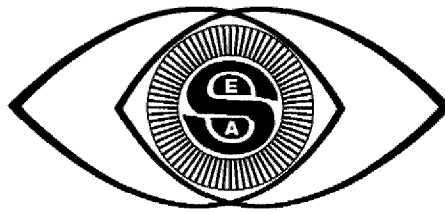


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# Lee Screen Test Versus The Ocular Motility Analyser® (OMA): Comparison of Technical Features And Testing Methods

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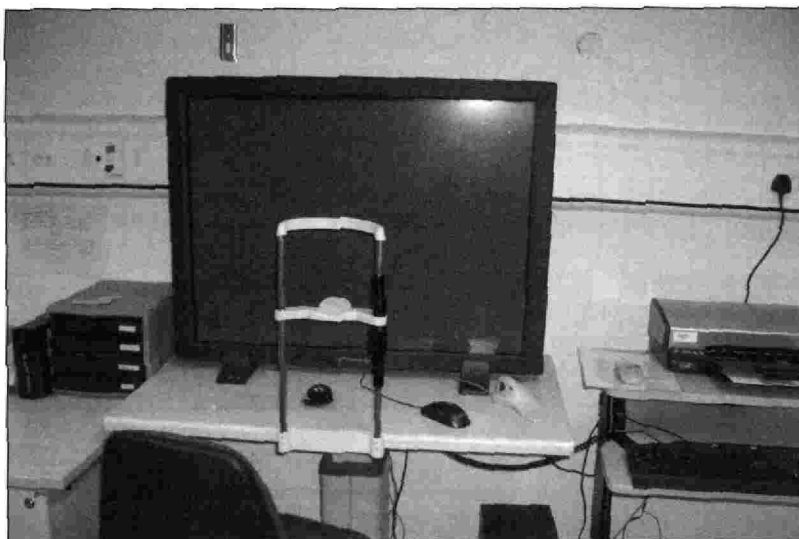
**ABSTRACT:** Currently in the UK the Lee screen is the most popular method of plotting the eye movements using Helmholtz coordinates. The Ocular Motility Analyser® (OMA)<sup>®</sup> is gaining popularity and is used by several hospitals in the UK.

The OMA uses computerised technology to test eyes movements. The aim of this paper is to compare these modalities of ocular movement testing.

## 1. METHODS

### *1. Screen size and testing distance*

The screen size in the Hess test is important; it directly affects the testing distance. In the Lee screen test the large screen size (approximately 78 cm) allows a testing distance of approximately 50 cm. It tests 37 degrees of the ocular motility field which is fixed.



*Figure 1. The OMA uses computerised technology to test the eye movements*

The OMA currently uses a display screen which gives a vertical dimension of approximately 52 cm. The testing distance will depend on the degrees tested away from the primary position. For example, if testing 45 degrees of the motility field, the testing distance is approximately 26 cm; while at 37 degrees, the testing distance is around 35 cm.

**2. Method of dissociation:**

Free space for the Lee Screen and R/G goggles for the OMA; fitting of goggles is important.

