

Diagnostic Accuracy of Van Herick Technique Compared to Gonioscopy in Detecting Primary Angle Closure Suspects among Eclipse Sign Positive Cases

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Abstract

One of the main causes of permanent blindness is glaucoma. Primary angle closure glaucoma affects 0.75 percent of adult Asians and 0.46 percent of adult Indians. The optic nerve head and the patient's vision are in danger since many angle closure glaucoma patients present at the stage of acute congestive glaucoma. Prophylactic laser peripheral iridotomy, an outpatient technique, can stop angle closure glaucoma from developing once an occludable angle has been found. So it's critical to check candidates for occludable angles.

Keywords: angle closure glaucoma; Van Herick technique; gonioscopy

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Introduction

According to the mechanism raising intraocular pressure, there are two types of glaucoma: closed angle type and open angle type. Asia is home to about 80 percent of those who have primary angle closure glaucoma.[1] Primary angle closure glaucoma affect 0.75 percent of older Asians and 0.46 percent of mature Indians. The blinding effects could be avoided if we could detect occludable angles before they develop into glaucomatous optic nerve head injury. Preventive laser peripheral iridotomy, an outpatient technique, can stop angle closure glaucoma from developing once an occludable angle has been found. Hence, it's

crucial to identify potential occludable angles in humans. In a situation like ours with a crowded outpatient department, the typical diagnostic procedure for angle closure is gonioscopy, which takes longer time and is therefore inadequate for screening. [2-3] Oblique flashlight testing to detect for eclipse signs is a low-cost, simple population diagnostic procedure. Another method that employs a thin slit beam to concentrate on the cornea and anterior chamber perpendicular to the temporal limbus to measure the peripheral anterior chamber depth is the Van Herick approach. [4-5]

Materials & Methods

All participants older than 40 who visited the same department's OPD were all torch-light-examined for eclipse signs. In our study, 200 eyes of 100 patients with positive eclipse sign, who satisfied the inclusion criteria were enrolled in the study. Patients who had undergone any type of eye surgery, trauma, or inflammation were prohibited. Their clinical profile of age, gender, best corrected visual acuity and intraocular pressure were recorded. In this study, a light beam was directed from the temporal side of the cornea towards the base of the nose, creating a semicircular shadow of the iris. A large shadow was considered a favourable eclipse

sign and was considered for the study. Those who exhibit the eclipse sign will be subjected to a slit lamp examination, and the peripheral anterior chamber depth was calculated as a percentage of corneal thickness to perform Van Herick grading (VHG) [6] (Table 1).

In this procedure, a tiny slit beam perpendicular to the temporal limbus was focused on the cornea and anterior chamber. All patients who had the eclipse sign underwent gonioscopy utilising a slit light and goniolens, and Shaffer's gonioscopy grading was used to grade the results (Table 2). Each quadrant of the angle was given a numerical grade. Grades of 1 and 0 were regarded well.

Table 1: Van Herick grading of peripheral anterior chamber depth

Grade	Relation between corneal Thickness & Ant. Chamber Depth	Interpretation
4	1 : 1 or higher	Angle closure very unlikely Angle approx. 3545 degrees
3	1 : ½ (or higher)	Angle closure unlikely Angle approx. 20 – 35 degrees
2	1 : ¼ (or higher)	Angle closure possible, Angle approx. 20 degrees
1	1 : less than ¼	Angle closure very likely, Angle approx. 10 degrees
0	Closed	Angle closure, Angle approx. 0 degrees

Table 2: Angle Classification on Gonioscopy (Shaffer)

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

Maximum number of patients were in the age group of 51-60 years (39, 39%). 24 (24%) were in the age group 41-50 years. Only 7 (7%) were of age more than 70 years. The mean age of patients was 57.2 years.

Among the 100 enrolled individuals, 66 (66%) were females and 34 (34%) were males.

Among the 200 sample eyes with positive eclipse sign, 96 (48%) had VHG 1 and 77 (38.5%) had VHG 2. Only 27 (13.5%) had VHG 3.

