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GONIOSCOPIC EVALUATION OF ANGLE OF ANTERIOR CHAMBER IN POPULATION

Ophthalomology

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ABSTRACT

Background: Glaucoma is the second leading cause of blindness worldwide after cataract, accounts for 12.3% of global blindness. Gonioscopy is simple and sensitive method for screening of occludable angles and presence of any other morphological abnormality like peripheral anterior synechiae. **Objective:** The objective of carrying out this study was to find the proportions of people with open angle and various types of angle closures and any other angle abnormality in the population. **Materials and method:** This was cross sectional study carried out from January 2013 to October 2014 at Department of Ophthalmology, Command Hospital (EC), Kolkata. The subjects enrolled in the study were sourced from those attending the Ophthalmology OPD of this institute. **Results and observations:** Out of total 1000 study subjects 72% study subjects belong to grade 4 angle abnormality followed by 26%, 1%, 0.9% and 0.1% study subjects belong to grade 3, 2, 1 and 0 angle abnormalities respectively. Proportion of males were more in study subjects were more in study subjects with grade 4 angle abnormality. Proportion of females were more in study subjects with grade 1, 2 and 3 angle abnormality. **Conclusion:** The lack of routine gonioscopy often culminates in misdiagnosis, mal-occurrence, and maltreatment. Routine gonioscopy detects early angle compromise in time to preserve vision in countless patient.

KEYWORDS

Anterior Chamber, Gonioscopy, Glaucoma, Angle closure, Open angle

INTRODUCTION

Glaucoma is characterized by chronic progressive optic neuropathy caused by group of ocular conditions which lead to damage of the optic nerve with loss of visual function. Glaucoma is the second leading cause of blindness worldwide after cataract, accounts for 12.3% of global blindness (1). In India, 7.9% of total blindness are reported to occur due to glaucoma (2). In nearly all cases, however, blindness from glaucoma is preventable. Nevertheless, this prevention requires early detection and proper treatment. Detection depends on the ability of available diagnostic methods to recognize the early subtle signs of various forms of glaucoma.

The Glaucoma constitutes a diverse group of disorders associated with elevated intraocular pressure that culminate in a characteristic pattern of optic atrophy and loss of visual field. It is typically associated with progressive loss of vision that may escape detection by the patient or by attending physician for long period.

A carefully directed history and physical examination are essential for the correct diagnosis and proper management of a disease that may have many causes. The measurement of intraocular pressure (tonometry) and assessment of aqueous humour outflow facility (gonioscopy) are very important investigations to be performed.

Glaucoma is the leading cause of irreversible blindness worldwide and second most common cause of blindness overall (3). There is a significantly high incidence of PACG in India, which forms almost half of all adult primary glaucomas seen in a hospital setting (4, 5). The social and economic impact of glaucoma is enormous but difficult to quantify.

Glaucoma can occur due to various mechanisms out of which chronic open angle glaucoma and angle closure glaucoma are basic mechanism behind various types of glaucoma.

In Asians populations where angle closure glaucoma is the predominant cause of morbidity from glaucoma, there is great potential for screening programs to prevent angle closure glaucoma (6).

Gonioscopy is simple and sensitive method for screening of occludable angles and presence of any other morphological abnormality like peripheral anterior synechiae. Peripheral anterior synechiae compromise the drainage of the aqueous humour and results in a rise of IOP, and thus contributes to the optic neuropathy. Hence it is important to assess in detail those anterior chambers which on screening are found to be suspiciously shallow, in order to detect the presence of peripheral anterior synechiae. The objective of carrying out this study was to find the proportions of people with open angle and various types of angle closures and any other angle abnormality in the population.

MATERIALS AND METHOD

This was cross sectional study carried out from January 2013 to October 2014 at Department of Ophthalmology, Command Hospital (EC), Kolkata.

Study population

The subjects enrolled in the study were sourced from those attending the Ophthalmology OPD of this institute.

Inclusion Criteria:

All Ocularly asymptomatic patients more than 40 years of age.

Exclusion Criteria:

1. If a patient is a known case of Glaucoma.
2. Patients with a previous history of any ocular surgery.
3. Patient with any ocular disease.
4. Those who are not willing to participate in the study.

Sample Size

The study included 500 patients coming to ophthalmology OPD for routine eye check-up and fulfilling the above-mentioned inclusion and exclusion criteria. The ophthalmological findings were recorded and the data was statistically evaluated.

