

DESCRIPTION OF AGE, CENTRAL CORNEAL THICKNESS AND INTRAOCULAR PRESSURE IN PATIENTS AT DEPARTMENT OF OPHTHALMOLOGY PHC HOSPITAL SURABAYA

Ivaldo H Ardhana¹⁾, Titiek Ernawati²⁾, Gladdy L Waworuntu³⁾

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ABSTRACT

Introduction: Eyes are one of the most important sense organs in human life. Eyes can help humans in activities and get information visually. Disorders of the eye will hinder and make it difficult for humans to carry out daily activities and reduce the quality of life. The cornea is one of the most important parts of the eye. Central Corneal Thickness (CCT) is the middle part of the cornea. CCT examination is a routine examination that must be carried out, but there are still many who have not carried out routine CCT examinations. Patients with thick CCTs may cause the IOP readings to appear higher than the actual condition, and conversely, patients with thinner CCTs may give the interpretations the impressions that they are lower than the actual condition. Data related to CCT and IOP in Indonesia is still lacking, especially in Surabaya, so a search for research on age, CCT and IOP needs to be done.

Purpose: The purpose of this study was to describe data on age, CCT and IOP in patients aged 20 to 70 years in the outpatient polyclinic of Ophthalmology, PHC Hospital Surabaya.

Method: This study used a cross-sectional research design. The sampling method used is total sampling.

Result: In this study, CCT was examined using a Canon TX-20P measuring instrument and examined on both eyes. The average CCT examination results in the 20-30 age group was $537.67 \pm 28.16 \mu\text{m}$ and the 31-40 age group $544.89 \pm 29.28 \mu\text{m}$. In the age group 20-30 and 31-40 years, the CCT increased by $7.22 \mu\text{m}$, however in the 41-50 age group, the average CCT was $540.09 \pm 30.44 \mu\text{m}$, which showed a decrease of $4.80 \mu\text{m}$ compared to 31-40 age group. In the 51-60 age group, the results were $553.35 \pm 28.60 \mu\text{m}$ which showed an increase in CCT compared to the 41-50 age group and the 61-70 age group got the results of $550.35 \pm 30.47 \mu\text{m}$ showing a decrease of 3.00 m compared to the 51-60 age group. IOP in the 20-30 age group obtained results of $16.25 \pm 2.93 \text{ mmHg}$, this value is lower than the 31-40 age group. In the age group 31-70 years, the results of IOP decreased over time.

Conclusion: Descriptive data obtained regarding age, CCT and IOP that can be used as baseline data or comparison in eye examinations.

Keyword: Central Corneal Thickness, Intraocular Pressure, Eyes, Age, Cornea.

¹⁾ Undergraduate Student, Faculty of Medicine, Widya Mandala Catholic University Surabaya
Email: aldohadii@gmail.com

²⁾ Department of Ophthalmology, Faculty of Medicine, Widya Mandala Catholic University Surabaya

³⁾ Department of Parasitology and Microbiology, Faculty of Medicine, Widya Mandala Catholic University Surabaya

INTRODUCTION

Eyes are one of the most important sense organs in human life. Eyes can help humans in activities and get information visually¹. Disorders of the eye will hinder and make it difficult for humans to carry out daily activities and reduce the quality of life^{2,3}.

The cornea is one of the most important parts of the eye. The cornea covers about one-sixth of the eye's surface, Central Corneal Thickness (CCT) is the center of the cornea⁴. CCT can be used to assess the physiological condition of the cornea as well as the pathological changes associated with eye disease. CCT can help classify glaucoma suspects between primary open angle glaucoma, ocular hypertension and normal pressure glaucoma. Therefore knowledge of CCT can help to attribute the likelihood of disease progression and assigning risks may change clinical management decisions⁵.

Thicker cornea will cause the IOP reading to appear higher than the actual is. Patients with thinner CCT cause IOP readings to appear lower, leading to misdiagnosis and a risk factor for glaucoma due to ocular hypertension⁶⁻⁹. IOP plays an important role in eye physiology. Higher IOP can lead to glaucoma^{10,11}. Glaucoma is one of the important factors causing irreversible blindness^{12,13}.

According to Belovay et al. (2018), patients with a CCT of 555 μm or less had a threefold higher risk of developing glaucoma at 5 years than those with a CCT of more than 588 μm ¹⁴. Based on research Hashmani et al. (2017) of 5,112 samples, found that as the age increase the CCT gets thinner⁵.

Data related to CCT and IOP in Indonesia is still lacking, especially in Surabaya. The search for research on the description of age, Central Corneal Thickness and intraocular pressure conducted in Indonesia has not yet been found. This study aims to determine age,

CCT and IOP in patients in Surabaya so that it will produce useful data in measuring IOP.

