

Management of residual cavity of liver hydatid cysts after partial cystectomy: which procedure for which patient?

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Background

Hydatidosis caused by *Echinococcus granulosus* remains an important and challenging medical problem. The most common location of the hydatid cysts is the liver. In this study, we present the experience in the management of hepatic hydatid cyst residual cavities, and we designed a management algorithm depending on the size and location of the cyst.

Patients and methods

This study was conducted in Cairo University Hospital, Egypt, and Al-Thawrah and Al-Kuwait Teaching Hospitals, Sana'a, Yemen, between March 2006 and February 2017. Only patients with single hydatid cyst in the liver were included in this study.

Results

All patients had endocystectomy and then were managed according to the size of the cyst as the proposed algorithm. Complicated cysts required external drainage, whereas uncomplicated cysts were classified into three groups according to their size (<7, 7–15, and >15 cm).

Conclusion

The surgical strategy for managing hepatic hydatid cysts is not yet standardized. The surgical procedure selected must be made according to the complications of the cyst and its size.

Keywords:

hydatid cyst, liver cyst, residual cavity

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Introduction

Hydatidosis is a zoonosis caused by *Echinococcus granulosus* and remains an important and challenging medical problem. The most common location of the hydatid cysts is the liver, then lung, whereas elsewhere is very rare. Its incidence has been maintained constant over the last 40 years, with a worldwide distribution being endemic in many countries of the Mediterranean area, Middle and Far East, and South America [1]. Most patients are asymptomatic and usually have vague symptoms. Those who are diagnosed are discovered accidentally or owing to a complication in the cyst or pressure on an adjacent structure [2]. Laboratory investigations are not accurate in diagnosing hydatid cyst; however, the use of polyclonal antibodies against Con-A purified human hydatid antigen allowed better results, reaching 91.8% specificity [3].

The most important factor for successful management is early diagnosis by imaging and timely surgical intervention. Hepatic hydatid cysts can be treated with different methods, and surgery remains the main modality of treatment despite advances in medical and minimally invasive image-guided therapies [4].

Liver hydatid cyst can be treated surgically by two methods. The radical method involves total excision

of the cyst by pericystectomy or hepatectomy but is associated with an increased operative risk of a benign disease. The other method includes inactivation of scolices, removal of cyst contents leaving the outer most layer (the adventitia), and management of the residual cavity, and often named endocystectomy. The conservative treatment is often used in endemic areas [5]. However, the main postoperative dilemma in endocystectomy is in managing the residual cavity after evacuation of the cyst [6]. Various technical choices are available, the most commonly used of which are omentoplasty and capitonnage [7,8]. However, there have been no studies up to our knowledge with a great level of proof that endorses the viability of one technique over the other in terms of the postoperative morbidity [9].

In this study, we present the experience in the management of hepatic hydatid cyst residual cavities, and we designed a management algorithm depending on the size and location of the cyst.

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Patients and methods

This study was conducted in Cairo University Hospital, Egypt, and Al-Thawrah and Al-Kuwait Teaching Hospitals, Sana'a, Yemen, between March 2006 and February 2017. This research was performed at the Department of General Surgery, Cairo University Hospital, Egypt, and Al-Thawrah and Al-Kuwait Teaching Hospitals, Sana'a, Yemen, Ethical Committee approval and written, informed consent were obtained from all participants. Patients with single hydatid cyst were included in the study, whereas patients with multiple hepatic hydatid cysts or hydatid cyst involving other abdominal viscera or extra-abdominal involvement were excluded. Similarly, patients with previous history of abdominal surgery, other hepatobiliary conditions like liver abscess, and gallstones were also excluded.

