

An account of hydatids found in the omentum of an axis deer : with observations on their pathological changes : illustrated by an engraving / by John Houston, M.D.

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Publication/Creation

Dublin : Hodges and Smith, 1835.

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With Dr Houston's kind regard
AN ACCOUNT

11

OF

HYDATIDS

FOUND IN

THE OMENTUM OF AN AXIS DEER;

WITH

OBSERVATIONS

ON

THEIR PATHOLOGICAL CHANGES:

ILLUSTRATED BY AN ENGRAVING.

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FROM THE DUBLIN MEDICAL AND CHEMICAL JOURNAL, FOR NOV. 1835.

READ BEFORE THE MEDICAL SECTION OF THE BRITISH ASSOCIATION AT DUBLIN.

DUBLIN:

HODGES AND SMITH, COLLEGE-GREEN.

MDCCC.XXXV.

AN ACCOUNT OF HYDATIDS,

&c. &c.

THE great interest which has of late years attached to investigations respecting parasitical animals, encourages me in bringing forward some observations on a variety of hydatid termed *cysticercus tenuicollis*, found by me in the omentum of an *Axis Deer*, which died in the Zoological Gardens at Dublin.*

On opening the abdomen of the animal, bunches of soft tumours presented themselves, hanging pendulous from the omentum. Similar tumours were found, after a little farther search, in the folds of peritoneum attaching the spleen to the stomach, and also about the ligaments of the bladder; but none such existed in connexion with those parts of the membrane forming the mesentery, or those covering directly any of the viscera in the cavity; neither were any such discoverable in the parenchymatous structure of these viscera. The tumours were of various sizes, from a pea to an orange, and somewhat flattened. They were all located in loose folds of peritoneum formed by the apposition of two layers, and exhibited different degrees of suspension. Some hung down by narrow pedunculated necks; some were held loosely in their places by broad points of attach-

* The animal died of disease of the lungs. These organs were universally studded with tubercles of various sizes, filled with soft curdy matter, which escaped readily under pressure, leaving behind, smooth, vascular cysts. The lungs appear to have become incapable of supporting life from the enormous accumulation of small tubercles, and not, as occurs generally in the human body, from the coalition of those morbid growths, and their conversion into large suppurating cavities. In some places recent adhesions had cemented the surface of the lungs to the pleura parietalis. The commencement of the disease in the lungs was, I am disposed to think, of a more recent date than that at which the hydatids made their first appearance in the omentum; and most probably the two affections were altogether independent of each other, both in cause and effect.

ment; and others were so disposed as merely to exhibit a projection equally obvious on both surfaces of the omentum. In general, however, they were more prominent on that surface looking forwards to the abdominal parietes, than on that in contact with the viscera. When the peritoneum was stripped off any of the more perfect of these rounded bodies, an operation easily accomplished, as the connexion was only by loose reticular tissue, a capsule presented itself, composed of flattened, white, fibrous bands, (see Plate, Fig. 1,) interlacing and joining with each other, so as to leave between them small, translucent intervals. This capsule did not appear filled to the full extent of its capacity; and when pinched up between the finger and thumb, felt as if holding within it another detached bag, of more delicate organization. On making an incision into any part of the outer tunic, and exerting on it a gentle pressure, that inside dropped out, without sustaining any injury by the separation. Of the two structures, the latter was the cysticercus; the former the cyst or apartment, which had been developed for its habitation. The exterior surface of the hydatid was everywhere in contact with the interior of the cyst, but without any actual point of adhesion, as both surfaces were lubricated with a fine serous exhalation, in quantity, however, barely sufficient to preserve them in a moistened state.

As these parasitical animals have been already frequently the subject of research and controversy, I shall only speak of their zoological characters as far as the investigations I have been enabled to make tend to confirm or refute the observations of other writers, and to place the nature of the animal in its true light.

