



Optometry mismanagement in Patient with latent hyperopia, misdiagnosed as Pre-Presbyopia (age 30-35yrs)

Authors

Samir Sutar¹, Mossab Omaer¹, Ram Gopal¹, Dr Pradeep Agrawal²

¹Department of Optometry and Vision science, C L Gupta Eye Institute

²Department of Pediatric Ophthalmology and Strabismus, C L Gupta Eye Institute

Abstract

This study highlights mismanagement in glass prescription in optometry care services and the importance of modified fogging technique (Borish's delayed subjective refraction) to detect latent hyperopia, especially those patient age group of (30-35 years) associated with prolonged near work followed by asthenopia symptoms and near vision blur. This retrospective case series study was done at a tertiary care eye hospital in Uttar Pradesh, India. Thirty patients, presented with complaints of blurring of vision specially near work and asthenopic symptoms with history of aggravation of symptoms with prolonged near work (ill sustained of accommodation). Refraction was initially showing hyperopic refractive error but it was ignored view of vision was 20/20-20/25 for distance but found to be gross near vision difficulty (N18), simple near addition was prescribed. To prove mismanagement in Optometry care, a simple / modified fogging technique was introduced and was performed over the same patient. After this technique there was noted latent hyperopia and VA was 20/20 for distance with near vision N6 without any near add found. Diagnosis of latent hyperopia was made. Single glasses for distance were prescribed. Patients were observed after 2 months in which none had recurrence. The condition resolved and asthenopic symptoms were improved.

Keywords: Latent hyperopia, Boris's delayed subjective test, Ill sustained of accommodation.

Introduction

Many persons between the ages of 30 and 40 years who have low hyperopia require no correction, because they have no visual symptoms^[18]. Ample accommodative reserves shelter them from visual problems related to their hyperopia. Under increased visual stress, such persons may develop symptoms that require correction. Wearing prescribed lenses with low amounts of plus power usually alleviates the problem. Patients with moderate degrees of hyperopia are more likely to require at least part-time correction, especially those who have significant near demands or have accommodative or binocular

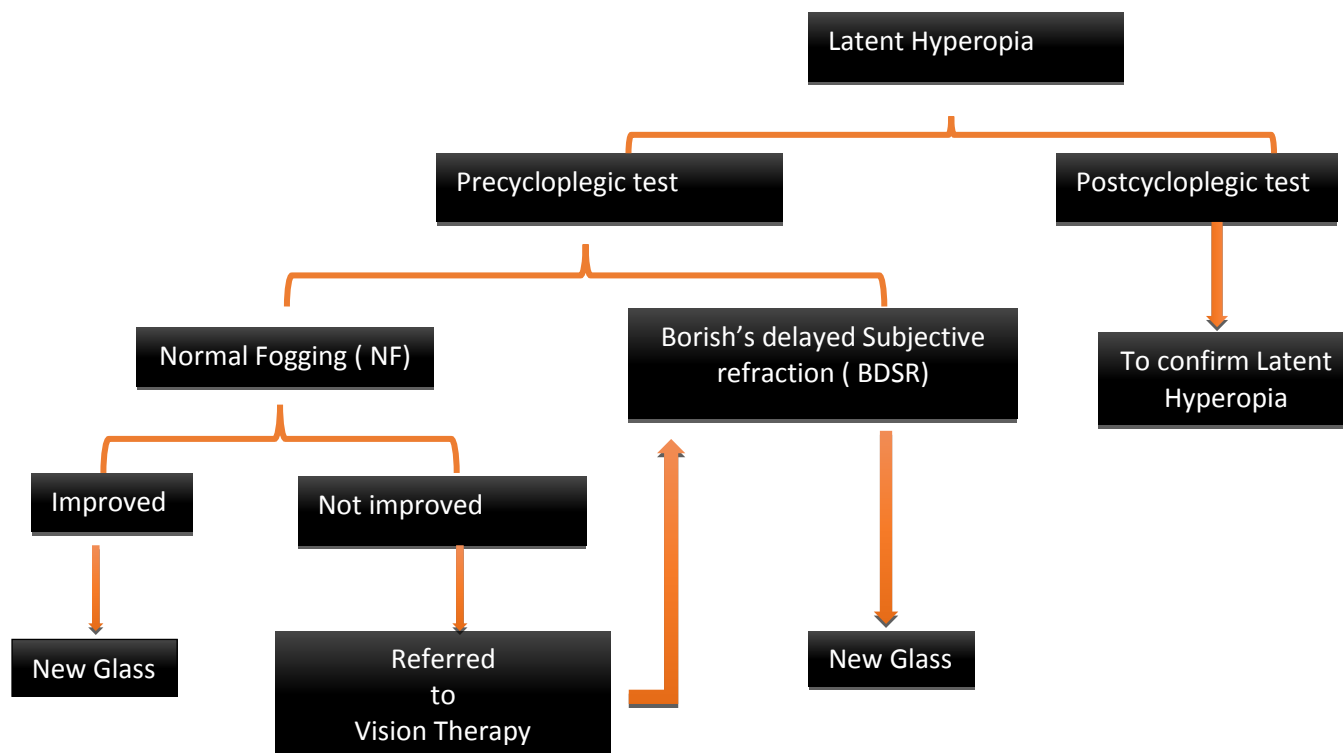
anomalies.^[18-19] Management includes determining its underlying etiology and inhibiting the ill sustained of accommodation using strong modified fogging noncycloplegic agents and single vision glass for distance. Recurrence is sometimes associated with irregular using of glass and continuous near work. In this study, we have reported mismanagement in optometry care to ignore latent hyperopia, and later on we have used modified fogging technique in case of latent hyperopia with the presence of aggravating factors and observed the effect of slow weaning effect of distance correction along with the avoidance of aggravating factors to prevent its recurrence.

