

## Ambispective comparative study of two surgical strategies for liver hydatidosis

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### Abstract

**AIM:** To investigate the morbidity, mortality, recurrence and technical aspects of two distinct surgical strategies that were implemented in successive periods.

**METHODS:** Ninety-two patients with 113 cysts underwent surgical procedures. The study was divided into 2 periods. Data from first period (P1) were compiled retrospectively. The surgical strategy was conservative surgery. The second period (P2) included a prospective study conducted according to a protocol following the criterion that radical procedures should be performed whenever it is technically feasible.

**RESULTS:** Patients of both periods showed no statistically significant differences in age, gender, cyst location or mortality. Among the P2 group, patients exhibited more preoperative jaundice, and cyst size was smaller ( $P < 0.05$ ). Changes in surgical strategy increased the rate of radical surgery, decreases morbidity and in-hospital stay ( $P < 0.001$ ). A negative result in P2 was the death of two old patients (4.8%) who had undergone conser-

vative treatments. The rate of radical surgery in P2 was around 75%.

**CONCLUSION:** Radical surgery should be the technique of choice whenever it is feasible, because it diminishes morbidity and in-hospital stay. Conservative surgery must be employed only in selected cases.

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**Key words:** Hydatid disease; Surgery; Morbidity; Liver

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### INTRODUCTION

The primary therapeutic objective in hydatid disease of the liver (HDL) is to completely eliminate the parasite and prevent recurrences with minimal morbidity and mortality<sup>[1-6]</sup>. Although several treatment options exist, the mainstay of therapy is surgery<sup>[1,2,4,6-14]</sup>. At present, no scientific evidence exists regarding which of two possible technical options, radical surgery (RS) or conservative surgery (CS), is most appropriate<sup>[4,7,11]</sup>. The main difference between the two surgical options is that the parasitic cyst is completely excised in RS, whereas only a variable percentage of the cyst is excised in CS, which makes complementary therapeutic measures for the residual cavity necessary<sup>[3,9,10]</sup>. We made an ambispective (retrospective and prospective) study to compare two consecutive

periods in our center in which the preferential surgical strategy for HDL changed from conservative surgery to radical surgery.

## MATERIALS AND METHODS

The inclusion criterion was: patients with HDL who underwent scheduled surgery in our center in the study period (January 2001 to November 2010). A total of 92 patients with 113 cysts made up the study group. The exclusion criterion was emergency surgery for HDL.

RS was defined as complete open or closed cystectomy and/or hepatectomy. All other interventions (subtotal cystectomy, Lagrot surgery, marsupialization, and others) were categorized as CS<sup>[2,7,13,15]</sup>. Blood tests, liver tests, indirect anti-Echinococcus antibody hemagglutination, abdominal CT and ultrasonography were done in all patients. All patients had CE1, CE2 or CE3 type cysts (World Health Organization classification).

The study had two periods. The data from the first period (January 2001 to April 2007) (P1) were compiled retrospectively. The preferred surgical strategy was conservative surgery with insertion of a Kehr tube if preoperative jaundice, intracystic bile, or bile duct dilation was present. The period from May 2007 to January 2010 (P2) was a prospective study conducted according to protocol guided by the criterion the RS should be performed whenever it was technically feasible. The decision to perform total cystectomy or hepatectomy depended exclusively on cyst location and the relation between the cyst and vascular and biliary structures. A Kehr tube was not inserted unless required to resolve situations that arose intraoperatively. Systematic preoperative endoscopic retrograde cholangiopancreatography (ERCP) was performed if a frank intrabiliary rupture was present. Albendazole was administered only if conservative surgery is going to be performed for one month preoperatively and 3 months postoperatively.

Morbidity and mortality were assessed according to the Dindo-Clavien classification<sup>[15,16]</sup>. Data were analyzed with the SPSS 16.0 program for Mac. Approval of ethics committee was obtained for P2.

## RESULTS

### General findings

In the 2001-2007 period (P1), 50 patients with 60 cysts were treated (Table 1). The patients were 56% men (28/50) and the median age of patients was 53 years (range: 11-77). Previously operated recurrent cysts were present in 22% (11/50) of patients. The usual clinical manifestation was abdominal pain (60%) (30/50); only 10% (5/50) of patients debuted with obstructive jaundice. The median number of cyst was one. The cyst locations were: 18 in left liver, 23 in right liver, and 9 bilobar. Median cyst size was 8.5 cm (2-20 cm) and 48.3% of cysts were larger than 10 cm. Only 2 patients (4%) had preoperative ERCP.

