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ARTICLE

ASSESSMENT OF LAG OF ACCOMMODATION IN ADULTS WITH PREFERENTIAL NEAR WORK WITH MODIFIED BELL RETINOSCOPY

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ABSTRACT

OBJECTIVES: *The objective of this study was to assess the lag of accommodation in the adult population who do near work to find out the association of lag with the demand of near work.*

METHODOLOGY: *A comparative cross-sectional study of 36 patients with near work assessing accommodative lag by performing dynamically modified bell retinoscopy and measuring near the point of accommodation (NPA) by a Retractable inch tape. The study was conducted in October to December 2019.*

RESULTS: *Out of 36 patients, 18 (50%) patients of Intermediate near work showed normal lag, and 13 (36.4%) patients of close near work had lag in the normal range while 5 (13.9%) patients had lag greater than normal. Mann-Whitney U test showed a statistically significant association of accommodative lag with near work (p=0.016). The amplitude of accommodation was noted less than patient age in all 5 patients who had accommodative lag greater than normal and Refractive correction was given to them.*

CONCLUSION: *This study concludes that accommodative lag increases on increasing the demand in near work, leading to accommodative insufficiency.*

KEYWORDS: *Accommodative demand, Accommodative lag, Modified Bell Retinoscopy.*

INTRODUCTION

The process of accommodation is a reflex activity of the eye, as a result of concentrating on a close target, then seeing at distance object (and vice versa), and involves facilitated changes in vergence, crystalline lens shape and size of pupil.[1]

The accommodative response (AR) is the visual capacity that enables individuals to see plainly at various distances and hence a fitting working of the AR is necessary to do customary duties without visual distress, particularly for those related with close review task.[2]

A wide range of factors have been found to impact the precision of AR under typical or anomalous binocular conditions, such as task command, residual uncorrected refractive errors, higher-order aberrations of the eye, and pupil diameter (via mechanism of depth-of focus).[3]

Accommodative response is not always the same as accommodative demand. When accommodative response is less than actual demand, it is considered as Accommodation lag. Lag of accommodation somewhere in the range of 0 and +0.75 D is viewed as ordinary in paediatric population and in young adults for a normal close to working distance (around 33–40 cm). Accommodative lag regularly increments past this range with propelling age and expanding accommodative demand.[4]

When the accommodative response (AR) is larger than the actual accommodative demand it is termed as lead of accommodation.[5] The AR of a person who isn't presbyopic is normally not exactly the same as demand, particularly less, if the stimulus to accommodation surpasses about 1.00 diopter (D).[6]

One speculation to clarify the connection to close work

and perusing is that accommodation is inadequate at close target separation (''lag of accommodation") so that the focal plane winds up behind the retina. This lag of accommodation is an ordinary conduct during close vision activities. In any case, bigger accommodative lag brings about bigger hyperopic defocus, and could along these lines be a trigger for axial lengthening of the eye, thus, leading towards myopia.[7]

There is no conclusive evidence whether the larger accommodative lag with cell phone use causes asthenopic side effects. One study that explored both lag and symptoms found no adjustment in lag with a Kindle ® tablet read at 50 cm yet found an expansion in tired eyes and general eye inconvenience. Regardless of this, an expanded lag related with expanded visual inconvenience brings about a variety of asthenopic indications, for example, obscure, cerebral pains and irritation.[8]

"Dynamic" retinoscopy strategies evaluate accommodative lag by identifying the refractive condition of the freely accommodative eye at a single point in time. Customary technique incorporates Nott retinoscopy (NR), Monocular estimate method (MEM), and Bell retinoscopy. Dynamic retinoscopy is testing and difficult to perform in younger age group. With a moving or oblivious youngster, it is hard to introduce MEM lenses quickly, so as not to impact convenience. Hunter proposed assessing accommodation in kids by beginning from a fixed retinoscope position and moving the target towards the kid until the retinoscopic reflex is neutralized. Since the underlying rule is equivalent to that in bell retinoscopy, the methodology is called Modified bell retinoscopy (MBR).[9]

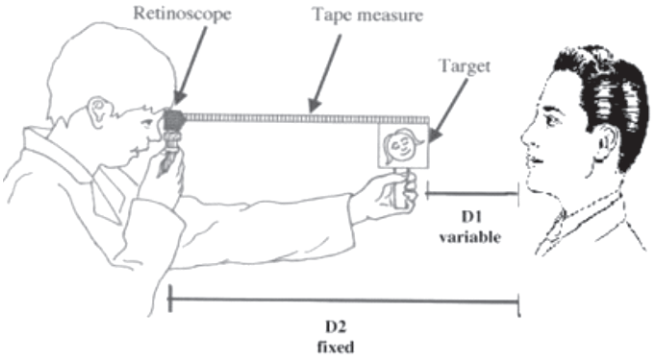
The study utilizes dynamic Modified bell retinoscopy to assess the lag of accommodation. Purpose of the study is to assess the accommodative lag in adult population knowing the importance of accommodative lag as a residual refractive error causing asthenopic symptoms and checking that either these symptoms vary with the demand of accommodation. Aim is to quantify the lag of accommodation in near workers with modified bell retinoscopy.

MATERIALS AND METHODS

We studied 36 people with preferential near work of their routines like at different Banks, software houses, and the Tailor market of Lahore. On basis of their work, we divided them into 2 groups, 1st group of intermediate near work who were working on computer and 2nd group of close near work on tailor machine.

