

in the course of some studies on the subject. In both of these, the available data are very meager, but the essential fact bearing on the question is clear: In neither case was there any doubt that the condition originated in Minnesota.

CASE 1.—A Minneapolis boy, aged 8 years, had been suffering from gastric trouble. On treatment, a specimen of *Dibothriocephalus*, 7 meters long, including the head, was expelled. It is preserved in the collection of the Department of Pathology of the University of Minnesota, under the number 0-17-404, but with only the significant note that the patient was born and had lived for all his life in Minnesota.

CASE 2.—A young Chippewa Indian child, on the White Earth Indian Reservation in Mahnom County, Minn., is the second case which has come to my attention and which is even more significant than the first. Here again many data which would be of value could not be obtained, but this much is known: The child had never been away from the reservation, but was infested by a *Dibothriocephalus*. On treatment more than 3 meters of proglottids were recovered. Unfortunately the head was not obtained, or at least was not preserved. The narrowest neck segments present measured 1.5 mm. in breadth. The eggs of the worm agree very well in measurement with those of the typical *Dibothriocephalus latus*, measuring from 65 to 70 microns by 50 to 55 microns.

Such information as is available regarding the first of these cases I owe to Dr. M. Barron of the Department of Pathology of the University of Minnesota, who treated the patient. That regarding the second case was obtained through the courtesy of Mr. P. A. Starr, teacher in the Indian School at Naytahwausch, who aided me in confirming reports and who put the specimen at my disposal. To each of these I wish to acknowledge my obligation.

An unfortunate misstatement of Nickerson's conclusions has gained wide currency, evidently due to errors in the reports by Singer<sup>4</sup> (who cites "Nichorson"), and of Kopelowitz,<sup>3</sup> 1916, who says:

Nichorson has frequently found the larvae of *Bothriocephalus latus* in fish caught in the Great Lakes.

In reality, Nickerson was very careful to avoid making this statement. He does state that:

Larvae of *Dibothriocephalus* do occur in American fishes. I have obtained them from fish caught in the Great Lakes; but without feeding experiments to rear the adult worm from the larvae, it is impossible to determine the species of *Dibothriocephalus* and the probability is in favor of such larvae being of some species other than *latus*—the parasite of man (italics mine).

Recently, Hall and Wigdor,<sup>5</sup> have described a bothriocephalid tapeworm from a dog at Detroit. Four specimens were collected. As they differ from *Dibothriocephalus latus* and from related species which have previously been reported from the dog, the writers regard the species as new, and propose for it the name of *Diphyllobothrium (Dibothriocephalus) americanum*.

Dr. W. L. Chandler, of the Michigan Agricultural College, has also collected a worm of this genus from a dog at East Lansing, Mich. The worm when found was not in condition for study, but careful measurements of eggs have shown that they average considerably smaller than those of *D. latus*, being about 62 by 37 microns, as compared with about 70 by 45 microns for the latter species. Unfortunately, none of

the strobilae of *D. americanum* had eggs present, and it is therefore impossible to state whether Chandler's specimen should be regarded as of this species.

Hall and Wigdor call attention to the fact that the bothriocephalid larvae, or plerocercoids, found by Nickerson in fish from the Great Lakes may have been the larvae of their dog tapeworm. "The idea is of interest, as bothriocephalids parasitic in man are commonly capable of parasitizing dogs, and vice versa. It may be, herefore, that fish caught in the Great Lakes and consumed here in Detroit, and elsewhere, are parasitized by a plerocercoid other than that of *D. latus* but possibly capable, nevertheless, of parasitizing man."

I have received a number of complaints of "wormy bass" and other fish in the lakes of northern Minnesota, and in several instances, physicians have stated that the parasites were tapeworms transmissible to man. This conclusion obviously was based on a knowledge of the life history of *Dibothriocephalus latus*, or of Nickerson's report. On investigation, it was found that the supposed tapeworms were larval trematodes encysted in the flesh of the fish. In the case of several small-mouthed black bass, taken from Bass Lake, Mahnom County, in early September, there were in the viscera numerous proteocephalid tapeworm larvae which have been identified by Dr. George R. La Rue, as those of *Proteocephalus ambloplitis* (Leidy).

However, the possibility that there may occur in this region bothriocephalid larvae other than those of *D. latus*, but equally capable of developing in the human host, is strong. Their development in the dog is suggestive, but the question as to their relation to man can be settled only by direct experimentation as opportunity offers.

# 1. CYSTICERCUS OF THE VITREOUS 2. CONGENITAL MULTIFOCAL CYSTS IN RELATION WITH THE RETINA 3. ANTERIOR LENTICONUS

## A CLINICAL COMMUNICATION \*

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## CYSTICERCUS OF THE VITREOUS

CASE 1.—History.—An unmarried woman, aged 19, born in Ireland, who had been a resident of the United States for thirty-four months, and whose family and personal medical history, so far as it was possible to obtain it, was unimportant, had always been a healthy girl, and with the exception of measles at the age of 14, had had no illness. Ten months prior to the examination she had noted blurred vision of the left eye. This gradually increased and was associated with the appearance of white, cloudy masses floating in front of the eye. At the expiration of five months they ceased to be apparent, and she was no longer able to distinguish even bright light.

