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Original Research Paper

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COMPARISION BETWEEN GONIOSCOPY AND ULTRASOUND BIOMICROSCOPY IN ANGLE CLOSURE PATIENTS

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ABSTRACT Glaucoma is an irreversible preventable cause of visual loss worldwide with Primary Angle Closure Glaucoma (PACG) being one of the leading causes of blindness in Asian population. Gonioscopy is the gold standard technique to assess anterior chamber but is an subjective method and has interpersonal variability. Ultrasound bio microscopy is an objective method visualizing the angle structures. This study is mainly to screen for angle closure disease in south Indian population and to compare gonioscopy findings with UBM.

KEYWORDS : Primary angle closure glaucoma (PACG), Ultrasound biomicroscopy(UBM

INTRODUCTION

Glaucoma is a silent thief of eyesight. Primary angle closure glaucoma (PACG) is a major cause of blindness in the Asian population[1]. It is potentially preventable if diagnosed early in the course of the disease. Angle closure disease (ACG) is three times more common than Open-angle glaucoma (OAG). An estimated 4.3 million people are blind due to ACG, while OAG has affected 3.3 million. Less than 10% of those with OAG are bilaterally blind, but the number is as high as 25-30% in ACG cases. PACG may be responsible for almost half of the cases of glaucoma globally. It progresses rapidly and result in visual loss than POAG[2]. The angle-closure disease is most common in hypermetropic and elderly patients, with female predominance between 55 -70 years in the Asian population.

Angle-closure glaucoma can be classified as primary and secondary. According to the International Society of Geographical & Epidemiological Ophthalmology (ISGEO), PACS is defined as Irido -trabecular contact noted in three or more quadrants, no peripheral anterior synechiae, normal IOP, normal visual fields and normal optic disc. PAC is defined as iridotrabecular contact in 3 or more quadrants, PAS present, raised IOP, normal visual fields, normal optic disc. PACG is defined as iridotrabecular contact in 3 or more quadrants, PAS present, raised IOP, visual field changes, and optic nerve damage with glaucomatous cupping. Secondary angle-closure glaucoma can result from structural or anatomical abnormalities in the anterior or posterior segments of the eye, such as iris plateau, lens subluxation or malignant glaucoma.[3,4]

Gonioscopy is the gold standard technique to assess anterior chamber angle but is subjective with an inter-observer variation. Ultrasound biomicroscopy (UBM) is an objective method of visualising the angle structures quantitative evaluation of the angle in degrees, and the risk staging of the angle closure. This study is mainly to screen for angle closure disease, which can prevent visual loss with early and appropriate intervention [5]and to compare gonioscopy with UBM in angle closure patients.

MATERIALS AND METHODOLOGY

Prospective Observational study conducted between Febuarary 2021 to August 2022 in glaucoma clinic of Minto Ophthalmic hospital, RIO Bangalore Medical College and Research Institute. Study was conducted after taking appropriate ethical clearance from the Institutional Ethical Committee of BMCRI. 56 eyes of 28 patient were included after meeting the inclusion criteria (written informed, 40-75 years old, shallow anterior chamber, normal or raised IOP). Non cooperative patients, previous ocular surgeries, laser iridotomies, ocular trauma, secondary glaucoma were excluded.

After obtaining informed consent, history and a detailed slit lamp ocular examination was done. Visual acuity checked using Snellen's chart, IOP measured by Goldman applanation tonometer, undilated gonioscopy is done by using Goldmann single mirror goniolens and graded using Shaffer grading system. In cases of normal IOP with occludable angles, mid dilated IOP checked and dilated fundus examination was done. For occludable angles with high IOP, undilated fundus examination done using 90D lens slit lamp biomicroscopy was done. UBM (Marvel II A/B, Appaswamy) was done and angle structures assessed by measuring angle width.

Data was analysed using Statistical Package for the Social Sciences (SPSS) trial version. For descriptive statistics-mean, standard deviation, percentage and proportion wherever applicable was be used. Chi square test was used to check the association of categorical variable. A value of $p \leq 0.05$ was considered to be statistically significant.

RESULTS:

A total of 56 eyes of 28 patients were recruited for the study out of which 16 males (57.14%) and 12 females (42.86%). Patients were aged between 40- 79 years (58.37 ± 9.82). 62.5% subjects had IOP between 10-21 mmHg. In our study PACS 34(60.7%), PAC 6 (10.7%), PACG 16(28.6%) were noted.