Distribution of VHG in the sample according to the age

Table 3: Distribution of VHG in the sample according to the age

Age group (years)	No. of eyes with VHG 1	No. of eyes with VHG 2	No. of eyes with VHG 3
41-50	23 (24%)	21 (27.3%)	4 (14.8%)
51-60	36 (37.5%)	29 (37.7%)	13 (48.1)
61-70	33 (34.4%)	17 (22%)	9 (33.3%)
71-80	4 (4.1%)	10 (13%)	1 (3.7%)
Total	96 (100%)	77 (100%)	27 (100%)

Among the VHG 1 eyes, 58 (60.4%) were females. Among the VHG 2 eyes 53 (68.8%) and in VHG 3 eyes 21 (77.8%) were females.

Gonioscopy results in the sample

Table 4: Distribution of gonioscopy results in the sample

Gonioscopy Result	Number	Percentage
Positive	141	70.5%
Negative	59	29.5%

141 (70.5%) eyes were gonioscopically occludable or PACS. 59 (29.5%) eyes were having open angles.

Age wise distribution of PACS in the sample

Table 5: Age wise distribution of PACS in the sample

Age group (years)	Gonioscopy positive	Gonioscopy negative
41-50	36(75%)	12(25%)
51-60	47(60.3%)	31(39.7%)
61-70	44(73.3%)	16(26.7%)
71-80	14(100%)	0(0%)

Though the maximum number of disease positives were in the age group of 51-60 years (47, 33.3%), for a given age group, the percentage of people turning disease positive was maximum in the age group of 41-50 years (36, 75%).

55 (80.9%) eyes of males tested positive in gonioscopy. Only 86 (65.2%) of females who had occludable angles by VHG had PACS in gonioscopy. But the majority of the detected PACS were females (86, 60.99%).

Reliability indices

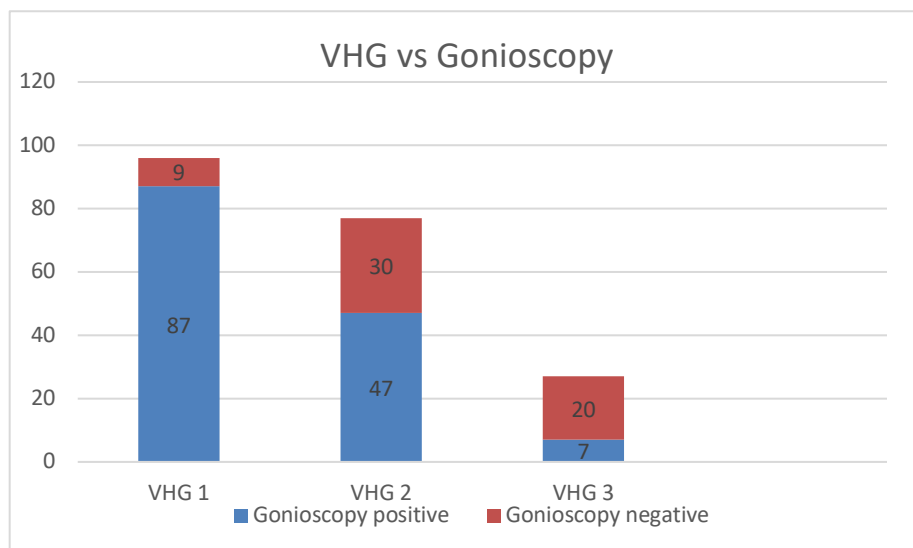


Figure 1: Distribution of gonioscopy results according to VHG

Among the VHG 1 eyes, 87 (90.62%) were tested positive for occludable angles by gonioscopy. 61.04% of VHG 2 eyes (47) and 25.9% of VHG 3 eyes (7) were gonioscopically occludable.

