

Anaphylactic shock ensuing therapeutic puncture of an echinococcal cyst

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Abstract Cystic echinococcosis (CE) is a widespread zoonosis. For treating single echinococcal cysts during the last decades, therapeutic puncture of the cyst, aspiration, injection of a scolicide, and re-aspiration (PAIR) has been established as a minimal-invasive alternative method to surgery. A recent review on the complications of therapeutic cyst punctures has shown that dangerous complications occur much less frequently than previously assumed. A case is described where an allergic acute bronchospasm and arterial hypotension led to a life-threatening shock immediately after echinococcal cyst puncture. Fortunately, the situation could be managed by an experienced and well-equipped anesthesiology team. Life-threatening allergic phenomena after puncture of echinococcal cysts may occur less frequently than generally assumed; nevertheless, they must be taken into account, and precautions must be taken to manage serious adverse events.

Keywords Anaphylaxis · Shock · Echinococcosis · Hydatid cysts · Hydatid disease · *Echinococcus granulosus* · *Echinococcus* spp. · PAIR · Albendazole

Cystic echinococcosis (CE) is a widespread zoonosis. Traditionally, CE is treated by surgical resection. In former times, puncture of echinococcal cysts was considered to be strictly contraindicated because of the fear to cause anaphylactic shock and to spread the disease to the whole organism. Since the advent of benzimidazole therapy during the last decades, puncture of cyst, aspiration, injection of a scolicide, and re-aspiration (PAIR) under albendazole coverage has been established as a minimal-invasive alternative method to surgery for the treatment of single echinococcal cysts (WHO 2001). A recent systematic literature review summarizing 5943 percutaneous treatment (PT) procedures performed on 5517 hepatic and non-hepatic echinococcal cysts found that lethal anaphylaxis occurs in 0.03 % (2 in 5943) of PT procedures, corresponding to 0.04 % (2 in 5517) of treated cysts, while reversible allergic reactions complicate 1.7 % (99 in 5943) of PT procedures, corresponding to 1.8 % (99 in 5517) of treated echinococcal cysts (Neumayr et al. 2011).

A 24-year-old woman who recently migrated from Uzbekistan to Germany was referred to our service because of a suspicious liver cyst. Medical history confirmed a long time close contact with her own dog in Uzbekistan. Furthermore, atopia and allergic reactions to pineapple and kiwi fruit leading to dyspnea was recalled. Laboratory results included a moderately increased total IgE of 202 IU/ml (normal <100). Differential blood cell count showed a normal relative (2.5 %) and absolute eosinophil count (200 cells/ μ l [normal count 100–400 cells/ μ l]). Serology results showed a positive immune hemagglutinin assay (IHA) for *Echinococcus* spp. at 1:64 (Bordier; Crissier, Switzerland) and a positive EIA for *Echinococcus granulosus*, whereas the enzyme immune assay (EIA) for *Echinococcus multilocularis* was negative (Siemens Healthcare AG, Erlangen, Germany). Test results were confirmed in another laboratory (Bernhard-Nocht-Institute of Tropical Medicine, Hamburg, Germany) where in-house tests are used: the positive IHA for *E. granulosus* was confirmed at

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1:40, whereas the IHA for *E. multilocularis* was positive at 1:320, and EIA's were negative for both species (de la Rue et al. 2010). Ultrasonography revealed a typical fertile CE1-liver cyst (WHO 2001) (Fig. 1). Based on the diagnosis of cystic echinococcosis (CE), the patient was given albendazole at a dosage of 400 mg b.i.d. to cover the planned PAIR. The advantages of PAIR as compared to surgery comprise its lower invasiveness, its lower complication rate, and the shorter hospitalization time (WHO 2001; Daradkeh et al. 2007; Junghanss et al. 2008). Furthermore, PAIR can be performed in inoperable patients and during pregnancy (Brunetti et al. 2010).

Prior to the intervention, the patient was extensively informed on the risks and benefits of PAIR. She gave her informed written consent to the procedure. She strongly endorses this publication in order to prevent other teams performing PAIR from not being well prepared and equipped for handling possible future other cases of serious adverse events.

PAIR was performed 8 days after the initiation of albendazole coverage according to the recommendations of the WHO expert group on echinococcosis (WHO 2001). The team experienced with this procedure consisted in one gastroenterologist/ultrasonographer who performed the procedure, one specialist of infectious diseases responsible for the immediate diagnostic examination of the material, one biologist who performed the on-spot parasitological investigations (Hira et al. 1988), one anesthesiologist, one anesthesiology nurse, and one assistant nurse. According to the wish of the anxious patient who did not want to experience the procedure consciously, the procedure was performed under general anesthesia.

