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ORIGINAL RESEARCH

Laparoscopic Management in Hydatid Disease of Liver: A series of 30 Cases in Safeer Al-Imam Al-Hussain Surgical Hospital

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ABSTRACT

Background: Surgery is the main treatment for hydatid liver disease (HLD), focusing on removing the cyst and preventing parasite spread. Advances in laparoscopic surgery (LS) have improved treatment options, moving from simple drainage to more complex procedures like pericystectomy and hepatectomy. Laparoscopy offers benefits such as reduced morbidity, faster recovery, and better visualization of complications. However, it's not suitable for all cases, such as large cysts, ruptured cysts in the biliary tract, or multiple cysts. Challenges include potential cyst fluid spillage and allergic reactions, though these are less common than in open surgery.
Objectives: to evaluate the outcomes of LS for HLD specifically focusing on complications.
Methodology: a case series prospective study that was conducted in Safeer Al-Imam Al-Hussain Surgical Hospital/ Iraq/ Karbala for a period of 1 year and involved 30 patients that were treated laparoscopically for HLD.
Results: The mean age of the study sample (n=30) was 43.7, Females were more than males with M:F ration of 1:1.3, most of the study sample patients live in urban areas (63.3%), abdominal pain was the most common presentation, 21 patients (70%) had single cystic lesion, 5 patients had couple cysts (16.7%) and 4 patients (13.3%) had 3 cysts, The right lobe of the liver was the most common site of the cysts, successful LS was done for 26 patients (86.7%), 4 patients were converted to open surgery for various causes.
Conclusion: Laparoscopic management of HLD have the advantages of minimal invasiveness, shorter operative time and shorter hospital stay after surgery, still in some cases conversion to open surgery may be mandatory. LS is a viable option for treating HLD with numerous benefits over traditional open surgery. However, careful patient selection is crucial to manage potential complications effectively.

Keywords: laparoscopic surgery, echinococcus granulosus, liver disease, hydatid liver disease, and cystectomy.

INTRODUCTION

Surgery is considered the most effective treatment for hydatid liver disease (HLD), aiming to neutralize the parasite, remove the cyst while excising the germinal layer, prevent the spread of scolices into the peritoneum, and close the residual cavity [(1)].

With advances in technology and LS, the surgical approach HLD has evolved from basic drainage to more complex procedures like pericystectomy, segmentectomy, and, in some cases, hepatectomy [(2)].

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As LS has progressed and surgeons have gained a better understanding of pressure dynamics during pneumoperitoneum, the approach to LS of HLD has shifted [3].

The rapid improvement in LS techniques has prompted surgeons to apply the principles of traditional hydatid surgery using minimally invasive methods. Multiple studies have shown that LS of hepatic hydatid is feasible [4].

The laparoscopic techniques for treating HLD include simple drainage, puncture with aspiration and marsupialization, deroofing with omentoplasty, partial cystectomy, total pericystectomy, and even anatomical hepatic resections [5].

LS offers several advantages over open surgery, such as reduced morbidity, shorter hospital stays, and quicker recovery times. Additionally, it provides better visual control of the cyst cavity due to magnification, which improves the detection of biliary fistulas. However, this method is suitable only for selected cases [6].

Advantages of LS include [7].

- **Minimally Invasive:** LS involves small incisions, leading to less tissue damage and a significantly reduced risk of infection.
- **Lower Morbidity:** Compared to open surgery, LS tend to result in less pain, fewer complications, and a quicker recovery.
- **Better Visualization:** LS allows for magnified, high-definition visualization of the cysts, which aids in precise surgery and better detection of potential complications, such as biliary fistulas or inadvertent spillage of cyst contents.
- **Shorter Hospital Stay:** Patients who undergo LS typically experience a shorter hospitalization period, contributing to faster overall recovery.
- **Reduced Scar Formation:** The small incisions used in laparoscopy lead to less visible scarring, which is beneficial for patients concerned about cosmetic outcomes.

