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Monocular effect of cycloplegia on accommodation

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Abstract

Purpose: This study aimed to assess the monocular effect of cycloplegia on accommodation.

Methodology: Participants in this experimental study ranged in age from 18 to 30. The patients were chosen from various Sankara eye hospitals units. The study excluded patients with visual anomalies, strabismus, presbyopia, aphakia, and pseudo-phakia. Before and after administering 1% cyclopentolate to the other eye, the individuals underwent pupillography, the near point of accommodation test (NPA), the monocular estimating method (MEM), and the accommodative facility test (AF).

Result: 20 individuals in all, of whom 45% were women and 55% men, were included in the study. Prior to the administration of Cycloplegic, the mean pupil value was 4.0185%, and it was 4.3175% post cycloplegic effect. Similar to this, the un-dilated eye's mean NPA value was 8.3 while the dilated eye's mean value was 9.55. Before the injection, the mean value of AF was 8.5, and it was 7.2 afterward. Additionally, the mean MEM value of the un-dilated eye was 0.225, and the subsequent value was 0.3125.

Conclusion: After the cycloplegia instillation, there was a modest change in the monocular undiluted eye's pupil size. All individuals' monocular un-dilated eyes showed an increase in NPA value and a decrease in AF, although their MEM remained stable in 70% of cases but showed a minor shift in 30% of cases.

Keywords: Cycloplegia, accommodation

Introduction

By changing the curvature of the lens, the eye adjusts its refractive power to focus on objects at various distances. This process is known as accommodation. Although it can be continuously controlled, accommodation frequently behaves like a reflex, including a portion of the accommodative vergence reflex ^[1]. The ciliary muscle contracts and the zonules relax to produce accommodation ^[2]. The lens is thinner when the ciliary muscles are relaxed. It has a longer focus length as a result, and when the ciliary muscles contract, the lens' thickness rises, causing the diameter to fall as the lens becomes more spherical ^[3]. Cycloplegics inhibit accommodation & allow latent refractive errors to become manifest, thus enabling accurate estimation of the error ^[4]. the paralysis of the ciliary muscles of the eye resulting in the loss of visual acuity is defined as cycloplegia ^[5]. Cycloplegics drugs are also known as antimuscarinics, anticholinergic or parasympathetic ^[6]. These helps in paralysis of sphincter muscle of iris causing dilatation of the pupil, for this reason they are also called as mydriatics. Cycloplegic blocks the action of parasympathetic nervous system and results in paralysis of ciliary muscle & mydriasis inhibiting accommodation and manifest latent refractive errors ^[7]. Cycloplegia is necessary for controlling accommodation & obtaining an accurate refraction in patients ^[8]. there are many cycloplegic drugs which are used. Cyclopentolate, a synthetic antimuscarinic agent with action similar to that of atropine ^[9]. Cyclopentolate was used in this study to induce quick mydriasis & inhibit accommodation. Cycloplegic is formulated as hydrochloric salt solution & most commonly used drug. The drop is instilled for 3 times 5-10 minutes of gap & onset of this agent is 30-40 minutes after instillation. The cycloplegic & mydriatic affects typically last for 6-24 hours or may last for several days in some patients and the tonus allowance is +0.75D ^[10].

Materials and Methods

In this research work, 20 participants-9 women and 11 men-were selected from the Sankara Eye Hospital using a practical sampling method. The age range is between 18 and 30.

The study only included those subjects who gave their consent and had no refractive problems. In all participants, the best corrected monocular visual acuity measured was 6/6. Both objective and subjective refraction were performed. Patients were excluded from the research if they had any ocular pathology, neurological disorder, amblyopia, presbyopia, developmental delay, aphakia, strabismus, pseudophakia, were unwilling to participate, or had refractive errors. The primary eye examination, which included history collection, visual acuity testing, objective refraction, subjective refraction, and comprehensive eye evaluation was performed for each subject after the individuals who were willing to participate in the study signed the consent form. A slit lamp and an ophthalmoscope were used to evaluate the anterior segment and posterior segment. All subjects' unaided visual acuity was measured. All subjects had their pupils measured using corneal topography. All patients had their near point of accommodation assessed using a same scale and linear target. Retinoscopy was used to carry out MEM. All subjects completed the final task, the accommodation flipper, prior to receiving the 1% cyclopentolate injection. After comprehensive eye examination, patients satisfying the inclusion criteria were selected for the study. An informed consent form is provided before the participation.