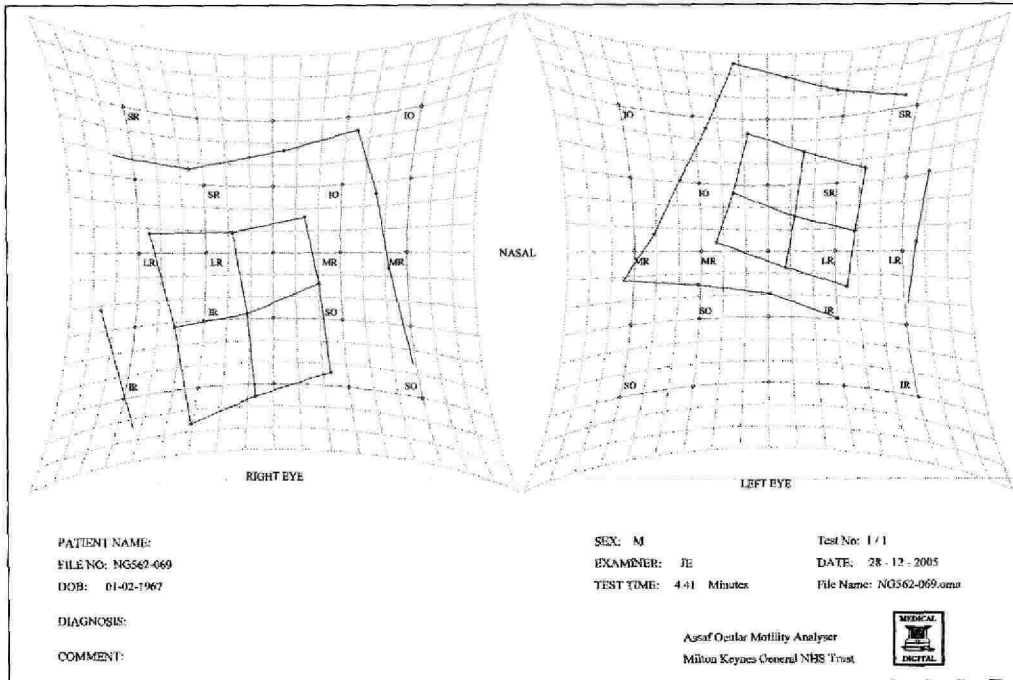


Figure 2. Print out of an OMA computerised Hess test in a patient with left superior oblique palsy. In the OMA displays the right eye to right of patient similar to the recording of eye movements.

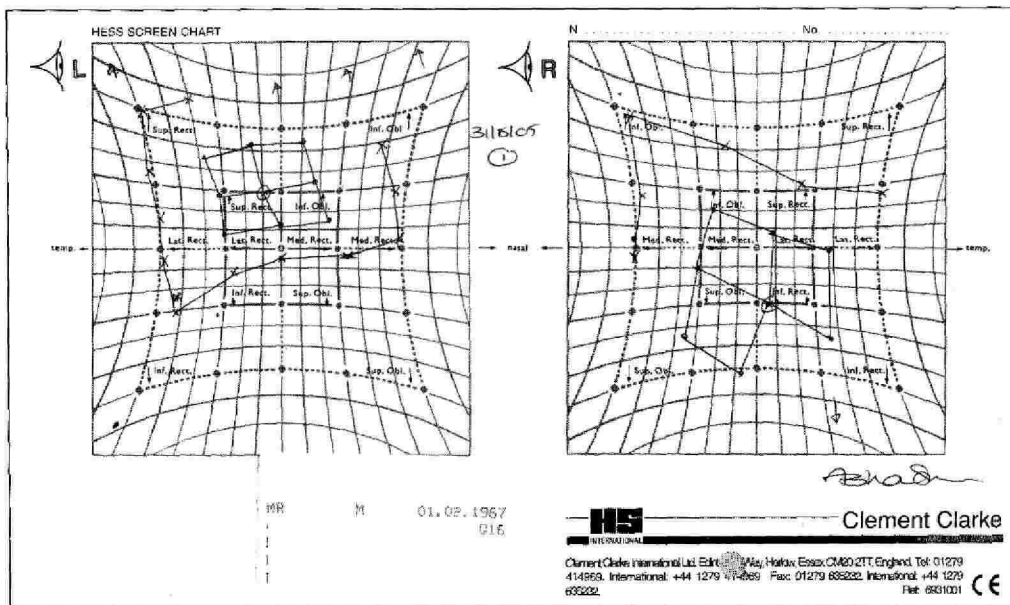


Figure 3. Same patient's Hess test using the Lee screen test. The right eye is displayed to the left of the patient.

**3. Mobility:**

The Lee Screen is fixed while OMA is mobile.

The OMA uses a motorized adjustable height table with a chin rest.

#### *4. Flexibility*

The Lee's is a rigid un-flexible test. The OMA uses computer technology therefore it is flexible. It is possible to implement variations in the Hess test by changing the software. Several other ocular motility tests (torsion, field of BSV and uniocular field of fixation (UFF)) are already implemented using the same hardware. Apart from the computerised Hess, other tests are implemented in the OMA which include torsion, field of BSV and UFF. The torsion module on the OMA allows measurement of the horizontal, vertical and torsional deviations in all directions of gaze in patients without suppression.

#### *5. Ease of Use*

Lee test uses a pointing hand held stick. The OMA uses a mouse/track ball to move the ball on the screen. OMA allows wheel chair access.

#### *6. Reproducibility and Comparability*

The Lee Screen and the OMA tests are reproducible. However both are not directly comparable since they use different testing distances and different methods of dissociation.

## 2. DISCUSSION

A study on computerised Hess was published by Assaf and Gallagher in 2000.<sup>1</sup> The authors found that the computerised Hess was preferred by both patients and orthoptists. This device was further developed into the OMA.