The following are criteria for excluding LS for HLD [8]:

1. Ruptured cyst in the biliary tract
2. Central cyst location
3. Cysts larger than 15 cm
4. More than three cysts
5. Thickened or calcified cyst walls
6. Bile leakage from bile ducts

Despite its advantages, LS has some limitations, including the absence of preventive measures against spillage due to high intra-abdominal pressures from pneumoperitoneum. Allergic reactions may be more frequent in LS due to peritoneal spillage, although the overall morbidity is lower and hospital stays are shorter compared to open surgery [9]. Additionally, LS often lead to spillage of cyst fluid or daughter cysts, making it difficult to evacuate the cysts without leakage, particularly since techniques to prevent such spillage are better established in open surgeries [10].

Locally a study conducted at Al-jumhoory Teaching Hospital in Mosul, Iraq compared laparoscopic and open surgery approaches for liver hydatid cysts, highlighting the advantages of the laparoscopic method such as shorter operative times, faster recovery, and lower post-operative complications. This reflects a growing acceptance and efficacy of laparoscopic techniques in managing hydatid disease locally [11].

another study has documented laparoscopic management of liver hydatid disease, demonstrating its safety and effectiveness [12]. These studies have shown favorable outcomes with laparoscopic surgery, which aligns with the global shift towards minimally invasive surgical approaches for this condition.

AIMS OF THE STUDY

To evaluate the outcomes of LS treatment for HLD, specifically focusing on complications.

METHODOLOGY

Study design: case series design

Setting: The study was conducted in Safeer Al-Imam Al-Hussain Surgical Hospital/Iraq/Karbala for a period

of 1 year from October 2022 till November 2023. Data was collected prospectively and the study involved 30 patients that were treated laparoscopically for HLD that fit the inclusion criteria.

Inclusion criteria:

1. Adult patients that were diagnosed to have HLD that requires surgical intervention by senior surgeon decision.
2. Agreed to participate in the study.

Exclusion criteria:

1. Patients with previous history of abdominal surgery.
2. HLD that is not fit for LS (evidence of rapture into the biliary tract, large cysts of >15 cm, thick wall cysts or calcified cysts, multiple cysts > 3).
3. Patients who refused the laparoscopic approach.
4. Patients who refused to participate in the study.
5. Pediatrics age group.

After admission to the surgical ward preoperative preparation for general anesthesia is done by performing the required investigations (CBC, viral screen, CXR, ECG, RFT, LFT), Medical consultation for GA fitness is also established.

The diagnosis relied on a combination of medical history, clinical examination, biochemical, serological and hematological tests, as well as abdominal US.

Chest X-rays were performed to identify the presence of thoracic cysts, and a CT study was conducted for each patient to assess the number, locations, and sizes of the cysts.

Prior to surgery, all patients received Albendazole, administered as a 400 mg tablet once daily for 14 days.

Technique

Under general anesthesia a nasogastric tube is inserted to all the patients to decompress the stomach. This helps in preventing aspiration of gastric contents during anesthesia, especially in patients who are at risk of vomiting or have a full stomach. It can also reduce the risk of gastrointestinal distension during surgery, which might otherwise interfere with the surgical field, particularly during laparoscopic procedures.

Foley's catheter was also inserted to all the patients according to the hospital surgical protocols to continuously drain the bladder during longer surgeries to keep the surgical area clear and prevent urinary complications. For abdominal surgeries, an empty bladder reduces the risk of accidental bladder injury.

hydrocortisone is given to all the patients to reduce the risk of anaphylaxis in case of spillage, prophylactic antibiotics are also given to all the patients.

once pneumoperitoneum is established using either the Verres needle or open technique, a 10 mm trocar was positioned above the umbilicus, serving as the optical port for a 30-degree telescope. The hydatid cyst was identified, and the placement of the other two port sites varied based on the cyst's location. Scolicidal agents, either a 10% povidone iodine solution or hypertonic saline-soaked gauzes, were introduced into the abdominal cavity and strategically placed around the cyst to create a barrier.

