

Percutaneous treatment of liver hydatid cysts in 190 patients: a retrospective study

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Acta Radiologica
0(0) 1–9
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2016
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DOI: 10.1177/0284185116664226
acr.sagepub.com



Abstract

Background: Hydatid liver disease (HLD) is a significant health problem, especially in endemic areas worldwide. Percutaneous treatment is an effective alternative therapeutic option.

Purpose: To present the clinical and radiological results of percutaneous treatment of HLD in 190 patients.

Material and Methods: Percutaneous treatment of HLD between April 2005 and March 2015 was analyzed retrospectively. The demographic data, numbers and types of cysts, initial and final volumes of the cysts, types of percutaneous treatment, and procedure-related complications were determined.

Results: A total of 190 patients (95 male patients and 95 female patients; age range, 5–82 years) with 283 liver hydatid cysts who underwent percutaneous treatment were included in the study. Of the 283 cysts, 234 (83%) were cystic echinococcosis CE1, 31 (11%) were CE3a, and 18 (6%) were CE2 cysts, according to the World Health Organization (WHO) classification. The percutaneous procedure was successful in all patients. A total of 12 (6.3%) major complications, including anaphylaxis, allergic skin reaction, perihepatic hemorrhage, and cavity infection, were seen. No mortality was noted. Recurrence in one patient and an additional cyst in one patient were seen. All patients were asymptomatic during the follow-up period. Mean volume reduction was 77.5%, with a mean follow-up period of 18 months.

Conclusion: Percutaneous treatment is an effective and safe method for the treatment of HLD. It should be regarded as a first-line treatment method for uncomplicated hydatid cysts.

Keywords

Percutaneous treatment, hydatid cyst, hepatic, echinococcosis

Date received: 10 January 2016; accepted: 4 July 2016

Introduction

Hydatid disease is an endemic zoonotic disease caused by tapeworm larvae of the genus *Echinococcus granulosus*. It is a significant public health problem in countries in which it is endemic, including countries in the Mediterranean, Eastern Europe, South America, and the Far East (1–5). In the human who in this context is an intermediate host, it primarily affects the liver (60–70%) and the lungs (20–30%). Treatment of liver hydatid cysts is important because of the risk of serious complications, such as rupture, infection, and anaphylaxis. Medical treatment, surgical treatment, and percutaneous drainage techniques are active treatment options for hydatid liver disease (HLD) (1,4–17). “Watch and wait” is another approach for management of inactive cysts which do not require any treatment, if uncomplicated (18).

Percutaneous techniques, including puncture and aspiration of cyst contents, injection of scolical agents, with re-aspiration (PAIR) or with catheter drainage and injection of sclerosing agents (PAIDS), as well as a modified catheter technique (MoCaT), have been used for treatment of HLD, with minimal morbidity (4,5,7–10,15–19). In this study, we present the outcomes of percutaneous treatment of 190 patients with 283 liver hydatid cysts.

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Material and Methods

Patients

A total of 190 patients with 283 liver hydatid cysts who underwent percutaneous treatment between April 2005 and March 2015 were included in the study. The cysts were detected in different centers and departments, and the patients were then referred to our interventional radiology department for percutaneous treatment with the diagnoses of HLD. Inclusion criteria were: symptomatic/asymptomatic patients with cystic echinococcosis CE1, CE2, and CE3 cysts according to the WHO classification (20); and patients who had refused surgery or were considered unsuitable for surgery. Exclusion criteria were: patients with CE4 and CE5 cysts; infected cysts; superficially located cysts; major cysts with extrahepatic components; or cysts that had ruptured into the biliary tree, pleura, or peritoneum. Table 1 summarizes the criteria for inclusion, exclusion, and the treatment methods chosen for the excluded patients.

The demographic data, symptoms, types of cysts, post-procedural complications, initial and final volumes of the cysts, changes in cyst morphology after the procedure, and lengths of follow-up were recorded for each patient. The diagnosis of hydatid cysts was achieved with ultrasound (US), computed tomography (CT), and magnetic resonance imaging (MRI). Cyst volume was calculated by means of

US on the basis of an ellipsoid formula obtained from three axes.

