Finger on the Pulsar

Bill Harvey takes a look at the latest Octopus fields machine and suggests the combination of an established standard automated perimetry function with the Pulsar early detection strategy makes this an excellent all-round instrument with a surprisingly low profile in the UK

The significance of changes in the field of vision as an indicator of underlying eye and other neurological disease has a long history. Many suggest that the first recorded details of field loss came from Hippocrates. Others suggest the ease with which David was able to slay the giant Goliath, as described in the Bible, may have been a result of pituitary-related problems, causing both the remarkable stature and a bilateral loss of temporal field rendering the giant vulnerable to a side-on attack.

The principles and concepts of automated perimetry were first developed in around 1972 by Professor Franz Fankhauser and others and the first automated static perimeter, the Octopus 201, appeared in 1974. Since then, standard automated perimetry (SAP) has become an important part of optometric assessment of eye health. Strategies of assessing retinal function using single and multiple stimuli allow the threshold of light detection to be assessed with good reliability and repeatability, and these may be directly focused in areas either side of the vertical and horizontal midlines to ensure high sensitivity (the term representing the ability to detect disease) in detecting retinal nerve fibre layer diseases, such as glaucoma, as well as visual pathway disease, such as intracranial lesions. Screening strategies are routinely employed on the majority of patients in the UK and the employment of suprathreshold stimuli ensures good specificity (a term representing the ability to allow a normal patient to have their normal field confirmed).

Over recent decades, SAP has been popularised in the UK by the various incarnations of the Humphrey perimeters, so much so that these instruments are regularly cited as the 'gold standard' and most field assessment and monitoring in secondary care is undertaken using them. However, development of other instruments, including the original Octopus, has continued apace and are the instruments of choice elsewhere. The latest Octopus 600 pro boasts not only full SAP capability but also an interesting strategy for early glaucoma detection known as Pulsar. I was keen to take a look at this so we recently had the instrument installed at City University Fight for Sight clinic.


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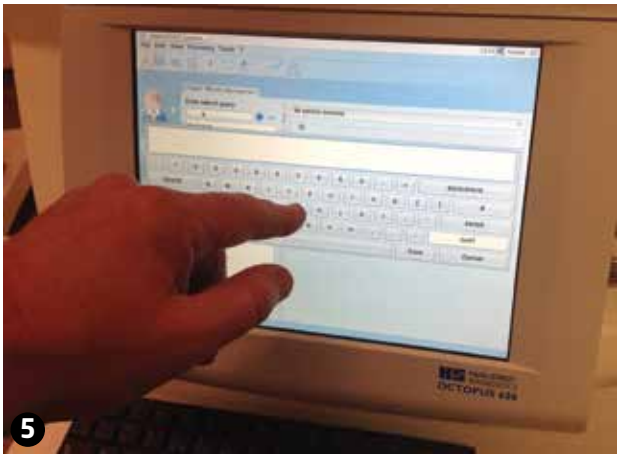
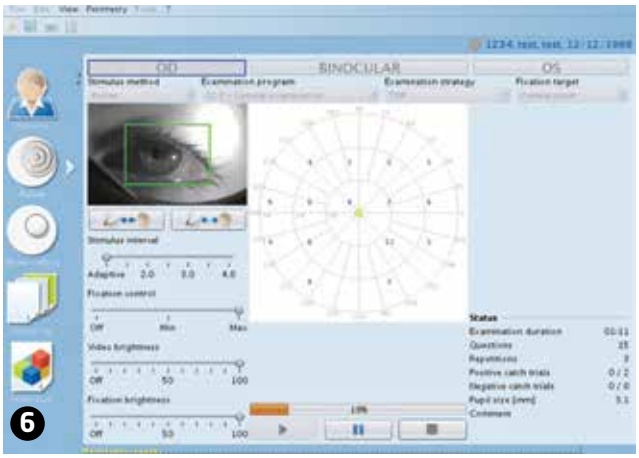
Early detection strategy

The use of white on white stimulus strategies is familiar to most and the measurement of repeatable reductions in the ability of areas of the retina to detect white stimuli is important in the diagnosis of glaucoma. Some areas of retina are of particular interest. Differences in the threshold of stimulus recognition above and below the horizontal midline in the nasal field (a nasal step), for example, are a good indication of arcuate retinal nerve fibre bundle damage. Programmes aimed at the more vulnerable areas of retina and using thresholding 'shortcuts' (such as the SITA algorithm strategies on the Humphrey, the TOP strategy on the Octopus or the ZATA algorithm on the Henson 800) have allowed sensitive assessment while speeding up the testing process which also helps the specificity. The problem for those using fields assessment for the early detection of progressive conditions such as glaucoma is that significant ganglion cell and axon functional loss has to occur before repeatable and reliable white-on-white field defects can be detected. Some authorities have cited as much as 40 per cent nerve fibre layer damage has to occur.

