



## Study Of Endothelial Cells In Primary Glaucoma Patients-A Cross Sectional Comparative Study

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

**Abstract:** Nil

**Keywords:** Nil

### Introduction:

Glaucoma is the second common cause of world blindness after cataract. The global prevalence of glaucoma is increasing gradually and on the basis of available data it is estimated to affect 111.8 million people by 2040. India accounts for 12.8% of glaucoma and prevalence of angle closure glaucoma is 12.7% and open angle glaucoma is 12.9%, nearly same[1].

Glaucoma is not a single disease process. Rather, it is a large group of disorders characterized by widely diverse clinical and histopathological manifestations, which results in a characteristic optic neuropathy.[2]

Many population-based studies and many hospitals in India, have studied the prevalence and risk factor of glaucoma. Several studies have determined some of risk factors for the glaucoma like old age, raised intraocular pressure (IOP), systemic hypertension, diabetes, and myopia[3],[4],[5],[6],[7],[8],[9],[10]. Loss of Corneal endothelial cells has been observed in various types of glaucoma such as primary angle-closure glaucoma, primary open-angle glaucoma (POAG).

Acute angle closure presents as an acute symptomatic event with blurring of vision associated with pain, red eye, headache, nausea, and vomiting. It mostly presents with high intraocular pressure (IOP), corneal haze,

shallow anterior chamber depth, sphincter atrophy and a closed angle on gonioscopy. Widening of angle and preventing further angle closure, is the mainstay goal for medical or surgical therapy. If glaucoma has developed, the

target is to lower IOP.

Loss of Corneal endothelial cells has been observed in various types of glaucoma such as primary angle-closure glaucoma, primary open-angle glaucoma (POAG). The proposed mechanism to endothelial cell loss is attributed to raised intraocular pressure in glaucoma and preservatives used in treatment that lowers intraocular pressure (IOP). Moreover, endothelial cell loss is also caused by glaucoma surgery, specially in patients after application of antiproliferative medication in filtration surgery and aqueous shunt implantation.[11,12,13,14]

### Materials & Methods:

A comparative cross sectional study was carried out from December 2020 to may 2021 in a tertiary care centre of central India. Ethical permission was obtained from ethical committee of the institute. Total 110 patients were enrolled. 55 patients were diagnosed cases of PACG. 55 healthy subjects were taken as comparison group. Subjects with previous ocular surgery, ocular trauma, other ocular and systemic diseases that could affect vision were excluded.

Demographic data of patients was collected including name, age, sex, occupation and personal detail. Detailed history of systemic disorders and past relevant ocular history and medication history was noted. Other clinical data collected including previous ocular surgery or laser procedure.

Initial ophthalmological examination including best corrected visual

acuity (BCVA), slit lamp bio-microscopy, IOP measurement with goldmann applanation tonometer (GAT) done. Detailed glaucoma work up was done including 2-mirror gonioscopy, (CCT)central corneal thickness, visual field-24'2 (perimetry), OCT-RNFL(retinal nerve fibre layer).

The data was collected,entered and analysed using using MICROSOFT EXCEL 2007.Mean and

standard deviation have been analysed for descriptive statistics. Tests of significance such as chi square test and z test of proportion have been applied appropriately with  $p < 0.05$  considered significant.

**Observation and results:**

**Table 1:Distribution of study subjects based on the age groups**

Age group (years)	Number of cases	Number of age matched controls
41-50	10	20
51-60	30	27
61-70	15	8
Total	55	55

**Table 2: Comparison of endothelial cell count (ECC) in different age group.**

Age group in years	Mean ECC (cells/m2)	SD ECC (cells/m2)
41-50	2677.85	271.88
51-60	2552.60	218.57
61-70	2497.58	213.19

**Table 3: Comparison of ECC in age matched group, acute PACG(primary angle closure glaucoma), chronic PACG and in controls**

Age group	PACG(ACUTE)	PACG(ACUTE) MEAN ECC	PACG(ACUTE) SD ECC	P VALUE
41-50	6	2214.00	192.07	<0.0001

51-60	6	2251.17	160.35	<0.0001
<b>Age group</b>	<b>PACG(CHRONIC)</b>	<b>PACG (CHRONIC) MEAN ECC</b>	<b>PACG (CHRONIC) SD ECC</b>	<b>P VALUE</b>
41-50	4	2541.50	210.67	<0.0001
51-60	24	2361.96	151.84	<0.0001
61-70	15	2302.40	130.04	<0.0001
<b>Age group</b>	<b>CONTROL</b>	<b>CONTROL MEAN ECC</b>	<b>CONTROL SD ECC</b>	
41-50	20	2830.45	181.45	
51-60	27	2722.00	135.72	
61-70	8	2656.50	166.38	