METHODS

This study is a descriptive study with a cross-sectional research design. The sampling method used in this research is total sampling. This study was conducted to determine age, CCT and IOP. Examination was carried out on both eyes. The sample in this study were all patients at the Eye Clinic of PHC Surabaya Hospital who met the inclusion criteria: 1) Patients in the age group of 20 to 70 years; 2) Willing to be a respondent by signing an informed consent; and exclusion criteria: 1) The patient had a history of corneal trauma; 2) The patient has a history of corneal dystrophy; 3) The patient has a history of eye surgery.

This study was conducted from September to November 2021, which aims to determine the description of age, CCT and IOP of patients aged 20-70 years at the Eye Clinic of PHC Hospital Surabaya. Data was collected after the patient read the information for consent and filled out the informed consent. Patients who have signed the informed consent, then performed CCT and IOP examination of the right and left eyes. The study was conducted on 200 samples with a total of 400 eyes, then grouped into 5 age groups, namely 20-30, 31-40, 41-50, 51-60, and 61-70 years old with 40 samples in each group.

RESULT

Table 1. Statistical distribution data across sample age groups based on CCT and IOP.

Age Groups (Year)	n	Mean \pm Standard Deviation	
		CCT (μm)	TIO (mmHg)
20-30	40	537.67 \pm 28.16	16.25 \pm 2.93
31-40	40	544.89 \pm 29.28	16.92 \pm 2.15
41-50	40	540.09 \pm 30.44	16.83 \pm 2.57
51-60	40	553.35 \pm 28.60	16.43 \pm 2.96
61-70	40	550.35 \pm 30.47	16.08 \pm 3.12

Table 1 shows the distribution of samples by age group which is divided into

5 groups with each group consisting of 40 samples. Distribution data including CCT and IOP are presented in the form of mean values with standard deviation. The study was conducted on both eyes of the patient. The study was conducted in September and October 2021 with a total sample of 200 people. Age samples were taken between the ages of 20-70 years and then divided into 5 age groups, namely 20-30, 31-40, 41-50, 51-60 and 61-70 years with a total of 40 samples in each group. The process of grouping samples begins when the patient registers Eye Clinic of PHC Surabaya Hospital by showing an ID card.

The selection of this age group takes into account the minimum age of 20 years because it is an age that is capable of making decisions independently to contribute to research and 70 years of age is an old age which is the age of life expectancy in Indonesia.¹⁵.

DISCUSSION

In this study, CCT was examined using a Canon TX-20P measuring instrument and carried out on both eyes of the sample. The results of CCT examinations in the 20-30 and 31-40 age groups experienced an increase in CCT but in the 41-50 age group there was a decrease and in the 51-60 age group there was an increase in CCT and in the 61-70 age group it decreased.

In the 51-70 year age group, a higher CCT value was obtained than the younger age group, this was due to the possibility that the sample of this study had undetected diabetes mellitus. Based on Luo X et al. (2019) Patients with diabetes mellitus have thicker CCT due to diabetes mellitus, which has high glucose levels in the previous days which causes the accumulation of intracellular sorbitol which is an osmotic agent, resulting in swelling of endothelial cells¹⁶.

IOP is the internal pressure of the eye produced by the intraocular fluid, which consists of aqueous humor and vitreous humor^{17,18}. In this study, IOP

measurements were carried out using the Canon TX-20P NCT and operated on by an ophthalmologist. The NCT device was chosen because it does not make direct contact with the eye, thereby reducing the risk of infection, does not require anesthesia before the examination, does not require painting using fluorescein on the eye so that it is more comfortable for the patient, and obtained 3 kinds of results simultaneously, namely CCT, IOP and compensated IOP (C.IOP) which is a measurement of IOP value by adding a CCT component in it so that it can shorten the inspection time on routine inspections¹⁹⁻²¹. Measurement and data collection of IOP results were grouped according to 5 age groups, namely the ages of 20-30, 31-40, 41-50, 51-60 and 61-70 years.

The results of the measurement showed that the IOP value in the 20-30 age group was lower than the 31-40 age group. Age groups of 31-40 to 61-70, was found that as the age increase, the IOP decreases.

CONCLUSIONS

Based on the results of the study of age, central corneal thickness (CCT), and intraocular pressure (IOP) that was done at the Eye Clinic of PHC Surabaya Hospital for four weeks, with a total sample of 200 patients, it was concluded that the CCT value was in the 20-30 age group is 537.67 ± 28.16 μm ; CCT values in the 31-40 age group were 544.89 ± 29.28 μm ; CCT values in the 41-50 age group were 540.09 ± 30.44 μm ; CCT values in the 51-60 age group were 553.35 ± 28.60 μm ; the CCT value of the 61-70 age group was 550.35 ± 30.47 μm .