A suction catheter, inserted through one of the ports, was utilized to aspirate approximately one-third of the cyst fluid. The cavity was then filled with a scolicidal agent for a duration of 10 minutes to ensure the eradication of all viable scolices. Subsequently, the iodine solution was aspirated, followed by the dissection of the cyst cavity and removal of germinal membranes using a polythene bag for drainage.

The cyst cavity underwent irrigation with normal saline and was carefully examined for any cysto-biliary communication, assessing if bile drainage was present.

In some cases, partial or complete resection of the pericyst through normal liver tissue was performed. Cystobiliary communicating channels were sutured using 3.0 vicryl, and the cavity was closed through techniques such as omentoplasty, capitonage, or the placement of a drain in the cavity.

To facilitate postoperative drainage, a tube was inserted into the residual cavity. The tube was removed after 2-3 days if it remained empty.

Patients were typically discharged home on the 3rd to 4th postoperative day, unless bile leakage necessitated a more extended presence of the tube. Ultrasound assessments of the residual cavity were conducted after 14 days during follow up. In cases where the ultrasound report was inconclusive, a CT scan was performed for further evaluation. Additionally, all patients received Albendazole before surgery and for three months following the surgery. Follow up of the patients continued till one year after surgery searching for any complications such as hernia and recurrence.

RESULTS

The mean age of the study sample (n=30) was 43.7 ± 16.8 years, ranging from 23 years to 67 years. Females were more than males with M:F ration of 1:1.3, 17 female patients (56.7%) and 13 male patients (43.3%).

Regarding the initial chief complain that brought the patient to seek medical care and lead to the diagnosis of HLD abdominal pain was the most common presentation, 22 patients (73.4%) had abdominal pain as an initial presenting symptom, only 4 patients (13.3%) had fever, and 4 patients (13.3%) were asymptomatic and discovered incidentally.

Two patients were totally asymptomatic (6.6%) and the hydatid cyst were discovered incidentally. During clinical examination 6 patients (20%) had abdominal mass lesions at the right upper quadrant, and 3 patients (10%) had jaundice.

Abdominal CT scan was done to evaluate the nature of the cyst and confirm the diagnosis, CT scans provide detailed imaging that helps in accurately locating the cysts within the liver, determining their size, and assessing their relationship with other vital structures such as blood vessels and bile ducts. This information is vital for surgical planning, especially to decide whether a laparoscopic approach is feasible and to plan the placement of trocars and surgical instruments and to detect any additional cysts.

21 patients (70%) had single cystic lesion, 5 patients had couple cysts (16.7%) and 4 patients (13.3%) had 3 cysts.

The right lobe of the liver was the most common site of the cysts, 25 patients (83.3%) had a cyst or more at the right lobe, only 4 patients (13.3%) had the disease at the left lobe of the liver, and one patient (3.4%) had both lobes involved with multiple cysts.

Successful LS treatment was done for 26 patients (86.7%) of the study sample without intraoperative complications, mean intraoperative time was (63.5 ± 32.8) minutes, and those 26 patients stay at hospital for a mean of (2.6 ± 2.2) days after surgery.

4 patients were converted to open surgery for various causes demonstrated at table 4, the mean intraoperative time of open surgery was longer (98.8 ± 55.7) minutes, the difference compared to LS was highly statistically significant (P=0.003) as shown in table 5.

Patients who underwent open surgery stayed longer at the hospital with a mean of (6.5 ± 5.3) days, and in comparison, with patients who had LS, there was a high statistical difference with P value of (0.001).

Post-surgical complications were recorded for 7 patients (23.3%) of the study sample, port site infection was the commonest with 3 patients (10%), infection took place after LS once and after open surgery for two patients.

Bile leakage was recorded for two patients (6.7%), one who had successful LS and another one who were converted to open surgery.

