



Seronegative, complicated hydatid cyst of the lung: A case report



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ARTICLE INFO

Article history:

Received 19 February 2017

Received in revised form

5 April 2017

Accepted 6 April 2017

ABSTRACT

Cystic echinococcosis (CE) is an important helminthic zoonotic disease that commonly affects the liver and lungs. Imaging methods and serology establish the diagnosis in most cases. Chest x-ray can diagnose uncomplicated pulmonary hydatid cysts, whereas superinfection and/or rupture of the hydatid cyst (complicated cysts) may change the radiographic appearance and lead to delayed diagnosis and treatment. We report the case of a patient with hemoptysis and chest pain, where computer tomography scan of the lung suggested a large, ruptured hydatid cyst. However, serological tests with indirect hemagglutination (IHA) for *Echinococcus granulosus* antibodies were negative, and there was massive growth of *Streptococcus pneumoniae* in sputum. Based on this, we concluded that the patient had a bacterial lung abscess. The diagnosis of CE was only made after surgical removal of the cyst followed by microscopy and polymerase chain reaction.

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1. Introduction

Echinococcosis is a zoonosis caused by tapeworms of the genus *Echinococcus*. The most medically important forms are cystic echinococcosis (CE), caused by *E. granulosus*, and alveolar echinococcosis, caused by *E. multilocularis* [1]. Carnivores such as dogs and wolves are definitive hosts for *E. granulosus*. Infection occurs by ingestion of the viscera of intermediate hosts (e.g., goats, pigs, cattle) containing hydatid cysts. The infected carnivores pass eggs by defecation [2]. Humans get infected by ingesting eggs from the contaminated ground. Larvae that are released from the eggs, penetrate the intestinal lining and are transported by blood or lymph to different organs [1]. The liver and the lungs are the most commonly affected organs [2]. The hydatid cyst grows slowly and in some cases do not cause symptoms for years. Imaging methods and serology establish the diagnosis in most cases. However, diagnosis of a complicated hydatid cyst is difficult and usually delayed [3]. Here, we describe a patient case that illustrates the difficulties in diagnosing CE.

2. Case report

A 24-year-old man presented with left-sided tightening chest pain for three days and a few hours of productive coughing with blood-clotted sputum. The patient reported unintentional weight loss during the last month, intermittent night sweats but no fever or lethargy. His medical history was unremarkable, and he took no medicine. He had previously smoked for six months. The patient, a refugee from a rural Syria, had lived in Denmark for one year. He was exposed to sheep and dogs during his childhood. General physical examination revealed fever, a temperature of 39°C, a heart rate of 76 beats per minute, a respiratory rate of 22 breaths per minute, and a blood pressure of 130/70 mm Hg. Apart from this, the clinical examination was unremarkable. Blood samples revealed an elevated CRP of 197 mg/l, leukocytosis ($15.4 \times 10^9/L$) with a strong component of granulocytosis, but no eosinophilia.

Chest X-ray revealed consolidation of the upper two thirds of the left lung (Fig. 1). Because of the medical history and possible exposure to tuberculosis, the patient was suspected to have pulmonary tuberculosis. Interferon-gamma release assay (IGRA) was taken and sputum was sent for microscopy; both were negative.

A computed tomography scan (CT scan) of the thorax showed a cavitary lesion with septae and air-fluid-level with filaments measuring approximately $8 \times 11 \times 13$ cm, involving the left superior lobe. Folded membrane-like structures within the cavity

