The Heidelberg Retina Tomograph III

Practice-friendly glaucoma screening

Bill Harvey tries out the latest incarnation of the Heidelberg Tomograph and finds it has several interesting features that distinguish it from the increasingly popular HRT II device

FIGURE 1. The HRT III

IT IS FOUR YEARS NOW since we trialled the HRT II instrument (glaucoma/optic nerve head programme) at the City University optometry clinic.[1]

The ease of use of the instrument and the apparent reliability of the results reflected what has since become well established in the refereed journals. There have been developments of corneal and retinal oedema adaptations to the original glaucoma model too.

The use of the scanning laser ophthalmoscope allows accurate analysis of disc head topography relative to a confocal reference plane.

Small structural changes may be detected with high sensitivity, making this technique very useful in monitoring discs, particularly in high risk patients, over a period of time.[2,3,4]

Any progression in cupping or loss of neuroretinal structure will be detected. The HRT II not only allows accurate topographic measurement to allow monitoring of change, but it also can compare the disc profile with data gathered by Moorfields to predict the risk of a disc being suspect. This facility is useful to those in glaucoma screening practice as it helps to decide whether a suspicious looking disc should definitely be investigated further.

There are two concerns sometimes levelled against the HRT II which the latest version, the HRT III, aims to address. Firstly, the HRT II was introduced as a more practice-friendly version of the original (and very large) HRT I found mainly in hospitals or research labs.

The hook-up to a desk top and monitor does, however, mean that the HRT II takes up a good deal of floor space (a refraction cubicle in our clinic was occupied by the instrument). The HRT III (Figure 1), on the other hand, is much more compact, and the laser unit plus the attached laptop sit on a single table unit. Not only does this take up less room (the manufacturers suggest the entire system with seating for patient and practitioner fits into a space of 1.25m by 1.75m) but is easily moved from room to room, something not easily possible for the HRT II.

Another much-publicised criticism of the HRT II was the requirement for the practitioner to define manually the outline of the disc in order for the computer to calculate profile against the Moorfields regression analysis data and define whether the disc is suspicious or not.

Inter-practitioner variation was found to be significant when outlining the disc margin, and this was indeed the case when *Optician* tested it. The more experienced practitioners were better able to define the disc as opposed to areas of peri-papillary atrophy, for example.

On the other hand, the use of the machine to detect changes over time would rely on the same operator defining the disc serially so even if there were errors in definition, this would not necessarily affect the sensitivity in change detection.

Furthermore, it might not be unrealistic to expect a degree of skill in the operation of a machine with such capability.

GLAUCOMA PROBABILITY SCORE

An extra facility is available in the HRT III aimed at automating the disc 'capture' called the Glaucoma Probability Score (GPS). Once the instrument has undertaken its three scans of the disc and processed the topographic data, the GPS function automatically analyses the profile of the disc to specify its outline and three-dimensional shape and then, with comparison with data specific to three ethnic groups, give an analysis of whether the disc is suspect or not.

The HRT III does, however, also allow the manual definition of the disc so that ▶

an operator may themselves carry out dimension assessment and comparison with the Moorfields' data.

OPERATION OF THE HRT III

The laser unit has not changed and may be used on the undilated patient. After some patient details have been input, the unit is moved towards the pupil such that the circle of red light from the laser is passing mostly through the pupil with minimum scatter from the iris. The vertical, horizontal and axial adjustments take a little getting used to, but my speed of setting up had increased dramatically by the third patient I assessed.

A horizontal bar display on-screen fills up to a point (ideally over 80 per cent) where the scans may be made. All the time the three scans are undertaken, good fixation is required by the patient. Once the scans are complete, the reliability of the data may be calculated and a table indicates where, if any, error has occurred.

I found several patients with poor fixation (Figure 2a) and one where I had incorrectly adjusted the focusing eye piece (Figure 2b), and so had to repeat the scan.

