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# Central crystalline corneal dystrophy

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The purpose of this paper is to report the first family from Great Britain with central crystalline corneal dystrophy and to discuss the pathogenesis of this condition, a well-documented entity (Waardenburg, Franceschetti, and Klein, 1961), the genetical basis of which was first demonstrated in a family of eight by van Went and Wibaut (1924), and confirmed by Schnyder (1927, 1929, 1939). The condition is often known as the crystalline corneal dystrophy of Schnyder.. It is transmitted as an autosomal dominant trait, usually with 100 per cent. penetrance (Franceschetti and Forni, 1952).

The clinical descriptions of reported cases are fairly uniform. The essential feature is the presence of many tiny needle-like crystals in the anterior stroma of the central cornea as seen with the slit lamp. These crystals shine and reflect many different colours.

Macroscopically the corneal dystrophy is greyish or brownish in colour, central in position, and usually disciform in shape. The opacity is present in the first few years of life and progresses very slowly, rarely causing significant impairment of vision. There is no vascularization, no irritative phenomena, and no impairment of corneal sensation.

Because of the infrequent necessity for corneal grafting only three studies of the composition of the crystals have been reported. The crystals have shown them to be fatty in nature. Bonnet, Paufique, and Bonamour (1934) thought that they were cholesterol crystals because they were doubly refractile in polarized light and were soluble in ether. Sédan and Vallès (1946) found cholesterol and oxalic acid by chemical analysis, and Malbrán, Paunessa, and Vidal (1953) thought that the crystals consisted of neutral fat as they stained with Sudan IV.

The presence of arcus juvenilis or senilis in association with central crystalline dystrophy was noted by Sysi (1950), Malbrán and others (1953), and other workers.

Bonnet and others (1934) were the first to consider blood fat levels and in a single case the blood cholesterol was found to be 160 mg. per cent., a normal result. Similar normal values were found in the isolated cases reported by Cavara (1940) and Pandolfi (1941) and also in the nine cases reported by Fry and Pickett (1950).

Raised levels of blood fat were found by Pérez Llorca (1949) in two isolated cases, Sysi (1950) in four familial cases, and by Malbrán and others (1953) in the one case he studied out of a family with six affected members. Luxenberg (1967), in an isolated case, found mild elevation of serum cholesterol and phospholipids, but these were not significantly above the normal range.

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## Clinical features of present family

The family tree is given in Fig. 1.

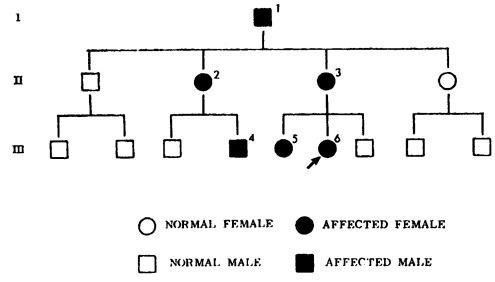


FIG. 1 *Family tree.*

The clinical appearance of affected members of this family is similar to that in previously reported cases (Figs 2 and 3).