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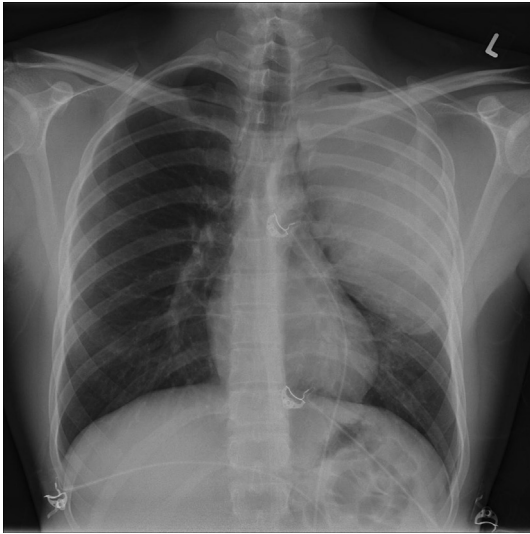


Fig. 1. Chest X-ray showed consolidation of the upper two thirds of the left lung.

suggested a hydatid cyst. The air filling indicated that the cyst communicated with the airways. The rest of the lung fields and mediastinum appeared without pathology. (Fig. 2). A CT scan of the abdomen revealed no abnormality. The patient was prescribed antihelminthic treatment with albendazole 400 mg, two times daily.

Blood samples tested with enzyme-linked immunosorbent assay (ELISA) for *E. multilocularis* and with indirect hemagglutination (IHA) for *E. granulosus* antibodies came out negative. Microscopy of sputum showed massive growth of *Streptococcus pneumoniae*, and it was concluded that the patient had a lung abscess. The patient was prescribed broad-spectrum antibiotics and albendazole was discontinued.

Few days later the patient developed acute chest pain; chest X-ray (Fig. 3) showed atelectasis of the lower part of the left lung with an air compartment above the abscess and a small mediastinal shift away from the pleural effusion. CT-scan showed a ruptured lung abscess or cyst and hydropneumothorax of the left lung. The patient was treated with therapeutic thoracentesis, approximately



Fig. 3. Chest X-ray showed atelectasis of the lower part of the left lung with an air compartment above the abscess.

600 mL yellow liquid was removed and sent for microscopy. Due to respiratory distress the patient was transferred to our intensive care unit (ICU). After 24 hours of care in the ICU, the now stable patient was transferred to the pulmonary ward.

A multidisciplinary team conference was held to discuss differential diagnoses, further investigations and management. The team concluded that further investigation with bronchoscopy was necessary. Microscopy and polymerase chain reaction (PCR) tests for *E. granulosus* bronchio-alveolar lavage (BAL) fluid were negative. However, tests for *Aspergillus* galactomannan antigen were positive. On suspicion of invasive aspergillosis the patient was prescribed antimycotic treatment with IV voriconazol 200 mg twice daily.

After presentation of the case to the department of thoracic surgery, lateral thoracotomy at IC5 was performed and the cyst was removed by lobectomy of the superior lobe of the left lung. Microscopic examination and polymerase chain reaction (PCR) for DNA showed the presence of *E. granulosus*. Thus, the diagnosis was changed accordingly, and the patient was prescribed albendazole 400 mg, twice daily for 6 months.



Fig. 2. CT-scan of the thorax (coronal view to the left and mediastinal window the right) showed a cavitary lesion with septae and air-fluid-level with filaments measuring app. 8×11×13 cm in the left superior lobe. Folded membrane-like structures were seen within the cavity.

The patient came to regular follow-up in the outpatient clinic for infectious diseases for 12 months. The patient was asymptomatic during this period and no recurrence was observed.

3. Discussion

CE is one of the major zoonotic diseases in the world, and it is found on every continent except for Antarctica. High prevalence of *E. granulosus* is reported in the Middle East [4]. In our case, the patient came from rural Syria, where CE is endemic.

The clinical presentation of CE differs between simple and complicated cysts. A complicated hydatid cyst of the lung is defined as a cyst that has ruptured into the pleural or bronchus cavity, with or without secondary infection of the cyst [5]. Those cysts regularly cause cough, chest pain and shortness of breath. Small hydatid cysts are usually asymptomatic [6]. Our patient presented with hemoptysis in addition to the typical symptoms. Parasitic aetiology of hemoptysis is rare, as it is more common in tuberculosis, bronchiectasis, bronchogenic carcinoma or trauma. In our case tuberculosis was ruled out by a negative IGRA and negative sputum cultures. Hemoptysis in patients with CE may be caused by pressure erosion of a bronchus, an obstructive effect with bronchial infection or rupture of cysts into the bronchus, which can lead to massive hemoptysis [6].