The patients were informed about all treatment options. All patients were treated as part of routine care, and informed consent was obtained from all patients or their parents before the procedure. Albendazole prophylaxis (10 mg/kg/day) was started orally 1 week before the procedure and continued for 1 month to prevent dissemination of the disease. During this period, liver function tests (LFTs) were closely observed. Prophylactic ampicillin-sulbactam was given to all patients before the procedure.

This study was approved by our institutional research ethics board. Statistical analysis was performed using SPSS software, version 14.0, for Windows (SPSS Inc., Chicago, IL, USA).

Technique

Procedures were performed under intravenous sedation provided by an anesthesia team in all patients. All patients were monitored continuously for possible anaphylaxis. The PAIR procedure was used for cysts smaller than 6 cm in diameter. Larger cysts were treated with the PAIDS procedure. MoCaT was used for CE2 and CE1 cysts larger than 10 cm. Thirty percent hypertonic saline was used as a scolical agent, and 95% absolute alcohol as a sclerosing agent. The

Table 1. The criteria for inclusion, exclusion and the treatment methods chosen for excluded patients with liver hydatid cyst.

Inclusion criteria	Exclusion criteria	Treatment options for excluded patients
CE type I	CE type IV	Watch and wait: in cysts having little or no fluid component. Percutaneous drainage: in large cysts having considerable fluid component
CE type II CE type III		
Patients who refuse surgery or are unsuitable for surgery	CE type V	Watch and wait: no indication for any kind of treatment
	Hydatid cysts that have extrahepatic component/cysts located superficially	Surgery
	Hydatid cysts with rupture into the peritoneum or pleura	Surgery
	Hydatid cysts with rupture into the biliary system	Surgery/percutaneous drainage of cyst cavity without using scolical/sclerosing agent with clearance of bile duct by endoscopic or percutaneous techniques
	The infected hydatid cysts	Percutaneous drainage and antibiotics as liver abscess
	Serious coagulation abnormalities	Medical treatment

CE, cystic echinococcosis.

procedures were performed under US guidance and combined with fluoroscopy if needed.

Patients were placed in the supine or left lateral decubitus position, depending on cyst localization. The location of the cyst and the puncture site were determined by US. To prevent peritoneal dissemination, the puncture site was chosen from an area that included a pass through normal liver tissue. Local anesthesia using 1% lidocaine was given under sterile conditions. In the PAIR procedure, the cyst was punctured using an 18-gauge Chiba needle (Cook Medical, Bloomington, IN, USA) with US guidance. More than half of the estimated cyst volume was aspirated. The aspirated specimens were submitted for cytological and biochemical assessment. After initial fluid aspiration, the endocyst detached, which is highly suggestive of a hydatid cyst. Then, we injected 30% hypertonic saline equivalent to an estimated one-third of the cyst volume into the cyst cavity and waited for 15 min. After this period, all fluid in the cavity was re-aspirated for cysts smaller than 6 cm.

In the PAIDS procedure for cysts larger than 6 cm, following puncture and aspiration of cyst contents and injection of the scolicalid agent, an 8 French (F) pigtail drainage catheter (BIOTEQUE Corporation, Taipei, Taiwan) was inserted into the cavity under fluoroscopic guidance, and all of the fluid in the cavity was re-aspirated through the catheter. The catheter was kept in place until fluid drainage was less than 10 mL/day. Then, a cystogram was obtained to confirm that there was no communication between the biliary ducts and the cyst cavity. Then, 95% absolute alcohol (25–35% of the estimated cyst volume) was administered into the cyst cavity to sclerose the cyst wall. After 15 min, all fluid was re-aspirated and the catheter was withdrawn.

