

HEPATIC HYDATID CYSTS WITH SUPERINFECTION IN A NON-ENDEMIC AREA IN TAIWAN

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Abstract. Hepatic hydatid cysts are extremely rare in Taiwan. We report a case of complicated, multivesicular, hydatid cysts in the liver and a secondary infection with *Klebsiella pneumoniae*. The cysts were detected in an early stage by ultrasonography and computed tomography and treated successfully with radical resection.

INTRODUCTION

Hydatid cyst disease (hydatidosis) is caused by infestation with the parasitic tapeworm *Echinococcus granulosus*. Dogs are the definitive hosts, while humans, sheep, and cattle are intermediate hosts. This disease occurs worldwide and is common in sheep-raising regions, including southern Australia, New Zealand, Africa, southern Europe, and the Middle and Far East.¹ Hydatid disease is extremely rare in Taiwan; no historic prevalence has been reported and the epidemiology of this infection is not available. In the past 20 years, only one case of hepatic hydatid cysts in Taiwan has been reported.² We report a case of multivesicular hydatid cysts in the liver and a secondary infection with *Klebsiella pneumoniae* in a non-endemic area of Taiwan, and elucidate the roles of computed tomography (CT) and early aggressive surgery in the diagnosis and treatment of complicated hydatid cysts. This is the second reported case of hepatic hydatid cysts in Taiwan, and is the first complicated by superinfection. Both of these cases were sheep-dog-mediated infections.

CASE REPORT

The case was a 65-year-old woman farmer who lived in the northern part (Hsin Chu County) of Taiwan. She raised sheep and had a dog with which she had daily intimate contact. The sheep and dog originated in Taiwan. She had episodes of intermittent discomfort in the right upper quadrant, and hepatic cysts were detected at a local hospital when she was 60 years old. She had a history of diabetes mellitus and hypertension for six years that was continuously treated. She had received oral medications from a local clinic; however, the identity of these drugs was not known. Her blood glucose level was not available. She reported no history of travel outside Taiwan before she was admitted to a hospital, and she had a fever and right upper quadrant pain for two days before admission. The pain was sharp and continuous, without radiation, and was associated with vomiting. She was then admitted to our hospital for additional treatment.

On physical examination, she had a body temperature of 39°C that persisted after admission, and her right upper quadrant abdomen was tender without a palpable liver. Her cardiovascular and respiratory parameters were unremarkable. Her white blood cell count was 20,700 cells/mm³, with 75% neutrophils, 2.5% band forms, and no eosinophilia. Plain chest and abdominal radiographs showed no abnormalities. The results of biochemical tests for aspartate aminotransferase, alanine aminotransferase, bilirubin, carcinoembryonic antigen, carbohydrate antigen 19-9, and alpha fetoprotein

were normal. She had a non-fasting serum glucose level of 315 mg/dL. Negative results were obtained on an indirect hemagglutination test for amebic infection. The results of urine analysis were normal.

Abdominal ultrasonography revealed two cysts in the right lobe of the liver. The medial cyst was relatively echolucent and measured 6.3 × 7.4 cm, while the lateral cyst was 7.2 × 8.5 cm with septa and a honeycombed appearance (Figure 1A). A CT study showed two large cystic lesions at segment 7: a lateral cyst with septa, multivesicular, and small air bubbles (Figure 1B), and a medial cyst with a heterogenous internal density. Wall enhancement of both cysts after injection of intravenous contrast media suggested inflammation. These findings led to a diagnosis of liver cysts with abscess formation.

Surgery was performed four days after admission because of the fear of rupture of the cysts. Exploratory laparotomy showed two huge cysts, both with maximal diameters of more than 10 cm. Radical resection by right hepatectomy without spillage of the cystic content was performed. A multivesicular cystic appearance and turbid fluid content with peel lining on the cystic wall were disclosed after incision of the cysts (Figure 2A). Blood culture showed no bacterial growth, but culture of the cyst fluid revealed light growth of *K. pneumoniae* that was sensitive to a cephalosporin (cefazolin sodium, Cefamezine®; Fujisawa, Tokyo, Japan) and an aminoglycoside (gentamicin).

