Laparoscopic versus open surgical management of liver hydatid cyst: a retrospective study

Ahmed S.M. Omar, Tarek A. Osman, Mohab G. El Barbary

Department of General Surgery, Ain Shams University, Cairo, Egypt

Correspondence to Ahmed S.M. Omar, MD, 52 El Helmeyia Buildings, Gesr El Suez, Ain Shams, Cairo 11724, Egypt. Tel: +002 01003324336; e-mail: ahmed_samy@med.asu.edu.eg

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Background
The liver is the most frequent organ to be affected by hydatidosis. Chemotherapy, percutaneous interventions, and surgery are the treatment options. Surgery remains the mainstay of therapy. Whether open or laparoscopic surgery, should offer the lowest morbidity, mortality, and recurrence rates.

Patients and methods
Retrospective evaluation of 138 patients with liver hydatid cyst in the period between March 2014 and October 2020. They were divided into two groups, group A (n=102), open surgery; group B (n=36), laparoscopic surgery. Patients with recurrent cysts or with previous hepatic surgeries were excluded.

Results
In group A, the mean cyst size was 11.960±4.002 versus 9.444±3.442 cm in group B (P=0.156). The mean operative time was 49.009±6.587 and 60.138±9.963 min in groups A and B, respectively (P=0.0007). The mean hospital stay was 4.676±1.857 days in group A versus 3.805±1.037 days in group B (P=0.0001). Four (11.11%) patients were shifted from laparoscopic to open surgery. Spillage of cyst content (clear fluid) occurred in three (8.33%) patients in group B. Persistent biliary fistula was seen in three (2.94%) patients in group A and one (2.78%) patient in group B (P=0.464), all four patients in both groups needed endoscopic retrograde cholangiopancreatography with sphincterotomy for fistula closure and all resolved within 1 week. In group A, five (4.9%) patients had incisional hernia, while in group B, one (2.78%) patient had port-site hernia (P=0.038). Four (3.92%) patients in group A versus one (2.78%) patient in group B had recurrence of the liver hydatid cyst (P=0.145).

Conclusion
Both laparoscopic and open approaches are safe and effective. The results are similar and comparable, and many of the open-surgery cases could be done laparoscopically if patients are properly selected. Recurrent, multiorgan hydatid cysts, multiple liver cysts, huge cysts with suspected major biliary communication, deep intraparenchymal located cysts, and those present in the blind area for laparoscopy in segments 1 and 7, are better to be managed by open surgery.

Keywords:
albendazole, biliary communication, biliary fistula, ERCP, hydatid, laparoscopic, liver, management, recurrence, spillage

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Introduction

Cystic echinococcosis or hydatidosis is a zoonotic disease caused mostly by the larval cestode *Echinococcus granulosus* and other organisms, for example, *Echinococcus multilocularis*, *Echinococcus vogeli*, and very rarely, *Echinococcus oligarthrus*. Most of the infections go to the liver and lungs (60–75 and 30%, respectively), and rarely in the kidney, bones, brain, pericardium, etc. [1]. Individuals with close contact with dogs are more susceptible to hydatid infection. It is a global parasitic zoonosis with prevalence in the Mediterranean region, Middle East, South America, Eastern Europe, and Australia [2]. Patients got the infection through oral route and they are accidentally an intermediate host [3].

Most patients had no symptoms as cysts grow slowly. The symptoms result from pressure on a nearby structure or viscera, or from cyst rupture into peritoneal cavity, pleural space, and biliary tree with or without obstruction. The liver is the most frequent organ to be affected, where the infection is settled in the right hepatic lobe in 55–80% of patients. The most common presenting symptoms are right hypochondrial discomfort and appetite loss. Other symptoms may be upper abdominal pain due to enlargement of the cyst, cholangitis due to bile duct obstruction by the daughter cysts [4], and anaphylactic reaction induced by cyst rupture [1].

Diagnosis of hepatic hydatidosis is based on epidemiology (i.e. residence in or visiting an endemic area), confirmed by imaging, and, in few cases, by immunochemistry, histopathology, or parasitology [1]. The pathognomonic criteria of hepatic hydatidosis are the presence of daughter cysts, detached laminated membrane, and cyst-wall calcifications. If radiological diagnosis is clear, no further investigation is usually required, and patients can be treated, depending on the stage of the disease. Ultrasound is usually initially enough for most of noncomplicated liver hydatid cysts. Computed tomography (CT), magnetic resonance cholangiopancreatography (MRCP), and endoscopic retrograde cholangiopancreatography (ERCP) can be requested alone or together for a more detailed diagnosis of complicated cysts. Hepatic hydatid cysts had many classifications, but the most widely accepted are those described by Gharbi *et al.* [5] (Table 1), and by WHO [6] (Table 2).

