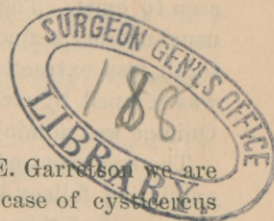


ON CYSTICERCUS CELLULOSÆ.

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THROUGH the courtesy of our friend Dr. J. E. Garrison we are enabled to present the notes of an interesting case of cysticercus within the human eye, concerning which rare lesion a few remarks we trust will be pertinent.

"History of case. Patient, J. J. Andrews, of Philadelphia, aged 55. Temperament, sanguine; health, vigorous; occupation, merchant. When a boy, the patient was struck upon the eye (in which was found the hydatid) by a basket in the hands of a playmate. As an immediate result of this accident great inflammation ensued in the injured organ, which, after a lengthy resistance to the means of cure employed, finally yielded, becoming as comfortable as before the blow. In early manhood the lens of this eye began to grow cataractous, the opacity progressing rapidly to complete monocular blindness.

Twenty years now passed, the patient finding satisfaction in an increased sight residing in the well eye. To use his own expression, 'this well eye had taken on itself the office of the sick one.'

Five years and a half ago another change occurred. Without explainable cause the cataractous eye became the seat of paroxysmal pains, recurring with a frequency and regularity suggestive of malarial influence. A peculiarity of diagnostic signification in connection with these pains lay in a gradually increasing intensity characterizing them. The cause, whatever it might prove to be, was evidently of a growing nature, and as a culmination of this intense pain the patient became conscious of blows struck on the inside of the eye, the sensation being described as 'hammer strokes.'

A marked feature associated with the painful paroxysms was vascular engorgement. In ten minutes from the striking of a blow the conjunctiva would congest to a condition of chemosis. Lachrymation was unusually profuse. The paroxysms (and the pain was described as excruciating) were about bi-weekly. The palpebral conjunctiva was somewhat granular.

Search after a Diagnosis.—The granulated lids, a bad tooth, and the periodicity characterizing the attacks were features attracting attention. As negatives, there was absence of all external glaucomatous expression. No history of specific or other peculiar disease. No neuralgic tendencies.

Treatment was commenced with reference to the derangements seen to exist. The granulated lids were given attention after the usual manner, a zinc and alum solution being combined. The affected tooth was extracted, while its alveolus, which was found carious, was scraped by means of a burr revolved by the surgical engine. Quinine was administered in consideration of the periodicity.

The treatment adopted meeting with no satisfactory result, thus exhibiting fallacy in inference, the search after cause was renewed. In pursuit of this search attempt was made by means of atropia to produce such dilatation of the pupil as should expose the whole circumference of the crystalline lens; this dilatation was found exceedingly difficult to secure, the iris being almost entirely wanting in response.

For three days a strong solution of atropia was used; on the third the iris had fully dilated. The patient, thus presenting, was subjected to an ophthalmoscopic examination; the illumination revealing the fundus of a sac existing in the posterior chamber. The cyst, or whatever it might prove to be, was evidently united to the ciliary margin. The sight obtained at this view was too indistinct to suggest thought of a cysticercus. The atropia being continued, a succeeding visit, made on the following day, revealed the secret of the diagnosis.

A balloon-shaped body was now plainly to be seen, in the act, evidently, of detaching itself from a part to which it had been adherent. The next day the detachment was complete, the parasite floating free in the aqueous humor.

To illustrate the movement of the animal, reference may be made to a balloon. A cysticercus is in form a miniature balloon, the head of the parasite, which is the dependent part, bears close likeness, when extended, to the basket.

To imagine a floating and swaying balloon suddenly drawing into its interior, and as suddenly throwing out its basket, is to secure the fullest notion of the action of the hydatid.

For a whole week the act of floating was continued in the posterior chamber. At one time the animal would be in full view; at another he would have retired within his sac, and be lost to view behind the iris. At no time did the parasite come through the pupil into the anterior chamber.

On the ninth day of observation, the head of the cysticercus was found fixed to the centre of the capsule of the crystalline lens, into which it seemed to be trying to force a way. This attachment continued unchanged until the hour of operation, three days later.

A diagnosis established, removal of the parasite was affected by the performance of Graefe's method for extraction of the lens."

The parasite lived for some time, after being placed in a warm saline solution. Macroscopically the animal presented its characteristic appearances, and subsequently, microscopically, the suckers and hooklets were plainly discernible.