Methodology

We have included 30 patients, consecutively diagnosed as Pre-presbyopia in our outpatient department, after all comprehensive eye examination, patient was advised for bifocal or near single vision glass, but recurrent visual symptoms noticed when patient presented to us again in outpatient department with complaint of glass is not adequate for near vision. Patients who are included in study and visited with complaints have used their glasses for a minimum of one month duration, again re-evaluate patient and found to be patient have gross hyperopia, which is latent component (which was confirm in dry refraction and found in severe lag of accommodation in dynamic Retinoscopy). According to management protocol of the case series we did normal dry fogging followed by

cyclo-plegicrefraction. If dry fogging is not enough to detect latent component, performed modified fogging technique (Borish’s delayed subjective refraction).This method basically used for accommodative excess and spasm of accommodation (NRA followed by distance defogged) as discussed by Borish’s clinical refraction. Finally result was quite unexpected in this technique after treatment group. All patients, those who are not accepted in normal subjective refraction, however those patient were undergone simple fogging technique and some of them are under gone modified fogging technique. Explained to the patient about pro and cons of glass and condition at present scenario and prescribe the glasses for distance. None of them had found to be recurrent visual significant complaint with glass over 2 months of times.

Management Protocol



Methodology

The study was carried out in patients attending Department of Pediatric ophthalmology and strabismus, C L Gupta Eye institute, Moradabad from December 2018 to May 2019. We included the latent hyperopic patients up to the age group

of 30-35 years and were willing to take part in study and were ready for regular follow-up. Diagnostic criteria based on Objective refraction followed by fogging. Patient with latent hyperopia, divided in to two groups (Pre and Post Cycloplegic Group).

In Precycloplgicphase, we did fogging followed by those patient improve with that, prescribed glass with explained pro and cons of the glass . In the other hand those who didn't improve with fogging, referred patient to vision therapy clinic. On the same day we did Borish's delayed subjective refraction (NRA followed distance defogging binocularly with adequate adaption) followed Prescribed glasses with explained all the necessary thing related to glass.

Statistical Method

All statistical analyses were performed using SPSS software. Comparisons of the clinical measures at baseline were performed using 1-way analysis of variance (ANOVA) and paired t test. Analysis of covariance was use also paired t test to compare the outcome measures using the baseline value as a covariate. In our case series pvalue <0.05 is considered as statistical significant

Results

The mean± SD age is 32.48±1.477 with male and female ration is (11:19). The mean±SD refractive error (acceptance) showed both the group a statistically and clinically significant ($P<.05$) from 0.25±0.23 to 0.94±0.18 pre and post fogging ($t=13.85, p<0.01, N=30$). There was also statistical and clinically significant in before and after fogging vision group ($P<0.05$) from 0.4±0.4 Log Mar to 0.0±0.0 Log Mar. The mean ± SD refraction shows statistical and clinical significant in dry refraction (0.96±0.31) and cycloplegic refraction (1.6±0.35) ($t=7.35, p<0.05, N=30$)
 The scatter plot graph (Table: 4 and Table C) showing results of normal fogging (NF) compare with Borish delayed subjective refraction (BDSR). The mean ±SD of normal fogging values is (0.75±0.00), which were after Borish's delayed subjective refraction (1.46±0.11), which was both clinical and statistical significant ($t=21.06, p<0.01, N=30$)

Table A: Subjective acceptance and vision Pre- fogging and post fogging.