Histologic analysis of these cysts showed inner germinal and outer laminated layers in the large simple cyst, surrounded by chronic inflammatory cells. The lateral cyst with septa and multivesicles had diffuse acute suppurative inflammation (Figure 2B) with necrosis on the inner wall in which some protoscolices with suckers and refractile hooklets were seen (Figure 2C).

The post-operative course was uneventful and cefazolin sodium and gentamicin were given to control the *K. pneumoniae* infection. Oral chemotherapy, such as albendazole, was not administered perioperatively. The patient was discharged two weeks later and was in good health during the follow-up period.

DISCUSSION

Echinococcus granulosus is a parasitic tapeworm that lives in the bowels of dogs. Both sheep and humans are intermediate hosts. The present case was a farmer who raised sheep and lived in the northern part of Taiwan. She had a dog with which she had close daily contact. Although the sheep and dog were not tested for infection with this parasite, her dog

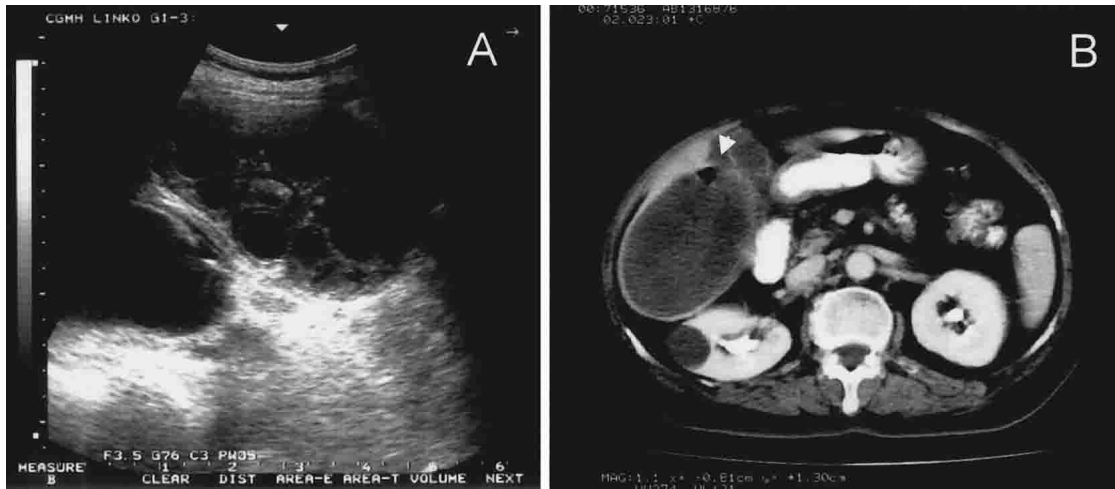


FIGURE 1. **A**, Ultrasonography showing two cysts in the right lobe of the liver. One is a single cyst and the other has septa and daughter cysts with a honeycombed appearance, referred to as Type I and Type III, respectively, as described by Gharbi and others.⁶ **B**, Computed tomography showing multivesicular cysts. Note the wall enhancement and the air density (**arrowhead**) in the cyst at the subhepatic space, which is an inflammatory change caused by superinfection. A right renal cyst is also visible.

was the most likely source of her infestation with *Echinococcus* because she reported no history of travel outside Taiwan before her admission to the hospital.

Seventy percent of human hydatid cysts develop in the liver.¹ The structure of the hydatid cyst consists of three layers: 1) the outer pericyst, which is composed of modified host cells that form a dense and fibrous protective zone, which may calcify when the cyst is old or dead; 2) the middle laminated membrane, which is acellular and allows the passage of nutrients; and 3) the germinal layer, where the scolices and the laminated membrane are produced. The latter two layers are referred to as the endocyst,^{1,3} which was present in our case.