4. Singer, J. J.: A Case of Bothriocephalus Latus Infection, J. A. M. A. 66: 1618-1619 (May 20) 1916.

5. Hall, M. C., and Wigdor, M.: A Bothriocephalid Tapeworm from the Dog in North America with Notes on Cestode Parasites of Dogs, J. A. Veter. M. A. 6: 355-362, 1918.

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**Ocular Examination** (July 14, 1918).—Vision of the right eye was 20/20; of the left eye, nil. The palpebral fissures were equal in width, the muscle rotations normal. The right pupil responded promptly to light and in accommodation, the media were clear, the disk slightly reddened in outline, and there was a slight pulsation of the inferior retinal vein. A single cilioretinal artery was noted on the temporal side. The general vascular system was normal and the refraction slightly hyperopic.

The pupil of the left eye dilated readily, and there were no gross changes in the iris; but in the lower portion of Descemet's membrane were a number of punctate deposits and two or three small dots on the anterior capsule of the lens, indicating previous points of adhesion between it and the margin of the iris. The vitreous was moderately cloudy, and there were a few fixed vitreous opacities in the anterior portion of this body. From the upper and inner quadrant a gray reflex was visible, indicating a choroidal infiltration, or perhaps a retinal detachment. Owing to the cloudiness of the vitreous directly in advance of this area, it was not possible to discern accurately, or focus on, any retinal vessel. The region of the disk was visible through the hazy vitreous, and its position could be differentiated by its color; but no vessels were distinguishable.

Quite anterior in the central field of the vitreous, and well in advance of the retina of the macular region, there was a large globular mass, light gray, with a slightly darkened center. The outline was regular and its border almost transparent. It was translucent toward the center, and it was from 6 to 7 disk diameters in width. From its lower border there protruded a tubular extension transversely wrinkled, which terminated beyond a slightly constricted neck into a head, on which two bright dots, and the position of the hooklets, could be distinguished. Distinct peristaltic movements of the cyst were visible and the movements of the protruded head, neck and body were often very active. At times the head was withdrawn within the sac, very much as might be the case with the head and neck of a diminutive turtle.

During a number of observations on the days following the discovery of the cysticercus, the conditions did not materially change, except that in various movements the observations could be improved. Thus, sometimes the head was situated directly downward, sometimes downward and forward, and sometimes more to the temporal side. Depending evidently on differences in the density of the vitreous opacities, the walls of the cyst, particularly those on the temporal side, were more clearly demonstrable. In short, the movements of the parasite, to use the language of Saltzmann, presented an everchanging and interesting spectacle. Naturally, the diagnosis of cysticercus of the vitreous was readily made.

**General and Laboratory Examinations.**—The patient was a well-nourished, rather pale girl, who in a few months prior to her examination had lost weight, and quite recently her appetite had been impaired and she had suffered somewhat from nausea. But the general examinations of the heart, lungs and abdominal viscera were negative, with the exception that one roentgenogram indicated a slight thickening in the region of the gallbladder. On repetition, however, of this examination, the roentgenologist was unprepared to say that this appearance was of pathologic significance. The urine showed no pathologic content; the blood count was, red blood corpuscles, 3,450,000; white blood cells, 5,000; the Wassermann test of the blood was negative. An examination of the stools revealed the presence of ova, but no segments of the worm. It was supposed that these ova were those of *Taenia saginata*, but, as is well known, the eggs of this tapeworm and those of *Taenia solium* so closely resemble each other that they cannot be distinguished microscopically, and the ophthalmoscopic appearance of the hooklets leave no doubt that the ocular intruder was *Cysticercus cellulosae* (Fig. 1).

**Operation.**—After keeping the patient under observation for two weeks, during which there was a manifest increase in the vitreous density and descemetitis, it was determined to operate, after the patient had been fully informed as to the chances of operative success and failure, and also fully

informed that if the parasite was not removed the eye was doomed to a destructive inflammation. The following operation was performed by Dr. Wiener:

An incision was made in the conjunctiva with scissors between the external and inferior rectus muscle, beyond the ciliary body and parallel with the corneal margin. Next, the sclera was incised longitudinally with a Graefe knife, the incision being 1 cm. in length, passing through the sclera, choroid and retina. At once fluid vitreous exuded. Guided by means of an electric ophthalmoscope, forceps were introduced into the opening and the cyst grasped and its removal attempted. This, however, was impossible owing to the fact that it promptly ruptured, and further efforts were not made. The wound was closed with conjunctival sutures and a dry dressing applied.