**Table 1** Comparison between radical and conservative surgery groups

	P1	P2	P value
Patients	50	42	NS
Cysts	60	53	NS
Age (yr)	53 (11-77)	52 (23-83)	NS
Men (%)	28/50 (56)	25/42 (59.6)	NS
Recurrent cysts (%)	11/50 (22)	7/42 (16.7)	NS
Primary symptom (%)	Abdominalpain (60)	Abdominalpain (69)	NS
Complicated cysts	5/50 (10)	13/42 (31)	< 0.01
Preoperative jaundice	5/50 (10)	9/42 (23.7)	< 0.01
Size (cm)	8.5	6.5	< 0.05
	44%>10 cm	21.1%>10 cm	
Location	18L/23R/9 bilobar	22L/15R/4 bilobar	NS
Radical surgery cyst (%)	4/60 (6.7)	39/53 (73.6)	< 0.001
Radical surgery patients (%)	3/50 (6)	31/42 (73.8)	< 0.001
Kehr tube insertion (%)	36/50 (72)	2/42 (4.8)	< 0.001
Morbidity (%)	21/50 (42)	7/42 (16.7)	< 0.001
Biliary fistula (%)	17/50 (34)	5/42 (12)	< 0.001
RS	0/31 (0)	2/31 (7.7)	
CS	4/11 (35)	3/11 (27.3)	
Mortality (%)	0/50 (0)	2/42 (4.8)	NS
RS	0/31 (0)	0/31 (0)	
CS	0/11 (0)	2/11 (18)	
Mean hospital stay	23 (6-71)	7 (4-50)	< 0.001
Recurrence	4	0	NS

L: Left; R: Right; NS: No statistical significance.

In the 2007-2010 period (P2), 42 patients with 53 cysts were treated. Seven patients (16.7%) were HDL cyst recurrence. The 59.6 % of patients (25/42) were men. The median age was 52 years (range: 23-83 years). Abdominal pain was the primary symptom in 29 patients (69%). The debut was as complicated HDL in 31% (13/42) of patients (8 cases of obstructive jaundice due to frank intrabiliary rupture, 2 cases of septic shock, 1 cutaneous hydatid fistula, 1 bilio-bronchial fistula, and 1 upper gastrointestinal hemorrhage due to esophageal varices originated by portal hypertension). The median cyst size was 6.5 cm (range: 3-20 cm) and 21.1% of cysts were more than 10 cm in diameter. The cyst locations were: 22 in left liver, 15 in right liver, 4 bilobar cysts, 2 in spleen, and 2 subcutaneous cysts. Preoperative ERCP was performed in 9 patients who debuted with obstructive jaundice (8 patients with obstructive jaundice and one patient with a bilio-bronchial fistula). Preoperative percutaneous drainage was done in the two patients with septic shock and were operated on later.

### Technical aspects

In P1, RS was performed in 3 patients (6%) and 4 cysts (6.6%) and consisted of 4 total cystectomies. In 47 patients (94%) with 56 cysts (93.4%), CS was performed, consisting of 47 partial cystectomies, which were accompanied by cyst marsupialization in 10 cases. A Kehr tube was installed in 36 patients (72%). Some type of morbidity occurred in 21 patients (42%). Postoperative biliary fistulas developed in 17 cases, that occurred in patients

that were treated by CS, as well as one stenosis of the intrahepatic biliary tract, one gas embolism, and two cases of bleeding of the residual cystic cavity, one of which required a new laparotomy (19 Clavien IIIa, 2 Clavien IVb). The mortality was 0%. The median hospital stay was 23 d (6-71 d). Four recurrences (6.7%) were detected during follow-up. The mean follow-up was 74 mo (range: 36-108 mo).

In P2, RS was performed in 31 patients (73.8%) and 39 cysts (73.6%). The operations performed were left lateral sectionectomy (11), left hepatectomy (5), right hepatectomy (2), total cystectomy (15), two of them by laparoscopic approach, and splenectomy (2). CS was performed in 11 patients with 14 cysts; cystectomy was almost complete in 8 of these patients. The Lagrot procedure with omentoplasty was performed in 2 patients and one marsupialization. The most frequent reason for not performing RS was the presence of more than 5 cm of contact surface with the inferior vena cava (8/11). Two Kehr tubes (5%) were inserted. Seven patients experienced morbidity (17%); 5 patients had a Clavien-Dindo IIIa morbidity consisting in postoperative biliary fistulas that were resolved by postoperative ERCP. The patients presenting biliary fistula three have been treated by CS and 2 by RS. The two patients treated by RS had hepatic hilar damage, which was managed by hepatectomy and reconstruction of the biliary tree. Two patients with Clavien-Dindo V pathology, an 81-year-old patient and an 83-year-old patient with complicated cysts, were treated by means of CS (bilio-bronchial fistula and septic shock due to an infected cyst). These patients developed numerous complications and died (mortality: 2/42, 4.8%). The median hospital stay was 7 d (range: 4-50 d; in the follow-up conducted (range: 1-36 mo), no recurrences were observed.