Most cases of CE are diagnosed by a combination of history of exposure, serological testing of serum or hydatid fluid and imaging [3]. Chest X-ray is usually the initial investigation for a patient with lung symptoms. An intact single hydatid cyst appears as a homogeneous spherical opacity with definite edges. It is often surrounded by normal lung tissue [7]. Images of a complicated hydatid cyst vary and it may resemble a lung abscess, malignant tumor, tuberculosis, and other cystic lesions of the lung [6]. Large cysts can cause atelectasis of adjacent parenchyma, induce a pleural reaction or shift the mediastinum [8] as seen in our case.

For complicated hydatid cysts, CT scan has proven to be an important imaging modality. Various signs are associated with hydatid cyst, e.g. both the serpent sign and the spin sign indicate a collapsed parasitic membrane [9]. Other classical radiographic signs are: signet ring, water lily, crescent or meniscus, inverse crescent, air bubble and dry cyst [10]. Superinfection with bacteria of ruptured hydatid cysts can change the appearance of the cyst on X-ray and CT scan [11].

Serological methods such as ELISA, IHA, latex agglutination test and immunoblot test (IB) are commonly used to detect hydatid cyst [12]. However, commercially available serological tests have shown unsatisfactory performance in terms of both sensitivity and specificity. Factors such as cyst size, stage, location and patient characteristics have been suggested to affect the test results [13]. A negative serological test normally does not rule out CE [14]. IHA test for serum antibodies for *E. granulosus* is positive in approximately 50% of patients with pulmonary CE [15]. However, complicated cyst usually causes positive serology. In a series of 100 cases, IHA showed a sensitivity of 100% in patients with ruptured cysts [16]. In our case, the CT scan indicated a large, ruptured hydatid cyst. Therefore, negative *E. granulosus* serology strongly suggested the absence of CE. However, in patients with initial negative serological testing a combination of several tests may increase diagnostic accuracy [17]. This was not performed in our case because massive growth of *S. pneumoniae* in sputum instead led us to conclude that the patient had a bacterial lung abscess. Later, positive *Aspergillus* galactomannan antigen in the BAL fluid indicated that the patient had invasive aspergillosis. Investigation after the removal of the hydatid cyst revealed a secondary *S. pneumoniae* infection of the cyst and false positive results for aspergillosis.

Peripheral blood eosinophilia is present in <25% of persons with

hydatid cysts and are more common in cases of ruptured cysts [12]. There was no peripheral blood eosinophilia in our case.

Protoscolices may be detected in the sputum or bronchial washings in patients with ruptured pulmonary hydatid cysts [12]. Sputum was not evaluated for protoscolices, membranes or parasite hooks in our case. Considering our suspicion of a complicated hydatid cyst and that the patient came from a country where *E. granulosus* is endemic it would have been appropriate to investigate sputum with microscopy and PCR. Though we evaluated BAL fluid for *E. granulosus*, an evaluation of sputum may have increased the chance of detecting the infection at an earlier stage.

Treatment of lung hydatid cysts is essentially surgical. Surgery is associated with low mortality (1–2%), acceptable morbidity rate, and low recurrence rates (1–3%) [18]. The surgical options include lobectomy, wedge resection, pericystectomy, intact endocystectomy, and capitonnage [19]. There are only two antihelminthics effective against CE: albendazole and mebendazole. Albendazole is the drug of choice because its systemic absorption and penetration into hydatid cysts is higher than mebendazole. When surgery is necessary, presurgical use of albendazole reduces risk of recurrence and facilitates the removal of the cyst by reducing intracystic pressure [18]. Albendazole is effective at a dosage of 15 mg per kg body weight in 2 divided doses, and the usual dose is about 800 mg daily. Therapy is often indicated for a minimum of 3–6 months [20].