The results of the IOP examination in this examination showed that the IOP value in the 20-30 age group were 16.25 ± 2.93 mmHg; IOP values in the 31-40 age group were 16.92 ± 2.15 mmHg; IOP values in the 41-50 age group were 16.83 ± 2.57 mmHg; IOP values in the 51-60 age group were 16.43 ± 2.96 mmHg; IOP

value in the 61-70 age group was 16.08 ± 3.12 mmHg.

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REFERENCES

1. Ismandari F. InfoDATIN Situasi Gangguan Penglihatan. Kementrian Kesehat RI Pus Data dan Inf. 2018;
2. Lal V, Truong D. Eye movement abnormalities in movement disorders. *Clin Park Relat Disord*. 2019;
3. Benítez-del-Castillo J, Labetoulle M, Baudouin C, Rolando M, Akova YA, Aragona P, et al. Visual acuity and quality of life in dry eye disease: Proceedings of the OCEAN group meeting. In: *Ocular Surface*. 2017.
4. Brar VS, Law SK, Lindsey JL. 2019-2020 Basic and Clinical Science Course, Section 02: Fundamentals and Principles of Ophthalmology. In *American Academy of Ophthalmology*; 2019.
5. Hashmani N, Hashmani S, Hanfi AN, Ayub M, Saad CM, Rajani H, et al. Effect of age, sex, and refractive errors on central corneal thickness measured by oculus pentacam®. *Clin Ophthalmol*. 2017;
6. Mimouni M, Flores V, Shapira Y, Graffi S, Levartovsky S, Sela T, et al. Correlation between central corneal thickness and myopia. *Int Ophthalmol*. 2018;
7. Sng CCA, Ang M, Barton K. Central corneal thickness in glaucoma. *Current Opinion in Ophthalmology*. 2017.
8. Baboolal SO, Smit DP. South African Eye Study (SAES): Ethnic differences in central corneal thickness and intraocular pressure. *Eye*. 2018;
9. Tonnu PA, Ho T, Newson T, El Sheikh A, Sharma K, White E, et al. The influence of central corneal thickness and age on intraocular pressure measured by pneumotometry, non-contact tonometry, the Tono-Pen XL, and Goldmann applanation tonometry. *Br J Ophthalmol*. 2005;
10. Kim JH, Caprioli J. Intraocular pressure fluctuation: Is it important? *Journal of Ophthalmic and Vision Research*. 2018.
11. Pronin S, Brown L, Megaw R, Tatham AJ. Measurement of intraocular pressure by patients with glaucoma. *JAMA Ophthalmol*. 2017;
12. Batawi H, Lollett IV, Maliakal C, Wellik SR, Anderson MG, Feuer W, et al. A Comparative Study of Central Corneal Epithelial, Stromal, and Total Thickness in Males With and Without Primary Open-Angle Glaucoma. *Cornea*. 2018;
13. Kesav N, Palestine AG, Kahook MY, Pantcheva MB. Current management of uveitis-associated ocular hypertension and glaucoma. Vol. 65, *Survey of Ophthalmology*. 2020. p. 397–407.
14. Belovay GW, Goldberg I. The thick and thin of the central corneal thickness in glaucoma. *Eye (Basingstoke)*. 2018.
15. Angka Harapan Hidup (AHH) menurut Provinsi dan Jenis Kelamin, 2010-2019 [Internet]. Badan Pusat Statistik. [cited 2021 Oct 29]. Available from: <https://www.bps.go.id/linkTableDinamis/view/id/1114>
16. Luo XY, Dai W, Chee ML, Tao Y,

- Chua J, Tan NYQ, et al. Association of Diabetes With Central Corneal Thickness Among a Multiethnic Asian Population. *JAMA Netw open*. 2019;
17. Basak S, Basak S. Glaucoma. In: *Essentials of Ophthalmology*. 2016.
 18. Guyton A, Hall J. *Guyton and Hall Textbook of Medical Physiology Twelfth Edition*. Elsevier Inc. 2013.
 19. Jansson U, Brautaset R, Cerviño A, Nilsson M. A comparison of the Canon TX-20P™ non-contact tonometer and pachymeter in healthy eyes. *Int J Ophthalmic Pract*. 2012;
 20. Erdogan H, Akingol Z, Cam O, Sencan S. A comparison of NCT, goldman application tonometry values with and without fluorescein. *Clin Ophthalmol*. 2018;
 21. Bang SP, Lee CE, Kim YC. Comparison of intraocular pressure as measured by three different non-contact tonometers and Goldmann applanation tonometer for non-glaucomatous subjects. *BMC Ophthalmol*. 2017;