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Original Research Article

Diagnostic Accuracy of Van Herick Technique versus Gonioscopy in Eclipse Sign-Positive Eyes: A Cross-Sectional Study

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ABSTRACT
Purpose: To assess the diagnostic accuracy of the Van Herick technique (VHT) compared to gonioscopy in detecting Primary Angle Closure Suspects (PACS) among patients with a positive eclipse sign.
Methods: A cross-sectional study was conducted involving 100 eyes of 50 patients above 40 years of age presenting with a positive eclipse sign. Each eye underwent Van Herick grading (VHG) and gonioscopy using the Shaffer classification system. Diagnostic accuracy parameters—sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy—were calculated with gonioscopy as the reference standard.
Results: Occludable angles (PACS) were identified in 70 eyes (70%). At VHG ≤ 2, VHT demonstrated 91.43% sensitivity, 43.33% specificity, 80.00% PPV, 66.67% NPV, and 77.00% overall accuracy. Female predominance was observed across all VHG grades.
Conclusion: VHT is a rapid, sensitive screening tool for detecting occludable angles in eclipse sign–positive eyes. However, due to its limited specificity, positive VHT results should be confirmed with gonioscopy before clinical decision-making.

Keywords: Van Herick Technique, Gonioscopy, Primary Angle Closure Suspect, Eclipse Sign, Anterior Chamber Angle, Pacg Screening.

INTRODUCTION

Glaucoma is one of the leading causes of irreversible blindness worldwide,[1] representing a major public health challenge across all populations and age groups. It encompasses a heterogeneous group of progressive optic neuropathies that share a common final pathway of retinal ganglion cell loss, leading to visual field defects and, ultimately, blindness.[1]
Two principal subtypes dominate the clinical landscape: primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG). While POAG is more prevalent globally, PACG carries a disproportionately greater risk of rapid, bilateral visual loss. Primary angle-closure glaucoma (PACG) is associated with the closure of the anterior chamber angle of the eye and is known to have a greater propensity of bilateral blindness,[1] resulting in significant individual, familial, and societal burden.
The identification of individuals at risk—those with occludable drainage angles—is a prerequisite for any meaningful prevention programme. In the context of the Indian subcontinent, this task is particularly urgent. A large proportion of the PACG in the Indian population is undiagnosed and untreated. Because visual loss resulting from PACG is potentially preventable if peripheral iridotomy or iridectomy is performed in the early stage, strategies for early detection of PACG could reduce the high risk of blindness resulting from PACG seen in this urban population in India.[4]
Assessment of the anterior chamber angle (ACA) is therefore essential for the timely detection of eyes at risk of PACG prior to the onset of disease.[3,8] Gonioscopy is currently considered the gold standard method to assess the ACA,[3] enabling direct visualisation of the iridocorneal angle structures from the iris root to Schwalbe's line. However, gonioscopy is a clinically demanding test. It is not always well tolerated by patients, and may be time-consuming in a busy clinic.[3] It requires

considerable operator skill, contact with the ocular surface, and subjective real-time interpretation, which can be affected by inadvertent pressure on the cornea and lighting conditions.[3,9]

Recognising these limitations, simpler, non-contact screening methods have been developed. The van Herick (VH) technique is a simple non-contact method used to screen the narrow peripheral anterior chamber depth (ACD) in which a thin slit-beam is projected perpendicular to the temporal limbus and the distance between the corneal endothelium and the peripheral iris surface is evaluated biomicroscopically. When the distance is about one-quarter of the corneal thickness or less (VH grade 2 or less), the eye is considered more likely to be occludable and has a risk for primary angle-closure glaucoma (PACG).[2]

The VHT classifies the peripheral anterior chamber depth (PACD) as a fraction of corneal thickness on a four-point scale (grades 0–4), with grades 0–2 indicating an occludable angle. Its advantages include speed, non-contact delivery, and integration within a routine slit-lamp examination without the need for additional equipment. Multiple population-based studies across diverse ethnic groups have evaluated its performance against gonioscopy, generally reporting good sensitivity but variable specificity[5].