Table 6: Reliability indices of Van Herick grade with cut-off VHG 2, compared to gonioscopy

Reliability indices	Value	95% CI
Sensitivity	95.04%	90.04%-97.98%
Specificity	33.9%	22.08%-47.39%
Positive Likelihood ratio	1.44	1.19-1.73
Negative Likelihood ratio	0.15	0.07-0.33
Disease prevalence	70.5%	63.66%-76.72%
Positive Predictive Value	77.46%	74.03%-80.55%
Negative Predictive Value	74.07%	56.08%-86.47%
Accuracy	77%	70.54%-82.64%

Table 7: Reliability indices of Van Herick grade with cut-off VHG 1, compared to gonioscopy

Reliability indices	Value	95% CI
Sensitivity	61.7%	53.15%-69.76%
Specificity	84.75%	73.01%-92.78%
Positive Likelihood ratio	4.04	2.19-7.48
Negative Likelihood ratio	0.45	0.36-0.57

Disease prevalence	70.5%	63.66%-76.72%
Positive Predictive Value	90.62%	83.93%-94.71%
Negative Predictive Value	48.08%	42.24%-53.96%
Accuracy	68.5%	61.57%-74.87%

Discussions

Reliability indices of Van Herick grade with cut off VHG 2, compared to gonioscopy

In our study, among the 173 eyes which tested positive with a cut off of VHG 2, 134 (77.4%) were gonioscopically occludable. Among the 27 test negatives, 7 (25.9%) had gonioscopically occludable angles and 20 (74.07%) had open angles. The sensitivity was 95.04% and specificity 33.9%. The positive likelihood ratio was 1.44 with a 95% confidence interval (CI) of 1.19-1.73. The negative likelihood ratio was 0.15 with a 95% CI of 0.07-0.33. In the study by Choudhari *et al*, the sensitivity and specificity were 75.4 and 90.5 % respectively (81). The study included both open and narrow angle clusters unlike our study, which might be the reason for the difference in the reliability indices [7].

Reliability indices of Van Herick grade with cut-off of VHG 1, compared to gonioscopy

With lowered cut off to VHG 1, 96 eyes were test positive and remaining 104 were test negative. Among these 96 eyes, 87 (90.6%) were gonioscopically occludable and the rest were having open angles. 54 (51.9%) of the test negatives had gonioscopically occludable angles. With this lowered cut-off the sensitivity decreased (61.7%) and specificity increased (84.75%). In the study conducted by Choudhari *et al* also had similar trends with lowered cut off (sensitivity 53.6 and specificity 95.2 %) (81). In a study conducted by Thomas *et al* the sensitivity was 61.9% and specificity was 89.33% with a cut off of VHG 1 . The sensitivity slightly improved (66.7%) when a combination of

flashlight test and van Herick test were used and the specificity became 87.16% (51)

In our study conducted, in eyes with seemingly narrow angles (VHG 0, 1 and 2), diagnosis of occludable angle was made on gonioscopy in 103 eyes out of 116 eyes (agreement 88.8%). On the other hand, in eyes with seemingly open angle (VHG 3), 86 were found non-occludable on gonioscopy out of 106 eyes (agreement 81.1%). The overall harmony seen in this study was 87.6%, which showed the test to be fairly accurate. The VHG 1 eyes were 48 percent among the sample eyes in our study. 38.5% of the eyes had VHG 2 and only 13.5% had VHG 3. In a study conducted by Choudhari *et al*. [8], only 29.7% were VHG 1, 21.6% were VHG 2 and 32.4% were VHG 3. The eyes from both the narrow and open-angle clusters were included in their study. 141 (70.5%) eyes were gonioscopically occludable or PACS. 59 (29.5%) eyes were having open angles. In the study conducted by Choudhari *et al*. [8] the 62.1% eyes were occludable in gonioscopy. The study included both shallow and open angle clusters, whereas we included only shallow angled eyes as detected by oblique flashlight test. The highest numbers of gonioscopically occludable eyes (87, 61.7%) were in VHG 1. The proportion of gonioscopically occludable eyes (87, 90.62%) was also highest in this group as expected according to the existing literature. Among the VHG 1 eyes, were detected to have occludable angles by gonioscopy. 61.04% of VHG 2 eyes (47) and 25.9% of VHG 3 eyes (7) were gonioscopically occludable.

Conclusion

The Van Herick method for estimating peripheral anterior chamber depth in our study of 200 eyes was found to be a highly helpful method for rapid and simple evaluations of eyes with narrow angles in the population of south India. However, gonioscopy must be used for patient care and final diagnostic procedures.

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