For three days there was no reaction, when pain developed in the eye, lasting for about an hour. A small point of adhesion to the iris and the lens in the upper and outer quadrant was discovered, but there was no ciliary injection. The lens, however, was quite milky in appearance. Convalescence proceeded uneventfully, and four days after operation the patient was discharged, the eye being free from irritation but the lens cataractous.

Twenty-eight days after operation, the eye suddenly became very painful, the conjunctiva was intensely congested, and there was marked ciliary injection, the iris being dull, dark, and slightly greenish in hue. The patient was advised to permit the enucleation of the eye, to which operation she consented. Following this operation there were no complications, and at the expiration of a proper period an artificial eye was adjusted, and it was noted that the patient's general condition began very rapidly to improve.

Dec. 11, 1918, or practically six weeks after the enucleation of the eye, the patient reported that a hemorrhage had occurred from the socket. She was immediately examined, and a clot of blood found at the apex of the orbit. This hemorrhage was coincident with a menstrual menses. About 1 ounce of blood was lost, but no further hemorrhage occurred. She gave the history that on one previous occasion menstruation had been associated with epistaxis. Since this date there has been no report of any complication.

According to H. B. Ward,<sup>1</sup> three different species of tapeworm larvae are known to occur in the eye and its adnexa, namely, those of *Taenia solium*, *Taenia echinococcus* and the bothriocephalid tapeworms. Of these, *Cysticercus cellulosae* is the most common.

Referring to the frequency of ocular, and especially of retinal and vitreous involvement, Vosgien's figures,<sup>2</sup> quoted by Ward, may be reproduced. Among 807 observations tabulated by Vosgien as recorded for a definite location, 372 were concerned with the eye, and of these, 120 of the retina and 112 of the vitreous. None the less, in individual experiences the cysticercus is not common. For example, in the often quoted figures of von Graefe, there were ninety cases in a total of 80,000 patients with eye diseases.

Extra-ocular cysticercus is of comparatively slight importance. The intra-ocular situation of the parasite may be in the anterior chamber, in the posterior chamber, even in the lens, but naturally, a cysticercus in the posterior segment of the eye, that is, under the retina and in the vitreous, is the one that presents the greatest clinical interest.

As Ward points out, the large number of cases in which this parasite has been found in the retina is noteworthy; moreover, such as are recorded as free in the vitreous body are in the majority of instances seen there after they have escaped from beneath the retina into the vitreous. Indeed, observers have main-

1. Ward, H. B.: Ocular Parasites, American Encyclopedia of Ophthalmology, 12: 9265, 1918.

2. Vosgien: Le cysticercus cellulosae chez l'homme et les animaux, Paris, 1911.

tained that the parasite always makes its first appearance behind the retina, the cysticercus having gained entrance into the vessels of the choroid, and from them has passed beneath the retina, which it detaches from the choroid. Von Graefe, however, was of the opinion that the parasite was able to develop floating in the vitreous, and Fuchs, as will be recalled, states that the cysticercus may find its way into a vessel of the retina or the ciliary body, from which position it may enter the vitreous directly without a preceding detachment of the retina.

The natural history, etiology and distribution of the tapeworm need not be discussed, as they have been dealt with fully in many articles. Among those easily accessible are the one by Saltzmann,<sup>3</sup> and in quite recent times the one by H. B. Ward,<sup>1</sup> already referred to.

Naturally, the lodgment of a *Cysticercus cellulosae*, which is the larval stage of *Taenia solium*, or pork tapeworm of man, can exist only where *Taenia solium* is found. At one time this was most frequent in northern Germany, but even here, owing to the improvement in meat inspection, etc., there has been a noticeable diminution of this form of tapeworm infection. So far as we are aware, *Taenia solium* has not been found in native Americans, but only in those who have emigrated to this country, and even so, it is very rare among them.

In general terms, the fertilized eggs of the adult tapeworm are distributed with the feces of the primary host. By some chance, for example, drinking contaminated water, eating vegetables which have been grown in land that has been fertilized with fresh manure, or dwelling in close community with persons who are suffering from tapeworm and whose habits are uncleanly, the infection is communicated, and the eggs reach the stomach of the new host, where they are hatched, and the embryo, reaching the intestinal canal, gains access to the surrounding tissues, where it may remain or be picked up by the lymph or blood circulation and sent to a distant portion of the body.

As has already been pointed out, the passage into the eye is most frequently through the vessels of the uveal tract, but the parasite may also reach the vitreous through a retinal vessel. After the embryo reaches its final destination, it develops into a bladder worm, which, if it is simple, is called a cysticercus, *Cysticercus cellulosae* being the bladder worm, or the larval stage of *Taenia solium*.

It is stated that it usually requires at least two months before the suckers and hooklets of the adult form are visible.

