ANTERIOR CHAMBER DEPTH IN NORMAL ADULT INDIAN POPULATION BY PENTACAM

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ABSTRACT

The present study was conducted in 250 normal Indian subjects (500 eyes) of either sex to assess anterior chamber depth (ACD) to establish normal values in the adult Indian population without any eye disease for reference for future studies. The ACD was assessed by using pentacam. ACD was found to be 3.188 ±0.3551mm. There was no significant difference in ACD values of right and left eyes (p= 0.6256). The ACD values of normal adult Indian population were similar to those of other countries.

KEYWORDS: Anterior chamber depth, Pentacam, Adult, Indian, Eyes.

INTRODUCTION

The pentacam has rotating Scheimpflug camera to image the anterior segment of the eye, allows for quantitative measurement of the corneal topography, corneal thickness, and anterior chamber angle, anterior chamber depth, and anterior chamber volume in few seconds.[1,2] Its usefulness for evaluating corneal topography is well documented.[3,4] It measures 25000 data points over the cornea in fewer than 2 seconds. The pentacam is an easy to use biometry system, simple and quick that can be used to obtain the corneal thickness from the central zone of the cornea upto 5 mm away from the centre (close to the limbus).[3] Pentacam has been found to be comparable and interchangeable with other imaging modalities in measuring ACD.[2,5] The measurement of the ACV and the peripheral anterior chamber depth (ACD) which is useful for evaluating the anterior ocular segment topography in narrow angle is also done by pentacam.[2,6] Vicent et al described that all the parameters of anterior segment of eye can be easily and accurately measured with pentacam.[7]

The anterior chamber depth is calculated from corneal endothelium in line with the corneal vertex to the anterior surface of lens and it can also be calculated from corneal epithelium by changing the settings on machine. Preoperative measurement of ACD is used in advanced Intraoccular lens (IOL) calculation formulas. Internal ACD and ACD are the two major aspects that must be considered before implantation of phakic IOL.[8,9] Measurement of ACD is also used for primary angle closure glaucoma screening.[10]

MATERIALS AND METHODS

There were 111 females (222 eyes) and 139 males (278 eyes). OCULUS Pentacam, Sterile cotton/gauzes, Spirit, Black cloth were used. After obtaining the written informed consent, participants were examined using the OCULUS Pentacam. Consent was taken from subjects and were examined in sitting position. The study was conducted in 250 Indian participants (500 eyes) attending Ophthalmology OPD in NIMS Medical College and Hospital, Jaipur. Both eyes of each participants were scanned by same observer. All participants underwent a complete ophthalmological and optometric examination, including visual acuity evaluation, slit lamp examination and ocular fundus examination. Testing was done with natural pupils under same conditions in ambient lighting.

The machine was used in automatic release mode to rule out confounding operated related variables. The imaging device was automatically calibrated prior to the start of each new set of measurements. Participants were made to sit comfortably on examination stool. Participants were instructed to keep both eyes open and look directly at black fixation target for 2 seconds. The chin was placed at chin rest and forehead was placed on forehead rest. A black cloth was placed on subject's head to omit any light. The eyes were randomly examined. In order to avoid the documented daily changes in corneal thickness and other parameters, all measurements were conducted between 9:00 am to 2:00 pm and at least 4 hours after waking. It was ensured that all participants had at least 6 hours of overnight sleep. Three readings of all measurements were taken and their mean value were

considered. Anterior chamber depth of both the eyes were measured. The statistical analysis was done by using unpaired student's 't' test for comparison of ACD of left and right eyes. The p value ≤ 0.05 was considered statistically significant, p value > 0.05 was considered as not statistically significant and p value < 0.001 was considered as very highly significant.

RESULTS
Table 1: Minimum, Maximum, Median, Mean, SD, SEM, Lower and Upper 95% CI of anterior chamber depth.

	ACD (mm) of left eyes	ACD (mm) of right eyes	ACD (mm) of both eyes
Minimum	2.140	2.020	2.020
Maximum	4.280	4.290	4.290
Median	3.160	3.170	3.160
Mean	3.180	3.196	3.188
SD	0.3553	0.3555	0.3551
SEM	0.02247	0.02248	0.0158
Lower 95% CI of mean	3.136	3.151	3.157
Upper 95% CI of mean	3.224	3.240	3.219
Mean± SEM of ACD (mm)	3.180 ± 0.02247	3.196 ± 0.02248	

When mean of ACD of left eye were compared with right eye, then the difference of ACD was found not significant (p 0.6256) (Table 1).