METHODOLOGY

The history taking, ophthalmic examinations and investigations were done at CH (EC). Gonioscopy was performed with Zeiss 4-mirror hand-held gonioscope. After taking clearance from ethical committee of the institute, study was conducted in the Department of Ophthalmology, Command Hospital (EC). Patients coming for eye checkup who are asymptomatic > 40-year age and free of any ocular disease, with no history of ocular surgery and asymptomatic systemically was enrolled in the study. A complete ocular examination was done inclusive of unaided visual acuity (VA), best corrected visual

acuity (BCVA) with the details of the refractive error, slit lamp examination of the anterior chamber inclusive of assessment of angle depth by Van Herrick's method. The ocular fundus will be examined in the un-dilated eye by direct ophthalmoscopy. The patient was then be subjected to gonioscopy on slit lamp. After briefly explaining the procedure to the patient gonioscopy was performed with Zeiss 4-mirror hand-held gonioscope. The width of the angle will be studied based on the **Shaffer classification (7)** (grade 4, wide open (35º-45º): grade 3, moderately open (25º-34º); grade 2, moderately narrow (20º); grade 1, very narrow (10º); grade 0, closed (0º). Any other finding will also be noted as also the level of iris insertion. The results will be noted, tabulated and subjected to statistical study.

Statistical Analysis
Incidence Rate:
Definition
Incidence rate is the pace or intensity of accumulation of disease cases. In other words, incidence rate measures how fast a disease is spreading.

Incidence rate is calculated using the following formula:
(Number of New Cases) / (Person-Time at Risk)
- The numerator (Number of New Cases) is a straightforward count of new cases.
- The denominator (Person-Time at Risk) is measured as follows.

Person-Time: The amount of at-risk time each person contributes Data was entered in excel sheet. Excel sheet was analysed with the help of software SPSS Version 24. Result was presented in form of graphs and percentages. Proportion of patients with different angle abnormalities was presented inform of numbers and percentages.

RESULTS AND OBSERVATIONS

Table 1: Distribution of study subjects according to age and grades of angle (Shaffer's system)

TOTAL POPULATION	GD IV ANGLE	GD III ANGLE	GD II ANGLE	GD I ANGLE	GD 0 ANGLE
41-50 (300)	96(98.8%)	04(1.3%)	0	0	0
51-60 (200)	100 (50%)	96(48%)	02(1%)	01(0.5%)	01(0.5%)
61-70 (200)	128(64%)	60(30%)	06(3%)	06(3%)	0
71-80 (300)	196(65.3%)	100(33.33%)	02 (0.66%)	02(0.66%)	0
1000	720 (72%)	260(26%)	10(1%)	9 (0.9%)	1 (0.1%)

Above table showed distribution of study subjects according to age and grades of angle (Shaffer's system). Out of total 1000 study subjects 72% study subjects belong to grade 4 angle abnormality followed by 26%, 1%, 0.9% and 0.1% study subjects belong to grade 3, 2, 1 and 0 angle abnormalities respectively. In study subjects with grade 4 and 3 angle abnormalities maximum study subjects belong to age group of 71-80 years. In study subjects with grade 2 and 1 angle abnormalities maximum study subjects belong to age group of 61-70 years. There was one patient with no angle abnormality who lies in age group of 51 to 60 years.

Table 2: Distribution of study subjects according to gender and grades of angle (Shaffer's system)

TOTAL	GRD IV	GRD III	GRD II	GRD I	GRD 0
Male	392(72.4%)	100(20%)	04(0.8%)	04(0.8%)	0
Female	328(65.6%)	160(32%)	06(1.2%)	05(1%)	01(0.2%)
1000	720 (72%)	260(26%)	10(1%)	9 (0.9%)	1 (0.1%)

Above table shows that out of total 1000 study subjects 50% were males and 50% were females. Proportion of males were more in study subjects were more in study subjects with grade 4 angle abnormality. Proportion of females were more in study subjects with grade 1, 2 and 3 angle abnormality. There is one female without any angle abnormality.

