

# Visual field defects due to opacities in the optical media

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The object of this paper is to draw attention to the fact that asymmetrical opacities of the optical media, especially of the posterior layers of the crystalline lens, may cause asymmetrical defects in the visual field, and that such defects vary with the diameter of the pupil. Opacities situated in the posterior layers of the lens cause a defect in the visual field on the *opposite* side, while opacities in the cornea cause a defect in the visual field on the *same* side. The optics of these two situations are explained in simplified diagrams below in Figs 1 and 2.

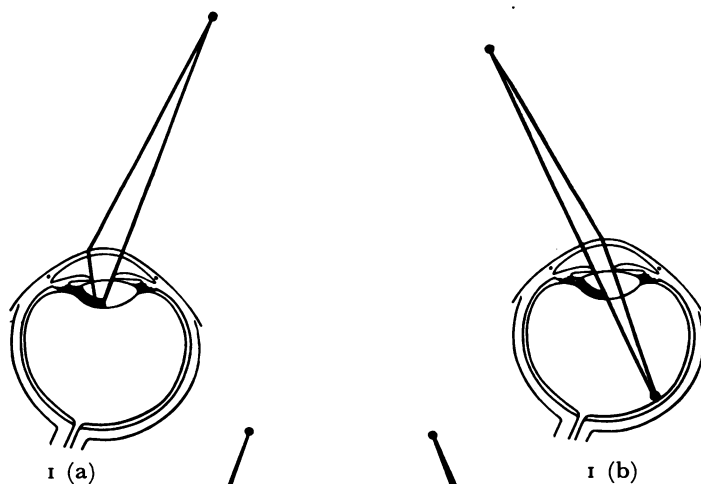


FIG. 1 Diagram of a horizontal section of an eye with an opacity in the posterior layers of the crystalline lens limited to one side. This has resulted in a loss of field of vision on the opposite side (a), whereas rays of light from the same side reach the retina unhindered (b)

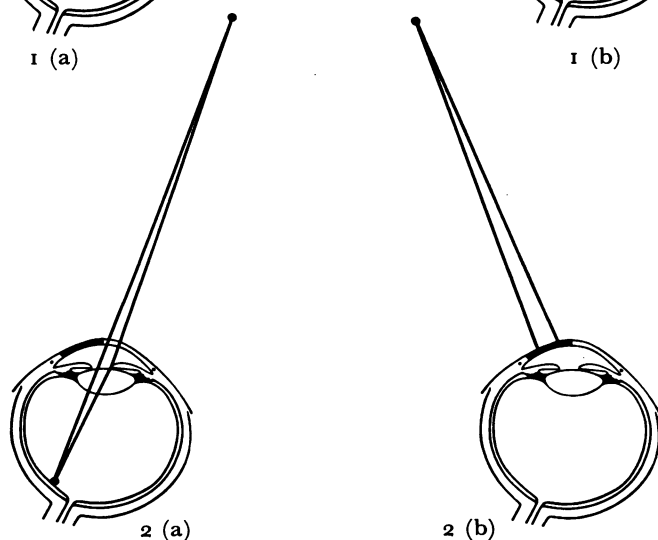


FIG. 2 Diagram of a horizontal section of an eye with an opacity in the cornea limited to one side. This has resulted in a loss of field of vision on the same side (b), whereas rays of light from the opposite side reach the retina unhindered (a)

Three patients will be described to illustrate these principles. The first patient was initially diagnosed as having a hemianopia until more detailed examination showed the true cause of his visual field defect.

**Patient 1**

A man aged 57 years had a posterior cortical opacity in the left eye mainly on the temporal side. Visual acuity was "counting fingers".

The central field charted with his pupil at its normal diameter of 2.5 mm. showed a large nasal defect, almost a hemianopia (Fig. 3).