DISCUSSION
Fernández-Vigo et al studied ACD with the pentacam in normal Caucasian subjects of mean age 49.1 ± 15.2 years (range 18-84) and 61% of participants were women. The mean value of ACD was 3.35 ± 0.43 mm, maximum being 4.64 mm and minimum 2.07 mm. They also observed that in men, ACD was correlated with ACA, axial length (AL), corneal diameter, spherical refractive error and age (p<0.001). Five variables i.e. age, sex, spherical error, corneal diameter and ACA were able to explain 74.1% of variation produced in ACD (R^2=0.741; p<0.001), among which age emerged as the main determinant. Age was found to be correlated with ACD (R= -0.527; p<0.001). Anterior chamber gradually shallows as the age advances. Excellent correlation was also found between right and left eye ACD values (R=0.960; p<0.001). Anterior chamber depths were greater in men than in women by a mean value of 0.131 mm (95% CI 0.101-0.160 mm; p<0.001).[11]

Rabsilber et al studied anterior chamber parameters in Germans. They studied in 76 healthy volunteers (mean age 46.6 years ± 16.8). Three consecutive readings of one eye and ACD were evaluated. The mean ACD was 2.93± 0.36 mm (range 2.15 to 3.67 mm). Increasing age was associated with reduced ACD. There was good

correlation between ACD and ACV (R= 0.92). The ACD and mean ACA correlated only moderately (R= 0.65).[2]

Cho et al studied ACD with pentacam in 88 eyes of Korean subjects aged 67.92±10.12 years (range 25-88 years) and their mean values were 3.11± 0.43 mm.[12] Hashemi et al studied in 283 Iranian subjects with mean age 29.1±7.5 years in emmetropic group, the ACD was found 2.9±0.3mm. On comparing emmetropic group ACD values with myopic and hyperopic groups, they were found highly significant (p<0.001).[13]

According to two major population based studies in Iran, the mean ACD in the population over 40 years old was less than 3.0 mm (between 2.50 mm and 2.69 mm) with Orbscan and 2.69 mm with pentacam.[14, 15] In European populations, the mean ACD has been reported at least 1.0 mm higher than Asians.[16-20] In contrast in a Singaporean population, where the mean ACD (3.08) was lower than European and American populations.[21]

Gharaee et al studied normal anterior chamber depth in 1001(2002 eyes) Iranian individuals with age range 18-45 years, 616 (61.54%) were females and 385 (38.46%) were males. The mean±SD of age was 29.07±5.86 years (male 28.86±5.53 and female 29.01±3.77 years). The mean ACD was 3.65±0.30 and it was 3.64±0.30 mm in males and 3.67±0.32 mm in females. This difference was found statistically significant. Age, gender and race are three important factors influencing ACD values. The ACD was thought to be deeper in men conventionally which is in contrast to results of Gharaee et al and it is due to the reason that the cases included in Gharaee et al study were restricted to low myopic and hyperopic and did not indicate the distribution in normal population. ACD values decreases with advancing age as seen in several studies. Gharaee et al found 0.013 mm decrease per year by linear regression analysis but surprisingly in Tehran eye study the linear regression was also exactly 0.013 mm per year and this can indicate that the race is a critical factor in decreasing ACD by advancing age. Gharaee et al did the measurements of ACD in right and left eyes separately and the mean ACD in right and left eyes were 3.65±0.30 and 3.66±0.31 respectively (p value= 0.72). There was much similarity in ACD values in both eyes.[22]

Eperjesi et al observed the mean ACD (2.89±0.43).[23] The mean ACD by Orbscan measured as 3.49±0.30 by Utine et al and 3.54±0.07 by Salouti et al. [24, 25] In a study by Hashemi et al in Tehran population the mean ACD was 2.79±0.02 and it was about 0.1 mm deeper in men in contrast to Gharaee et al results.[13] Pan et al found the mean ACD in Indian population was 3.15±0.36.[26] But the mean reported by Olurin in Nigeria of ACD was 3.23 mm.[27]

Wang et al studied anterior segment parameters by using Galilei Dual Scheimpflug analyzer (GSA) in 153 normal subjects (58 males, 95 females) at Shanghai sixth

People's Hospital. Han Chinese participants were included in the study. The subject's age ranged from 12 to 85 years (mean 34±17 years). The mean value of ACD was 3.03±0.35 mm (minimum 1.89 and maximum 3.83).[28] The anterior chamber depth observed by Hosseini et al was 3.14±0.33mm.[29] Emre et al found the anterior chamber depth 3.1±0.3mm.[30] Shanker et al found anterior chamber depth by using pentacam 3.07±0.32mm.[31] Elbaz et al observed the anterior chamber depth 3.08±0.38mm.[32]

In the present study, the mean value of ACD of left eyes, right eyes and both eyes is 3.180 ± 0.02247, 3.196 ± 0.02248 and 3.188 ±0.3551mm (2.020-4.290) respectively which is similar to other researchers (Table 1). The mean of ACD of left and right eyes were compared and the difference was found not significant (p 0.6256). Comparable ACD values are reported by several researchers which include Lackner et al 3.18±0.38mm, Vicent et al 3.19±0.2mm, Cho et al 3.11±0.43mm, Pan et al 3.15±0.36mm, Wang et al 3.03±0.35mm, Hosseini et al 3.14±0.33mm, Emre et al 3.1±0.3mm, Shanker et al 3.07±0.32mm and Elbaz et al 3.08±0.38mm.[5,7,12,26,28,29,30,31,32}

CONCLUSION
The mean value of anterior chamber depth in normal adult Indian population is 3.188 ±0.3551mm by using pentacam which is similar to other researchers. There was no significant difference between ACD values of right and left eyes in normal adult Indian population by using pentacam.

Acknowledgement

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