Chemotherapy, percutaneous interventions, and surgery whether open or laparoscopic, are the treatment options. Medications alone have been disappointing for treatment of hepatic hydatid cyst. Benzimidazole compounds (albendazole and mebendazole) are used mainly before surgery, for inoperable cases, for recurrence prevention, and to complement the treatment after surgery [7]. Surgery remains the mainstay of therapy, despite the debate about the most appropriate surgical technique that offers complete cure with less postoperative morbidity [8].

Surgical options can be either the classic open surgery, or via the use of laparoscopy, or the minimally invasive procedures. Open surgical management can be either (a) conservative methods where part or most of the pericyst remains in place, and (b) radical methods. Laparoscopic management of liver hydatid disease had gained more popularity due to the advantages of reduced incisional complications, for example, incisional hernia and postoperative pain, shorter hospital stay, less abdominal adhesions, and better cosmoses in comparison with open surgery [9]. We conducted this study to present our experience and the long-term outcomes of open and laparoscopic surgery in the management of liver hydatid cyst and to compare their postoperative complications, morbidity, and recurrence of the disease.

Table 1 The Gharbi classification of hydatid cysts [5]

Types	Description
I	Pure fluid collection (the cyst is similar to simple liver cysts)
II	Fluid collection with a detached membrane
III	Fluid collection with multiple septa and/or daughter cysts
IV	Hyperechoic with high internal echoes
V	Cyst with reflecting, calcified, thick wall

Patients and methods

This retrospective study was conducted at Ain Shams University Hospitals in Egypt and Saudi Hospital in Hajja, Yemen. Ethical Committee approval and written, informed consent were obtained from all participants. After approval of the Ethical Committee, 138 patients with liver hydatid cyst in the period between March 2014 and October 2020 were retrospectively evaluated. They were divided into two groups, group A (n=102), open surgery; group B (n=36), laparoscopic surgery.

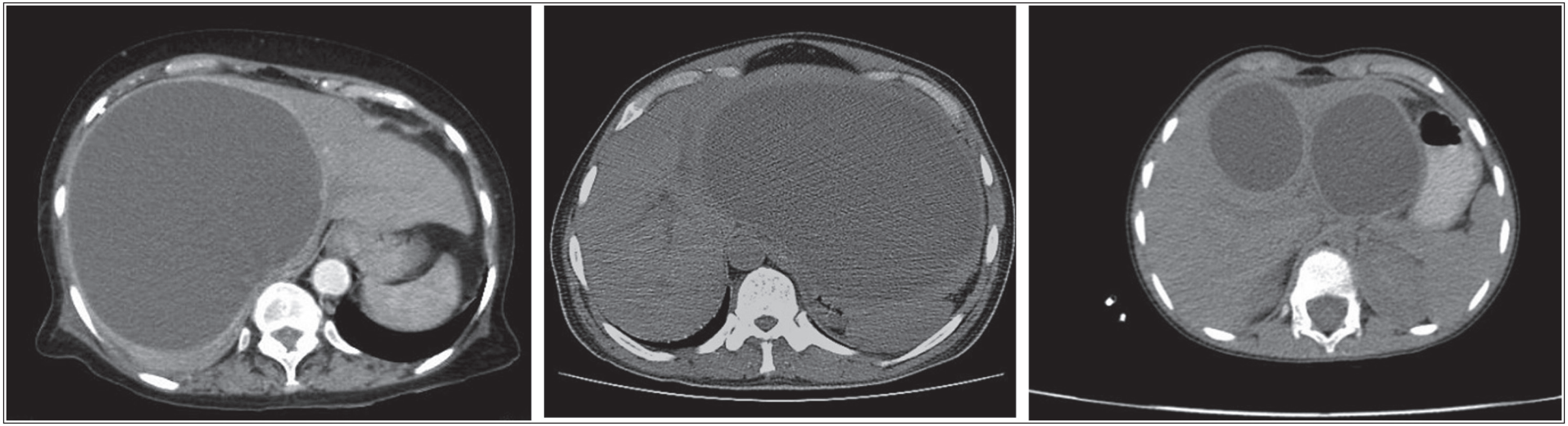
History, physical examination, and laboratory investigations were carried out for all patients. The epidemiologic data (regarding geographical location and profession) might support diagnosis in several cases. Diagnosis was made mainly by ultrasonography as most of the patients were coming from endemic areas. Contrast-enhanced CT scan of the abdomen (Fig. 1) was reserved for recurrent cases (excluded), or patients with unclear diagnosis. Chest radiograph was also done to confirm or exclude lung hydatid cysts (Fig. 2). MRCP and ERCP were spared for selected cases with jaundice, cholangitis, dilated biliary ductal system, hydatid element evidence in the bile ducts, or elevation of serum liver transaminases. Serology was not used for diagnosis in this study.

All patients received albendazole preoperatively in a dosage of 10–15 mg/kg/day in two divided doses for 4 weeks, in two courses separated by a 2-week interval. One course of albendazole was given to all patients after surgery to prevent recurrence. In patients with peritoneal spillage during the surgical maneuvers, the postoperative albendazole was extended to three courses each for 4 weeks separated by a 2-week interval.

