

Qualitative visual field analysis using the Aston Perimetry Tool

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Kinetic boundary perimetry with central field analysis

Several researchers have shown that it is not enough to just check the boundary extent of the visual field and have advocated against the use of kinetic boundary perimetry on its own as most defects affect the central field and some only affect the central field. Kinetic boundary perimetry can easily be enhanced to test the central field. Once the patient has seen the target at the boundary of the visual field the clinician can continue moving it in towards the central fixation point and check for any scotomas, that is, the patient is asked to report if the target dims or disappears. Again, as the examiner is looking straight at the patient during the test they can be immediately aware of any fixation losses and although these cannot be quantified they do give some qualitative information on the accuracy of the test conducted.

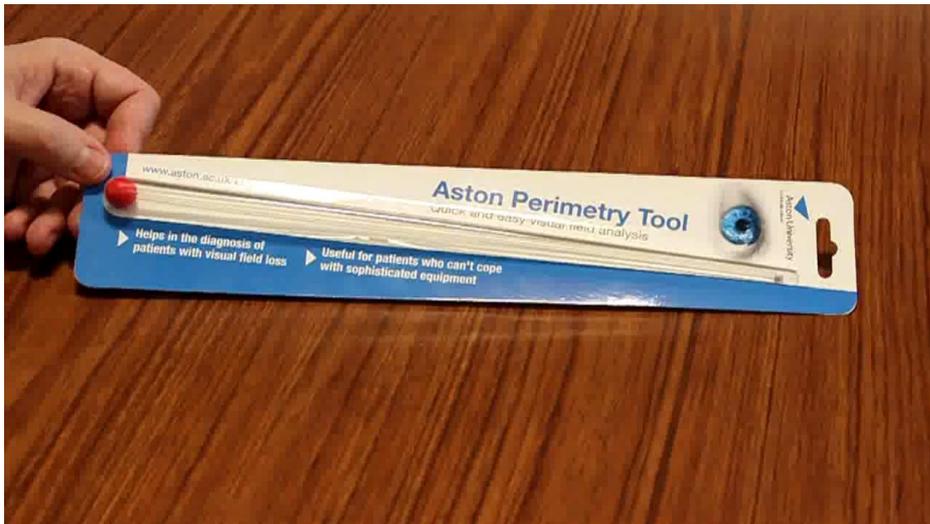
Pandit et al (2001) prospectively compared the results of qualitative visual field tests with those of full threshold automated static perimetry in 138 consecutive outpatients attending a hospital based eye clinic. Arcuate scotomas, nasal steps, and concentric constriction made up 97% of the visual field defects. Seven confrontation field tests were conducted by one researcher who was masked to the results of the automated perimetry and to the diagnosis. Three tests involving kinetic boundary assessment and central field assessment using coloured targets will be described here. Kinetic boundary testing to a white target 20mm in diameter, kinetic boundary test to a red target 20 mm in diameter to which the patient reported first perception of red colour. Central red field test in which a red target of 5mm in diameter was first used kinetically to ascertain the boundary of the central red field (details not provided). The target was then presented statically to multiple points within the central 20 degree field. At every position the patient reported whether the target was clearly seen as red. Most confrontation tests are not sensitive enough to identify small or shallow defects in the visual field. Kinetic 20 mm white stimulus had a sensitivity of 48% (i.e. 48% of those patients with a visual field defect were detected) and a specificity of 100% (i.e. all normal patients were detected), kinetic 20 mm red stimulus had a sensitivity of 56% and a specificity of 100%, while the central red 5 mm stimulus had a sensitivity of 73% and a specificity of 100%.

Henson (2000: 26) warned of a lowered sensitivity to scotomas located within the boundary of the visual field when using qualitative visual field analysis. He continued 'The majority of patients want to be helpful and want to be able to see the stimulus. As a consequence of this they often fail to report or notice the momentary disappearance that occurs when the stimulus passes through a scotoma. Lapses of attention by the patient may also result in the patient failing to recognize that the stimulus has disappeared.'