There are then several options to analyse the data. The contour line tab allows the practitioner to trace around the disc margin (as with the HRT II) and then, having accepted the contour, the machine will identify whether any of six segments of disc are suspect (a red cross marking), worth monitoring (yellow explanation mark) or normal (green tick, as in Figure 3). Alternatively the GPS software may automatically assess the disc and make a judgement as to normality (Figure 4).

The GPS software is undoubtedly useful, but a note of caution. I measured a number of students with large cups (three dimensional representation shown in Figure 5) who the GPS denoted as suspect (Figure 6, for example).

A yet more extreme example was found when I measured one of my clinic

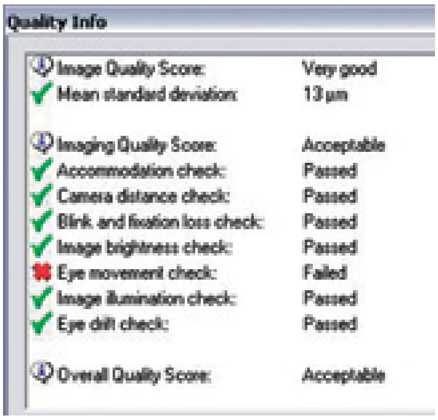

Figure 2a

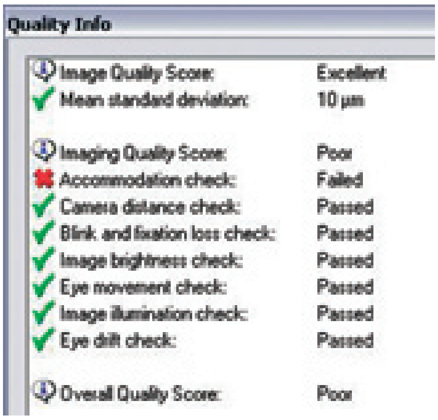

Figure 2b

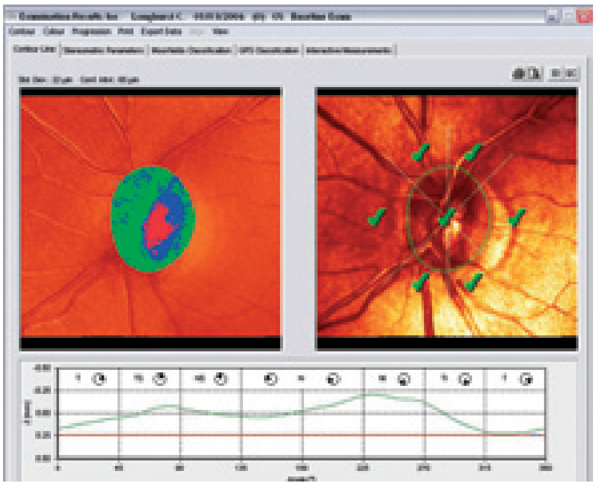

Figure 3

supervisor colleagues whom I knew had large physiological cupping (Figure 7).

When manually outlining the disc (Figure 8) and when then comparing with the Moorfields' data (Figure 9), his disc was shown to be within normal limits. The GPS software, however, showed him to be abnormal in all six segments (Figure 10).

Our conclusion is that the GPS is certainly an improvement and is successful for more typical discs. It

