

# An Imported Case of Echinococcosis of the Liver in a Korean Who Traveled to Western and Central Europe

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**Abstract:** *Echinococcus granulosus*, an intestinal tapeworm of dogs and other canids, infects humans in its larval stage and causes human echinococcosis or hydatid disease. In the Republic of Korea, 31 parasite-proven human echinococcosis cases have been reported, most of which were imported from the Middle East. We recently examined a 61-year-old Korean man who had a large cystic mass in his liver. ELISA was negative for tissue parasitic infections, including echinococcosis, cysticercosis, paragonimiasis, and sparganosis. The patient underwent surgery to remove the cyst, and the resected cyst was processed histopathologically for microscopic examinations. In sectioned cyst tissue, necrotizing protoscolices with disintegrated hooklets of *E. granulosus* were found. In some areas, only freed, fragmented hooklets were detected. The patient had traveled to western and central Europe in 1996, and had no other history of overseas travel. We report our patient as a hepatic echinococcosis case which was probably imported from Europe.

**Key words:** *Echinococcus granulosus*, liver, case report, ELISA, histopathology, protoscolex

## INTRODUCTION

Human echinococcosis or hydatidosis is a zoonotic disease caused by infection with the metacestode of *Echinococcus granulosus* or *Echinococcus multilocularis*, an intestinal tapeworm of the dogs, cats, and foxes [1]. A wide range of mammals, including cattle, sheep, goats, marsupials, and primates, serve as intermediate hosts. In these animals, *E. granulosus* causes cystic echinococcosis (CE) presenting with a large, unilocular cyst, whereas *E. multilocularis* causes alveolar echinococcosis (AE) presenting with small, multilocular cysts. Humans are aberrant (accidental) hosts, and the parasite does not complete development into adults in human hosts [1]. Endemic areas include the Mediterranean regions, the Middle East, the Russian Federation, the People's Republic of China, eastern and northern Africa, Australia, South America, and some European countries [1].

In the Republic of Korea, a total of 31 echinococcosis cases have been reported in the literature based on identification of the parasite; the patients included 24 Koreans, 6 Uzbeks, and 1 Mongolian [2-16]. One recurring case in the peritoneal cavity was described in a Korean [17]. Most of the cases were imported, with the exception of 2 Korean cases in which the origin of

infection was obscure [9,18]. The remaining 22 Korean patients had a history of travel to or residence in highly endemic areas, including the Middle East (17 cases), Libya (1 case), Pakistan (1 case), Vietnam (1 case), China (1 case), and Brazil (1 case) [2-16]. We report here a presumed imported case of cystic echinococcosis (CE) in the liver of an otherwise healthy, 61-year-old man who had a travel history to western and central Europe.

## CASE DESCRIPTION

In November 2008, a 61-year-old Korean man was transferred to the Seoul National University Hospital, Seoul, Republic of Korea for a large cystic liver mass detected by ultrasonography on health checkup. He did not have liver disease or any other medical problems. He traveled to Europe (France, German, Italy, Switzerland, and Spain) in 1996.

At ultrasonography, a heterogeneous echoic mass of about 8 cm in diameter was detected, and the characteristic 'ball of wool' appearance was recognized (Fig. 1). In magnetic resonance imaging (MRI), the mass was characterized by a T1 low and T2 heterogeneous high signal intensity without enhancement. The tentative radiologic diagnosis was either of an atypical epidermoid cyst, a cystic teratoma, a pseudocyst, a foreign body reaction, or a parasite infection. The results of routine blood biochemistry were normal. Serological tests by ELISA to detect anti-

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Fig. 1. Ultrasonography of the patient. The liver cyst (arrows) shows a 'ball of wool' appearance.



Fig. 2. Surgical specimen of the echinococcal cyst resected from the patient. A protruding large cystic mass (upper) is seen.