Declaration of interest

The authors declare no conflict of interest. The study received no financial support.

References

- [1] D.P. Mc Manus, W. Zhang, J. Li, et al., Echinococcosis, *Lancet* 362 (2003) 1295–1304.
- [2] P. Moro, P.M. Schantz, Echinococcosis: a review, *Int. J. Infect. Dis.* 13 (2009) 123–133.
- [3] U. Singh, S. Kumar, H. Gour, et al., Complicated hydatid cyst and "air bubble" sign: a stepping stone to correct diagnosis, *Am. J. Case Rep.* 16 (2015) 20–24.
- [4] S.M. Sadjjadi, Present situation of echinococcosis in the Middle East and Arabic North Africa, *Parasitol. Int.* 55 (2006) 197–202.
- [5] A. Kuzucu, O. Soysal, M. Ozgel, et al., Complicated hydatid cysts of the lung: clinical and therapeutic issues, *Ann. Thorac. Surg.* 77 (2004) 1200–1204.
- [6] C. Tekinbas, S. Turedi, A. Gunduz, et al., Hydatid cyst disease of the lung as an unusual cause of massive hemoptysis: a case report, *J. Med. Case Rep.* 3 (2009) 21–23.
- [7] G. Ramos, A. Orduña, M. García-Yuste, Hydatid cyst of the lung: diagnosis and treatment, *World J. Surg.* 25 (2001) 46–57.
- [8] I. Beggs, The radiology of hydatid disease, *AJR Am. J. Roentgenol.* 145 (1985) 639–648.
- [9] W.N. Von Sinner, New diagnostic signs in hydatid disease; radiography, ultrasound, CT and MRI correlated to pathology, *Eur. J. Radiol.* 12 (1991) 150.
- [10] A.T. Turgut, L. Altin, S. Topçu, et al., Unusual imaging characteristics of complicated hydatid disease, *Eur. J. Radiol.* 63 (2007) 84–93.
- [11] W.N. von Sinner, Radiographic, CT and MRI spectrum of hydatid disease of the chest: a pictorial essay, *Eur. Radiol.* 3 (1993) 62–70.
- [12] M. Sarkar, R. Pathania, A. Jhobta, et al., Cystic pulmonary hydatidosis, *Lung India* 33 (2016) 179–191.
- [13] B. Sarkari, Z. Rezaei, Immunodiagnosis of human hydatid disease: where do we stand? *World J. Methodol.* 5 (2015) 185–195.
- [14] M.F. Biava, A. Dao, B. Fortier, Laboratory diagnosis of cystic hydatid disease, *World J. Surg.* 25 (2001) 10–14.
- [15] B. Gottstein, J. Reichen, Hydatid lung disease (echinococcosis/hydatidosis), *Clin. Chest Med.* 23 (2002) 397–408.
- [16] J. Zapatero, L. Madrigal, J. Lago, et al., Surgical treatment of thoracic hydatidosis. A review of 100 cases, *Eur. J. Cardiothorac. Surg.* 3 (1989) 436–440.
- [17] L. Force, J.M. Torres, A. Carrillo, et al., Evaluation of eight serological tests in the diagnosis of human echinococcosis and follow-up, *Clin. Infect. Dis.* 15 (1992) 473–480.
- [18] R. Morar, C. Feldman, Pulmonary echinococcosis, *Eur. Respir. J.* 21 (2003) 1069–1077.
- [19] A. Yilmaz, L.Y. Tuncer, E. Damadoglu, et al., Pulmonary hydatid disease diagnosed by bronchoscopy: a report of three cases, *Respirology* 14 (2009) 141–143.
- [20] D. Anadol, U. Ozcelik, N. Kiper, et al., Treatment of hydatid disease, *Paediatr. Drugs* 3 (2001) 123–135.