



Original Research Article

COMPARATIVE EVALUATION OF VAN HERICK GRADING AND GONIOSCOPIC FINDINGS FOR ANTERIOR CHAMBER ANGLE ASSESSMENT: A CROSS-SECTIONAL STUDY FROM A TERTIARY CARE HOSPITAL IN NORTH INDIA

Asif Jasmine¹, Zainab Haroon Jan², Nazia Anjum³, Hemant³, Romana Ahmad Mi²

¹Associate Professor, GMC Srinagar, Jammu and Kashmir, India

²Senior Resident, GMC Srinagar, Jammu and Kashmir, India

³Post Graduate, GMC Srinagar, Jammu and Kashmir, India

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Corresponding Author:

Dr. Zainab Haroon Jan,
Senior Resident, GMC Srinagar, Jammu
and Kashmir, India.
Email: zainabharoonjan@gmail.com

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ABSTRACT

Background: Primary angle-closure disease is a significant cause of preventable visual impairment particularly among Asians. The anterior chamber angle must also be determined precisely to identify it at an early stage. Even though the gonioscopy is considered as the gold standard of assessing the angle, it is time consuming and requires skills. Van Herick is a non-contact method of screening which is carried out relatively rapidly, though the predictive ability of the method on gonioscopic findings ought to be confirmed. The objective is to determine a relationship between Van Herick and gonioscopic outcome and establish the relationship and concordance of Van Herick and gonioscopic outcome among patients in tertiary care centre in North India.

Materials and Methods: It was a cross-sectional observational study done at GMC Srinagar among the patients who were taking routine ophthalmic check-up. Van Herick grading was performed and graded between 0 and 4. Gonioscopy was done in all four quadrants. The statistical analysis was made to find out the correlation between Van Herick grades and the gonioscopic risk categories and agreement between the two.

Results: There was statistically significant correlation between the gonioscopic angle and Van Herick grading and closure risk. High-risk or closed angles on gonioscopy were largely associated with lower Van Herick grades and higher Van Herick grades with open angles. An agreement of 100% was found in patients with 0 grade VH and occludability on gonioscopy. This was followed by an agreement of 90.67% with respect to occludability on gonioscopy in patients of wide open VH. Extremely narrow, narrow and open VH grading agreed 75.92%, 70%, and 66.67%, respectively. It was also noted that the results of right and left eye of both Van Herick grading and the gonioscopic classification were highly consistent.

Conclusion: The gonioscopic results are well correlated with van Herick grading, and van Herick grading is an excellent screening instrument in the identification of the at-risk eyes. However, gonioscopy continues to play an important role in the measurement of angles conclusively. A high level of inter-eye agreement may be a possible sign of bilateral symmetry of anterior chamber angle set up in most of the patients.

Keywords: Van Herick grading; Gonioscopy; Anterior chamber angle.

INTRODUCTION

Glaucoma is a major cause of irreversible blindness worldwide, and primary angle-closure glaucoma results in visual morbidity amongst the Asian people, including India (He et al., 2020). The eyes at risk of angle closure are to be checked at an early stage, as the anatomical narrowing of the anterior chamber angle often develops prior to the appearance of the symptomatic disease. Failure to identify the occludable angles may result in late diagnosis and progressive glaucoma with irreversible visual loss (Thomas et al., 2021).^[1,2]

Van Herick test is a non-contact slit lamp method of estimating the anterior chamber depth in the periphery by comparing it with the cornea thickness. It is an easy-to-use tool that can be utilized in daily outpatient practices due to its simplicity and speed and the least amount of cooperation that patients may need to perform the test which makes it a screening tool to determine whether an individual has angle closure or not (Baskaran et al., 2022). Van Herick grading is a good method of identifying patients requiring gonioscopic examination in a busy clinic with limited resources. This method is also significantly important in deciding safety of mydriasis in routine ophthalmic examination or before its therapeutic use in conditions such as infectious keratitis and iridocyclitis. However, the technique will not monitor the entire circumferential angle anatomy as only the temporal limbal area is measured, and it must be corroborated with gonioscopy (Nongpiur et al., 2021).^[3,4]