In the MoCaT procedure, a 14 F (n=20) or 16 F (n=2) drainage catheter was inserted into the cyst cavity. Then, cyst contents, such as germinative membranes, solid components, daughter cysts, and infected material, were aspirated by irrigation using hypertonic saline under fluoroscopic guidance. After the cyst contents were completely evacuated, a smaller catheter, an 8/10 F, was placed into the cyst cavity and remained there until fluid drainage was less than 10 mL/day. Our primary concern was the risk of hemorrhage during the MoCaT procedures. The puncture site was selected carefully to avoid the vessels, and aspiration and catheter manipulations were done gently to reduce the risk of bleeding. All patients were monitored for 3–6 h after the procedure and the PAIR patients were discharged from hospital the same day. PAIDS and MoCaT patients were hospitalized until the catheter was withdrawn.

All patients were followed up by the interventional radiologist in our department every third month in the first year and every sixth month in subsequent years

after the procedure. An US examination was performed at every follow-up and changes in cyst volume and morphology were recorded. Complete disappearance of the cyst cavity, an anechoic shrunken cyst cavity without cyst content after the MoCaT procedure, or a solid appearance with or without calcification after the PAIR or PAIDS procedure was accepted as an indicator of complete cure, whereas a semi-solid appearance with heterogeneous echo pattern was only suggestive of cure. Other organs and peritoneal structures were checked for possible development of new cysts. Persistence without any change in the morphology or enlargement of the cyst was considered signs of unsuccessful treatment. Recurrent disease was defined as the appearance of a new active cyst.

Results

A total of 190 patients (95 male patients and 95 female patients; age range, 5–82 years; mean age, 24.8 ± 20 years) with 283 liver hydatid cysts who underwent percutaneous treatment were included in the study. Presenting symptoms were abdominal pain in most patients and allergic rashes in a few patients. Cysts were detected incidentally during a medical check-up in some patients. Of the 283 cysts, 234 (83%) were CE1, 31 (11%) were CE3a, and 18 (6%) were CE2. Of the 190 patients, 155 patients had only one cyst. Thirty-five patients had multiple (range, 2–20). The sizes of the cysts were in the range of 20–170 mm (mean, 75 mm). The initial volumes of the cysts were in the range of 4.1–1785 mL (mean, 242 mL).

Of 283 cysts in 190 patients, 155 were treated by the PAIR procedure, 106 by the PAIDS procedure, and 22 by MoCaT. In PAIDS and MoCaT patients, the mean hospitalization time was 3.1 days (range, 2–9 days). In MoCaT patients, 18 cysts were CE2 and four were CE1. In 9/190 patients (4.7%), extrahepatic involvement was also present, with lung involvement (n=8) and soft-tissue involvement (n=1) which were treated by surgery and percutaneous drainage, respectively.

The percutaneous procedure was successful in all patients. A total of 12 (6.3%) major complications were seen: anaphylaxis (n=3), with allergic reaction (n=4), perihepatic hemorrhage (n=2), and cavity infection (n=3). All patients with allergic reactions and one patient who developed perihepatic hemorrhage required short hospitalization of <48 h. The other seven patients required major therapy and hospitalization >48 h. Tracheal intubation and medical therapy with antihistaminic drugs were performed, and the procedure was then completed in patients who developed anaphylaxis. Allergic reactions were managed medically. Abscesses were drained percutaneously. In two patients who developed perihepatic hemorrhage, one

