



STUDY OF ENDOTHELIAL CELLS IN PRIMARY OPEN ANGLE GLAUCOMA PATIENTS-A CROSS SECTIONAL COMPARATIVE STUDY

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KEYWORDS :

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).

Primary open angle glaucoma (POAG) is an optic neuropathy with a slow progression, usually asymmetrical and bilateral. It usually occurs in adults with open anterior chamber angles and does not associate with other eye diseases that lead to changes in the optic nerve[13]. Studies describe several risk factors for POAG: increased intraocular pressure (IOP) [14], age (over 60 years old), [15] gender[16], black ethnicity[16], high myopia, [17] family history of glaucoma[18], decreased central thickness of the cornea (ECC) [21], hypertension (SAH), [17], diabetes mellitus (DM),[11] migraine[14] and sleep apnea[20]. Increased IOP is a major risk factor for glaucoma, and the only one that can be measured with the possibility of intervention. [19]

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 comitte of the institute.Total 110 patients were enrolled.55 patients were diagnosed cases of POAG.55 healthy subjects were taken as comparison group. Subjects with previous ocular surgery,oculartrauma,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 goldmannapplanation 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	28	27
61-70	17	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, POAG(Primary open angle glaucoma) and in controls

Age group	POAG	POAG MEAN ECC	POAG SD ECC	P VALUE
41-50	10	2705.50	105.95	<0.0001
51-60	28	2628.07	112.09	<0.0001
61-70	17	2595.00	159.54	<0.0001
Age group	CONTROL	CONTROL MEAN ECC	CONTROL SD ECC	
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,55 in 51-60 years of age (28 cases and 27 controls) and 25 in 61-70 years of age. (17 cases and 8 controls).

Table 2 shows correlation between age group and mean ECC.The mean ECC in 41-50 years was 2677.85 ± 271.88, in 51-60 years age was 2552.60 ± 218.57 and 61-70 years age group

was 2497.58 ± 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 and POAG (primary open angle glaucoma) patients. The mean ECC in 41-50 years controls was 2830.45 ± 181.45 and in POAG was 2705.50 ± 105.95 ($P < 0.0001$). The mean ECC in 51-60 years controls was 2722.00 ± 135.72 and in POAG was 2628.07 ± 112.09 ($P < 0.0001$). The mean ECC in 61-70 years control was 2656.50 ± 166.38 and in POAG was 2595.00 ± 159.54 ($p < 0.0001$). The difference in all groups were statistically significant.

DISCUSSION:

The present study was conducted to know effect of primary open angle 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 criterias were applied and diagnosed cases of primary open angle glaucoma were sorted. All patients were divided in 2 groups,

1. Primary open angle glaucoma, 2. 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, 55 in 51-60 years of age (28 cases and 27 controls) and 25 in 61-70 years of age (17 cases and 8 controls).

M M Gagnon et al [22] 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 ± 271.88 , in 51-60 years age was 2552.60 ± 218.57 and 61-70 years age group was 2497.58 ± 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 [23] 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/mm². Rao et al [24] 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 ± 181.45 and in POAG was 2705.50 ± 105.95 ($P < 0.0001$). The mean ECC in 51-60 years controls was 2722.00 ± 135.72 and in POAG was 2628.07 ± 112.09 ($P < 0.0001$). The mean ECC in 61-70 years control was 2656.50 ± 166.38 and in POAG was 2595.00 ± 159.54 ($p < 0.0001$). The difference in all groups were statistically significant. Aparna Nayak et al [23] had found out that corneal endothelial cell density was reduced more in POAG than NTG. ($p < 0.001$).

M M Gagnon et al [22] concluded that corneal endothelial cell counts were significantly low in patients with glaucoma ($2,154 \pm 419$ cells/mm²) than in controls (2560 ± 360 cells/mm²; ttest, $p < 0.0001$).

CONCLUSION:

The study concludes that there was significant decrease in endothelial cell counts in comparison to age matched controls in POAG group.

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