Naturalists recognize in the cysticercus tenuicollis a *head*, *neck*, *body*, and *caudal vesicle*. The *head*, in the largest specimens, is not bigger than a millet seed. It appears to the naked eye little more than a transparent vesicle, but when inspected through a magnifying glass (see Fig. 2,) is found to be complex in its organization and arrangement. It is truncated anteriorly, where it terminates in a circular transparent plane,

the rim or outer border of which is of a more opaque character, and armed with a double row of horn-like, sharp-pointed, retroverted ciliæ, in number, as far as I could count, about twenty. Behind the attachment of the ciliæ the head enlarges for a short distance, and at the widest part presents four smooth depressions, arranged circularly, and at equal distances from each other, around the transverse axis. These depressions are called mouths, meaning thereby patulous orifices; but, from my own observations, I believe them to be covered over by the same kind of transparent membrane as that which completes the anterior plane, for I had abundant opportunities of remarking that the fluid of the caudal vesicle, when squeezed along the neck into the head, protruded, and rendered them prominent without making its escape from apertures in their centre. Indeed, to such an extent did this yielding of the structures of the head take place, that the anterior plane was rendered convex, and the part immediately adjoining it elongated into a sort of cylindrical proboscis, before giving way to the pressure from within. The representation given in fig. 2 is taken from an hydatid with the head distended after this fashion.

Behind the lateral mouths, the head suddenly narrows, and terminates by giving attachment to the *neck*. This part of the worm is about one line and half in length, (Fig. 2 magnified,) as small as the finest silk, and narrowest about the centre. It is composed of bundles of circular fibres, like rings, closely approximated. It is tubular, as shown by the transmission which it affords to fluids squeezed from the vesicle in the direction of the head,—an experiment which may be practised satisfactorily while the parts are lying under the field of the microscope.

The *body* (Fig. 2) varies in size; it is pyramidal, nearly half an inch long, pointed anteriorly, and about a line in diameter at its junction with the caudal vesicle. It is firm, opaque, and white; striking the eye at first sight as a distinct part of the animal. It is composed of circular fibres, arranged like those of the neck, and giving to the animal a jointed appearance like that observable in the common earth-worm. Pressure on the fluid

contents of the caudal vesicle produces no apparent enlargement in the bulk of the body, the thickness of the structures of this part being such as to leave little cavity in its interior.

The *caudal vesicle*, (Fig. 2,) the largest and most conspicuous part of the little animal, varies, in different individuals, from the size of an almond to that of a middling orange. I was not able to discover any at an earlier stage of their growth. In some the vesicle is nearly round; in others it bears more the shape of a leech. When looked at in a particular light, with a common lens, fibres are discernible running parallel to the transverse axis of the cavity. Its contents, which suffice in no instance to fill more than half the bag, are nearly transparent, and consist, according to an analysis of Dr. Apjohn, of water, a large proportion of albumen, and some salts. The tenacity and strength of the textures of the hydatid are such as to admit of its being lifted by the extremity, supporting the weight of the fluid within, without bursting. Several whitish, zig-zag lines, with lateral ramifications, like vessels, run backwards from the body, and are imperceptibly lost towards the posterior extremity of the caudal vesicle.

In every perfect specimen examined by me, the head, neck, and part of the body were out of sight: they had undergone a complete inversion, leaving little more in view, in most instances, than a white ring,—a part of the posterior extremity of the body,—with a circular depression in the extremity. (See Fig. 3.) In some even the whole body had disappeared, and hid itself in the cavity of the caudal vesicle. By squeezing forwards the fluid contents of the vesicle, and pressing on the body with the finger-nail, or the handle of a knife, the inversion was removed, and the anterior part of the body, and in some instances the head and neck also, were brought into view; but the full exposition of all these parts, by such manipulations, was difficult and unsatisfactory. Neither was the plan of immersing the hydatids in tepid water, as recommended, more successful, in my hands, in causing a protrusion of the head, as accidentally they had been all immersed in spirits before the experiment was resorted to.

I discovered, however, some hydatids, to be hereafter described, which appear to have died some time previously to the death of the parent animal, but without having undergone any decomposition, in which the inversion above alluded to had ceased to exist, and in which all the parts of the worm lay naked and exposed. In the examination of these I received a full corroboration of the accuracy of the above description, and which I acknowledge I could not otherwise have put forward with so much confidence, apprehensive lest by the means resorted to, in the other instances, for the extraction of the head and neck from the interior of the body, these parts might have been too much deranged and disfigured for yielding a view of them which could be relied upon.

