Original Article

The Relative Frequency and Risk Factors of Primary Open Angle Glaucoma and Angle Closure Glaucoma

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Purpose: To determine the frequency and compare the potential risk factors for primary open angle glaucoma and primary angle closure glaucoma in admitted patients.

Materials And Methods: A detailed history was taken. Patient's height and mentovertex (MVHt) height was measured in centimeters. Complete ocular examination was carried out, including recording visual acuity, anterior segment examination, posterior segment examination, intraocular pressure measurement, peripheral and central anterior chamber depth, corneal diameter and axial length measurement. Gonioscopy was performed. Visual field was recorded by automated visual field analyzer.

Results: One hundred patients were examined, 60 were males and 40 were females. 58 patients had primary open angle glaucoma (POAG), 42 had primary angle closure glaucoma (PACG). Ten patients had systemic associations of hypertension and/ or diabetes mellitus.

Mean intraocular pressure was 25.54 mm Hg with no significant difference in gender distribution and with type of glaucoma. No significant difference was found in the height of patient with either type of glaucoma. In POAG the average mentovertex height was 23.52 cm and in PACG it was 20.98cm. Mean axial length of globe in POAG was 23.2mm and in PACG it was 21.3mm. Mean corneal diameter in POAG was 11.29mm and in PACG 11.13 mm. Anterior chamber depth was calculated to be less than 1/4th of corneal thickness in 29%, 1/4-1/2 in 19% and more than1/2 in 52% cases of PACG. It was found significantly shallower in PACG cases than in POAG.

Conclusions: We concluded from this study that Primary open angle glaucoma is more common and males are more prone to glaucomatous optic neuropathy. No correlation exists between patient's height and the type of glaucoma but strong positive correlation is there between the short mentovertex height and angle closure glaucoma. Shorter axial length, smaller corneal diameter and shallower anterior chamber were found to be significant risk factors for angle closure glaucoma.

Who program of prevention of blindness, has given estimates of glaucoma blindness for year 2000 as 8 million i.e. 16% of the total blindness[1]. So far, there have been twenty published population based surveys about prevalence of glaucoma. Globally, there are 13.5 million cases of POAG out of which 3 million are blind while out of total 6 million PACG cases 2 millions are blind[2]. Early diagnosis and management is the key to address the disease and has many avenues to work upon.

Glaucoma is a multifactor optic neuropathy for which the most blamed risk factor is raised intraocular pressure. However, optic nerve damage of more or less same extent has been seen with much lower pressures or there are normal eyes with much higher pressures. This gives us the clue that there has to be some other risk factor/s that predisposes the optic nerve to glaucomatous damage. These factors are systemic as well as local, physiological as well as anatomical. Keeping in view of these multiple factors that are still unclear, a cross-sectional comparative study was conducted to find out the relative anatomical risk factors for primary open angle and angle closure glaucoma in 100 consecutive patients admitted to the Department of Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar.

MATERIAL AND METHODS

To find out the relative frequency and risk factors of primary open angle and angle closure glaucoma, a detailed performa was prepared to record the personal details and chief complaints of the patients. Hundred consecutive patients of primary glaucoma admitted to the Khyber Institute of ophthalmic medical sciences Hayatabad medical complex were included in the study.

The inclusion criteria were any primary glaucoma case aging more than forty years with IOP more than or equal to 21 mm, Cup disc ratio (CD) of more than or equal to 0.5 and any degree of visual field defect.

The Exclusion criteria were all cases below age 40, normal tension glaucoma ocular hypertension and secondary glaucoma's were excluded.

After informed consent, detailed history was taken including the history of present illness, past history, systemic history with special emphasis given to diabetes mellitus and hypertension, family history and relevant drug history with special reference to anti glaucoma medication and steroids. Patient's height and mento-vertex height was measured in centimeters. For mento-vertex calculation, patient was seated on slit lamp and distance from his/her chin to vertex was measured with a measuring tape. A thorough ocular examination was performed with special emphasis placed upon the objectives of the study, including uncorrected and best-corrected visual acuity using Log MAR charts. Anterior segment was examined with slit-lamp (Topcon slit lamp SL-3C Japan). Peripheral anterior chamber depth was measured by Van Herrick method[4] and graded as 1=less than one fourth of corneal thickness, 2= one fourth to half of corneal thickness and 3= more than half of corneal thickness, corneal diameter was measured with vernier caliper, axial length was measured by A-Scan (Storz Compuscan LT, ULT1000 USA), and posterior segment examination was conducted with direct (Hiene beta 2000 Japan) and indirect ophthalmoscopes and biomicroscopy with 78 D lens was performed if required. Intraocular pressure was measured with the Goldmann tonometer (Haag- Streit) Detailed gonioscopy was performed on every patient to acertain the angle width and its configuration with gonioscope (single mirror goniodiagnostic lens, Ocular instruments inc USA) and angle was graded according to Scheie's classification[5]. Visual field was recorded on automated visual field analyzer (Kowa Automatic Visual field plotterAO-125, Japan).

