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A NOTE ON SOME SYMPTOMS ASSOCIATED WITH A RETINAL LESION

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Introduction

THE purpose of this note is to record some subjective symptoms experienced by the writer since 1940 when abnormalities of vision were first noticed. Up to that time, when I was aged 47 years, vision had been good in both eyes. One year previously, on an occasion when the usual correction for reading was prescribed, both fundi were found to be normal.

In 1940 I began to experience some difficulties in vision accompanied by the appearance of a veiling patch of light. The eyes were then examined by Mr. Williamson-Noble who reported as follows: "I saw Dr. Hill first in November, 1940, when he told me that the right eye had appeared to be different from the left eye for the last five or six weeks. Vision, with correction of a small error of refraction, was 6/5 in each eye. Examination on the screen failed to show the presence of any scotoma. Ophthalmoscopic examination showed that the left fundus was normal, but in the right eye there was a shimmering area in the macular region, which I took to be located in the internal limiting membrane, and to be due possibly to some thickening of this. I have seen two other cases of a similar character in which there

was no material diminution of visual acuity and no progressive deterioration."

As the condition seemed somewhat rare the writer undertook to record details of any symptoms as far as they were accessible to subjective examination.

Further examination by Mr. Williamson-Noble in January, 1941, and October, 1942, confirmed the expectation that the appearances would remain unchanged and the vision was still found to be 6/5 partly with correction. Moreover, the complex of symptoms had, in the interval, shown no signs of alteration.

Account of the Symptoms

These subjective effects may conveniently be classified as follows: (a) Image distortion with localised aniseikonia, (b) the appearance of a luminous or a shadowy veil, (c) a phenomenon termed the "After Flash," (d) a convergence effect, and (e) pain. These effects will be treated separately.

(a) Image distortion.—The images of objects subtending angles up to a few degrees are given barrel-shaped distortion in the right eye which amounts to about 10 per cent. aniseikonia with irregularities within the apparently expanded area. Fig. 1 is a sketch of the appearance of a uniformly ruled objective field, the centre of which is a fixation point.

This apparent aniseikonia gives rise to disturbances of stereoscopic vision over this region, but the effect does not obtrude itself significantly in the ordinary use of the eyes. As, however, the area affected includes the foveal region, there is some difficulty with image fusion, and it is surmised that the strain involved accounts for the pain mentioned in (e) above. The aniseikonia can be made obvious with increase in apparent object size when vision is alternated between the two eyes, the right eye being opened as the left is closed.

Some points of interest may be mentioned in connection with the appearance of retinal projection when a uniformly illuminated field is scanned circularly with a pinhole aperture. The appearance is normal in the left eye, but the projected vascular system of the right eye is much more pronounced and is very irregularly shaped, having the central clear area contracted in size. The linear value of this contraction is of the order of 10 per cent., which conforms with the increase in image dimensions shown in Fig. 1. It may be deduced that the central retinal elements are bunched to this extent. The vascular system is so easily seen by this scanning process that it can be observed by half blinking the eye. It is thus possible to see simultaneously the vascular projection and, if the field is bright enough, the individual corpuscles traversing

it. These small silvery specks, which are visible in the normal eye against the sky brightness and seem usually to follow random paths, are here seen to be constrained to the vascular tracks, and

FIG 1.

FIG 2.

it is possible to count the corpuscles traversing any particular vessel. This has been found to average about one per second under normal quiescent conditions.

Superposed on this projected vascular system there is a darker irregularly shaped area coinciding with the veiling effect to be

described. Fig. 2 is a sketch of the centre of the projected appearance resulting from a scanning pinhole. It shows also the comparison with the left eye.

(b) Luminous Veil.—The description of this effect seems of necessity to be somewhat complex. It may best be described as a sluggish local adaptation to changing illumination. If the eye looks at a uniform field lit by light of any colour including white, but specifically excepting blue, any change in the illumination of the field is followed normally by a corresponding change in the brightness of the apparent field with the exception of an irregularly shaped area, centrally placed, of about two degrees horizontally by one degree vertically. This region fails to keep pace with the change unless it is very slow. For most values of illumination the area presents a bright veil when the brightness is decreased and a darker one if it is increased. The effect lasts a few seconds until adaptation is attained, when the lack of uniformity is no longer apparent. If the eye is allowed to rove normally over a field containing a high brightness contrast this area presents the appearance of a persistent veil. If coloured filters are placed before the eye the effect is seen in all colours except blue, when the abnormal veil vanishes.

