COMPARATIVE EFFECT OF CYCLOPENTOLATE 1% AND TROPICAMIDE 0.5% ON BEHAVIOUR OF ASTIGMATISM

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ABSTRACT

OBJECTIVE: *The purpose of this study was to compare the effect of cyclopentolate and tropicamide on behavior of astigmatism. In this study, we assessed the association of cycloplegia with astigmatism.*

MATERIALS AND METHOD: *In this comparative cross-sectional (analytical) study 78 patients were included. The instruments used in this study were Trial frame, Trial box, Snellen chart, Retinoscope, Cycloplegic drugs (cyclopentolate 1% and tropicamide 0.5%). Cycloplegic refraction was compared with non-cycloplegic refraction. Cycloplegic retinoscopy was done with cyclopentolate and tropicamide. This data were entered on a self-designed proforma. The proforma consisted of patient profile, non-cycloplegic refraction, and cycloplegic refraction with cyclopentolate and with tropicamide.*

RESULTS: *Wilcoxon test was used to analyze the results for 78 eyes. Non-significant difference was seen with cyclopentolate retinoscopy and tropicamide retinoscopy ($p>0.05$). Spherical and cylindrical values show significant difference ($p<0.001$) and axis shows insignificancy.*

CONCLUSION: *Cycloplegic refraction and non-cycloplegic refraction was compared. In comparison sphere had a significant difference in both eyes after cycloplegia. Cylindrical value had a little difference after cycloplegia. In this study I found that axis did not change after cycloplegia. In this study I found that astigmatism did not alter with cycloplegia whether it is cyclopentolate or tropicamide.*

INTRODUCTION

A state in which the light rays entering the eyes focus on two distinct focal lines, rather than a single focal point is known as astigmatism. It occurs due to change in the curvature and refractive index of the eye. It also occurs due to change in optical components of the eye. Significant reductions in visual performance may occur due to uncorrected astigmatism and it may alter the visual and refractive development. The first description of the correction of astigmatism was done by the astronomer Sir George Biddell Airy in 1827. He corrected the oblique astigmatism of approximately 4D of his own eye by a cylindrical lens.[1]

In ophthalmological practice astigmatism is most common refractive error. Different types of ocular symptoms such as blurred vision, diplopia, glare and headache may occur as a result of uncorrected astigmatism. The direction of the axis of astigmatism is a key factor that influences the frequency and severity of subjective symptoms. Accurate determination of the axis of cylinder is essential to improve asthenopia induced by astigmatism and prevent meridional amblyopia.[2]

Astigmatism is a common refractive anomaly. Two components of astigmatism can be measured independently, refractive astigmatism (AR) and corneal astigmatism (CA). It is believed that the difference between the two internal astigmatisms (IA) arises from the inner optics of the eye, as well as the asymmetries associated with the crystalline lens.[3]

To determine the origin of ocular astigmatism, Young neutralized the effective power of his cornea by immersing in water in his study, he described the asymmetries in cornea, pupil, lens and the distances of the fovea and optic nerve from the visual axis; he concluded that the astigmatism was caused by the asymmetries of ocular components.[4]

Only about -0.305D posterior corneal astigmatism was found in human adults (18 to 65 years old).[5] The internal astigmatism in human is about 0.50D, against-the-rule.[6]

In school-aged children, uncorrected refractive error including astigmatism is a common vision anomaly which causes visual impairment and is the second leading cause of treatable blindness worldwide. Astigmatism changes the emmetropization and is associated with myopia progression and development of amblyopia. The factors which influence the prevalence of astigmatism are race, ethnicity, gender and age.[7]

High degrees of astigmatism may result in vision that cannot be improved into the normal range with any spectacle correction. If the refractive error is not optimally corrected in childhood, meridonial amblyopia may result.[8]

The increasingly frequent use of computers, tablets, and samartphones, both for work and free time, has caused healthy problems, of which the most frequent are the eyes (ie, asthenopia), which include discomfort, tension, fatigue, tiredness, burning redness and / or irritated eyes and blurred and double vision, in addition to discomfort in the neck/shoulders.[9] Refractive errors are the most common vision problem in the world. According to different studies, astigmatism is about 13 % of refractive error in the human eye. Many studies have described the incidence of astigmatism at different ages in rural and urban populations. The distortion and blur of the image are different according to the type of astigmatism.[10] Because of incorrective refractive error, more than 12 million 515 year-old children are visually impaired globally.[11] The prevalence of astigmatism in Chinese children ranges from 2% to 42.7%.[12]