	Results ($t_1=13.85, p<0.05, N=30$)		p Value
	pre-fogging	post fogging	
Refraction	0.25±0.23	0.94±0.18	<0.05
Vision	0.4±0.4	0.0±0.0	<0.05

Table B: Dry Refraction and Wet retinoscopy

	Dry retinoscopy	Wet retinoscopy
Refraction	0.96±0.31	1.6±0.35
$t_2 = 7.35, p<0.05, N=30$		

Table C: Comparison of subjective acceptance NF (Normal fogging) and Borish's delayed subjective refraction (BDSR)

	NF	BDSR
Refraction	0.75±0.00	1.46±0.11
$t=21.06, p<0.01, N=30$		

Table: 1

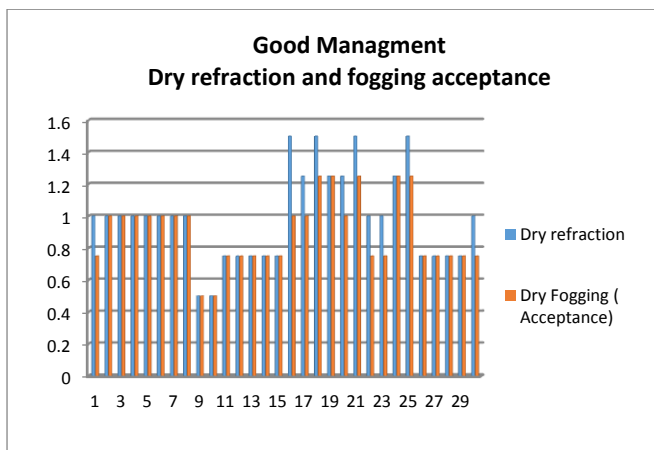


Table: 2

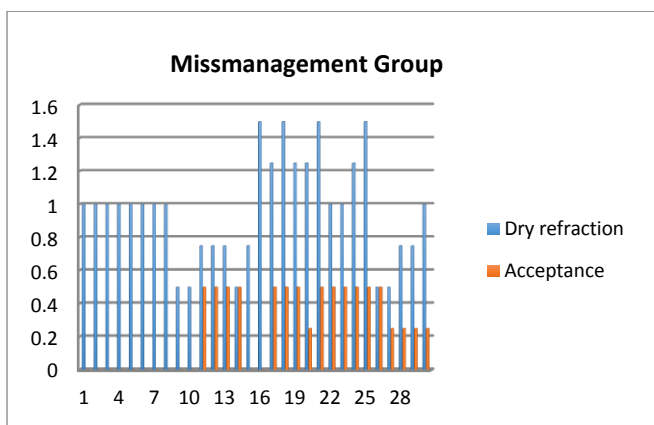


Table: 3

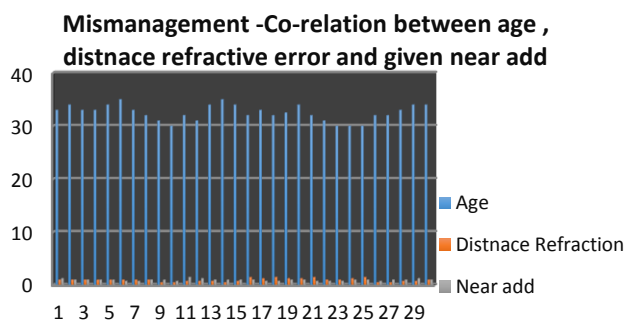


Table: 4

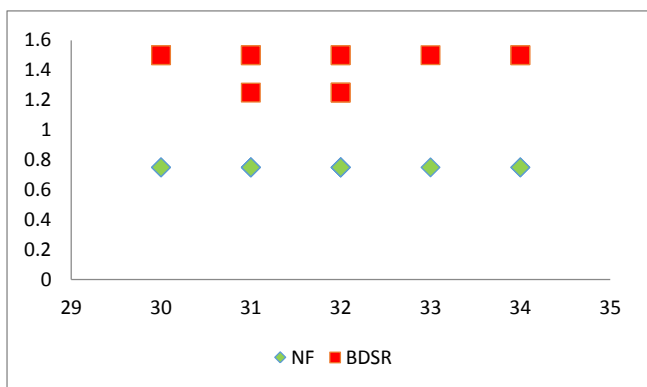


Table 2 and 3: Shows mismanagement done by optometrist. Most of the patient did not accept