Data was entered using SPSS 8 software. The files were them merged and validated for any data entry errors. Frequency of all the variables was checked and any missing values or outliers were confirmed from the questionnaires.

Frequency was calculated as percentages and proportions. Comparisons were made through analysis of variance (ANOVA) and p-values were calculated using students t test.

RESULTS

Description of sample subjects

The sample included 40% females and 60% males.

The mean age and standard deviation of the sample was 65 years (SD 1.94).

Mean height of the sample subjects was 176cm (SD 1.42)

Mean mentovertex height (MVHt) of the sample subjects was 22.46cm (SD 1.94)

Mean axial length was 22.45mm (SD 1.43)

Mean corneal diameter was 11.23mm (SD 1.43)

58 % of the sample subject had POAG and 42% had PACG (Fig. 1).

No statistically significant difference was found between the male to female ratio in the two types of glaucoma (Fig. 2).

Patients with POAG had significantly longer MVHt (23.52cm) than those with POAG (20.98cm) (p-value 0.00) (Fig. 3).

There was no effect of age or gender on this relationship. (p-values 0.45 and 0.35).

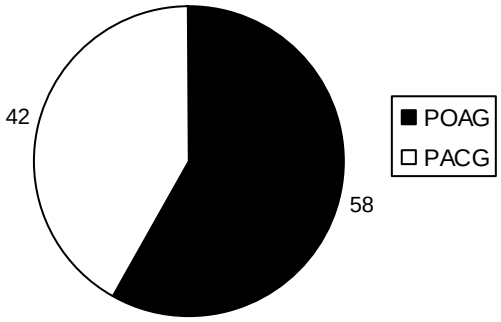

Fig. 1: Type of glaucoma.

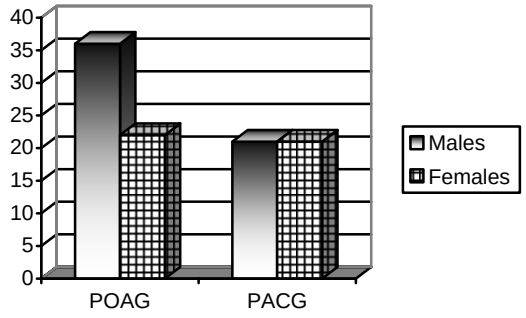

Fig. 2: Gender distribution in POAG and PACG.

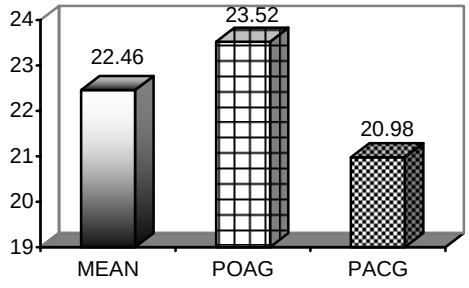

Fig. 3: Mentovertex height.

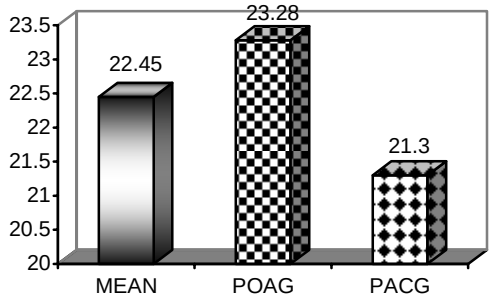

Fig. 4: Axial length of eyeball.

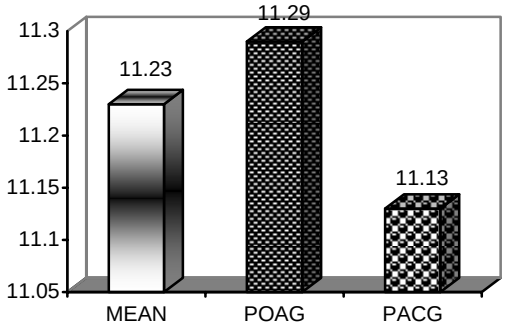

Fig. 5: Corneal diameter.

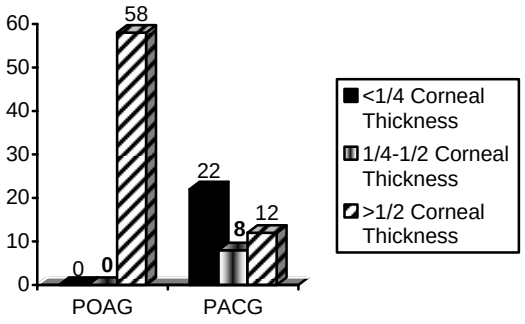

Fig. 6: Distribution of anterior depth.

Mean axial length was found significantly longer i.e.23.20mm (p-value 0.00) in POAG cases than PACG (21.30mm) as shown in (Fig. 4).

