

## Laparoscopic Treatment of Hydatid Liver and Pancreas Disease: Some Technical Aspects and Importance

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### ABSTRACT

**Objective:** Hydatid cyst disease is a widespread zoonotic disease infecting humans as an intermediate host. Since the first description of this pathology, many modalities have been introduced into modern treatment protocols. Minimally invasive surgical treatment is well-described and widely used, but has many points where rationalization and modification can be applied. In this case series, we describe small differences in surgical technique and the corresponding treatment results.

**Materials and Methods:** Out of 44 patients, 16 were included in this study. Patients were retrospectively evaluated in two groups in accordance with the preferred cyst aspiration technique, i.e. via a standard laparoscopic aspirator or a large diameter venous catheter (the control and study groups, respectively). Demographic, clinical and surgical data like duration of surgery, hospital stay and complication rates were evaluated in both groups.

**Results:** Equal numbers of males and females participated, with a median age of 40 years. Most patients had a type III hydatid cyst (n=11, 68.75%). Surgery duration and hospital stay were significantly shorter in the study group, without a significant difference in terms of complication rates.

**Conclusion:** Laparoscopic procedures quickly became plausible for selected hydatid cysts located in liver. Success of such procedures shows to be depending on the success and duration of the laparoscopic intervention. The latter, according to our calculations, seems to be inversely proportional to the diameter of the aspirator tip and its piping.

**Keywords:** Cyst hydatid, pancreatic cyst hydatid, laparoscopic treatment of hydatid cysts

## INTRODUCTION

Hydatid cyst is a zoonotic disease caused by *Echinococcus granulosus*, for which humans serve as an intermediate host. The modern approach to treating hydatid cysts consists of medical, percutaneous and surgical treatment. Bekhti was the first to introduce medical treatment with mebendazole in 1977, followed by the introduction of further generations of medications like albendazole, praziquantel, ivermectin and cambendazole. The basic mechanism of action for these drugs is the impairment of microtubule

assembly and uptake of glucose-depleting glycogen stores. Albendazole is the most prescribed medication and is available in the form of albendazole sulfoxide. The dosage recommended by the World Health Organization (WHO) is 10-15 mg/kg for up to 1 year [1].

The option for the percutaneous treatment of hydatid cyst was introduced in 1981. Since 1986, percutaneous treatment has evolved into the "puncture, aspiration, injection, respiration" (PAIR) concept and has developed rapidly ever since. This

modality is mostly used for the treatment of type I, III and selected type II cysts [1,2].

In spite of the development of rather effective medical and invasive radiological treatments, surgery is still preferred in the radical treatment of hydatid cysts. Surgical treatment can be performed either by open or laparoscopic route. The open approach can consist of combined procedures of varying complexity which may include partial cystectomy, omentoplasty, capitonnage and cavity drainage.

The first successful laparoscopic treatment of a hydatid cyst was performed by Katkhouda in 1992. Nowadays, the laparoscopic approach incorporates techniques such as segmental hepatectomy, unroofing, cystopericystectomy, and the evacuation of cyst contents with further omentoplasty. All laparoscopic procedures have the common technical difficulty of aspirating the cyst contents without contaminating the peritoneal cavity. Another consideration is the length of the procedure in comparison to the open procedure [3,4]. Another common problem is the unavoidability of at least slight contamination of the peritoneal cavity, especially in cases with liver or pancreas involvement, which is usually not an issue during resection due to these anatomical involvements. Imaging of cysts, evidence and verification of the connection between cysts and the biliary tree are other important diagnostic problems commonly seen in hydatid cyst patients. The aim of this study was to share and discuss some technical aspects of hepatic and pancreatic hydatid disease treatment in our facility.

