AN INDELIBLE "3-OBJECT" COMPARATIVE TEST FOR CENTRAL COLOUR SCOTOMA—ALSO IN CASES OF CONGENITAL COLOUR ABNORMALITIES

BY

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SINCE 1905 I have published several articles in the Norwegian, French, and German languages (Lit. 1, 2, 3, 4, 6, and 7) on a rapid and extremely sensitive comparative method for the detection of central or paracentral colour scotoma, due to axial intoxication of, or axial inflammation in, the optic nerve.

In the discussion on Perimetric Methods at Oxford, 1920, I demonstrated the 1914 model of my chord perimeter, with the "3-Objects" as celluloid discs on the outside of the two rules (*Brit. Jl. of Ophthal.*, Vol. IV, pp. 470-473, 1920); but otherwise I have not published anything in English on the "3-Object" Test.

The following year I introduced Engelking and Eckstein's Colour Cartoons (Lit. 5) for my "3-Object" Test (Lit. 6); these

FIG. 1.

Dr. Holth's indelible "3-Object" Comparative Test for Central Colour Scotoma. (Reduced in size to 2/3.)

colours are very good when new, but are liable to fade in light, and should then, and when soiled, be renewed with discs from the original cartoons.

I have therefore since the early spring of 1924 (Lit. 7) reverted to celluloid discs for the larger objects (red and pink) and to my first material, melted and ground sealing wax for the small objects (yellow and light blue); none of these objects fade in light and when soiled they can be cleaned in a moment with soap and water.

The instrument (Fig. 1) consists of a black ebonite rule, 16 cm. long, 2 cm. broad and 5.5 mm. thick; a round hole near one end allows the instrument to be hung on a small nail in the wall near the patient's head. Or the instrument may be laid among the accessories of the trial case.

On each of the four sides of the rule there are bored three round holes, each 1 mm. deep; the three holes have a mutual distance of 4 centimetres. On one of the broad sides there is inlaid in

each of the 15 mm. holes a *bright red* celluloid disc; on the other side there is inlaid a *pink* celluloid disc in each of the 10 mm. holes. The two narrow sides have three holes of 3 mm. in diameter, which are filled with melted sealing-wax which is ground after complete coagulation. On one side the three holes are filled with *light blue* sealing-wax (Denisson No. 252 "light azure blue"); on the other side the three holes are filled with *pure yellow* (Denisson No. 261 "canary").

I now use the "3-Object" Test in the following manner:

The patient sits with his back to the window or a "daylight" electric light; the eye not under examination is covered. The rule is held horizontally 1.5 ft. (formerly 1 ft.) from the examined eye, with the upper edge of its surface inclined a little forward, in order to eliminate every trace of reflexes from the surfaces of the three objects. The patient gazes at the central object.

A. No central colour scotoma

All three objects of each of the four surfaces have the same colour, whether the congenital colour sense is normal or not.

The only exception is the *amblyopia* of a *squinting eye*; here very often the central object (Fig. 2a) is seen discoloured, or is not seen at all when vision is less than 1/50.

B. Central colour scotoma

(a) *In patients with congenital normal colour sense.*

Vision=5/6 to 5/10: In all cases the nasal, and in many cases also the central object, is seen in the right colour; but the temporal one is seen faded (Fig. 2b), which also may be the case with the central object (bright red=light red; pink=paler rose). Repeat questions with the rule turned 180°.

Vision=5/15 to 5/50: The nasal object is still seen in the right colour, the central and the temporal discoloured (temporal bright red is often named "brown" and pink often "grey" (Fig. 2c).

Vision under 5/50: all three objects are discoloured, the nasal less. Vision=2/50 to 1/50: the temporal object may be completely invisible and the central object nearly so.

When the rule is held vertically (Fig. 3) the superior and inferior objects are generally normal, the central object is seen discoloured, not only in the rare cases where the scotoma is absolutely central without the least excentricity as in Fig. 2a, but also as in Fig. 2c; in cases as Fig. 2b the central object may be seen paler than the two other objects—but here as in most cases the horizontal position of the rule is better.

(b) *In patients with congenital abnormalities of the colour sense.*

Here also the bright red and the pink objects should be used; but *do not demand the names of the colours* (congenital colour abnormals may, without central colour scotoma, tell you that "pink" is "green," but more frequently "bluish" or "grey").

FIG. 2.

Recording central and paracentral colour scotomata for the right eye in the diary while the "3-Object" Test is held *horizontally*:

- a. Absolutely central scotoma, without any trace of excentricity (rarely seen in axial neuritis retrobulbaris but often in *amblyopia* of a *squinting eye*).
- b. Pure excentric colour scotoma ($V = 5/6$ to $5/10$.)
- c. Ordinary central and excentric colour scotoma ($V = 5/15$ to $5/50$.)