The head of the *cysticercus tenuicollis* would appear to be the least important part of the animal. The term head, if applied to it in the sense in which it is commonly used, viz. as the agent by which the materials for the nutrition and growth of the individual are taken into the system, or as one for securing an attachment to surrounding objects, is, I think, altogether misplaced. For, independently of its diminutive size, and the questionable character of the lateral depressions to which the term mouths is applied,—questionable, inasmuch as some have even hesitated to admit their existence at all ; and as, according to my own view of them, already stated, it would appear that they are closed over by a membranous expansion,—there are, in addition, good reasons for believing, that this part of the animal is not usually, in the living state, in a predicament for coming in contact with exterior objects, or, of acting on them as an organ of imbibition or of prehension. I believe that the inversion of the body and head, observable in all the specimens, is the usual condition in the living state, and not, as described by writers, a state into which it passes during or after death,—“*retracté apres la mort.*” For during the attempts at dislodging the body and head by pressure, as described, strings and flakes of a whitish matter, like inspissated mucus, were pushed out and liberated. Some of the by-standers were at first disposed to look upon the

white matter coming out of the extremity of the body during the experiment of evolution, as the head of the cysticercus making its first appearance; but as soon as the white matter became detached, and floated off in the water under which the experiment was made, and that the transparent head subsequently showed itself, all doubts on the nature of the fact witnessed were abandoned. The stringy matter was mucus, inspissated by long confinement,—a state of things of which we have examples, even in the human body, wherever a surface, which should be naturally exposed, is placed under such circumstances, that its usual secretions have not a ready outlet for their escape. I know of no other explanation of the fact which I have been endeavouring to describe; and if it be admitted as correct, the conclusion cannot be resisted, that the inversion of the heads and bodies of these animals must be a natural condition, of long standing, and not, as supposed, the result of sickness and of death.

In farther corroboration of this view of the matter, it may be observed, that, even from the accounts of those writers who maintain an opposite opinion, proofs may be gathered that the death of the hydatid is not the cause of retraction of its head; for, if such be the case, why does it become necessary to subject the worm to some process likely to deprive it of life, such as immersion in hot water, or the like, in order to bring the head out of its hiding place, for the purpose of subjecting it to microscopic observations? Death appears, even from this experiment alone, to be a cause of protrusion and not of retraction of this part of the animal; and this view of the subject is still farther borne out by the fact, that all those specimens in the case before us which had undergone a natural death, during the life-time of the animal whose body they inhabited, lay with their heads and necks protruded, whilst all those which retained life until after the decease of the parent animal, exhibited the opposite condition. This is a circumstance which has not hitherto, I believe, arrested the attention of helminthologists; I mean the fact of natural death, if it may be so called, in the hydatid, being always attended with a protruded condition of the head.

The tapeworm has, no doubt, at one extremity an organ called the head, in which there are five depressions like those on the head of the cysticercus; but, nevertheless, the tapeworm possesses powers of growth, generation and locomotion independently of this so called head—the most diminutive part of its long jointed body. The leech, likewise, owes perhaps little to its teeth and sucking mouth for the accomplishment of its growth: the animal can live and move as well without as with them. I have had in my possession, and there is now preserved in the museum of the Royal College of Surgeons in Dublin, the posterior half of a leech which lived, and moved, and grew big for a period of nine months, after being torn by violence from the anterior half, in the act of emptying the animal of blood which it had sucked in, and after the wound of its lacerated body was so cicatrized as to leave no aperture into the stomach. The sucker of its tail served as the medium of attachment to some neighbouring object, and the exterior surface of its body acted as the agent for the imbibition of nutriment.

Lastly, the acephalocysts or echinococci, which are completely devoid of any organ of this description, nevertheless grow, and generate young, and preserve the plenitude of their caudal vesicles, which are exactly alike in structure and contents to those of the cysticerci.

