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COMMUNICATIONS

BINOCULAR CHOROIDAL TUBERCULOSIS WITH
DETACHMENT OF THE RETINA IN TWO KITTENS*

BY

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THE kitten, a half-bred Persian, about five months old, was apparently in good condition; it had not wasted appreciably nor failed to take food; it had been fed largely on milk from the household supply. The defect of sight appears to have developed rapidly, nothing unusual having been noticed by the owner until the animal walked into a small sunken tub containing water in the garden. I saw the kitten one morning in bright sunlight. The pupils were dilated, apparently motionless to light, and the animal as far as could be ascertained was unconscious of light and shade. I examined it again next day in a darkened room with artificial light and again failed to obtain any evidence of perception of light. In each eye there was extensive detachment of the retina easily seen by focal illumination and by the ophthalmoscope. Tension seemed normal, the corneae were bright and the lenses clear. Two days later the kitten was killed by chloroform: I removed the eyeballs and placed them in Zenker's fluid. I regret that there was no opportunity of examining the viscera of this kitten; the animal was brought to me in the country and I was unable to bring the body to the laboratory at once.

* Communicated at the Section of Ophthalmology, Royal Society of Medicine, at a Clinical Meeting, February, 1923.

The examination of the eyeballs has been made by Mr. Neame, and the description of the pathological changes is entirely his work. I take this opportunity of thanking him for the trouble he has taken and will ask him to give you a description of the specimens.

Shortly before this communication was made to the Section of Ophthalmology, another kitten from the same litter was brought to me for examination. It was well grown and healthy looking, but not as active or playful as kittens usually are. Its sight was apparently good, and the fundi did not exhibit any changes which I could recognize as abnormal. Between two and three weeks later the kitten was brought to me again, and examination then revealed detachment of the retina plainly visible in the left eye, less obvious in the right. The animal was obviously in distress, refusing food and lying still all day. I obtained possession of it and next day handed it to Mr. Neame, who has included it as Case 2 in his paper.

Pathological examination of the eyes of a blind kitten*

CASE 1.—Path. No. R.L.O.H. 1540.—The eyes were fixed in Zenker's fluid, and were divided horizontally.

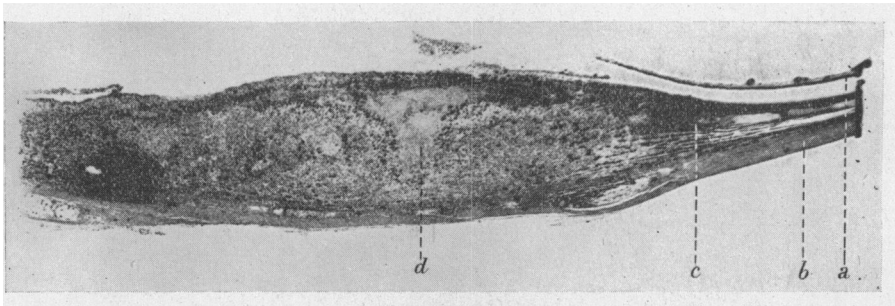
Macroscopic Examination.—A similar appearance was present in the two eyes. The anterior chambers, containing a loose granular coagulum, were about 2.0 mm. deep in the centre. The iris was retracted so as to leave a wide pupil. The lens appeared normal, and the ciliary body normal. The retina was completely detached, so that no vitreous cavity remained in either eye. The subretinal space was filled with firm powdery coagulum. The choroid was in situ, but on examination with a lens, revealed in each eye a definite diffuse thickening in the posterior part.

Microscopic Examination.—The half of one eye was embedded in celloidin, and sections were stained with Ehrlich's haematoxylin and eosin, and with Weigert's iron haematoxylin and van Gieson's stain. The sections show marked conjunctival and episcleral vascularization. The cornea shows a normal structure. There are a few foci of cell infiltration in conjunctival and episcleral tissue, but no apparent invasion of the cornea. The anterior chamber contains a few cells free in the angle and within spaces enclosed by the ligamentum pectinatum. The iris contains, in some of the sections examined, a small collection of lymphocytes at its root. There are small collections of inflammatory cells around the ciliary processes. The retina is completely detached, and has small areas of infiltration mostly around blood-vessels.

