



COMPARATIVE STUDY BETWEEN GONIOSCOPY AND ULTRASOUND BIOMICROSCOPY IN MEASURING ANGLES OF ANTERIOR CHAMBER OF EYES

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ABSTRACT

Glaucoma is the most common cause of irreversible blindness and second leading cause of blindness. It is characterized by optic neuropathy and visual function loss. Primary angle closure glaucoma is potentially preventable if diagnosis is done before irreversible damage. Hence to an ophthalmologist direct visualisation of the angle of anterior chamber of eyes is of crucial importance. Aqueous outflow occurs through the angles and should be studied as an important structure of eyes. Ultrasound biomicroscopy and gonioscopy are the two important measures to study angles of anterior chamber of eyes. The study puts in an effort to compare between gonioscopy and ultrasound biomicroscopy in measuring angles of anterior chamber of eyes

KEYWORDS : Glaucoma, USG, Gonioscope.

Introduction:

Glaucoma is the most common cause of irreversible blindness and second leading cause of blindness'. It is characterized by optic neuropathy and visual function loss. Primary angle closure glaucoma is potentially preventable if diagnosis is done before irreversible damage. Hence to an ophthalmologist direct visualisation of the angle of anterior chamber of eyes is of crucial importance. Aqueous outflow occurs through the angles and should be studied as an important structure of eyes. Ultrasound biomicroscopy and gonioscopy are the two important measures to study angles of anterior chamber of eyes.

Gonioscopy is a subjective method of study of anterior chamber angles of eyes, it is considered as the gold standard technique. It is an integral part of diagnostic evaluation and is done routinely in all patients with glaucoma. It is often associated with misdiagnosis and under detection of angle closure.

Ultrasound biomicroscopy has revolutionised the evaluation of eye i.e. the anterior segment to understand the path of angle closure glaucoma, pigmentary glaucoma. It also helps in quantitative analysis to yield mechanism of oppositional angle closure and dynamic function of the iris. Hence early detection and treatment of angle closure significantly improves visual prognosis.

Ultrasound biomicroscopy is more established technique which allows a more objective assessment of anterior segment status. Recently used in objective measurement of anterior chamber angles. Also used to study anatomic configuration in normal and glaucomatous eyes.

Advantage of ultrasound biomicroscopy is high image resolution allowing accurate identification of structural landmarks. It is used to measure angle parameters and quantitative data.

Aims and Objectives:

To compare ultrasound biomicroscopy measurement of anterior chamber angle of eyes with gonioscopy in patients attending Ophthalmology outpatient department

Materials and Methods:

SOURCE OF DATA :

It is a hospital based comparative study. It consist of patient attending the ophthalmology out patient department in Kanachur Institute of medical Sciences, Mangalore. It included patients of age group of 20 – 70 years.

METHOD OF COLLECTION OF THE DATA

STUDY DESIGN: One year comparative study of patients.

SAMPLE SIZE : 100 eyes

SAMPLE : Patient attending the outpatient department. Between the age group of 20–70 years.

INCLUSION CRITERIA

- Patient attending ophthalmology OPD aged between 20 -70 years
- Patient with normal cup disc ratio on funduscopy.
- Patient with clinically suspected narrow angles

EXCLUSION CRITERIA

- Patient with conjunctivitis, keratitis, uveitis.
- Patient with perforating injury.
- Patient with corneal haziness.
- Patients with previous history of glaucoma surgery, laser surgery.

METHOD:

The study was conducted on 50 subjects attending outpatient department of our hospital who were healthy within the age group of 20-70 years with normal intraocular pressure, normal fundus and also with suspected narrow angles.

Informed consent was taken from all the participants explaining to them the procedure and the risk. All patients underwent initial evaluation of vision both eye, intraocular pressure with applanation tonometry, anterior segment was evaluated using slit lamp mainly conjunctiva for any signs of infection, cornea also for infections and opacities, AC depth for assessing shallow or normal depth, iris for any change in colour and pattern, pupil reactions, lens for changes. For AC depth Van Herick's method was used.

Gonioscopy was done under standard room illumination with short and narrow beam avoiding the pupil with Zeiss 4 mirror gonioscopy. With patient examined in slit lamp with gonioscope using light of 2mm width. Avoid light falling in the pupillary area as it will cause false estimation of the angle grades. It was examined under high power. Shaffer's grading system was used to grade the angle into 0, 1, 2, 3 and 4. Clinically grade 2 is cut off for occludability. The above angles were further divided for comparative purpose into occludable i.e. 0, 1, 2. and non occludable 3, 4.

UBM was performed on all the patients with OTI with 35 MHz transducer probe which facilitate 4-5mm tissue penetration and has a resolution of 50µm. OTI (ophthalmologic technologies Toronto, Canada) is device probe used for ultrasound biomicroscopy, probe is light and small enough not to use suspension arm and a sector

scanning method is used. It produces a 4x4mm field with 256 vertical lines at the scan of 5 frames per second.

UBM was performed under the same standard room illumination as the gonioscopy performed in supine position with eye fixing the distance. Under topical anaesthesia an ocular cup was placed filled with saline. Subject was imaged by UBM by radial scans at 12, 3, 6, 9 o'clock position to obtain the image. Parameters measured were anterior chamber angle. Trabecular iris angle is defined as an angle formed with the apex at the iris recess and the arms passing through the point on the trabecular meshwork 500µm from the sclera spur and the point on the iris perpendicularly opposite according to Pavlin's measurement^{22,25}. These angles were graded into Shaffer's grading into 0,1,2,3 and 4 grades. Further divided into occludable which included grade 0,1,2 angles and non occludable angles which included 3 and 4 grade angles..

