



GONIOSCOPY - A SIMPLE TOOL FOR DIAGNOSTIC, PROGNOSTIC AND THERAPEUTIC EVALUATION OF GLAUCOMA

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Abstract: Treatment modalities for open/closed angle glaucoma's differ considerably and gonioscopy is the most valuable and simple tool for classifying angle/glaucoma. This study aimed at finding variations in anatomy of angle of anterior chamber in various types of glaucoma patients. This prospective study was done from June 2011 to May 2013. Gonioscopic examination of 100 glaucoma patients was done by Goldman 3-mirror gonioscopy by single examiner and findings were noted down using Shaffer's grading. Out of 100, 37 were bilateral and 63 unocular glaucoma patients, 54 were males and 46 were females. 51 patients had POAG and 39 patients had PACG and 10 patients had occludable angle. 15 patients were already operated. PAS were found in 17 patients. Pigmentation was found in 34 patients. Iris processes were found in 19 patients. Foreign body in the angle and blood in schlemm's canal was found in 1 patient each. Out of the 15 operated patients, 11 patients had patent scleral window. 4 patients had obliterated scleral window (all PACG) and 7 patients showed highly pigmented angle. Along with categorizing patients into open/closed angle glaucoma, gonioscopy also helps in deciding management, following-up post-operative cases and to decide whether any re-procedure is required.

Keywords: Gonioscopy, Angle of anterior chamber, Glaucoma, Shaffer's Grading, Post-trabeculectomy evaluation

INTRODUCTION

Glaucoma is second only to cataract as the leading cause of preventable blindness in the world. Glaucoma causes irreversible blindness and many (50%) of the affected people are unaware of their condition.^[1] Thus, it is important to diagnose and treat glaucoma as early as possible. The diagnosis of glaucoma is made after looking for a combination of clinical signs;

- Characteristic changes in the optic nerve head
- Abnormalities in the visual field, and
- A rise in IOP

Gonioscopy is bio microscopic examination of the anterior chamber angle of the eye, where aqueous humor gains access to Schlemm's canal.

A simple procedure, it is underutilized in clinical practice. It enables glaucoma to be classified into two main groups, angle-closure glaucoma and open-angle glaucoma. Gonioscopy is helpful in screening of preclinical cases, diagnosis of glaucoma, reassessment of treatment given and post trabeculectomy evaluation. Therefore, Gonioscopy is helpful diagnostically, Prognostically, and therapeutically in glaucoma.^[2,5]

This study was done to find out the variations in anatomy of angle of anterior chamber in various types of glaucoma patients.

The main objective of the present research is to study the angle of anterior chamber by gonioscopy in diagnosed glaucoma patients, find out the variation in angle anatomy in various different types of glaucoma and to modify treatment accordingly.

MATERIALS AND METHODS

It is a prospective study in which patients of age more than 40 years who came in Out Patient Department of SAIMS Medical College and P. G. Institute in the period of June 2011 to May 2013 were screened. 100 Cases diagnosed to have glaucoma or were known, already diagnosed cases of glaucoma, operated or on medication and new patients were included.

Exclusion Criteria's

- Congenital Glaucoma
- Ocular Hypertension

All these patients underwent a set protocol of investigations either for diagnosis or follow-up of glaucoma. The protocol included following set of examinations/investigations:

1. Complete thorough history was taken from each patient.
2. Refraction and BCVA.
3. Thorough Slit lamp examination.
4. Applanation Tonometry.
5. Pachymetry.
6. Visual fields.

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7. Gonioscopy.
8. Fundus examination after cycloplegia.

The patients were classified into various types of glaucoma considering the clinical picture, the visual field changes and the gonioscopic findings.

The Gonioscopic examination of all the patients was done and recorded on slit-lamp camera. Gonioscopy was done with a Goldman 3 mirror goniolens (VOLK G3 Goniofundus lens) by a single examiner and findings were noted down using the Shaffer's grading. Any special or unusual findings were noted separately.

There have been various proposed classifications to grade the angle of anterior chamber. Some of the widely followed classifications include Shaffer's, Spaeth's, Van Herrick's grading using slit lamp, Scheie's grading system, etc.,

The system used in this study is Shaffer's Grading System, Details of which are given below:

Shaffer's Grading System^[6]: Records the angle in degrees between two imaginary lines tangential to the inner surface of the trabeculum and the anterior surface of the iris about 1/3rd of the distance from its periphery. In practice, the angle is graded by many according to the visibility of various structures.