It was a descriptive cross-sectional study and a self-made Proforma was developed about: Name, age, sex, chief complaints, distance and near VA, occupation, the amplitude of accommodation, and lag measurement with dynamically modified bell retinoscopy. In MBR, the observer maintains a good fixed distance from the patient.

Fig:1 The target is advanced until the retinoscopic reflex is neutralized.



The target is attached to the end of the retractable tape measure, which is attached to the retinoscope head, to measure the distance advanced. The accommodative demand, accommodative response, and accommodative lag are calculated from the known fixed distance between retinoscope and child (D2 in Fig. 1), and the final recorded distance between retinoscope and target. D1 in Fig. 1 is the difference between D2, and the recorded retinoscope target distance; the inverse of D1 is the dioptric viewing distance between patient and target and is, henceforth, termed the accommodative demand. When the retinoscopic reflex is neutralized, the dioptric distance between patient and retinoscope (inverse of D2) is the accommodative response corresponding to that demand. The difference between accommodative demand and response is the accommodative lag. Figure 1 Shows the Modified bell retinoscopy technique. D1: the distance between child and target, corresponding to accommodative demand; this is variable because the target is advanced until retinoscopic reflex neutrality is observed. D2: the distance between child and retinoscope, corresponding, at reflex neutrality, to the

accommodative response; this distance is set by the examiner at the start of measurement.

Data were analyzed by making tables and graphs in SPSS 20 software and frequencies and percentages of different variables were calculated through it. The Chi-Square test was used to check the relationship of near work with accommodative lag.

RESULTS

Total frequency and percentage of 36 people in which people with a close near work 18(50%) and with intermediate work 18(50%). Visual acuity of all these patients was 20/20-N6.

All participants were divided into 3 groups of different ages.

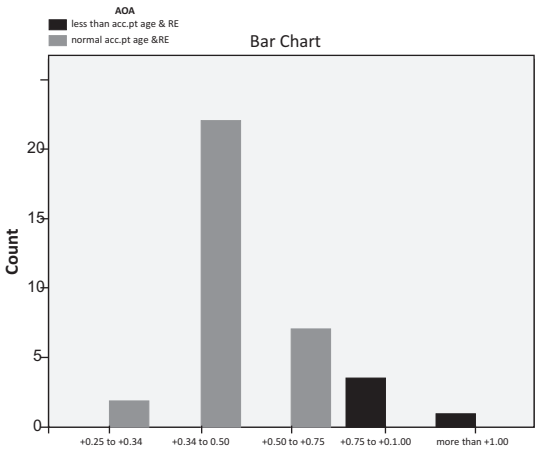
Table No: 1 Relation between near work and average Accommodative Lag

			Near Work		Total
			Intermediate near work	Close near work	
Average lag	+0.25 to +0.34	Count	0	2	2
		% of Total	0.0%	5.6%	5.6%
	+0.34 to +0.50	Count	17	5	22
		% of Total	47.2%	13.9%	61.1%
	+0.50 to +o.75	Count	1	6	7
		% of Total	2.8%	16.7%	19.4%
	+0.75 to +1.00	Count	0	4	4
		% of Total	0.0%	11.1%	11.1%
	more than +1.00	Count	0	1	1
		% of Total	0.0%	2.8%	2.8%
Total		Count	18	18	36
		% of Total	50.0%	50.0%	100.0%

Table no. 1 shows the distribution of average lag across two different accommodative demands. Accommodative lag was found more in person with more accommodative demand in tailors

Those people in which lag was more than accommodative demand, were also found to have the amplitude of accommodation less than their age and were more likely to have accommodative insufficiency

Fig:2 Relation between amplitude of accommodation and accommodative Lag



DISCUSSION

The term lag of accommodation does not mean that accommodative response is deficient. Some discrepancy between accommodative demand and accommodative response is normal. Several patients account symptoms during near work, and these may be associated with improper levels of accommodation. It is well recognized that the accommodative response is usually less than the accommodative stimulus when viewing most near targets.

Mark Rosenfield calculated the lag of accommodation between 5 to 60 years of age and their outcomes revealed with Nott retinoscopy that No significant variation in lag of accommodation as a function of age was detected for subjects below 40 years of age. The mean lag in this age group was 0.54 D, with nearly all subjects having lags between 0 and 1.00D. Our study also concluded that there is no effect of age lag of accommodation, and lag remains same across all age group in presbyopic person.

Tosha et al studied the Accommodation response and visual discomfort and their results showed a significant interaction between the high and low discomfort groups over time in accommodation response. The high discomfort group showed an increase in accommodative lag, whereas the low discomfort group had a stable response. their study suggested that the high visual discomfort group is characterized by accommodative fatigue, with a higher lag of accommodation developing at a near viewing distance over time.

When we compared our results with this previous study, we concluded that subjects with lag in normal range had no difficulty in doing near work while subjects with higher lag of accommodation were having more discomfort and having accommodative insufficiency rather than accommodative fatigue because the subjects with lag greater than normal were also having decrease of amplitude of accommodation according to patient refractive error and age and that was checked by push up method

This study consisted of total 36 patients of 18 to 34 years of age which have routine near work in life. All these subjects were having distance vision 6/6 and near vision N6.

MBR was attempted in 38 patients among which 2 were having lead of accommodation that were excluded from study while 36 were having lag of accommodation. Subjective Refraction was done in some patient who required and preferred near work with glasses

CONCLUSION

Accommodative lag associated with near work vary with the demand of near work. Tailors who have increased accommodative demand, shown increased accommodative lag while computer users have normal lag of accommodation. Lag greater than normal along with decrease in amplitude of accommodation leads to accommodation insufficiency.

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