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Surgical Management of Hydatid Disease

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Abstract

Management of hydatid disease carries a substantial risk of complications and recurrence. The ultimate goal of surgery is to kill the parasites, evacuate the cyst, remove the germinal layer, and obliterate the residual cavity all while preserving the healthy liver tissue. In endemic areas, a conservative approach is preferred. The open surgeries have a substantial risk of complications, such as bile leakage, parasite contamination, and presence of dead spaces, in which an abscess can form. These complications then have to be managed with more radical surgical approaches. The most commonly used surgical approaches are pericystectomy, partial pericystectomy, and even hepatic resection. With the right indications, subadventitial cystectomy has low postoperative complication, mortality, and recurrence. The condition of the cyst and the patient, the general status of the patient and the cyst size, location, and pathology are factors that indicate the optimal surgical approach.

Keywords: echinococcosis, hydatid disease surgical approach, pericystectomy, cystic hepatic echinococcosis, hepatic hydatid cyst, open surgical approach

1. Introduction

Hydatid disease is a global parasitic zoonosis, mostly found in the northern hemisphere, caused by the larval stages of the dog tapeworm *Echinococcus granulosus*. Humans become intermediate hosts through ingestion of the parasite eggs and are infected directly by contact with dogs or indirectly by contaminated food or dirt. The eggs then develop into larvae after crossing the intestinal wall and migrate to the liver, where they form cysts. The liver is the most frequent site for the cystic lesions seen in hydatid disease, followed by the lung and brain. Liver cysts, such as these usually remain asymptomatic and untreated for years until they compress their adjacent organs, form fistulas into them or even rupture into the

abdomen. Complete elimination of the parasite with minimum morbidity and mortality is the goal of the surgical treatment. There are three treatment options (**Table 1**): surgery, medical therapy, and interventional procedures. Management of hydatid cysts in the liver typically involves an open surgical approach with meticulous operative site packing and employment of a variety of conservative and radical operative techniques. This chapter reviews the available surgical approaches used to treat cystic echinococcosis of the liver and summarizes the safety and effectiveness of surgical interventions [1].

Pharmaceutical: medical therapy	<ul style="list-style-type: none">• Mebendazole• Albendazole• Praziquantel
Percutaneous	<ul style="list-style-type: none">• PAIR technique (puncture, aspiration, injection, reaspiration)• Catheterization (percutaneous evacuation, modified catheterization, dilatable multifunction trocar)
Surgical treatment: open or laparoscopic	<ul style="list-style-type: none">• Conservative: external drainage, omentoplasty, capitonnage• Radical: subadventitial pericystectomy, (partial) pericystectomy, hepatic resection

Table 1. Treatment options of echinococcal (hydatid) hepatic cysts.

2. Surgical treatment

To date, surgical management remains the treatment of choice for most cases of hydatid hepatic cysts. It is the only method that allows complete eradication of the parasite, treatment or prevention of complications, and evasion of relapse. Indications for surgical management are mentioned in **Table 2** [9].

In general, the physical condition of the patient and the characteristics of the hydatid cyst indicate the necessity of surgical treatment. In cases where surgical treatment is contraindicated, systematic monitoring in combination with drug therapy—with or without minimally invasive, nonsurgical techniques—is the recommended treatment approach (wait and watch). The goals of surgical treatment are mentioned in **Table 3**.

Indications	Contraindications
<ul style="list-style-type: none">• Superficial cysts with a high rupture risk• Large cysts, containing multiple daughter cysts• Hepatobiliary communication• Compression of neighboring organs (symptomatic)• Pus containing, infected echinococcal cyst• Nonhepatic echinococcal cysts (lungs, kidneys, etc.)• Cysts exerting pressure on adjacent vital organs	<ul style="list-style-type: none">• Multiple cysts• Inactive, difficult to access cysts• Dead cysts• Inactive cysts that are partially or totally calcified• Very small cysts• unsuitable patient’s condition

Table 2. Indications for surgical treatment of hydatid echinococcal hepatic cysts.