### P1-P2 comparison

The patients of the two periods showed no statistically significant differences in age, gender, primary symptom, cyst location, previous surgery, mortality, or recurrence (Table 1). Among the P2 patients, patients had more preoperative jaundice, more preoperative ERCPs were performed, and cyst size was smaller ( $P < 0.05$ ). In addition, the change in surgical strategy substantially increased the rate of radical surgery and diminished the number of Kehr tubes installed, morbidity, particularly biliary fistula, and the mean stay ( $P < 0.001$ ). In P2, the death of two patients occurred (5%) who had been treated by means of CS.

## DISCUSSION

HDL is still an endemic disease in certain areas of the planet<sup>[2-7,10,11,13,14]</sup>. No consensus exists in the international literature regarding the optimal treatment for HDL<sup>[10,13,17-19]</sup>. Possible therapeutic options are observation, anthelmintics, percutaneous aspiration, or surgery (conservative or radical). Surgery is considered the therapy of choice<sup>[2,3,8-11,17-19]</sup>.

There are many studies for and against both surgical options<sup>[8,19]</sup>. Current evidence on which type of surgery is optimal for HDL is supported only by evidence level IV grade C<sup>[7,8,13]</sup>.

The two technical options, CS and RS, have their respective advantages and disadvantages. Only a randomized study with a large number of patients can provide a methodologically valid response. The most important problem is the bias inherent to the fact that CS is universally applicable, whereas RS sometimes is not feasible.

The characteristics of the cyst (number, size and location), presence of complications related to the HDL, the patient's age and comorbidities, presence of new or recurrent disease, and the surgeon's experience in hepatic surgery condition decision-making with regard to selection of the technique<sup>[2-4,9-11,17,19]</sup>. CS offers acceptable results, is easily performed at any center and on any cyst by surgeons with little experience in hepatic surgery, and has a low mortality rate and an appreciable morbidity rate, particularly biliary morbidity and recurrence<sup>[1,4,10,12,17,19]</sup>. Since laparoscopy came into use for the treatment of HDL, CS has become popular again as the preferred method because laparoscopic RS is technically more challenging<sup>[11,14,19]</sup>.

RS is safe and efficient, and produces less morbidity, especially in terms of postoperative biliary fistula and cavity infection. RS eliminates the possibility of untreated satellite lesions in CS and achieves a shorter hospital stay with fewer recurrences<sup>[1,4,7,8,10,11,14,17]</sup>. RS is generally criticized as associated with high morbidity and mortality that are considered disproportionate in the case of a benign pathology, although the benignity of HDL is questionable<sup>[1,8,10,14,17,19]</sup>. The only prospective comparative study of RS and CS concluded that RS is associated with less morbidity and mortality, fewer recurrences, and a shorter hospital stay<sup>[20]</sup>. The election of total cystectomy or anatomic resection depends on cyst location and the anatomic relations of the cyst(s)<sup>[10]</sup>. RS, despite the advantages mentioned, has not been generally accepted as the treatment of choice.

RS is not feasible in certain cases of extensive contact (> 5 cm) with the inferior vena cava<sup>[9]</sup>. In our series, this was the main contraindication for RS. A small number of combined resections of the inferior vena cava and hydatid cyst have been reported<sup>[21]</sup>, but we believe that this procedure should be performed only in cases of serious complications (Budd-Chiari syndrome, hemorrhage or other) that justify exeresis.

Major hepatectomy, which was once unthinkable, has been demonstrated to achieve excellent results with very low morbidity, mortality and recurrence rates<sup>[17]</sup>. The 20% rate of major hepatectomy in our series was high compared to 3.3%-10% in other series<sup>[14]</sup>. Major hepatectomy was performed for biliary rupture at the hilar plate or the presence of several cysts that affected the entire hepatic lobe. The hepatic resection most frequently performed was left lateral sectionectomy for cysts that affected segments II-III<sup>[14]</sup>.

Published series on surgery for HDL usually involve cases of CS or a combination of patients treated by CS and/or RS<sup>[3,4,6,9,10,17,19]</sup>. Few publications exist on patients treated exclusively by RS (22). The percentage of RS in mixed series varies widely and ranges from 15% to 80%<sup>[1-14,17-21]</sup>, but a few series have reported as many as 75% of patients treated with RS, including our series<sup>[11,17,22]</sup>. The use of an ultrasonic bisturi, a more refined hepatic surgery technique, to treat patients with HDL in hepato-bilio-pancreatic units that have experience in treating this condition, and the surgical team's awareness of the advantages of RS, are the key to attaining this RS rate, with CS being restricted to very specific cases<sup>[23]</sup>.

The literature overall morbidity of RS is 3.2% to 32% lower than the morbidity of CS (15.7%-54%)<sup>[2-6,9-11,13,17,19,22]</sup>. In the second period, in which the RS rate was high, there was a drastic decrease in morbidity.