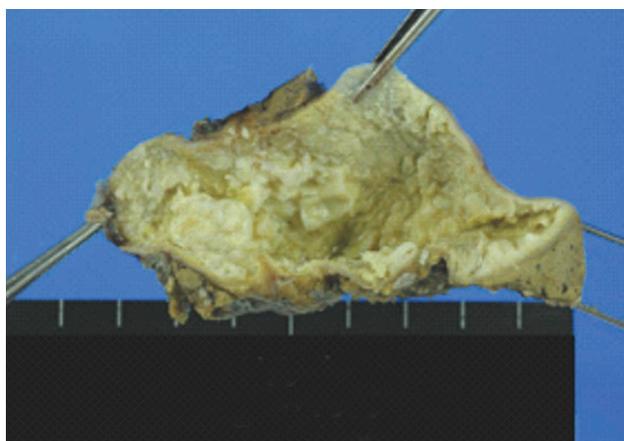


Fig. 3. Gross photograph of the interior of the cyst. The cyst contains necrotic tissues, but without protruding masses or objects.

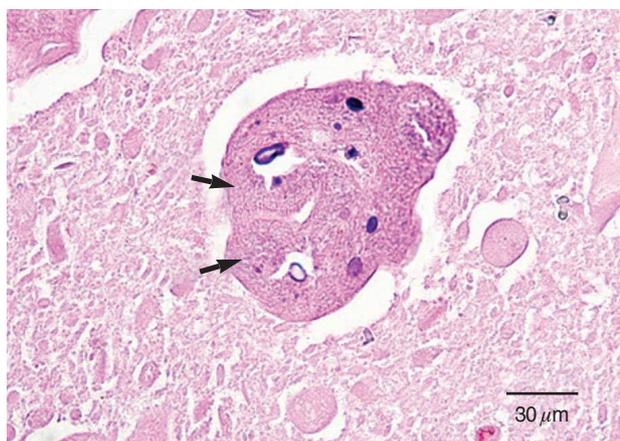


Fig. 4. A degenerating protoscolex of *Echinococcus granulosus* showing 2 suckers (arrows) and necrotic background of the cyst. H-E stain, × 400.

bodies against *Taenia solium* metacestode, *Paragonimus westermani*, sparganum, *Clonorchis sinensis*, and hydatid cyst (*E. granulosus*) were performed. However, ELISA was negative for all the parasites. Regardless of this uncertain clinical setting, he received a tumorectomy because a slowly-growing large mass by itself is an indication for a surgical intervention.

In the Department of Pathology, the resected specimen was processed in a general manner. In gross examinations, the mass measured 9 × 6 × 5 cm (Fig. 2). The cyst was filled with yellowish, necrotic liquid materials, and there was no solid mass growth inside the cyst (Fig. 3). No grossly recognizable parasites or parasite eggs were detected in the necrotic materials under a stereomicroscope. However, small, spherical particles were identified that were not transparent enough to examine stereoscopically (photograph not taken). These particles were later identified as necrotizing protoscolices of *E. granulosus* in light micro-

scopic examinations of the sectioned histopathological specimens.

After fixation in 10% neutral buffered formalin, the cystic mass was sampled at several places according to standard procedures. The tissue samples were processed for serial, 3-μm thick paraffin sections and stained with hematoxylin and eosin (H-E) for conventional histopathological examinations. The liver parenchyma around the cyst showed signs of chronic granulomatous inflammation. The cyst was composed of a thick fibrous wall without lining epithelia and of extensive necrotic materials inside. Among the necrotic materials, many small structures resembling parasites and parasite eggs (Figs. 4, 5) were recognized. Under the suspicion of a parasitic infection, the specimen was submitted to the Department of Parasitology and Tropical Medicine for further examination. Finally, the structures were



Fig. 5. Another degenerating protoscolex of *E. granulosus* showing hooklets (arrow). H-E stain,  $\times 600$ .