-
- Obliteration of the cyst
 - Prevention of intraoperative transfer of the parasites
 - Treatment of the remaining hepatic parenchyma
 - Identification and treatment of possible hepatobiliary communication
-

Table 3. The goals of surgical treatment of echinococcal (hydatid) hepatic cysts.

Surgical treatment is reserved for complicated cysts, for example, cysts that develop a biliary fistula or perforated cysts and cysts that contain daughter cysts. In addition, it is a treatment of choice for superficial cysts that are smaller than 10 cm or are at high risk of rupture and for patients not suitable for percutaneous treatment. Complete obliteration of the parasite, evacuation of the cyst cavity, elimination of the residual cavity, inactivation of the parasite, and removal of the germinal layer are the main goals of a surgical approach to treating hydatid disease. There are three treatment approaches, and they consist of a conservative or a radical open approach and a laparoscopic approach [6]. Regardless of the technique chosen to treat each patient, it must be noted that medical treatment with benzimidazole prior to any surgery must take place to achieve sterilization of the cyst content and prevent dissemination or anaphylaxis. The operating field must be scrupulously packed in all cases, along with the use of solutions that are capable of eradicating even the protoscolices of the parasite, within the content of the cyst [2]. Some of the scolicidal solutions used in surgical approaches are hypertonic saline, povidone iodine, hydrogen peroxide, iodine, formalin, silver nitrate, and albendazole. These scolicides can be used alone or in combination. Regarding cystic echinococcosis, deep, endoparenchymatic, or rear cysts, close to large vessels, containing multiple daughter cells or calcified cysts must be treated with open surgery. On the other hand, superficial cysts on the anterior side of the liver are more suitably treated with laparoscopic surgery [3].

Surgical options include radical and conservative surgeries. Recurrence and complication rates tend to be higher with conservative surgery as compared to those with radical surgery. The recurrences are usually relative to failure of complete removal of the endocysts and/or their dissemination during the surgery. As in all techniques, the choice of the patients that will be operated on laparoscopically or openly should be made considering the indications. Known advantages of minimally invasive methods, smaller incision, and shorter hospitalization time also take place here. Most common laparoscopic technique used is that of injection evacuation omentoplasty.

2.1. Conservative operations

In conservative procedures, only the parasitic cyst contents are removed, whereas the pericystic membrane is retained and the residual cavity is managed with different techniques such as omentoplasty, capitonnage, or external drainage. The cyst is exposed safely. The pericystic area and operating field are covered with pads soaked with scolicidal agent to prevent the spillage of parasites into the surrounding tissue and peritoneal cavity. The cyst is punctured and aspirated. Before instilling the scolicidal agent, as much fluid as possible is aspirated to prevent dilution of the scolicidal agent. Then, the scolicidal agent is instilled into the cyst cavity and left for approximately 5–15 minutes [4]. Then, the scolicidal agent is aspirated, and the cyst is unroofed. The cyst contents, such as the germinative membrane and daughter cysts, are evacuated. At this point, the cavity should be explored carefully for any gross communication with the biliary tract and

for the presence of exogenous cysts embedded in the wall. The next step in conservative treatment is managing the residual cavity. This can be done using various methods such as external drainage, marsupialization, internal drainage, capitonnage, introflexion, and omentoplasty. The Mabit procedure consists of deroofing the cyst and extraction of the parasite with omentoplasty and external drainage of the cyst cavity. The Posadas procedure consists of deroofing of the cyst with capitonnage (the surgical closure of a cyst cavity by applying sutures so as to cause approximation of the opposition surfaces) of the cavity without drainage. During partial pericystectomy, a deeply situated part of cyst wall is left within the liver. Marsupialization is the surgical exteriorization of a cyst by resection of the anterior wall and suture of the cut edges of the remaining cyst to the adjacent edges of the skin, thereby establishing a pouch of what was formally an enclosed cyst. Conservative surgery is easy, safe, and rapid, but has high morbidity and recurrence rates.