hyperopic correction in normal subjective refraction also advised for near but table: 1 shows good management group after strong fogging, all the patient accept hyperopic correction without any near add.

Discussion

The pre-presbyope or emerging presbyopia is surprised by decreased vision for near. In fact the pre-presbyopia or emerging presbyope is apprehensive about what's coming next⁽¹⁾. As noted in the present study, inertia of accommodation or accommodation in facility was the most frequent primary diagnosis among this 30 to 35 yrs.

In our case series, we had thirty cases which were diagnosed pre-presbyopia, early accepted near addition and the presence of predisposing factor such as excessive near work, that can leads to in this age group and landed to ill sustain of accommodation. All patient undergone a simple fogging technique proved latent hyperopia component and those patient are still not improved with normal fogging technique, was performed modified fogging technique (Broish's delayed subjective refraction). Simple MEM (monocular estimation method) followed by a normal fogging can able to diagnosed latent hyperopia component in this age group instead of diagnosed those to pre-presbyopia. There is exceptional case where patient have accommodation insufficiency will need near addition, apart from this there no such term pre-presbyopia . Previous few authors have named it emerging presbyopia (going to have add)^[18]. After prescribing the distance glass to all patient, visual symptoms was not noted in any of the patient .After 2 months also none of them had visual significant with prescribed glass .But larger sample size with longer follow up is required to reach definite conclusion on emerging presbyopia Describe the Basic pathology, patient receive near add instead of latent hyperopic for distance. This model showing vergence and accommodation adaptation and dual interaction.