The description quoted has been copied verbatim from Dr. Garretson's account, because of its peculiar clinical value, describing as it does most vividly "the search after a diagnosis," and as giving also the "fullest notion of the actions of the hydatid."

As the subject under consideration is one of unusual interest, we have thought it best to include a brief and concise account of the method of development of the cysticercus cellulosa or larval tapeworm from the eggs of the tænia solium or parent tapeworm. Its novel course of life and travel, *i. e.*, from one individual to another, and unique method of propagation must be thoroughly understood before the significance of this peculiar lesion can be appreciated.

The entozoon under consideration is the larval form of what is known as the Tænia Solium or tapeworm.

It was known in the very earliest times, and was described by Plater¹ in 1602. Göze² first recognized its animal nature in 1784, Werner³ found it in man in 1786, and Küchenmeister was the first who showed it to be the larval condition of the tænia solium.

The cysticercus cellulosa is, as its name implies, a bag-tailed entozoon of the cellular tissue. It has its origin in the inter-muscular connective tissue of the "measly pig," the uncooked meat of which contains the embryos. People become measly, then, not directly from eating "measly pork," as we even now sometimes read, but by the circuitous mode of the tapeworm developing in the intestine.

The person infected may derive the mature eggs of the tænia solium from his own intestine or from the tapeworm of some other individual. The former—self infection—may occur in two ways, mature eggs either free or accompanying the detached and expelled joints of a tapeworm may be taken into the mouth and swallowed, or mature egg containing segments may, by vomiting, be regurgitated into the

¹ Ziemssen, vol. vii. p. 686.

² Göze, "Neuste entdeckung, das die Finnen im Schweinefleisch keine drusen krankheit, sondern Blasenwürmer, sind." Halle, 1784.

³ Werner, Verm. intest, brev. expositions cont. II., Lips. 1786.

stomach. In the second way by food or through the use of cooking utensils.

The ways and means by which tapeworms are acquired may in a general way be deduced from a consideration of their development. The habit, or rather the bad habit, says Ziemssen,¹ of using meat imperfectly cooked or quite raw, which is becoming every day more common, is extremely favorable to the propagation of tapeworms or the development of their embryos (*cysticercus cellulosa*).

Butchers, bakers, and cooks who harbor tapeworms are, in consequence of their occupations, especially likely, from lack of cleanliness, to infect the food supplied or prepared by them, and in this way bring about the measly infection. Every person affected with tapeworm, not only carries with him danger, but is constantly threatening the health of his neighbors.

Concerning prophylaxis we would here reiterate the advice Ziemssen² gives upon this important subject. "With regard to swine, the idea that they thrive better amid filth must be looked upon as a prejudice that is no longer entertained by skilled agriculturists. The habit that still prevails in some farm-yards of intentionally giving the animals access to the excrement of human beings, should at once be put a stop to as thoroughly worthy of reprobation, and pigs should be so inclosed as to be unable to wallow about in the dung heap and other filth. Though the ruminants have no such filthy propensities, still they too should be shut out from access to human excrement. With this object, the barbarous custom of defecating in every place promiscuously, should be put down with a high hand."

Tania solium, or tapeworm, is found in the small intestines of man. The head is usually fastened to the mucous membrane of the intestine in its upper third. Up to the present time tapeworm has only been found in man, and seems peculiar to him. It is very frequent in Europe and America. In Europe, the middle of Germany is remarkable for being the land where it is most widely diffused.

The tapeworm must be looked upon as a colony of animals having an alternation of generation. The so-called head is the larva-like nurse; the segments of the worm—the proglottides—are the animals with sexual organs. From the head (scolex), without any mingling of the sexes, are produced these segments by a process of budding. These segments (animals) are hermaphroditic and generate eggs, in which a six-hooked embryo becomes developed. If these segments find entry into the stomach of a suitable animal, their envelopes become softened or undone, and the eggs are set free. Once hatched,

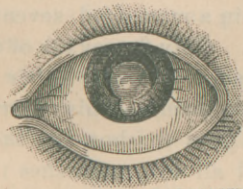
¹ Ziemssen, vol. iii.

² Ziemssen, vol. viii.

the embryos are set free, and boring their way through the walls of the stomach, disseminate themselves throughout an animal's body. In the course of its boring, an embryo now and then penetrates the walls of a bloodvessel, and is whisked away to some remote portion of the body; *i. e.*, the head or the extremities. There it continues to grow; and, living a prescribed life, becomes encysted, shrivels, or undergoes calcareous degeneration; or, if superficial, may be discharged by abscess formation. It is no difficult matter, therefore, to understand, and account for, the appearance of a cysticercus (measle) within or about the eye of an infected animal.