Table 2 The WHO classification of hydatid cysts [6]

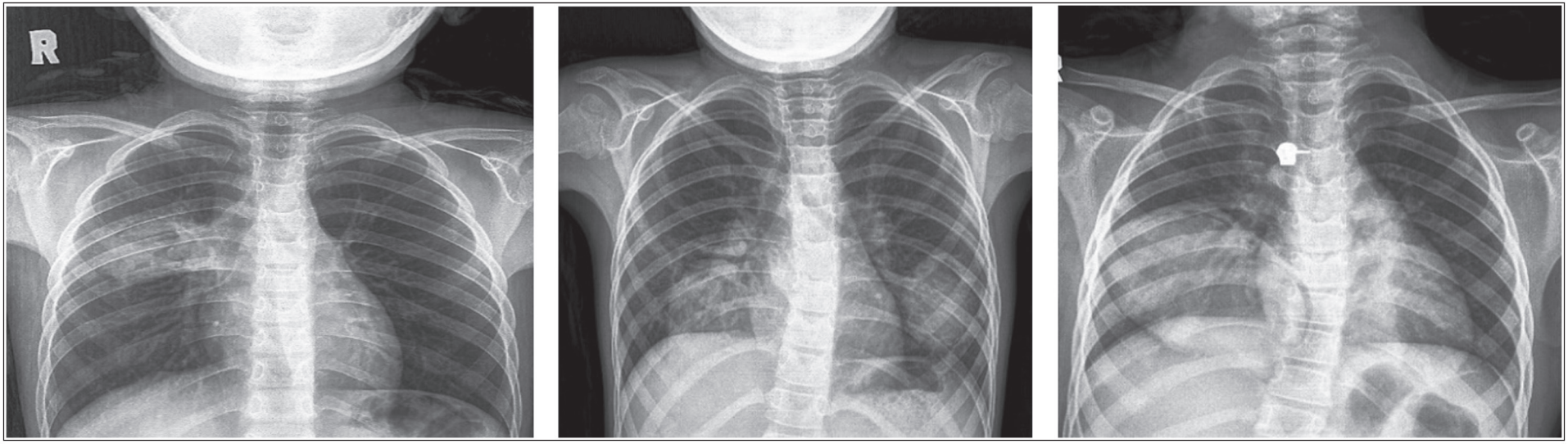
WHO stages	Characteristics	Activity
CE1	Unilocular, anechoic cyst with double-line sign	Active
CE2	Multiseptated 'rosette-like' 'honeycomb pattern' cyst	Active
CE3a	Cyst with detached membrane (water-lily sign)	Transitional
CE3b	Daughter cysts in solid matrix	Transitional
CE4	Heterogonous cyst, no daughter vesicles	Inactive
CE5	Solid matrix with calcified wall	Inactive

Figure 1



CT images of diverse presentations of liver hydatid cyst. CT, computed tomography.

Figure 2



Chest radiograph for lung hydatid cysts (associated with liver hydatid cysts).

For this study, 138 patients with liver hydatid cyst were divided into two groups, group A (*n*=102), open surgery; group B (*n*=36), laparoscopic surgery. The following aspects were considered as exclusion criteria for laparoscopic surgery: patients with cardiopulmonary disease, history of multiple upper abdominal surgeries, multiple and recurrent liver cysts, those with calcified wall, deep intraparenchymal location, cysts in the blind area for laparoscopy in segments 1 and 7, and cysts with huge size with suspected major cystobiliary communication. The perioperative course was documented and the follow-up data were recorded.

Clinical data, including age, sex, cyst characters (size, site, number, and suspected biliary rupture), operative time, intraoperative spillage, rate of conversion to laparotomy, intraoperative bleeding, pus discharge, bile discharge, need for ERCP, wound infection, hospital stay, incisional hernia, and recurrence, were compared. Combined surgery was also reported. Patients were followed up for at least 1 year postoperative, for early and late complications.

Surgical technique

Technique for open hydatid cyst surgery

Incision was either right subcostal or midline based on cyst size and location (Fig. 3). The liver was carefully packed with gauzes soaked in 20% hypertonic saline or Betadine (10% povidone–iodine) solution around the cysts to avoid the risk of intraperitoneal spillage and contamination with high recurrence risk. After aspiration of the cyst fluid with a syringe, injection of 20% hypertonic saline into the cyst and left for 5–10 min. The puncture site was covered with hypertonic saline-soaked pads.

Starting from the puncture site, partial pericystectomy was performed, with removal of daughter vesicles and the germinal membrane with complete cyst evacuation. After evacuation and wash inside the cyst with hypertonic saline, we searched for any cystobiliary communication and it was closed with vicryl, then a sufficient part of omental fat was sutured to the cyst wall. In peripherally located cysts, total cystectomy was done. Other associated cysts in the spleen or in pelvis were managed at the same time. A Nelaton drain was left in the cyst cavity or in the subphrenic space in all patients.