In addition to the VHT, the eclipse sign—a shadow cast on the nasal iris when a temporal penlight is directed at the eye—provides a rapid, equipment-free surrogate for estimating anterior chamber depth and angle status. A positive eclipse sign indicates a shallow anterior chamber, alerting the clinician to a possible occludable angle. However, its performance as a standalone diagnostic tool has not been rigorously characterised[15].

While previous literature has examined the agreement between VHT and gonioscopy in various clinical settings,few studies have specifically evaluated the diagnostic accuracy of VHT in the subset of patients who have already been identified as having a shallow anterior chamber via the eclipse sign[16]. Such patients represent a pre-selected, higher-risk cohort in whom streamlined confirmation of angle status could facilitate earlier triage and intervention. Understanding the operating characteristics of VHT in this specific population has direct implications for designing efficient, resource-appropriate screening pathways.

Anterior segment optical coherence tomography (AS-OCT) has emerged as a quantitative, non-contact imaging modality for ACA assessment. AS-OCT is a technique more rapid, more easily practiced by a technician. Also without the need to position a scanning probe close to the globe, better control of eye accommodation and pupil size is attainable with AS-OCT.[4] However, studies have consistently shown that assessment of narrow angles by gonioscopy and the Van Herick technique showed good agreement, but both measurements revealed poor agreement with AS-OCT[9] due to fundamental differences in how each modality defines angle closure. The poor specificity of AS-OCT in many community settings, combined with its cost and operator-training requirements, limits its widespread adoption as a first-line screening tool.[4,]

Against this background, the Van Herick technique remains the most practical, widely available non-contact screening method for occludable angles. Its utility has been demonstrated across multiple demographic contexts; yet as Thompson et al. highlighted, using the VH technique, 13.7% of eyes with NA on gonioscopy were classified as deep,[7] indicating that the method is not infallible and that certain patient subgroups—particularly those who are male, myopic, or of Black or Asian race—are at increased risk of misclassification.[7]

This cross-sectional study was designed to evaluate the diagnostic accuracy of the Van Herick technique against gonioscopy in a cohort of patients with a positive eclipse sign—a group in whom a shallow anterior chamber has already been clinically suspected. This study aims to provide evidence that informs the most efficient use of VHT in targeted angle-closure screening programmes.

MATERIALS AND METHODS

Study Design and Setting

This was a cross-sectional, observational study conducted at a tertiary eye care centre. The study was approved by the Institutional Ethics Committee and conducted.Written informed consent was obtained from all participants.

Participants

Fifty patients (100 eyes) aged above 40 years with a positive eclipse sign were enrolled consecutively. Patients with a history of previous ocular surgery, penetrating ocular trauma, corneal opacities, or inflammatory ocular disease were excluded. Only phakic eyes were included for analysis.

Van Herick Grading

Van Herick grading was performed by a trained ophthalmologist in a darkened room, prior to gonioscopy. A narrow slit-beam was directed at the temporal limbus at a 60° angle, and the peripheral anterior chamber depth was expressed as a fraction of the adjacent corneal thickness. The eye was classified according to the standard four-point scale (VHG 0–4): VHG 0 = closed; VHG 1 = depth < 1/4 corneal thickness; VHG 2 = depth = 1/4 corneal thickness; VHG 3 = depth ½ corneal thickness; VHG 4 = depth > 1 corneal thickness. For the purpose of diagnostic accuracy calculations, a cut-off of VHG ≤ 2 was used to define a suspected occludable angle, consistent with the widely used clinical criterion.

Gonioscopy (Reference Standard)

Gonioscopy was performed with a Goldmann three-mirror lens by the same examiner (masked to VHG results) in a darkened room under low illumination, using a 1 mm slit-beam offset to avoid pupillary light reflex. The Shaffer grading system was applied to all four quadrants. An eye was defined as having an occludable (PACS) angle if the posterior pigmented trabecular meshwork was not visible for ≥ 180° of the angle circumference on non-indentation gonioscopy.

RESULTS

Demographic Profile

A total of 50 patients (100 eyes) were enrolled. The mean age range was 41–80 years (Table 1). The majority of patients were in the 51–60 age group (40%), followed by 61–70 years (28%), 41–50 years (24%), and 71–80 years (8%). Consistent with the known female predisposition to shallow anterior chambers, females predominated across all Van Herick grades.