All patients were evaluated clinically, biochemically, and by imaging before surgical intervention. Preoperative investigations included full blood counts, liver function tests, coagulation profile, hepatitis markers and HIV, blood sugar, blood urea, chest radiograph (posteroanterior view), ultrasound abdomen and pelvis, and computed tomography scan of abdomen and pelvis. Computed tomography scan of the thorax was done in selected cases. Medical treatment in the form of albendazole 400 mg twice daily was given perioperatively to all patients starting 2 weeks before surgery and is continued 4 weeks after it. All patients were admitted one day before surgery and one unit of cross-matched blood was arranged in selected cases. An informed consent was taken from all patients.

An extended right subcostal incision was made in all patients. Abdominal exploration was done as usual including the liver and the cyst. Packs immersed in scolicidal agent (hypertonic saline 10%) were used to cover the surgical field to avoid the spread of the parasite and decrease the risk of intraperitoneal contamination. First aspiration of the cyst was done to check if there is bile in the fluid of the cyst or not for fear of biliary communication. Then the cyst is injected with hypertonic saline if there was no bile and left for ~5 min. The cyst is then aspirated completely with a closed system suction device. Following complete evacuation of the cyst contents, it was deroofed with removal of the germinal layer and the remaining daughter cysts. A clean white gauze was applied over the unremoved outer layer of the cyst (adventitia) to identify bile leak from bile duct openings. If there was any bile duct opening, it was sutured using polypropylene 5/0 to prevent postoperative bile

leakage. Hypertonic saline-immersed gauze was used to pack and sterilize the cyst cavity for 10 min and then removed. At this stage, all patients had endocystectomy followed by management according to the cyst size. The first group of patients in which the size of the cyst reaching up to 7 cm was considered for obliteration of its cavity by horizontal mattress sutures. Cysts with a size between 7 and 15 cm group were padded with omentum, unless inaccessible for omental padding, which were left for external drainage. The third group with cyst size more than 15 cm was treated with external drainage (closed suction). Complicated cyst with any size was left for closed suction drainage without obliteration. An algorithm for managing the remaining cavity is proposed (Fig. 1).

Results

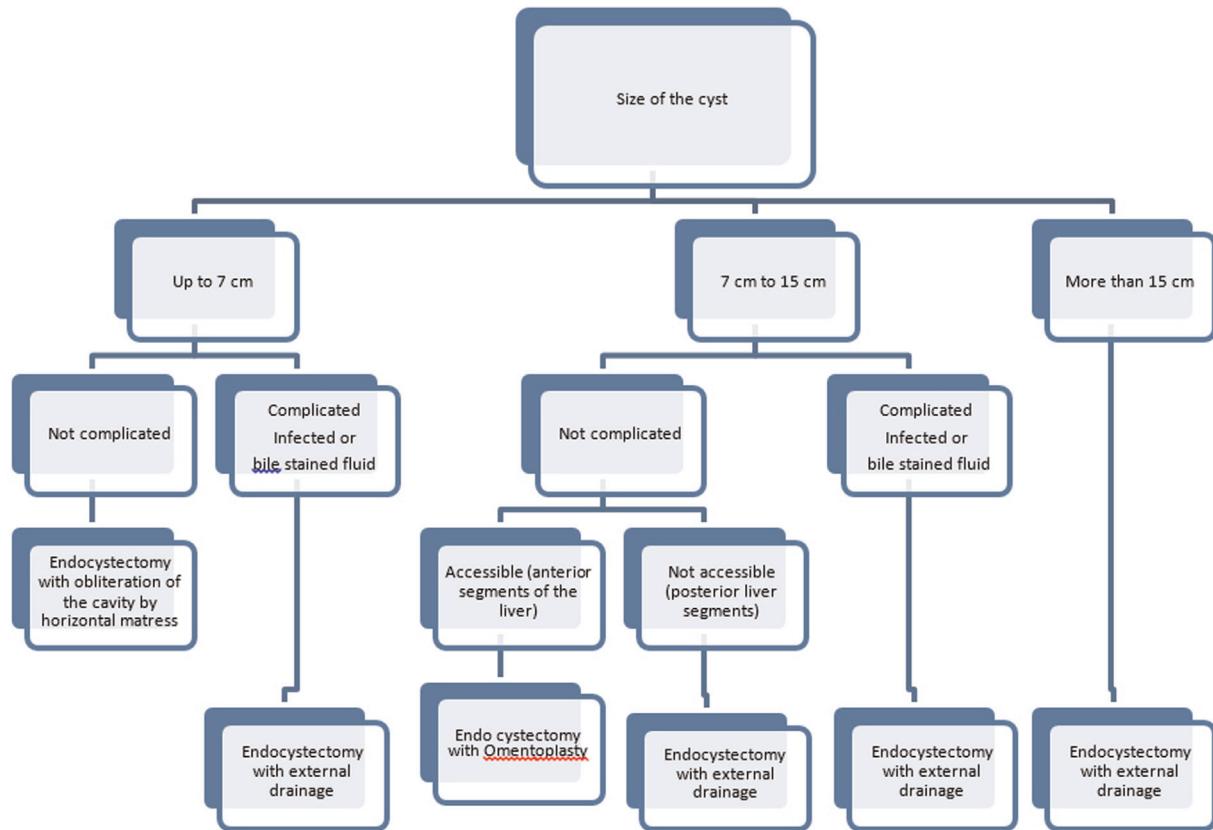
A total of 84 patients with single hydatid cysts were operated upon, where 60 patients were males, whereas 24 were females. The range of age was 24–57 years, with a mean age of 40 years. Table 1 demonstrates the patients' demographic data.

