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THE SCOTOMATA OF TOBACCO AMBLYOPIA

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INVESTIGATION of the central zone of the retina, and in particular of the size and shape of the blind spot, by means of the various scotometers now in use, is playing an increasingly important part in the diagnosis of ocular disease. In the amblyopia caused by tobacco it has long been common knowledge that the loss of visual function is confined to the zone of the retina supplied by the papillo-macular bundle of nerve fibres, that the peripheral field is unaffected, and that a central scotoma for red is the most characteristic feature of the disease.

But now that small changes in the acuity of the central retinal zone form so important a factor in the early diagnosis of glaucoma, it is important that more exact knowledge of the various scotomata associated with the different diseases affecting the central retinal zone should be determined.

In my observations upon cases of tobacco amblyopia I have placed most importance upon the results obtained by the use of a white test object. When using coloured test objects additional difficulties arise. It is then not only a question of when the test object becomes noticeable to the patient, but at what point he can appreciate its colour, and a further difficulty is met in trying to make the patient adopt a standard saturation for the colours of the test object, so that he will not signal his appreciation of the

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coloured test object until this standard saturation has been reached. For instance, when moving a red test object from a scotomatous area to a seeing area, the tobacco patient often says that he first sees the red test object as brown in colour, and not until it has been moved further from the scotomatous area does he see it as red in colour.

But red is easier to work with than green. Even to the normal eye a green test object, when moved inwards from the peripheral region of the field, appears white for a considerable period before the green colouration is apparent, and it is a matter of extreme difficulty, even to the normal eye, to decide upon the exact moment at which the green colour is appreciated.

FIG. 1. L.E.

I found, in fact, that the use of a green test object proved so unsatisfactory that I gave up using it as a routine part of the examination, but I may here state that I formed the impression that in tobacco cases the field for green conformed to that for red, though the green scotoma tended to be of a greater size.

There is a further difficulty in that the majority of tobacco patients are not of a high grade of intelligence, and at times may attempt to give the answers which they think will please the observer best. The fixation of the eye must be closely watched all the time, as in all tobacco cases there is some diminution of central visual acuity. Again the process is a very fatiguing one to the patient.

The scotometer which I have used is that devised by Mr. Bishop Harman. I feel very strongly that the Bjerrum screen

used at a working distance of one metre is the method of real accuracy, but it is an instrument for the laboratory rather than for the out-patient room, and at any rate it can always be employed as the final arbiter in a doubtful case.

To begin with, I used the 2 mm. test object for white and red, but when working as a control upon normal eyes I found that with the 2 mm. red test object the red colour was not appreciated outside the 10 degree circle, so for colours I have used a 4 mm. test object.

Turning now to the scotomata which are met with in tobacco amblyopia, there appear to be three types:—

(I) A large scotoma involving the blind spot and the area

FIG. 2. R.E.

between the blind spot and fixation, but which stops just short of the actual fixation point (Fig. 1).

(II) A scotoma lying close to fixation within the 5 degree circle, connected by a relative area to the blind spot, which may or may not be prolonged towards fixation (Fig. 2).

(III) A scotomatous finger pointing from the blind spot towards fixation (Fig. 3).

The scotomata shown in these charts are absolute scotomata. And it would appear that these three forms demonstrate different degrees of severity of the disease, Fig. I being the most, and Fig. III the least severe. For the most part this is true, and certainly in early cases of tobacco amblyopia a small scotomatous finger, extending from the blind spot towards fixation, is a very constant sign. But the size of the absolute scotoma has no

certain relation to the visual acuity. The whole of the central zone is relatively affected, and the correlation between the absolute and relative scotomatous areas varies from case to case.

The charting of relatively scotomatous areas is a matter of great difficulty. It is easy to find a relative area, but to chart its limits with any accuracy is most difficult. The only satisfactory method is to reduce the size of the test object, and by using the Elliot scotometer or Bjerrum screen with a 2 mm. test object at a working distance of 1 metre, it is possible to delineate a small finger of absolute scotoma extending from the blind spot towards fixation, when, with the Bishop Harman instrument, which has a working

FIG. 3. L.E.

distance of $\frac{1}{3}$ metre, the same sized test object only shows a relative scotoma in this region.

With regard to colours, speaking generally, blue conforms with white and red with green. The relation of red to white is also more or less constant as regards shape, but the area where red is not appreciated is very much larger, and, except in very slight cases, the fixation point is involved.

The following three cases may be considered typical of the condition :—

CASE I (Figs. 4 and 5).—J. W. complains that his vision has been failing for the last two months. He smokes 2 oz. of shag a week, is in good work, and has no worries.