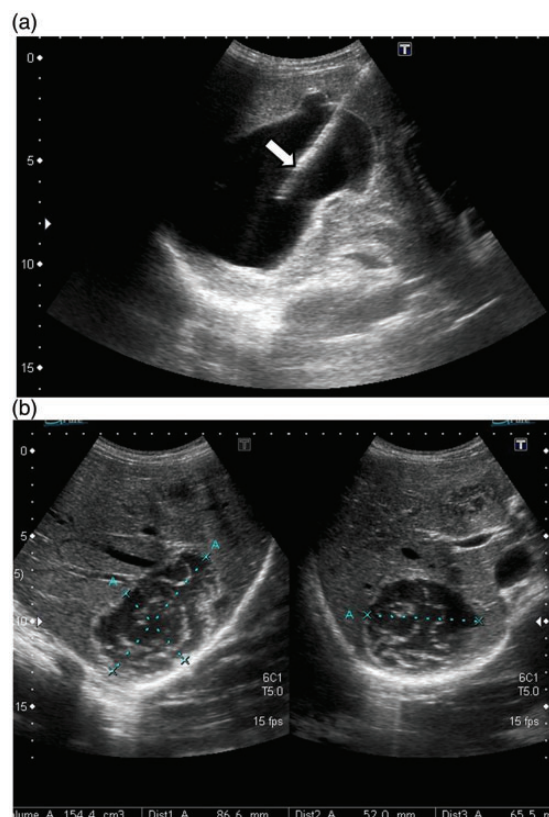


Fig. 1. (a) Intercoastal US image of a 19-year-old female patient who presented with right upper quadrant pain shows percutaneous drainage of a CE1 cyst. Note the needle within the cyst (arrow). (b) Subcostal US image shows typical membrane detachment with the loss of cyst fluid and a semisolid appearance 6 months after percutaneous treatment (arrow).

patient required a blood transfusion in the intensive care unit and the other patient was managed conservatively. Albendazole-related LFTs elevation was seen in one patient (0.5%). With discontinuation of albendazole, LFTs returned to within normal limits in this patient. No mortality was noted.

Recurrence was seen as the development of daughter vesicles in the residual cyst cavity in one patient (0.5%). One additional new CE1 cyst, 2 cm in diameter, was observed in another segment of the liver in this patient. These patients were successfully treated percutaneously. All patients remained asymptomatic during the follow-up period. The mean follow-up time was 18 months (range, 9–120 months).

Follow-up US examinations revealed a semi-solid appearance with heterogeneous echo pattern in 132 cysts (Fig. 1), a solid appearance in 102 cysts (Fig. 2), a solid appearance with calcification in 18 cysts (Fig. 3), and an anechoic shrunken cyst cavity without cyst content in 22 patients (Figs 4 and 5). Nine cysts completely disappeared, with

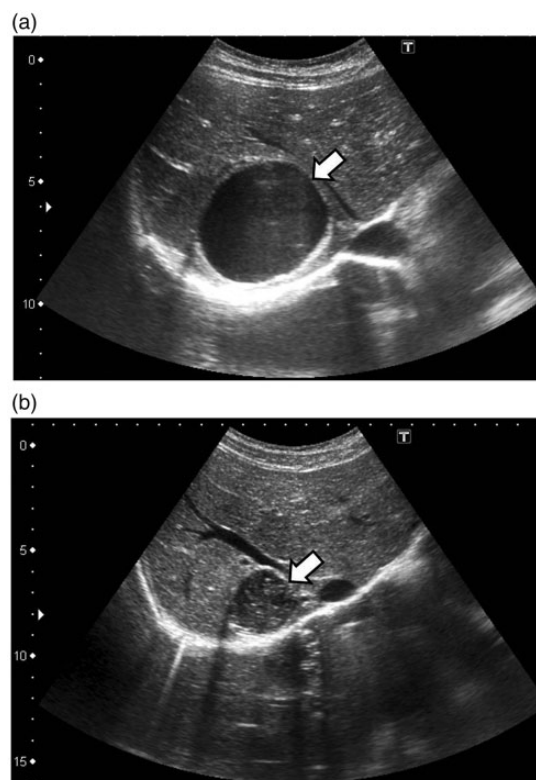


Fig. 2. (a) US image of a 7-year-old male patient who presented with abdominal discomfort shows a CE1 cyst (arrow) in the right lobe of the liver. (b) Control US image obtained 4 years after percutaneous treatment shows a hypoechoic solid echo pattern of the cyst with a decrease in the dimensions (arrow).

reconstitution of the liver parenchyma after the procedure (Fig. 6). The final volumes of the cysts were in the range of 0–550 mL (mean, 54.3 mL). Volume reduction at the time of the last follow-up was 34–100% (mean, 77.5%).