It is rare that an intestinal tapeworm and an ocular cysticercus are coincident, but such coincidence has been reported. It is also most unusual that more than one cysticercus shall be present in the eye; however, two in one eye have been reported by Alfred Graefe, and Schöbl observed three cysticeri in the same eye. In our patient, upward and inward there was what appeared to be a detachment of the retina. It is possible that this indicated the location of a subretinal cysticercus. Most unfortunately, the enucleated eyeball was mislaid or lost by some one in the personnel of the laboratory. Otherwise this point could have been decided, as well as a report of the pathologic histology of the globe included.

When Ward wrote his article on ocular parasites (it was published in 1918) four cases of cysticeri of the eye had been reported in the United States. Two of these presented only iris involvement, and two occupied the retinal-vitreous position.<sup>4</sup> It is possible that the cysticercus in our patient had been subretinal and

escaped into the vitreous; but certainly when under observation it was entirely free in the vitreous and well in advance of the central area of the retina.

Operative experience has taught that a subretinal cysticercus is most easily secured; next, one that is fixed in the vitreous; but the chances of success when the bladder worm is free in the vitreous are exceedingly slim. The last named condition was the case in our patient, who none the less was advised to submit to operative procedure, because in the absence of it the eye is practically sure to go on to a progressive iridocyclitis with destruction of the eyeball. Occasionally, however, cysti-

cerci may live in the eye from two to four years, and a few cases are on record in which the residence of the parasite within the globe occupied a much longer period of time.

#### CONGENITAL MULTILOCULAR CYSTS IN RELATION WITH THE RETINA

CASE 2.—A man from the Dental Corps, aged 22, was referred to the ophthalmic service because of defective vision of the left eye. There was no history of injury and no evidence of constitutional disease. This defective vision had existed from childhood, and at the time of examination vision equaled light perception. The media were clear, the disk was pale and sharply outlined, and to its outer side there was a small crescent of choroidal disturbance. The arteries were small and straight, the veins normal in size, color and outline. In the macular region a large, white, atrophic spot, slightly greater in diameter than the disk area, was visible. Protruding from the upper half of this area there was a large cyst formation, in shape somewhat resembling an observation balloon. Its summit was best studied with + 4.50 D. On the surface were a number of small vessels. It was transparent

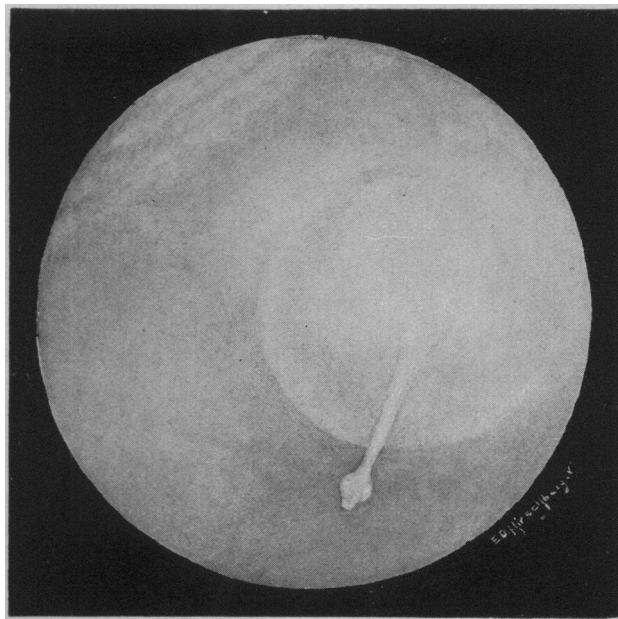


Fig. 1.—Cysticercus of the vitreous.

3. Saltzmann: The Entozoa of the Human Eye, System of Diseases of the Eye, edited by Norris and Oliver 4: 843, 1900.

4. Turnbull: Cincinnati M. News 9: 373, 1880. Miner: M. Rec., Dec. 26, 1884.



and it covered about three fourths of the atrophic macular area.

Extending from the lower temporal edge of this cyst for a distance of about 3 disk diameters there was a narrow, transparent tube carrying two atrophic vessels. This tube resembled in appearance and size a manifest canal of Cloquet. The canal terminated in a wide-spreading cyst mass, which was less transparent than the one in the macular area, and fully four times as large. It possessed the shape of a rounded cone, with the base gradually losing itself in the peripheral part of the temporal quadrant of the retina. On its superior surface there were numerous small cysts, or vesicles, and some which were confluent. The surface of the mass was covered with vessels, which were for the most part atrophic. In the lower quadrant of the field the retina was elevated 2 diopters.

The entire middle and lower field of the fundus was occupied by retinal pigment deposits, unassociated with any atrophic spots, with the exception of one to the nasal side of the inferior temporal artery, just below the disk, and two less pronounced ones still farther below. The vision of the right eye was 20/20, and the eyeground was entirely normal (Fig. 2).