Figure 4

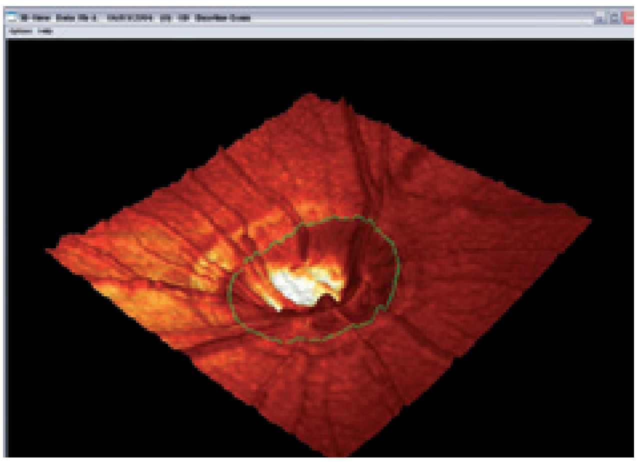

Figure 5

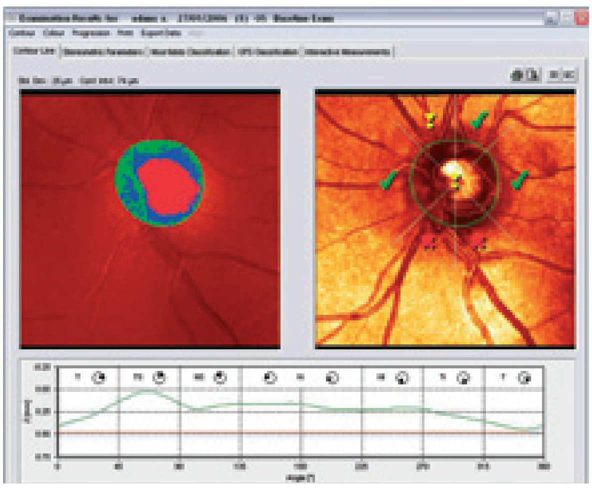

Figure 6

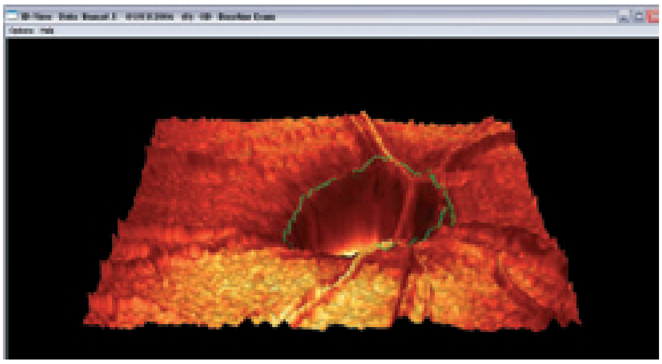

FIGURE 7

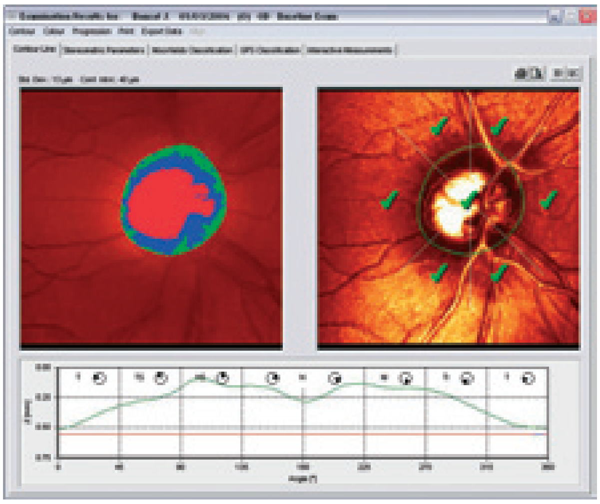

FIGURE 8

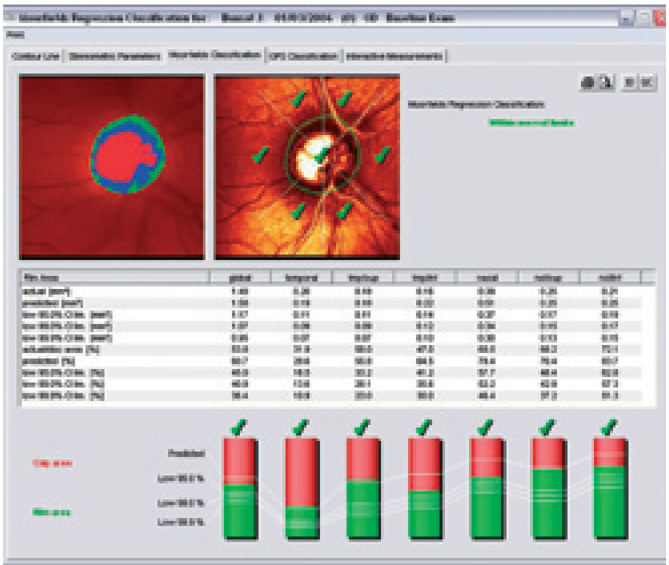

FIGURE 9

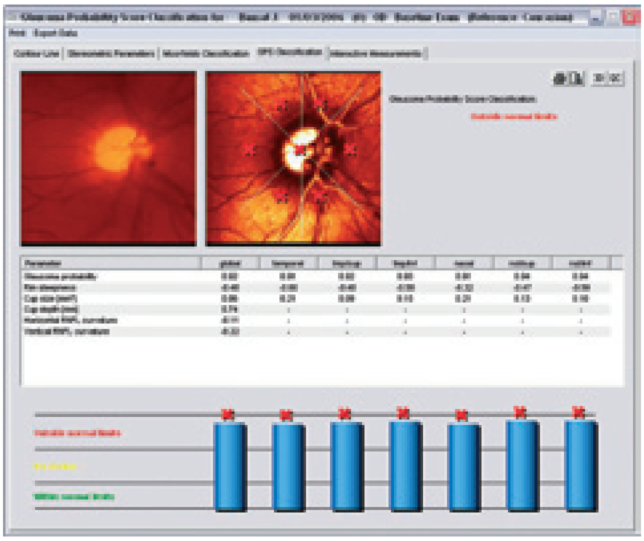

FIGURE 10

saves time and also does away with any practitioner error when defining the disc margin.

However, I believe that where a disc is initially seen to be less than typical in shape, the subjective setting of a contour line around the disc margin makes for a more useful analysis, and that with practice, the seasoned practitioner becomes very skilled at this anyway.

The interactive view of the disc (Figure 11) allows a specific x/y/z co-ordinate to be taken which can then be rechecked at a later date, providing very accurate indication of any changes to shape.

This facility to accurately define anatomical structure at any one time, irrespective of operator skill, makes this an impressively accurate system for detecting topographical changes at the disc. As such, it is already being considered for inclusion in some of the community-based glaucoma screening pathways.