Aston Perimetry Tool

The Aston Perimetry Tool (APT) can be used to make a speedy and assessment of a patient's visual field. It consists of a white target 5 mm in diameter (0.87° angular subtense) and a red spherical target 15 mm in diameter (2.60°). See figure 1. The size of the white target was chosen and the size of the red target was chosen so as to be similar to the target used by Frisén (1973) in his colour comparison test. Some authorities have suggested that the white target in this type of test should be chosen to mimic the I2e target on a Goldmann Bowl but the I2e target is $\frac{1}{4} \text{ mm}^2$ and this would be far too small to be detected in a standard consulting room even by a person with normal visual field. Also, it is often stated that the red target has to be 3 times the size of the white target in order to plot the same visual field as the white target. This is untrue when using a stimulus resolution strategy in that there is no difference in kinetic boundary perimetry results (Eperjesi, 2009 unpublished data) for the white and red target however if using a colour recognition strategy then the red target does have to be three times the size of the white for the technique to be assessing the same kinetic boundary recognition isopter. The white and red stimuli are attached to the ends of a thin (2 mm) rod and separated by 330 mm. The APT can be used for confrontation testing, kinetic perimetry, Frisén colour comparison testing and kinetic perimetry with central field analysis. The last two of these testing strategies are described in detail below.

Figure 1 The Aston Perimetry Tool (APT)



Step-by-step APT procedure for the Frisén colour comparison test

This test is useful in early optic nerve head and visual pathway disease

1. The patient should be instructed to cover over their left eye using their left hand. The patient should use a palm cupped over the eye and the clinician should ensure that the patient is not peeking or not pressing on the cornea. The latter would cause residual blurring of vision and make subsequent testing of this eye difficult.

2. The clinician should move her/his head so it is directly in front of and at the same height as the patient's head.

3. The patient should be instructed to look at the bridge of the clinician's nose.

4. The clinician should position the red stimulus approximately 20 cm from the patient's face and move it slowly in a circle 10 to 20° eccentric from the patient's line of fixation. Note, colour judgements become more and more difficult with increasing eccentricity in the visual field. An eccentricity of 20° of angle may well represent an optimal outer limit. Ten degrees of angle seems to represent a practical inner limit because lesser eccentricities tend to induce wavering fixation.

5. The subject is then asked to describe the colour of the red stimulus in simple words. If an incorrect response is obtained, the test object should be moved along the circle of eccentricity until a correct response is obtained. This defines a reference region in the sense that the apparent hue and saturation at other point along the same parallel circle are to be compared with those of the reference region

6. The clinician should then move the test object along the parallel circle into a neighbouring area at the same time as the patient is asked to report any change in hue or saturation of the red stimulus as it is moved. A red stimulus will appear orange, pale yellow, white or pink depending on the degree of disturbance. The stimulus should be kept in motion to prevent any local adaptation.

7 Comparisons should always be made along one and the same parallel circle, thus avoiding difficulties associated with the normally decreasing saturation of colour with increasing eccentricity of the visual field

8. Steps 1 to 7 are repeated for the other eye.

9. The patient should also be asked if there was any difference in the appearance of the red stimulus between eyes.

Step-by-step APT procedure for kinetic perimetry with central field analysis

1. The patient should be instructed to cover over their left eye using their left hand. The patient should use a palm cupped over the eye and the clinician should ensure that the patient is not peeking or not pressing on the cornea. The latter would cause residual blurring of vision and make subsequent testing of this eye difficult.

2. The clinician should move her/his head so it is directly in front of and at the same height as the patient's head.

3. The patient should be instructed to look at the bridge of the clinician's nose.
4. The clinician should position the white or red target out of the direct line of sight of the patient in the horizontal meridian (i.e. in line with the patient's eyes) so when they are looking at the bridge of the nose they cannot see the target.
5. The clinician should use the APT to gauge how far away from the patient's head to position the white or red target. The APT is 33 cm long and this is how far the white or red target should be held from the patients head. See figure 2.

Figure 2 Using the Aston Perimetry Tool (APT) to gauge the correct working distance



6. The clinician should move the white or red target slowly in an arc centred on the patient's head and at all times keep the target 33 cm from the patient's head and remind the patient to keep looking at the bridge of your nose. See figure 3.

Figure 3 Using the Aston Perimetry Tool (APT) for qualitative visual field analysis



7. The clinician should ask the patient to let him/her know when they first see the target (they don't have to name the colour just to be aware of the stimulus and this should be made clear at the start of the procedure).

8. The clinician should make a mental note of when the patient first detects the target and then compare this to the result that would be expected for a person with a normal visual field.

9. The clinician should continue to move the target in an arc towards the centre of their line of sight and ask the patient to indicate if the target disappears. If the target does disappear the clinician should make a mental note of where it disappears and then to continue moving the target and for the patient to indicate when the target reappears.

10. The clinician should stop moving the target when it reaches the patient's line of sight for the right eye.

11. Then repeat steps 4 to 10 at 45°, 90°, 135°, 180°, 225°, 270° and 360°.

12. Then repeat steps 1 to 11 for the left eye with the right eye covered.

References

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Pandit RJ, Gales K, Griffiths PG. (2001). Effectiveness of testing visual fields by confrontation. *Lancet.* 358:1339-40.