

### Pathogenesis of cerebral hydatid disease

#### *To the Editor*

Clinical features and surgical outcomes of cerebral hydatid disease were recently discussed by Hasan et al.<sup>1</sup> In their case series, they introduced bypassing the liver as the route of pulmonary involvement.<sup>1</sup> However, 2 other distinct pathways have also been introduced for pulmonary hydatidosis; lymphatic spread via the thoracic duct into the right heart and ultimately to the pulmonary parenchyma, and direct pulmonary exposure from inhalation of eggs. Indeed, the former is considered a major pathway for the larvae to bypass the hepatic sinusoidal system, raising the probability of cerebral involvement.<sup>2,3</sup> The diagnosis of hydatid disease is based on several modalities among which non-invasive imaging and serological tests are of high value.<sup>4</sup> Serodiagnostic tests are frequently used for the preoperative diagnosis of extrahepatic hydatid disease, despite not being as sensitive as for liver hydatosis.<sup>5</sup> Nonetheless, eosinophilia in the peripheral blood is usually informative.<sup>6</sup> This diagnostic criterion seems to have been overlooked by Hasan et al.<sup>1</sup>

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#### *Reply from the Author*

I would like to express my thanks to Professor Sokouti et al for their valuable comments regarding our case series on the clinical features and surgical outcomes of cerebral hydatid disease in 8 Iraqi patients.<sup>1</sup> I completely agree with the comments regarding the pathways of pulmonary involvement; in fact there are more than 4 pathways for pulmonary involvement. The first is the passage of embryos with a diameter not exceeding 0.3 mm, which may pass through the hepatic sinusoidal venous system into the vena cava through the hepatic vein to reach the right side of the heart and the

pulmonary vessels. The second pathway is lymphatic through the thoracic duct to the internal jugular vein, and then the right side of the heart. There is also another possible lymphatic pathway, which is the lymphatics of the dome of the liver and the diaphragmatic lymphatics, which ascend into the parasternal and intercostal lymph nodes. The third possible pathway is the presence of venal-venous anastomosis in the liver and the space of Retzius. The last pathway, as suggested by some researchers, is the inhalation of air contaminated with *Echinococcus*. Furthermore, there are case reports of transdiaphragmatic dissemination via a bronchobiliary fistula due to hydatid disease and transdiaphragmatic rupture of liver hydatid, and this mechanism may explain the simultaneous involvement of both liver and lungs.

The diagnosis of hydatid cyst is mainly based on different imaging methods and on serology; however, serology has only a confirmatory role. Routine laboratory tests are nonspecific. Cyst rupture into the biliary tree may cause elevation of alkaline phosphatase, sometimes in association with hyperamylasemia and eosinophilia (up to 60%). Otherwise, eosinophilia is low grade or absent

Serologic tests are useful for confirmation of presumptive imaging diagnoses. However, many tests are available, and they are not standardized. Their sensitivity varies with the location of the cysts. Hepatic cysts are more likely to elicit an immune response than are pulmonary, brain, or splenic cysts. Serologic test results are usually positive when the endocyst is detached and in active and transitional stages. Serologic test results are generally negative in patients with inactive cysts. Titers may remain positive after conservative surgery in which the antigen source (the germinal layer) is not completely removed. Antibody titers usually increase immediately after medical or percutaneous treatments because of the mobilization of the antigen following disruption of cyst integrity. Fine-needle aspiration biopsy of the cyst performed under ultrasonographic guidance, with a transhepatic approach, under anthelmintic coverage, is useful to rule out the diagnosis of malignant neoplasms, abscesses, and nonparasitic cysts. The procedure must be carried out in the presence of an anesthesiologist ready to manage the rare but possible anaphylactic reaction.

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