The most common presentation was incidental, representing 39 (46.4%) of 84 patients. Other presentations include abdominal pain, hypochondrial mass, gastrointestinal discomfort, jaundice, and portal hypertension. The column chart summarizes the different types of presentation (Chart 1).

Imaging revealed that the cyst harbored the right lobe in 63 (75%) patients, whereas the left lobe was the seat for the cyst in 21 (25%) patients, as seen in Chart 2.

To facilitate the study of the results, patients were classified into three groups according to the size of the cyst. All patients had endocystectomy and then managed according to the size of the cyst as the aforementioned algorithm. Group 1 included eight patients with cyst size less than 7 cm; in seven of which, the cyst was obliterated by horizontal mattress sutures using suture type Polypropylene 3/0, and one cyst was left for external drainage, being complicated. Group 2 included 68 patients with cyst size between 7 and 15 cm, comprising 64 patients with uncomplicated cyst and four with complicated cyst. A total of 37 patients from those with uncomplicated cysts were obliterated by an omental pad, whereas the other 27 had external drainage owing to inaccessible omental padding. The four patients with complicated cysts had external drainage. Group 3 included eight patients who were treated by external drainage, whether complicated or not. Table 2 summarizes the

Figure 1



Algorithm for managing the remaining cyst cavity.

Table 1 Demographic data of the patients

	n (%)
Sex	
Total	84
Male	60 (71.4)
Female	24 (28.6)
Age (years)	
Minimum–maximum	24–57
Mean±SD	40.40±8.11
Median	39

number of patients in each group and if they were complicated or not.

A total of 62 (73.8%) patients out of 84 had no complications postoperatively, whereas 21 (25%) patients had postoperative complications and one (1.2%) patient died. The most common postoperative complication was wound infection, representing nine patients, who were managed conservatively. Seven patients experienced bile leakage, of whom, three were managed conservatively and the other four patients required endoscopic retrograde cholangiogram with stent insertion. Atelectasis and pleural effusion were found in three patients and were managed conservatively. The residual cavity that was left for

