

ECHINOCOCCUS CYST OF THE LIVER.¹

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DURING the past few years it has been my good fortune to have been able to study five cases of echinococcus of the liver, occurring in the clinic of Professor Fowler. The following history is that of a case referred to me by Drs. Accetta, Desante, and Verneglia, January 24, 1900.

The patient, twenty-eight years of age, an Italian, had spent the first twenty-five years of her life in Italy, coming to this country about three years ago. Since childhood she had suffered from frequent micturition, with at times the passage of large quantities of urine. One year before I saw her, she had had a miscarriage at three months, from which she suffered no after effects. With this exception she had enjoyed perfect health up to within three months of the time I saw her. At that time she had noticed a gradually increasing dragging pain in the left loin. Soon afterwards she discovered a tumor in the region of the umbilicus. This was tender and movable. It did not increase in size, but the dragging pains, which were not constant at first, became almost continuous and much more severe. There was nothing in the history to guide in establishing a diagnosis. The physical signs alone were to be depended upon. Bimanual examination disclosed that the tumor had absolutely no connection with the uterus or appendages. It could, however, be moved to any part

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of the abdominal cavity. Percussion revealed that the liver was of the normal size and normally situated. The colon could be traced throughout its entire course, the only peculiarity being that the transverse portions seemed a little higher than normal. There was no abnormal dullness over any part of the abdomen. The spleen could not be made out. The right kidney was larger than normal and normally situated. The left kidney could not be palpated in any position of the body. The tumor was of the size of two fists. Over it lay the transverse colon. It was smooth in its lower part, elastic to the feel, in its upper part solid. It felt and acted like a floating cystic kidney. Malignant disease was ruled out, as there was no loss of weight or strength, as one would expect with a malignant tumor of such proportions. The tumor could not be traced to the liver in the neighborhood of the gall-bladder; in addition, the tumor was not pear-shaped, nor had there been any symptoms of jaundice or gall-bladder disease. The tumor did not perceptibly move with respiration. Moreover, the colon overlay the tumor. It was noted, however, that the colon moved with the tumor. The provisional diagnosis of floating cystic kidney was made. The diagnosis was founded on the following facts: the tumor did not move with respiration; it was of the size and shape of a cystic kidney; the colon was in front of it; it was freely movable to all parts of the abdominal cavity, and the left kidney could not be palpated in any position of the body. Nevertheless, I was doubtful of my diagnosis, and advised laparotomy, so that, in case the tumor should not be a kidney, the operation need not be prolonged. I might say that, previous to my examination, another consultant had diagnosed the case as one of cystoma of the ovary.

The case was admitted to the Brooklyn Hospital, service of Dr. George R. Fowler, January 26, and operated upon by me January 27. A four-inch median incision was carried through the abdominal wall and the peritoneal cavity opened. The colon presented in the incision. This was pushed downward, exposing the tumor and also the left lobe of the liver. The case was plainly one of echinococcus cyst of the under surface of the left lobe of the liver, which by its weight had dragged the left lobe downward, causing the condition known as partial floating liver. The lower rounded portion of the cyst had become adherent to the anterior layer of the lesser omentum, and had adhered to this

and to the colon in such a manner as to cause the colon to overlie it. The cyst was separated from the colon and anterior layer of the lesser omentum, and was then easily delivered through the abdominal wound, which was enlarged for the purpose. The extent to which the cyst was attached to the liver was approximately six inches by two inches. The case was a suitable one for hepatectomy. The liver substance was incised with the thermocautery, and the cyst removed entire without rupturing. There was but one point on the liver surface, which bled rather profusely. That was in the neighborhood of the transverse fissure, probably one of the larger branches of the portal vein. A circum-suture sufficed to arrest the hæmorrhage at this point. The liver was gently replaced and a strip of iodoform gauze packed against the cauterized surface. It was noted that the liver was hyperæmic and quite friable. The round ligament was shortened and stitched to the abdominal wall with formic catgut, thus fixing the liver in its proper position. Gauze was packed between the liver and the diaphragm to produce adhesions, and thus aid in the support of the organ. The wound was closed, except at the upper angle, at which the ends of the gauze strips emerged. Half the packing was removed on the second day, the remainder one day later. The first few dressings were bile-stained, but this soon ceased. Final recovery was uneventful. At the present time, six months after the operation, the patient is in perfect health.