In recent years improvements in the assessment and detection of structural damage, such as the use of OCTs in detecting thinning of the nerve fibre or ganglion cell layer, have improved early disease detection, but the drive to improve fields assessment techniques in early glaucoma detection has led to alternatives to SAP. These have tended to use stimuli that would selectively target retinal ganglion cell layer functioning and include short wavelength automated perimetry





(SWAP), frequency doubling technology, flicker defined form techniques and the Pulsar perimetry approach included in the Octopus 600.

Octopus 600

By including both Pulsar and white-on-white strategies, the Octopus 600 (or the Octopus Pro which also includes the TOP strategy) is an instrument that should be of interest to anyone hoping to detect the early onset of glaucoma (using the former) and monitor accurately any field loss progression in a way that also reflects the approach that might be adopted in secondary care (the latter).

The Octopus has a small footprint (Figure 1) which is always an important feature for those investing in new instrumentation. The patient viewing area allows easy binocular assessment if required and a large enough aperture to allow a patient to use their own near correction easily (Figure 2). A side panel holds a range of large aperture magnetic trial lenses if the patient's own correction is not suitable (Figure 3) and patient response is via a recently adapted press button (Figure 4). Entering patient data into the integral management software (Eyesuite) is easy using the touchscreen (Figure 5) and this may be networked with other compatible instrumentation if available. So the first challenge, ease of installation into a busy and space-valuable clinic along with easy patient set-up, is well met.

The predominance of the Humphrey and white stimulus strategies, especially in the centres to which optometrists might be referring a patient, make such approaches essential in the UK. To run such a test, I simply selected the white-white button on screen (Figure 6). A TOP field assessment was easy to run, took typically two to three minutes per eye and was reported as easy to undertake by all the patients I tried it upon. Reliability was very good even in the more 'distractible' of patients. The data can be presented or transmitted in a variety of formats (Figure 7 shows a composite of seven different data plots, Figure 8 an isolated grey-scale plot, and Figure 9 a 'Humphrey-friendly' representation) which I hope all those in secondary care should be happy with to incorporate in any follow-up plan.

I then selected the Pulsar option on the touchscreen. The TFT-based internal monitor changes the white screen view to a grey background upon which 5 degree diameter circular sinusoidal targets are presented. These look like the ripples resulting from a stone being dropped into still water (Figure 10), flicker at around 30 Hz, and decrease in contrast with increasing eccentricity from fixation. Pulsar perimetry is designed to preferentially stimulate the magnocellular ganglion cell pathway and has a good track record in recent published literature in the early detection of glaucoma (reference list available from william.harvey@rbi.co.uk on request). Importantly, Pulsar is both quick to perform (again a couple of minutes is typical) and my patients all performed the test with ease.

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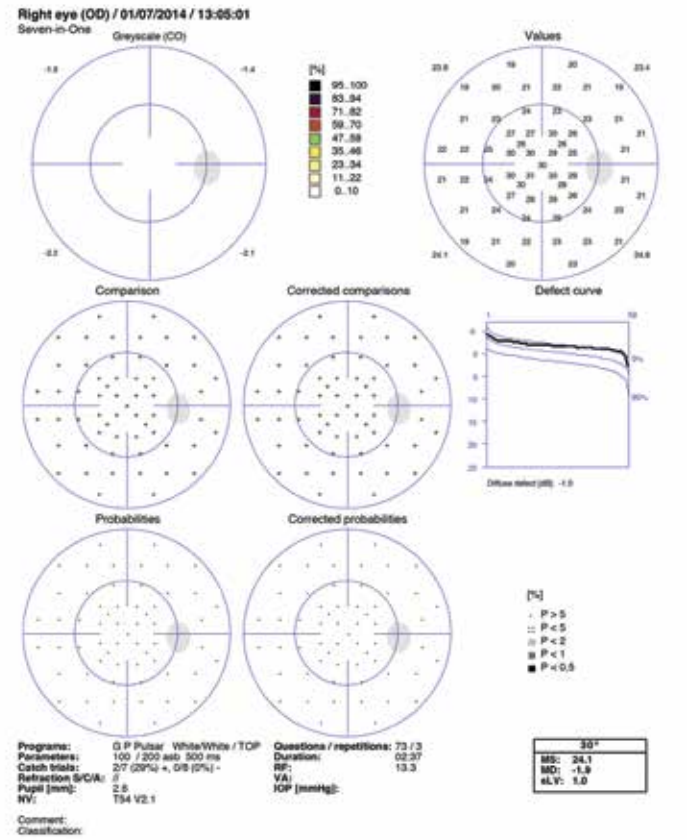

