Changes in pattern electroretinogram after application of 0.01% atropine eye drops

Dear Sir,

We want to report a profound, reversible reduction in p50 (N35–p50) amplitude in the pattern Electroretinogram (PERG) of eyes treated with low dose (0.01%) atropine eye drops without a significant change in the implicit time.

Recently, 0.01% atropine eye drops has become popular as first-line treatment for progressive myopia in children.[1] Potential side effects of topical atropine eye drops include pupillary mydriasis, reduced accommodation, light sensitivity, near vision blur, headache, ocular allergy, periocular dermatitis, angle closure glaucoma, drug-related retinal toxicity, and mydriasis-related phototoxicity. The investigators of Atropine in the Treatment of Myopia studies have reported a lack of retinal toxicity with long term (2 years) use of atropine eye drops in children with progressive myopia using multifocal ERG (MFERG) testing.[2,3]

We obtained full field ERG (FFERG), PERG, and MFERG from the eyes of the authors (subject 1, MK, male, 43 years old, high myopia with best corrected vision 20/20 and subject 2, NK, female, 32 years old, emmetrope with best corrected vision 20/20). Both the subjects underwent ERGs on a Roland Consult ERG machine (Brandenburg, Germany) and Dawson, Trick, Litzkow (DTL) electrodes using International Society for Clinical Electrophysiology of Vision (ISCEV) standard protocol. After obtaining the baseline ERGs, one drop of 0.01% atropine eye drop (Myopin®, Appasamy, Chennai, India) was instilled four times at an interval of 1 min in the right eye of subject 1 and left eye of subject 2. The other eye was used as a "control." Forty five minutes after after application of 0.01% atropine eye drops, ERGs were repeated using the same protocol. This was immediately followed by anterior segment optical coherence tomography (ASOCT) using Cirrus HD-OCT (Zeiss, Germany) to document the biometric changes. As such, the ERG technician and the electrophysiologist (DB) were unaware about which eye had received atropine eye drops.

One week later ERGs were re-recorded. The "control" eye of each subject (as designated above) was dilated with two drops of tropicamide 0.8%-phenylephrine 5% eye drops (Itrop plus®, Cipla, Mumbai, India). After 45 min, the ERGs were obtained from both the eyes to assess the effect of mydriasis and loss of accommodation sans "atropine effect".

No significant changes were found with either Myopin® or Itrop plus® on FFERG and MFERG. PERGs demonstrated profound, reversible reduction in the amplitude of P50 (N35-P50), more in the Myopin® treated eyes than Itrop plus® treated eyes [Table 1 and Fig. 1]. The biometric changes on ASOCT as well as P50 changes were more profound in subject 1, who had light colored iris compared to subject 2.

Atropine is a potent anticholinergic drug and a variety of vertebrate species possess cholinergic transmitting mechanisms in their retinae.[4] The acetylcholine-receptors are detected in the outer and inner plexiform layers of the birds and mammals with a considerable interspecies variability in its distribution.[4] Compared to avian retinae, mammalian retinae have higher cholinergic activity in the inner plexiform layer than the outer plexiform layer. The PERG finding discovered by us could be a result of an alteration in the signal transmission in the retina or due to blurring induced due to cycloplegia and mydriasis or both.

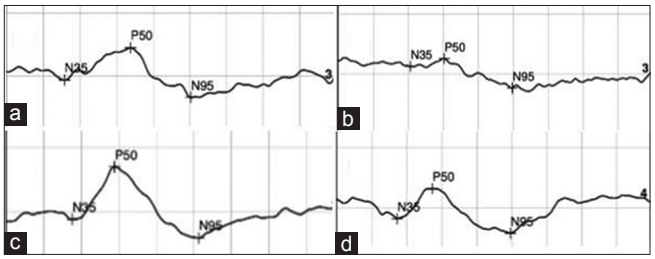

Figure 1: PERGs of subjects 1 and 2 before and after 0.01% atropine eye drops. (a) Baseline PERG of subject 1. (b) After 0.01% atropine eye drops demonstrating a decrease in P50 amplitude from 2.58 μv to 600 nv on small checker board pattern. (c) Baseline PERG of subject 2. (d) After 0.01% atropine eye drops demonstrating a decrease in P50 amplitude from 4.10 μv to 2.51 μv on small checker board pattern

Table 1: Biometric changes (anterior segment OCT) and changes in PERG after Myopin® eye drops and Itrop plus® eye drops

		Baseline	After Myopin®	Baseline	After Itrop plus®
Subject 1	P50 (mv)	2.58	0.6	2.83	1.05
	Pupil (mm)	3.239	6.284	3.230	6.251
	Anterior chamber volume (mm^2)	24.79	28.79	24.26	29.17
Subject 2	P50 (mv)	4.10	2.51	3.31	2.87
	Pupil (mm)	3.264	4.396	3.790	4.861
	Anterior chamber volume (mm^2)	21.20	20.27	20.94	22.58

Further studies are necessary to assess the macular functions of children treated with low dose atropine eye drops.

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Conflicts of interest

There are no conflicts of interest.

Mihir Kothari[1,2], Deepak Bhat[3], Nitu Khadse[1], Rishika Jain[1], Vivek Rathod[1], Pallavi Aru[1]

[1]Department of Pediatric Clinical Optics and Refraction, Jyotirmay Eye Clinic and Ocular Motility Laboratory, 104/105, Kaalika Tower, Kolbad Road, Opp. Pratap Cinema, Khopat, Thane, [2]Department of Pediatric Ophthalmology and Strabismus, Mahatme Eye Bank and Eye Hospital, Chintaman Nagar, Somalwada, Nagpur, [3]Department of Electrophysiology, UBM Institute - The Institute for High Resolution Ophthalmic Diagnosis, Door No. A1, Ganesh Baug, No. 214, Behind Ruia College, Bhalchandra Road, Dadar East, Mumbai, Maharashtra, India

Correspondence to: Dr. Mihir Kothari, Jyotirmay Eye Clinic, 104/105, Kaalika Tower, Kolbad Road, Opp. Pratap Cinema, Khopat, Thane, Maharashtra - 400 601, India. E-mail: drmihirkothari@jyotirmay.com

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