V.R. 6/18, V.L. 6/24 ptly.; no pallor of discs.

After-images, not obtained with red or green; obtained with blue. In the L.E. there is a large scotoma for white extending

from the blind spot to just short of fixation. In this case, considering the size of the scotoma, the macula is fairly efficient. The red scotoma conforms in shape with the white scotoma, but is larger and includes the macula. The blue scotoma is similar to that for white.

In the R.E. there is a relative scotoma to white and blue extending from the blind spot to the 5 degree circle, and a large absolute scotoma for red which passes just below fixation.

The patient was told to stop smoking and given a strychnine mixture. When seen again 6 weeks later (Fig. 6) V.R. 6/6, V.L. - 6/18.

After-images obtained with red, green, and blue.

The scotomata of each eye are much decreased in size.

FIG. 4. L.E. The outer line delimits the scotoma for red and the inner one that for blue.

CASE II (Fig. 7 and 8).—J. D. complains that the vision has been failing for 3 months. He smokes 1 oz. of tobacco daily; he is in good work.

V.R. less 6/60, V.L. - 6/18 ptly.; no pallor of discs.

In the R.E. there is an absolute scotoma for white on the 5 degree circle, and a relative area connecting this scotoma with the blind spot, which has a slight projection inwards. Red is not appreciated anywhere in the central zone.

In the L.E. the blind spot is enlarged towards fixation, and a relative area extends up to and involves fixation. The red scotoma corresponds in shape to the white scotoma.

The patient was told to stop smoking and was given a strychnine mixture.

Seen again 2 months later (Fig. 9 and 10) V.R. 6/18, V.L. 6/6. In the R.E. there is now a very small absolute scotoma on the 5 degree circle, and it is possible to chart a red scotoma. In the

FIG. 5. R.E. The outer line delimits the scotoma for red.

L.E. the only pathological feature is the red scotoma which shows a finger projection towards fixation.

FIG. 6. R. & L.E. The outer line delimits the scotomata for red.

CASE III (Fig. 2).—This is a good example of the recovery stage of the disease. The patient has been under treatment for some months. When seen the vision in each eye was 6/12. In

this case both eyes seem to be affected to an exactly equal degree. In my experience this is unusual. Both eyes show a small

FIG. 7. R.E.

scotomatous finger for white extending from the blind spot towards fixation and a red scotoma of larger size but of similar shape.

Comparing now the scotomata seen in early glaucoma with

FIG. 8. L.E. The outer line delimits the scotoma for red.

those in tobacco amblyopia, in glaucoma it is rather along the 10 degree and 15 degree circles, or from the upper and lower borders of the blind spot that the earliest scotomata are found; whereas

in tobacco amblyopia it is the area between the blind spot and fixation which is primarily involved.

FIG. 9. R.E. The outer line delimits the scotoma for red.

In dealing with tobacco amblyopia certain further points are worthy of notice. Amongst the cases under my observation there were 12 which I was able to follow more or less consistently for

FIG. 10. L.E. The outer line delimits the scotoma for red.

6 months, and the following figures are derived from them. All the 12 were pipe smokers, and 5 are definitely noted as smoking shag tobacco. The amount of tobacco consumed varied from 1½

to 6 oz. a week. Three of the 12 were out of work. In 4 cases pallor of the temporal portion of the optic discs was noted. With regard to alcohol, the highest consumption admitted was 6 pints of beer a day, in one case only.

As a final point : in all the later cases of tobacco amblyopia which I have observed I have taken their after-images to red, green, and blue. This has been done in the following manner. The patient has been told to hold a large clear piece of white blotting-paper in front of him at arm's length, and on the centre of the blotting-paper a red card is placed. He is told to gaze steadily at this card while he slowly counts up to ninety. The card is then hastily snatched away—the patient having been previously warned to keep his gaze fixed on the centre of the blotting paper where the

FIG. 11. R. & L.E. The outer line delimits the scotoma for red.

card lay—and the patient asked if he notices any difference in the centre of the blotting-paper at the place where the red card lay. The same process is then repeated with a green card and a blue card.

This method is, of course, very unscientific, as it takes no heed of the phenomenon of successive induction as affecting the green and the blue exposures. However, the results are fairly constant. Tobacco patients will see the yellow after-image of the blue card, but, except in mild cases, will not appreciate the after-image of the red or green card. They will often say, after the red card has been removed, that its site looks rather brighter than the surrounding area, and, after the green exposure, rather darker than the surrounding area. At times the green-blue after-image of the red is perceived, but not the purple after-image of the green.