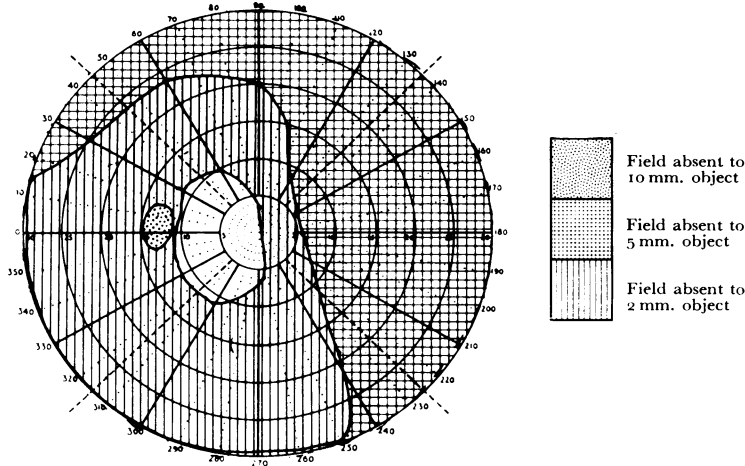


FIG. 3 Patient 1. Left central field recorded with a pupillary size of 2.5 mm. (Bjerrum screen at 2 m.)

With the pupil 6 mm. in diameter there was considerable reduction in the field defect, suggesting that the lens opacity was responsible for the abnormality in the field (Fig. 4).

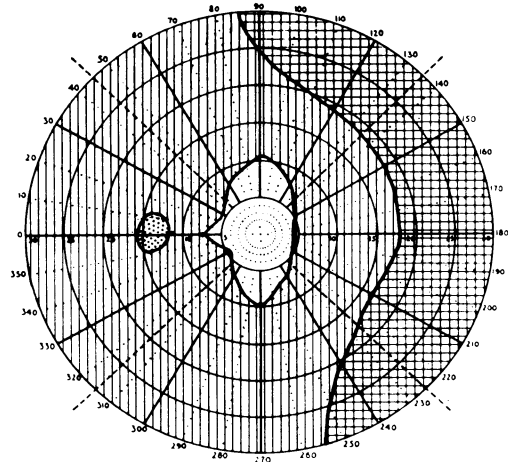


FIG. 4 Patient 1. Left central field at pupillary diameter of 6 mm. (Bjerrum screen at 2 m.), showing a considerable reduction in the area of scotoma (cf. Fig. 3)

**Patient 2**

A woman aged 45 years with a dense circumscribed, congenital, posterior cortical lens opacity in the right eye slightly above and temporal to the posterior pole of the lens. The central field, charted with the pupil at its normal diameter of 7 mm., showed no scotoma to a 2-mm. test object and the visual acuity was 6/9 (Fig. 5, opposite).

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However, when the pupil was constricted to a diameter of 2 mm., a dense scotoma appeared immediately nasal to and slightly below the fixation point (Fig 6). The visual acuity was then counting fingers.

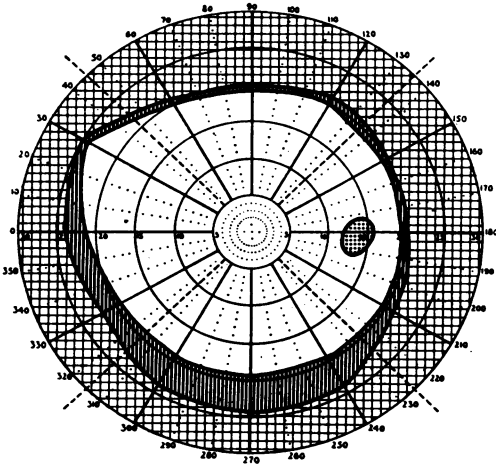


FIG. 5 Patient 2. Right central field recorded with a pupillary size of 7 mm. (Bjerrum screen at 2 m.). Visual acuity 6/9

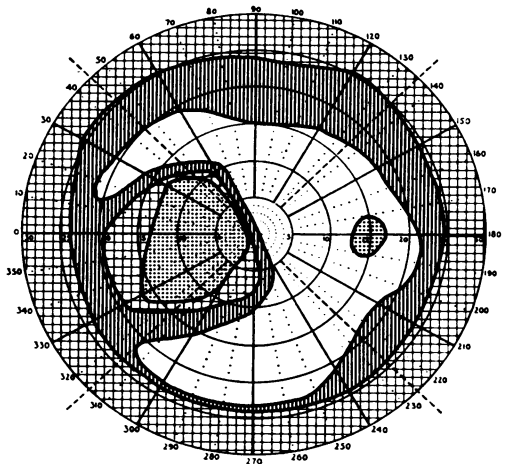


FIG. 6 Patient 2. Right central field recorded with a pupillary size of 2 mm. (Bjerrum screen at 2 m.). Visual acuity counting fingers

### Patient 3

In order to confirm the effect of variation in size of pupil on the field defects caused by opacities in the media, the same procedure was carried out on a patient who had a corneal opacity on the *temporal* side causing a field defect also on the *temporal* side (this type of field loss has been recorded previously—see Discussion). Again a marked reduction in the area of scotoma was produced with a fully dilated pupil.