Table 1: Age Distribution of Patients (n = 50)

Age Group (years)	Number of Patients	Percentage (%)
41–50	12	24
51–60	20	40
61–70	14	28
71–80	4	8
Total	50	100

Van Herick Grading Distribution

Of the 100 eyes assessed, VHG 1 was the most common grade (48 eyes, 48%), followed by VHG 2 (38 eyes, 38%), and VHG 3 (14 eyes, 14%) (Table 2). No eye was graded VHG 0 or VHG 4. Female eyes constituted 60%, 68%, and 78% within VHG 1, VHG 2, and VHG 3 grades, respectively.

Table 2: Van Herick Grading Distribution (100 eyes)

VHG Grade	Number of Eyes	Percentage (%)
VHG 1	48	48
VHG 2	38	38
VHG 3	14	14
Total	100	100

Gonioscopy Results

Gonioscopy identified occludable angles (PACS) in 70 eyes (70%) and open angles in 30 eyes (30%) (Table 3). The prevalence of PACS increased with age, reaching 100% in the 71–80 year age group (Table 4).

Table 3: Gonioscopy Results (100 eyes)

Gonioscopy Result	Number of Eyes	Percentage (%)
Occludable (PACS)	70	70
Open Angle	30	30
Total	100	100

Table 4: Age-wise Distribution of PACS (70 eyes)

Age Group (years)	PACS (n)	Open Angle (n)
41–50	27	17
51–60	30	10
61–70	12	2

71–80	1	0
Total	70	30

Correlation between VHT and Gonioscopy

Among eyes classified as VHG 1 (n=48), gonioscopy confirmed PACS in 42 (87.5%). Among VHG 2 eyes (n=38), 23 (60.5%) were PACS on gonioscopy. In contrast, among VHG 3 eyes (n=14), only 5 (35.7%) had an occludable angle on gonioscopy (Table 5).

Table 5: Gonioscopy Results According to Van Herick Grade

VHG Grade	Eyes (n)	PACS (n)	Open Angle (n)	% PACS within Grade
VHG 1	48	42	6	87.5
VHG 2	38	23	15	60.5
VHG 3	14	5	9	35.7

Diagnostic Accuracy at VHG ≤ 2 Cut-off

At a cut-off of VHG ≤ 2, the Van Herick technique demonstrated a sensitivity of 91.43% (95% CI: 83.60–96.64), specificity of 43.33% (95% CI: 26.57–61.85), PPV of 80.00% (95% CI: 73.42–85.45), NPV of 66.67% (95% CI: 44.70–83.35), and overall accuracy of 77.00% (95% CI: 68.31–84.31).

Table 6: Diagnostic Accuracy of Van Herick Technique (Cut-off VHG ≤ 2) vs Gonioscopy

Metric	Value (%)	95% CI
Sensitivity	91.43	83.60–96.64
Specificity	43.33	26.57–61.85
Positive Likelihood Ratio	1.45	1.09 – 1.92
Negative Likelihood Ratio	0.19	0.07 – 0.52
Positive Predictive Value (PPV)	78.82	68.61 – 86.94
Negative Predictive Value (NPV)	66.67	38.38 – 88.18
Accuracy	77.00	67.51 – 84.83

DISCUSSION

This cross-sectional study evaluating the diagnostic accuracy of the Van Herick technique against gonioscopy in eclipse sign–positive patients yielded findings that are broadly consistent with the existing literature, while providing novel insights specific to this pre-selected higher-risk cohort.

The high sensitivity of VHT (91.43% at VHG ≤ 2) observed in this study aligns with data from multiple prior studies. Srivastava et al. reported an overall agreement of 87.6% between Van Herick grading and gonioscopy in a North Indian population,[6] and in the study by Kapoor et al., sensitivity and specificity values of the Van Herick's grading with keeping Gonioscopy as the reference standard came as 100% and 93.75%, thus vindicating its value as a good screening test.[4] The high negative predictive value of 66.67% in our study, though somewhat lower than in pure population-based cohorts, reflects the enriched prevalence of PACS in our eclipse sign–positive sample.