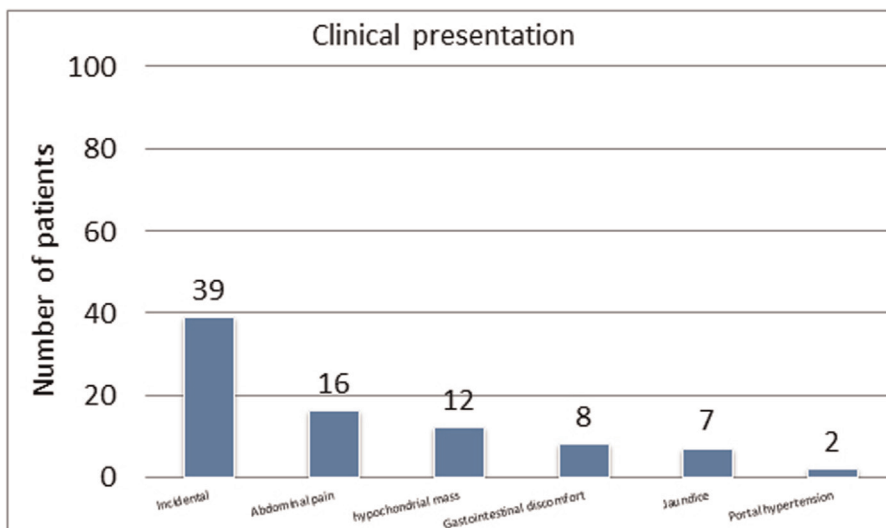
external drainage had suppurative collection in three patients: one managed conservatively, one required reoperation with lavage and better drainage, and the last patient developed septic shock and passed away (Chart 3).

Discussion

The noncomplicated hydatid disease can be treated effectively by evacuating the cyst contents and obliterating the residual cystic cavity; however, there is no standard surgical management for the complicated ones. The stage of the cyst and the relation of the cyst to the bile ducts or surrounding organs determines the treatment [10]. In this study, we designed an algorithm for management of patients with a single hydatid cyst in the liver who are candidate for surgery. Patients had endocystectomy, and the residual cavity of the cyst was managed based on its size and if it is complicated or not.

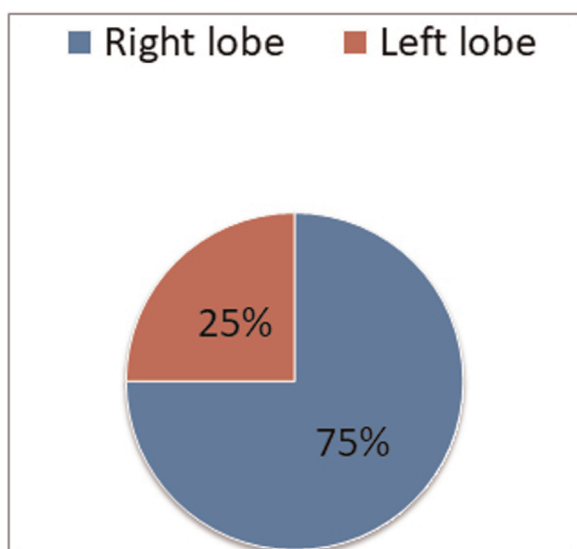
In our study, we had 50 (59.5%) patients with uncomplicated cyst who were managed according to our proposed algorithm. For patients with cyst size less than 7 cm, we obliterated the residual cyst cavity by horizontal mattress sutures, whereas those with cysts

Chart 1



Clinical presentation of patients.

Chart 2



Pie chart showing the cyst location in the liver.

between 7 and 15 cm were obliterated by omental padding. Patients with cysts above 15 cm were treated by external drainage because suturing was not feasible and omental padding was not enough to cover the whole cavity. In a prospective randomized study, Dziri *et al.* [11] showed that omental padding after unroofing of the cyst or after pericystectomy covering the hepatic raw area reduced the rate and severity of residual cavity complications. There is another way of obliterating the cavity, which involves suturing the walls together from within, the ‘capitonnage’ technique. Because of the large vessels and ducts in the cyst wall, this method has some risks and is not often used. Capitonnage and introflexion