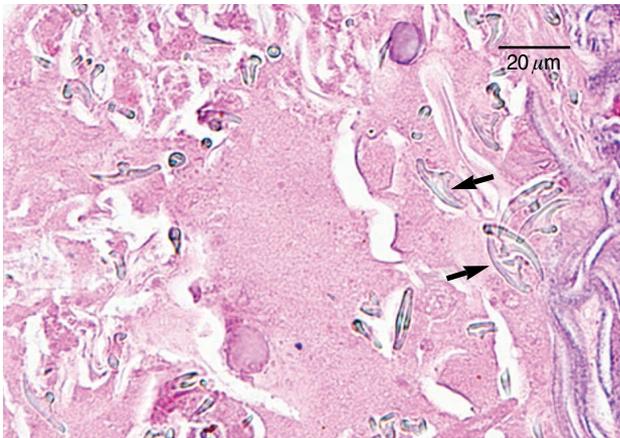


Fig. 7. Freed protoscolices (arrows) of *E. granulosus* within the cyst. H-E stain,  $\times 600$ .

identified as protoscolices and hooklets of *E. granulosus* (Figs. 4-7), and the cyst wall was typically composed of a thick laminated layer (Fig. 6). Thus, the cyst was confirmed to be a unilocular echinococcal cyst. Many of the protoscolices were necrotic and had lost their normal contour (Fig. 6), but some had retained their suckers (Fig. 4) or hooklets (Fig. 5). There were also numerous freed hooklets (Fig. 7), about 20  $\mu\text{m}$  in length, embedded in the necrotic materials.

After the diagnosis, the ultrasonographic images were reviewed. According to the classification proposed by the WHO Informal Working Group on Echinococcosis [1], the cyst was classified as an echinococcal cyst type CE 4 (medium size; 5-10 cm), which is inactive, with heterogeneous degenerative contents (hyperechoic or hypoechoic), and without daughter cysts. Moreover, as the surgery was performed without any complications, no additional chemotherapy was needed. After the surgery, the

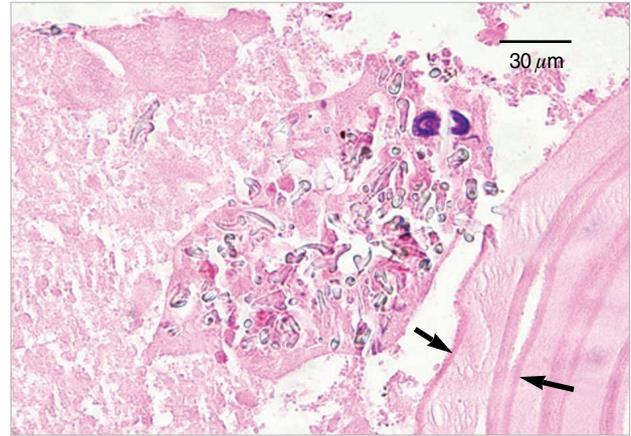


Fig. 6. Freed (upper left) and grouped (center) hooklets of *E. granulosus* in the necrotic background, with the laminated cyst wall (long arrow) and the germinal layer (short arrow), which is a characteristic feature of hydatid cysts. H-E stain,  $\times 400$ .

patient did not show any sign of relapse.

## DISCUSSION

The diagnosis of human echinococcosis is difficult even in large hospitals in the Republic of Korea, because this zoonotic disease is exotic and uncommon. In acute and active stages, radiological and serological tests, including ELISA, are useful for diagnosis [1,19]. However, in chronic and inactive stages, radiological examinations may reveal non-specific findings and serological tests may not be sensitive enough [1]. Therefore, careful histological examinations are essential to diagnose chronic and inactive echinococcal cysts. In our case, the diagnosis could not be made until the surgically removed mass was processed for histopathological examination and light microscopy. The cyst was filled with necrotic materials, and degenerating protoscolices and hooklets of *E. granulosus* were detected among these materials.

ELISA is a highly sensitive and useful serological test for echinococcosis, especially in its active stages. However, like other serological tests, ELISA may produce false negative results [1]. False negatives may be due to the small size of a cyst (< 10 mm in diameter) and/or to the separation of the cyst from the surrounding tissue [1]. In both cases, the concentration of parasite antigen may be too low to elicit humoral immune responses [19].