Discussion

Treatment indications for CE are complex and are based on cyst characteristics such as size, location, grade of the cysts, presence/absence of complications, and availability of medical/interventional/surgical expertise (18). Treatment is mandatory in symptomatic patients and recommended in asymptomatic patients with viable cysts due to risk of serious complications (1,5,9,15,17). The aim of all treatment modalities for HLD should be to relieve symptoms, inactivate and completely remove viable scolices and germinative membranes, and manage the residual cavity. There is no best treatment option; various methods are available and include: medical therapy with benzimidazole compounds; conservative or

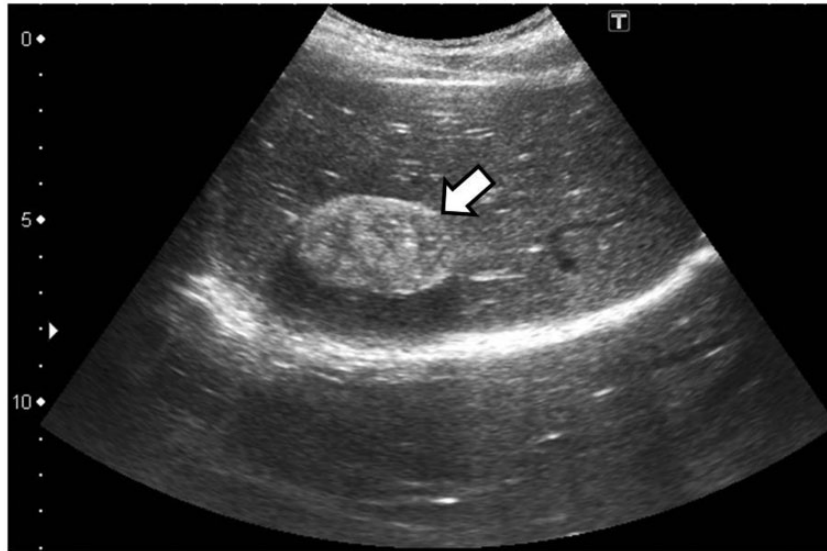


Fig. 3. US image obtained 5 years after percutaneous treatment of a CEI cyst 6 cm in diameter (not shown) shows the solid appearance of the cyst with calcification, which causes posterior acoustic shadowing (arrow).

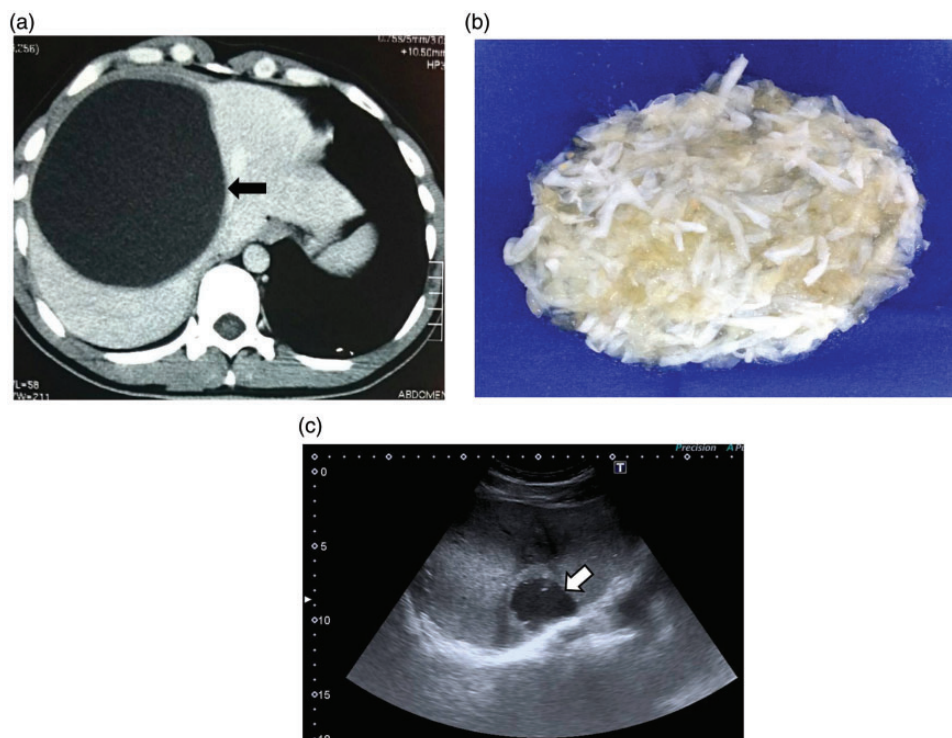


Fig. 4. A 30-year-old man presented with right upper quadrant pain and a palpable mass. (a) Axial CT image clearly demonstrates a CEI cyst 14 cm in diameter (cranio-caudal length was 17 cm) in the right lobe of the liver (arrow). (b) The image shows some part of the germinative membranes evacuated via a 14 F catheter. (c) US image obtained 3 years after the MoCaT procedure clearly demonstrates a shrunken residual cyst cavity without cyst content (arrow). The patient remained asymptomatic during the follow-up period.