The cyst fluid of an uncomplicated case is a transudate of serum that contains protein and is antigenic. This fluid may cause eosinophilia or anaphylaxis after being released into the circulation. However, our case showed no eosinophilia or anaphylactic reaction.

Hydatid cyst disease (hydatidosis) is usually asymptomatic, but complications can result from compression of adjacent structures, perforation of a cyst, infection of its content or exophytic growth, biliary communication, peritoneal seeding, transdiaphragmatic thoracic involvement, perforation into hollow viscera, portal vein involvement, abdominal wall invasion, and hematogenous dissemination.³ The rupture of the

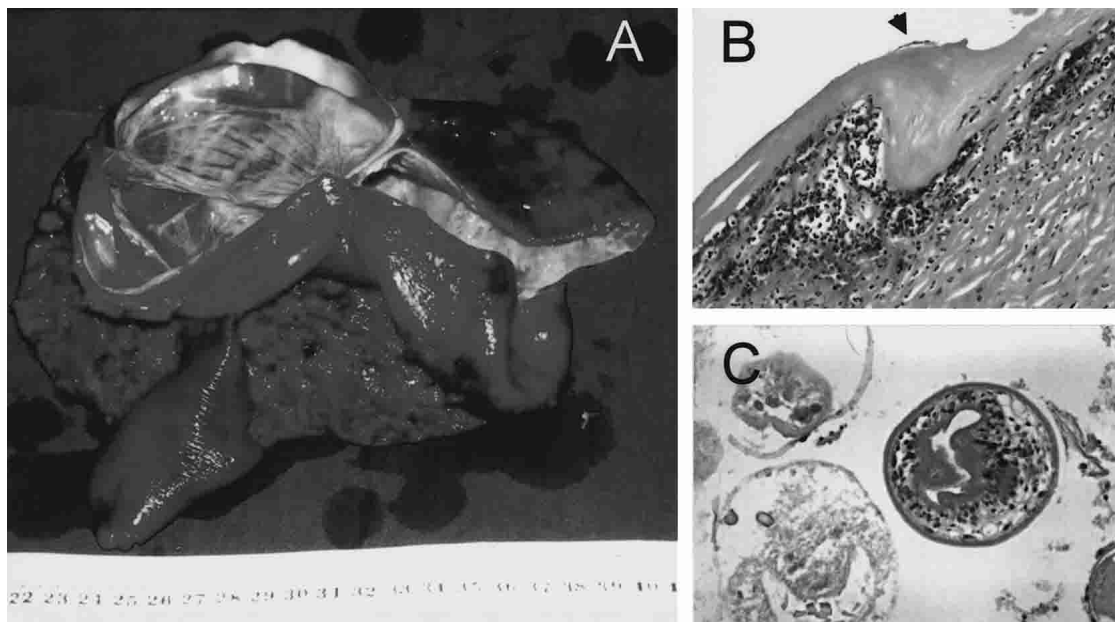


FIGURE 2. **A**, Two large cysts following right hepatectomy. Septa with daughter cysts and white peel lining are seen after incision of the cysts. **B**, Diffuse infiltration of neutrophils, suggestive of suppuration, adjacent to the acellular laminated membrane of the hydatid cyst. A partial germinal layer is also noted (**arrowhead**) (hematoxylin and eosin stained, magnification $\times 200$). **C**, Protoscolices with a sucker and refractile hooklets (hematoxylin and eosin stained, magnification $\times 400$).

cysts as a complication occurs in 50–90% of cases,⁴ and infection develops only after rupture of both the pericyst and endocyst (5–8% of cases).^{3,4} Infection and intrabiliary rupture are the most common complications.⁵ This case may have been infected for more than five years because the liver cysts were diagnosed previously at a local hospital. These cysts resulted in occasional right upper quadrant discomfort that she neglected to have treated. Complications of cystic infection may have developed five years later and resulted in her being admitted to our hospital.