Table 1: Shaffer's Grading System - The system assigns a numerical grade to each quadrant of the angle as follows^[6]:

Grade	Degree	Angle	Structure Seen
Grade 4 (FIGURE 1)	35-45°	Wide Open	All structures till Ciliary Body
Grade 3 (FIGURE 2)	25-35°	Open Angle	At least till Scleral Spur
Grade 2 (FIGURE 3)	20°	Moderately Narrow Angle	Trabecular Meshwork
Grade 1 (FIGURE 4)	10°	Very Narrow Angle	Schwalbe's Line or Maximum till top of Trabecular meshwork
Slit Angle	-	Closed Angle but No obvious iridocorneal contact	No angle structure seen
Grade 0 (FIGURE 5)	0°	Closed Angle due to Iridocorneal Contact (Recognized by inability to identify apex of corneal wedge)	No Angle structure seen



Figure 1: Grade IV Angle



Figure 2: Grade III Angle



Figure 3: Grade II Angle



Figure 4: Grade I Angle

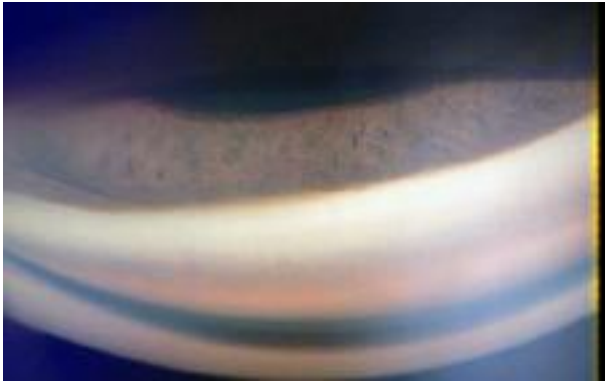


Figure 5: Grade 0 Angle



Figure 9: Blood in Schlemm's canal



Figure 6: Peripheral Anterior Synchia



Figure 10: Patent inner sclera window in trabeculectomy



Figure 7: Iris Processes



Figure 11: Obliterated inner window in trabeculectomy



Figure 8: Foreign Body in Angle

Gonioscopy was performed in all patients using a Goldman's three mirror gonioscope after anaesthetizing the ocular surface in dim lit room. Patient was asked to look up while the examiner pulled the lower lid and placed the gonioscope contact surface filled with viscoelastic on the patient's cornea. The patient was asked to look straight and a narrow beam of slit lamp was put over the tongue shaped lens of the gonioscope to visualize the angle of the opposite side. In this manner 360° angle of the anterior chamber was examined and also dynamic gonioscopy was also done for all the patients. The findings were noted using the Shaffer's grading system. The same procedure was then repeated in the other eye.

Observations

Out of 100 patients 37 were having bilateral glaucoma and remaining 63 were unioocular glaucoma patients.

Chart 1: Gender Wise Distribution of Glaucoma Cases

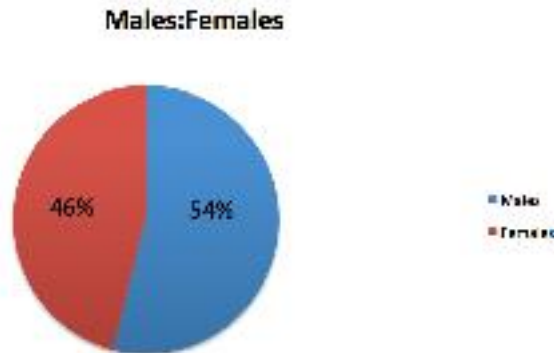


Chart 1 shows that out of 100 patients 54 were males and 46 were females.

Chart 2: Categorization of Patients into Various Types Of Glaucoma

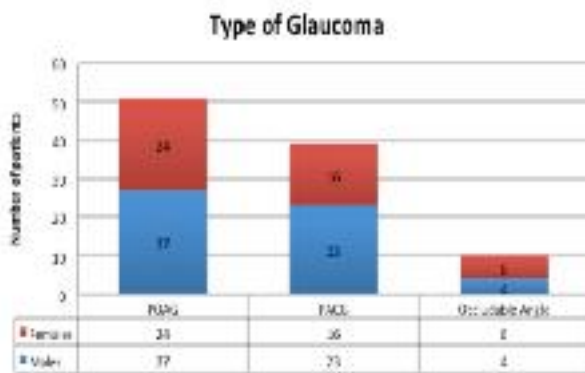


Chart 2 shows that 67 eyes of 51 patients had POAG (27 males and 24 females) and 54 eyes of 39 patients had PACG (23 males and 16 females) and 16 eyes of 10 patients had occludable angle (4 males and 6 females).