FIG. 3.

Recording central colour scotoma while the "3-Object" test is held *vertically*; such will be the result both for Fig. 2a and Fig. 2c—sometimes also for Fig. 2b the central object is paler than the two excentric objects.

Ask them: "which disc is the brightest?" Answer: the nasal one (R.E.: "the left one"; L.E.: "the right one"). Then try them with the three small "pure yellow" and "light blue" objects, held horizontally at 1 ft. (30 cm.) distance. Ask: "which colour is darkest? or dullest?" Answer: the temporal one (R.E.: "the right disc"; L.E.: "the left disc"). Then ask: "which colour is brightest?" Answer: the nasal one, whose name, when vision is 5/50 or better, is generally correctly named "yellow" or "blue."

For investigation of irregular central scotomata of different size, due to ophthalmoscopic visible conditions (*e.g.*, chorio-retinitis centralis, vascular lesions, haemorrhage, traumatic hole at the macula) the "3-Object" Test is *not* intended; in these cases a stereoscopic examination of the central visual field with very small white objects is the correct method (Dr. E. Haitz's Stereoscopic Cartoons from J. F. Bergmann, Munich).

The "3-Object" Test, as mentioned, is only designed for central and paracentral, *colour scotoma* due to *retrobulbar affections* of the *optic nerve*, caused by intoxication, inflammation, or finally atrophy in the *axial bundles* of the nerve without visible ophthalmoscopic alterations—at most the temporal part of the disc (in case of axial atrophy) may be paler than normal. This applies, *e.g.*, to intoxications with tobacco, alcohol or lead, diabetic auto-intoxications and to multiple sclerosis. There are cases of tumour in the hypophysis cerebri with bitemporal paracentral scotomata as in Fig. 2*b*—the least suspicion of this requires complete and exact examination of both visual fields; the same may be necessary in multiple sclerosis. In most cases of tobacco amblyopia a rapid examination of the limits of white and colours in the horizontal meridian only may be sufficient.

For the diagnosis of *incipient tobacco amblyopia* with vision still good enough for reading ($V.=5/6$ to $5/10$) the "3-Object" Test is very sensitive (Fig. 2*b*); after sufficient abstinence from tobacco the vision may rise to $5/4$ in such cases. I have also seen this occur in partial obscurations of the lens, where *tobacco intoxication* and *not* this *incipient cataract* was the *cause* of the *sunken visual acuity*.

When in spite of completely transparent media, normal fundus and exact correction of any error of refraction the vision remains relatively low, a rapid examination with the "3-Object" Test may reveal a central colour scotoma.

As assistant at the University Eye Clinic in Oslo, 1899-1905, I repeatedly found with my "3-Object" Test *central colour scotoma* in *sympathetic uveitis*, both in the injured and in the sympathizing eye (Lit. 1); but I also saw cases of sympathetic uveitis without any trace of central colour scotoma. On the other hand I found some central colour scotoma also in *ordinary chronic irido-cyclitis* (Lit. 2 and 3); I first thought that these scotomata were due to a secondary retrobulbar neuritis optici, which may be so in some cases, as once demonstrated microscopically by Professor J. Meller in Vienna about ten years ago. But I thought later (Lit. 2, p. 174), that most cases were due to an intoxication of the optic nerve from resorption of intra-ocular inflammatory toxins; I named the condition "amblyopie irido-cyclitique" (Lit. 3, p. 308). I am glad to see that Mr. J. Gray Clegg (Lit. 8 and 9) has seen a series of

cases of central colour scotoma in anterior uveitis, and that he concurs in my opinion as to the rôle of the intra-ocular inflammatory toxins.

The instrument is made by Theodore Hamblin, Ltd., Dispensing Opticians, 15, Wigmore Street, Cavendish Square, London, W.1.

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MASSIVE RETINAL HAEMORRHAGE

BY

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THE publication of an abstract in *Brit. Jl. of Ophthal.*, Vol. XI, p. 573, of a paper by A. Fuchs on "Rare Syphilitic Affections of the Eye," especially the third section entitled neuritis papulosa, has recalled to my mind two similar cases which have been under my care during the last eleven years. My cases differed from those described by Fuchs in being bilateral, whereas his are stated to have been unilateral; but, judging from the report, there is a large measure of similarity between them.

Case I

A man, aged 25 years, was referred to me from the V.D. department of St. George's Hospital in October, 1922, on account of defective vision of about five months' duration. He was wearing glasses of -0.75D. spherical strength.