Within 2 min after ultrasound-guided puncture of the liver cyst with a 8.3 French pigtail catheter (Pflugbeil GmbH, Zorneding, Germany), an anaphylactic reaction type I

occurred with acute bronchospasm. Although the patient was intubated, controlled mechanic ventilation became impossible because of the insurmountable resistance of the spastic bronchial system resulting in hypoxia and shock (arterial blood pressure was not measurable for 2 min). Intravenous adrenaline, arterenol, and prednisolone were given via a central venous catheter and cardiac massage was performed until the patient's recovery within 10 min was achieved. Thereafter, the PAIR procedure could be continued by instillation of alcohol and re-aspiration as foreseen by the protocol and the cyst collapsed completely (Fig. 2). Because of the allergic reaction, it was decided to remove the pigtail catheter despite the large size of the cyst.

Further course was uneventful. For preventing spreading of scolices, praziquantel was added to albendazole. Although not well supported by data in vivo, praziquantel has a scolicidal effect in vitro adding to the parasitostatic effect of albendazole thus possibly preventing the dissemination of echinococcal cysts (Urrea-Paris et al. 2001). Since praziquantel is well-tolerated, its use in this indication in our opinion outweighs a conceivable limited risk of any adverse event (Bygott and Chiodini 2009). IHA antibody titre to *Echinococcus* spp. raised from initial 1:64 to 1:16386 and IgE from 202 to 928 IU/ml and eosinophil count from 2.5 to 10.8 %, i.e., from 200 to 1500 cells/ μ l when controlled 20 days later. As expected, the cyst collapsed completely after 675 ml of cyst fluid were drawn from the cyst containing a multitude of scolices (Figs. 3 and 4). During the following 20 days, the cyst cavity refilled with fluid with the disrupted parasite membrane floating inside (Fig. 5). The patient recovered without any organic damage resulting from the anaphylactic reaction. During the following 20 months when the patient was last seen, there was also no evidence of dissemination of echinococcosis to other organs.

A recent systematic literature review summarizing 5943 percutaneous treatment (PT) procedures performed on 5517 hepatic and non-hepatic echinococcal cysts found that lethal anaphylaxis occurs in 0.03 % (2 in 5943) of PT procedures,



Fig. 1 Active echinococcal cyst type CE1 according to a WHO expert group (WHO 2001)



Fig. 2 Cyst completely collapsed after PAIR



Fig. 3 Cyst refilled with fluid with disrupted parasite wall floating inside

corresponding to 0.04 % (2 in 5517) of treated cysts, while reversible allergic reactions complicate 1.7 % (99 in 5943) of PT procedures, corresponding to 1.8 % (99 in 5517) of treated echinococcal cysts (Neumayr et al. 2011). For comparison, in a prospective international study to determine the incidence of allergic reactions to monthly intramuscular benzathine penicillin G to prevent recurrences in patients with rheumatic fever, 57 of 1570 patients (3.2 %) had an allergic reaction, and 4 (0.2 %) had anaphylactic shock (International Rheumatic Fever Study Group 1991). Although anaphylaxis after a puncture of an echinococcal cyst occurs much less frequently than commonly believed, it still constitutes a serious, potentially life-threatening adverse event. Most likely, the same would have occurred if the cyst had been removed with modern conservative surgical procedures such as deroofing the cyst with external drainage or endocystectomy (Daradkeh et al. 2007). In a patient series treated surgically in China, the



Fig. 4 Typical echinococcal aspirate drawn from the cyst

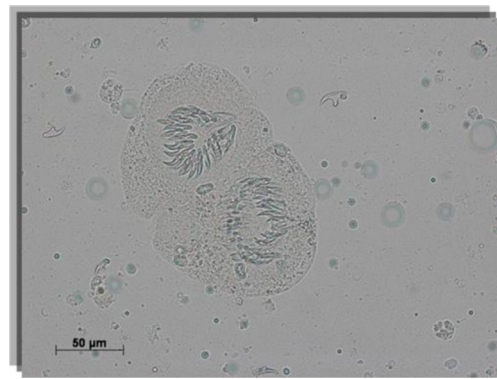


Fig. 5 Viable scolices and hooklets seen by microscopy of cyst aspirate

incidence of anaphylactic shock was reported to be 2.24 % (10 cases of 446 surgeries) (Li et al. 2011). It may be speculated that our patient was at a particular risk of anaphylaxis because the cyst was highly active as also evident from the multitude of scolices in the cyst fluid. In the series of patients treated surgically, another risk factor was the young age of the patient (Li et al. 2011).