radical surgery; percutaneous treatment; and a “watch and wait” approach (1–19,21,22). The success rate of medical therapy alone for HLD is 18–50%, with a recurrence rate of 3–30% (11–13,21).

Albendazole is mainly used in conjunction with surgery or percutaneous treatment to prevent inadvertent dissemination and recurrent disease (5–9,15,17,23–25). Surgical treatment is the traditional method and has

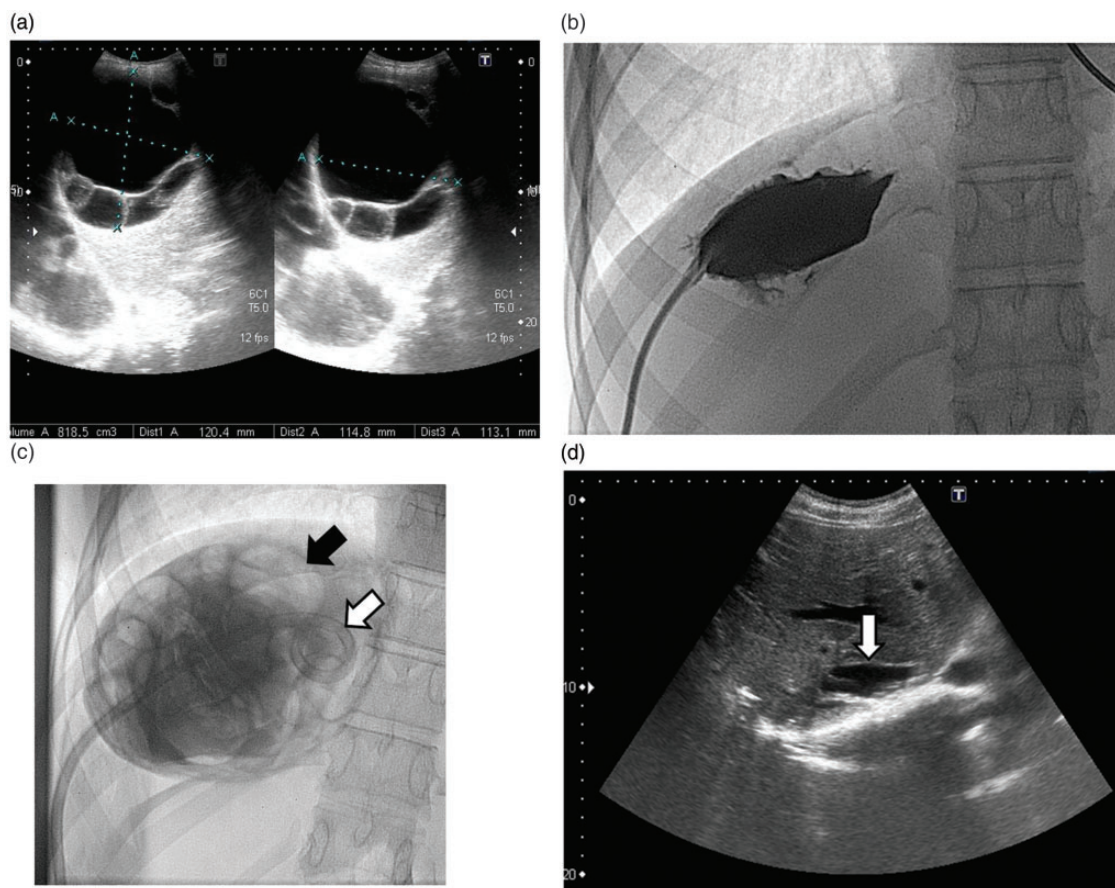


Fig. 5. (a) US image of a 17-year-old female patient who presented with right upper quadrant pain shows a CE2 cyst with dimensions of $12 \times 11 \times 11$ cm in the right lobe of the liver. (b) Fluoroscopic image shows daughter vesicles (black arrows) and a 14 F catheter (white arrow) in the cyst cavity. (c) Fluoroscopic image obtained immediately after evacuation of the cyst contents via the catheter shows a residual cyst cavity without cyst content. (d) US image obtained 3 months after the MoCaT procedure; the cyst cavity was found to have shrunk and is without cyst contents (arrow).

its own indications including patients with superficially located cysts, cysts with a major extrahepatic component or cysts with complications such as rupture, compression of vessels and vital organs, and hemorrhage (4,11,12,17,26–28). The “watch and wait” approach is an option for management of uncomplicated CE4 and CE5 inactive cysts which do not require any treatment (18).

Percutaneous treatment of HLD was introduced in 1985 by Mueller et al. and has become an alternative to surgery and medical therapy (29); it is now used worldwide after the introduction of PAIR and its modifications, such as PAIDS, percutaneous evacuation (PEVAC), and MoCaT. Mid-term and long-term results of percutaneous HLD treatment have been reported in the literature (4,7–10,19,22,23,30,31). The