**Results:**

Table 1 shows shows distribution of patients according to age. Out of 110 patients, there were total 30 (10 cases and 20 controls) in 41-50 years of age, 57 in 51-60 years of age (30 cases and 27 controls) and 23 in 61-70 years of age. (15 cases and 8 controls)

Table 2 shows correlation between age group and mean ECC. The mean ECC in 41-50 years was  $2677.85 \pm 271.88$ , in 51-60 years age was  $2552.60 \pm 218.57$  and 61-70 years age group was  $2497.58 \pm 213.19$ . Coefficient of correlation of ECC with age was  $-0.304405795$ , which suggests as age increases, ECC decreases.

Table 3 shows age matched comparison of endothelial cell counts in controls, acute PACG and chronic PACG. The mean ECC in 41-50 years controls was  $2830.45 \pm 181.45$ , acute PACG was  $2214.0 \pm 192.07$  and chronic PACG was  $2541.50 \pm 210.67$ . ( $P < 0.0001$ ). The mean ECC in 51-60 years controls was  $2722.00 \pm 135.72$ , acute PACG was  $2251.17 \pm 160.35$ , chronic PACG was  $2361.96 \pm 151.84$  ( $P < 0.0001$ ). The mean ECC in 61-70 years control was  $2656.50 \pm 166.38$ , chronic PACG

was  $2302.40 \pm 130.04$ . ( $p < 0.0001$ ). The difference in all groups were statistically significant.

**Discussion:**

The present study was conducted to know effect of primary angle closure glaucoma on corneal endothelial cells.

The study was conducted at Mahatma Eye Bank Eye Hospital

Somalwada Nagpur on patients of primary glaucoma during the study period of December 2020 to May 2021. A sample size of 110 eyes were enrolled for the study. Detailed examination of patient was done.

After detailed ocular examination of patients; inclusion and exclusion

criteria were applied and diagnosed cases of primary angle closure glaucoma were sorted. All patients were divided in 3 groups,

1. primary acute angle closure glaucoma
2. primary chronic angle closure glaucoma,
3. age matched

control. Corneal endothelial cells analysis was done by using non contact specular microscopy CEM 530.

In our study, Table 1 showed that in current study out of 110 patients, there were total 30 (10 cases and 20 controls) in 41-50 years of age, 57 in 51-60 years of age (30 cases and 27 controls) and 23 in 61-70 years of age. (15 cases and 8 controls). M M Gagnon et al [15] had enrolled 154 patients in his study aged 50-87 years and there was no statistical difference in age.

Table 2 showed, mean ECC in 41-50 years was  $2677.85 \pm 271.88$ , in 51-60 years age was  $2552.60 \pm 218.57$  and 61-70 years age group was  $2497.58 \pm 213.19$ . There was negative correlation of age and endothelial cell density, which suggested that as age increased, ECC decreased.

In Aparna Nayak et al study [16] there was statistically significant negative correlation of ECC with age found.

As age increases by one year, endothelial cell density decreases by 5.078 cell/mm<sup>2</sup>. Rao et al [17] noticed decrease in endothelial cells with age in normal

Indian eyes. The reason behind endothelial cell loss may be cellular apoptosis and/or necrosis due to light induced oxidative damage [18]

Table 3 concluded that in current study the mean ECC in 41-50 years controls was  $2830.45 \pm 181.45$ , acute PACG was  $2214.0 \pm 192.07$  and chronic PACG was  $2541.50 \pm 210.67$ . ( $P < 0.0001$ ). The mean ECC in 51-60 years controls was  $2722.00 \pm 135.72$ , acute PACG was  $2251.17 \pm 160.35$ , chronic PACG was  $2361.96 \pm 151.84$ . ( $P < 0.0001$ ). The mean ECC in 61-70 years control was  $2656.50 \pm 166.38$ , chronic PACG was  $2302.40 \pm 130.04$  ( $p < 0.0001$ ). The difference in all groups were statistically significant.

### Conclusion:

The study concludes that There was significant decrease in endothelial cell counts in comparison to age matched controls in PACG group. The loss was more in acute PACG group followed by chronic PACG group. There was significant change in coefficient of variation in acute PACG group suggesting polymegathism. Mean percentage of hexagonality did not vary much in all groups.

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