ORIGINAL RESEARCH PAPER

Ophthalmology

"COMPARISON BETWEEN RAF RULE METHOD AND MINUS LENS METHOD FOR MEASURING AMPLITUDE OF ACCOMMODATION"

KEY WORDS: Amplitude of accommodation, RAF Rule, Minus lens method.

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INTRODUCTION

Accommodation is defined as an increase in the dioptric or refractive power of the eye to focus objects clearly at various distances[1]. An increase in the refractive power of the eye occurs because of an increase in the anterior and posterior surface curvatures of the crystalline lens resulting from contraction of the ciliary body muscle[2].

The radius of curvature of the anterior surface of the crystalline lens reduces by 0.33 mm per dioptre of accommodation, while the posterior surface reduces by 0.15 mm per dioptre of accommodation[3].

Maximum refractive change that an eye can undergo or the maximum amount of accommodation that can be exerted is called the amplitude of accommodation[4]. Amplitude of accommodation is depend upon age from maximum in the early teenage years to presence of presbyopic symptoms starting at about 40 to 45 years of age due to decrease in amplitude of accommodation, when the accommodative reserve becomes insufficient to maintain focus on near objects[5]. Role of amplitude of accommodation in accommodative esotropia is also well known[6].

Various methods for measurement of amplitude of accommodation are[7] :-

1) RAF Rule method
2) Minus lens method
3) Pushup method

Purpose of this study is to compare between RAF Rule method and Minus lens method for measurement of amplitude of accommodation in normal subjects of age group between 20 to 25 year.

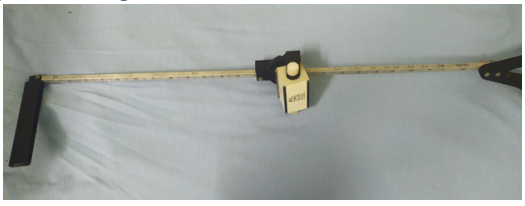
MATERIALS AND METHODS

After taking informed consent, measurement of amplitude of accommodation is done on 30 normal subjects with visual acuity of 6/6 in each eye at 6 m and 40 cm by using distant and handheld reduced Snellen chart respectively and rule out amblyopia, strabismus, any other ocular pathology. Study is done in MBS Hospital & Govt. Medical Collage, Kota.

RAF Rule method :-

Measurement of NPA is done by using either Times roman typeface, Reduced snellen chart or G.P.O. telephone directory as standard target on RAF Rule. Measurement is done with full refractive correction, first each eye separately and then both eye simultaneously and in normal room illumination. The ruler is hold and gently places the cheek rest on the inferior orbital margin of subject. Then asked to patient to focus on target and slowly moves the drum towards the patient's eyes at a constant rate of about 1-2 cm per second[8] and NPA is when the patient reports blurring of latters and amplitude of accommodation is measured by NPA.

Figure showing RAF Rule



Minus lens method:-

A reduced snellen chart was placed in front at viewing distance of 40 cm then subjects were instructed to keep the illuminated letters clear and sharp and to report when first noticeable sustained blur that could not be cleared by further conscious effort. Minus lenses in 0.25 D steps were introduced over the distance correction. When the letters became and remained blurred that point is recorded and add 2.5D ignoring the minus sign[9].

RESULTS

Out of 30 subjects 18 were male and 12 were female. Amplitude of accommodation value measured by RAF Rule method and Minus lens method for various subjects are shown in Table no. 1

Table no.1 showing measured value for amplitude of accommodation

S.N.	Name	Age	Sex	RAF RULE METHOD		MINUS LENS METHOD
				NPA (cm)	AMPLITUDE (in diopter)	AMPLITUDE (in diopter)
1	Patient 1	23	M	9	11.11	9.5
2	Patient 2	20	F	11.1	9	7.75
3	Patient 3	25	M	9.8	10.2	10.5
4	Patient 4	23	M	9.6	10.41	9.25
5	Patient 5	24	M	10.6	9.43	9
6	Patient 6	21	M	8.5	11.76	10
7	Patient 7	23	F	8.2	12.19	8.5
8	Patient 8	25	M	8.6	11.62	9.5
9	Patient 9	23	M	9.6	10.41	7.25
10	Patient 10	21	F	8.4	11.9	9
11	Patient 11	25	M	8.9	11.23	7
12	Patient 12	21	M	10.8	9.25	10
13	Patient 13	23	F	8.5	11.76	8.75
14	Patient 14	23	F	9.8	10.2	8.5

15	Patient 15	21	M	8	12.5	9.25
16	Patient 16	23	F	10.6	9.43	7.25
17	Patient 17	25	M	9	11.11	9
18	Patient 18	25	F	8.9	11.23	8
19	Patient 19	23	F	9.4	10.63	10.25
20	Patient 20	20	M	8.4	11.9	7.5
21	Patient 21	23	F	10.4	9.61	9.25
22	Patient 22	25	M	10.4	9.61	8.5
23	Patient 23	25	F	8.6	11.62	8
24	Patient 24	25	M	8.9	11.23	10
25	Patient 25	24	F	8.6	11.62	8.75
26	Patient 26	24	M	8	12.5	9.75
27	Patient 27	25	M	9.6	10.41	9
28	Patient 28	23	M	8.7	11.49	7
29	Patient 29	23	M	10.2	9.8	8.5
30	Patient 30	23	F	9.2	10.86	8.25

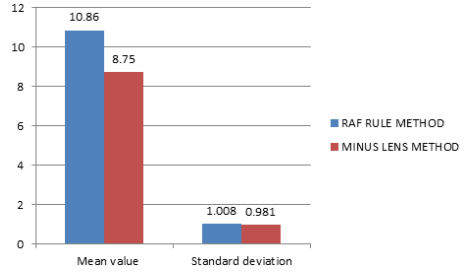
NPA- Near point of accommodation

Mean value of amplitude of accommodation by RAF Rule method and Minus lens method are 10.86D and 8.75D respectively. When measured value are compared statistically this difference is significant as calculated p value is <0.0001 (as value <0.001 is considered statistically highly significant).

Table no.2 showing various value of amplitude of accommodation

	Mean value	Standard deviation	p value
RAF RULE METHOD	10.86	1.008	< 0.0001
MINUS LENS METHOD	8.75	0.981	

Graphical display for value of amplitude of accommodation



DISSCUSSION

In our study we found that RAF Rule method is overestimate while the minus lens method underestimate the amplitude of accommodation, causes behind this may be that RAF Rule lead to relative magnification of target while the minus lens method creates an abnormal viewing environment in which the target is stationary but the stimulus becomes increasingly minified[10].

CONCLUSION

NPA and amplitude of accommodation is the primary finding for diagnosis of anomalies of accommodation. RAF Rule and minus lens method show significant difference in measuring amplitude of accommodation. Other methods available are push up and push down can also be used.

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