The lesions portrayed in the accompanying water color are subject to several explanations, none of which is entirely satisfactory. That edema and degeneration may result in cysts or cystic spaces in the retina is well known, and such conditions have often been found in the examination of enucleated eyeballs, the so-called Iwanoff cysts back of the ora serrata being good examples. That retinal cysts form in association with separation of the retina of long standing is also well known, and it has been suggested by Leber that some of the cases of detachment of the retina clinically recorded were really instances of cystic degeneration. Derby,<sup>5</sup>

in reporting a probable cyst of the retina and noting that clinical observations in this regard are rare, refers to Gunn's case of congenital microphthalmos and cyst of the retina, to Collins' observation of a retinal cyst which was shown to have developed between the outer and inner nuclear layers, and to Thompson's description of a cystic detachment of the retina. One of us (de Schweinitz<sup>6</sup>) has recorded a cyst of the retina in association with detachment of the retina. It is interesting that in Derby's, Thompson's and de Schweinitz's cases the cysts partly overhung the disk. Incidentally, our case does not belong in this category.

Among the many anomalies of, and associated with, persistent hyaloid artery,<sup>7</sup> various types of cysts, small and large, have been reported. Rarely, the origin of

this vessel, instead of being the usual one, is from a point more or less distant from the optic disk. For instance, in Schöbl's<sup>8</sup> case it arose  $1\frac{1}{2}$  disk diameters down and in from the papilla as a translucent cone with a broad base, which suggests a cystic process, and proceeded from the apex in two strands, one of which ended in the posterior surface of the lens.

In Silcock's<sup>9</sup> case the source was from a macular coloboma, and the strand reached the posterior part of the lens.

Is it possible that the balloon-like cyst in our case, from which a cord carrying two vessels passed to the temporal portion of the retina, terminating in the large multilocular cystic area, may be an eccentric vestigial hyaloid vessel with a bulbous expansion at its origin, bent over and twisted away from an approach to the posterior surface of the lens, to be fastened as is portrayed in the illustration? Choroiditis, such as we observed, probably congenital, has been reported in a

number of examples of persistent hyaloid artery and its anomalies. We frankly think this theory of the appearances in our patient's eye has little if anything to commend it, but it is mentioned because of the numerous anomalies that have been reported in connection with the remnants of a hyaloid vessel and its sheath.

Doubtless the whole process is best explained by assuming that in intra-uterine life there developed some type of hemorrhagic retinochoroiditis, and that cystic changes occurred in the secondary exudative processes. There seems no doubt that the balloon-shaped mass is a cyst, and the large area in the temporal periphery of the retina almost certainly represents a mass

of exudation which elevates the retina (it may have started in the choroid) and in this elevated retina multilocular cysts have developed. What the nature of the underlying mass is we do not pretend to state, although in this connection it may be worth while to refer to a case observed and reported by de Schweinitz and Shumway<sup>10</sup> which ophthalmoscopically suggested a new growth, a glioma, indeed, but on examination proved to be a detachment of the retina, with extensive dropsical cystic degeneration of the rod and cone visual cells. It may be that the large area in the temporal part of the retina should be classified as an example, in limited space, of exudative retinitis, as described especially by Coats, with cystlike changes on its surface.

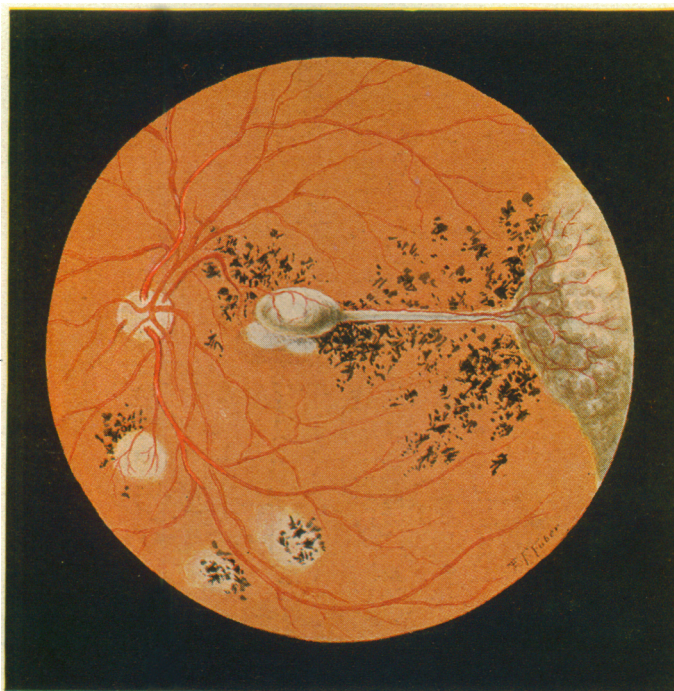


Fig. 2.—Congenital multilocular cysts in relation with the retina, and associated with quiescent pigmentary retino-choroiditis.

5. Derby: Tr. Am. Ophth. Soc. 12: 827, 1909, 1911.

6. De Schweinitz, G. E.: Diseases of the Eye, Ed. 8. This case was also reported in the Ophthalmic Section of the College of Physicians, Philadelphia, but the report was not published.

