Gastroenterol Hepatol. 2018;41(8):532–534

Gastroenterología y Hepatología

www.elsevier.es/gastroenterologia

SPECIAL ARTICLE

Hydatid cysts in Classical and late Antiquity

Quistes hidatídicos en la Antigüedad clásica y tardía

Niki Papavramidou[a,*], **Helen Christopoulou-Aletra**[a], **Theodossis Papavramidis**[b]

[a] *History of Medicine, School of Medicine, Aristotle University of Thessaloniki, Greece*
[b] *1st Department of Surgery, AHEPA Hospital, School of Medicine, Aristotle University of Thessaloniki, Greece*

Received 16 April 2018; accepted 4 June 2018

Introduction

The medical literature of Classical and late Antiquity contains some of the first detailed descriptions of diseases, thus deviating from supernatural explanations that were based on erroneous conclusions about human anatomy, physiology and pathogeny. The attempts of the physicians of that era should not be overlooked because they managed to reach accurate diagnoses and apply effective treatments so early in history.

''Hydatid cysts'' were well known in antiquity and they were described in the *Hippocratic Corpus*, the texts of Celsus (1st century A.D.), of Aretaeus (2nd century A.D.) and of Galen (2nd century A.D.). However, it was not until the 17th century that Francisco Redi mentioned the parasitic nature of these cysts. Today, ''hydatid disease'' is identified as a parasitic infection caused by a tapeworm of the genus *Echinococcus*, while the most common sites for cystic echinococcis infection are the liver and lungs, although ''hydatid cysts'' may also be rarely found in other organs.[1]

In ancient literature the same erroneous assumption prevails: ''hydatid cysts'', according to the writers, are localized forms of dropsy. Such an assumption is made in order to explain the presence of water accumulation in the body, since water was not among the four primary humours that were believed to circulate inside the body. Consequently, all authors based their aetiology of ''hydatid cysts'' on the theory of dropsy development. For example, the Hippocratic physicians mention that dropsy usually occurs when a patient keeps his body unclean for a long time. As a consequence, his flesh is ''corrupted'', melts and turns into water.[2] More specifically, when phlegm reaches the liver, the latter attracts it, gets filled with humidity, causing thus great heat and formation of steam. Then, steam, alike with the mechanism of rain, turns to water that cannot escape from the liver due to the impermeability of the structure, creating as a result hydatid cysts.[3] Celsus, though, takes the aetiology of the disease a little further by claiming that hydatid cysts are formed by an inflammation of the portal system of the liver,[4] an implication that even though sounds more accurate than the Hippocratic one, it does not actually relflect the true aetiology of the disease.

Clinical manifestations

The Hippocratic physicians provide us with a detailed description of the clinical manifestations of the hydatid disease of the liver when they write that ''there is a tickling cough with scarcely any perceptible expectoration and the feet swell; there are no expectorations from the bowels, unless such are hard and forced; and there are swellings about the belly, sometimes on the one side and sometimes on the other; and these increase and diminish by turns''.[5] Furthermore, when the liver is filled with water,

* Corresponding author at: History of Medicine, School of Medicine, Aristotle University of Thessaloniki, University Campus, 54124 Thessaloniki, Greece.
E-mail addresses: papavramidou@hotmail.com, npapavramidou@auth.gr (N. Papavramidou).

irritation appears in the body and the liver becomes hard and swollen.[3]

Celsus provides the reader with even more details: if the patient survives three weeks after the first occurrence of an inflammation of the liver, hydatid cysts are formed. The patient is thirsty but drinks only a little, he loses weight and develops a desire for acid foods. This disease usually appears during autumn, probably, according to Celsus, due to indigestion caused by eating too many summer fruits and it may affect people of all ages, but most often adults. He finally alleges that this disease may affect also the head, the lungs, the spleen, or the womb in women.[6]

Aretaeus' description is somewhat different from the previous ones. He claims that there is a form of dropsy that occurs in small and numerous ''cysts'', which are filled with fluid, along with the development of ascites. These ''cysts'' float in copious fluid, and ''if one perforates the abdomen so as to evacuate the fluid, after a small discharge of the fluid, a cyst within will block up the passage; but if you push the instrument further in, the discharge will be renewed''. The prognosis of this disease is very bad, because there is no passage by which the ''cysts'' might escape.[7]

Galen finally, known for his extremely detailed descriptions of diseases, provides us with long, sensible accounts. He refers actually to two cases: (a) a case he encountered of hydatids near the pericardium and (b) the most common case of hydatids found in the liver. For the first case, he had observed in some animals that multilocular cysts occupied the entire pericardial sac; these cysts were filled with a clear yellowish fluid that resembled the hydatid cysts, but he states that he had never observed similar cysts in the heart of a human patient.[8] For the second case of hydatids of the liver, he seems to agree with Celsus' aetiology, which provides us with clinical manifestations based on the inflammatory nature of the disease, in combination though, with the theory of gases turning into water of his predecessors. Hence, the inflammation of the liver does not permit the conversion of food to blood; the unprocessed food remains useless, ''feeding'' further more the inflammation of the liver. Then, the inflammation produces extreme heat to the organ and afterwards follows the Hippocratic theory of liquification and storage of the fluid in the cysts to the liver's outer membrane. Galen reports cough as a symptom of the presence of hydatids and he makes an attempt to explain the mechanism: the inflamed liver, he writes, reduces the space for the lungs causing cough to the patient, in an attempt to alleviate thus the feeling of tightness. Furthermore, Galen adds swelling to the symptoms, first of the legs and then of the abdominal area, explaining that this is caused by the phlegmatic nature of the blood that supplies the skin.[9]