Technique for laparoscopic hydatid cyst surgery

Under general anesthesia with nasogastric tube and Foley catheter inserted, the patients were positioned supine with head 30° reverse Trendelenburg position (Fig. 4). The position may be changed according to the site of the cyst. The surgeon stands on the patient's left or right side or between legs, according to cyst location.

Via the open technique, a 10-mm port was placed just above the umbilicus. After creation of pneumoperitoneum to a pressure of 14 mmHg, a 30° telescope was introduced, and then a 12-mm trocar and two 5-mm trocars were placed at the epigastrium according to cyst location. Surgery starts by exploration of the abdomen to search for any other cyst or any other pathology. After routine exploration, the liver was carefully packed with gauzes soaked in 20% hypertonic saline or Betadine (10% povidone–iodine) solution around the cysts to avoid the risk of intraperitoneal spillage. After aspiration of the cyst fluid with a syringe connected to a Veress needle, injection of 20% hypertonic saline into the cyst and left for 5–10 min followed by aspiration. The cyst wall was punctured with LigaSure (Valleylab, Boulder, Colorado, USA), and daughter vesicles in the cyst were aspirated completely using 10-mm suction apparatus. Via LigaSure, partial excision of the pericyst wall versus total cystectomy in peripherally located cysts was done.

Using an endobag, the cyst contents, including daughter vesicles, germinal membrane, and the excised pericyst wall, were removed through the 12-mm trocar. If there was peritoneal spillage, it was suctioned, then continuously washed with hypertonic saline, and these cases were documented to extend the postoperative course of albendazole. After evacuation and wash inside the cyst with hypertonic saline, we searched for any cystobiliary communication and it was closed with vicryl as long as it is accessible to laparoscopic suturing, then a sufficient part of omental fat was sutured to the cyst.

In cystobiliary fistulas located in an area difficult to be sutured laparoscopically, laparoscopic endoclipping was performed with metallic clips. Two metal clips were applied over the fistula site after lifting the edges up with a Maryland grasper. Cessation of the bile leak indicated successful occlusion of the fistula. In all patients, a Nelaton drain was placed inside the residual cavity. The 10 and 12-mm port puncture sites were closed to prevent port-site hernia. The Foley catheter was removed at the end of surgery.

Results

Statistical analysis

Continuous data were presented as mean±SD. Categorical data were presented as percentages. Analysis of variance and the rank-sum test were used to analyze continuous