Interestingly, before the intervention, total IgE was only moderately increased and blood eosinophil count was normal. However, as suggested by the serology results, the immune system of the patient was already sensitized to parasite antigens before puncture. Unfortunately, due to the rarity of the event, there is no study proving a protective effect of preventive steroid, antihistaminic drugs, and/or Anti-IgE antibodies so far but such an effect may be anticipated in analogy to reactions against anesthetic drugs or radiology contrast media (Lieberman 1990; Fisher and Doig 2004; Chang et al. 2007). Such measures should be discussed at least in high-risk patients who have already been sensitized for echinococcal antigens as resulting from serology. In the case described here, the situation could be managed by an experienced and well-equipped anesthesiology team consisting of one anesthesiologist and one nurse. Furthermore, the patient was already intubated before the anaphylactic reaction occurred.

Because of the acute allergic reaction, the pigtail catheter was removed immediately after the procedure. In other patients with large cysts, we currently adopted the method described by Men et al. (2006) in leaving the pigtail catheter inside the liver cyst until no more fluid is produced. Thereby, complete re-absorption of the cyst is reached more rapidly.

We conclude that, although life-threatening allergic phenomena after puncture of echinococcal cysts may occur less frequently than generally assumed, these must still be taken into account and precautions must be taken to manage serious adverse events. Therefore, we suggest that PAIR should be performed under coverage with corticosteroids, combined H1/H2 antagonists, and/or Anti-IgE antibodies to prevent anaphylaxis at least in patients who have already been sensitized to echinococcal antigens as evident

from a positive specific serology (Lieberman 1990; Fisher and Doig 2004; Chang et al. 2007).

References

- Brunetti E, Kern P, Vuitton DA, Writing Panel for the WHO-IWGE (2010) Expert consensus for the diagnosis and treatment of cystic and alveolar echinococcosis in humans. *Acta Trop* 114:1–16
- Bygott JM, Chiodini PL (2009) Praziquantel: neglected drug? Ineffective treatment? Or therapeutic choice in cystic hydatid disease? *Acta Trop* 111(2):95–101
- Chang TW, Wu PC, Hsu CL, Hung AF (2007) Anti-IgE antibodies for the treatment of IgE-mediated allergic diseases. *Adv Immunol* 93:63–119
- Daradkeh S, El Muhtaseb H, Farah G et al (2007) Predictors of morbidity and mortality in the surgical management of hydatid cyst of the liver. *Langenbecks Arch Surg* 392:35–39
- de la Rue ML, Yamano K, Almeida CE et al (2010) Serological reactivity of patients with *Echinococcus* infections (*E. granulosus*, *E. vogeli*, and *E. multilocularis*) against three antigen B subunits. *Parasitol Res* 106(3):741–745
- Fisher MM, Doig GS (2004) Prevention of anaphylactic reactions to anaesthetic drugs. *Drug Saf* 27(6):393–410
- Hira PR, Lindbergh LG, Francis I et al (1988) Diagnosis of cystic hydatid disease: role of aspiration cytology. *Lancet* ii:655–657
- International Rheumatic Fever Study Group (1991) Allergic reactions to long-term benzathine penicillin prophylaxis for rheumatic fever. *Lancet* 337:1308–1310
- Junghanss T, da Silva AM, Horton J et al (2008) Clinical management of cystic echinococcosis: state of the art, problems, and perspectives. *Am J Trop Med Hyg* 79(3):301–311
- Li Y, Zheng H, Cao X et al (2011) Demographic and clinical characteristics of patients with anaphylactic shock after surgery for cystic echinococcosis. *Am J Trop Med Hyg* 85(3):452–455
- Lieberman P (1990) The use of antihistamines in the prevention and treatment of anaphylaxis and anaphylactoid reactions. *J Allergy Clin Immunol* 86:684–686
- Men S, Yücesoy C, Edgüer TR et al (2006) Percutaneous treatment of giant abdominal hydatid cysts: long-term results. *Surg Endosc* 20(10):1600–1606
- Neumayr A, Troia G, de Bernardis C et al (2011) Justified concern or exaggerated fear: the risk of anaphylaxis in percutaneous treatment of cystic echinococcosis—a systematic literature review. *PLoS Negl Trop Dis* 5(6):e1154
- Urrea-París MA, Casado N, Moreno MJ et al (2001) Chemoprophylactic praziquantel treatment in experimental hydatidosis. *Parasitol Res* 87(6):510–512
- World Health Organization (WHO) (2001) Puncture aspiration injection and Re-aspiration – an option for the treatment of cystic echinococcosis. WHO Informal Working Group on Echinococcosis (WHO-IWGE); WHO/CDS/CSR/APH/2001