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COMMUNICATIONS

A THIRD ENTITY OF PRIMARY SYMMETRICAL
FATTY CORNEAL DYSTROPHY

BY

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WE have thought fit to place on record an account of a case of symmetrical lipoidosis corneae, and with it certain cognate observations. We are moved to do this for two reasons. One is that we consider this case to be unique of its type. A second reason is to express the hope that this contribution may stimulate interest in and enquiry and research into a condition, which is probably not too uncommon and about which, apparently, our knowledge is still very incomplete.

Before describing the case, certain general facts regarding fatty change in the cornea, might usefully be recalled.

The young, normal, human corneal tissue is—as far as is known—fat free. Fatty compounds are found only in senile and pathological corneal tissue. The breakdown of protein into fat has so far never been observed as having taken place in the cornea, although we would not rule out this possibility. Our assumption is that visible fat found within corneal tissue, is fat derived from the blood, and that it originates from ingested food. According to the histological researches the nourishing plasma leaves the vascular network at the limbus, and its fat is oxydised in the corneal lamellae. Possibly if too much fat enters the corneal tissue, or if the normal oxydising power of the cornea is not strong enough, or if both

conditions collaborate, the fat is stored, and not oxydised. It might be mentioned here that on the other hand cases have been observed with a high cholesterol content (about 1000 mgm. per cent., the normal being 150-200 mgm. per cent.), this feature being of long duration, and yet without the appearance of a fatty corneal deposit.

A lipoidal corneal arc, however, can be produced in the rabbit by feeding it on cholesterol in olive oil. This arc is very similar, but not quite identical, with the senile arc. Sometimes the eye of a rabbit fed in this way shows in addition to the arc a diffuse fatty dystrophy (sklerokeratitis lipoides, Loewenstein, 1942).

It will be recalled also that fatty changes are observed in corneal tissue of reduced vitality. Kerato-malacia is an instance, another being the fatty infiltration found in eyes debilitated by scars or inflammation. These changes are explained as being due to defective *local* oxydising power of the cornea.

The study of fatty changes in the cornea has taught us to distinguish between *primary* and *secondary* dystrophies. In a primary fatty dystrophy we witness the appearance of fat in a cornea which careful clinical examination by all the methods at our disposal, reveals to be otherwise normal. In a secondary dystrophy signs of disease or injury in the eye are observed to account for the appearance of the visible fat. In cases of primary symmetrical fatty corneal dystrophy both eyes are impaired, not inflamed, the corneal epithelium is undisturbed, the parenchyma is usually more or less diffusely opaque with distinct greyish-white spots. In some cases the spots coalesce to form a homogeneous yellowish white mass. No vascularisation is observed or secondarily only, due to a foreign body reaction. Twelve cases are known in the literature. No successful line of treatment is published. Histologically one of us found slight fatty changes in Bowman's membrane and minute fatty droplets in the anterior corneal lamellae. The middle layers are entirely destroyed and full of fatty masses and cholesterol crystals, while tiny fatty droplets occur in the posterior lamellae. Descemet's membrane is fatty in its anterior third only. No sign of inflammation was discovered. Aetiology of this appearance is obscure.

A second primary symmetrical fatty corneal dystrophy exists in dysostosis multiplex (Gargoylism or G. Hurler's syndrome). Twenty-five cases have been described so far: in twenty-four cases the very uniform corneal changes have been recognised. Corneal surface is smooth, grey-white, minute opacities are distributed all over the cornea throughout the whole parenchyma. Some of the patches are somewhat larger. No other changes in the eyes have been observed. Histologically a fatty infiltration is observed within the spaces between the corneal fibres. Lipoidal substances are found in Hurler's disease in liver, spleen and lymph nodes. A linkage to Tay-Sachs's amaurotic idiocy is worth considering as certain

cerebral changes described in Hurler's disease are reminiscent of those in amaurotic idiocy.

Up to date these two groups of primary, symmetrical lipoidal dystrophy are known. We add here a new form of this mysterious corneal change.

History

M. M., female, single, age 35 years, came for eye examination, with the complaint of difficulty in vision for near work. She was well-built, but of delicate appearance, and there was an obvious right lobe goitre swelling. Unaided superficial examination of the eyes showed a generalised "cloudiness" of both corneae. Her family history revealed nothing that assisted in forming an estimate as to the probable cause of her eye condition. She has indoor work in an office. The patient herself had been in good health until about twenty years of age, when she began to have kidney trouble. Later on she noticed the thyroid swelling. Shortly before coming for eye examination she had had a long period in bed with kidney disease. She stated that she felt far from well, and was tired and breathless. Her general symptoms indicated failing cardiac and kidney competence.

Bulbi both slightly exophthalmic in an equal degree. Lid fissures 12 mm. looking straight forward. Four pingueculae of considerable size and of sulphur-like colour. Normal eye movements. It is remarkable that the red blood corpuscles within the conjunctival vessels move regularly for the most part, but, to the observing eye,

FIG. 1.

Primary symmetrical nephrotic corneal lipoidal dystrophy.

they disappear in some apparently empty vessels. Here the movement is visible again in bends only.

A broad lipoidal arch of .1 mm.—1.3 mm. in diameter does not reach the limbus (Fig. 1). The lucid interval between arch and sclera is slightly hazy. The arcus lipoid can be dissolved at the narrow slit and high power into coarse grey granules and fades towards the centre of the cornea. The peripheral margin of the arc (Fig. 2), is very irregular and reminds one of the ice lumps of the cinguliform dystrophy. The whole cornea is equally infiltrated by very small greyish-white dots. They stretch from the sub-epithelial level (Fig. 3) throughout the whole thickness of the

FIG. 2.