Lim et al recently published a study in the *Jr of AAPOS* on the 'validity of computerised Hess chart'.<sup>2</sup> This study was also presented at the British Isles Strabismological Association (BISA) meeting held in Newcastle, UK in 2006.<sup>3</sup> The study compared the Assaf Ocular Motility Analyser (OMA) with that of the Lee Screen test. The authors found the OMA produced more exo measurements when compared with the Lee. The authors did not state in their abstract the testing distance for both tests, which is crucial in assessing the eye movements and binocular functions. The version of the OMA used in their study utilized a testing distance of approximately 26 cm, versus approximately 50 cm for the Lee. Hence the comparatively higher figure for the OMA particularly in the direction of exodeviation.

The findings of the above authors were similar to the findings of an earlier study from Reading, UK which was presented at the annual meeting of BISA held in Southampton, UK in 2005.<sup>4</sup> Similarly at Reading they used an older version of the OMA with a testing distance of approximately 26 cm. Additionally, this study used a lower zoom of 0.65 compared to a maximum of 1. The OMA allows the test screen to be reduced in size of the display (lowering the zoom) in steps of 1 to 5 to catch peripheral points, the test results are then corrected mathematically. The 0.65 zoom represents the maximum reduction step, the 5<sup>th</sup> step; the then default zoom setting on the OMA. The tendency to exo in the Reading study was even higher than that of the Cardiff most likely due of the lower zoom used. The findings in this study are represented in figure 4 below.

Since then the Reading OMA was upgraded to a testing distance of around 35 cm. A more recent repeat study was carried out in Reading using this new testing distance, with a full zoom of 1, comparing the OMA with the Lee screen testing and cover test deviation measurements at 1/3 meter. The study was presented at BISA Meeting held in Brighton, 2007.<sup>5</sup> This study showed the OMA, with these new settings, has comparable deviation measurements to those obtained by cover test carried out at 1/3 of a meter distance (figure 4). At the same time the Lee with a testing distance of around 50 cm underestimates the measurements when compared to that of the cover test carried at the standard distance of 1/3 of a meter (figure 4). The latest version of the OMA uses this new distance of 35 cm and a zoom of 1 is recommended; now the default setting. The validity of zoom less than 1 at this new testing distance has not yet been studied and is not advisable except for research purposes.

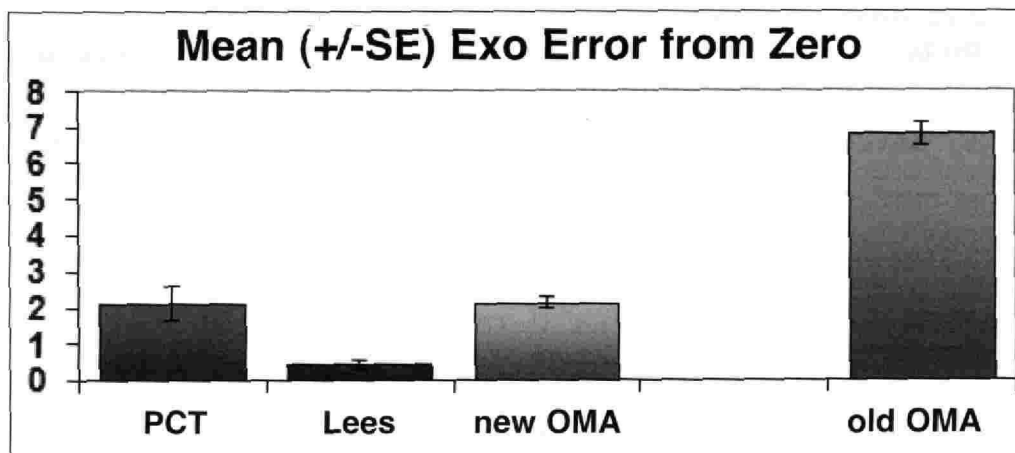


Figure 4. The old OMA appeared to exaggerate the exo deviation (Anna Horwood<sup>4</sup>). However, the latest study showed the Lee screen appears to underestimate near exodeviation while the new upgraded OMA reflects near exophoria when compared to the measurements obtained by the prism cover test (PCT) performed at the distance of 1/3 meter (Anna Horwood)<sup>5</sup>.

§ OMA is manufactured by Medical Digital Ltd, UK.

Declaration: As the OMA innovator, I have a financial interest in this device.

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