Table 3: Distribution of study subjects according to age and other angle abnormalities

Age	Pseudo-exfoliation	Iris Processes	PAS	Plateau iris	Neo vascularisation	angle recession	Pigmentation
40-50	0	50 (28.4%)	O1 (50%)	02 (50%)	0	0	18(45%)
51-60	02(6.66%)	70 (39.77%)	01(50%)	02 (50%)	0	01 (33%)	16(40%)
61-70	15(50.0%)	36 (20.4%)	0	0	01 (100)	02 (67%)	06(15%)
71-80	13 (43.33%)	20 (11.3%)	0	0	0	0	0
Total	30 (100%)	176 (100%)	02 (100%)	04 (100%)	01 (100%)	03 (100%)	40 (100%)

In above table we observed that out of total 1000 study subjects 1.76% showed Iris Processes followed by in 0.04% Pigmentation, 0.03% study subject's Pseudo-exfoliation. 0.004% study subjects Plateau iris, in 0.003% study subjects angle recession, in 0.002% study subjects PAS and 0.001% study subjects Neovascularisation. Out of 30 study subjects with Pseudo-exfoliation maximum were belong to age group of 61-70 years. Out of 176 study subjects with Iris Processes maximum numbers belong to age group of 51-60 years. Out of 40 study subjects with pigmentation maximum study subjects belong to 41 – 50 years age group.

Table 3: Distribution of study subjects according to gender and other angle abnormalities

Gender	Pseudo-exfoliation	Iris Processes	PAS	Plateau iris	Neo vascularisation	Angle recession	Pigmentation
Males	18 (60%)	98 (55.68%)	00 (50%)	02 (50%)	01	03 (100%)	24 (45%)
Females	12(40%)	78 (44.32%)	02 (50%)	02 (50%)	0	0	16 (40%)
Total	30 (100%)	60 (100%)	02 (100%)	04 (100%)	01 (100%)	03 (100%)	40 (100%)

Above table shows that proportion of males were high in study subjects with Pseudo-exfoliation, Iris Processes and Pigmentation. Two study subjects with PAS were females. All study subjects with angle recession were males. One study subject with v was male. 50% study subjects with Plateau iris were males and 50% were females.

DISCUSSION

The Aim of this study was to evaluate the morphology of anterior chamber angle and to estimate the risk of angle closure in population. This study included 1000 eyes of 500 patients between the age group of 40-80 years with male and female patients in equal proportion, attending eye OPD's of Command Hospital (EC), Kolkata for routine eye examination.

Out of 1000 eyes 720 (72%) eyes were having grade IV angle, 260(26%) eyes had grade III, 10 (1%) had grade II, 9(0.9%) had grade I and one eye with grade 0 angle were found. This shows that overall, an incidence of open angle is more in population compared to angle closure.

The incidence of grade IV angle was more common in the age group of 41-50 years with an incidence rate of 296 (98.8%). The highest incidence of grade III angle was seen in 51-60 years age group i.e., 48%. The 61-70 years age group had a highest incidence for grade II & I i.e 3% of each. The grade 0 was seen more commonly in the 51-60 years age group i.e. 0.5%. There was an increased incidence of angle closure with increasing age.

The previous studies of anterior chamber depth and narrow angle gave an impression that depth and volume of anterior chamber diminishes with age (8) which may result from thickening and forward displacement of lens (9, 10). Consequently, the percentage of individuals with narrow angle was higher in older age groups. One study found a bimodal pattern, with the first peak at ages 53 to 58 years and the second at 63 to 70 years (9).

This study also revealed an increased incidence of grade II angle in females (1.2%) compared to male (0.8%), In females grade I angle was (1%) and in males it was (0.8%) & grade 0 angle was (0.2%) in female and (0%) in male population, which showed chances of ACG is more in females.

Sihota *et al*. also found a marginal female predominance (51.4%) for angle closure (11). Chennai Glaucoma Study (CGS) also reported PAC and PACG to be more common in women (12**)**.

Female gender has been reported to be an independent risk factor for angle closure glaucoma and for angle closure disease. This is possibly related to biometric differences between genders since women appear to have shorter eyes and a shallower anterior chamber depth than men (10, 13).

Pseudo exfoliation was seen in 30 (3%) eyes with increased incidence in age group of 61-70 & 71-80 years, out of which 18 (60%) were males and 12 (40%) were females.

Aravind Comprehensive Eye Study (ACES) from a different part of southern India shows prevalence of PEX (25.7%) in population (14).