Table 1: Gonioscopy grading done using shaffers grading system

	Superior angle		Inferior angle		Temporal angle		Nasal angle	
Grade 0	32 eyes	(57%)	19 eyes	(34%)	33 eyes	(59%)	30 eyes	(54%)
Grade 1	-		4 eyes	(7%)	3 eyes	(5 %)	-	

Grade 2	24 eyes	(43%)	32 eyes	(57%)	20 eyes	(36%)	26 eyes	(46%)
Grade 3	-		1 eye	(2%)	-		-	
Grade 4	-		-		-		-	

Gonioscopy grading done using Shaffers grading system (Table 1) and UBM (Table 2)

Table 2: Shaffer's grading by UBM

Grade	Superior angle		Inferior angle		Temporal angle		Nasal angle	
Grade 0	17 eyes	30 %	11 eyes	20 %	24 eyes	43 %	18 eyes	32 %
Grade 1	28 eyes	50 %	23 eyes	41 %	22 eyes	40 %	27 eyes	48 %
Grade 2	06 eyes	11 %	08 eyes	14 %	05 eyes	09 %	05 eyes	09 %
Grade 3	05 eyes	09 %	14 eyes	25 %	04 eyes	07 %	06 eyes	11 %
Grade 4	-		-		01 eyes	02 %	-	

In this study, 62.5 % participants had normal IOP, while 37.5 % had elevated IOP. On comparision of angle grades of both gonioscopy and UBM findings, 50.88 % of eyes showed Grade 0 by gonioscopy but only 31.27 % eyes showed Grade 0 by UBM. 3.12 % eyes showed Grade 1 on gonioscopy, while 44.64 % eyes showed Grade 1 by UBM. 45.55 % eyes showed Grade 2 by gonioscopy, while only 10.71 % eyes showed Grade 2 by UBM. 0.44 % eyes showed Grade 3 by gonioscopy, while 12.94 % eyes showed Grade 3 on UBM. None of the eyes showed Grade 4 by gonioscopy while 0.44 % showed Grade 4 by UBM. (Table 3)

Table 3: Comparison of Angle Grades of Gonioscopy and UBM

	Gonioscopy	UBM
Grade 0	50.89%	31.27 %
Grade1	03.12 %	44.64 %
Grade 2	45.55 %	10.71 %
Grade 3	0.44 %	12.94 %
Grade 4	-	0.44 %

DISCUSSION

Grading of the angle of the anterior chamber forms an essential part in assessment and screening of glaucoma. Gonioscopy and ultrasound biomicroscopy both are used as an important tool for assessment, former being subjective method while the latter is objective one.

Gonioscopy is clinical technique based on principle of total internal reflection that allows the structures in the anterior chamber angle to be visualized. It is the main stay at present for diagnosing narrow angles. There are various angle grading system devised of which Shaffer grading system is commonly used. It grades the angle into 4 grades. Shaffer's Grade 2 or less constitute "narrow angles" or occludable and grade 3 and 4 constitute "open angles" or non occludable.

UBM enables comprehensive imaging of the ciliary body as well as in depth analysis of AC angle structures, anatomical variations and allows for detailed imaging of the ciliary body. [3,4] It is also useful in conditions such as corneal edema or corneal opacification where gonioscopic assessment is difficult. UBM and more recently anterior segment optical coherence tomography are imaging modalities that can be used to obtain two-dimensional images of the angle and surrounding structures. It has the advantage of being able to illustrate the ciliary body and therefore give clinicians information on nonpupil block mechanisms of primary angle closure and also diagnose other abnormalities such as cyclodialysis clefts[7]. With the UBM examination of the angle iris, ciliary body, and scleral spur details can be identified easily. [8] It successfully measures and evaluates angle structures in glaucoma with added advantage of ability to visualize ciliary body, pars plana and zonules. Hence, the UBM and gonioscopy both are useful in aid to glaucoma evaluation with few advantages and disadvantages of each tool.

If we consider Shaffer Grade 2 or less to be classified as occludable angle, then we can say that in this study, 100 % eyes were classified as occludable eyes by gonioscopy, while 87 % eyes were classified as occludable by UBM. Gonioscopy led to over diagnosis of occludable angles in our study. Narayanswamy et al[6] reported that UBM provided a more quantitative measurements in glaucoma evaluation. UBM was able to measure angle more accurately as compared to gonioscopy. As in our study, Gonioscopy led to overdiagnosis of occludable angles in their study too.

CONCLUSION

Our study shows that there is some amount of difference in estimation of angle by gonioscopy and UBM in terms of Grades assigned to the eyes. There is difference in configuration of visualisation of angle structures in gonioscopy and UBM.

All the same, gonioscopy is helpful to differentiate appositional from synechial angle closure and extent of peripheral anterior synechiae. So, we recommend use of UBM for accurate grading of angle in every suspected narrow angle patients by van Herick's method on slit lamp examination.

Conflict Of Interest

None declared

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