CONCLUSION

Its ease of use and portability make the HRT III an attractive instrument for all in practice wishing to assess discs accurately (and who does not?).

The initial cost of the unit, at around £20,000 is not these days exhaustive and when one considers a move towards supplementary charging for extra assessments and investigations, the instrument becomes more viable still.

Whether at the centre of a glaucoma screening group of practices, or within one single practice, the HRT III is worthy of consideration by all interested in glaucoma screening and monitoring.

References

1 Harvey W. Heidelberg Retina Tomograph II. *Optician*, 2002; Vol 223, March 22, pp16-20.

2 Kass MA *et al.* A Randomized Trial Determines That Topical Ocular Hypotensive Medication Delays or Prevents the Onset of Primary Open-Angle Glaucoma. *Arch Ophthalmol*, 2002; 120: 701-713.

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4 Strouthidis *et al.* Factors affecting the test-retest variability of Heidelberg retina tomography. *Br J Ophthalmol*, 2005; 89: 1427-1432.

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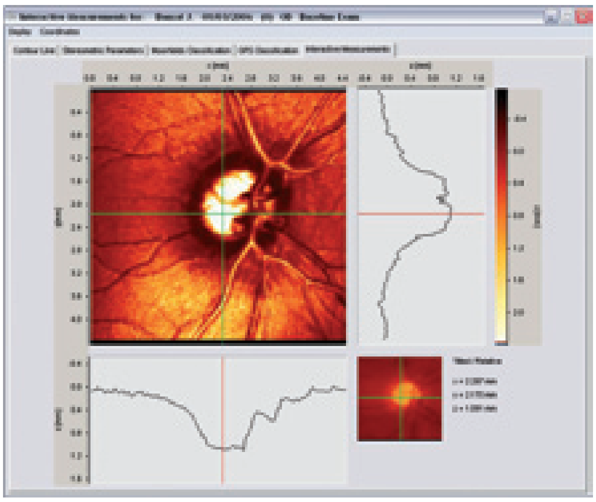

FIGURE 11