Gonioscopy is the gold standard of angle visualization. It allows assessment of the angle width, geometry, pigmentation, and the presence of peripheral anterior synechiae by assessing all four quadrants (AAO, 2020). Due to the identification of specific anatomical features, e.g., Schwalbe line, trabecular meshwork, scleral spur, and ciliary body band, the angle status and the risk of closure can be accurately identified. Gonioscopy is lengthy and demands skills that limit its use in practice as a valuable screening tool (Thomas et al., 2021).^[5,6]

Given that there are some practical advantages of Van Herick technique and gonioscopy is accurate as a diagnostic tool, the need to correlate the findings of two techniques is of clinical importance. The development of a viable relationship would help to gain the trust in Van Herick grading as a preliminary screening test to assess whether the eyes are in danger of angle closure and prioritize the patients to gonioscopy (Baskaran et al., 2022). Previous studies have demonstrated that Van Herick grading and gonioscopic outcomes possess inconsistent rates of agreement.^[7]

MATERIALS AND METHODS

This was a hospital-based cross-sectional observational study conducted in the Department of

Ophthalmology, GMC Srinagar, a tertiary care centre in North India. The patients underwent routine anterior segment evaluation as part of comprehensive eye examination. A total of 190 eyes of 95 patients were examined. Patients above the age of 18 years, either gender were included while patients with any ocular surgery, laser, trauma or ocular inflammation were excluded.

Van Herick test was performed by projecting a narrow-slit beam of light on the peripheral cornea as near as possible to the limbus at angle of 60 degrees, resulting in formation of a slit image on the cornea. The width of this illuminated corneal slit is used as reference (Corneal Thickness = CT). After traveling through the cornea, the slit beam falls on iris. Now the width of peripheral anterior chamber can be judged by the distance (space) between corneal and iris slit in fraction of corneal thickness. Gonioscopy was done using Sussman Goniolens and graded as per table.

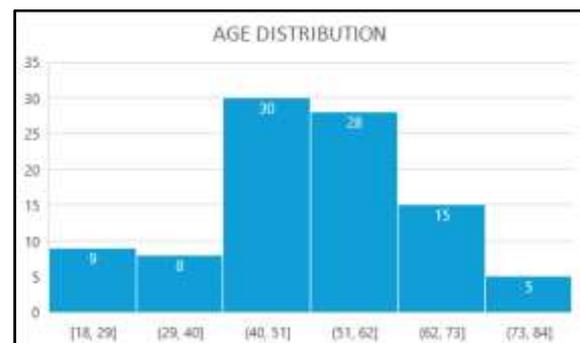
Width of the empty space (LACD) as compared to the corneal thickness	van Herick Grade	Angle status
No black space observed	0	Closed
<1/4 Corneal thickness	1	Extremely narrow
1/4 of corneal thickness	2	Narrow
>1/4 to 1/2 of corneal thickness	3	Open
≥1 of corneal thickness	4	Wide open

LACD = Limbal Anterior Chamber Depth.

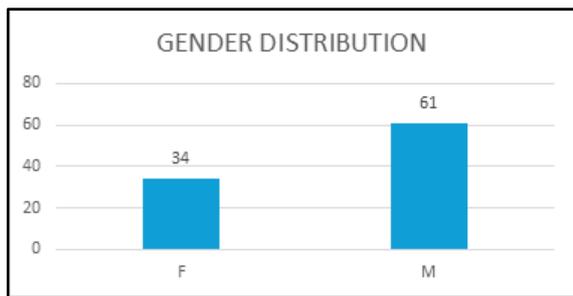
Gonioscopy Grading.

Grading	Angle Width	Findings	Angle Closure Risk
0	0	No angular structures are visible.	Closed
1	10	Schwalbe's line is visible. Even the most anterior portion of the trabecular meshwork may be visible.	High Risk
2	20	Trabecular meshwork is entirely visible.	Possible
3	20-35	Scleral spur is visible.	Impossible
4	35-45	Ciliary body is clearly visible.	Impossible

RESULTS



Mean age of patients in our study was found to be 51.421 ± 14.096 . Out of a total of 95 patients, 61 were males and 34 were females reflecting a greater health care seeking behaviour in men. The same demographic patterns were also observed in hospital-based angle assessment research in the Indian subcontinent (Thomas et al., 2021; Baskaran et al., 2022).^[8,9]



Van Herick grading showed a similar distribution pattern in both eyes. The two-eye grading is also similar, which confirms bilateral anterior chamber depth anatomical symmetry as seen in previous research (He et al., 2020). Most eyes were graded as wide open (75 eyes) followed by extremely narrow angles (54 eyes), open angles (39 eyes). Narrow and closed angles were less frequent. This suggests that most patients had anatomically open anterior chamber angles on screening examination.