For reasons of this nature we may be justified in considering that the part of the cysticercus called the head does not either serve as an organ for the imbibition of nutriment, or as a medium of connexion with exterior bodies. It may, perhaps, deserve no other rank in this respect than that of a rudimental part, establishing, by its presence, an approximation to more complicated beings, and adding a new but imperfect link in the chain upon which all such beings are typified.

The neck, body, and caudal vesicle of the cysticerci are all formed, apparently, of the same elements. They consist equally of transverse parallel fibres, which, after running a certain course, insensibly disappear, the circuit being completed by

others which arise and terminate in a similar manner. These fibres are no doubt muscular, and the degrees of transparency observable in different parts of the animal are perhaps due to their greater or less abundance. The whole exterior surface of the body is, then, it may be presumed, the agent for the imbibition of nutriment, and the parts called mouths contribute, in a very minor degree, if at all, to this function.

A consideration respecting hydatids, not less curious and interesting than that of their zoological and anatomical characters, is the manner and issue of the final termination of their existence. Some writers entertain an opinion that many malignant diseases, and others which, if not of a malignant nature, are yet not less certainly fatal, have their origin in parasitical animals, which by their growth contaminate and destroy the parent individual. Such, for instance, have been supposed to be the nature of cancer, fungus hæmatodes, and more especially diseases of a tubercular nature. But all this is mere matter of conjecture: no facts have been hitherto advanced sufficient to establish the position that any such diseases are, either at their commencement or at any subsequent period of their progress, of such a character. No animal has ever been seen of any definite shape in connexion with them; and where the powers of the microscope can be brought with such effect in aid of investigations of this nature, why, it may fairly be asked, if such pestiferous animals exist, have they not, ere this, been demonstrated? The fact is, that all the circumstances connected with the growth and decay of such parasites as our senses can take cognizance of, tend to lead to a conclusion of an opposite nature, viz. that these animals have their periods of existence as living beings, and having passed from this state, instead of polluting the whole frame, or running into extensive diseases, disappear, and leave little or no injurious effects behind them, unless what may have arisen from their mechanical interference with the functions of some vital organ.

The details which I am enabled to offer respecting the na-

ture and order of the changes occurring during the degeneracy of the hydatids which have come under my notice, will not only place this matter in a clear light, but will afford a means of correcting views on the subject which to me appear erroneous, especially those adopted by the celebrated Bremser, whose expressions, as conveying the most approved doctrines, I beg leave to quote, before entering on the discussion of the subject. He says: "At first the limpid contents of the hydatid begin to lose their transparency, and the vesicle, formerly much distended, becomes flaccid; the fluid thickens more and more, it becomes yellow, and acquires a resemblance to soft cheese. The vesicle hardens, and finally its contents, which had been primarily fluid, are converted into a solid mass. When observations are made at an early period of the degeneration, some traces or packets of the corrugated tissue of the vesicle are still observable. At length it disappears altogether, and the *hydatid transforms itself* into a calcareous mass, which can sometimes be detached from the organ in which it lies as readily as the original, sound hydatid. This calcareous mass is also covered by a peculiar envelope." According to M. Bremser, therefore, the morbid alteration begins and passes through all its stages in the little animal itself. "The hydatid," he says, "transforms itself into a calcareous mass."

Now, according to my observations, the cyst of the hydatid,—the house in which it dwells,—is demonstrably the seat of these alterations, and is the instrument all through the process by which the degeneration is accomplished. The death of the contained animal may be, perhaps, the primary cause of disturbance in the cyst, but, as I hope to show, the latter is the sole agent by which the subsequent changes are effected.

In the omentum of the axis deer, examined by me, the hydatid tumours presented a great variety of conditions; and the phenomena of change from that which may be considered the perfect and full grown state of the worm, to that in which

nothing but a nucleus of bone occupied its place, were readily traceable.

In all those instances in which the least deviation from the above described healthy state of the tumours existed, the worm was found dead; its head and neck lay stretched out, and exposed to view, and not, as in the other instances, shut out of sight by inversion into the caudal vesicle; its tunics were opaque, and its contents muddy. It had certainly before this period undergone the phenomena of death, but, though dead, no decomposition of its textures had taken place, for it was by the examination of such specimens as these that I became best enabled to make the microscopic observations already alluded to.