PAIR technique is used for CE1 and CE3a cysts smaller than 5 cm in diameter and is an outpatient procedure (5,7–10,17). For larger cysts, the PAIDS procedure is preferred to prevent fluid retention into the cyst cavity. The PAIR procedure is not feasible for the treatment of

CE2 cysts. PEVAC, MoCaT as well as dilatable multifunction trocar can be used for aspiration of solid content, germinal membranes, and daughter vesicles in CE2 cysts (4). MoCaT requires hospitalization and is more time-consuming and complicated than PAIR and PAIDS, as seen in our study. We used hypertonic saline as scolical agent and for irrigation during percutaneous procedures because its effectiveness has been clearly documented in the literature (5,9,10,23,31). In cysts larger than 6 cm, sclerosis of the cyst wall was performed using alcohol to prevent the occurrence of a large cystic collection. Sclerotherapy is not required for cysts smaller than 6 cm (9,10).

The safety and efficacy of percutaneous treatment of CE1 and CE3a cysts have been well demonstrated with success rate of 97.1–100% (5,7–10,16,22,23,30). However, percutaneous treatment of CE2 cysts may be more problematic due to the contents of the cysts, and a lower success rate (39%) was reported with the PAIR procedure (31). In our series, there were 18 CE2 cysts, and we used the MoCaT procedure

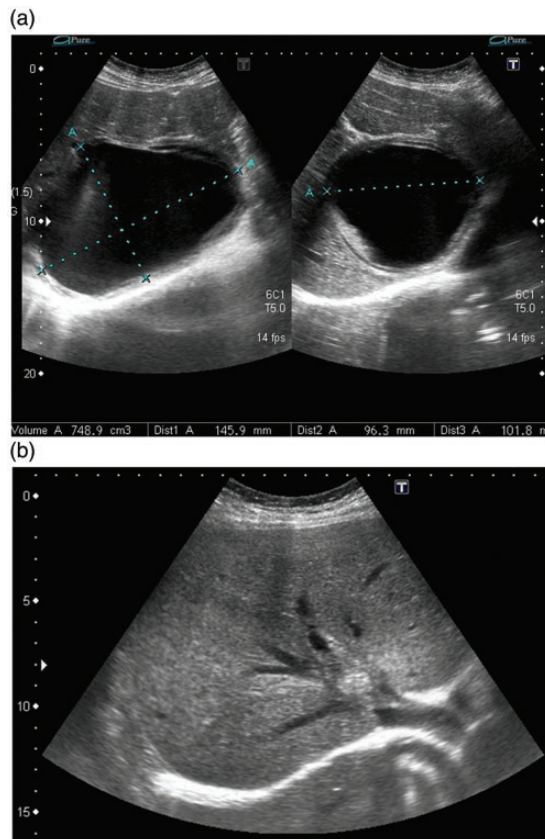


Fig. 6. (a) US image of a 13-year-old male patient who presented with right upper quadrant pain shows a CE1 cyst with dimensions of $14.5 \times 9.6 \times 10$ cm in the right lobe of the liver. (b) Follow-up US image obtained 9 months after the MoCaT procedure shows the complete disappearance of the cyst cavity. In this patient, one session of infected bilioma drainage was performed 1 month after the procedure (not shown).