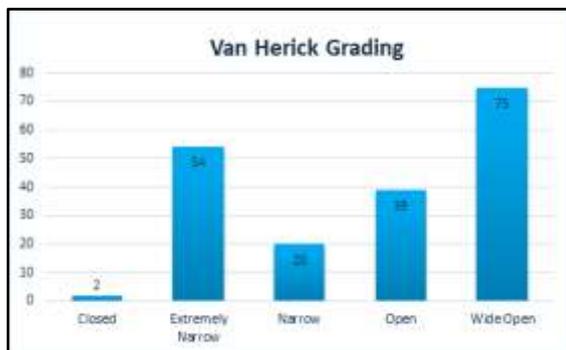
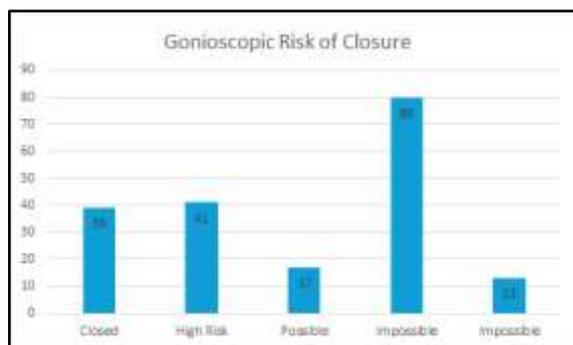


Table 1

Van Herick Grade	Occludability according to Van Herick	No. of eyes
0	Closed	2
1	Extremely Narrow	54
2	Narrow	20
3	Open	39
4	Wide Open	75
Total		190

Table 2

Gonioscopy Grading	Risk of Closure	No. of eyes
0	Closed	39
1	High Risk	41
2	Possible	17
3	Impossible	80
4	Impossible	13
Total		190



Gonioscopy revealed that most eyes fell into the impossible risk of closure category (93 eyes) followed by high risk (41 eyes) and closed angles (39 eyes). A smaller proportion of eyes showed possible risk of angle closure (17 eyes). A high degree of agreement was observed between the right and left eyes for both Van Herick grading and gonioscopic classification. Most patients showed bilateral symmetry in anterior chamber angle configuration, supporting the concept of inter-eye correlation in angle assessment.

Table 3

VH Grade	Occludability according to Van Herick	No. of eyes	Number of eyes showing Occludability on gonioscopy	% of Agreement
0	Closed	2	2	100%
1	Extremely Narrow (Very Likely)	54	41	75.92%
2	Narrow (Possible)	20	14	70%
3	Open (Unlikely)	39	13	66.67%
4	Wide Open (Impossible)	75	7	90.67%
Total		190		

In 2 eyes with Van Herick grade 0, gonioscopy showed closed angle in both the eyes, showing 100%

agreement. In 54 eyes with Van Herick grade 1, 41 eyes showed occludability, where only 1/3 or less of

anterior trabecular meshwork was visible, showing 75.92% agreement. In 20 eyes with Van Herick grade 2, 14 eyes showed occludability, showing 70% agreement. In 39 eyes with Van Herick grade 3, only 13 eyes showed occludability depicting agreement of 66.67%. In 75 eyes of Van Herick grade 4, only 7 eyes showed occludability, showing agreement of 90.67%. This agrees with Anil Kumar Srivastava et al.^[10]

