Measurement and diagnosis of cyclodeviation by the after-image method

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Lesions involving the vertical muscles or their nerve supply usually result in some degree of torsional deviation of the eye which may produce intractable and distressing asthenopia. Although cyclophoria has long been recognized and has been demonstrated with such apparatus as the Maddox rod, Maddox wing, Maddox double prism, and synoptophore, it is nevertheless frequently overlooked. Moreover these tests permit no definite conclusions to be drawn regarding the muscle at fault. A new method of diagnosing cyclodeviation of the eye with the help of the "after-image" test is described below. If it is carried out in three positions of gaze, namely looking straight forwards, looking up, and looking down, the muscle involved can be identified.

Apparatus and method

Two special slides have been devised for use in the synoptophore.

SLIDE A consists of a black circle on a white background, the horizontal diameter of which subtends an angle of 12° . The horizontal diameter is subdivided into divisions of 1° each and in the centre is a tiny circle. On the right side of this central circle the divisions are marked from left to right with the figures 1 to 5, and on the left they are marked from right to left with the letters A to E. The circumference of the circle is marked in degrees, and lines are drawn from 30° , 60° , etc., on the circumference towards the centre like the spokes of a wheel (Fig. 1). These enable the patient to determine the position of the after-image more precisely.

SLIDE B is identical with Slide A except that the circle and other markings are shown in white against a black background (Fig. 2).

FIGS 1 and 2 White (A) and black (B) shown side-by-side

In most cases either slide can be used, but Slide A is more suitable for patients who experience a more persistent negative after-image, and Slide B for those who experience a more persistent positive after-image. These slides can also be used for the quantitative measurement of anomalous retinal correspondence (Sood, Sen, Jain, and Singh, 1969) and of the angle Kappa.

After the determination of the refractive error and investigation of the type of squint and binocular function, the patient is placed in front of the synoptophore and told to look straight ahead. A vertical after-image is created in one eye, preferably in that with the more defective vision, and the patient is instructed to look at the central spot on the white light. One of the slides described above is now placed before the other eye, and the patient is asked to look at the centre of the circle and to describe the position of the after-image in relation to the markings on the circumference.

The process is repeated after an interval when the previous after-image has completely disappeared, the limbs of the synoptophore being moved first 25° upwards and then 25° downwards.

Conclusion

With the eyes in the primary position, if the vertical after-image points to 90° — 90° there is no cyclodeviation. If the upper end of the vertical after-image deviates nasally, excyclodeviation is present; if it deviates temporally, incyclodeviation is present. The degree of deviation can be read off directly from the markings on the circle.

In looking upwards, elevation is produced by the action of the superior rectus and inferior oblique muscles, the intorsion produced by the superior rectus being neutralized by the extorsion produced by the inferior oblique. Intorsion revealed in this position by the after-image suggests weakness of the inferior oblique, and extorsion suggests weakness of the superior rectus.

In looking downwards, depression is produced by the action of the inferior rectus and the superior oblique muscles. Intorsion revealed in this position indicates weakness of the inferior rectus, and extorsion suggests weakness of the superior oblique.

Discussion

Among the various methods used to detect cyclodeviation the Maddox rod and the Maddox wing tests, although simple, are less accurate and cannot measure easily the degree of cyclodeviation in different directions of gaze. With the Maddox double prism, a slight malpositioning of the prism in the spectacle frame or maladjustment of the frame on the face may introduce a considerable error. Our new method is simpler and more accurate and is particularly useful in following cases of vertical muscle palsy due to trauma or some neurological disorder.

Summary

- (1) A method of measuring cyclodeviation of the eyes by the after-image test using two special synoptophore slides is described.
- (2) By this method it is possible to identify the vertical muscle at fault.

Reference

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