Chart 3: History of Glaucoma Surgery

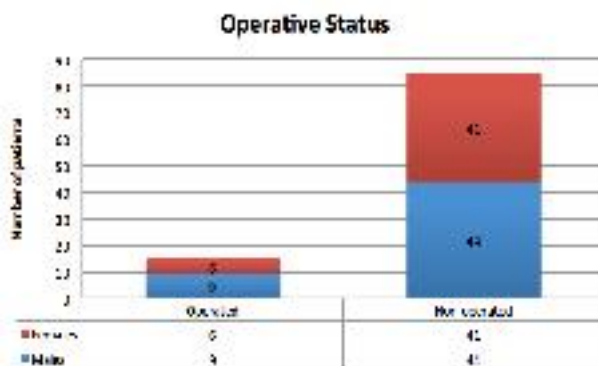


Chart 3 shows that out of 100, 15 patients were already operated (9 males and 6 females) with 19 operated eyes out of which 10 had POAG and 9 had PACG.

Chart 4: Gonioscopy Findings

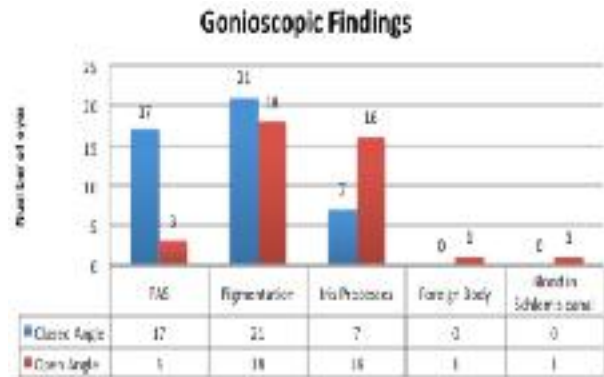


Chart 4 shows that PAS (FIGURE 6) were found in 17 patients (20 eyes) out of which 14 were PACG (3 bilateral) and 3 were POAG patients. Pigmentation was found in 39 eyes of 34 patients (21 PACG and 18 POAG). Iris processes (FIGURE 7) were found in 23 eyes of 19 patients (16 POAG, 7 PACG) and occludable angle was found in 16 eyes of 10 patients (6 POAG and 1 PACG) (3 bilateral POAG). 1 eye of 1 patient with open angle glaucoma showed a foreign body in the angle (FIGURE 8). 1 eye of 1 patient with open angle glaucoma showed blood in the schlemm's canal (FIGURE 9).

Chart 5: Gonioscopic Findings In Operated Patients

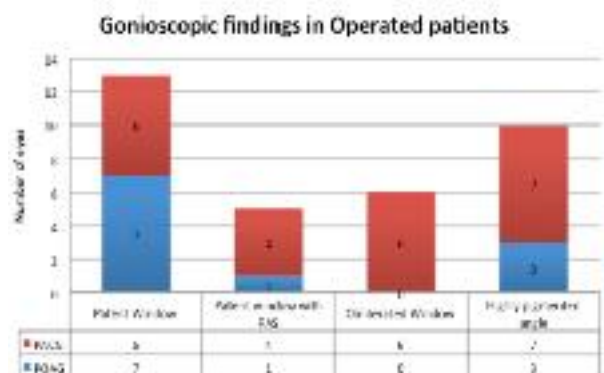


Chart 5 shows that out of the 15 operated patients, 11 patients (7 POAG (7 eyes) and 4 PACG (6 eyes)) had patent inner scleral window (FIGURE 10) of which 5 angles had associated PAS (4 PACG and 1 POAG). 4 patients (6 eyes) had obliterated inner scleral window (FIGURE 11) (all PACG) and 7 patients (10 eyes) showed highly pigmented angle (4 PACG (7 eyes) and 3 POAG (3 eyes)).