The literature rate of postoperative biliary fistula in RS was 0% to 7.7%, compared to 11.3%-25.6% for CS<sup>[2,8,11,14,18,19]</sup>. Traditionally, when CS is performed, if bile is present in the cyst, the bile ducts are dilated, or preoperative cholangitis is observed, the bile ducts found inside the cystic cavity are sutured and a Kehr tube is inserted in the choledochus or a biliary derivation is performed<sup>[1,3,6,13,19]</sup>. The rate of Kehr tube use in series of patients treated by CS is 30% to 50%<sup>[4]</sup>.

Performance of preoperative ERCP in patients who debut with obstructive jaundice due to a frank intrabiliary rupture, established by protocol in our unit, facilitates optimal bile duct cleaning and helps to eliminate the need for bile duct opening<sup>[2,3]</sup>. The combination of preoperative ERCP and RS drastically reduces the need for a Kehr tube, thus eliminating the morbidity associated with this procedure and shortening the mean hospital stay<sup>[3,6,14]</sup>. In series in which RS is the most frequently used technique, the Kehr tube is used in only 4% compared to 4.8% in our series. Patients with frank biliary rupture into the cyst are at the highest risk of postoperative biliary fistula, so we consider them to be a sub-group of patients who may benefit especially from RS.

Infection of the residual cystic cavity is an exclusive complication of CS<sup>[1,2]</sup>. The frequency of abscess formation in the residual cavity ranges from 5.5% to 37%<sup>[1,8,10,12,19]</sup>. Several techniques exist to diminish this complication, including omentoplasty, introflexion, capitonage, external drainage, *etc.*<sup>[4]</sup>. In P2, a patient who debuted with cyst infection and septic shock in which CS with omentoplasty was practiced presented infection of the cystic cavity. Omentoplasty seems to be accompanied by less morbidity than other techniques<sup>[4,6,7,12]</sup>. In patients in whom RS is performed, an intra-abdominal abscess can develop in the dead space remaining after the hepatic parenchyma is resected, although the rate of this complication is lower (3%) than the rate of intracystic cavity infection<sup>[2,8]</sup> and we did not observe it in our series. An added problem of CS is the difficulty of conducting postoperative follow-up using imaging techniques, since it is complicated to assess residual cavities and differentiate between a residual cavity with disease recurrence and one without recurrence<sup>[24]</sup>.

The recurrence rate after surgery for HDL is 0% to 25%. The recurrence rate differs between RS (0%-6.4%) and CS (6%-25%)<sup>[2,4,6,8-11,14,17,18]</sup>. However, although recurrence after RS is much less frequent than after CS, RS is not suitable for all patients<sup>[18]</sup>. Cases of HDL recurrence should be treated by RS if this is technically feasible<sup>[2,9]</sup>. Our recurrence rate was 6% in the first period, when patients were treated preferentially by CS. The follow-up of patients in the second period is too short to draw conclusions yet.

Mortality due to surgery for HDL is low and differs between patients treated by CS (0%-2.1%) and by RS, which has a slightly higher mortality (0%-2.9%)<sup>[2-4,6,9,10,13,14,17-19,22]</sup>. Higher mortality rates (4.5%) have been reported in series limited to cysts that communicate with the biliary tract, all treated by CS<sup>[2,25]</sup>. In our series, the two deaths that occurred in the second period were patients over 80 who had complicated cysts (septic shock due to an infected cyst and bilio-bronchial fistula) treated by means of CS. No deaths occurred in the patients of the RS group.

Despite the methodologic limitations of an ambispective study, we believe that radical surgery should be performed in HDL because it reduces morbidity, especially biliary complications, the duration of the hospital stay and, according to published series, has a lower recurrence rate. Conservative surgery is useful in certain extreme cases in which the risk is extremely high<sup>[8,11]</sup>.

## COMMENTS

### Background

No evidence medicine data about best surgical option for liver hydatidosis exist. We have performed an ambispective study divided in 2 periods, first period we performed as first option conservative surgery, in second radical surgery. We compare morbidity, relapse and feasibility of radical surgery.

### Research frontiers

The research hotspot is how to completely eliminate hydatid disease of the liver and prevent recurrences with minimal morbidity and mortality. But, which of two possible technical options, radical surgery or conservative surgery, is most appropriate? In this study, the authors attempt to answer this question.

### Innovations and breakthroughs

Very few ambispective of liver hydatidosis exist. Randomized trial comparing radical and conservative surgery are scarce.

### Applications

Radical surgery is the best surgical therapy but not always is feasible.

### Peer review

Morbidity, relapse and hospital stay is reduced with radical surgery but these techniques are not always feasible. Preoperative endoscopic retrograde cholangiopancreatography in jaundiced patients is recommended.

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