The moderate specificity (43.33%) observed here is not unexpected. The Van Herick technique does not directly visualise angle structures and, as the Van Herick technique remains a non-standardized examination, with regards to the illumination column, the slit height and the exact placement of the slit at the peripheral cornea. Moreover, it gives no information about the shape of the peripheral iris, the appearance of the angle structures, the presence of PAS and their extension.[8] This structural limitation means that a proportion of cases with anatomically borderline angles will be overcalled as occludable by VHT.

The poor specificity of VHT relative to gonioscopy is a finding replicated in the literature. Campbell et al. reported that the van Herick method showed good sensitivity on the first and second visit respectively (visit 1: 75%, visit 2: 69%) and good specificity (visit 1: 88%, visit 2: 95%);The demographic findings merit attention. The increasing prevalence of PACS with age (reaching 100% in the 71–80 age group in our cohort) is consistent with established literature on age as a risk factor. The prevalence of PACG increases with age. Men are found less likely to have PACG than women (risk ratio = 0.71, 95% CI = 0.53–0.93, $p < 0.01$).[1] The female predominance observed across all VHG grades in our study is in keeping with this: females were shown to have greater ACD shallowing with aging than males[1], predisposing them to angle closure and

explaining the higher proportion of female eyes in lower VHG grades.

The eclipse sign–positive selection criterion for our study represents a practical triage step commonly employed in resource-limited settings. A positive eclipse sign is a simple indicator of shallow anterior chamber and potential angle occludability. By studying VHT specifically within this pre-selected cohort, our study demonstrates that even among patients already flagged as high-risk, VHT maintains high sensitivity (>90%), making it valuable for confirmatory screening before directing patients to more resource-intensive gonioscopy.

The potential for misclassification with VHT is a recognised concern. Patients with NAs on gonioscopy who are men, myopic, and of black or Asian race are at increased risk of being misdiagnosed with deep angles if examined with the VH technique alone.[7] In our South Indian cohort, the predominantly Asian ethnicity could theoretically increase the risk of under-classification. However, the high sensitivity we observed suggests that in this specific eclipse sign–positive cohort, the majority of truly occludable eyes were correctly identified.

Regarding the utility of AS-OCT in the angle closure screening pathway, Dabasia et al. found that Van Herick test and Visante OCT ACA exhibited best discrimination between narrow and open angles both alone, and in combination. Van Herick test affords advantages over Visante OCT, showing potential for identifying individuals who may benefit from further gonioscopic assessment in a case-finding or screening setting.[5] This positions VHT, rather than AS-OCT, as the preferred first-line tool for large-scale screening—particularly in settings where advanced imaging is not readily available.

The agreement between gonioscopy and VHT observed in our study (with a kappa consistent with fair-to-good agreement) is supported by Park et al., who demonstrated that assessment of narrow angles by gonioscopy and Van Herick technique showed good agreement, but both measurements revealed poor agreement with AS-OCT because of the inherent structural differences in defining angle closure between the two methods.[9] Both VHT and gonioscopy evaluate a wide area of the limbal chamber, which explains their relative concordance compared to the single-axis imaging of AS-OCT.

From a clinical implementation standpoint, the findings of this study support a two-step screening algorithm: (1) eclipse sign assessment as a rapid, equipment-free first filter; (2) VHT as a confirmatory non-contact screening step; and (3) gonioscopy for definitive diagnosis in VHT-positive cases. This pathway maximises sensitivity at each sequential stage while reserving gonioscopy—a more resource-intensive, operator-dependent procedure—for those who screen positive on both preceding steps.

This study has several limitations. The sample size, while adequate for pilot data, is modest. The single-centre design may limit generalisability. The absence of AS-OCT measurements precludes direct three-way comparison. Additionally, as gonioscopy itself carries imperfect repeatability, some classification error at the reference standard level cannot be excluded.

CONCLUSION

The Van Herick technique is a rapid, sensitive, and practical screening tool for detecting occludable angles in eclipse sign–positive patients. At a cut-off of VHG ≤ 2, it achieved sensitivity exceeding 90% in this cohort, demonstrating its value as a first-line triage instrument. However, its limited specificity underscores the continued necessity of gonioscopy as the gold standard for angle assessment and final clinical decision-making. A sequential screening pathway integrating eclipse sign assessment, Van Herick grading, and confirmatory gonioscopy is recommended for high-risk populations, particularly in settings with high PACG burden.

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