Data of each eye of the subject were studied and gonioscopic data of the same eye was used for comparative analysis against ultrasound biomicroscopy of the same eye. Chi square was used to compare the variables and the p value of less than 0.05 was considered significant.

Results:

Table - 1

Gonio

Gonio	No.of eyes	Percentage
1	4	4
2	12	12
3	67	67
4	17	17
Total	100	100

Gonioscopy was done on all patients both eyes using 4 mirror gonioscopy and angles of all quadrants were graded according to Shaffer's grading under room illumination. It was found that 4% of the eyes were of grade1, 12% of eyes were of grade2, 67% of eyes were of grade3, 17% of the eyes were of grade4.

Table - 2s

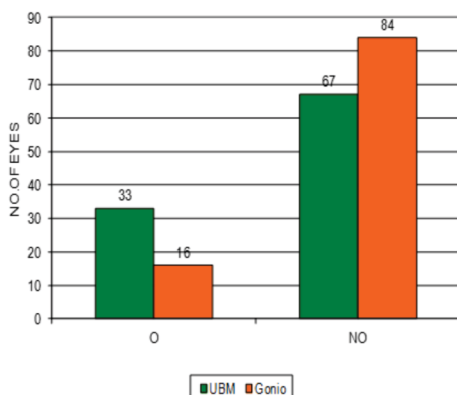
UBM

UBM	No.of eyes	Percentage
1	12	12
2	21	21
3	52	52
4	15	15
Total	100	100

Ultrasound biomicroscopy was evaluated for the same eyes under similar illuminating conditions using OTI scan 35 MHz probe with saline bath. It was found that of the eyes in the study group 12% were grade 1, 21% grade2, 52% grade 3, 15% grade 4.

Fig 1: Distribution of Angle Status By Gonioscopy and UBMs

DISTRIBUTION OF ANGLE STATUS BY GONIOSCOPY AND UBM



Gonioscopy angles were further divided into occludable consisting of grade1 and 2 accounting for 16% of the eyes studied and rest were non occludable consisting of grade3 and 4 accounting for 84% of the eyes studied for comparison purpose.

UBM angles were further divided into occludable and non occludable accounting for 33% and 67% respectively.

Table - 3

Gonio

Gonio	UBM		Total
	O	NO	
O	16	0	16
NO	17	67	84
Total	33	67	100

P value (for Gonio OVs UBM O) = 0.043 Significant

P value (for Gonio NOVs UBM NO) = 0.348 Not Significant

Chi square test was applied to the occludable and non occludable groups detected by gonioscopy and UBM. It was found to be significant for the occludable angles.

Table - 4

Gonioscopy Total No.of Grade III	UBM		
	Grade I	Grade II	Grade III
67	8	7	52

Finally certain mismatches were found as follows, out of the 67(100%)eyes graded as 3 in gonioscopy , 8(11.3%) were grade 1, 7 (10.4%) were grade 2 and 52 (77.6%) were grade3 on ultrasound biomicroscopy.

Table - 5

sGonioscopy Total No.of Grade IV	UBM			
	Grade I	Grade II	Grade III	Grade IV
17	0	2	0	15

In grade 4 on gonioscopy which were 17 (100%) eyes out of which 2 (11.76%) eyes were grade 2 and 15(18.2%) were grade 4 on ultrasound biomicroscopy.

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 and the later being objective one.

Gonioscopy is the main stay at present for diagnosing narrow angles. The Shaffer's grading system² of the angles is the main stay of grading of angles into 4 grades can be further divided into occludable and non occludable.

Shaffer's grading system was used for angle grading¹ same grading system was used in Kaushik et al³, Narayanasamy et al⁴, Barkan et al⁵ studies in angles grading system.

Similar to gonioscopy, UBM was performed in the same patients under same illumination system but in supine position and the grading of the angles done by Pavlin et al^{22,25} parameters using Shaffer's grading system.

This study was in par with Wong N et al⁶ the result of this study showed gonioscopy showed little wider angle than its natural status especially its difficult to distinguish functional closure from adhesion.

In study done by Spaeth et al⁷ correlated gonioscopy and UBM

findings in 22 eyes with varied angle width , 6 eyes found to have iridiotrabecular contact on gonioscopy , 4 had similar finding in UBM but 2 had iris contact anterior to the meshwork.

Sakuma et al⁸ studied angle closure in 50% of the 46 eyes by gonioscopy which was said to be of higher percentage in UBM.

Pavlin et al^{9,10} gave importance in examining the patient under same illumination as variation gave false results.

Our study was in agreement with Narayanasamy et al²¹, angle depth by gonioscopy is inaccurate in slit like and grade 1 angles while estimation of grade 2 and 3 was fairly accurate. These errors did not occur in wrong classification of the occludable and non occludable angles. Indicating it to be still a gold standard subjective test.

In our study drawback is the other parameter like angle opening distance, TCPD were not measured which correlates well with the angle width and would be useful quantitative parameter iris and lens position and axial length and anterior chamber depth would be also a reliable parameter. We used a 35 MHz probe for the study.

Conclusion:

Gonioscopy appears equally effective in grading of the anterior chamber angle as compared to the UBM.

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