Recurrence of the cystic disease was recorded during the follow up for one patient who had LS, hernia formation complicated one open surgery.

Complications like anaphylactic shock, peritonitis and mortality were not recorded during the current study.

DISCUSSION:

This current study included participants with an age range of 23-67 years, and the mean age was (43.7 ± 16.8) years. Similar age distributions were reported by Chautems R et al. [13].

Females predominated in this study, aligning with findings from other studies [13, 14], while other studies like Cohen H et al. have reported male predominance and explained by higher risk of exposure to the infection, this variation in gender distribution among studies reflect regional exposure to the source of infection [15].

Abdominal pain manifested as the predominant clinical presentation in 73.3% of cases in this investigation, a finding consistent with reports from other researchers [16].

2 patients were identified incidentally, in individuals presenting with an abdominal mass, pain, fever, or jaundice, consideration should be given to the possibility of HLD. Nevertheless, in regions where this condition is not endemic, a significant proportion of cases remain asymptomatic and are typically identified incidentally on a routine abdominal ultrasound or an ultrasound performed for diagnosing other pathologies [17].

Regarding cyst distribution, 21 (70 %) patients in our study presented with a solitary cyst, 5 (16.7%) had two cysts, and 4 (13.3%) had three cysts (multiple cysts in 30%). Rooh-ul-Muqim et al. reported a single cyst in 31 (72.09%) patients, two cysts in 13.95%, and three cysts in 13.95% [14]. while Sangani et al. reported that conversion to open surgery was done in 40% of their cases due to a number of cysts more than 3 [18].

The current study results show that the right lobe of the liver was infected in (83.3%) of the patients, the left lobe by (13.3%) and both lobes by (3.4%) All studies consistently indicate a higher prevalence of involvement in the right lobe, likely attributed to the larger size of the right lobe and the portal vein's circulation to this region, Al-Doghan et al. for example documented that location in right lobe of liver in (79.6 %), Left Lobe in (16.7%) and both lobes in 3.7% [19].

LS was successfully performed in 26 patients (86.7%), while 4 patients required conversion to open surgery due to various complications. The approach utilized laparoscopic de-roofing and cyst drainage, with a plan for open surgery if challenges arose. In a study by Seven R et al., laparoscopic simple drainage was performed in 16 patients (70%) and unroofing and drainage in 6 patients (26%) [20]. Ertem et al. reported performing laparoscopic cystectomy or partial cystectomy with tube drainage in 33 cases, omentoplasty in 15 patients, and converting to open surgery in 2 patients [21].

Both Misra MC et al. and Foster EN et al. performed hepatic resections and pericystodigestive anastomosis during laparoscopy [22, 23].

Causes for conversion included 1 case (3.3 %) with deep intraparenchymal cysts, 1 case (3.3%) with posteriorly located cysts, 1 case (3.3%) with a thick calcified cystic wall and 1 case (3.3%) with complex cystic mass, Sangani et al. reported a 40% conversion rate to open surgery, attributing it to multiple cysts, thick calcified walls, and a complex heterogeneous cyst (GHARBI type IV) [18].

Rooh-ul-Muqim reported a conversion rate to laparotomy of 6.97% due to unclear anatomy and exposure issues. [14] Ertem M et al. [21] and Seven R et al. [20] reported conversion rates of 4% and 23%, respectively, for similar reasons.

Hanan R Rihanni et al. reported no conversions in their study but their sample size was only 4 patients which could led to the nil results [24].

The mean intraoperative time for the laparoscopic approach was 63.5 ± 32.8 (minutes), the duration varies among studies and it depends on the surgeons and staff experience, type of laparoscopic devices that are used and complexity of

case, for instant Rooh-ul-Muqim et al. reported that the mean duration of surgery was 46.27 ± 13.84 minutes which is slightly shorter than the current study [14].