* Specimens shown at the meeting of the Section of Ophthalmology, Royal Society of Medicine, February, 1923.

At the ora serrata the choroid presents an oval mass of cells which for the most part are epithelioid in type. In the posterior part of the eye the choroid is involved over a wide area, and shows infiltration, mainly with epithelioid cells, but also with collections of lymphocytes here and there, and patches of necrosis. The latter are all nearer to the inner surface, and in places are separated from the subretinal space only by the thinnest layer of epithelioid cells and lymphocytes. Within this zone of granulomatous tissue many vessels are seen whose walls show proliferation of their endothelial lining, but no actual giant cells are to be seen.

The subretinal space contains a considerable amount of fibrinous and granular material and some cells scattered along the outer wall of the space.



CASE I. FIG. 1.

Microphotograph of part of tuberculous lesion in choroid. *a*. Pigment epithelium. *b*. Sclerotic. *c*. Choroid, at margin of tuberculous lesion. *d*. Caseation in the tuberculous mass in the choroid.

The condition is practically that of ulceration of the choroid into the subretinal space, with the passage of fluid and cells into this space, so as to cause detachment of the retina.

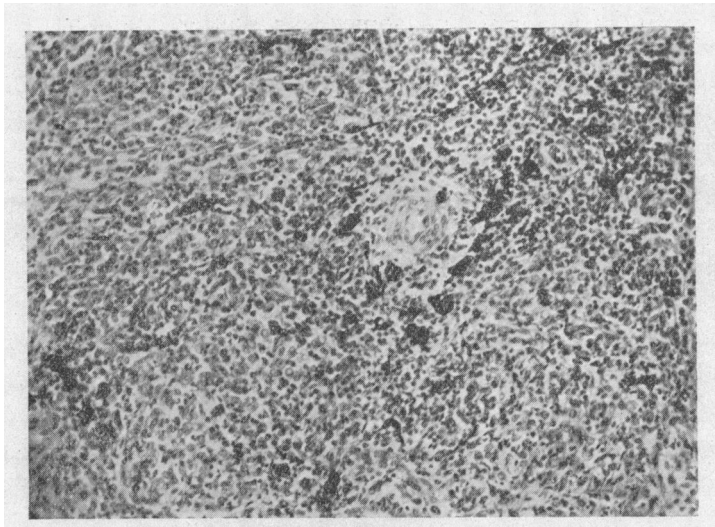
Prolonged search in sections stained by Spengler's modification of Ziehl-Neelsen's method failed to reveal any tubercle bacilli. (See note *re* further examination for bacilli.)

Illustration No. 1 shows part of the infiltrated area of the choroid, the total extent of which was about three times that shown.

Illustration No. 2 shows a typical part of the granuloma, with endothelial proliferation of a vessel in the centre, and a large proportion of epithelioid cells.

Hancock and Coats⁽¹⁾ described, in 1911, 6 cases of tuberculosis of the choroid in the cat. They found that this condition had, as far as the literature showed, been ignored. Of the six cats, most of which were young, five had bilateral disease. They were of various breeds, and their general condition was, in most of

them, good. In one only was there wasting. In two cases the temperature was raised to between 102° and 104° F. The condition was visible on examination of the fundus, as extensive areas of small spots of yellowish exudate beneath the retinal vessels. Retinal detachment was to some extent usual. Post-mortem examination of five of the cases failed to reveal any sign of tuberculosis in any other organ in one of them. In four, there was lung disease, in three, kidney disease, and other organs were affected in one. Inoculation of guinea-pigs with material from three of the cats gave



CASE I. FIG. 2.

