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Original Research Article

Lens thickness and associated ocular biometric factors among cataract patients in tertiary hospital

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ABSTRACT

Background: A significant factor in determining intraocular lens power is the biometry assessment of cataract patients prior to surgery. To evaluate the distribution of lens thickness (LT) and its associations with other ocular biometric factors among cataract patients.
Methods: Total 978 eyes from cataract patients were retrospectively included. Ocular biometric factors including k1, k2, LT, central corneal thickness (CCT), anterior chamber depth (ACD), white-to-white (WTW) distance, and axial length (AL) were collected based on the medical records. The associations between LT and general or ocular factors were assessed. We analyzed the data using descriptive analysis and correlated each variable using the Spearman's Rho analysis.
Results: The mean age was 62.5±15.70 years and 55.11% were females. Mean LT was 4.35±0.41 mm. The LT was greater in older patients. LT positively correlated with AL, WTW and CCT, while negatively correlated with ACD.
Conclusions: LT is an important biometric parameter that should be considered, along with other biometric parameters, in determining effective lens position in patients undergoing cataract surgery. ACD is predominantly influenced by LT than the AL.

Keywords: ACD, AL, Biometry, Intraocular lens, LT

INTRODUCTION

Cataract is a major cause of blindness and ocular morbidity throughout the world, and any means of delaying or preventing its onset would have enormous social and economic benefits.[1]

Accurate biometric measurement has become a key component in surgical planning because of advancements in cataract surgery and intraocular lens (IOL) design. One of the key factors in ocular biometry is LT. It is not only a crucial variable in fourth-generation IOL formulations, but connections with other ocular factors may also have an impact on the actual position of the lens after surgery.[2] The ability to obtain accurate measurement of ocular biometric dimensions, such as AL, ACD, and crystalline LT, is essential for many clinical and research applications. AL is used clinically for intraocular lens (IOL) power calculation prior to cataract and refractive surgeries and to diagnose ocular conditions such as staphyloma, to evaluate the risk of retinal detachment as well as to measure structural and dimensional components in myopia.[3-6]

Bearing in mind the vital role of ocular biometrics in diagnostic and therapeutic eye care, we evaluated the distribution of LT and its associations with other ocular biometric factors among cataract patients.

METHODS

This cross-sectional study data was obtained from January 2022-June 2022 at GMC, Jammu, India. Total

978 cataract patients were retrospectively included. Ocular biometric factors were calculated by biometer and corneal analyser integrated of Topcon which included k1, k2, LT, CCT, ACD, WTW distance and AL were collected based on the medical records. The associations between LT and general or ocular factors were assessed. The inclusion criteria for this study are patients who underwent cataract surgery in the period of year January 2022-June 2022 in GMC Jammu with complete medical record data. The exclusion criteria were any co-morbidity in ophthalmology including glaucoma, retinal detachment, traumatic cataract, and any other ophthalmology condition except cataract. Medical records with missing data were excluded from the study. We analyzed the data using descriptive analysis and correlated each variable using the Spearman's Rho analysis.

RESULTS

Table 1 shows that amongst 978 patients, females outnumbered the males as 539 patients were females and 439 were males. Mean age of the patients was 56.36 years. In most of the cases that is 51.4% right eye was affected.

Table 1: Demographic characteristic of the patients.

Demographic characteristic		Value
Gender	Male	439
	Female	539
Age (Years)	Mean ± SD	56.36±15.70
Laterality (%)	Right eye	51.4
	Left eye	48.6

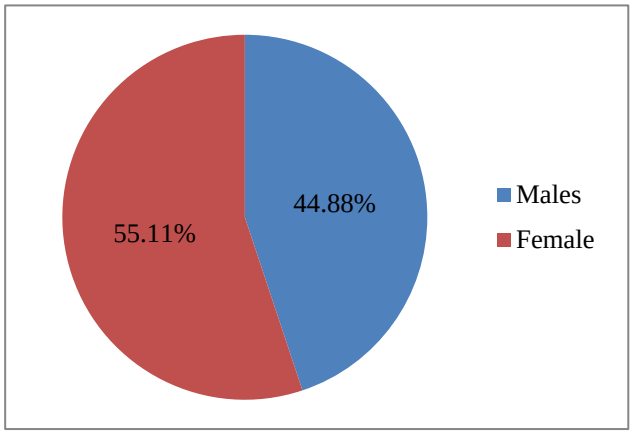

Figure 1: Gender distribution.

Table 2: Patient's baseline characteristics.