## MATERIALS and METHODS

Eligible patients were included in the study after obtaining the local ethics committee approval numbered 2019/208 on 14.01.2019. A total of 44 patients with hydatid disease were admitted to our facility between January 1 2010 and December 31 2017. Age, gender, admission complaints, location and number of hydatid cysts, intraoperative complications, procedure type, technique and duration, hospital stay, and postoperative complications were evaluated. An informed consent was acquired from all patients participated in the study. Sixteen patients who underwent a

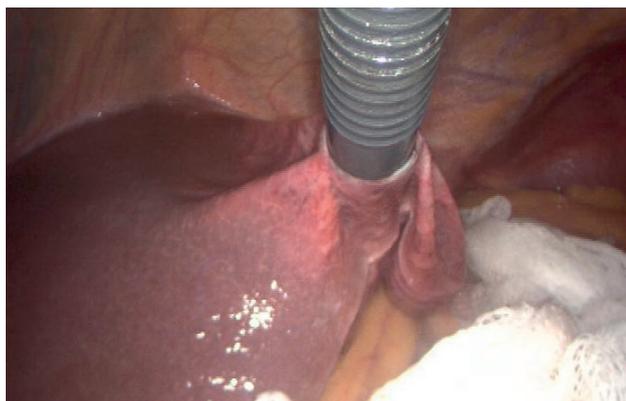
laparoscopic procedure using various techniques were included, while patients who underwent open procedures were excluded. The control group was formed of patients who were operated on using the standard technique, i.e. where a standard laparoscopic 5 mm aspirator was used. The study group was composed of patients who were operated on using a 32 French (F) cannula. Preoperatively, all patients had 10 mg/kg albendazole treatment which was carried out for another two months after the operation. Patients were followed up at 1, 3, 6, 12 and 18 months using clinical, serologic (some patients) and radiologic investigations, with no recurrences or complications observed.

## Statistical Analysis

Statistical analyses were performed using SPSS software version 20 (IBM™). The variables were investigated using analytical methods (one-sample Kolmogorov-Smirnov) to determine whether or not they were normally distributed; it was found out that all the analyzed variables were normally distributed. Independent t-test was used to determine whether there was a statistically significant difference between variables. Correlation analysis was performed calculating Pearson's correlation coefficient. A p-value of less than or equal to 0.05 was accepted as statistically significant.

## Surgical Technique

After standard preparation in the supine position, a Veress needle was used to create a pneumoperitoneum via an infraumbilical incision. A 30-degree optic scope was routinely used. Intraabdominal pressure was held in the interval of 12-14 mm Hg. Other trocars were placed according to anatomical location of the cyst in each specific case. The area surrounding the cyst was covered with gauze impregnated with 20% hypertonic saline solution in order to prevent probable contamination. Cysts were punctured and aspirated as much as possible using a laparoscopic needle, then using the same needle, 20% hypertonic sodium chloride solution was injected until the cyst cavity was full of hypertonic saline. After 15 minutes, the cysts were again aspirated using various techniques. In three suitable patients (two with right lobe and one with pancreatic head involvement), a 10 mm trocar was introduced inside the cysts after directly passing through the abdominal wall and aspiration was performed via the trocar itself (Figure 1).



**Figure 1.** A 10 mm trocar inserted into the cyst with an aspirator

In other patient group, cysts were aspirated by surgically creating an opening in the cyst wall. The cysts of ten patients were aspirated using a standard reusable laparoscopic aspirator, while in other six patients, aspiration was performed via a 32 F venous cannula mounted to a 10 mm aspirator (Figure 2).

All cysts were inspected from inside using a scope introduced via the trocar or the direct opening in the cyst wall (Figure 3).



**Figure 2.** 32F venous cannula used for aspiration (white arrow)



**Figure 3.** Appearance of daughter vesicles in pancreatic cyst



**Figure 4.** Biliary fistula opening into the cyst (black arrow)

In three patients, biliary fistulae were observed and after partial cystectomy were directly sutured using a laparoscopic technique (Figure 4).

Including patients who had biliary fistula repair, all cases underwent partial cystectomy with drainage using a silicone tube.

## RESULTS

Among 16 operated patients, 8 (50%) were males and 8 (50%) were females. The median age was 40 years (25-79 years) and all patients were living in urbanized areas. None of the patients were actively working or dealing with animal breeding or farming. The most frequent complaint was epigastric abdominal pain (n=12, 75%), while another four patients had complaints of abdominal mass (n=4, 25%).