Previous studies have shown a marked age-related increase in the incidence of PXF; typically, <1% in persons younger than 60 years and increasing to 6.28% among subjects 60 years of age or older (14, 15). Although the reason for this age-related increase is unknown, it has been speculated that the changes in gene expression that occur with age may be responsible (16).

There are conflicting reports of gender differences in the prevalence of PXF (17). We found the prevalence of PXF among men to be marginally higher than in women, but the difference was not statistically significant.

Iris processes were seen in 176(17.6%) eyes with increased incidence in age group of 51-60 years. And 55.68% in males and 44.31% in females**.** Iris processes may be confused with peripheral anterior synechiae. Iris processes are most common nasally and gradually diminish with increasing age (18). Iris processes are found in 35% of normal eyes (18). They typically extend from the peripheral iris to the ciliary body or scleral spur. Occasionally the iris processes extend to the posterior aspect of the trabecular meshwork or Schwalbe's line.

PAS are seen only in two cases both were females one was 47-year-old and other was 52 years old, both of them had grade I angle with raised IOP and thinning in OCT Optic nerve head analysis, they were diagnosed as case of angle closure Glaucoma. We found incidence of PAS and PAC is more in females. Andra Pradesh eye disease study (APEDS) also found more prevalence of PACG in women (19). There are three cases with angle recession all of three patients were males of age group of 51,62 and 65years.

Angle-recession glaucoma is classified as a type of traumatic secondary open-angle glaucoma (20). In a 1994 population-based survey on gonioscopy in individuals older than 40 years in a community in South Africa, the authors reported a cumulative prevalence of angle recession of 14.6%. Among eyes with 360° of angle recession, 8% had glaucoma, and the overall prevalence of glaucoma of eyes with any degree of angle recession was 5.5% (21).

A strong predominance of eye trauma exists in men, with a male-to-female ratio of 4:1. Therefore, it may be assumed that angle recession and angle-recession glaucoma occur most frequently in men.

We found dark pigmentation in 40 patients out of which 18(45%) are in age group of 40-50 years, 16(40%) are 51-60 years and 06(15%) are 61-70 years. 60% of them were males and 40% were females. It is common to see some pigment dusting the inferior portion of the angle, especially in individuals over age 50 (22). A minimal amount of angle pigment is expected but excessive angle pigmentation should prompt the examiner to search for its cause. This may be caused by pigmentary glaucoma, pseudo exfoliation, trauma, uveitis, or tumours. Angle pigment. Excessive angle pigment always demands an explanation.

There was only one case in which neovascularization is seen in one eye patient was 62-year-old men with CRVO in the same eye. Normal angle vessels are seen in 62% of individuals with blue eyes and only 9% with brown eyes (23). There are certain features that differentiate normal from abnormal angle vessels. Normal angle vessels rarely bridge the scleral spur and do not branch. They are usually single vessels without arborisation. Abnormal vessels seen in patients having neovascular glaucoma secondary to some ocular ischemic conditions like CRVO, BRVO and Diabetic retinopathy. In our study diabetes and other vascular eye disease are exclusion so we found only one case.

There were 04 cases in which plateau iris configuration is seen three of them were females of age 47, 52 and 54 years and one was male of age 50 year. The term plateau iris was first used in 1958 in describing the configuration of the iris in a patient (24). In 1977, a study of 8 patients who presented with angle closure glaucoma after an iridotomy helped clarify the condition.

CONCLUSION

In this study we did Gonioscopic evaluation of 1000 eyes of normal patients attending eye OPD of this tertiary health care centre.

We found that the overall incidence of grade IV angle is highest in the general population i.e. about 72% of total study population.

This study also revealed that angle closure is more in females as compared to males which is correlated with earlier studies.

Apart from the grading of angles, this study revealed other components of angle like PEX, neovascularization, plateau iris, iris processes, pigmentation, angle recession which are important in diagnosing various types of glaucoma in their earlier stages before they could lead to significant visual loss.

This study also showed that most of the angle abnormalities are seen fairly common in elderly age group.

The lack of routine gonioscopy often culminates in misdiagnosis, mal-occurrence, and maltreatment. Routine gonioscopy detects early angle compromise in time to preserve vision in countless patient. To summarise, Gonioscopy is an essential ophthalmic skill necessary for the correct diagnosis and treatment of multiple ophthalmic disorders. zMaintenance of gonioscopic skills will increase the likelihood of a lifetime of vision for patients at risk for any type of angle pathology

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