7. De Beck: Persistent Remnants of the Fetal Hyaloid Artery, Press of Robert Clarke & Co., Cincinnati, 1890.

8. Schöbl: System of Diseases of the Eye, edited by Norris and Oliver, 3: 422, 1898, Plate IV.

9. Silcock: Tr. Ophth. Soc. U. K. 20: 188, 1900.

10. De Schweinitz and Shumway: Dropsical Degeneration of the Rod and Cone Visual Cells of the Retina which Clinically Simulated Glioma, Am. J. M. Sc., December, 1901.

## ANTERIOR LENTICONUS

CASE 3.—A recruit, aged 20, was referred by the camp infirmary for examination because of defective vision which had existed from infancy. It was possible to see him only once. Vision, right eye was 8/200; left eye, 10/200. It was not possible in the brief time at the disposal of the examiners to ascertain whether any spheric or cylindric combination could improve vision. Each lens presented a pronounced anterior cone, which could readily be seen by ordinary daylight, looking through the anterior chamber, especially from the side, and also when the pupils were dilated. During this dilatation it was noted that the lenses were small and slightly hazy, except in the region of the zonula. Fundus examination by the indirect method detected no abnormality. The tip of each cone almost touched the posterior layer of cornea (Fig. 3).

So far as we are aware, only two cases of anterior lenticonus have been reported, one by Webster,<sup>11</sup> in which the conicity resembled that of a conical cornea. Without atropin, the following lenses raised the vision, which was 15/200, to 20/200, namely,

$$\begin{array}{l} \text{O. D.} - \frac{1}{11\frac{1}{2}} \\ \text{O. S.} - \frac{1}{2} \text{ C} - 1/10 \text{ c. axis } 135 \end{array}$$

After atropin, the vision of each eye was 20/40, the right eye accepting a  $+ \frac{1}{10}$  and the left eye a  $+ \frac{1}{10} \text{ C} + \frac{1}{24} \text{ c. axis } 135$ .

The second case is the one recorded by Van der Laan<sup>12</sup> under the name anterior polar crystal-conus; the patient, a man aged 23, the anomaly being said to have developed slowly during eight years. There was a conical protuberance of the lens into the anterior chamber, occasioning through its center a high grade myopia, while through the periphery of the lens the refraction was hyperopic. The cone is said not to have differed in any way from the ordinary lens substance.

Neither of these reporters, in the abstracts which we have been able to consult, undertakes to give any explanation of this lenticular anomaly. As is well known, examinations of posterior lenticonus have usually demonstrated a rupture of the posterior capsule, and certainly displacement backward of the nucleus is a constant feature. Both of these observations of anterior lenticonus antedate the discovery of posterior lenticonus, first made in a human being by F. Meyer in 1888. Referring to this fact, Louis Dor<sup>13</sup> suggests that there may have been an error in observation, the reporters having been deceived by reflections, whereby they mistook a posterior conicity for an anterior lenticonus. Dr. Wiener, who examined the patient whose brief clinical history has just been reported, is confident that the conicity was an anterior one, as stated, so pronounced that it projected almost to the posterior surface of the cornea.

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11. Webster: Arch. f. Augenh. 4: 262.

12. Van der Laan: Jahresh. f. Ophth. 11: 369, 1880.

13. Dor, Louis, in Encyclopedie française d'ophtalmologie 7: 23, 1908.

## ABSTRACT OF DISCUSSION

DR. F. H. VERHOEFF, Boston: I have seen only one certain case of intra-ocular cysticercus. Since my opportunity for seeing rare cases has been unusually great, the condition must be extremely rare, at least in the vicinity of Boston. This case was shown to me by Dr. Greenwood. The cyst was remarkably similar in size and situation to that described by the essayists. Microscopically, I have examined two cases. A specimen from one of these, a case of preretinal cysticercus, was sent to me several years ago by Professor Fuchs. The other case occurred in the practice of Dr. Marlow who removed the eye and submitted it to me for examination. This cyst was entirely subretinal, and occurring in a child, led Dr. Marlow naturally enough to make the diagnosis of glioma retinae. In each of these cases the cyst was ruptured and a marked chronic inflammatory reaction of essentially the same character had been set up. There was complete separation of the retina with formation of cyclitic membranes and formation of cicatricial tissue on the inner surface of the retina. Surrounding the cysts the infiltrates and exudates consisted chiefly of plasma cells, eosinophils, and endothelial phagocytes. Pus cells were notably scanty.

