Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.759
*Biol. Clin. Sci. Res. J., Volume, **2024**: 759*
Original Research Article

ASSESSMENT OF ANTERIOR CHAMBER ANGLE ON ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY IN PATIENTS WITH ANGLE CLOSURE GLAUCOMA AND ANGLE CLOSURE SUSPECTS

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(Received, 09th December 2023, Revised 29th January 2024, Published 19th March 2024)

Abstract: *The objective of this cross-sectional study was to determine the anterior chamber angle using anterior segment optical coherence tomography (AS-OCT) in patients diagnosed with angle closure glaucoma and angle closure suspects. The research was conducted at Shaheed Mohtarma Benazir Bhutto Medical University Larkana, spanning from March 3, 2022, to June 30, 2023. Patients meeting the inclusion criteria and diagnosed with primary angle-closure glaucoma (PACG) were enrolled in the study after obtaining informed consent. The procedure, risks, and benefits of the study were explained to the patients before obtaining consent. AS-OCT was utilized to evaluate patients suspected of primary angle closure and those with confirmed primary angle closure. The results revealed a mean age of 56.21 ± 12.31 years among the study participants, with a confidence interval of 55.04 to 57.38. The mean duration of primary angle closure glaucoma was 22.52 ± 10.98 months, with a confidence interval of 21.47 to 23.57. Of the 423 patients included in the study, 219 (52%) were male, and 204 (48%) were female. Primary angle closure suspect and primary angle closure were observed in 47 (11%) and 44 (10%) patients, respectively. In conclusion, older age, higher central corneal thickness (CCT), and shorter axial length or presence of hyperopia were identified as important independent predictors of suspicion of primary angle closure and primary angle closure. These findings underscore the significance of thorough assessment and monitoring of these parameters in patients at risk of angle closure glaucoma.*

Keywords: Acute Primary Angle-Closure, Anterior Segment, Glaucoma, Intra Ocular Pressure, Iridotomy, Primary Angle Closure Glaucoma.

Introduction

Glaucoma is the most common cause of irreversible blindness (Vijaya et al., 2014). Around 6 to 67 million people worldwide suffer from glaucoma. More than half of blindness cases are due to primary angle-closure glaucoma, and more than 80% of people with angle-closure glaucoma live in Asia (Tham et al., 2014). Although gonioscopy is the gold standard method for angle assessment, the advancement of imaging technology through ASOCT now provides high-resolution cross-sectional images of angle structures. These images can be assessed both qualitatively and qualitatively. An important milestone for the qualitative assessment in OCT is SCLERAL SPUR. This is an inward projection of the sclera at the transition between the inner scleral and corneal curvatures. Opposition between the iris and the inner corneal wall was used as a qualitative method to detect angle closure. The angle is quantitatively evaluated using various parameters in the integrated AS-OCT. Four of them are the anterior chamber angle (ACA), the angle opening distance (AOD), the trabecular-iris space area (1 ISA), and the angle recess area (ARA) (Benitez-del-Castillo et al., 2022; Ly et al., 2019).
Unlike gonioscopy, it is a non-contact procedure that can be performed by a technician and a major advantage is that it can be performed on children. Custom software can be used for semi-automated analysis of ASOCT images to obtain multiple measurements of the anterior chamber angle. The results of the analysis could help identify eyes at risk of angle closure. The Kumejima study conducted in Japan and presented in the American Academy of Ophthalmology showed that the incidence of primary angle closure (PACS) and primary angle closure (PAC) is 8.8% and 3.7%, respectively (Gupta et al., 2022; Hao et al., 2022).
The current study aims to evaluate the frequency of primary angle closure and primary angle closure in patients with primary angle closure glaucoma (PACG). In addition, my study can focus on early diagnosis and treatment of this problem to reduce morbidities and complications.