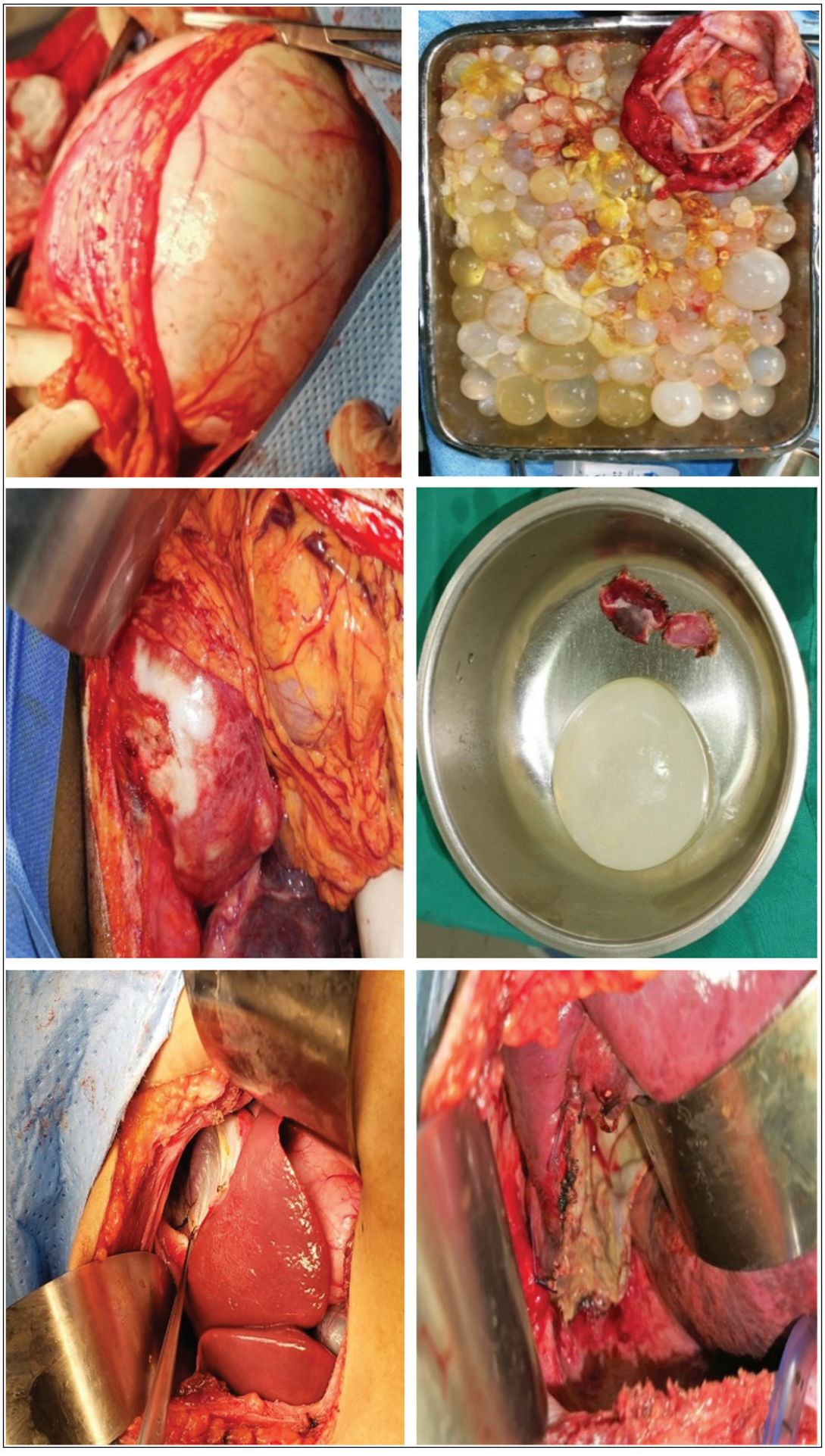


Figure 3 Open-liver hydatid cyst surgery.

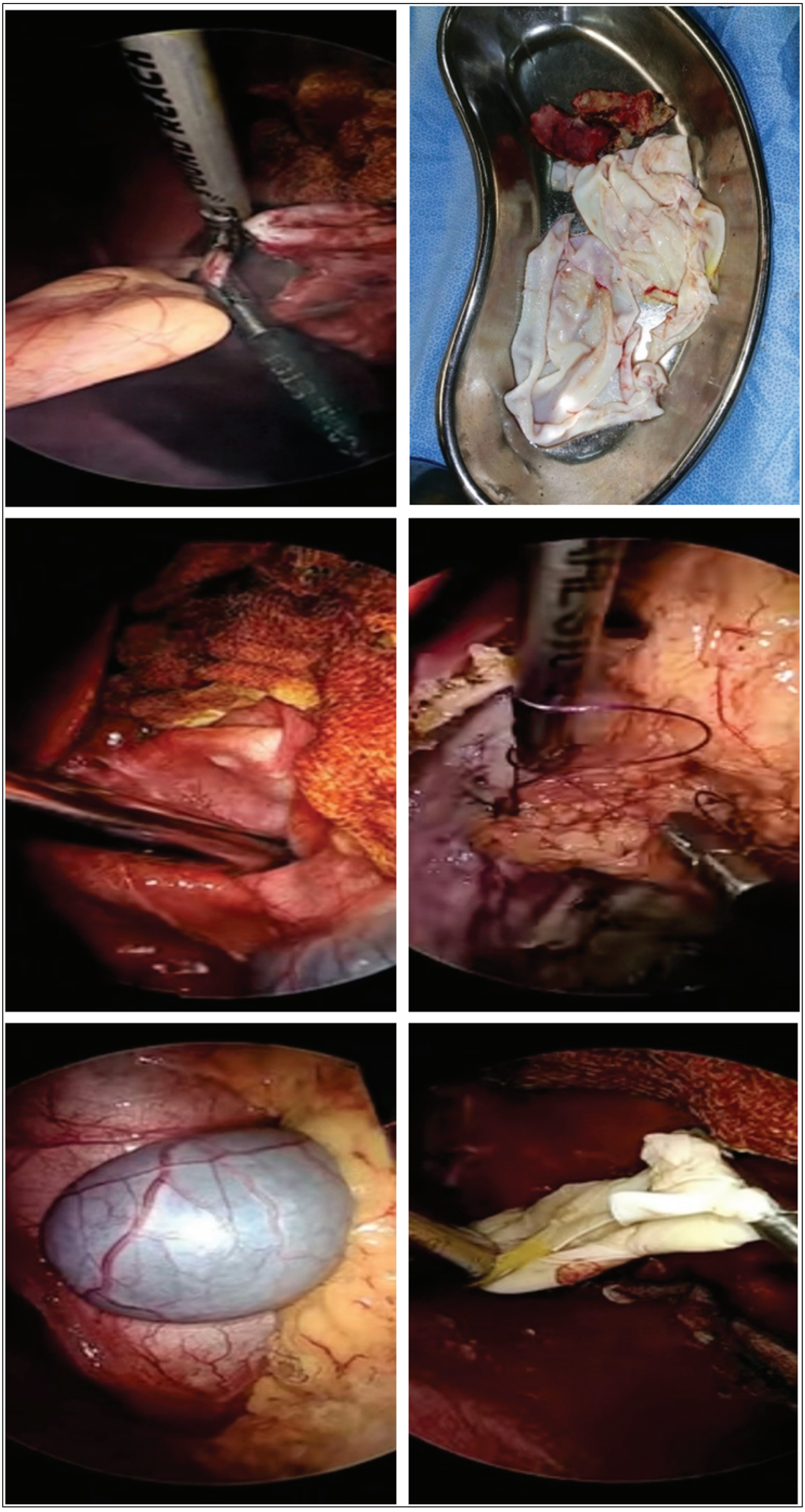


Figure 4

Laparoscopic liver hydatid cyst surgery.

data. The results were regarded significant with *P* value less than 0.05 and highly significant with *P* value less than 0.01. *P* value more than or equal to 0.05 was regarded nonsignificant. χ^2 test (with Yates correction and Fisher's exact test) and the Student *t* or Mann–Whitney *U* tests were used according to the characteristics of the study variables and the conditions of applicability.