In our study, there was no recorded mortality, but various complications were reported in 7 patients (23.3%), (3 patients with LS and 4 patients with open procedures). Among these, 3 (10%) patients experienced wound infections (port site), 2 (6.7%) had bile leakage, 1 (3.3%) from the converted patients developed hernia formation and 1 (3.3%) from the LS group experienced recurrence, (note: patients may have more than one complication). Notably, no anaphylactic reactions were observed due to the spillage of cystic content, and there were no injuries to the biliary system or any blood vessels.

Other studies, such as Rooh-ul-Muqim et al., documented early complications including port site infection, biliary leakage, and peritonitis in 5%, while hernia and recurrence occurred in 2 (4.65%) cases as late complications [14].

In another series, infection was reported in 3%, biliary leakage in 13.7% [15]. Seven R et al. reported a 4% preoperative and 17% postoperative complication rate, along with a 9% recurrence rate [20]. Ertem M et al. reported a recurrence rate ranging from 3% to 10% following surgery for HLD [21].

In our series, the bile leak that occurred in 2 patients was managed conservatively through endoscopic retrograde cholangiopancreatography (ERCP) and drainage.

Furthermore, in this study, patients who underwent LS had significantly lower intraoperative time and shorter duration of hospital stay after surgery.

CONCLUSIONS:

LS in management of HLD have the advantages of minimal invasiveness, shorter operative time and shorter hospital stay after surgery, still in some cases conversion to open surgery may be mandatory.

LS is a viable option for treating HLD with numerous benefits over traditional open surgery. However, careful patient selection is crucial to manage potential complications effectively.

RECOMMENDATIONS:

- LS once available could be considered as a preferred method for HLD management with preparations to conversion to open surgery in some complicated cases.
- Ensure that the local surgical facilities are equipped with advanced laparoscopic tools and imaging technologies that support precise and safe surgery. Facilities should have the capability to perform high-resolution imaging like intraoperative ultrasound or CT scans to aid in accurate cyst location and characterization.
- Regular training sessions, including simulation-based learning for handling emergency scenarios related to hydatid cyst surgery, can significantly improve the outcome and reduce the duration of surgery and make the teams more familiar with complications management.

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TABLES & Figures:

Table (1): demographic variables of the study sample (n=30)

Age (years)	**Mean ± SD**	**43.7 ± 16.8**
	Range	23-67
Gender (n/%)	**Male**	13 / 43.3
	Female	17 / 56.7

n=number, %= percentage.

Table (2): presentation of HLD and clinical examination findings of the study sample patients

Features		**N**	**%**
Symptoms	Pain	22	73.4
	Fever	4	13.3
	Asymptomatic	4	13.3
Signs	Mass	6	20
	Jaundice	3	10
Combined		28	93.4
Incidental finding		2	6.6

Table (3): Cystic disease variables of the study sample

Variable		**N**	**%**
Number of cysts	Single cyst	21	70
	2 cysts	5	16.7
	3 cysts	4	13.3
Location	Right Lobe	25	83.3
	left lobe	4	13.3
	both lobes	1	3.4

n=number, %= percentage.

Table (4): Intraoperative management variables of HLD

Operative Variables		**N**	**%**
Successful LS		26	86.7
Converted to open surgery		4	13.3
Causes of conversion	**Posteriorly located cyst**	1	3.3
	Thick calcified cystic wall	1	3.3
	Complex cystic mass	1	3.3
	Deep intraparenchymal cyst	1	3.3

n=number, %= percentage, LS=laparoscopic surgery.

Table (5): Operative time and post-surgery hospital stay.

mean ± SD	**successful LS**	**converted to open surgery**	**P value**
intraoperative time (minutes)	63.5 ± 32.8	98.8 ± 55.7	0.003
hospital stay (days)	2.6 ± 2.2	6.5 ± 5.3	0.001

SD=standard deviation.