A drop cyclopentolate 1% was instilled monocularly in all subjects. The application of cyclopentolate 1% was repeated after 10 minute's gap in each subjects for 3 times. At last, complete mydriasis was checked after 35-45 minutes. As there was no pupillary activity observed, the four tests which includes NPA, MEM, Pupillography, and Accommodative facility was performed again in fellow non-dilated eye. After complete examination data was collected and therefore analyzed.

Result

MS Excel was used to do the statistical analysis. The entire number of respondents was chosen, with 9 (45%) females and 11 (55%) males in the 18-30 age range. Before cycloplegic was injected into an undilated eye, the mean pupillography value was 4.0180.80; after cycloplegic was injected, it was 4.1840.06. The mean NPA value before injection was 8.300.96, and the mean NPA value after injection was 9.550.66. In an undilated eye, the mean MEM value before injection was 0.220.34 and the mean MEM value after injection was 0.030.42. At last, mean value of AF before was 8.50 ± 3.26 & after was 7.20 ± 3.02 in fellow undilated eye.

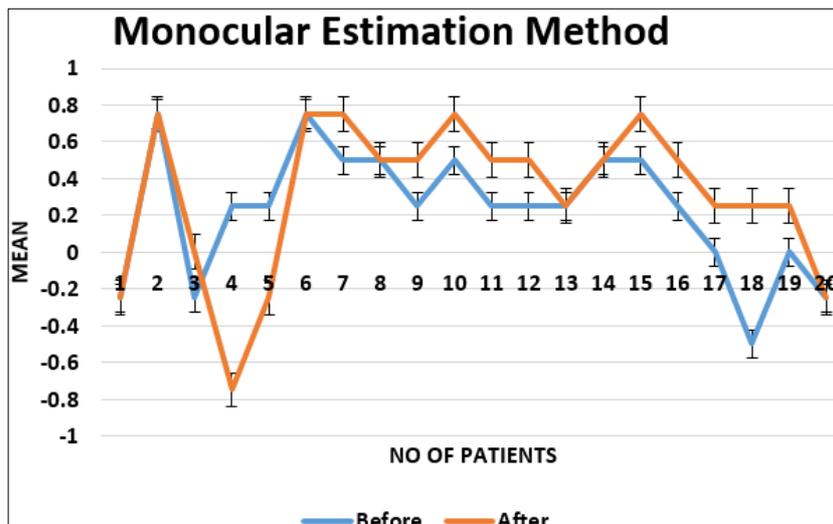


Fig 1: The diagram shows changes in monocular estimation method (MEM test) before and after instillation of cycloplegic eye drops

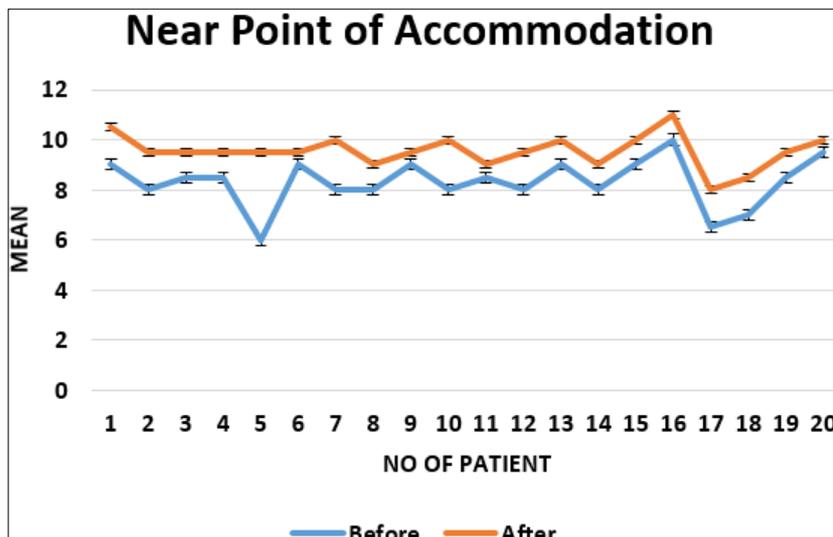


Fig 2: The diagram shows changes in Near Point of Accommodation (NPA) before and after instillation of cycloplegic eye drops

