was higher than non-dominating.[9] The accommodative lag was less related to ocular dominance as compared to accommodative

facility and amplitude. There was no significant difference between accommodation response between two eyes (p>0.05). The mean accommodative lag of dominant eye was 0.80D whereas of non-dominant eye was 0.76D. Odigie OM et al, in his study reported that, although there is a difference in accommodative response of both eyes but this difference is not significant.[16]

A study proposed that AR of dominant eye was higher in binocular view than monocular view and was found to be same in both eye during monocular view. But this difference was not statistically significant.[2]

CONCLUSION

Accommodative facility, amplitude of accommodation and accommodative lag of dominant eye was higher than the non-dominant eye. However, this difference was not statistically significant. Hence it is not an important clinical factor to be considered while determining the effect of ocular dominance on accommodative functions.

RECOMMENDATION

1. With an increase in frequency of binocular vision abnormalities and near visual tasks, early diagnosis and accurate management can improve the eye-related quality of life of the population, by performing accommodative function tests in routine clinical examination.
2. A balanced study, ensuring the inclusion of wide age range population should be conducted to obtain more accurate results.
3. Accurate determination of ocular dominance is significantly helpful in clinical decision making, as it refers to monovision management of presbyopia, with intraocular lens implantation in cataract surgery, contact lenses prescription or Laser-assisted in situ keratomileusis.
4. Detecting dominance is of great importance when treating presbyopic patients with monovision contact lenses or refractive surgery.

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