The first changes from this state depend upon an inflammatory condition of the cyst, which becomes thicker in texture, and acquires, by the deposit of lymph on its internal surface, a roughened granular appearance, such as is frequently observed on the serous surfaces of the pericardium or pleura, previous to the establishment of adhesions. (See Fig. 4.) At a more advanced period the lymph is thrown out in greater quantity, and becomes adherent to the exterior of the worm, first by a few points, and subsequently all over the surface. (See Fig. 5.) But whether the adhesion be of an organized nature, or simply a mechanical agglutination of the parts, it is not easy to determine. I am, however, inclined to think that the connexion is only mechanical, as, up to the latest period at which the hydatid is discernible, it admits of being separated, though not without considerable pains and patience, from the new formed texture thrown out in its vicinity. The contents of the caudal vesicle, from being, after the first changes, of an opaque white colour, become, as the degeneration goes on, reduced in quantity, and acquire a more muddy, and, in some instances, a reddish character; and are, finally, completely absorbed, leaving the walls of the hydatid empty and collapsed. At this period, too, the exterior surface of the cyst becomes more adherent than formerly to the surrounding peritoneum, in consequence of the

slow extension of the inflammatory process from it to that membrane. In one diseased specimen which I examined, holding two hydatids, the animals were both found dead and empty, and squeezed up together by the surrounding extravasated lymph.

As the degeneration goes on, the tumour diminishes in size: it becomes more firm, loses the feeling of fluctuation, and when cut into exhibits nothing but softened lymph mixed with some curdy matter, and fragments of broken hydatid.

In more advanced stages, the tumour diminishes still farther in size, loses all traces of the hydatid inside, and appears in the section like firm cheese, but still surrounded by a capsule, which is, however, formed of the structures constituting originally the cyst, and not those of the degenerated hydatid, as described by M. Bremser.

Numerous hard, earthy tumours, about the bulk of peas, lay scattered over the omentum, among the other variously conditioned hydatids; and were, no doubt, the remains of former worms, which, having passed through the stages above described, had arrived at this, their latest and perhaps final degree of degeneracy.

With respect to the question, whether the disease in the cyst precedes, and becomes the cause of death in the hydatid, or that the animal itself passing into the state of death, and thence acting as a source of irritation on the investing membrane, gives rise to those changes in that texture which have been just described, it is very probable that the latter view of the case is the correct one, viz. that the worm having arrived at a certain age dies; that it then comes to act as a foreign body; and that all the subsequent changes which take place in the cyst, are merely the consequences which flow therefrom. The numerous and singular differences in the condition of the hydatid tumours, from that state in which they exist as translucent and living bodies to that in which they appear in the form of small bone-like particles, would appear to indicate that a long

period had elapsed since the development of the first series of hydatids in the omentum, and that these having passed away were succeeded by others, which, in their turn, gave place to ternary and quaternary formations, each equally subject to decay, and running by the same processes into the same ultimate states of degeneration. In fact the animals might be said to have established in the omentum a sort of colony, propagating their young, passing through "les quatre âges de la vie," and finally converting their habitations into sepulchres, where their bodies passed into complete decay without further damage to the surrounding parts. There is most probably with these, as with all animated beings, a limit to the term of their existence, a period beyond which they are fated not to retain the condition of vitality.

The acephalocysts, which are often met in the human body, take a somewhat analogous course, but the result to the body in which they grow is likely to be different on account of their enormous accumulation in one part, and the consequent obstruction which they give to the functions of some particular organ. The liver is a frequent nidus for their development: they are generally collected into one cyst, in which great numbers are formed in succession,—the primary ones dying away, and being converted into detached extraneous matter, whilst new ones take their place, and subsequently run the same course. I have seen several instances of this kind. There are four such preparations preserved in the museum of the Royal College of Surgeons in Ireland; and I may mention another, which occurred in the practice of Mr. Trant of this city, in which the cyst opened externally by slough, and gave discharge to numerous acephalocysts, even during the life-time of the patient. All these cases were connected with the liver: the cysts were as thick and tough as leather, and capable of holding several quarts. When opened, they were found filled with a great variety of materials, but all evidently consisting of hydatid matter in different states and stages. In some parts, the hydatids were plump, transpa-