In Fuchs' case there was a layer of fused endothelial leukocytes lining the external wall of the cyst. In my case the choroid was markedly infiltrated with plasma cells and eosinophils, but in Fuchs' case it was almost free from infiltration, due no doubt to the fact that the cyst was preretinal. From these cases I should judge that it is the content of the cysts that causes the inflammatory reaction, and this fact no doubt explains the reaction which followed the operative interference in the essayists' case. In regard to the case of retinal cysts reported by the essayists, I may say that I have never seen a similar case. In fact, so far as I can recall, the only case of retinal cysts that I have seen clinically was that reported by Dr. Derby and referred to by the essayists. I have frequently found retinal cysts, however, in eyes that have been removed for chronic inflammatory conditions associated with separation of the retina. These cysts seem always to be due to splitting of the retina in the layer of Henley, that is, to separation of the neuro-epithelium of the retina from the nervous portion, and are thus in a way, analogous to vesicles of the cornea or skin.

I found them once in a case of glaucoma secondary to contusion of the eye. This case was so unusual that I am passing around a section from it. The essayists offer several possible explanations for the cysts in their case, but state that none is satisfactory. The explanation, however, that they consider the least satisfactory appeals to me the most strongly; namely, that the cysts have resulted from a partial persistence of the hyaloid system associated with an abnormal development of embryonic tissue. Their suggestion that the case is in any way related to retinitis with massive exudation seems to me improbable.

As to the case of anterior lenticonus: I recall seeing a similar case about fifteen year ago, but I am unable to find the record of it. The essayists wisely refrain from attempting an explanation of this condition about which so little is known, but in a discussion such caution does not seem to be considered necessary, so that I venture to suggest two possibilities, first, that the condition is due to persistence of the conical shape of the embryonic lens vesicle, or second, that it is due to delayed separation of the lens from the cornea.

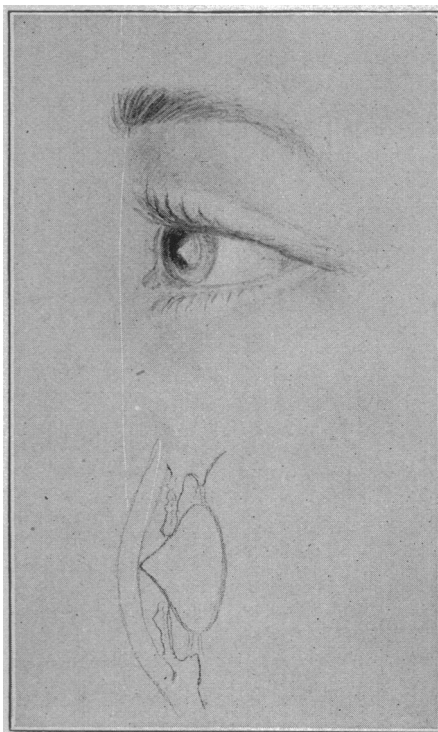


Fig. 3.—Anterior lenticonus.

DR. ALEXANDER DUANE, New York: Apart from the very rare cases of extreme anterior lenticonus, such as the authors have described, we occasionally see cases in which the condition exists to a moderate degree, not incompatible with fair sight. I can recall two such cases of moderate, progressive anterior lenticonus, both observed in women between 20 and 30 years of age. In both there was well marked, somewhat irregular corneal astigmatism with the rule and a total astigmatism against the rule, the latter increasing in the one case from 2.50 D to 6 D in nine years, and in the other from 4 D to 7 D in over three years. In both the ophthalmoscope showed the characteristic, small central area of metamorphopsia, shifting with movements of the eye more rapidly than the corneal reflex. In both fairly good and serviceable vision was secured by cylindrical glasses. In both also the condition was more marked in the right eye. Somewhat analogous to the congenital cyst noted by the authors was the peculiar condition I have elsewhere described, in which there was an egg shaped pigment bordered coloboma of the choroid, to one margin of which was attached by threads resembling the byssus of a mussel a slender and elongated, very delicate and transparent, apparently tubular bag, which, running straight up in the vitreous, lay parallel to the retina and about 1 mm. in front of it. At its upper end this structure tapered off into a point, to which was attached a hook-like appendage. This peculiar body differed entirely in appearance, situation, and direction from a persistent hyaloid artery, nor was it in any way like a retinitis proliferans. It remained unchanged all the time the patient was under observation (eight years). The only other fundus change was a faint, striate atrophy in the region of the macula, causing a central scotoma, which reduced the vision of 17/100. It is, perhaps, a fact of some interest that this patient was rejected for life insurance, because the examining physician had taken his coloboma of the choroid for an albuminuric retinitis. Perhaps also cystic was the condition which I have reported as occurring in a child, whose eyes, otherwise normal in appearance, showed shrunken, rudimentary optic discs, practically complete absence of the retinal vessels, and at each macula a sharp-cut round ring, which I took to be the base of a translucent protrusion of the retina, although I could not actually demonstrate this, since there were no vessels or markings, on which the presence of retinal structure over the area circumscribed by the ring could be predicated.