The findings in this patient are shown below (Figs 7 and 8).

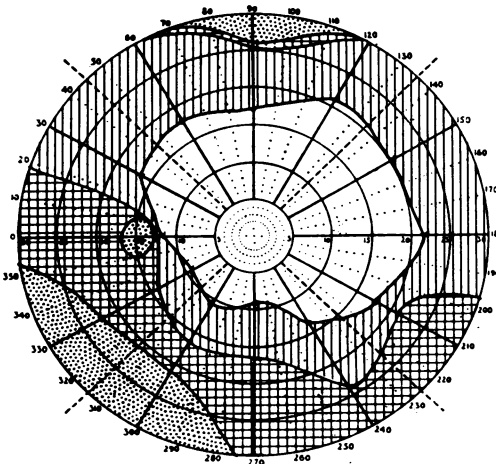


FIG. 7 Patient 3. Left central field at a pupillary diameter of 2.5 mm. (Bjerrum screen at 2 m.), showing field loss due to a paracentral corneal opacity

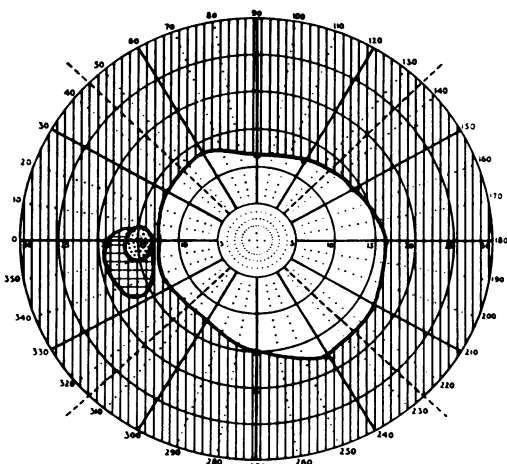


FIG. 8 Patient 3. Central field of the same eye but at a pupillary diameter of 7 mm. (Bjerrum screen at 2 m.), showing a marked reduction in the area of scotoma

## Discussion

It is well known that opacities of the media, the commonest being in the crystalline lens, may cause an apparent progression in scotomata due to glaucoma (Harrington, 1964). This effect is the same as that obtained by reducing the illumination of the test screen. It is also well known that opacification of the lens may give an apparent generalized reduction in size of both the central and peripheral field which may be overcome by increasing either the illumination of the test screen or the size of the test object.

It does not seem, however, so well appreciated that localized paraxial opacities of the media may cause an asymmetrical field defect (which may closely resemble a hemianopia or quadrantic defect in the field).

Tavolara (1959) described 22 cases of pterygium with a reduction of the isopters proportionate to the extent of the lesion. These disappeared after excision of the pterygium. Blum, Gates, and James (1959) mentioned a nasal defect in the peripheral field due to the same condition which disappeared after operation. Gayer Morgan (1958) noted loss of the upper visual field in cases of lens opacity and attributed it to a combination of the lens opacity and lesser sensitivity of the lower as opposed to the upper retina.

As far as we have been able to determine, however, a field loss similar to those described above due to a posterior cortical lens opacity has not been recorded, perhaps because such a localized asymmetrical lesion is not commonly seen.

Pupillary dilatation presumably reduces the area of scotoma by allowing light rays to enter the eye around the opacity.

This would apply very much less to a lesion close to the retina such as a vitreous haemorrhage (a patient with a large vitreous haemorrhage which had settled to the lower half of the vitreous cavity causing a loss of the upper half of the visual field has been seen).

## Summary

- (1) Two patients in whom a posterior cortical opacity of the *temporal* part of the crystalline lens caused a field defect on the *nasal* side are described (Figs 1 to 6).
- (2) A further patient with an asymmetrical corneal opacity on the *temporal* side causing a field defect on the *temporal* side is also described (Figs 7 and 8).
- (3) Dilatation of the pupil caused a marked decrease in the area of scotomata in all three cases.

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## References

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