



Original Article

Diurnal Change In Amplitude Of Accommodation in Adults

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Purpose: To find out the diurnal changes of amplitude of accommodation in adults.

Materials and Methods: This descriptive type cross sectional study was conducted on one hundred and ten patients (110) in the eye department of Mayo hospital Lahore from November 2014 to December 2014. The patients were selected by using non-probability convenient sampling technique. Amplitude of accommodation was measured on same subjects in morning and evening by push up method.

Result: Out of 110 subjects 8.33% (9) were from 18 to 19 years, 8.33% (9) were 28 to 29 years old, 6.48% (7) were 26 to 27 years, 12.04% (13) were 24 to 25 years, 28.70% (27) were 22 to 23 years, and 36.11% (35) were 20 to 21 years old.

Morning amplitude of accommodation was 6 to 7.9D in 21.30% (20) subjects, 8 to 9.9D in 37.96% (36), 10 to 11.9% (11) in 39.81% (40) and 12 to 13D in 0.93% (1) subjects. Evening amplitude of accommodation was 6 to 7D in 34.26% (33) subjects. It was 8 to 9D in 43.52% (43) and 10 to 11D in 22.22% subjects. There was significant difference between morning and evening amplitude of accommodation as $p < 0.005$.

Conclusion: Amplitude of accommodation was significantly decreased in the evening as compared to morning.

Key Words: Diurnal changes. Amplitude of accommodation.

Introduction:

Amplitude of accommodation can be defined as measurement of eye ability that focuses clearly on near object. It can also be defined as it is eye ability to alter the refractive power of crystalline lenses that focus the object's image on retina placed at various distance.²

Accommodation is a flexible system and does not fatigue but dysfunction is often seen.³ these are commonly seen with school age youths. There is no accommodation at birth and it gets mature gradually up to age of 5-7 months as the lenses grow and form new cell throughout life.⁴

Corrected hypermetropes show less effect on accommodation as compared to emmetropes and they, therefore, need near addition at younger age. This is because of low effectiveness of convex lenses for near as compared to concave lenses. It is therefore more symptomatic than myopes or emmetropes.

McBrien et al measured amplitude of accommodation of young university student in a group between the age of 18 to 22 years and found that at it was highest in late onset myopes and was least in hypermetropes.⁵

Kurtev, et al demonstrated that most of visual functions like Intraocular Pressure, visual field of eye etc. exhibit diurnal changes but accommodation was an obvious exception. These results, however, when compared with other published data showed that accommodation may be subject to diurnal changes.⁶

There was a statistically significant difference in age of 35-39-year-olds, their Amplitude of Accommodation between hypermetropes and myopes ($P < 0.005$) and between emmetropes and myopes ($P < 0.005$) and there was a significant difference in AA between hypermetropes and emmetropes ($P < 0.0001$), myopes and emmetropes ($P < 0.01$) and myopic and hypermetropic ($P < 0.0001$) in the 40-45 years old. There was no significant difference in patients over 45 years ($P > 0.5$). It shows that higher amplitude in myopes as compared to emmetropes and hypermetropes.

There was moderate correlation (Pearson correlation coefficient $r = 0.56$) between AA and Axial Length and between central anterior chamber depth and in myopic the age group 35-39 years have AA ($r = 0.53$). In the other age groups and the groups considered as a whole, there was no correlation. In hyperopic and emmetropic, there was no correlation between AA and ocular parameters above. There was no significant correlation between lens and AA across different age groups and refractive errors. There was no significant correlation between AA and ocular parameters such as the anterior chamber depth, axial length and lens thickness.⁷

According to studies, change in accommodation in

young adults having different daily habit they were divided into two groups those who use computer 2 hours per day and those who use 8 hours per day. The purpose of study was to see if there was a change in accommodation between these two groups. Results showed that the accommodation difference range was 0.25 D maximum.⁸

According to a study the average amplitude of accommodation was 16.86 ± 3.07 D (95% CI = 16:57, 17:15). This is significantly higher than expected age norms calculated by Hofstetter equation. The accommodative amplitude showed the characteristic decrease with age.⁹

Materials and Methods:

This descriptive type cross sectional study was conducted on one hundred and ten patients (110) in the eye department of Mayo hospital Lahore from November 2014 to December 2014. The patients were selected by using non-probability convenient sampling technique. Amplitude of accommodation was measured on same subjects in morning and evening by push up method.

