

Compare the Mean Difference of Visual Acuity Between Subjective and Auto Refraction

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ABSTRACT

Objective: To compare the mean difference of spherical, cylindrical and cylindrical axis between subjective and auto refraction.

Study Design: Cross-sectional study

Place and Duration of Study: Department of Ophthalmology, Bolan University of Medical & Health Sciences/Helper's Eye Hospital, Quetta from 1st January 2020 to 31st December 2020.

Methodology: Two hundred and thirty patients of both genders undergoing retinoscopy were enrolled and age between 15 to 60 years. After taking written informed consent detailed demographics including age, sex, and body mass index were recorded. Refractive error was measured by auto and subjective refraction methods. Detailed anterior segment examination with slit lamp and dilated fundus examination with indirect ophthalmoscopy was performed.

Results: There were 130 (56.52%) males and 100 (43.48%) patients were females. Mean age of patients were 39.42±8.77 years. The difference of visual acuity was significant difference (P<0.05) between auto and subjective refraction.

Conclusion: The mean difference of visual acuity between auto and subjective refraction was significant.

Keywords: Retinoscopy, Subjective refraction, Auto refraction, Refractive error

INTRODUCTION

In many ophthalmic clinical studies, the primary results in the evaluation of therapy efficacy are best corrected visual acuity.¹⁻⁴ Methods for best-corrected visual acuity are either mostly subjective, for example manifest refraction with test lenses, phoropter lenses or objective, for example retinoscopy or auto-refraction.^{5,6} Both methods of refraction demand various levels of examining expertise, training and time for each operation. Refraction from manifestations demands a fundamental grasp of ocular optics. In general, a clinician needs months of practical experience for successful and reproductive refraction. Clinical studies often include manifested refraction by following a set of steps defined in a protocol or procedure manual. Many patients with different degrees of visual acuity and types of refractive errors need to be treated with this technology before it is mastered.^{7,8} Auto-refraction, by contrast, requires no knowledge of ophthalmic optics or practical refraction experience. It requires just an initial grasp of how the auto-refractor can be used and learnt from the reading of the auto-refractor instruction manual and from the least amount of patient experience.^{9,10}

In comparison with subjective refraction the accuracy and reliability of the various auto-refractors have been tested in a number of studies.^{11,12} In a recent investigation, AR estimates of visual acuity (VA) (Nidek OPD-Scan III) were compared with subjective refraction values.¹³ The refractive results were often closely related, although the visual sharpness was almost the same as or equal to the AR refraction when the AR provided a different value to subjective evaluation. We performed this study to compare the mean difference between automatic and subjective refraction in visual acuity.

MATERIALS AND METHODS

This cross-sectional study was conducted at Department of Ophthalmology, Bolan University of Medical & Health Sciences/Helper's Eye Hospital, Quetta from 1st January 2020 to 31st December 2020 and comprised 230 patients. Patients less than 15 years of age and those did not give any written consent were excluded. Two hundred and thirty patients of both genders undergoing retinoscopy were enrolled. Patient's ages were ranging between 15 to 60 years. After taking written informed consent detailed demographics including age, sex, and body mass index were recorded. Refractive error was measured by auto and subjective refraction methods. Detailed anterior segment examination with slit lamp and dilated fundus examination with indirect ophthalmoscopy was performed. Data was analyzed by SPSS 24.

RESULTS

There were 130 (56.52%) males and 100 (43.48%) patients were females. Mean age of patients were 39.42±8.77 years with mean BMI 25.16±7.34 kg/m² (Table 1). Mean spherical auto-refraction and subjective refraction was 0.0428±2.67 and -0.364±2.86 D with mean difference of -0.578±1.85 D. Mean cylindrical auto and subjective refraction was -0.102±0.66 D and -0.883±0.73 D and mean difference was 0.364±0.48 D. Mean cylindrical axis of auto and subjective refraction was 119.64±52.53 and 118.28±52.58 with mean difference as 0.92±2.19 D. The difference of visual acuity was significant difference between auto and subjective refraction with p-value <0.05 (Table 2).

Table 1: Demographic information of the patients (n=230)

Variable	No.	%
Mean age (years)	39.42±8.77	
Mean BMI (kg/m ²)	25.16±7.34	
Gender		
Male	130	56.52
Female	100	43.48

Table 2: Comparison of mean values between auto and subjective refraction with mean difference

Variable	Auto-refraction	Subjective refraction	Mean difference
Mean spherical	0.0428±2.67	-0.364±2.86	-0.578±1.85
Mean cylindrical	0.102±0.66	-0.883±0.73	0.364±0.48
Mean axis	119.64±52.53	118.28±52.58	0.92±2.19

DISCUSSION

In order to rectify refractive errors, refractive correction is given.¹⁴ Refraction is used clinically to begin the spectacle prescription in order to obtain the best possible acuity.^{15,16} Several individuals with impaired vision have since reported that their lenses do not help and some may find refractive neglect suitable. Refraction is the most important component in patients using phoropters to enhance efficacy yet it is favorable for low-sight patients since it allows unusual positions when necessary. Refraction is the most important component.¹⁷ In addition, the phoropter shows lens changes in increments of 0.25 diopter (D), however the examiner can establish magnitude differences between the lens selections in refraction assessments. The refraction of the test frame is time intensive for low-vision patients.

In the present study, majority of the patients were males 56.52%. Mean age of patients were 39.42±8.77 years. Our findings were comparable to the previous study in 2020, in which females were less than that of males and mean age was 34.71±7.45 years.¹⁸ Various procedures are utilized for the optimum correction of refractive visual acuity. The evaluation of lenses or phoropter or objective breakdown with a streak retinoscopy and self-refraction uses predominantly subjective refraction.¹⁹ Both refractive procedures involve different amounts of instruction, practice and time for each examiner. Subjective refraction requires basic optical knowledge. It usually takes months for the clinician to properly and reproducibly accomplish subjective refraction. The procedure must be applied in a large number of patients in order to master subjective refraction. Self-refractive does not require understanding in basic eye optics or practical knowledge in the field of refraction in comparison.²⁰

This study showed that mean difference of visual acuity between auto and subjective refraction was significant. Mean spherical auto-refraction and subjective refraction was 0.0428±2.67 and -0.364±2.86 D with mean difference of -0.578±1.85 D. Mean cylindrical auto and subjective refraction was -0.102±0.66 D and -0.883±0.73 D and mean difference was 0.364±0.48 D. Mean cylindrical axis of auto and subjective refraction was 119.64±52.53 and 118.28±52.58 with mean difference as 0.92±2.19 D. The difference of visual acuity was significant difference between auto and subjective refraction with p-value <0.05.^{18,21,22} In addition, investigations have shown insufficient agreement in non-cycloplegic circumstances in particular. Grand SeikoWR-5100K has the best of the three

autorefractors.^{23,24} In order to demonstrate a link to this different with age, a study has been conducted to compare the reflection obtained by self-refraction and subjective refraction.²⁵

Attebo et al²⁶ revealed in their investigation that after adjustment for age, women were slightly more hyperopic (mean +0.75 diopters) than men (mean +0.59 D). The gender adjusted mean spherical error increased with age +0.03 D in persons aged < 60 years to +1.2 D in persons aged ≥80 years (P<0.0001). The gender adjusted mean cylinder power similarly increased with age, from -0.6 D in those aged <60 years to -1.2 D in persons aged ≥80 years. Over the last few centuries, auto-refraction has become a key component of normal eye care and therapeutic practice. It has been found to be an excellent method for screening refractive error in pediatric patients.

CONCLUSION

The mean difference of visual acuity between auto and subjective refraction was significant.

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