Microphotograph, magnification $\times 175$, of part of the tuberculous tissue shown in Fig. 1. Near the centre is a capillary with several layers of endothelial cells forming its wall. The black masses are choroid pigment. Close examination, particularly with a lens, discloses the abundance of epithelioid cells, many of whose nuclei appear as rings.

positive results—development of tuberculosis—in two. The organism was not found in the eye lesions. Comparison of the microphotographs here reproduced with those of Hancock and Coats shows a close resemblance in the granulomatous structure. In each case the preponderating cell is a large epithelioid cell. In Hancock and Coats' examinations giant cells were very rare, and caseation was not characteristic, but when present was usually more towards the inner aspect of the choroid as in the case here described. A number of cases of intraocular tuberculosis have been described in other animals, as referred to in the bibliography

of the above-mentioned paper. One case of this disease occurring in the calf is of particular interest in that the rarer complication of parenchymatous keratitis was present in conjunction with nodular iritis. The corneal opacity was in the form of interstitial streaks and spots, which proved on histological examination to be masses of cell infiltration between the lamellae (Priewe²).

Since the date when the specimen and sections of this case were shown at the Ophthalmic Section of the Royal Society of Medicine, further examination for the tubercle bacillus by a different method has met with success. Part of the thickened portion of the choroid of one of the eyes was removed and spread, partly by teasing, partly by pressure, upon a glass slide treated with egg albumen solution, and there fixed by heat. In one specimen so prepared the pigment of the uvea was removed by bleaching with hydrogen peroxide. In both this and the unbleached preparations scattered acid-fast bacilli were demonstrated by means of Ziehl-Neelsen's stain, with the morphological characteristics of the tubercle bacillus. This was confirmed by Dr. P. Fildes.

REFERENCES

1. **Hancock and Coats.**—"Tubercle of the choroid in the cat." *Veterinary Record*, Vol. XXIII, p. 443, Jan., 1911.
2. **Priewe.**—"Choroiditis u. Iritis tuberculosa nebst tuberculoser Keratitis parenchymatosa beim Kalb." *Berlin tierarztl. Wochenschr.*, p. 841, 1908.
3. **Mayou.**—*Trans. Ophthal. Soc.*, Vol. XXXIV., p. 319.

CASE 2.—Since the completion of the examination of the above described specimen, a second kitten of the same litter became blind. The animal was received alive and examination of the left eye was satisfactorily carried out. Details of the fundus of the right eye could not be seen clearly.

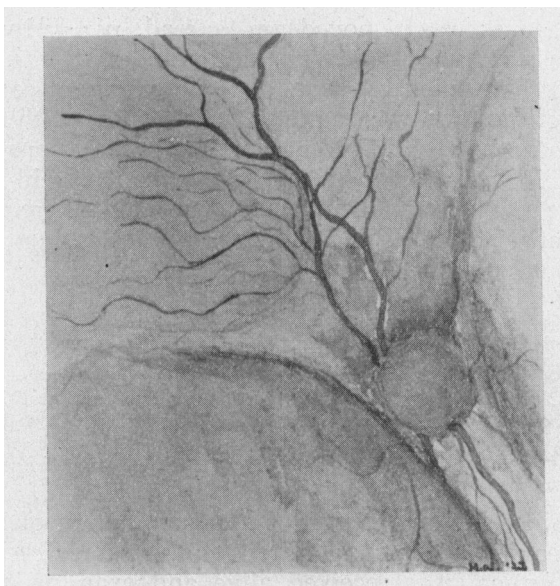
This kitten was said to be eleven months old and the only survivor of the litter. It was stated never to have been lively, and for the last ten days had become lethargic and had taken very little food. It was stated that the kitten had been fed on boiled milk from the table at breakfast, but on unboiled cow's milk from the dairy at other times. There was no history of any known illness among the inhabitants of the house in which these kittens were born, nor in the house in which the second kitten had lived from the age of six weeks. The milk supply to the two houses in which the kittens lived was obtained from different dairies. The mother was stated to be alive and healthy. A rough drawing of the fundus of the left eye was made before the animal was killed. The optic disc was visible between two large prominent retinal detachments, one on the temporal side, the other in the inferior

nasal region. Just above the lower detachment was a pinkish slightly raised area upon which coursed many delicate blood-vessels connected with the main retinal vessels (Fig. 3).