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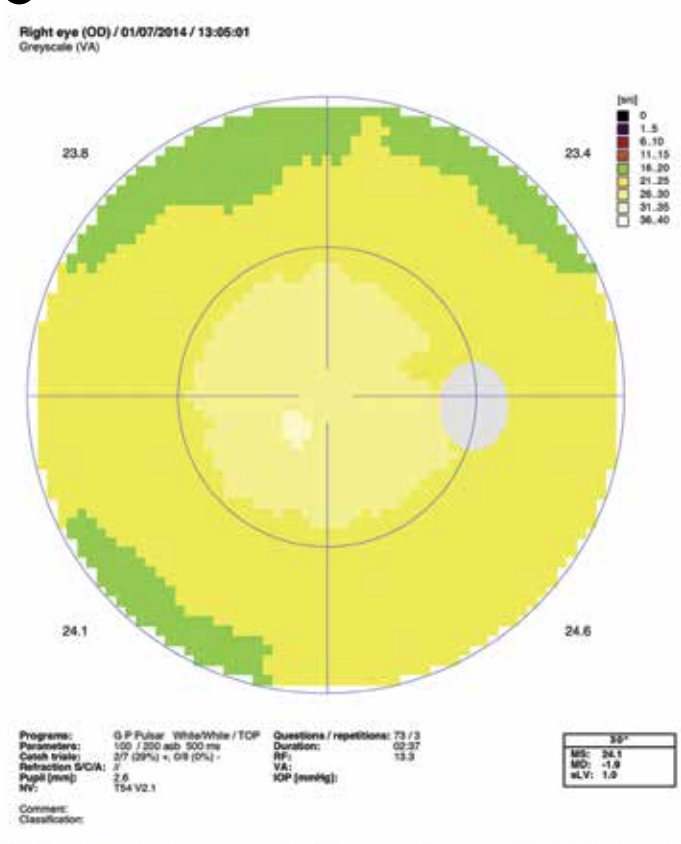

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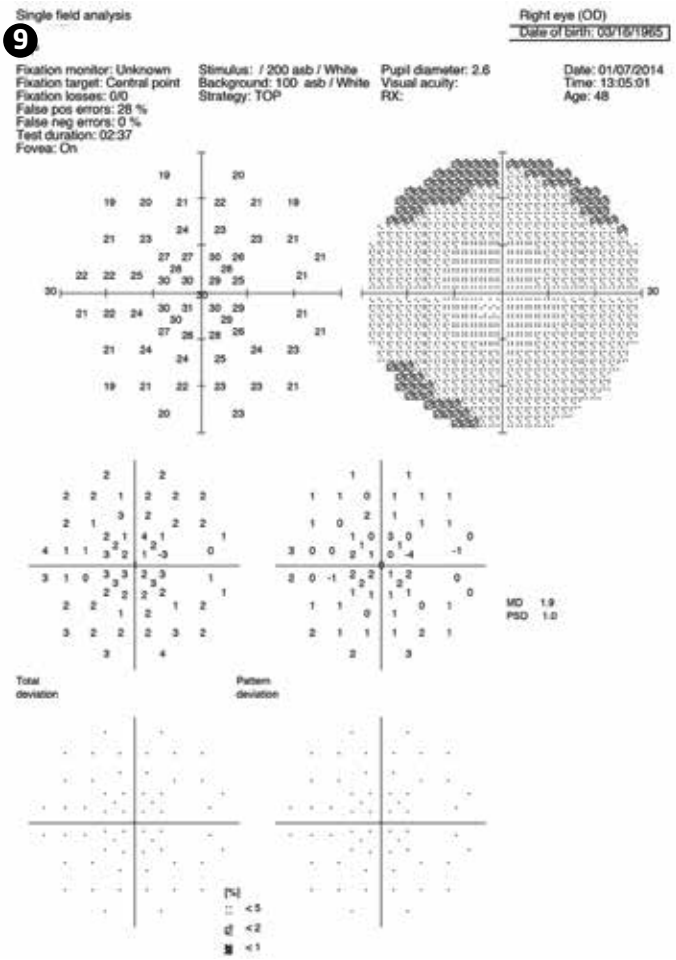

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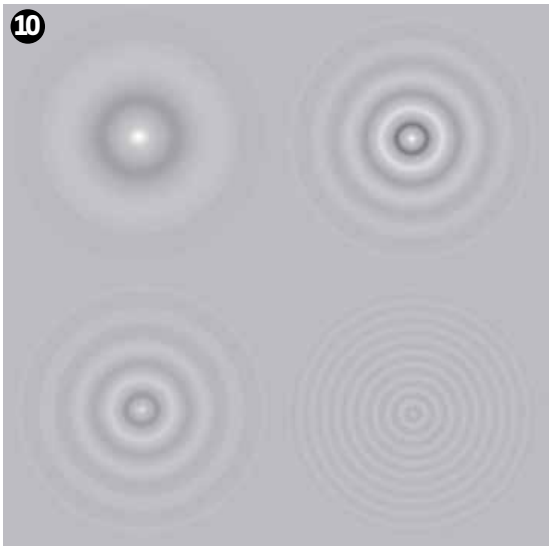

Viewpoint

The prevalence of one instrument in any market should not blinker us to developments elsewhere and I feel that the design, useability, adaptability and, importantly, incorporation of a useful early detection strategy make the Octopus 600 instrument something that optometrists in the UK should be aware of. I also think that those in secondary care should be flexible enough to recognise new technologies backed by research into any referral protocols if the data is easily interpreted, assimilated and managed.

● For further information contact Haag Streit UK at www.haag-stret-uk.comstreit-uk.com