Baseline characteristics	Value (Mean ± SD)
LT	4.35±0.41
AL	23.17±0.73
CCT	498.01±37.23
ACD	3.28±0.33
WTW	11.41±0.45

Table 2 shows that the mean LT was 4.35 mm, AL was 23.17 mm, CCT was 498.01 mm, ACD was 3.28 mm and white to white distance was 11.41 mm.

Table 3: Distribution of LT according to age.

Age (Years)	Mean LT
≤30	3.68±0.38
31-40	4.21±0.42
41-50	4.29±0.40
51-60	4.34±0.63
61-70	4.62±0.65
71-80	4.68±0.44
>80	4.70±0.52

When LT was stratified by age, it gradually increased with the increasing age.

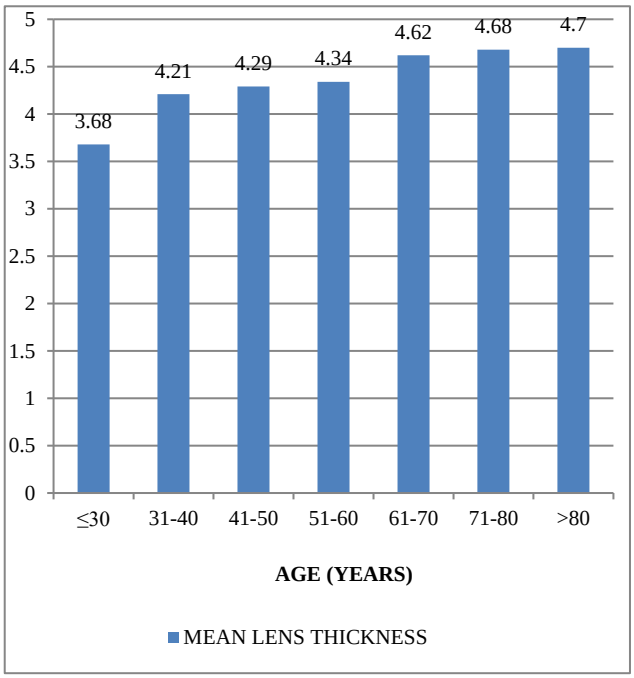

Figure 2: Age distribution and LT.

Table 4: Spearman's correlation of LT with other ocular biometric factors.

Ocular biometric factors	R	P value
AL	0.141	0.002
CCT	0.006	0.001
ACD	-0.49	0.05
WTW	0.10	0.03

On applying Spearman's correlation, a significant positive relationship of LT with AL, CCT and white to white distance was observed. This means that as there is increase in LT, AL, CCT and white to white distance will also increase. A significant negative relationship of LT with ACD was observed; this means that LT increases, ACD will decrease.