Cysticerci have been found, we might say, in all parts of the body. Deloré and Bonhomme¹ found 3000 in one individual, of which number one was found in the heart, pancreas, and medulla oblongata, four in the cerebellum, seven in the parotid gland, sixteen in the lungs, twenty-two in the meninges, eighty-four in the brain, and myriads in the mesentery and cellular connective tissue. Leuckart² found them in the blood of the portal vein, and the liver is oftenest the seat of these larvæ. They have, also, been found in the domesticated deer and polar bear, dog and rat.

The cysticercus cellulosa is a thin-walled vesicle with limpid contents, seldom exceeding the size of a pea or bean. This vesicle has an irregularly wavy surface. It is usually surrounded by a capsule of connective tissue, to the inner surface of which it is closely applied. Inside of the cyst and visible through it, is a firm, round, whitish body, which is connected with the depression in the wall of the cyst. On opening the cyst this body is found to be a pear-shaped sac. Inside this sac is the head of the cysticercus, turned inside out like the finger of a glove. The head resembles, in every way, the head of the *tænia solium* (tapeworm).



The accompanying cut representing a living cysticercus³ in the anterior chamber of the human eye, is taken from Graefe's Archives

¹ Archiv. Gén. 1865, i. p. 355.

² Menschlichen Parasiten, i. p. 199.

³ This parasite Von Graefe removed alive through a corneal section with subsequent complete restoration of sight.

of Ophthalmology,¹ and is of peculiar value, being, doubtless, a facsimile of one prepared under the direct supervision of the great Von Graefe himself.

Since Von Graefe and Liebreich made the first exact observations upon this subject the number of cases has greatly increased. The first case of this rare lesion was one in which a cysticercus cellulosa (lebender Finnenwurm) was discovered in 1829 by Sömmering,² in the anterior chamber of the eye of a healthy girl eighteen years of age. The parasite floated free in the anterior chamber, now and then took hold of the iris and by its motions caused intense pain. It was removed alive by Dr. Schott, through a corneal incision, and subsequently lived in warm water for half an hour. It has also been found by Logan in anterior chamber, Mackenzie, 1832; under the conjunctiva by Baum, 1838; under the epithelium of the cornea by Cunier, 1841; under the skin of the eyelid by Sichel, 1847; twice in anterior chamber, under the skin of the eyelid, and under the ocular conjunctiva, Mackenzie, 1848; ophthalmoscopically, in the posterior half of the eye, Von Graefe, 1853;³ in the orbit, Von Graefe, 1863; in the lens, Von Graefe, 1864.

The late Albrecht Von Graefe⁴ in a practice of thirteen years, saw about 80,000 eye patients, out of which there were 81 cases of cysticercus, within or about the eye; that is, about one in a thousand cases. Out of this number it occurred three times in the anterior chamber, five times under the conjunctiva, once in the lens, and once in the orbit, whilst the greatest number were found situated in the posterior portion of the eyeball, *i. e.*, retinal or sub-retinal, and generally escaping into the vitreous. Virchow, up to 1866, had seen it in the brain in two per cent. of all the post mortems made in Berlin. The youngest individual affected was eight years of age. Ninety per cent. were between 15 and 55 years, and it occurred only once under the retina in a man aged seventy. Two-thirds of the cases occurred in males. Only five or six of the patients previously had tapeworm, while very frequently other inmates of the house were giving lodgment to them. (This observation is of more than usual significance, as it goes to show the thoroughness with which Von Graefe prosecuted all his researches.) In South Germany, Switzerland, and France, cysticerci are rare. Among 61,000 eye patients whom Graefe⁵ in Halle saw up to 1878, he had seen but two

¹ Graefe's "Archiv für Ophthalmologie," Ester Band, Berlin, 1854.

² Ammon's Zeitschrift für die Ophthalmol.

³ Archiv für Oph., Bd. i. Abth. i. p. 457.

⁴ Archiv für Oph., Bd. xii. Abth. ii. p. 174.