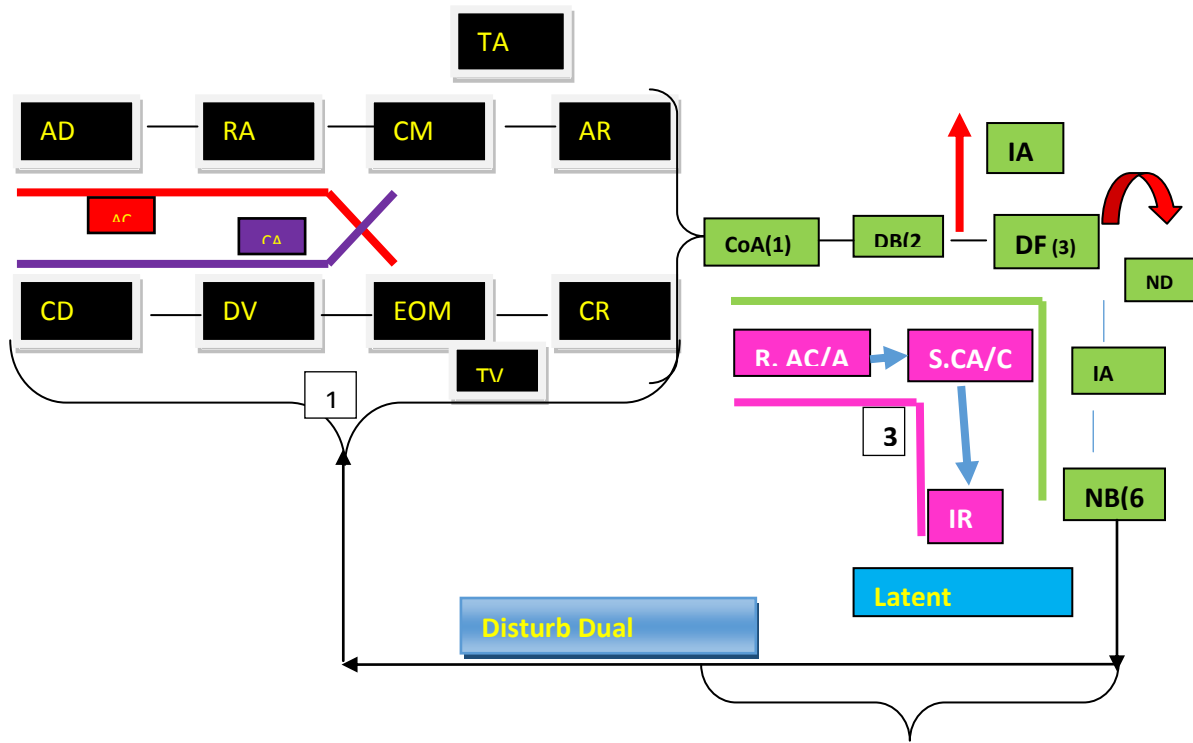


Table 1: Dual interaction (Ac/A and CA/C) , The 1st part of model described by Borish’s Clinical refraction and 2nd and 3rd part of model modified by Samir (2019) showing Pathology , how latent hyperopia activate
 Table 2 (Green) : CoA-Constant accommodation, DB-distance blur, IAD- increase accommodation demand, DF- Distance feedback, ND- Near demand, IA- Inertia of accommodation, NB- near blur
 Table 3 (Pink): R.AC/A – Response accommodation convergence / accommodation, S.CA/C- Stimulus convergence accommodation / convergence, IRA- Inappropriate reflex accommodation.

As Borish’s described about dual interaction (near synkinetic reflex) occurs in every individual .But as age is increase amplitude of accommodation decrease with age (0.30D/year)^[7, 8, 9, 10]. Before presbyopia our accommodation start decrease in general (starts 20 years and end 50 years of age) as described in Borish’s in clinical refraction. There are seven static component acts to before introduce presbyopia in general (Tonic accommodation, Gain, accommodation adaptation, depth of focus, AC/A, CA/C, amplitude of accommodation)^[7, 11, 12, 13, 14]. All the factors are getting diminished of their mechanism starting from 20 years and ends in 50 years of age^[7,8]. However in this period, most of the patient developed latent hyperopia, which we have shown in our case series during that period patient only demand for near but not for distance (ignored latent hyperopia).

AC/A and CA/C is two types (stimulus and response). As age increase, the response AC/A is also increase (0.10 PD/1D) because near blur stimulate reflex accommodation which is carried by AC/A. At the same time stimulus CA/C is decrease as age is increase (0.90D/1MA)^[1-3]. CA/C As described by Borish’s CA/A were abnormally high or low with age (idiopathic), reflex accommodation would not receive appropriate convergence accommodation ^[1, 2]. CA/A and ratio is highly co-related with presbyopia, which declines linearly from the age of 20 years to until presbyopia ^[4, 5, 6]. CA/C stimulate by retinal disparity and AC/A stimulated by blur. CA/C is strongly associated with AC/A. If CA/C is decrease, AC/A also decrease with age and have temporary patient will landed to inertia accommodation .That inertia of accommodation leads to develop hyperopia , that hyperopia part have near blur and constant accommodation . To

clear, patient will accommodation for near, that was described by feedback loop chapter of horizontal vergence in boorish clinical refraction. To correct that latent hyperopia part, need strong fogging and that fogging will help to restore that accommodation and vergence part after accommodation and vergence adaption. but as per Borish's if the CA/C ratio decreased with age and also have latent hyperopia component, fogging would not help much to reactivate the vergence and accommodation part^[15,16,17], however to prove that, we have performed boorish delayed subjective refraction test instead of normal fogging for latent hyperopia and given adaption time to patient for 45 mints after end of the procedure, soon after we checked AC/A, it was within normal limit (6:1) and also CA/C also improved (previously it was NFV-5PD break point, after adaption with strong fogged lens NFV was 12-14PD).

As author's knowledge, there can be possibilities for near demand and ignorance of latent hyperopia in this age groups. There statuses of four static components with age as follows. Might patient have predominately hyperopia, due to inertia of accommodation or it can be Idiopathic (age increase amplitude of accommodation, accommodation adaption decreased) or else due to abnormally CA/C ration high or low which was described by boorish et al.