Methodology

A Cross-Sectional study was conducted from 03-07-2022 to 30-06-2023 in the Department of Ophthalmology, Shaheed Mohtarma Benazir Bhutto Medical University Larkana. All patients included in the study were people diagnosed with cases of primary angle closure glaucoma, aged between 20 and 80 years, regardless of gender and duration. While secondary angle-closure glaucoma, primary open-angle glaucoma, normal tension glaucoma, neovascular glaucoma, pigmentary glaucoma, glaucoma-related to ocular trauma, glaucoma-related to increased episcleral venous pressure, glaucoma secondary to corneal, iris, retinal abnormalities, and intraocular tumors were excluded. All patients who met the inclusion criteria were included in the study after the principal investigator obtained written informed consent from each patient. Patients were evaluated

[Citation: Bhutto, S.A., Leghari, A.A., Katpar, N.A.1, Gopang, Z., Shaikh, D.Y.D., Gul, P.A. (2024). Assessment of anterior chamber angle on anterior segment optical coherence tomography in patients with angle closure glaucoma and angle closure suspects. *Biol. Clin. Sci. Res. J.*, **2024***: 759*. doi: https://doi.org/10.54112/bcsrj.v2024i1.759]

for suspected primary angle closure and primary angle closure using AS-OCT. All results were reviewed by a consultant ophthalmologist with more than 5 years of experience. Data were stratified by age, gender, and duration of primary angle-closure glaucoma to determine their impact on outcome variables. After stratification, chi-square was applied with P 0.05 as significant.

Results

In this study, 423 patients were included to determine the frequency of primary angle suspect and primary angle closure in patients with primary angle-closure glaucoma (PACG), and the results were analyzed. Out of 423 patients, 219(52%) were male and 204 (48%) were female with a mean ± SD of age was 56.21±12.31 years. The mean ± SD of the duration of Primary angle closure glaucoma was 22.52±10.98 with C.I (21.47--23.57) months as shown in Table 1. Primary angle closure suspect was noted in 47 (11%) patients. Primary angle closure was found to be in 44 (10%) patients as shown in Table 1. In stratification of age group (21-55) and (>55) years, gender and duration of primary angle closure glaucoma (6 – 22) and (> 22) months concerning primary angle closure suspect and primary angle closure as shown in TABLE (2&3).

Table 1. Demographics and descriptive statistics parameters of study participant

Parameters	
Age (years)	56.21 ± 12.31
Duration of disease (Months)	22.52 ± 10.98
Gender	
• Female	204(48%)
• Male	219(52%)
PRIMARY ANGLE CLOSURE SUSPECT	
• Yes	47(11%)
• No	376(89%)
PRIMARY ANGLE CLOSURE	
• Yes	44(10%)
• No	379(90%)

Table 2: Stratification of different variables concerning primary angle closure suspect

VARIABLE	**PRIMARY ANGLE CLOSURE SUSPECT**		**P-Value**
	Yes	No	
Age Group (Years)			
• 21 – 55	13(3.1%)	176(41.6%)	0.013
• >55	34(8.0%)	200(47.3%)	
Gender			
• Male	18(4.3%)	201(47.5%)	0.050
• Female	29(6.9%)	175(41.4%)	
Duration (Months)			
• 6 – 22	15(3.5%)	179(42.3%)	0.042
• >22	32(7.6%)	197(46.6%)	

Table 3: Stratification of the different variables concerning primary angle closure

VARIABLE	**PRIMARY ANGLE CLOSURE**		**P-Value**
	Yes	**No**	
Age Group (Years)			
• 21 – 55	9(2.1%)	180(42.6%)	0.001
• >55	35(8.3%)	199(47.0%)	
Gender			
• Male	16(3.8%)	203(48.0%)	0.031
• Female	28(6.6%)	176(41.6%)	
Duration (Months)			
• 6 – 22	14(3.3%)	180(42.6%)	0.048
• >22	30(7.1%)	199(47.0%)	

Discussion

Primary angle closure glaucoma is a disease that has the potential to impair vision. The implementation of peripheral laser iridotomy (LPI) is a therapeutic measure that is both attractive and relatively straightforward in its application for the treatment of PACS. Although LPIs are generally linked with low morbidity, it is important to note that certain eyes may necessitate multiple sessions and complications, and an association with cataract progression should be considered, and an association with cataract progression should be considered (FRIEDMAN, 2001; Thomas et al., 1999).