The present data shoe prevelanceprevalence of refractive error is more common at the age of 810 years. But, the early finding of refractive errors in 35-year-olds remains significant objective because there is major progress in visual acuity and quality of life after providing initial treatment.[13]

The refractive status of 100 eyes was examined using retinoscopy in cycloplegic and non cycloplegic conditions. The statistical analysis of the result showed that the retinoscopic measurements for spherical and cylindrical values show small difference under cycloplegic and non-cycloplegic conditions.[14]

A study conducted between non cycloplegic refraction and cycloplegic refraction in 80 myopic eyes from age 5 to 13 years. It shows that the difference between cycloplegic and non cycloplegic refraction is relatively small which is less than 0.50 D.[15]

MATERIAL & METHODS

Ethical clearance to conduct this study regarding Effect of cycloplegia on behavior of Astigmatism was obtained from the College ofOphthalmology Aand Allied Vision Sciences, King Edward Medical University, Lahore. A comparative cross-sectional study (Analytical) was utilized. The size of the obtained sample was 78. The demographic details were also noted which included age and gender. The patients having astigmatism with no gender and age discrimination were included in this study. The uncooperative patients and patients with any ocular or systemic disease sanction and iInformed consent from the participants was also obtained. Informatiwas gatheredred by self-designed proforma in the form of hard copy. Data was fed omputercaptured using SPSS version 23.0 and Microsocting the data.Wilcoxon test was used to analyze the results. Qualitative variables was analyzed by using descriptive statistics e.g. frequency and percentages.

RESULTS

TABLE 1

	N	Minimum	Maximum	Mean	Std. Deviation
Age	78	3.00	15.00	6.6410	2.43873
Non cyclo_spherical_R	78	-6.50	7.25	0.8397	3.14244
non cyclo_Cyl_R	78	-4.25	-.25	-1.3141	1.11034
non cyclo_Axis_R	78	10.00	180.00	128.4615	51.04307
non cyclo_SPHERICAL_L	78	-5.00	6.25	.8718	2.44210
non cyclo_CYL_L	78	-5.00	-.25	-1.4103	1.16564
non cyclo_AXIS_L	78	90.00	180.00	146.4103	39.64041
cyclo_Sp_R	78	-6.25	7.50	1.1282	3.50365
cyclo_C_R	78	-4.75	-.25	-1.4359	1.23493
cyclo_A_R	78	10.00	180.00	128.9744	50.74995
cyclo_SP_L	78	-5.75	6.75	1.0962	2.86130
cyclo_C_L	78	-4.50	-.25	-1.4615	1.20677
cyclo_A_L	78	90.00	180.00	146.4103	39.64041

Wilcoxon test was used to compare the result between cycloplegic refraction and non-cycloplegic refraction.

Right eye spherical value (RES, non-cycloplegic) was compared with right eye spherical value (RES, cycloplegic).

The mean value of RES (non-cycloplegic) was 0.8397 and standard deviation was 3.14244.

The mean value of RES (cycloplegic) was 1.1282 and standard deviation was 3.50365. A small difference was occurred between non-cycloplegic and cycloplegic mean value. Right eye cylindrical value REC (non-cycloplegic) was compared with right eye cylindrical value REC (cycloplegic).

The mean value of REC (non-cycloplegic) was -1.3141 and standard deviation was 1.11034. The mean value of REC (cycloplegic) was -1.4359 and standard deviation was 1.23493. Right eye axis REA (non-cycloplegic) was compared with right eye axis REA (cycloplegic).

The mean value of REA (non-cycloplegic) was 128.4615 and standard deviation was 51.64367. The mean value of REA (cycloplegic) was 128.9744 and standard deviation was 50.74995. The mean values before and after cycloplegic retinoscopy was almost same.

The same comparison was applied with the left eye before

and after cycloplegia.