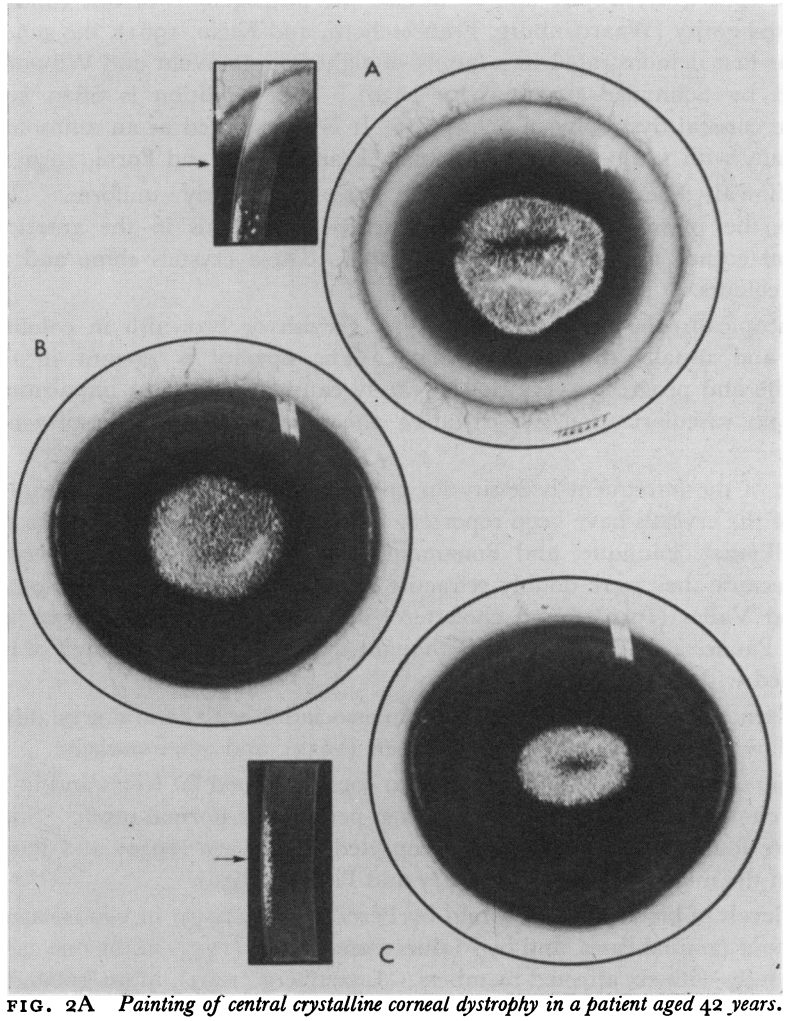


FIG. 2A *Painting of central crystalline corneal dystrophy in a patient aged 42 years.*
B and C *Paintings of corneae of patient aged 14.*

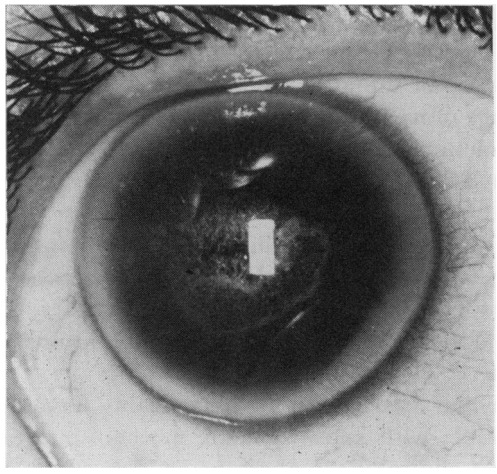

FIG. 3 *Photograph of cornea of patient aged 42 years.*

All affected cases also had arcus juvenilis. The blood fat was investigated in two cases and the results are shown in the Table.

**Table** *Serum fat in two patients compared with normal levels*

| *Serum fat* | *Patient aged* 14 (16 (*arrowed*)) | *Patient aged* 42 (13) | *Normal levels [Guy's Hospital] in serum ± standard error of mean* |
|---|---|---|---|
| Free cholesterol (mg./100 ml.) | 40 | 64 | 58 ± 8·3 |
| Cholesterol esters (mg./100 ml.) | 224 | 296 | 292 ± 22·5 |
| Total cholesterol (mg./100 ml.) | 174 | 242 | 233 ± 36·4 |
| Glyceride (mg./100 ml.) | 86 | 80 | 88 ± 8·3 |
| Phospholipid (mg./100 ml.) | 270 | 311 | 293 ± 17·6 |
| Total lipid (mg./100 ml.) | 620 | 750 | 800 |
| β-lipoprotein (per cent.) | 87 | 98 | 100 (in pool of normal sera) |

The blood fat estimations were carried out by Prof. I. Macdonald of the Department of Physiology of Guy's Hospital. Estimations were gravimetric, following chromatographic separation (for full method see Macdonald, 1968). The lipoprotein estimations were performed by Dr. M. Pandolfi of the Paediatric Research Unit of Guy's Hospital, using an immunodiffusion technique.

## Discussion

As the Table shows, the serum fat levels in the two cases investigated in this family were normal. To exclude the effect of a previous fat-containing meal, blood was taken before breakfast.

Examination of the reports alleging raised blood fat levels in crystalline corneal dystrophy does not bear critical analysis. The effects of previous fat-containing food have not been excluded. Also, many of the allegedly raised levels of blood fat can be regarded as being in the upper range of normal. For example, of the four cases reported by Sysi (1950), only one had a cholesterol level above 300 mg. per cent.

The oldest patient in the present family, who is 83 years of age, has no history of any occlusive arterial disease.

The genetic association of arcus with central crystalline dystrophy is interesting. It is called arcus juvenilis here because of its presence in the patient of 14 years of age. Its presence is well seen in the painting of the 42-year-old patient (Fig. 2A). The slit-lamp appearance is typical of an arcus, occurring mainly in the anterior stroma, with a clear interval between it and the limbus.

As in the three classical parenchymal dystrophies, the abnormality remains confined to the cornea. This is not incompatible with known genetic mechanisms and it may be that the corneal dystrophies express clinically the aberrant activity of genetically-determined proteins specific for the cornea.

## Summary

A family with central crystalline corneal dystrophy is presented. This is the first such family study to be reported in Great Britain.

The blood fat of two patients was found to be normal.

We wish to thank Prof. Macdonald and Dr. Pandolfi for estimating the blood fats, Prof. Polani for his helpful discussion on genetic mechanisms, and Mr. J. Pereira for his translation of Spanish and French papers.

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