rent, and alive; in others, multitudes of them were found flaccid, opaque, and dead. Flakes of lymph, several inches square, rolled up in a singular manner, and apparently of the same texture as the vesicles of hydatids, occupied a large part of the cavity, and packets of cretaceous matter, in substance somewhat analogous to the ultimate degeneration of the cysticeri, filled up the remainder. These great cysts were, however, perfectly insulated; they entered into no direct union with the ultimate particles of the organ, and sent no roots through its structure. Their only interference with the liver was that of mechanical pressure, causing absorption of a portion of its texture immediately in contact with them, and diminishing thereby its bulk.

The great size and number of the specimens of cysticeri examined by me, afforded opportunities of witnessing the phenomena of degeneration on a scale which does not appear to have been offered to Bremser: his observations having been principally made on cysticeri located in the liver, in which the actual changes could not have been so free from the influence of surrounding objects, the conclusions to be drawn from them are more liable to a suspicion of error.

Besides, all the phenomena witnessed are more explicable, and more in accordance with our standard notions of pathology, on the principle that the cyst of the deceased hydatid, a part of the original living body, is the seat of the changes which occur subsequently to the death of the little animal, than that the latter should of itself, when dead, exert any influence in accomplishing farther alterations in its condition.

At all events it is very obvious, that no resemblance or connexion whatever, can be traced between the hydatid tumours of the omentum, and those tubercular cavities in the lungs, of which the animal died; the one, having passed through certain stages, disappeared leaving little trace of their former existence; the others, having progressed with a fatal certainty, ended in the total destruction of the organ in which they were developed.

EXPLANATION OF THE PLATE.

Fig. I. A natural representation of the external surface of the capsule of a full grown hydatid (*cysticercus tenuicollis*) in the healthy condition, stripped of the peritoneum.

Fig. II. The head, neck, body, and part of the caudal vesicle of the cysticercus tenuicollis, magnified.

Fig. III. A magnified view of the posterior part of the body, and adjoining part of vesicle, into which the remainder of the body, together with the head and neck, have been inverted.

Fig. IV. Fibrous capsule of an hydatid altered in texture by inflammation. It is thickened, diminished in size, and granular on the internal surface. The cysticercus removed from this capsule, was empty and opaque, and free from inversion of any part of the body, neck, or head.

Fig. V. Fibrous capsule, thickened and filled with lymph, which adheres to, and compresses the cysticercus contained within it. The lymph and hydatid have been brought into view by the elevation of a flap of the capsule.

DR HOUSTON'S VIEWS OF THE *CYSTICERCUS TENNICOLLIS*.

Fig. 5.

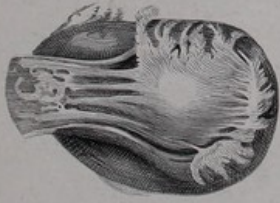


Fig. 4.



Fig. 1.

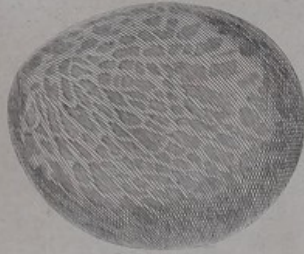


Fig. 2.

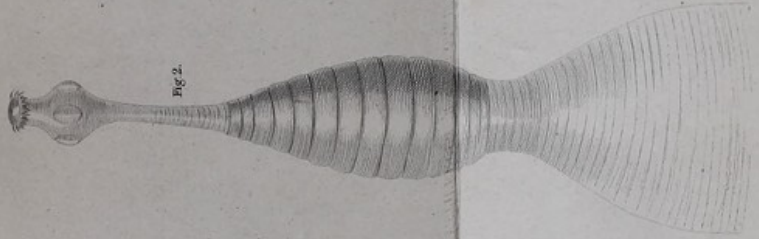


Fig. 3.