Historical Data.—The most scholarly article upon hydatid cysts that I have read appears in "A Clinical Treatise on Diseases of the Liver," by Dr. Fried. Theod. Frerichs, Professor of Clinical Medicine in the University of Berlin. A translation of this work by Charles Murchison, of London, was published in 1879. Though written twenty-odd years ago, this treatise stands to-day a model of painstaking care and accuracy, and might well serve to stimulate the student of to-day in making more thorough his researches along special lines. Hippocrates, Galen, and Aretæus mention the occurrence of large cysts of the liver filled with water, so that this condition was evidently familiar to ancient physicians. But it remained for the anatomists of the sixteenth and seventeenth centuries to accurately describe these cysts. We have

records of careful observations of these cases by Felix Plater, Vega, and Riverius. In the "Sepulchretum" of Bonetus there are several well described cases. Up to 1760 the cysts were supposed to be enlargements of the lymphatics, and their peculiar nature remained unknown. Finally, Palbas proved them to be independent parasites, and showed their close relation to the tapeworm. This was subsequently confirmed by Goeze. The first accurate descriptions of the echinococcus occurring in the human body was published by Bremser in 1821. From 1860, the year in which Davaine published his excellent work, to the present time, there have been numerous cases reported in detail, until now it would seem that the pathology and treatment of this interesting disease were established, and it only remained for us to so increase our diagnostic skill that the lesion might invariably be recognized.

The *exciting cause* in the production of an echinococcus cyst is the *tenia echinococcus*. This parasite has its habitat in the upper portion of the small intestine of dogs. In its mature condition, the worm is from four to five millimetres in length. The head is 0.3 millimetre in diameter. There are two rows of hooklets around the rostellum. There are three or four proglottides, the last being the largest. Introduced into the intestinal canal of man, the ova undergo partial development, and may be carried to distant parts of the body. The manner in which this occurs is as follows,—digestion destroys the covering of the ova, and its contained scolices are liberated, burrow in the intestinal wall, and thus enter the circulation. Should they, as is commonly the case, enter a radicle of the portal vein, they are carried to the liver. Here, or in other tissues, cysts are formed in the immature or cysticereus stage (Prudden), and are known as hydatids. Owing to the inflammatory reaction set up in the parts in which the cyst is lodged, a protective connective-tissue encapsulation is finally effected. The cyst wall proper consists of two layers,—an outer, laminated layer, the cuticle, and an inner muscular and vascular, designated as the parenchymatous layer. Within the primary or parent cyst are generally found secondary or daughter cysts,

and within these, again, other cysts may develop. The heads or scolices of the parasite are formed on the inner surface of the cysts. These develop in the pediculated vesicles called brood capsules (Prudden), the walls of which are similar in structure to the primary cysts. Several scolices may be formed in each brood capsule. They are similar to the head of the adult parasite, having a double row of hooklets surrounding the rostellum and four sucking discs. There is a pedicle on the posterior end of the scolex, marking the site of its attachment to the wall of the vesicle. Small, laminated concretions of lime salts are often present in the scolex. The scolices may be found free in the brood capsule, or, should these rupture, they are found free in the cysts. The hooklets, on the death of the scolices, may be embedded in the granular mass formed by the degeneration of the latter, or may be free in the brood capsule or in the cavities of the cysts. It may happen that neither brood capsules nor scolices develop in the cysts. Such cysts are known as sterile cysts. The cysts contain a clear gelatinous fluid which may be present in large or small amounts, or may be almost absent from the primary cysts. It is the presence or absence of fluid in the primary cyst which causes the variations in the so-called hydatid fremitus. The reaction of the fluid is, as a rule, neutral; rarely it is alkaline, and more rarely still, acid (Lueke). The specific gravity varies from 1.007 to 1.015. Albumen is absent. Succinic acid may be present, but is not constant. Grape sugar, leucin, inosite, and sodium chloride have been found in the fluid. Disintegration of the scolices may render the fluid turbid, or it may contain fatty detritus, cholesterin crystals, or lime salts. The fluid may be partially absorbed, leaving a thick grumous material within the cysts, which may become calcified.

Boinet, in April, 1894, reported his results in experimentation with the fluid from hydatid cysts. From this fluid he extracted a ptomaine, of which three-sixty-fourths of a grain injected under the skin of a mouse caused death in five minutes; seven-eighths of a grain injected into the veins of a rabbit gave rise to symptoms of hydatid intoxication, convul-

sions; first, accelerated and then retarded respiration, rapid action of the heart, dilatation of the pupil, collapse, and a reduction of temperature to about 80° F. Death was preceded by a few convulsive attacks. A patient with hydatid disease of the liver succumbed with symptoms of rapid respiration, and convulsions followed by paresis of the lower extremities, symptoms very similar to those observed in the animals experimented upon. This toxin is found more abundantly in cases in which puncture and electrolysis have modified the vitality of the hydatids; transforming the clear fluid into a yellowish, turbid, syrupy liquid rich in albuminoid matters. It resembles the mytilotoxin of mussels, and results from the reduplication of albuminoid matters. This ptomaine seems to exercise a toxic action upon the still intact hydatid vesicles, causing their aseptic necrosis and death.