DISCUSSION

The current research shows that there is a high correlation between Van Herick grading and gonioscopic findings of right and left eyes. All closed or high-risk anterior chamber angles on gonioscopy were always in the low Van Herick grades and all open angles were in the high VH grades. An agreement of 100% was found in patients with 0 grade VH and occludability on gonioscopy. This was followed by an agreement of 90.67% with respect to occludability on gonioscopy in patients of wide open VH. Extremely narrow, narrow and open VH grading agreed 75.92%, 70%, and 66.67%, respectively. This proves that the depth of the peripheral anterior chamber that is measured using Van Herick method indicates the underlying angle anatomy in a clinically significant manner. The same correlations are highlighted by the recent studies that focus on the anatomical foundation of the narrowing of angles in primary angle-closure disease (Nongpiur et al., 2021; Thomas et al., 2021). A Japanese study on 923 eyes by Kenji Kashiwagi et al in 2005 found good agreement between Van Herick grading and gonioscopy findings. Thomas et al in 1996 opined that flashlight Van Herick tests are poor predictors for angle occludability. In 2011, a study by Park et al, on 148 subjects, comparing these two and Anterior segment OCT, showed good agreement.^[11-15]

Van Herick grading is a useful and effective screening test in detecting at-risk eyes. Its non-contact, quick performance and easiness of use make it especially appropriate in high-volume outpatient environments. But since Van Herick grading forms of assessment of the temporal angle but not the circumferential area hence cannot be substituted by gonioscopy in conclusive diagnosis. These results correspond with the recent assessments of Van Herick grading as a screening, and not a diagnostic modality (Baskaran et al., 2022; AAO, 2020).^[16,17] Clinically, the results indicate application of Van Herick grading as a useful screening instrument in normal ophthalmic practice especially in resource-based settings. Heralding of at-risk eyes early enough means that gonioscopy and further intervention may be referred to in time and therefore the burden of angle-closure glaucoma may be reduced. Van Herick grading with normal slit-lamp screening can amplify early recognition measures and is not associated with much difference in terms of examination period. The simple screening approaches to detect high-risk

patients, who require further screening of the angle, are also encouraged in current glaucoma practice guidelines (AAO, 2020; He et al., 2020).^[18-20]

Limitations of the Study

Both gonioscopy and Van Herick grading are examiner-dependent techniques and are prone to inter-observer and intra-observer errors. Minor variations in the illumination in the slit lamp, the angle of observation, and the experience of the examiner can influence the results of the grading process. It has been an inherent subjectivity of the methods of measuring the anterior chamber angle, which depend on the clinical judgment instead of objective imaging (Thomas et al., 2021).

The current research was carried out within a hospital context, and this could be inaccurate in being representative of the general population. Ocular complaints or requiring a specialist assessment are more prevalent in patients visiting tertiary care centres, which may result in the introduction of selection bias. Consequently, the results cannot be immediately extrapolated to population groups that are based in the community (He et al., 2020).

The study is cross-sectional, so it is impossible to evaluate the development of the disease or whether Van Herick grading is predictable in the long run. It would be necessary to follow up longitudinally on whether the eyes that are considered at risk develop angle closure or glaucoma as the modern glaucoma studies have stressed (Nongpiur et al., 2021).

Recommendations

Slit-lamp examination should also include a regular use of van Herick grading as a screening instrument to detect at-risk eyes as those that may experience the angle closure. Its application can be used to prioritize patients who need more detailed analysis especially when dealing with a high volume of outpatients (Baskaran et al., 2022).

Eyes that are labeled as having narrow or suspicious angles on Van Herick grading must be examined gonioscopically to ascertain the status of angle and provide guidance. In some cases, the use of Van Herick grading can be not sufficient to estimate the risk of angle

closure, which is why gonioscopy is necessary (AAO, 2020).

Research in the future ought to target large population-oriented investigations to confirm the results in a wide range of demographic populations. Prospective studies comparing the course of narrow angle to conclusive angle-closure glaucoma would help understand the predictive utility of Van Herick grading and optimize screening efforts (He et al., 2020; Nongpiur et al., 2021).

CONCLUSION

The gonioscopic results are well correlated with van Herick grading, and van Herick grading is an excellent screening instrument in the identification of the at-risk eyes. However, gonioscopy continues to

play an important role in the measurement of angles conclusively. A high level of inter-eye agreement may be a possible sign of bilateral symmetry of anterior chamber angle set up in most of the patients.

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