Table (6): Surgical management complications.

complications	successful LS	converted to open surgery	Total n/% 7/23.3
Anaphylactic shock	nil	nil	nil
Infection (port site)	1	2	3/10
Bile leakage	1	1	2/6.7
Peritonitis	nil	nil	nil
Recurrence	1	nil	1/3.3
Hernia formation	nil	1	1/3.3
Mortality	nil	nil	nil

n=number, %= percentage, LS=laparoscopic surgery.

Figure (1): Identification of the hydatid cyst laparoscopically.

Figure (2): aspiration of the cyst fluid and filling with scolicidal agent.

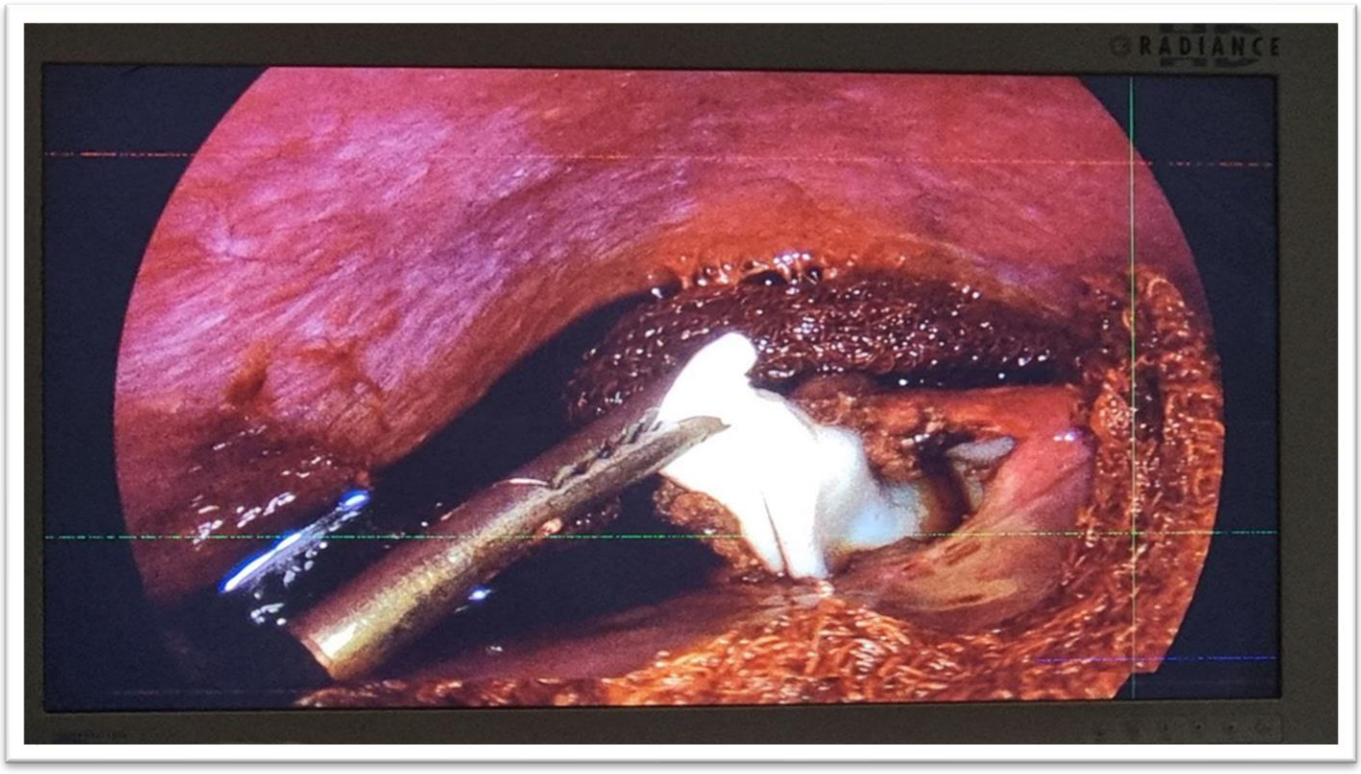

Figure (3): dissection of the cyst cavity and removal of germinal membranes.