Ultrasonography is the first method of choice in the diagnosis of hydatid liver cysts. Gharbi and others⁶ classified the ultrasonographic appearance of these cysts into five types: I) pure fluid collection; II) fluid collection with a split wall; III) fluid collection with septa; IV) heterogeneous echo patterns; and V) reflecting thick walls. Computed tomography and magnetic resonance imaging have shown cyst wall calcification, cyst infection, cyst wall defects, peritoneal seeding, and transdiaphragmatic migration of hydatid disease.³ The findings of a solid appearance, a mixed pattern with solid and fluid elements, internal echogenic foci, and air or air-fluid levels within the cyst suggest infection.³ Whereas ultrasonographic findings are nonspecific, CT is the preferred method for identifying cyst infection. Contrast-mediated CT can reveal the typical rim enhancement that indicates an abscess surrounding the lesion. Ultrasonography showed the typical appearance of type I (medial) and type II (lateral) hydatid cysts in our case. However, abscess formation in cysts cannot be easily identified by this method. Computed tomography revealed air density in one of the cysts at the subhepatic space. Contrast-mediated CT showed wall enhancement, suggestive of an inflammatory change, and resulted in the early detection of this complication.

Surgery remains the preferred method of treatment for hepatic hydatid cysts.^{5,7} This procedure includes conservative and radical procedures. Conservative surgery results in the neutralization of the parasite and evacuation of cyst contents, leaving the pericyst intact. Radical surgery results in the complete removal of both the cyst and pericyst. In the present case, radical procedure was performed after a diagnosis of complicated hydatid liver cysts with abscess formation and a high risk of perforation.

The histologic study showed typical endocystic layers with suppurative inflammation. Culture of the cyst fluid indicated the presence of *K. pneumoniae*. Although cases with hydatid cysts infected with *Streptococcus milleri* and *Haemophilus influenzae* have been reported,^{8,9} our case is the first report of infection with *K. pneumoniae*. The high incidence of liver abscess with infection with *K. pneumoniae* in patients with diabetes has been previously reported in Taiwan,^{10,11} and we believe that this infection is a significant finding. The relationship between the blood glucose level and the increased risk of infection by *K. pneumoniae* in liver abscesses is not well documented. The higher level of blood glucose may have been induced by the cystic superinfection. A defect in the host defense mechanisms against infection with *K. pneumoniae* has also been suggested to be involved.¹¹ The surgical procedure did not include the retroperitoneum of the right renal cyst. The appearance of the right renal cyst in the CT scan was round, well-demarcated, and without the inflammatory change seen with an infection, and was believed to be an incidental finding of a simple cyst.

Percutaneous aspiration and injection of alcohol or hypertonic saline under sonographic or CT guidance has been developed as a new therapeutic approach for the treatment of hydatid liver cysts. Oral chemotherapy with albendazole has also been advocated; however, chemotherapy combined with percutaneous drainage has been shown to achieve better results in the management of uncomplicated hydatid cysts.¹² Although the number of alternative conservative treatments for management of hydatid cysts is increasing, surgery is still the preferred method for treatment of those with complicated hepatic hydatid cysts.

In conclusion, infection with *E. granulosus* can occur worldwide, and sporadic cases have been diagnosed in non-endemic areas. The only previously reported case of hydatid liver cysts in Taiwan did not show complications and was treated by radical cystopericystectomy. The present case is the first to show complicated hydatid cysts with superinfection by *K. pneumoniae* and abscess formation in a patient with diabetes. The specific ultrasonographic appearance of these cysts is typical and should be kept in mind whenever one is evaluating hepatic cystic lesions, especially in patients that have close contact with definitive or intermediate hosts of *E. granulosus*. Ultrasonography is not a definitive procedure for the diagnosis of additional bacterial infections. Computed tomography with contrast media can detect complications, such as cyst infection. Thus, the use of aggressive surgery for complicated hydatid liver cysts is still warranted in the treatment of this disease.

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