Corneal diameter was found significantly smaller i.e.11.13mm (p-value 0.00) in PACG than POAG (11.29mm) as can be seen in (Fig. 5).

Anterior chamber depth was found significantly shallower (p-value 0.00) in PACG cases than in POAG. Anterior chamber depth was calculated to be less than 1/4th of corneal thickness in 29% (12), 1/4-1/2 in 19% (8) and more than 1/2 in 52% (22) cases of PACG.

None of the POAG patients (58) had ACD less than 1/2 corneal thickness (Fig. 6).

DISCUSSION

Hundred consecutive admitted patients of primary adult glaucoma were included in the study at the Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar with the aim to document the relative frequency of primary open angle and angle closure glaucoma and their correlation with anatomical risk factors like individual's height, mentovertex height (MVHt), axial length of eyeball, corneal diameters and anterior chamber depth.

All patients were above 40 years of age, 27% were in 41- 50years age group, 62% in 51-60years age group and 11% were above 60 years.

This compares well with the results of the study from Hyderabad, where out of total glaucoma admissions, only 10.81% were under 40 years of age while the rest were above 40 years, out of these 44% were 41-50 years old, 32% were 51-60 years, 8% were 61-70 years and 4% were more than 70 years of age[6].

Fifty eight percent cases in our study suffered from POAG and 42% cases from PACG. Another hospital based study done in the same setting by Wajid SA, and Khan MD three years ago has also given preponderance of primary open angle glaucoma[3].

Sixty patients (60%) were males and forty females (40%). This is supported by Barbados and Rotterdam study where males are reported to be 1.5 and 3 times, respectively, more at risk for glaucoma. The Baltimore[7], Beaverdam, Rosscommon and Blue mountain[8] studies do not give any gender specificity. However, another hospital based study reports females glaucomatous patients as 58% and males as 42% of the total primary glaucoma admissions[3].

We recorded height in every patient with the view of considering that shorter height may be a predisposing risk factor for primary angle closure glaucoma and may be correlated with shorter eyeball, steeper cornea and shallow anterior chamber. Average height in our study was 176cm. Females were on average shorter than males. However no statistically significant difference was noted with the type of glaucoma. Thorough literature search has not shown any such relationship between the height and the type of glaucoma.

We measured mentovertex height in every case with the view of its possible association as anatomical risk factors for the two types of glaucoma. The hypothesis was that POAG have longer mentovertex height (MVHt) than PACG. Mean MVHt was 22.46cm with no significant gender difference. In POAG the mentovertex height was significantly longer (23.52cm) than in PACG cases (20.98). No reference supporting this relationship could be extracted from literature. Mentovertex height was also found to have a linear correlation with the anterior chamber depth and axial length of the eyeball.

Anatomical characteristics of eyes with primary glaucoma's are reported at several places in literature, all favoring shorter axial lengths, steeper corneas and shallow anterior chambers in angle closure glaucoma patients.

Mean corneal diameter was calculated as 11.23mm in all primary glaucoma cases. On average it was 11.29mm in POAG and 11.13mm in PACG. The difference was statistically significant, matching with study by Tomlinson et al., who gave normal values of 11.05mm and for ACG patients it was 10.72mm[9].

Anterior chamber depth has always been related with the angle grading. Measurement of the peripheral anterior chamber depth is a very reliable and non-invasive method of finding out the status of the angle. Central anterior chamber depth is about 2.5-3mm in normal individuals but in patients with ACG it is shallower. Anterior chamber depth is negatively correlated with lens thickness and positively correlated with axial length i.e. the thicker the lens shallower will be the anterior chamber and the longer the eyeball deeper will be the anterior chamber.

We studied the peripheral anterior chamber depth by Von Herrick method and found that anterior chamber depth was less than one fourth of corneal thickness in 29%(12), one fourth to half of the corneal thickness in 19%(8) and more than half in 52%(22) cases of PACG. In all POAG cases (58) the peripheral anterior chamber depth was more than half of the corneal thickness.

Eyes with PACG are studied for axial lengths and collectively shorter axial lengths are more common in PACG. We found an average axial length of 22.45mm. Eyes with PACG had a mean axial length 21.30mm while those with POAG had 23.28mm, showing statistically significant difference. Two studies report similar values of 23.10mm and 23.58mm for normal

and 22.01mm and 22.06mm for patients with angle closure glaucoma[10] respectively.

CONCLUSIONS

From this hospital-based study, we conclude that primary open angle glaucoma is more common patients and males are more prone to glaucomatous optic neuropathy than primary angle closure glaucoma. No correlation exists between patient's height and the type of glaucoma, but strong positive correlation is there between the short mentovertex height and primary angle closure glaucoma. Patients with primary angle closure glaucoma have shorter axial length, smaller corneal diameter and shallower anterior chamber as compared to primary open angle glaucoma patients.

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