The fully developed cyst is comparatively easy of macroscopic diagnosis. There is the connective-tissue capsule, the primary, secondary, and sometimes tertiary cysts, and the characteristic fluid. In cysts which have not degenerated, the microscope will show the scolices entire.

In cysts, the seat of degenerative changes, hooklets or portions of hooklets will be found in the detritus and also portions of the characteristic cyst membrane. In cysts which have become calcified there may be nothing to show the origin of the cyst. Prudden mentions two rare forms which the cysts may present. In the first the secondary vesicles are formed on the outside of the primary cysts. The name given to this variety is the *echinococcus scolecipariens* or *exogena*. It is rare in man. The second variety, the *echinococcus multilocularis*, is more common. It is almost always found in the liver. It seems to be the result of disturbances in the development of the cysts. There are a series of irregular sized cysts surrounded by broad and narrow bands of connective tissue. These contain gelatinous fluid and a few scolices or hooklets, the latter difficult of detection. The entire mass is encapsulated, and may present an alveolar appearance. For this reason it was formerly regarded as alveolar carcinoma.

In order to preserve the cysts in as nearly a natural state as possible, Prudden recommends that the specimen be placed at first in a 5-per-cent. aqueous solution of chloral hydrate. After remaining in this solution for a week the cyst is immersed for permanent preservation in a 10-per-cent. solution of the same drug. A saturated aqueous solution of chloroform acts almost as well.

The *contributing cause*, as intimated above, is close companionship with dogs and in persons of uncleanly habits. The parasite is most frequently found in the upper part of the small intestine. It is also present in the intestine of wolves and jackals. The ova of the parasite are evacuated with the feces, and may be taken into the human body through the medium of polluted drinking water. This mode of infection is probably not common. Much more likely the ova are introduced through handling or caressing dogs or coming into intimate contact with them. The ova may be conveyed by dogs licking the individual's hand or face. Iceland is the locality where the parasite attacks man most frequently, as in that country a close companionship exists between the inhabitants and their dogs. It is perhaps worthy of note, that not a single case of the multilocular variety has been noticed in Iceland. This variety is indeed rare. Bauemler, 1878, collected thirty-seven cases, and perhaps half as many more have been reported since that time. Next to Iceland, the disease occurs most frequently in Australia. The disease is seldom met with in France and Germany. In Russia it is very rare. An Italian physician tells me that the disease is quite common in Italy. This is borne out by my own experience, as the patients in whom I have observed the disease were all Italians. In England the disease is rarely met with outside of London. In the United States the disease is quite rare.

Symptoms.—These are due to pressure effects. Usually the first symptoms noted is the presence of a tumor in the liver region. Or there may be first noticed more or less discomfort or dragging pain in the epigastrium. Should the growth be situated upon the superior surface of the liver, that organ will

be pushed downward, so that its anterior edge may even reach the level of the umbilicus. The tumor in such a case will press upon the diaphragm and may cause some discomfort in breathing. Either the right or the left lobe may be the seat of the disease, which may be on the surface of the liver or entirely within its structure. Those cysts which are posteriorly placed are the most difficult of detection. Most frequently the tumor will be found springing from the inferior surface of the liver. In the case of the right lobe the mobility of the liver will probably not be increased; but if the left lobe is involved, the weight of the tumor will drag down that lobe, and it may well be that the tumor can be moved to almost any part of the abdominal cavity. Pressure on neighboring viscera may result in symptoms referable to those viscera. There may result interference with the action of the heart or lungs. The vena cava may be pressed upon, causing œdema of the lower extremities. Pressure on the bile passages may cause jaundice. Ascites may be caused by pressure on the portal vein. The tumor is firmly elastic and dull on percussion. Its surface is smooth and rounded. Its connection with the liver is usually readily made out.

Hydatid fremitus is due to the impulse of the daughter cysts upon one another in the absence of liquid in the parent sac. When the parent sac contains fluid, the daughter cysts swim, and do not yield the tremor (Tillaux).

Santoni, in 1894, found that the stethoscope (by auscultatory percussion) reveals a special and peculiar sound of sonorous quality having a low tone and of brief duration, which ceases abruptly. It may be compared to the sound produced by striking a membrane stretched upon a metallic frame. This sound is so characteristic, that once heard it can scarcely be forgotten. He considers it a pathognomonic sign of the disease.