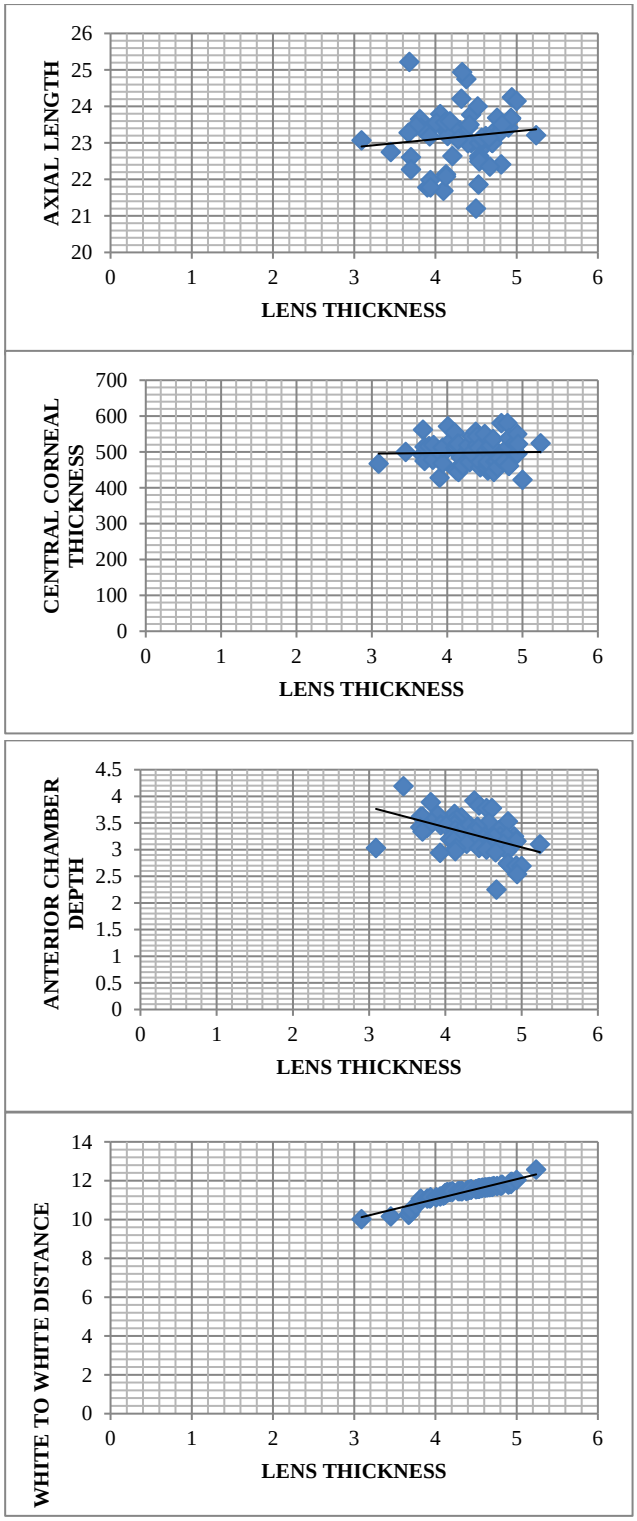

Figure 3: The correlation between LT and other ocular parameters.

DISCUSSION

Given the increasingly predictable refractive outcomes of contemporary phacoemulsification during the past two decades, surgeons have placed a growing emphasis on the use of optical biometers, which have shown to be reliable and competitive in many measurements.[7,8] The availability of this technology, together with advancements in IOL platforms, has significantly increased the demand for refractive cataract surgery.[9]

In addition to playing an increasingly significant role in the surgical planning of cataract patients, LT is a significant biometric parameter that also correlates to morphological changes in the lens with age or cataract formation.[10-13]

In the present study, there were 978 eyes of preoperative cataract patients met the inclusion criteria. Amongst 978 patients, females outnumbered the males as 55.11% (539) patients were females. The mean age of the patients was 56.36±15.70 years.

In this study mean LT was 4.35±0.41mm, this is thicker than the study done by Hashemi et al where the mean LT was 4.28 mm, but when compared with the study done by Jivrajka et al it was thinner where the mean LT was 4.93±0.56 mm.[14,15]

Mean AL was 23.17±0.73mm, which is slightly higher than study done in the USA, South China, Iran and Myanmar where the mean AL was 23.46±1.03 mm, 23.48 mm (23.40-23.55), 23.14 mm and 22.76 mm respectively.[14-17]

Mean CCT was 498.01±37.23, mean ACD was 3.28±0.33 mm and white to white distance was 11.41±0.45 mm. When LT was stratified by age, it was significantly greater in older patients. The increase in LT with age, which was noted in this study, will largely explain the progressive reduction in ACD. An increase in LT with age has been observed in other studies.[18,19-21] Age related nuclear sclerosis, increase in protein fiber layers forming under the capsule as well as continuously lying down of lens fibers with increasing age, have been reported as being the reasons for increase in LT in cataractous lens with advancing age.[22]

LT was positively correlated with AL, WTW and CCT, while negatively correlated with ACD. It is possible that a bigger lens and a thicker cornea are related because the association between LT and CCT in our study is consistent with earlier results.[23] In addition, we found LT and ACD to be negatively correlated. The lens tends to thicken in both directions when a cataract develops, which may cause the anterior chamber to become shallower.[24] Despite the fact that the statistical link between the preoperative ACD and the postoperative position of the IOL has been amply demonstrated, it is possible that the IOL formula bias will exist when the preoperative ACD is used independently as opposed to in conjunction with the LT.[10]

The association between LT and WTW is positive, which is another intriguing finding. Due to the absence of practical measurement tools, it might be challenging to directly measure capsular bag sizes in clinical practice.

As a result, the WTW may offer useful information for these sizes. Large WTW may be linked to the growth of bigger anterior segments, indicating the incompatibility of fixed-size IOLs with large capsular bags and the potential for further IOL stability issues. As a result, the IOL should be carefully chosen in cataract patients with bigger lenses.

CONCLUSION

LT is an important biometric parameter that should be considered, along with other biometric parameters, in determining effective lens position in patients undergoing cataract surgery. ACD is predominantly influenced by LT than the AL.

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