2.2. Radical operations

Radical surgery refers to the removal of the cyst along with the pericystic membrane and parasitic contents; it may also include liver resection if indicated. Radical surgical approach aims toward the eradication or elimination of local relapse or complications due to false orbiting. Additionally, it radically deals with the residual cavity, especially in cysts with partial calcification of the wall and biliary communication. There are two methods: the open-cyst method and the closed-cyst method. Radical procedures include: subadventitial cystectomy, (partial) pericystectomy, and hepatic resection. The subadventitial pericystectomy technique is enabled by understanding the surrounding structure of the cyst. The pericyst consists of two layers of different histological origin. Closest to the liver parenchyma is located the subadventitial layer, which is formed by fibrosis and by compression of the Glisson's capsules and hepatic veins. Next up closest to the parasitic cyst is the exocyst layer, which is caused by granulomatous reaction. In between the exocyst and the adventitial layer, there can be found the pericyst and it is the space formed in the in-between that is ideal for smooth detachment [3]. This approach however is not suitable for patients with cysts near the vital vessels or bile ducts. During the pericystectomy procedure, the cyst is dissected along its boundary with healthy liver tissue, blood vessels, and small biliary structures passing through the plane between the normal liver tissue and cyst are clamped and divided. During a hepatic resection operation, the cyst along with the pericyst and in conjunction with normal hepatic parenchyma is removed. Hepatic resection takes longer time to perform and is associated with more blood loss but presents a low rate of cyst recurrence. Pericystectomy and partial pericystectomy are easy to perform and associated with minimal blood loss and operation time. The rate of recurrence of cysts is lower in subadventitial cystectomy and hepatic resection. Subadventitial cystectomy causes less damage to healthy liver tissue than hepatic resection. In any case, treatment aims to one great common goal, that is, the residual cavity must always be treated with excellent care. This is critical to prevent biliary leakage, biliary fistula, and abscess formation. It is in the hands of the surgeon to decide how to go about treating each case separately, depending on the location of the cyst and always aiming towards the safest and most effective method [3]. Radical surgical approaches are associated with a low risk of postoperative complications, fewer relapse cases, long postoperative hospitalization, and low mortality rates; they are all operations with a high difficulty level mostly suitable for highly specialized to the liver surgeons. Radical surgery is superior to conservative surgery with lower morbidity, mortality, and reoccurrence rates [10].

2.3. The use of radiofrequency energy in hydatid disease surgery

The use of radiofrequency under ultrasound guidance allows for very little blood loss and results in minimal coagulation on the liver parenchyma. Ultrasonography (US)-guided RF pericystectomy is recommended specifically for cases where the cyst is not located near the liver hilum (**Figures 1 and 2**) [5].

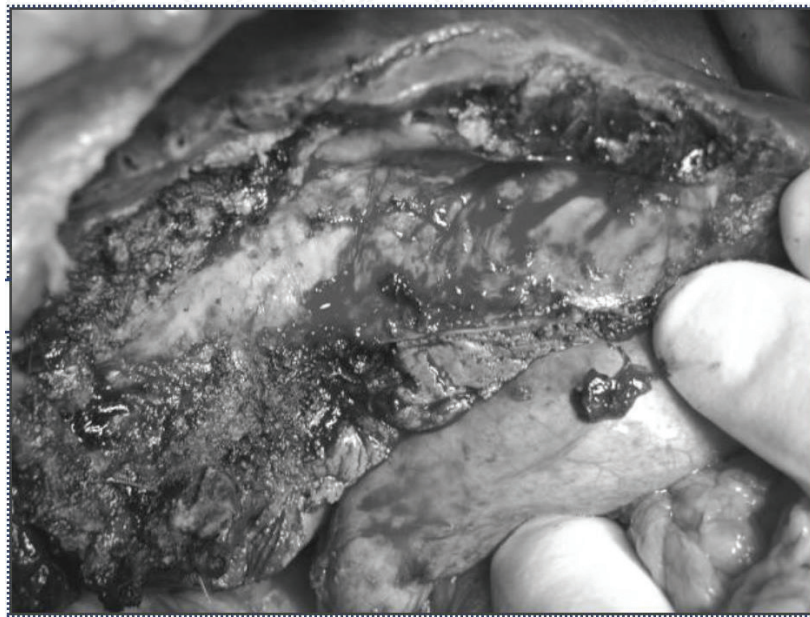


Figure 1. The liver parenchyma is shown with minimal coagulation and hemorrhage, after a radiofrequency assisted closed pericystectomy. (Image kindly supplied by Dr Zacharoulis) [5].