Thomas Fiaschi, of Sydney, 1895, considers Santoni's resounding or booming sign as a valuable addition to the semeiology of hydatid disease. A fourth practical application of the test, not mentioned by Santoni, is the diagnosis of

single from multiple cysts, the sound being uniform in a single cyst, no matter on what part of the tumor percussion is made; while in multiple cysts there is a variation of the hydatid resonance dependent upon the number of cysts and the point percussed.

Termination.—The disease untreated may progress indefinitely, and death may occur from intercurrent disease, or a spontaneous cure may be effected, or death may ensue in a variety of ways. Spontaneous cure may be effected in three ways. The parasites may die and the sac subsequently contract. A communication may be effected with the biliary apparatus, and the entrance of bile into the sac may kill the parasite (in some instances, however, the parasite may survive). The more usual manner of spontaneous cure is effected by rupture of the sac into one of the neighboring viscera, stomach, intestine, lung, or pleura. In case of the latter two, however, the chances are against a favorable result. In rare instances, rupture may occur externally. Rupture into the stomach will be shown by the vomited cysts. Some may also pass per rectum. In rupture into the intestine, the cysts will be passed per rectum. When rupture takes place into the lung the fluid and cysts will be coughed up.

Duration of the Disease.—The growth of hydatid cysts is slow, as a rule, though cases are on record in which rapid growth has supervened for a time. In some instances the existence of the disease has not been suspected, and has only been discovered in the course of a post-mortem. It may exist for years before it is recognized. Barrier (Paris, 1840) analyzed twenty cases in reference to the duration of the cysts in the liver. In three of these, the disease had lasted for two years; in eight, it had been present from two to four years; in four, from four to six years; in the remaining cases, fifteen, eighteen, twenty, and even thirty years. One case coming under Frerich's observation had suffered from the disease for seven years, others from periods varying from two to three years. Of the cases which have come under our own observation, in one the disease had given symptoms for three months; in the

second, two years; in the third, three years; in the fourth, one year; in a fifth case I am unable to state the time.

Treatment.—In the past, various operative procedures have been employed. The use of caustics to promote adhesions between the sac and the abdominal parietes belongs to the pre-aseptic days of surgery. Tapping either with or without the introduction of solutions calculated to kill the parasite in the absence of adhesions, in such a thick fibrous sac wall, is dangerous both from the suppurative changes which may ensue in the sac and the possibility of the escape of sac contents into the peritoneal cavity. Modern treatment consists in the stitching of the sac wall to the edges of a wound in the abdominal parietes and then incising it, either in one or two stages. In certain cases the cyst may best be reached by the transpleural route or through the lumbar region. The tension of the sac may be lessened by aspiration of a portion of its contents.

It is essential to success that none of the fluid be allowed to escape into the peritoneal cavity. Subsequent to incision, the lining membrane of the sac is peeled off as completely as possible. A stream of warm solution directed between the lining and the fibrous capsule will greatly facilitate this. The cavity is irrigated and packed daily until only a small sinus is left. This, as a rule, does not close readily. Finally, there remains a shrivelled-up mass of fibrous tissue attached to the liver. This healing process may take many months, and require constant attention. A liver fistula may persist indefinitely.

Because of the long period during which the cases drained are kept from active work, it is desirable in those cases which admit of the procedure being carried out with a fair chance of success, that a hepatectomy be performed in order to totally eradicate the disease. Cysts which are not very large, or where a comparatively small amount of liver tissue is involved, may be subjected to this procedure. Great care must be exercised in selecting such cases.

Palleroni (*Gazz. degli Osped.*, August 7, 1898) advocates the employment of a provisional ligature passed through the

entire thickness of the liver in order to maintain that organ in the abdominal wound while the hepatectomy is in progress. Terrillon, of Paris, used an elastic ligature around the portion of liver affected by a number of small hydatid cysts. The portion of liver thus encased was fastened into the abdominal wound. The elastic pressure caused gangrene, and the diseased portion, the size of two fists, separated as a slough. Burns successfully removed a multilocular cyst. Tansani dissected a cyst from the liver substance and sutured the resulting gap. This has also been done by Bergmann, Küster, and Eiselsberg. In 1893, C. Mansell-Moulin and Billroth each performed hepatectomy for this disease. In 1890, Rozzi, of Italy, removed two inches of liver substance with a cyst attached. In 1889, Loretta, of Bologna, excised the affected portion of liver. Bozzi in the same year reported a successful case of excision. In 1888, Landau reported three cases. In addition to these cases there are but few which have been treated by excision. Since writing the above, I have assisted Professor Fowler in the removal of a large single echinococcus cyst of the left lobe of the liver. The details of this case will be reported at a later date.