The animal was killed by means of chloroform. Both eyes were excised. Post-mortem examination of the viscera showed the following conditions (R.L.O.Hosp. Path. No. 1567):—

The lungs showed many tubercles of about 1 millimetre diameter and slightly larger, both on the surface and on section.

The bronchial glands on division were seen to be slightly



CASE II. FIG. 3.

Drawing of fundus of left eye, which shows a retinal detachment below, and another to the temporal side. Between these detachments is the disc at the edges of which appear the retinal vessels. Above and to the nasal side of the disc is a highly vascular area, which appeared slightly raised on ophthalmoscopic examination.

affected and to contain tubercles of less than 1 millimetre in diameter.

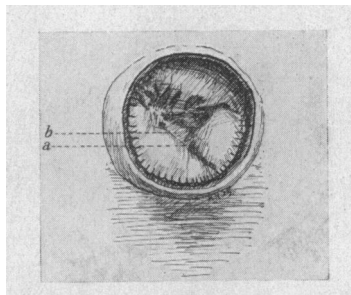
The mesenteric glands were very greatly enlarged, and contained confluent tubercles and caseating masses. One of these glands measured on cut surface 2.5 by 2.0 cm. The spleen also contained tubercles of varying sizes.

The large intestine showed on its surface circular patches of yellow-white colour, two to three millimetres in diameter. The peritoneal surface was not raised. The inner surface of the colon showed these patches to correspond with nodules in the centre

of each of which was a small depression. Portions of some of the organs were placed in a sterile vessel for inoculation experiments.

The specimens were placed in Bouin's fluid. The left eye was divided in the coronal plane a little way in front of the equator. Three large retinal detachments were present as shown in the drawing (Fig. 4). Enclosed between these was a depressed area which presented a somewhat corrugated surface over which many branching retinal blood-vessels were seen. The iris and ciliary processes were of normal appearance.

The posterior part of the left eye was again frozen and divided sagittally, to the nasal side of the optic disc, and as near as



CASE II. FIG. 4.

Drawing of left eye after removal of its anterior part by coronal section through the posterior ciliary region. Scale 1/1. It shows large retinal detachments below and to the temporal side, and a less prominent detachment above. Enclosed within the limits of these detachments is an area in which the retina is puckered. *a*. Marks the position of the optic disc, between the detachments. *b*. Shows the slight prominence which was visible on ophthalmoscopic examination as a pink highly vascular region.

possible through that part which corresponded with the pinkish vascular area figured in the fundus drawing. The cut surface shows homogeneous coagulated material beneath the large retinal detachments. Corresponding with the pinkish area referred to, the retina was slightly detached, and immediately beneath the latter was a solitary mass of greyish colour involving the choroid. This grey mass measured on its cut surface 5 mm. in length vertically, and 3 mm. antero-posteriorly.

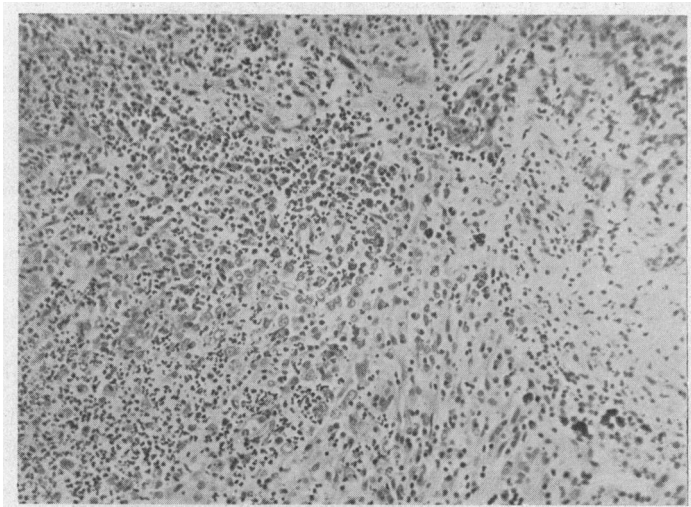
Microscopic Examination.—Spleen.—A smear preparation of a nodule, stained with haematoxylin and carbol-fuchsin, shows abundant acid-fast bacilli.