Conclusion

Latent hyperopia can misdiagnosed as pre-presbyopia. There is no term as such pre-presbyopia, can only named as emerging presbyopes as described by William et al. Triggering factors also provides key to diagnosis of latent hyperopia like focusing difficulty and lag of accommodation in MEM (monocular estimation method). Fogging is playing most important role in latent hyperopia. This is basic optometry practice, where can avoid to give glasses for near and diagnosed latent hyperopia instead of pre-presbyopia. Basic optometry practice, fogging should to be done in every cases

irrespective of refractive error. It's a technique of non cycloplegic relaxation the accommodation, however fogging can help much to regain accommodation and Vergence related issues in that particular age group.

For most eye care professionals, the goal of the treatment for latent hyperopia is not only provide glasses but also observe accommodative status in every visit because this patient very high chances to landed up toill sustained and inertia of accommodation. As an optometrist we should taking care of this part and visual symptoms along with explained nature and course of the condition. AI (Accommodative insufficiency) and CI (Convergence insufficiency) may act together (dual interaction), however that should not be excluded during examination as an optometrist along with fogging part. Thus, we used another set of criteria to define patients as "Improved" instead of cure

Patient consent

Written informed consent was obtained from all patients for any academic or publication of these case reports and if any accompanying images.

Funding

No funding or grant support.

Conflict of interest

The following authors have no financial disclosures

Reference

1. Bruce AS, Atchison DA, Bhoola H. 1995. Accommodative convergence and age. *Invest Ophthalmol Vis Sci* 36:406-413.
2. Ciuffreda KJ, Rosenfield M, Chen HW 1997. The AC/A ratio, age and presbyopia. *Ophthalmic Physiol Opt* 17:307-315.
3. Rosenfield M, Ciuffreda KJ, Chen HW 1995. Effect of age on the interaction between the AC/A and CAIC ratios. *Ophthalmic Physiol Opt* 15:451-455.
4. Fincham EF, Walton I. 1957. The reciprocal actions of accommodation and convergence] *Physiol (Land)*137:488-508.

5. Bruce AS, Atchison DA, Bhoola H. 1995. Accommodation convergence relationships and age. *Invest Ophthalmol Vis Sci*36:406-413.
6. Kent P Ro 1958. Convergence accommodation. *Am J Optom Arch Am Acad Optom* 35:393-406.
7. Mordi IM. 1991. Accommodation, aging and presbyopia. Doctoral dissertation, State College of Optometry, State University of New York, New York, NY.
8. Mordi IM, Ciuffreda KI. 1998. Static aspects of accommodation: Age and presbyopia. *Vision Res*38: 1643-1653.
9. Hofstetter HW. 1965. A longitudinal study of amplitude changes in presbyopia. *Am J Optom Arch Am Acad Optom*42:3-8.
10. Duane A. 1909. The accommodation and Donder's curve and the need of revising our ideas regarding them. *IAMA*52:1992-1996.
11. Ciuffreda KJ, Rosenfield MR, Mordi J, Chen HW. 2000. Accommodation, age, and presbyopia. In Franzen O (Ed), *Accommodation and Vergence Interactions*, pp 193-200. New York: Springer-Verlag.
12. Hung GK, Semmlow II.. 1980. Static behavior of accommodation and vergence: Computer simulation of an interactive dual-feedback system. *IEEE Trans Biomed Engn*27:439-447.
13. Hung GK. 1992. Adaptation model of accommodation and vergence. *Ophthalmic Physiol Opt* 12:319-326.
14. Hung GK, Ciuffreda KL, Khosroyani M, liang Be. 2002. Models of accommodation. In Hung GK, Ciuffreda KI (Eds), *Models of the Visual System*, pp 287-339. New York: Kluwer Academic/Plenum Publishers
15. Saladin II. 1986. Convergence insufficiency, fixation disparity, and control systems analysis. *Am J Optom Physiol Opt*63:645-653.
16. Carlson NB, Kurtz D, Heath DA, Hines e. 1996. *Clinical Procedures for Ocular Examination*, 2nd ed. p 135. Stamford, Appleton & Lange.
17. Ong E, Ciuffreda KI. 1995. Nearwork-induced transient myopia. *Doc Ophthalmol*91:57-85.
18. Objective accommodation measurements in prepresbyopic eyes using an auto refractor and an aberrometer Dorothy M. Win-Hall OD and Adrian Glasser PhD, *J Cataract Refract Surg*. 2008 May
19. Accommodation measurements in a prepresbyopic and presbyopic population. *Journal of Cataract and Refractive Surgery* [01 Jul 2004, Ostrin LA, Glasser A.