When the brightness is raised to values corresponding to a sunlit surface of high reflectivity a somewhat different effect is manifested. The affected area becomes and remains brighter than the surrounding field and all detail is lost in a localised glare. There is also some chromatic differentiation, as the area which is brighter is also greener. It would appear that this failure to limit the apparent brightness is restricted to the green and yellow, as no abnormality is shown in blue light. For very low values of brightness the affected area appears normal, and there is some evidence that the process of dark adaptation is accelerated in its later stages over this region.

Occasionally this irregularly shaped, but quite definite, region manifests itself in an endoptic manner. Without any intense lighting, but usually subsequent to a series of changing values of illumination, it fills with brilliant white light having no relation to the visual scene. A feature of its development which may be worth recording is that the area seems to grow like the spreading of a liquid when poured on a dry surface. It reaches its full brilliance in a matter of minutes, becomes entirely endoptic, and is therefore finally superposed on the vision of both eyes. At this stage the real field is blotted out unless it is very bright, but the effect now begins to fade, becoming pure green before it disappears. It may be emphasised that the presentation differs in every respect from migraine which has been previously experienced.

If the eye looks at bright sources on a dark field the apparent

size of the source differs in the two eyes. The distortion depends on the angular size roughly as follows: Sources subtending angles less than about ten minutes are the same in both eyes; sources subtending angles greater than this but less than about half a degree are enlarged so that they all seem to be about half a degree; sources larger than this appear unchanged in size. There is a similar chromatic change like that mentioned above. Small red sources appear greenish white.

(c) "After flash."—This effect is produced when a very abrupt reduction is made in the brightness of the visual field, such as suddenly closing the eyes, switching off the illumination, or averting the eye quickly from a bright field to a dark one. The

FIG 3.

result of these actions is a bright flash lasting approximately one-fifth of a second and confined to an area in the centre of vision about half a degree vertically and rather less horizontally. It may coincide with the fovea. The brightness of this flash is a function of the brightness and duration of the field to which the eye was immediately previously subjected. The colour of the flash is the same as the "stimulant field" except in blue light, when it is absent. This flash effect is now a permanent feature of vision in the affected eye and is superposed on the veil effect previously described. Fig. 3 shows the location and size of these areas.

It would appear that there is here some mechanism which can function as a light storage, but investigation has shown that although the flash is confined to the foveal area, this does not seem to be the region responsible for "storing the light" which is subsequently emitted. This has been found by varying the size of the bright stimulated area. For any given illumination the brightness of the after flash increases with angular increase of

the luminous field up to a few degrees diameter, beyond which no further effect is produced. On the other hand, if the luminous field extends all over the retina, but contains a dark centre of a few degrees diameter, no flash is experienced. It may therefore be concluded that the region responsible is confined to the retinal lesion.

Within limits of brightness, ranging from about five equivalent foot candles to sky brightness at midday, the brilliance of the after flash is, within limits, proportional to the product of the brightness and duration of exposure to the stimulant field. There is a saturation value which is attained, as far as can be estimated, when the flash becomes as bright as the previous field. As an example, if the eye looks at a centrally placed field of two degrees diameter, shining with white light of thirty equivalent foot candles, the brightness of the flash following the extinction of the field increases linearly for exposure times up to ten seconds, when it appears as bright as the stimulant field.

The act of blinking shows these effects very strikingly. The first blink induces the flash, but a continuous sequence fails to show it because there is not sufficient time in the intervals to build up some definite minimum of "stored light."

The result of a series of blinks in blue light is also remarkable in an entirely different way. Nothing noticeable results from a single blink even if preceded by protracted illumination, but a continuous sequence of blinks gives rise to the presentation of a very dark area coincident with the bright flash in other colours. This dark area deepens and persists throughout the sequence of blinks. The effect is not entirely absent in the other eye and there is some suggestion that it is an exaggeration of a normal effect.