Mesenteric Gland.—A smear made from crushed tissue of the largest mesenteric gland, stained with Ehrlich's haematoxylin and Ziehl-Neelsen's carbol-fuchsin, reveals abundant acid-fast bacilli. A section of part of this gland prepared from tissue embedded in

paraffin, stained by the same method, also shows abundant acid-fast bacilli.

Colon.—Sections of two of the nodules show a granulomatous structure with loss of the covering mucosa, and slight necrosis external to that.

Left Eye.—Part of the choroidal mass with its covering retina and sclerotic was embedded in photoxylin and paraffin by Jordan's method. Sections stained with haematoxylin and eosin show a portion of the sclera with the whole of the choroid internal to it much thickened, and its normal structure replaced by granulomatous



CASE II. FIG. 5.

Microphotograph, magnification $\times 200$, of part of the tuberculous lesion in the choroid, situated posterior to *b* in Fig. 4. It shows abundance of epithelioid cells as in Case 1.

tissue. The retina covering the inner surface of the choroidal mass is thrown into irregular folds, is highly vascularized with large capillaries, and is infiltrated with cells. Examination with Zeiss D objective and No. 4 eye-piece shows the following condition:—The central portion of the choroidal mass is necrosed; the peripheral part shows histological structure very similar to that of the choroid of the kitten previously described, but with the addition of a considerable number of polynuclear cells, especially at the margin of the necrotic area. The abundance of the epithelioid cells, the relative paucity of lymphocytes, and the absence of giant cells are the obvious feature (Fig. 5). Part of the retina is invaded by granulomatous tissue continuous with that of the choroid.

A section of the same portion of choroid stained with haematoxylin and carbol-fuchsin revealed, after prolonged search, the presence of a bacillus, acid-fast, and with the morphological character of a tubercle bacillus. This conclusion was agreed to by Dr. S. H. Browning who examined the section.

Inoculation Experiment.—Dr. Stanley Griffiths carried out inoculation experiments at the Field Laboratories, Cambridge, from which the following results were obtained:—"Emulsion of mesenteric gland produced tuberculosis in guinea-pig. Cultures of the tubercle bacillus were obtained directly from the mesenteric and bronchial glands. The cultures are dysgonic, i.e., they grow like tubercle bacilli of bovine tuberculosis."

Conclusion

The occurrence of blindness in cats is by no means common, and, as the result of binocular tuberculosis, is distinctly rare. The presence of tuberculosis in both eyes of each of two kittens of the same litter is probably unique. In one case the presence of the tubercle bacillus was demonstrated in the affected choroid of one eye. In the other case, in addition to the presence of tubercle bacillus in the choroid, this organism was found in abundance in a caseous mesenteric lymph gland, and in the spleen; cultures of tubercle bacillus were obtained from bronchial and mesenteric glands; inoculation of a guinea-pig gave a positive tuberculosis result; and lesions of tuberculous nature were found macroscopically in lungs, bronchial glands, spleen, large intestine, and mesenteric gland. The most advanced stage of tuberculosis was found in the mesenteric glands. It is probable that infection took place through the colon. Although no examination of the milk of the dairy of supply was carried out it seems highly probable that the second animal at least was infected from cow's milk.

CASES OF OPHTHALMOLOGICAL INTEREST FROM THE POST-MORTEM RECORDS OF ST. GEORGE'S HOSPITAL, LONDON, 1841-1921

BY

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SOME few years ago I began to search the post-mortem records of St. George's Hospital to see if I could obtain any facts as to the numbers of those dying in a general hospital of metastatic deposits occurring after removal of an eye affected with malignant disease.