to treat these patients; all cyst contents were successfully aspirated. We believe that catheterization and evacuation of cyst contents is essential for effective percutaneous treatment of CE2 cysts. This technique is also effective in the evacuation of the germinative membranes of large CE1 cysts. The success rate was 100% and no patient was referred for surgery due to complications or technical failure. Our results increased our confidence in percutaneous treatment of HLD in our institution.

Morphological changes in cysts after percutaneous treatment include shrinkage or disappearance of the fluid component, pseudotumor appearance, heterogeneous inner content with a semi-solid appearance, irregularity and thickening of the cyst wall, and hyper-echoic calcification during follow-up (7–10,16,23). It is important to recognize these changes to prevent their misdiagnosis as a tumor or relapse. In the current study, post-treatment US findings were similar with

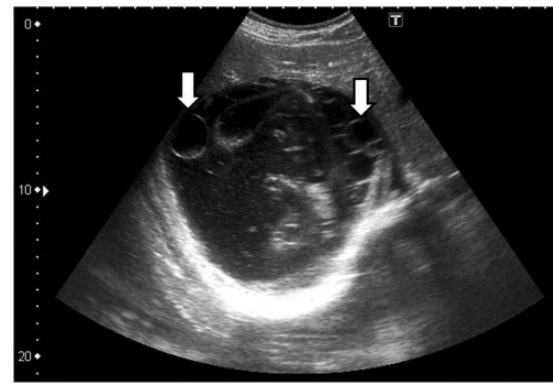


Fig. 7. US image of a 19-year-old female patient who underwent the PAIDS procedure for treatment of a CE1 cyst shows daughter cysts (arrows) in the residual cyst cavity 6 months after the procedure. This finding was indicative of recurrent HLD in this patient, who was eventually treated percutaneously.

those of previously reported studies (7–10). We believe that the most satisfactory results can be obtained by evacuation of all cyst content which facilitates the reconstitution of liver tissue.

The percutaneous techniques described herein have low morbidity and mortality rates. Several complications of percutaneous treatment of HLD, such as anaphylaxis, allergic skin rashes, pneumothorax, cavity infection, and development of a cysto-biliary fistula, have been reported in up to 8.6% of cases (5,9,10,14,22,23,31,32). In our series, the prevalence of major complications was 6.3%, which is consistent with previous reports (9,10,22,23,32). The main concern is the risk of hemorrhage during the MoCaT procedures. To reduce the risk of bleeding, the puncture site should be selected away from the vessels, and aggressive aspiration and catheter manipulations should not be done during the procedure. We believe that MoCaT patients should be monitored after removing the catheter. The mortality rate of percutaneous treatment is low. In a meta-analysis including 5943 percutaneous procedures for CE, the rate of fatal anaphylactic reactions was 0.03% (33). In our series, procedure-related death was not seen.

The recurrence rate of percutaneous hydatid cysts treatment is in the range of 0–4% (5,7–10,12). In our series, recurrent disease was seen in one patient 6 months after the PAIDS procedure and was successfully managed percutaneously (Fig. 7). All patients were cured during the follow-up period. Our results are in accordance with previously published reports and clearly demonstrate the benefit of percutaneous techniques in the treatment of HLD.

The major limitation of the current study is that it was not possible to compare the findings with that of other authors or with other treatment methods because

of the study design. Further clinical studies comparing all the different treatment methods will be valuable.

In conclusion, percutaneous treatment of HLD with albendazole prophylaxis is an effective and safe method with a low complication rate. We suggest that percutaneous treatment be regarded as a first-line treatment method.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

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