Evaluation of the Anterior Chamber Angle Closure: Comparison of the van Herick technique with Scheimplug Camera

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PURPOSE

About 77 million people in the world suffer from glaucoma,10% of which are visually impaired1. One of the risk factors is the high intraocular pressure (IOP) due to the poor outflow of the aqueous humor to the anterior chamber angle. The most severe form of glaucoma is the Closed-angle glaucoma. 2,3

To assess the risk of angle closure we can use the Shaffer Grading System (SGS)3: as shown in Tab 1.

Angle grade	Angle width	Clinical interpretation
Shaffer grade 4	35°-45°	Closure impossible
Shaffer grade 3	25°-35°	Closure impossible
Shaffer grade 2	20°	Closure possible
Shaffer grade 1	10°	Eventual closure probable
Shaffer grade 0	0°	Closure present or imminent

Tab 1 – Schaffer Grading System

The most popular technique for chamber angle measurement is gonioscopy, actually the gold standard. In some countries, where the optometrists can't use diagnostic drugs, the anterior chamber depth can be estimated by the OCT camera, the Sheimpflug Camera (SC), and the van Herick's Technique (vHT) 4. The van Herick's Technique, performed on the slit lamp, allows us to evaluate the width of the angle by comparing the distance between the corneal slit image and the slit image on the iris.

The aim of this study has been to evaluate the effectiveness of this quick and simple method to measure the angle by comparing the results with those obtained using the SC.

MATERILAS AND METHODS

The chamber angle has been evaluated in 72 patients who did not suffer from any form of pathology by using the vHT and the SC.

Because the vHT gives categorical evaluations from 0 to 4 (Tab. 2), and the SC gives quantitative results such as the measurement of the angle in degrees, the correlation according to correlation coefficient (Pearson) and the coefficient of determination (R2), has been made in two ways. First it has been evaluated by comparing the measurements of the vHT with the SC. Second, it has been given a score to every chamber angle value measured in degrees with SC, according to the grading system of Shaffer, and then made the evaluation of the Pearson coefficient and the coefficient of determination between the score

of vHT and SC modified according to Schaffer (SCS). The p-value was also calculated.

Grade	Corneal slit image and anterior chamber depth ratio	Interpretetion
4	1 : 1 or higher	Angle closure very unlikely; Chamber angle approx. 35°... 45°
3	1:1/2	Angle closure unlikely; Chamber angle approx. 20°... 35°
2	1:1/4	Angle closure possible; Chamber angle approx. 20°
1	1:<1/4	Angle closure likely; Chamber angle approx. 10°
0	closed	Angle closure; Chamber angle approx. 0°

Tab.2- Gradation of Chamber Angle aperture according to van Herick.

RESULTS

The anterior chamber angle values ranges between 21,80 and 55,48 degrees with the SC and between 2 and 4 grade with the vHT.

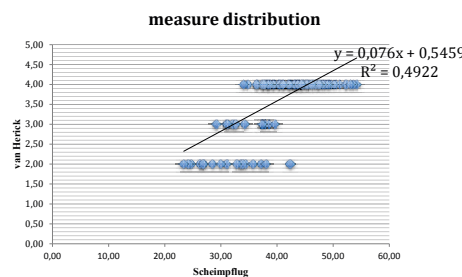Most of the patients analyzed shown chamber angles between 36 and 53°with the SC, and Grade 4 with the vHT (Fig. 1).

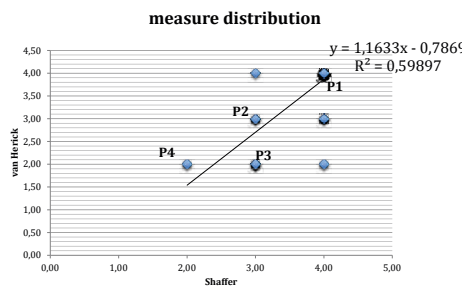Fig.1- Graph representing the comparison between vHT and Scheimpflug angles in degrees.

Fig. 2 - Graph representing the comparison between v.HT and Scheimpflug in score (SCS).

We can see in Fig. 2 how the techniques are fully in agreement for open angles (4 and 3). This can be recognized by the shading under the squares (P1 and P2). For moderate closed angles we have a slight disagreement since the point P3 is more shaded than the point P4. The R2 value is higher in the second graph than in the previous one, thus

conducting at an apparently stronger correlation between the data.The Pearson's coefficient and the coefficient of determination resulted: Pearson 0.68 (p=0.0001) and R2 0.49 for comparison between vH and SC (tab 3); Pearson 0.75 (p=0.0001) and R2 0.60 for comparison between vH and SCS (tab 3).

Correlation between:	correlation value	Significativity (p)	Determination Coefficient(R^2)
v.Herick-Scheimpflug	0.68	<0.0001	0,49
v.Herick-Shaffer	0.75	<0.0001	0,60

Tab. 3 – correlation and significance of the data

CONCLUSIONS AND POSSIBLE DEVELOPMENTS

The results obtained with the two different measurement methods seem to match. The Pearson value of +0.68 shows a correlation between the two methods. This value increases up to +0.75 when we compared the categorical data, that seems to better represent the distribution of data. The p value remains the same in all case and ensures the reliability of the comparison. The van Herick Technique can be considered useful for the measurement of the width of the chamber angle and also for screening for the presence of one of the risk factors for chamber angle closure. One limitation of this study is the low proportion of subjects with narrow angles. The opportunity to use the vHT for screening must be further verified both repeating the measurements in a sample with more people who have narrow angles and by comparing the results of the van Herick Technique with the gonioscopy, i.e. the gold standard for the diagnosis of the chamber angle closure.

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