Irregular "lucid interval" between lipoidal arc and sclera.

FIG. 3.

Slit-lamp narrow beam. Dots in Bowman's M. thicker.

corneal lamellae and are dense, especially in the region of Bowman's membrane. They cover the whole extent of the cornea equally without producing a bulge in the epithelium. There is no epithelial defect. There are no corneal vessels, and no corneal nerves were discovered. No changes on the posterior surface of the cornea were present, nor any corpuscular elements in the anterior chamber. Iris is of brownish-yellow colour and normal structure. Pupil mobile and active. Lens clear. Fundi reveal typical Gunn's dots, especially on the nasal side of the disc. Broad and hard reflexes of the retinal arteries. Some peripheral twigs of the retinal veins are of unequal calibre.

Vision, R.E.: 6/5 (?) +3.0 D.=6/5. L.E. 6/6 +3.0 D.=6/5.

The examination of blood and urine was done by Dr. James Eaton, in charge of the biochemical department of the Victoria Infirmary, Glasgow, to whom we are very much indebted.

Blood: urea: 54 mg. per cent. Plasma cholesterol: 216 mg. per

cent. Plasma total fat : 885 mg. per cent. Plasma albumen : 1.65 per cent. Plasma globulin : 2.02 per cent. Albumen/globulin ratio : 0.816.

Therefore the blood urea is high. Cholesterol is slightly increased. Albumen is very low and globulin high. The albumen/globulin ratio is very low. There is albumen in urine. According to Dr. James Eaton the chemistry of the blood corresponds to that which would be expected in a nephrotic type of renal lesion, but the cholesterol is not so high as is usually found.

Unfortunately not all the tests desirable and indicated could be carried out due to the unwillingness of the patient to allow the investigations to proceed any further.

Conclusion

We consider this to be an undescribed entity. We would place it in the group of "feeding" fatty dystrophies, in the sense of a corneal over supply of fat from the bloodstream. It is not a cholestaemia, but a lipaemia. A general disturbance in fat metabolism, or even a local disturbance cannot be ruled out. The first sign is the arcus lipoides. A lipoidal arc is found in young people, in cases of nephrosis with high blood fat figures, as one of us has described. The peripheral corneal tissue acts as a filter to protect the optically important central corneal areas. In our cases this filter broke down, and the central part became flooded with fatty droplets.

The increased blood fat alone cannot cause the fatty dystrophy, as the highest degree of lipaemia in diabetes, with tremendous fat masses in the blood serum does not provoke, as far as we know, the fatty corneal changes. We assume that it is the *long lasting* lipaemia which allows the fatty infiltration. There is a second supposition possible, namely, that a lower local corneal metabolism, a deficiency in its oxydising power, arises from altered endocrine influence. Admittedly we have no proof for this supposition except for the struma and the exophthalmos. No basal metabolism was done due to the lack of collaboration on the part of the patient.

We would call attention to the strange kind of corneal lipoidal arc. Its peripheral margin is like broken ice, sub-epithelial. Fractured plates correspond to calcareous incrustation in Bowman's membrane, and remind us of cinguliform corneal degeneration. The lucid interval is very irregular.

We formed the impression that corneal metabolism was severely damaged by an unknown cause. It is not impossible that it was due to the continuous over-flooding of the peripheral corneal tissue with fat rich plasma. The establishment of fatty infiltrates within the peripheral corneal fibres causes wear and tear of this tissue, and

renders difficult or impossible the proper filtering action of this part of the cornea.

One of us has observed this remarkable clinical picture once only. We are convinced other less obvious cases have been over-looked. In the future we shall be on the look out for cases of this type, and now that attention has been drawn to it, perhaps others will report similar cases. A suggested name for this affection might be "primary symmetrical interstitial fatty corneal dystrophy with lipoidal arc, due to nephrotic lipaemia." Further investigations by clinicians and biochemists will be required.

A CASE OF MUSTARD GAS KERATITIS UNDER CONSTANT OBSERVATION FOR A PERIOD OF TWENTY YEARS

BY

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LIVERPOOL

In a recent article in your journal by Miss Mann and Dr. Pullinger the authors expressed regret that we had few details of the treatment given to the earlier cases of delayed mustard gas keratitis. As few ophthalmologists can have had the opportunity of keeping in close touch with a case of this dread disease for a period of over twenty years, a few observations on its course, the treatment given—harmful or otherwise—and the gradual adaptation of the different therapeutic aids as they became available, may be of interest. Possibly the deductions drawn, though of no scientific value, may be helpful as to what to avoid and what to make use of in the treatment of any cases which may still develop even after so long a period.

Even now there is much to learn about delayed mustard gas keratitis—the reason for varying periods before onset of ulceration; why, under similar circumstances of infection "one should be taken and the other left"; whether focal or general disease may be a factor predisposing the gassed candidate to ulceration; in what measure the concentration of gas affects the issue. Most important of all, will the study of this form of keratitis become mainly academic owing to the stoppage of supply, or are we to visualize the future treatment of a vast throng of patients of both sexes and of all ages?

My patient, F.W.S., is now a man, aged 62 years, still an imposing figure, six feet two or three inches in height and proportionately built. Before the world war he was a County tennis