Ten had right lobe, two had left lobe and three patients had bilateral liver cysts. Only one patient had a pancreatic cyst localized in the head of the pancreas (Figure 5).

The mean diameter of the cysts was 10.1 cm (6-17 cm). Five patients (31.25%) had type II and 11 (68.75%) had type III cysts. Only two complications developed in the present series. One was a biliary fistula into the right lobe cyst which was diagnosed during preoperative preparation, and another patient had a left lobe cyst which developed an infection during the diagnostic period.

The control group was composed of ten patients who underwent the standard aspiration procedure described above; another 6 patients had their cysts aspirated via a venous cannula. The mean duration



**Figure 5.** Localized hydatid cyst lesion per pancreas (red arrow)

of the surgical procedure starting from anesthesia induction was 147.31 minutes (60-240 minutes); the mean in the control group was 187.70 minutes while that of the study group was 80.0 minutes ( $p < 0.05$ ). After reassessing the video records of the procedures, it was understood that the significant decrease in the duration of procedures in the study group was due to the trans-trocar aspiration technique. Hospital stay in the study group was also reduced. The overall mean duration of hospital stay was  $90.50 \pm 18.68$  hours for the control group and  $49.00 \pm 3.69$  hours for the study group ( $p < 0.05$ ) (Table 1).

A strong, statistically significant positive correlation was found between hospital stay and procedure duration (Table 2).

The criteria for discharge were the ability to feed normally on a standard diet, good general status, stability of vital signs, ability to perform normal daily activities without assistance and the absence of complications. Drains were routinely removed in the outpatient setting with a mean duration of 6.2 and 6.0 days in the control and study groups, respectively ( $p = 0.882$ ) (Table 1). Interestingly, drainage duration was strongly correlated with cyst diameter with  $\rho = 0.577$  and  $p = 0.019$  (Table 2). There was no peri- or postoperative mortality, and all patients were followed-up with no complications or recurrences.

## DISCUSSION

Hydatid cyst disease remains a population-wide problem in endemic regions [5]. Due to less and less constrained global migration regulations, this disorder can be seen outside of endemic regions [6]. The liver and lungs are the most frequently infected organs, but along with Keser et al. (2017), there are many reports on hydatid cysts affecting organs like the spleen, omentum, brain, pancreas and others [7].

According to general estimations, overall rates of infestation are around 1-7% [7]. The rate of liver involvement is reported to be 50-80% [1,5,7], while our series demonstrated it as 93%. Pancreatic involvement is quite a rare entity reported in 0.14-2% of cases [7-10]. This rate in our series was

**Table 1.** Differences between the standard technique and the 32 F venous cannula group.

	Group name	N	Mean $\pm$ SD*	P value
Hospital stay in hours	Standard technique	10	90.50 $\pm$ 18.68	0.000**
	Cannula technique	6	49.00 $\pm$ 3.69	
Duration of operation in minutes	Standard technique	10	187.7 $\pm$ 30.32	0.000**
	Cannula technique	6	80.00 $\pm$ 14.53	
Drainage duration in days	Standard technique	10	6.20 $\pm$ 3.05	0.882
	Cannula technique	6	6.00 $\pm$ 1.26	

\*SD – standard deviation

\*\* $P < 0.001$

**Table 2.** Pearson's correlation evaluating parameters affecting hospital stay and drainage duration.

	Cyst size (cm) r / P-value	Hospital stay (hours) r / P-value
Duration of operation (minutes) r / P-value	0,102	0,777
	0,708	0,000*
Drain duration (days) r / P-value	0,577	-0,119
	0,019*	0,661

\*Statistically significant correlation ( $p < 0.05$ ).

4.5%, still substantially outnumbering literature rates. The higher rates both for liver and pancreas involvement in our study could be explained by the small sample size.