Results:

Out of 110 subjects 8.33% (9) were from 18 to 19 years. 8.33% (9) were 28 to 29 years old. 6.48% (7) were 26 to 27 years, 12.04% (13) were 24 to 25 years, 28.70% (27) were 22 to 23 years, and 36.11% (35) were 20 to 21 years old. Morning amplitude of accommodation was 6 to 7.9D in 21.30% (20) subjects, 8 to 9.9D in 37.96% (36), 10 to 11.9% (11) in 39.81% (40) and 12 to 13D in 0.93% (1) subjects. Evening amplitude of accommodation was 6 to 7D in 34.26% (33) subjects. It was 8 to 9D in 43.52% (43) and 10 to 11D in 22.22% subjects. There was significant difference between morning and evening amplitude of accommodation as $p < 0.005$.

Figure 1: Distribution of patients according to age

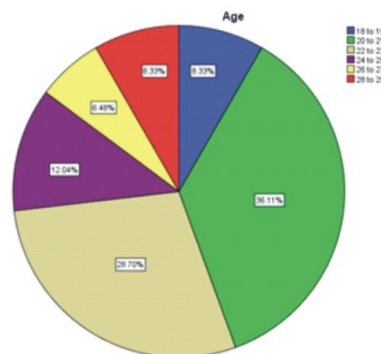


Figure 1 shows that out of 110 subjects 8.33% (9)

Table 1: Amplitude of accommodation at morning

Amplitude of Accommodation Morning (D)	No. of Patients	Percentage
6 - 7.9	23	21.3%
8 - 9.9	41	38.0%
10 - 11.9	43	39.8%
12 - 13	1	0.9%

Table 1 shows that morning amplitude of accommodation was 6 to 7.9D in 21.3% (23) subjects, 8 to 9.9D in 38.0% (41), 10 to 11.9D in 39.8% (43) and 12 to 13D in 0.9% (1) subjects

Table 2: Amplitude of accommodation at evening

Amplitude of Accommodation Morning (D)	No. of Patients	Percentage
6 - 7.9	33	34.3%
8 - 9.9	43	43.5%
10 - 11.9	22	39.2%
12 - 13	1	0.9%

Table 2 shows that evening amplitude of accommodation was 6 to 7.9D in 34.26% (33) subjects. It was 8 to 9D in 43.52% (43) and 10 to 11D in 22.22% subjects. There was significant difference between morning and evening amplitude of accommodation as $p < 0.005$.

Discussion :

In this study we have tried to measure the near and far point of accommodation in emmetropes during 24 hours and to calculate amplitude of accommodation at different times of day and record the diurnal change if any. Whether there is any change in amplitude of accommodation at early in the morning and at the evening after the exhaustion so that appropriate measure may be taken to minimize the anomalies of accommodation taking place due to near work. Out of 110 subjects 8.33% were ranging in age from 18 to 19 years. 8.33% were 28 to 29 years old. 6.48% were 26 to

27 years, 12.04% were 24 to 25 years, 28.70% were 22 to 23 years, and 36.11% were 20 to 21 years old. Morning amplitude of accommodation was 6 to 7.9D in 21.30% subjects, 8 to 9.9D in 37.96%, 10 to 11.9% in 39.81% and 12 to 13D in 0.93% subjects. Evening amplitude of accommodation was 6 to 7D in 34.26% subjects. It was 8 to 9D in 43.52% and 10 to 11D in 22.22% subjects. There was significant difference between morning and evening amplitude of accommodation as $p < 0.005$.

Conclusion:

Morning amplitude of accommodation was 6 to 7.9D in 21.30% subjects, 8 to 9.9D in 37.96%, 10 to 11.9% in 39.81% and 12 to 13D in 0.93% subjects. Evening amplitude of accommodation was 6 to 7D in 34.26% subjects. It was 8 to 9D in 43.52% and 10 to 11D in 22.22% subjects. There was significant difference between morning and evening amplitude of accommodation as $p < 0.005$.

Recommendations:

The diurnal changes of accommodation were observed in students who have to read extended hours daily. They have no need to worry because due to continuous study there is changes in their ciliary muscle due to which accommodation of lens not properly comprehended as a result some kind of diurnal change of accommodation is not considered as an anomalies.

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