In Korea, indigenous (presumed to be) *E. granulosus* was reported in 1937 and 1944 with echinococcal cysts detected in cattle and pigs [20,21]. Around that time, the average prevalence

Table 1. Brief summary of the 31 human echinococcosis cases reported in the Republic of Korea

Case No.	Age & sex	Chief complaints	History of travel abroad	Incubation period <sup>a</sup>	Involved organ	Reference
Koreans						
1	27/F	Chest pain	None	Uncertain	Lung	Reviewed [2], [18]
2	25/M	Chest pain	Kuwait	3 years	Lung	Reviewed [2], [18]
3	31/M	Asymptomatic	Middle East	4 years	Lung	Reviewed [2]
4	30/M	Chest pain	Middle East	6 months	Lung	Reviewed [2]
5	32/M	Epigastric discomfort	Saudi Arabia	5 years	Liver	Reviewed [2]
6	39/M	Epigastric discomfort	Saudi Arabia	3 years	Liver	Reviewed [2]
7	49/M	Pleurisy symptoms	Saudi Arabia	21 months	Lung	Reviewed [2]
8	25/M	Epigastric pain, wt. loss	Pakistan	2 years	Liver	Reviewed [2]
9	39/M	Epigastric discomfort	Saudi Arabia	11 years	Liver	Reviewed [2]
10	33/M	Abdominal discomfort	Saudi Arabia	6 years	Liver, peritoneal cavity	Reviewed [2], recurred [17]
11	26/M	Chest mass	Libya	2 years	Lung	Reviewed [2]
12	39/M	General malaise	Saudi Arabia	11 years	Liver	Reviewed [2]
13	44/M	Asymptomatic	Saudi Arabia	7 years	Lung	Reviewed [2]
14	55/M	Epigastric discomfort	Middle East	10 years	Liver	Reviewed [2]
15	43/M	Epigastric discomfort	Saudi Arabia	> 4-5 years	Liver	Reviewed [2]
16	38/M	Indigestion	Saudi Arabia	3 years	Liver	[2]
17	50/M	Abdominal discomfort	Saudi Arabia, Iraq	1 year	Liver, lung	[3]
18	27/F	Abdominal pain	China	1 year	Liver	[4]
19	53/M	Bloody sputum	Middle East	12 year	Liver, lung	[5]
20	53/M	Abdominal pain	Middle East	Unknown	Liver	[6]
21	49/M	Asymptomatic	Brazil	Unknown	Liver	[6]
22	52/M	Liver mass	Vietnam	33 years	Liver	[7]
23	66/M	General malaise	Saudi Arabia	> 30 years	Liver	[8]
24	56/F	Dizziness	Unknown	1-8 years	Kidney	[9]
Uzbek						
1	31/M	Syncope	Uzbekistan	Uncertain	Liver	[10]
2	38/M	Abdominal pain	Uzbekistan	Uncertain	Bladder	[11]
3	33/F	Exophthalmos	Uzbekistan	Uncertain	Orbit	[12]
4	35/M	Abdominal pain	Uzbekistan	Uncertain	Liver, peritoneal cavity	[13]
5	28/M	Abdominal discomfort	Uzbekistan	Uncertain	Spleen	[14]
6	30/M	Syncope	Uzbekistan	Uncertain	Liver	[15]
Mongolian						
1	34/M	Chest discomfort	Mongolia	Uncertain	Lung	[16]

<sup>a</sup>The duration between the history of exposure and onset of symptoms.

in cattle was 0.73% nationwide (excluding Jeju-do Island) [21]. On Jeju-do, the prevalence was much higher in bovines (6.8-27.5%) [21]. This high prevalence in bovines on Jeju-do persisted until the 1970s [20]. However, no further reports on bovine or swine echinococcosis were published after 1975 [20]. Adult worm infection in dogs or other canids have never been reported in Korea. With regard to human echinococcosis, 3 cases (2 were Koreans) were mentioned by H. Kobayashi in 1928, although they were not based on parasitological examinations [18,21].

Among the 31 parasitologically-proven echinococcosis cases reported in the Republic of Korea (1983-2009) (Table 1), 24 were native Koreans between the ages of 25 and 66 years (mean: 40.9). Of these 24 cases, 21 (87.5%) were men. The organs in-

involved were predominantly the liver (19 cases), followed by the lung (10 cases). The longest recorded incubation period was 33 years. With the exception of 2 Korean patients in whom the origin of infection is obscure [9,18], the remaining 29 cases are regarded as imported echinococcosis. The areas of acquisition were primarily the Middle East, and there were no cases imported from Europe. We consider that our patient is an echinococcosis case imported from a European country.

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