In total, 138 patients with liver hydatid cyst in the period between March 2014 and October 2020 were retrospectively evaluated. They were divided into two groups, group A (*n*=102), open surgery; group B (*n*=36), laparoscopic surgery. In our study, 15 patients had hydatid cysts in the lung (Fig. 2) and liver and they were managed according to cyst size and patient complaint where eight patients were operated for lung hydatid cyst initially followed by surgery for hepatic cyst. The other seven patients were operated only for the liver cyst as the lung cyst was small in size and already ruptured into bronchi at the time of presentation. Six patients presented to the emergency department with ruptured liver hydatid cyst and were managed as emergency surgery (Fig. 5). Our technique in both groups mainly was partial pericystectomy with removal of entire cyst contents followed by omentopexy to decrease the chance of recurrence; also in few cases, total cystectomy in peripherally located cysts was done.

Figure 5

CT image showing ruptured-liver hydatid cyst. CT, computed tomography.

Patients' demographics and clinical presentation

The study included 138 patients, 107 (77.54%) females and 31 (22.46%) males with no statistically significant difference between both groups regarding sex. In group A, the age ranged 10–41 years with a mean age of 21.87 ± 7.16 years, while in group B, the age ranged 16–38 years with a mean age of 26 ± 6.6 years (*P*=0.29).

The most frequent symptomatic presentation among patients with hepatic hydatid cyst was right hypochondrial and upper abdominal pain (Table 3). The second most common presentation was a palpable mass in the right hypochondrium, or in the epigastric area in patients with left-lobe liver hydatid cyst. Some patients presented with loss of appetite, weight loss, anemia, and jaundice, and few patients presented with repeated vomiting, fever, abdominal pain, and hypotension in cases of ruptured liver hydatid cyst. Some cysts were discovered during abdominal sonography for other reasons like antenatal care in pregnant women. In patients with liver and lung hydatid cysts, in addition to abdominal symptoms, they also had chest pain, cough, and dyspnea. In cases of ruptured lung hydatid cyst, patients had expectoration of cystic contents, fever, productive cough, repetitive hemoptysis, and dyspnea.

Characteristics of liver cysts

In group A, the cyst size ranged 5–27 cm with a mean size of 11.960 ± 4.002 cm, while in group B, the cyst size ranged 5–17 cm with a mean size of 9.444 ± 3.442 cm (Tables 4, 5).

In group A, nine (8.82%) patients had hydatid cysts in the liver and spleen and four (3.92%) patients had

Table 3 Clinical presentation

Main complaint	Group A (open) (*N*=102) [*n* (%)]	Group B (laparoscopic) (*N*=36) [*n* (%)]	*P* value
Abdominal pain	56 (54.9)	20 (55.55)	0.459
Abdominal mass	23 (22.55)	10 (27.77)	0.269
Weight loss, anemia	4 (3.92)	1 (2.78)	0.145
Jaundice	9 (8.82)	2 (5.56)	0.084
Cyst rupture	5 (4.9)	1 (2.78)	0.038
Incidental finding	5 (4.9)	2 (5.56)	0.294

Table 4 Size of liver cysts

Cyst size (cm)	Group A (open) (*N*=102) [*n* (%)]	Group B (laparoscopic) (*N*=36) [*n* (%)]	*P* value
5–10	48 (47.06)	24 (66.67)	0.383
10–15	34 (33.33)	9 (25)	0.311
>15	20 (19.61)	3 (8.33)	0.038

Table 5 Location of liver cysts

Cyst location	Group A (open) (*N*=102) [*n* (%)]	Group B (laparoscopic) (*N*=36)	*P* value
Segment 2	7 (6.86)	3 (8.33)	0.223
Segment 3	9 (8.82)	3 (8.33)	0.470
Segment 4	5 (4.90)	2 (5.56)	0.294
Segment 5	16 (15.7)	9 (25)	0.080
Segment 6	44 (43.14)	14 (38.89)	0.498
Segment 7	12 (11.76)	2 (5.56)	0.024
Segment 8	9 (8.82)	3 (8.33)	0.470

Figure 6

CT image showing liver and pelvic hydatid cyst. CT, computed tomography.

hydatid cysts in the liver and pelvis (Fig. 6) and were managed at the same surgery. One (0.98%) patient had hydatid cyst in the liver and right suprarenal gland. One (0.98%) patient had hydatid cyst in the liver and omentum with adhesions to urinary bladder. In group B, all cysts were located in the liver only and were single.