⁵ Archiv für Ophthalmologie, Bd. xxiv. Abth. i. p. 209.

cases of cysticerci, and these were in the anterior chamber; one was in the eye of a child four years of age (this fact is worthy of note as the youngest subject, mentioned by Von Graefe, was eight years of age). In other parts of the eye he had seen it four or five times annually. Intra-ocular cysticercus occurs at Lisbon (Fouseca, Jr.) only in the proportion of one in two thousand eye patients. The reason of cysticercus being so rarely found in the *anterior* portion of the eye, is because of the smallness of the arteries in that locality.

Leibreich¹ extracted a cysticercus by means of a canula-forceps through a scleral incision, aided by an ophthalmoscope attached to his head, so that he was able to illuminate and observe both parasite and instrument. He mentions that the base of the neck of the parasite, which is less transparent than the rest of its structure, and is dotted with fine white calcareous particles, is the part that is most resistant, and that affords the most secure hold for the forceps. Hirschler² reports a case which is identical with that of Dr. Garretson, and many more interesting cases of intra-ocular cysticerci are reported throughout Graefe's Archives.

The methods of operation for the removal of intra-ocular cysticerci are numerous and varied, and inasmuch as the several conditions in each case suggest the adoption of a particular plan of removal, it will be unnecessary to consider or discuss them in this connection.

Von Graefe decided that in the majority of cases of cysticercus, in the posterior half of the eye, phthisis of the globe was the usual sequence, although he³ successfully removed a living cysticercus from the vitreous, through a corneal section as early as 1858.⁴ Lawson⁵ mentions, without giving particulars, a similar case recorded by Mr. J. Pridgin Peale. Dr. D. S. Reynolds,⁶ of Louisville, published in June, 1874, "A case of cysticercus in the pupillary edge of the iris," of which he says "there was great pain and tenderness of the eyeball with a low degree of iritis. The pupil opened well under the influence of atropia, except at the inferior and external portion, where there was a white, opaque, pear-shaped tumor, the small end of which rested upon and was adherent to the capsule of

¹ Graefe's Archiv für Ophthalmologie, Bd. ii. Abth. i. p. 256.

² Archiv für Oph., Bd. iv. Abth. ii. p. 14.

³ Archiv für Oph., Bd. iv.

⁴ Dr. T. G. Morton, at a meeting of the Phila. Ophth. Society in 1870, exhibited a case of (dead) intra-ocular cysticercus, in a patient in whom both the late Dr. Gescheidt, of N. Y., and himself had previously seen the entozoon alive and in motion.

⁵ Diseases and Injuries of the Eye, London, 1874.

⁶ American Practitioner, June, 1874.

the lens. A portion of the iris containing the cyst was removed. The cyst itself was so firmly adherent to the lens capsule that it was necessary to seize it with a pair of forceps, and by careful traction, made in the same plane with the lens surface, to detach and remove it; and was successful in so doing, without rupturing the capsule of the crystalline. The cyst when placed under the microscope showed three suckers and a beautiful circlet of hooklets." Vision rapidly improved.

Dr. Chas. J. Kipp, of Newark, New Jersey, presented at the International Ophthalmological Congress, in 1876, a case of cysticercus extracted from the ocular conjunctiva.

"At a meeting of the Atlanta Academy of Medicine, in March, 1878, a case of intra-ocular cysticercus was reported by Dr. Calhoun. In this case, on account of the patient's unwillingness and the general bad results of the operation, no interference with the entozoon had been attempted."¹

For those who wish to investigate the subject of human and comparative helminthology, we would cordially recommend Dr. Cobbold's new "Treatise on the Entozoa, etc." The part of the book which treats of tapeworms will be found especially useful to students of sanitary science. To Dr. Cobbold we owe the knowledge which puts thus tersely the fact, that "all kinds of tapeworm larvæ, measles, bladder worms, etc., have a natural life epoch assigned to them."²

He, however, reminds us, while speaking of *tænia solium*, of the danger of handling fresh tapeworms, as we might get their eggs under our nails or on our clothes, and so swallow them. We are also reminded of the danger of eating salads which may have been manured with nightsoil containing, it may be, myriads of tapeworms' eggs.

For an account of the experiments of Pelizzari, Tommasi, Perroncito, and Giacomini, we must refer to the book itself; it will suffice to say that they in no way contravene the experiments of Lewis, who proved that a temperature of 140° Fahrenheit was sufficient to destroy the vitality of cysticerci of all kinds.

¹ Medical and Surgical Reporter, Philada., June, 1879.

² "A Treatise on the Entozoa of Man and Animals, including some account of the Ectozoa." T. S. Cobbold, M.D., F.R.S., F.L.S., etc., London, 1879.