Fig 1: Frequency of Change in Sphere after Cycloplegia

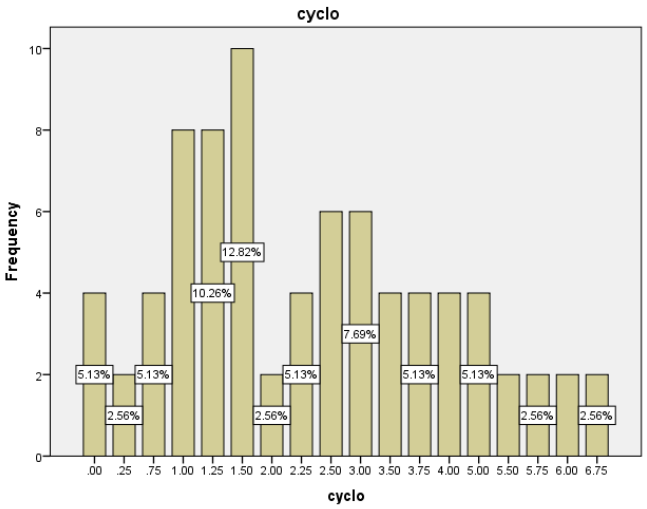

Fig. 1 shows that in majority of the patients change in sphere was in between +1.00 and +1.50D.

Fig 2: Frequency of Change in Cylinder after Cycloplegia

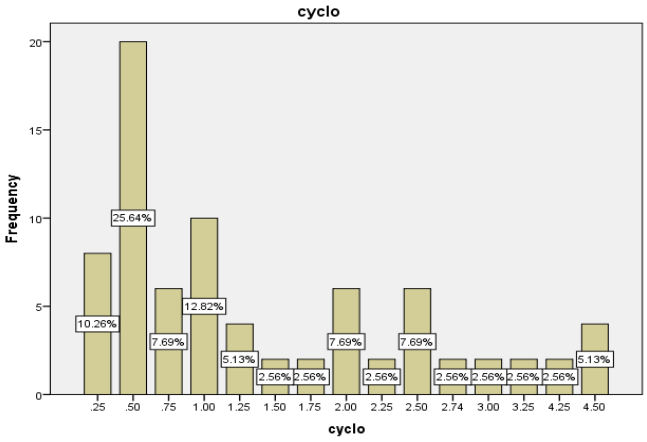

Fig. 2 shows that in majority of the patients there is no or little change in cylindrical value after cycloplegia. The patients with moderate astigmatism (25.64 %) show a change of +0.50 in cylindrical value, otherwise there is no change in cylindrical value in astigmatic patient.

TABLE 2: Frequency Table of Cycloplegic Drugs

	Frequency	Percent
Cyclopentolate 1%	40	51.3
Tropicamide 0.5%	38	48.7
Total	78	100.0

Table 2 shows that 51.3 % patients undergo cycloplegic refraction by cyclopentolate 1% and 48.7 % patients undergo cycloplegic refraction by tropicamide 0.5 %. The difference in these drugs is only the onset duration and functional recovery.

TABLE 3:

	cyclo_Sp_R - Non cyclo_ spherical_R	cyclo_C_R - non cyclo_Cyl_R	cyclo_A_R - non cyclo_ Axis_R	cyclo_SP_L - non cyclo_ SPHERICAL_L	cyclo_C_L - non cyclo_ CYL_L	cyclo_A_L - non cyclo_ AXIS_L
Z	-3.326[b]	-2.289[c]	-1.414[b]	-2.797[b]	-1.259[c]	.000[d]
Asymp. Sig. (2-tailed)	0.001	0.022	0.157	0.005	0.208	1

DISCUSSION:

Children which undergo cycloplegic refraction gets scared from examiner and avoid the next possible visit of optometrist. They also become highly uncooperative and some hostile towards the examiner to avoid the instillation of cycloplegic eye drops.

Most common problem which I observed while performing duty in pediatric clinic was that kids usually start crying in response to stinging effect of cycloplegics. This increases the chances wastage of drugs due to outflow of tears from eyes reducing the contact time of drug with eyes.

In a study, 50 subjects (100 eyes) were refracted initially by using non cycloplegic retinoscopy and then the procedure was repeated on the same patient, after instillation of 3 drops of cyclopentolate 1% eye drop separated at the interval of 10 minutes, after 45 minutes of instillation of first drop. Results showed significant difference found in spherical values of moderate astigmatism with p value 0.000, Whereas no difference found in cylindrical values of moderate astigmatism and spherical and cylindrical values of high astigmatism with p value greater than 0.05.

This above study correlates well with an international study conducted by Cordonnier M and Dramax M. In this cylindrical power was measured with and without cycloplegia by handheld refractive Retinomax. No difference was seen in cylindrical powers before and after instillation of cycloplegic drops.[16]

CONCLUSION

It is concluded that the difference between cycloplegic and non cycloplegic retinoscopy is relatively small. Spherical values change after cycloplegia but cylindrical values change a little. And axis did not change at all.

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