Operative time and hospital stay

In group A, the mean operative time was 49.009 ± 6.587 min, ranging from 47 to 80 min. In group B, the mean operative time was 60.138 ± 9.963 min, ranging from 55 to 95 min. The operative time was significantly high in the laparoscopic group (*P*=0.0007).

In group A, the mean hospital stay was 4.676 ± 1.857 days, ranging from 3 to 12 days. In group B, the mean hospital stay was 3.805 ± 1.037 days, ranging from 2 to 5 days with a significant difference between both groups (*P*=0.0001).

Conversion from laparoscopic to open surgery

Four (11.11%) patients were shifted from laparoscopic to open surgery. In one patient, the cyst was deeply located inside liver parenchyma in segment VIII and was localized only after intraoperative ultrasound, two patients with jaundice had cyst in segment VII posteriorly with multiple biliary communications, which was not accessible for safe laparoscopic closure even with metallic clips, and another patient had severe bleeding that cannot be controlled laparoscopically.

Postoperative morbidity

There were no cases of mortality or postoperative thrombotic complications in both groups. Five (4.9%) patients in group A and two (5.56%) patients in group B (*P*=0.294) developed chest infection with good response to medications and chest physiotherapy, none of which required ventilatory support. In group A, two (1.96%) patients had minimal right pleural effusion, and four (3.92%) patients were readmitted for fever of unknown origin, which subsided with antibiotics and antipyretics (Table 6).

In group A, five (4.9%) patients had surgical-site infection that responded to removal of some stitches plus antibiotics according to the result of culture and sensitivity in addition to regular dressing, while in group B, no patients had surgical-site infection (*P*<0.0001).

Spillage of cyst content (clear fluid) occurred in three (8.33%) patients in group B, it happened at the time of introduction of the needle to aspirate the cyst fluid in posteriorly located cysts in segments VII and VIII. In patients with peritoneal spillage, continuous suction irrigation with hypertonic saline was done, and the postoperative albendazole was extended to three courses each for 4 weeks separated by 2-week interval.

Postoperative bile leakage was observed in 12 (11.76%) patients, and in two (5.56%) patients in group A and

Table 6 Operative time, hospital stay, and postoperative complications

	Group A (open) (*N*=102) [*n* (%)]	Group B (laparoscopic) (*N*=36) [*n* (%)]	*P* value
Operative time			
Mean	49.009 ± 6.587 min	60.138 ± 9.963 min	0.0007
Range	47–80 min	55–95 min	
Hospital stay			
Mean	4.676 ± 1.857 days	3.805 ± 1.037 days	0.0001
Range	3–12 days	2–5 days	
Chest infection	5 (4.9)	2 (5.56)	0.294
Surgical-site infection	5 (4.9)	None	<0.0001
Postoperative bile leakage	12 (11.76)	2 (5.56)	0.024
Postoperative ERCP	3 (2.94)	1 (2.78)	0.464
Incisional hernia	5 (4.9)	1 (2.78)	0.038
Recurrence	4 (3.92)	1 (2.78)	0.145

ERCP: endoscopic retrograde cholangiopancreatography.

group B, respectively (*P*=0.024). However, persistent bile fistula was seen in three (2.94%) patients in group A and one (2.78%) patient in group B (*P*=0.464); all four patients in both groups needed ERCP with sphincterotomy for fistula closure and all resolved within 1 week.

In group A, five (4.9%) patients had incisional hernia, while in group B, one (2.78%) patient had port-site hernia (*P*=0.038). Four (3.92%) patients in group A versus one (2.78%) patient in group B had recurrence of the liver hydatid cyst (*P*=0.145). All of them needed surgery again by open approach and two patients of group A proved to be retained biloma (not true recurrence).

Discussion

Hydatidosis is a parasitic infestation caused mainly by *E. granulosus* and less commonly by *E. multilocularis* [10]. It is endemic in the Mediterranean, African, and Asian countries. The liver is the most common organ to be targeted by *E. granulosus*. It accounts for 70% of organs affected, and most commonly, the infection is settled in the right lobe [8,11–13].

Because of the slow growth rate of hydatidosis, it is usually asymptomatic for many years before symptoms related to pressure, infection, or rupture [14]. The most frequent complications of hepatic cystic echinococcosis are communication with biliary tree up to jaundice and cholangitis, intraperitoneal rupture, and spread to other organs. Rupture into intrahepatic bile ducts ranges 2–42% in different studies [15,16]. Liver hydatid cysts with huge size are more prone to cystobiliary communication [17].

