



Pericyst: The outermost layer of hydatid cyst

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Abstract

Hydatid disease, caused by the parasite *Echinococcus granulosus*, mostly affects the liver and the lungs with hydatid cysts which consist of three layers: (1) the outer pericyst; (2) the middle laminated membrane; and (3) the inner germinal layer. Pericyst, as the outermost layer of the hydatid cyst, is made by host cells encasing the hydatid cyst. An extremely close interaction exists between this host tissue and the parasite, and any degenerative changes of the pericyst would result in hydatid cyst degeneration or rupture. The pericyst plays an undeniably important role in the development and survival of the hydatid cyst.

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Key words: Hydatid disease; *Echinococcus granulosus*; Hydatid cyst; Pericyst; Layer

Core tip: Hydatid cysts consist of three layers: inner, outer and pericyst layers. An extremely close interaction exists between this host tissue and the parasite and any degenerative changes of the pericyst would result in hydatid cyst degeneration or rupture. The pericyst plays an undeniably important role in the development and

survival of the hydatid cyst.

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TO THE EDITOR

Hydatid disease, caused by the parasite *Echinococcus granulosus*, is a major public health concern within the developing world. The primary hosts of the *Echinococcus granulosus* tapeworms are dogs. The eggs of the parasite are produced in the intestine of the primary hosts and passed via the feces. Later, eggs are ingested by intermediate hosts such as cattle^[1]. Humans, as accidental hosts, might digest tapeworm eggs. In the upper gastrointestinal tract of the intermediate host, including humans (but not that of the primary host), the outer chitinous shells of hexacanth embryos become lysed, enabling the embryos to penetrate the mucosa of the duodenum and upper jejunum, enter the mesenteric venules and be carried in the portal stream to the liver. Theoretically, a few of the embryos can enter the lymphatics of the intestinal wall and bypass the liver through the cisterna chyli^[2]. Numerous alternative routes have also been proposed which result in involvement of other organs including bypass of the hepatic sinusoidal venous system, a lymphatic route through the thoracic duct, the inhalation of air contaminated with *Echinococcus*, and direct infection via adjacent affected sites. Embryos are able to form cysts in almost every organ^[3]. The diagnosis of a hydatid cyst is generally based on different imaging modalities and serology; however, serology is only useful for confirmation of the presumptive imaging diagnoses as it is nonspecific^[4]. Non-invasive diagnostic approaches including ultrasonography are also used^[5]. Although varied surgical methods have been introduced for the treatment of hydatid cysts, including enucleation, puncture, evacuation of cyst

contents, and cystotomy with or without capitonnage^[6,7], complications including recurrence are frequent^[8,9].

A hydatid cyst consists of three layers: (1) the outer pericyst; (2) the middle laminated membrane; and (3) the inner germinal layer. The pericyst, being the outermost zone of the hydatid cyst, and also known as the ectocyst or adventitial layer, consists almost entirely of host cells^[10]. The initial endothelial cells encompassing the hydatid cyst can be ultimately transformed into a thin yet distinct capsule being replaced by fibroblasts, connective tissue and the leading parenchymal cells. The parasite can be completely encased by this host-originated adventitial zone forming the outermost layer of the hydatid cyst. Histopathological evaluations reveal fibrous strands enveloped by more closely-arranged cellular layers, while minute vascular spaces and fragments of small ductal channels of the host organ coexist^[10]. Gradually, a blending of fibrous strands and compressed parenchymal cells with normal host tissue occurs so that no cleavage plane may be observed between the outermost portion of the layer and the surrounding normal host tissue. Osteopontin mainly distributes in the intra-pericystic layer of the hepatic hydatid cyst^[11]. The diameters of pericysts differ depending on the host organ, but generally do not exceed a few millimeters. Two major mechanical or protective and nutritional functions have been hypothesized for the pericyst. The former, though difficult to assess, can be appreciated when considering the extreme fragility of the parasite. The latter becomes more apparent when considering that the total metabolic rate of the parasite, especially those of larger size, would require a constant nutritional supply, which is provided by the vascular channels within the pericyst. This suggests a very close interaction between the host tissue and the parasite, an association developing from the early stages of the follicle or vesicle to the fully-developed large cystic stage. Interestingly, degenerative changes of the pericyst herald an amorphous degeneration or spontaneous expulsion of a hydatid cyst. This can also be seen in the situation where non-vascular channels or ducts of the host organ, such as bile canaliculi in the liver, bronchial openings in the lungs or collecting tubules in the kidney, open up on the surface of the cyst initiating hydatid cyst rupture^[6,8]. Different surgical approaches have been proposed for

the treatment of hydatid disease.

In summary, hydatid cysts consist of three layers, *i.e.*, inner, outer and pericyst layers; this seems to have been overlooked by Lantiga *et al.*^[12] when describing the structure of the hydatid cyst in the clinical features of hydatid disease.

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