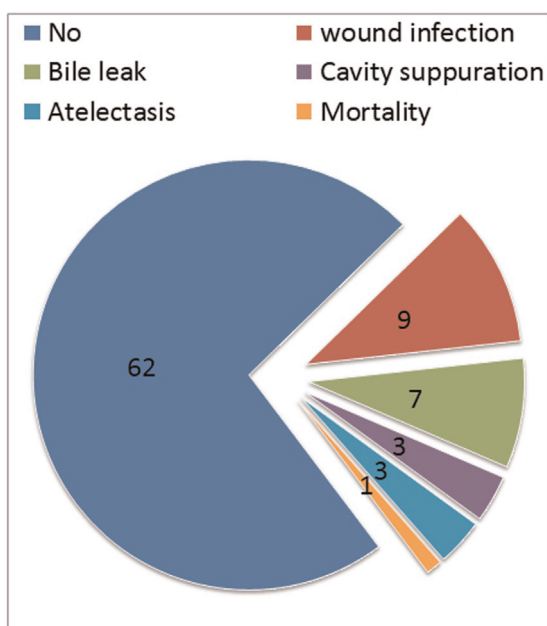
cannot be used in all cases, particularly when the cyst walls are calcified [12]. Dziri and colleagues and Muftuoglu and colleagues did not manage the residual cyst cavity according to its size as we did in our study, which would add a more precise idea of how to manage these cases safely and properly.

On the contrary, external drainage is a simple conservative method, easy to do but with a high morbidity owing to the longer hospital stay. During the long drainage period, infection of the cystic cavity is almost unavoidable [13,14]. Various postoperative complications, such as hepatic abscess, biliary fistulas, and a longer hospital stay, can follow drainage procedures. Therefore, omentoplasty for an uncomplicated hydatid cyst reduced complications considerably than external drainage, and patients left the hospital within a shorter period of time [15–17]. For that reason, only patients with complicated cysts or those that were not amenable for suturing or padding were left for external drainage. We had 40 patients who were treated by external drainage. Seven patients had complicated cysts, and 33 patients had uncomplicated cysts. Of the 33 patients, 27 had cyst size between 7 and 15 cm but the omentum was not accessible to pad the cyst cavity and six patients had cyst size more than 15 cm. At this point, we find that the site of the cyst in the liver would direct the management of the residual cavity regardless its size.

Ozacmak *et al.* [18] concluded that partial cystectomy followed by introflexion and omentoplasty is the treatment of choice for single, uncomplicated hydatid cysts, because it avoids the high morbidity

Table 2 Number of patients in each group according to cyst size and if complicated

	Group 1 (<7 cm)	Group 2 (7–15 cm)	Group 3 (>15 cm)	Total number of patients
Number of patients (%)	8 (9.5)	68 (81)	8 (9.5)	84 (100)
Uncomplicated cyst [<i>n</i> (%)]	7	64 (37 omental padding, 27 inaccessible cyst for omentoplasty)	6	77 (91.7)
Complicated cyst	1	4 bile in cyst	2	7 (8.3)

Chart 3

Post-operative complications.

associated with external drainage. Although Ozacmak and colleagues mentioned that they operated upon cyst size more than 5 cm, they did not define up to what extent in size you can do this and did not mention what to do if cyst size was less than 5 cm. This make our study unique in highlighting the management for a wider range of cyst sizes.

Helmy *et al.* [19] concluded that the surgical procedure of choice could be a combination of conservative and multiple radical techniques in the same operation, including intraoperative PAIR, pericystectomy, and omental packing of the cyst with no mortality. Therefore, for the treatment of hepatic hydatid cysts, no particular procedure can be applied, but the surgical method must be selected according to the complications of the cyst. Omentoplasty is the procedure of choice for uncomplicated cysts with a low complication rate and relatively shorter hospital stay. External tube drainage is recommended for infected cysts, and a biliary drainage procedure must be added to external tube drainage for cysts with intrabiliary rupture [20]. Our study goes hand in hand with this but adds to take the cyst size into

consideration while applying this because cyst size less than 7 cm can be obliterated by a much easier way and cyst size above 15 cm might not be suitable for omental padding.

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Conflicts of interest

There are no conflicts of interest.

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