(d) Convergence Effect.—Rapid movement of the eyeball or any attempt to converge the eye beyond the normal range of accommodation disturbs the apparent brightness of the field. This occurs over areas of the retina well outside those associated with all the previously described effects. If the affected eye looks at a large uniformly lit field and then converges, the uniform brightness of the apparent field is disturbed over a large area. The central region of a few degrees diameter darkens, while brighter areas appear outside it in a roughly concentric array. The peripheral region is not affected. Rapid movement of the eye causes this disturbed distribution to show momentarily. The effect disappears instantly with the relaxation of the convergence or cessation of rapid movement. There is no differentiation with colour and there is no colour change in the field. No effect is observable at low illuminations or in darkness.

Suggestions in the Direction of Explanation

The image distortion may presumably be attributed to a displacement of the retinal elements, and the character of the change shows that the centre of the retina must be bunched. The convergence effect seems to indicate a residual lack of rigidity in the posterior structure of the eye. It may also be mentioned here that, associated with these changes, a blind patch of ten minutes subtense made its appearance and is located, presumably significantly, exactly at the centre of the fovea.

The flash and veil phenomena are presumably bound up with the bleaching of the visual purple, and it would seem that the lesion has disturbed this mechanism over the affected area. As there is no reduction in the level of dark adaptation, the failure seems more related to the actual bleaching reaction than to the secretion of visual purple. The discrimination between the effects in blue and other colours may contribute to the elucidation of the mechanism of dark adaptation; as there is reason to suppose that the rate of dark adaptation is a function of the colour of the pre-adapting light.

Left Eye

In the foregoing the left eye has been assumed to be normal. The only exception to this is the fact that when the endoptic pool of light makes its appearance, there is some preliminary contribution ascribable to the left eye. This is established by the appearance of smaller patches of light, always the same shape, but visible only in the left eye for a short while before the effect becomes endoptic. None of the other appearances has ever been seen in the left eye.

Associated General Conditions

No reason can be adduced with any assurance for the retinal lesion which is presumably responsible for these abnormalities. The writer worked for many years with strong sources of radiation which, while screened from visible light, were found to transmit freely in the near infra-red region. Other co-workers have, however, not been affected in this way. It does appear, on consideration, that there may be some risk in looking at powerful sources through such filters, because the pupillary contraction normally associated with these sources will not be stimulated and the pupil will remain fully dilated. It may be pointed out that the residual radiation is of short enough wave-length to be transmitted, without significant loss, through cornea, lens and humours, and will therefore be focused as a powerful radiant,

invisible image on the fovea. Although there is no evidence that this has been a predisposing cause in the writer's case, unless the centrally placed blind patch be so considered, this may be a suitable occasion to issue a caveat to those engaged in occupations involving conditions similar to those described above.

It may be added finally that a complete dental radiological examination and a pathological blood test failed to reveal any contributory abnormalities.

A CASE OF BILATERAL INTERSTITIAL KERATITIS LEADING TO BLINDNESS

BY

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THIS young stoker completely lost his sight within the space of six months. He was aged nineteen years at the time. There was a "blitz" on Bristol on the night of April 24, 1941, and a bomb fell close to where he was stationed. He did not actually remember anything striking his left eye, but there was a "very bright flash." His head ached after this and during the night his eye became very painful, so that he got very little sleep. The following morning he found his eye was inflamed, he reported at the sick-bay and was admitted to the Naval Hospital at Barrow Gurney the same day.

On admission he was found to have commencing acute interstitial keratitis of his left eye. There was a small epaulette up and out with a "ground glass" area of cornea below. He was treated with atropine and hot bathings and the pupil dilated well. The right eye seemed quite healthy and normal with 6/6 vision. There were no signs of disseminated choroiditis in either eye. The Wassermann reaction of his blood came back as full positive. On May 2 he had to be evacuated to an E.M.S. Hospital, together with most of the other patients in the hospital. He returned to the Naval Hospital on June 10. His left eye was now a shrunken blind eye. There was some panophthalmitis and the cornea had evidently perforated. While in the E.M.S. Hospital he had had a course of five injections of N.A.B. rising from 0.15 gm. to 0.60 gm. and three injections of Bismuth of 0.2 gm. The right eye was white and the cornea was clear. On July 6 the remains of the left eye were excised under general anaesthesia. The right gave no trouble and was white and free from any inflammation