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Brief Communication

Reliability of Duo Chrome Test in Different Age Groups Considering Patient Satisfaction as Gold Standard

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ABSTRACT

Purpose: To check the reliability of the duo-chrome test in different age groups after best correction.

Study Design: Descriptive, Cross Sectional Study.

Place and Duration of Study: College of Ophthalmology and Allied Vision Sciences. King Edward Medical University, Lahore from September 2019 – December 2019.

Methods: Forty two cooperative patients of both genders more than 15 years of age were included but patients with poor fixation, any opacity or any other ocular pathology were excluded. Equipment used was Trial box Trial frame Auto-refractor and Snellen Chart. Group 1 composed of 17 patients (15 – 35 years of age). Group 2 (36 – 60 years) had 15 patients and group 3 (age 61-80 years) comprised of 10 patients. Data was collected on self-designed Performa. Duo Chrome was dependent variable and gender was independent variable. Data was analyzed by using statistical package for social science (SPSS22.00) and chi square test was applied.

Results: Out 42, 21 patients reported red, 12 reported green and 9 patients reported equally clear in the right eye. P value=0.156 showed that duo chrome test was equally reliable in every age group in the right eye. Similar results with p = 0.755 showed that duo chrome test was equally reliable in every age group in the left eye. Test when performed bilaterally, showed similar results. Out of 42 patients, 32 were satisfied and 10 were not satisfied with the test.

Conclusion: Red Green duo-chrome test is equally reliable in all age groups to confirm refraction.

Key Words: Duo chrome test, Refraction, Myopia, Hypermetropia.

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INTRODUCTION

Post refraction tests are done for the verification of subjective refraction including Duo-chrome, Plus one blur and pinhole etc. Since its introduction by Brown in 1927, the duo chrome test is a good clinical tool.[1] It is a test commonly used to refine the final sphere in refraction, which utilizes the phenomenon of transverse chromatic aberration of the eye. The patient is asked to compare the clarity of the green and red side letters on the bottom of the chart. If the green letters are clearer, sphere of +0.25 D is added and if the red letters are clear, a minus sphere of 0.25 D is added in the prescription. With best spherical correction, the letters in the red and green halves of the

chart appear equally clear. Because the principle of duo chrome test is chromatic aberration and not color discrimination, it is used even with people having deficiency of color vision. The eye with excessive accommodation may still require too much negative sphere to balance red and green. Cycloplegia may be required in these cases. Duo chrome test is not used in patients with visual acuity worse than 20/30 (6/12), as the difference of 0.50 D between the two sides is too small to be distinguished.[2]

The initial Duo-chrome test, which is also known as the Bichrome test, uses the principle of Chromatic aberration because the light of different wavelengths is refracted to a different extent.[3] The shortest wavelength (green) is refracted more as compared to the longest (red). The test first requires the power of the spherical lens to be known monocularly. The duo chrome test should be used after monocular refraction and shows the endpoint process of the examined eye. The prism dissociated Duo chrome test is used to match the stimulus with the accommodation of the two eyes in binocular vision. This test is initially used for presbyopia that need near add. The duo chrome test can be used clinically for the verification of final refraction for more than 60 years. The duo chrome test is used in research protocols for the final spherical adjustment of refraction and to avoid over or under distance correction. A study showed that red-green equality with fully corrected cylinder and without the cylindrical correction were not significantly different concluding that the red-green duo chrome test could be used both before and after cylindrical correction.[4]

This study was carried out to see the reliability of Duo chrome test in three different age groups in a tertiary care hospital.

METHODS

This cross-sectional study was conducted between September 2019 to December 2019 among three groups of 42 patients. Cooperative patients of both genders more than 15 years of age were included but patients with poor fixation, any opacity or any other ocular pathology were excluded. Equipment used was Trial box Trial frame Autorefractor and Snellen Chart. Group 1 composed of 17 patients (15 – 35 years of age). Group 2 (36 – 60 years) had 15 patients and group 3 (age 61 – 80 years) comprised of 10 patients. Age, distance visual acuity, autorefraction, pinhole improvement, subjective refraction and Duo-chrome were noted. Data was collected on self-designed Performa. Duo Chrome was dependent variable and gender was independent variable. Data was analyzed by using statistical package for social science (SPSS22.00) and chi square test was applied.

RESULTS

This table shows that out 42, 21 patients reported red 12 reported green and 9 patients reported equally clear. P value = 0.156 shows that duo chrome test was equally reliable in every age group in the right eye. Similar results with p = 0.755 shows that duo chrome test was equally reliable in every age group in the left eye.

Out of 42 patients, 32 were satisfied and 10 were not satisfied with the test.

Table 1: *Duo Chrome test of right eye, left eye and both eyes in different age groups.*

		DUO_Od			
		Red	**Green**	**Equally Clear/Blurr**	**Total**
Age	15 – 35	8	6	3	17
	36 – 60	9	1	5	15
	61 – 80	4	5	1	10
Total		21	12	9	42

DISCUSSION

Uncorrected refractive disorders are the main cause of distance visual loss and around 108 Million human beings are affected by it.[5] It has been assessed that refractive errors which are not corrected (especially myopia)results in a huge financial burden i.e. around 202 Billion Dollars per year. Therefore, eradication of all the preventable reasons of visual damage including uncorrected refractive errors could lead to a fundamental financial gain.[6] In order to rectify these refractive errors standard clinical processes should be established and modernized bylatest scientific researchesso that finest prescription is offered to the patients.

In another study, it was shown that the refractive end point measurements obtained from duo chrome and cross grid were well correlated and comparable, suggesting that they could be used interchangeably in most clinical settings. However, caution is needed when using measurements obtained by cross grid method in dim illumination.[7]

Similar results were seen in a Korean study.[8] Another important point is that before performing Duo chrome test, eye should be pathologically perfect because in the presence of yellow crystalline lens, sometimes Red background appears clearer compared to Greenbackground.[9,10]

Limitation of the study was that not all the refractive errors were equally represented. It was a single center study and accomodation was not disabled by cycloplegics.

Ethical Approval

The study was approved by the Institutional review board/Ethical review board **(COAVS/892/20).**

Conflict of Interest

Authors declared no conflict of interest.

CONCLUSION

Red Green duo chrome test is equally reliable in all three considered age groups as a post refraction confirmatory test as its P value is >0.05 which is non-significant and should be used by practitioners in clinical refraction. Precise Refraction is also very significant before certain surgical procedures like refractive surgery in order to avoid under or over-correction, which could later be difficult to treat.

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Authors' Designation and Contribution

Zehwa Mazhar; Optometrist: *Concepts, Literature Search, Data Acquisition, Manuscript Preparation, Manuscript Review.*

Rabia Manzoor; Optometrist: *Concepts, Design, Literature Search, Manuscript Preparation, Manuscript Review.*

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