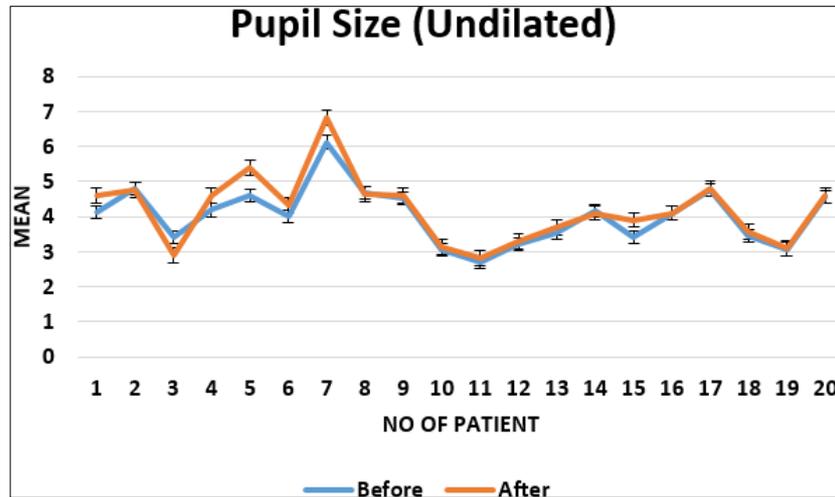


Fig 3: The diagram shows changes in Pupil size (Undilated) before and after instillation of cycloplegic eye drops

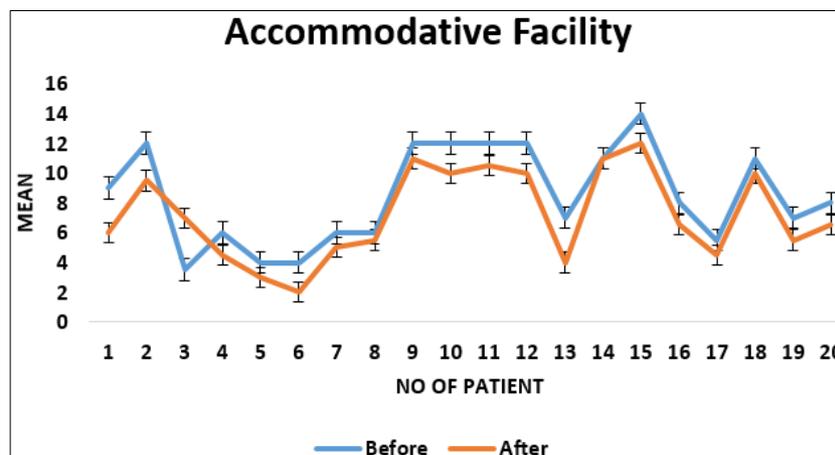


Fig 4: The diagram shows changes in Accommodative Facility before and after instillation of cycloplegic eye drops

	Mean(before)	Mean(after)
AF	8.50	7.20
	Before Cyclopentolate 1%	After Cyclopentolate 1%
Pupil Size (Un-dilated)	4.018+0.80	4.184+0.96
NPA	8.30+0.96	9.55+0.66
AF	8.50+3.26	7.20+3.02
MEM	0.22+0.34	0.3+0.42

Discussion

According to a 1986 study by M. Rosenfeld and P. B. Linfield on the impact of cycloplegics on apparent near point and distance accommodation capacity, measuring near point accommodation ability is not a reliable way to determine the severity of cycloplegia. In a different study on the effects of cyclopentolate and phenylephrine on pupil diameter and accommodation, J. Mordi *et al.* discovered that cyclopentolate has both immediate and long-lasting effects. In a study on residual accommodation under homatropine and cocaine cycloplegia, Paul M. Brickely and colleagues discovered that cycloplegia fully eliminated the power of accommodation. The investigation on monocular cycloplegia for controlling myopia by W.H. Luedde *et al.* discovered that the effect noted on the course of myopia was binocular rather than monocular cycloplegia and that there was no vision impairment or pathological alterations in ocular findings. Another study by Halil Ibrahim Altinsoy *et al.* examined the impact of cycloplegia on the identification of refractive errors in school-aged children using three different refractometers. They discovered that photo

refractometers can identify children's refractive problems without the requirement for cycloplegia.

Conclusion

Based on the result, it can be concluded that there are changes in parameters of accommodation where NPA was increased in un-dilated eye, pupil size changed slightly & AF was decreased un-dilated eye. Also MEM remained same in 70% and increased in 30% subjects. Therefore, the study showed monocular effect of cycloplegia on accommodation.

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