A considerable segment of our populace comprises individuals with Primary Angle Closure Susceptibility

(PACS). The implementation of a policy or prophylactic Laser Peripheral Iridotomy (LPI) would place an excessive burden on the healthcare system of any developing nation. The most optimal approach to LPI in PACS is one that is grounded in empirical evidence that highlights the likelihood of progression to angle closure, as well as the consequential risk of optic disc and visual field damage, which could ultimately lead to blindness. This is particularly pertinent given the high efficacy of LPI in the early stages of closure (Sun et al., 2017; Vijaya et al., 2017).

There is a possibility that during the initial visit, he may have been misdiagnosed as normal, particularly due to the requirement of a forced choice to classify as PACS or normal. On the other hand, it is worth noting that as one age, an angle may become occluded. Research has shown that 8% of non-excludable angles in Greenland Eskimos progressed (Costa et al., 2020).

The implementation of a forced choice methodology in our study may explain the notable prevalence of unilateral Primary Angle Closure Susceptibility. It is noteworthy that four out of the twelve unilateral PACS cases progressed to bilateral PACS (Mitchell et al., 2023).

A comparative analysis was conducted to ascertain the relative risk of new primary angle closure (PAC) in individuals with primary angle closure suspects (PACS) as opposed to a normal group. The findings reveal that the relative risk of progression from PACS to PAC is 24 (95% CI: 3.2 to 182.4) (Sackett et al., 1985). It is noteworthy that all progression occurred in bilateral PACS, although this may be attributed to differential examination rates. The relatively high number of unilateral PACS may be attributed to the study protocol, which necessitated a forced decision between PACS and normal. Importantly, none of the individuals who progressed developed disc and field changes indicative of primary angle closure glaucoma (PACG) (Gunning and Greve, 1991).

This discovery, which was not previously reported in the two earlier studies, is of critical importance from a management perspective, despite being compatible with a true rate as high as 6%. Despite the significant relative and absolute risks of progression, none of our PACS patients developed PACG over five years, nor did any experience acute angle closure. As such, it is worth considering whether PACS represents a public health concern in the short term, particularly if cataract surgery is viewed as a viable treatment option for early PACS and PACG (Thomas et al., 1999).

Our patient who underwent cataract surgery exhibited open angles and no indications of glaucoma. An internal study has revealed that an aggressive cataract surgical program may eventually catch up with the patient. In light of this, we must consider whether laser intervention is necessary. Additionally, it is important to note that LPI is highly effective in cases of early angle closure. If possible, it would be advisable to wait until the early stages of anatomical damage before initiating treatment, as this would help to avoid unnecessary iridotomies (Ling and Bell, 2018).

Our study identified PACS in 47 patients, representing 11.2% of the total sample. Of these patients, 18 (38.29%) were male and 29 (61.71%) were female. Based on our findings, it appears that intervention for PACS may not be necessary unless a currently unidentified risk factor is present. However, there may be certain circumstances, such as in diabetic patients requiring repeated dilatation or in cases where a critical angle is observed, where a surgeon may opt for an LPI as a precautionary measure. Ultimately, such decisions should be made on a case-by-case basis (Thomas et al., 1999).

Conclusion

Concluded that advanced age, increased central corneal thickness shorter axial length or the presence of hyperopia are significant independent predictors of suspicion of primary angle closure and primary angle closure. To validate the results of this study, future prospective investigations should be conducted using randomized trials with a large sample size and multiple study centers in Pakistan.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned.
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

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Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
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[Citation: Bhutto, S.A., Leghari, A.A., Katpar, N.A.1, Gopang, Z., Shaikh, D.Y.D., Gul, P.A. (2024). Assessment of anterior chamber angle on anterior segment optical coherence tomography in patients with angle closure glaucoma and angle closure suspects. *Biol. Clin. Sci. Res. J.,* **2024***: 759*. doi: https://doi.org/10.54112/bcsrj.v2024i1.759]