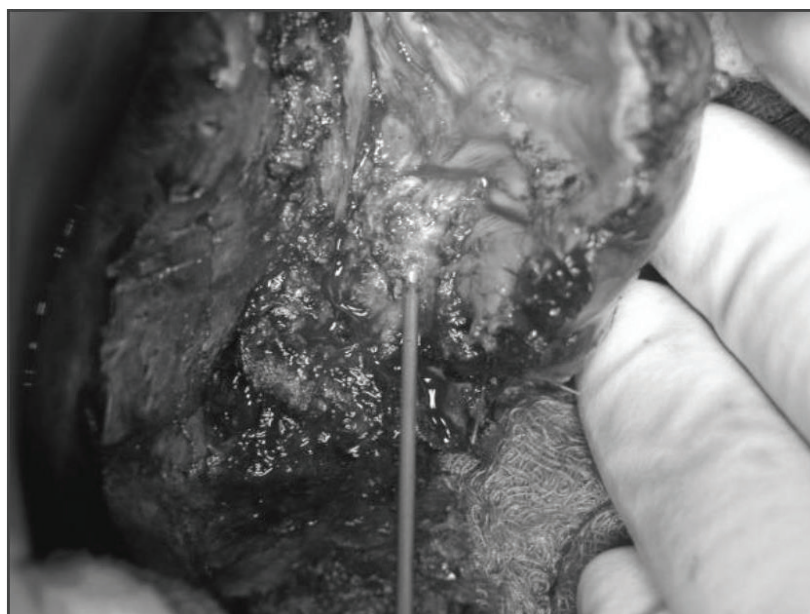


Figure 2. Radiofrequency assisted excision of the pericyst (open pericystectomy). (Image kindly supplied by Dr Zacharoulis) [5].

3. Complication

Potential major complications associated with the surgical treatment of hepatic hydatid cysts include secondary infection; obstructive jaundice due to pressure or rupture into the biliary tree, peritoneum, or an adjacent structure; anaphylaxis, postoperative hemorrhage, bile exudation from the residual cyst cavity, incisional fistula formation, cholangitis, wound infection, sepsis, incisional fistulae; pulmonary complications such as pneumonia and pulmonary embolization; complications of anesthesia; and death. Infection and biliary communication with the cyst (i.e., leakage or rupture with cholestasis) can occur before or after surgical interventions. In the case of intrabiliary rupture either during or after the completion of the operation, treatment can consist of a simple placement of a suture on the orifice, in cases with normal common bile duct caliber and no contamination. In the cases where the common bile duct has an abnormal caliber and the biliary tree is contaminated by cyst contents, firstly the leak must be thoroughly drained and decontaminated and t-tube drainage must be placed, moreover it might even be necessary for a choledochoduodenostomy procedure to be performed. Cases such as these can also be treated endoscopically by sphincterectomy and replacement of the nasobiliary catheter. Another complication or bile leakage which can be symptomatic or cause the formation of a high output biliary fistulae, this can also be managed endoscopically by performing sphincterectomy, nasobiliary drainage, or biliary stenting [7]. Surgical operations except from hepatic resections may leave behind a residual cavity that may easily be mistaken due to imaging techniques for a recurrence or any other condition. Recurrence, both local and as secondary echinococcosis, is associated with spillage during removal of the cyst, incomplete removal of the endocyst, and possibly the presence of unnoticed exophytic cyst development. Intraoperative US improves the quality of hepatic surgery [8].

4. Conclusion

In conclusion, hydatid disease remains to be a significant public health problem, and the main treatment goal should be parasite elimination, without recurrence and with minimal morbidity and mortality. Surgical techniques for the treatment of hepatic hydatid cysts range from hepatic resection to simple cyst evacuation and partial pericystectomy. These procedures eventually eradicate the entirety of the parasitic tissue, resulting in complete cure without recurrence. Even though surgical procedures are the golden therapeutic option, an optimal surgical technique is impossible to be decided on since each operation plan is specifically designed to each patient.

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