Albendazole is given to patients who are not indicated for surgery, preoperatively to decrease the chance of intraoperative spillage-induced spread, postoperatively to decrease recurrence rate, and for invasive hydatid disease [18,19]. Surgery is the gold-standard therapy and is considered as the main treatment of hydatid disease [20,21]. Recently, laparoscopic management of liver hydatidosis becomes more popular in comparison with open surgery that was more common in the past years. With the introduction of laparoscopy for surgical management of liver hydatidosis, there was a great concern regarding intraperitoneal spillage that increases the risk of dissemination and recurrence in comparison with open surgery [22,23]. Many surgeons tried to solve these issues by good cyst isolation, the use of wide-pore suction devices, use of laparoscopes with wide angles, and the use of albendazole before and after surgery [24].

Our study included 138 patients, 107 (77.54%) females and 31 (22.46%) males with more female predominance as reported by some studies [25,26], unlike male predominance reported by other studies [24,27]. The most frequent symptomatic presentation was right hypochondrial and epigastric pain (54.9% in group A and 55.55% in group B) with similar reports by other authors [28,29]. The second most common presentation was a palpable mass in the upper abdomen (22.55% in group A and 27.77% in group B) similar to findings published in other studies [30,31].

The mean operative time was 49.009 ± 6.587 and 60.138 ± 9.963 min in groups A and B, respectively (*P*=0.0007), with higher operative time in the laparoscopic group similar to the study reported by Zaharie *et al.* [32] In group A, the mean hospital stay was 4.676 ± 1.857 days, ranging from 3 to 12 days. In group B, the mean hospital stay was 3.805 ± 1.037 days, ranging from 2 to 5 days (*P*=0.0001). Bostanci *et al.* [33] reported shorter mean hospital stay in the laparoscopic group in comparison with open group (3.4 vs. 8.8 days). In the study conducted by Ertem *et al.* [34], he stated that hospital stay was 4.2 days for

patients with liver hydatid cyst who were managed laparoscopically. In this study, the hospital stay was shorter in the laparoscopic group similar to the reports of many other studies [35–37].

In our study, four (11.11%) patients were shifted from laparoscopic to open surgery similar to the rate of conversion reported by Baskaran and Patnaik [38]. Here the shift to open surgery was because of either deep intraparenchymal location of the cyst, or major cystobiliary communication, or severe bleeding that cannot be controlled laparoscopically. In the study conducted by Zaharie *et al*. [32], a shift from laparoscopic to open technique was required in three (4.84%) patients because of bleeding in two patients and difficult cyst location in the third patient.

In order to decrease risk of recurrence, more concern is given to spillage-free laparoscopic management of liver hydatid cyst, so surgeons worldwide developed specialized devices to prevent any spillage of cyst contents [25,39]. Spillage of cyst content (clear fluid) occurred in three (8.33%) patients in group B, it happened at the time of introduction of the needle to aspirate the cyst fluid in posteriorly located cysts in segments VII and VIII. In the study reported by Bayrak and Altıntas [26], no intraperitoneal spillage was seen in any of the patients undergoing laparoscopic surgery, while minor spillage occurred in 22.22% and major spillage occurred in 5.56% of patients in the study published by Baskaran and Patnaik [38]. In our patients with peritoneal spillage, continuous suction irrigation with hypertonic saline was done, and the postoperative albendazole was extended to three courses each for 4 weeks separated by 2-week interval.

Intraoperative detection and closure of cystobiliary communication is important to decrease the incidence of postoperative biliary fistula. Postoperative bile leakage was observed in 12 (11.76%) patients, and in two (5.56%) patients in group A and group B, respectively (P=0.024). However, ERCP was needed for persistent bile fistula in three (2.94%) patients in group A and in one (2.78%) patient in group B (P=0.464). Zaharie *et al.* [32] reported the incidence of external biliary fistula in 6.78 and 4.65% after laparoscopic and open management of liver hydatidosis, respectively, while Tuxun *et al.* [8] reported biliary fistula in 6.24% of patients treated laparoscopically.

During surgery for liver hydatid cyst, more attention is given to avoid recurrence that may result from spillage of cyst contents or from incomplete evacuation of the cyst. Many studies stated that short-term recurrence rate ranges 0–9% after laparoscopy [2,40,41], whereas in open surgery, it ranges 0–30% [42,43]. In this study, four (3.92%) patients in group A versus one (2.78%) patient in group B had recurrence of the liver hydatid cyst (P=0.145). All of them needed surgery again by open approach and two patients of group A proved to be retained biloma (not true recurrence). In the study published by Baskaran and Patnaik [38], actual recurrence of liver hydatid cyst occurred in 11% of patients, and false recurrence was seen in two (11%) patients, all after laparoscopic approach. In the study reported by Bayrak and Altıntas [26], recurrence was seen in 2.7 and 4.3% after laparoscopic and open surgery, respectively.

Conclusion

For the management of liver hydatid cyst, both laparoscopic and open approaches are safe and effective. The results are similar and comparable, and many of the open-surgery cases could be done laparoscopically if patients are properly selected. Recurrent, multiorgan hydatid cysts, multiple liver cysts, huge cysts with suspected major biliary communication, deep intraparenchymal located cysts, and those present in the blind area for laparoscopy in segments 1 and 7, are better to be managed by open surgery.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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