The Hippocratic physicians also refer to the case of rupture of the cysts in the omentum, filling the abdominal cavity with fluid, thus causing death.[10] Galen comments further on the Hippocratic *Aphorism*, providing more details. He writes that if the hydatid cysts rupture, the liquid is shed in the peritoneal area of the epigastrium, forming dropsy; the liquid cannot be shed to the omentum, unless it is somehow perforated. The omentum may be perforated usually to its right side, near the liver, due to corrosion. Usually the rupture of the cysts causes death to the patient, especially if the liquid accumulates in the area below the thorax.[11]

Treatment

The Hippocratic physicians provide specific information about the management both of the hydatid cysts and of their rupture. In the first case, if the cysts are just formed and the liver is in pain, the patient has to drink half a kotyle of white wine, silphium juice, and grated oregano. He also has to drink four kotyles of goat milk, to which, one third of water and honey is added. The patient must abstain from food during the first ten days, because within this period the determination will be made whether the illness will be fatal or not. Then the patient should consume barley gruel, together with well boiled honey and white wine from Mende or some other very sweet wine diluted with water. After the first ten days, the patient should eat unmixed foods made of breadstuffs; he should also eat boiled puppy, roasted dogfish, and torpedo and drink the same wine. If his condition remains bad, he should be fattened so much that his liver becomes very swollen; then, the physician should cauterize his liver with round point instrument.[3]

If a hydatid cyst ruptures in the abdominal cavity, the patient should first be treated as mentioned above. Then, he should only drink black acrid wine. If the physician suspects that the cysts are spread from the liver to another organ, he should cauterize the site where the illness breaks out, allowing some of the fluid to run. If the patient does not recover after all these, he will slowly wither and die in time, because the case is severe and only a few survive from it.[3]

Discussion

The ancient authors generally agree as far as the aetiology and the clinical manifestations of hydatid cysts. All, except Aretaeus, state that the cysts are a form of localized dropsy, caused by excessive phlegm in the liver, causing heat, formation of steam, liquification and, storage of the fluid produced in cysts, due to the impermeability of the liver. The patient suffering from such cysts develops cough, oedema in the limbs and the abdominal area, urine retention, constipation, thirst, and rigidity of the liver. In reality all authors describe cases of hepatic dysfunction/insufiency probably due to cirrhosis caused by occupancy of the liver parenchyma by the cyst and to chronic intraabdominal pressure.[12,13] The illness usually occurs in the liver, while there are some cases where the affected organs are the brain, the lungs, the spleen and the uterus. The authors mention that the rupture of the cysts has an extremely bad prognosis, since only few patients have survived after such rupture.

As far as the treating methods are concerned, the Hippocratic physicians first suggest the application of a strict diet that contains small amounts of goat milk and large amounts of gruels, breadstuffs and fish. If the situation of the patient remains bad, the doctor should fatten the patient so much that his liver becomes very swallen in order to facilitate cauterization of the cysts. Taking a close look at the diet prescribed to the patient, one could recognize a diet similar to the one given nowadays to those suffering from liver diseases, with low amount of protein and large amount of carbohydrates.

As far as cauterization is concerned, it was often indicated for diseases that could not otherwise be treated, as the last *Aphorism* states.[10,14] Cauterization was used in severe cases and the prognosis was, in most of them, bad.[3] This is the reason why the Hippocratic physician, after advising cauterization, usually states that the particular case is a very severe one. Cauterization sometimes caused severe burns to the patient, which certainly added to the bad prognosis.

It is amazing how the ancient physicians managed to provide a theory of pathogenesis of the cysts that made sense to them. They borrowed the mechanism of rain in order to explain how a cyst full of fluid appears in an otherwise solid organ, such as the liver. One of the four humours, usually the phlegm, reached the liver in excess. This humour caused an increase in temperature in the organ, which in turn, provoked the creation of steam. This steam, having nowhere to go, turned into fluid through liquification, which was stored in small cysts within the organ.

We know from modern medicine that hydatid cysts usually affect the liver, the lungs, the spleen, and rarely the brain, the central nervous system and the pericardium. The ancient authors correctly refer to these organs but they add more, such as the uterus. Such an addition should be expected when one takes into account that at that time, numerous kinds of cysts were identified as hydatids, without necessarily being such. It should be noted that the only diagnostic method used in ancient times was observation. It is characteristic that among the clinical manifestations mentioned by the ancient physicians, hepatomegaly was thought to be a sign for hydatid cysts of the liver, which also today is considered to be a characteristic symptom of echinococciasis.

Finally, the bewilderment of ancient writers, both of classical antiquity and the Greco-Roman period, in terms of internal diseases is obvious in the texts. Eventhough anatomy and physiology were still in their primitive stages, the empirical practice and observation served physicians of the time as a compass, in order to practice medicine. Thus, in several cases, their practices may come close to contemporary medical advice and practices. It is probable also that their observations of nature and physical phenomena intermix in order to help them explain and rationalize biological processes.

Author contributions

Niki Papavramidou: Conception and design of the work; the acquisition, analysis, and interpretation of data for the work, drafting the work, final approval of the version to be published, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Helen Christopoulou-Aletra: The acquisition, analysis, and interpretation of data for the work, revising it critically for important intellectual content, final approval of the version to be published, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Theodossis Papavramidis: Analysis, and interpretation of data for the work, drafting the work, final approval of the version to be published, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflicts of interest

The authors declare no conflicts of interest.

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