DR. ALLEN GREENWOOD, Boston: Dr. Verhoeff has asked me to discuss briefly the case he mentions, a case which was observed early, due to the fact that the cyst was between the macula and the disk, and when first seen appeared to be the size of a grain of rice, and about that shape. It was nearly round when I saw it. It projected only one or two diopters, and two or three days later it was down below the level of the macula, and later it crept up and covered the entire optic disk. It increased in size until it was about one and one half times the size of the disk, and protruded 5 D. It was easy to see that the eye would be lost by the growth of this cysticercus. Those of you who have tried to pick anything off the optic disk with a pair of forceps in one hand and an ophthalmoscope in the other can realize the difficulty—I had a pair of double reverse action forceps, where one blade revolves in the other. By making an incision between the external and the interior rectus, I brought the tip of the forceps to a level with the cyst and saw that the blades were each side of it, then I closed the forceps and removed the top of the cyst. Immediately the forceps were closed the fluid flowed into the vitreous and I got only the top part of the cyst itself. It required two operations for in the first one the vitreous clouded from hemorrhage. I made the puncture with a Graefe knife, but on account of the hemorrhage I had to wait two days before operating a second time. The patient was fine for about a month, could see finger movements, and the interior of the eye was clearing when she had an intra-ocular hemorrhage, pain for two or three days, the lens pushed forward, the anterior chamber was shallow, and the lens became opaque. The eye quieted down and remains as good as an artificial eye.

This is the only case of cysticercus I have ever seen.

DR. A. E. DAVIS, New York: I wish to report briefly a case which came under my own care. I kept this gentleman, aged 57, under observation for a number of years. He died recently. He suffered from migraine, and always had poor vision. The ophthalmometer showed astigmatism with the rule 2 D axis 90 plus 180—right eye, with the rule 2 D axis 75 plus 180—left eye. The patient, however, accepted a strong cylindric glass against the rule, as follows:

R. V.=20/200 : 20/50 w-5 D=-2.50 cyl. 90° L V.=20/200 :  
20/30 w-1 D=-3 C 75°  
Reads Jaeger 1 from 9" to 15" w-1 D=-2.50 cyl. 90° Rt.  
plus 3 cyl. 165° left.

Because of the great discrepancy between the astigmatism, as indicated by the ophthalmometer, and that found on subjective examination, some trouble with the lens was suspected, an incipient cataract, perhaps. On examination with the ophthalmoscope, no opacity of the lens whatever was found, but a transparent protuberance of a conical shape on the front surface of the lens of each eye. The corneas were perfectly clear, except for a very minute opacity just to the outer side of the center of the left. The shadows reflected from the pupil resembled in a marked degree the shadow-crescents seen in conical cornea.

DR. S. D. RISLEY, Philadelphia: Simply as a matter of historical interest I thought this might go on record in the transactions of this section: While making some historical studies last year, I took pains to go over the printed book in which the cases reported had been kept by the secretary of the Philadelphia Ophthalmological Society, which was founded in 1871, and lived three years. During that time a general surgeon, Dr. Richard Levis, presented to the society a case in which the cysticercus in great abundance was found in the orbit under the internal rectus muscle.

DR. GEORGE E. DE SCHWEINITZ, Philadelphia: Operative success in intra-ocular cysticercus depends largely on the position of the parasite; success has most often been obtained where it was subretinal. If free in the vitreous the effort to secure the parasite is most difficult.

DR. MEYER WIENER, St. Louis: I had no difficulty in putting the forceps around the part of the cysticercus which I desired to grasp. I could see it very plainly, and see the forceps passing around the cyst. I had no hemorrhage, but when I closed the forceps and tried to withdraw it, it was the same sensation as if you took a pair of forceps and tried to pick up a piece of jelly. It closed over the cyst but there was nothing there between the points of the forceps.

**Vaccination Against Typhoid in Spain.**—Professor Peset, director of the Instituto Provincial de Higiene at Valencia, delivered by request last December an address on this subject at the Paris Faculté de médecine. His figures show that active work has been done in this line in military and civilian circles in Spain and fine results accomplished. In the army at Tetuan in 1914, for example, there were no deaths from typhoid among the 12,000 vaccinated and only 2.61 per thousand cases developed. He relates a number of striking instances showing the protection conferred by the vaccination; the one or two persons in large families who refused vaccination were the only ones who contracted typhoid during an epidemic, notwithstanding that there was no isolation, one of the vaccinated even sleeping with the typhoid patient. At Cheste, there was not a case of typhoid among the 1,200 vaccinated while there were 171 cases among the 4,800 non-vaccinated. Similar figures are cited from the epidemic at Moguer in 1915, no cases of typhoid among the 363 vaccinated and 300 cases among the 7,631 nonvaccinated. Also from the epidemic at Torrente in 1917, no cases of typhoid among the 3,330 vaccinated and 407 among the 5,011 nonvaccinated. During 1918 vaccination of the members of the family whenever a case of typhoid developed at any point arrested the infection before it had a chance to assume epidemic form. Various types of vaccine are used. His address is reproduced in full in the *Laboratorio* of Barcelona 3:97 (March) 1919.