Despite being asymptomatic in 38-60% of cases at admission, some symptoms can be caused due to cyst location and size. Most symptoms like epigastric and right upper quadrant pain originate from the most commonly affected organ, the liver [6]. Cysts impose pressure on surrounding structures, leading to various complaints and complications like hepatomegaly, biliary cirrhosis, portal hypertension, cholestasis, jaundice and pancreatitis [11]. Rupture of hydatid cysts is another common complication. In general, up to 60% of cysts become complicated in the course of their natural history [12]. Direct complications related to cysts include opening of the cyst into the biliary tree, rupture of the cyst into the peritoneal cavity and abscess formation inside the cyst [11,12]. In our study, only one patient with bilateral liver cysts had a right lobe cyst complicated by draining into the biliary tree with concurrent abscess formation in the left lobe cyst.

Direct radiographs, computed tomography (CT) and magnetic resonance imaging (MRI) are widely used, but ultrasonography is preferred. Gharbi et al. in 1981 proposed a classification of hydatid cysts, dividing them into five categories. Type I cysts appear as well-delineated, mostly spherical lesions. Type II cysts, due to detachment of the laminar membrane, have a "water lily" appearance. Type III cysts appear multiseptated as a result of daughter vesicles. Type IV are irregular shaped cysts with heterogeneous dense contents, while type V cysts have calcified cyst walls [11]. Five (31.25%) of our patients had type II and 11 patients had type III cysts (68.75%).

Along with medical treatment and PAIR, surgical treatment plays an important role in the current approach to hydatid cyst disease. With the development of laparoscopic techniques, hydatid cyst laparoscopy has been applied safely in virtually all patient groups, including the pregnant subpopulation [3,13]. At the same time, some specific problems have arisen with the laparoscopic approach to hydatid cyst disease. Proper visualization of the cyst interior with timely recognition of biliary leaks, aspiration of cyst contents and intraoperative peritoneal

contamination are problems that need to be solved [14].

Cyst aspiration is one of the main reasons for the long duration of the procedure; this has been addressed in many studies where various laparoscopic aspirators, beveled tip transparent cannulas, custom designed grinder-tipped aspirators and many other solutions have been proposed [3,15,16]. In addition to these, Kayaalp et al. demonstrated in 2002 the possibility of direct introduction of a 10 mm trocar through the wall of the cyst in order to observe the cyst interior. Using this approach, a trocar can be introduced directly into the cyst for the sake of visualization but also to perform cyst aspiration through a 32 F venous cannula, significantly shortening procedure duration. Some of the abovementioned studies had mean operating times for laparoscopic cyst evacuation ranging from 50 to 95 minutes [3,15]. The mean procedure duration with a venous cannula in our study was 80 minutes, which was significantly shorter than that of the standard technique with a mean of 187 minutes. The cannula was easily and safely introduced via the wall opening or through the trocar that was directly inserted into the cyst. In cases of pancreatic hydatid cysts, we used the same technique without compromising the safety and duration of the procedure.

Laparoscopic pancreatic hydatid cysts are rarely managed via laparoscopy [17,18]. In our study, a cyst on the pancreatic head was exposed via a transected hepatogastric ligament. After the aspiration-injection sequence, a 10 mm trocar was inserted into the cyst, allowing for aspiration of the cyst contents through a large venous cannula.

In summary, our study showed a strong positive correlation between the length of the procedure and the duration of hospital stay.

### Study Limitations

One of the main limitations of this study was the sample size, so in order to verify such a correlation, studies with a larger sample size should be designed.

### CONCLUSIONS

Laparoscopic procedures for the treatment of hydatid cysts have become the standard of care for selected cases. Cyst aspiration plays an important

role in the success and duration of the laparoscopic intervention for hydatid cysts. To our knowledge, the best and safest way to achieve aspiration is to increase the diameter of the aspirator tip and its piping at the same time providing suction from a powerful aspirator machine.

### CONFLICT of INTEREST STATEMENT

We declare that there is no conflict of interest of all authors in this work. No financial support was provided for the conduct, preparation, collection, analysis, interpretation and writing of the report.

### Highlights

1. Hydatid cyst disease is a public health problem.
2. All cysts, including pancreatic hydatid cysts, can be treated by laparoscopic method.
3. Cyst aspiration is the most important and time consuming stage of this surgery.
4. Different modifications of the aspiration systems can facilitate this and significantly shorten the operation time.

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