DISCUSSION AND CONCLUSION

All the available literature shows population based studies of the angle of anterior chamber in different areas of the world but no study has evaluated angle of anterior chamber in only known glaucoma patients. Out of the 100 patients who fitted in the inclusion criteria's 54% males had glaucoma, which is slightly more than the females (46%). The gender

distribution of glaucoma patients in our study showed no significant predisposition to either gender. Similarly Vijaya L et al.,^[7] in their study done on prevalence of open angle glaucoma in a rural south Indian population and in The Chennai glaucoma study.^[8] A study on prevalence of primary open angle glaucoma in an urban south Indian population and comparison with a rural population, found no association of development of glaucoma with gender.

Whereas contrasting our result was a population-based, cross-sectional study on angle-closure glaucoma done in an urban population in southern India - The Andhra Pradesh Eye Disease study^[9] by Dandona L, et al., found that primary angle closure glaucoma was more common in females (odds ratio 1.70; 95% confidence interval [0.82-3.54]). Another study which conflicts this result was Ocular Hypertension Treatment study - baseline factors that predict the onset of primary open angle glaucoma done by Gordon MO, et al.,^[10] They found that baseline factors that predicted the development of primary open angle glaucoma included male sex.

Glaucoma was found bilaterally in 37 patients in our study. Both open and closed angle glaucoma are known to be bilateral but involvement may be more symmetrical in open angle glaucoma while closed angle glaucoma may be asymmetrical.^[11] Out of the 137 examined glaucomatous eyes 67 (51 patients), 54 (39 patients) and 16 eyes (10 patients) had open, closed and occludable angles respectively. Considering that occludable angle patients, might eventually, will land up in closed angles, approximately 50% of patients (49) were closed angle which correlates with the literature as Asian ethnic group is considered to develop PACG a decade earlier than other groups and PACG accounts for 50% of primary adult glaucomas in Asians.^[11] Categorization of glaucoma into open and closed types helps us in deciding the line of treatment. The occludable angle patients are at a higher risk of developing angle closure in subsequent time so it is important to keep them under frequent observation or go prophylactically for procedures like YAG-laser iridotomies or iridoplasties as per the configuration of the iris. PAS, more commonly found in closed angle glaucoma and iris processes, which may be associated with both open (more commonly) and closed angles, are important associated finding along with the angle grade and it is important to distinguish between them as management of both varies significantly. Pigmentation of angle is another commonly associated finding, which may be seen in either pigmentary glaucoma or even in post-operative eyes or uveitic eyes and may itself be the cause of glaucoma.^[12] A foreign body was also accidentally found in one patient in our study in an already operated patient, though in our

patient it was lying inert with no signs of inflammation and was small enough, not able to cause glaucoma so was left as it is, otherwise uncommon findings like foreign bodies or silicon oil in patients who have undergone retinal surgeries previously might itself be the cause of glaucoma. Such findings must be kept in mind and should not be missed. Blood in schlemm's canal was found in one patient in our study and indicates glaucoma due to increased resistance to the aqueous outflow due to raised episcleral pressure. It is important to identify this and rule out various causes of raised episcleral pressure which include a carotid cavernous fistula, A-V malformations in the orbit, orbital venous compression, Orbital varices, superior vena cava syndrome and Sturge-Weber syndrome.^[13] In our study we found that 13 operated eyes had a patent scleral window where as 6 operated eyes had obliterated/ fibrosed windows. This suggests that gonioscopy is not only for diagnosing and categorizing new patients but gonioscopy on follow-up in operated patients is also very important as it tells us about the state of the PI, the scleral window or the glaucoma drainage implants and helps us decide further management of the patient and whether any repeat procedure is required or not.^[13]

Gonioscopy is an integral part of glaucoma evaluation. Though practiced since long, it is not universally used as a routine OPD procedure for glaucoma screening. Furthermore, it also helps us in post-operative trabeculectomy patients for evaluation of the patency of the internal scleral window and in deciding regarding requirement of second surgical procedure like needling or a second site trabeculectomy. Thus, gonioscopy is a simple procedure that allows a bio microscopic examination of the angle of anterior chamber and helps diagnostically, prognostically and therapeutically in glaucoma patients. Use of gonioscopy as a screening procedure for glaucoma in high-risk patients will increase early and prompt diagnosis and treatment of glaucoma, thus, preventing glaucoma induced blindness.

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