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A COMPARATIVE STUDY OF LAPAROSCOPIC VERSUS OPEN SURGERY IN CASES OF LIVER HYDATID CYSTS

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Abstract: Background: The hydatid disease is an endemic public disease in Iraq. Surgical intervention in hydatid liver cyst is essential in preventing threatening complications and death.

Aim: To compare between morbidity of laparoscopic hydatid liver cyst removal versus open surgery technique.

Methods: A comparative clinical prospective study carried out in surgical department of Al-Imamain Al-Kadhmain Medical city in Baghdad city-Iraq during duration of one year from 1st of January till 31st of December, 2024 on sample of 90 patients with liver hydatid cysts (45 patients underwent laparoscopy removal and 45 patients underwent open surgery). The diagnosis of hydatid liver cyst was depending mainly on ultrasound and CT-scan finding. Postoperative follow up of patients was done daily for two months duration.

Results: There was a significant association between older age patients with hydatid cysts and laparoscopic removal ($p=0.03$). There was a highly significant association between patients with peripheral hydatid cyst location and laparoscopic removal ($p<0.001$), however, a significant association was observed between larger size of hydatid cyst and open surgery ($p=0.01$). The laparoscopy is characterized by shorter operation time, lower blood loss, absence of wound infection and shorter hospitalization stay.

Conclusions: The morbidity of laparoscopy is less than open surgery in removal of liver hydatid cysts.

Keywords: Liver hydatid cyst, Laparoscopic cystectomy, Open surgical cystectomy.

1. Introduction

The hydatid disease or cystic echinococcosis is a zoonotic infection in the larval stage by the tapeworm Echinococcus granulosus. This health condition is a major international health problem and the World Health Organization (WHO) approximates that the price of managing the disease is more than three billion US dollars a year [1]. Although the parasitic characteristics of such cysts were not recognized until the 17th century, the condition dates back to thousands of years past; medical records by Hippocrates and Celsus referred to the cysts, commonly mistakenly as localized dropsy. Regions like the Mediterranean, South America, Far East, Central Asia and Eastern Europe are endemic of the disease, but it is also being seen in non-endemic countries as a result of global travel. Human beings become accidental intermediate hosts when they consume eggs excreted by definitive hosts, which are usually dogs [2].

Liver is the commonest site of infection since it serves as the key filter to the parasite embryos, and the right lobe is affected in 55-80 percent cases [3]. After ingestion, the oncosphere larva penetrates the intestine and moves to the liver where it develops into a hydatid cyst made up of an inner germial layer with an outer layer [4,5] made up of laminated layers. Symptoms, in most cases, are caused by compression of the nearby structures or cyst rupture. The intrabiliary rupture (IBR) is a significant complication which may cause jaundice, cholangitis, or septicemia based on the extent of the communication [6]. Diagnosis is made by history, serology, and radiology of the patient. Ultrasonography is the most used screening modality, where WHO-IWGE (CE1–CE5) is used to stage disease activity, and Computed Tomography (CT) is essential in preoperative planning, especially in identifying complications such as rupture or involvement of a vascularity [7, 8, 9].

Therapeutic treatment of liver hydatid cysts has changed greatly with time. The management of the complicated cysts with multiple vesicles, rupture, or fistulae is to be surgically treated according to American College of Gastroenterology guidelines [10]. Classical open surgery is also a common procedure, and these surgeries include conservative cystectomy, to radical hepatic resection. The first difficulty about open surgery is how to close the remaining cavity to avoid recurrence and infection, the research indicates that methods such as omental plombage are better than mere drainage [11, 12]. The mortality rate of open surgery is approximately 0.95 to 3.6 and recurrence rate is about 11.3 in the first 5 years [3].

Laparoscopic surgery has become the dominant method of treatment of liver hydatidosis among endemic and non-endemic surgeons since the first case of laparoscopic treatment of the condition was reported in 1992 [13]. The laparoscopic surgeries that currently incorporate new techniques such as cystectomy and segmentectomy are normally used to treat small (<6 cm), superficial cysts on the anterior liver surface [14]. Although laparoscopy is safe with the risk of intraperitoneal fluid leakage and secondary hydatidosis, the method is not performed in large cysts (>15 cm) or those that have biliary communication [15]. The relative morbidity of laparoscopic resections and traditional laparoscopic minimally invasive surgeries, despite the gradual increment in the former, is yet to be assessed. Thus, this research paper seeks to establish the morbidity of laparoscopic hydatid liver cyst excision and open surgery.

2. Patients and Methods

This is a proposed comparative clinical trial study that was carried out at the Department of Surgery in Al-Imamain Al-Kadhmain Medical City, Baghdad, Iran. The research was conducted over a twelve months term between 1 st January and 31 st December, 2024. The approval of the ethical side was received in the Iraqi Board of Health Specializations, and the consent of the hospital administration was received. All the patients gave their informed consent in writing before they were enrolled in the study.

The population of the study included adult patients referred to the surgical department having the diagnosis of liver hydatid cyst in need of surgery. To sample 90 patients, a convenience sampling technique was employed. These patients were separated into two groups, 45 patients were treated by laparoscopic cyst removal and 45 patients were treated by open surgery.

The inclusion criteria were set as patients aged 18 years or more and confirmed with a diagnosis of liver hydatid cyst to undergo surgery. The exclusion criteria were patients with recurrent hydatid liver cysts, cysts in extra-hepatic organs, ruptured cysts or preoperative signs of cysto-biliary communication. Also patients who had undergone other forms of interventional therapies (i.e. radiotherapy), unfit to undergo surgery (ASA classification restrictions), and lost to follow-up were excluded.

A complete preoperative examination of all patients was conducted, such as a detailed history, physical examination, and laboratory studies. The finding of ultrasound and Computed Tomography (CT) scan were primarily used to establish the diagnosis by a supervising Senior Surgeon. The classification of cysts was done according to the World Health Organization (WHO) classification, as the basis of staging was done

based on the characteristics of the ultrasound. The structured questionnaire was used to collect data through a questionnaire whose design was based on this research. The demographic variables (age, sex), preoperative variables (WHO stage, ASA), cyst size and cyst location were recorded, as well as intraoperative variables, such as the surgical technique, the length of the operation, and the blood loss.

A Senior Surgeon conducted surgery. In the laparoscopic method, the patients were positioned in supine position with 30° reverse Trendelenburg tilt based on the location of the cysts. General anesthesia was resorted to introducing nasogastric tube and Foley catheters. At 14 mmHg, pneumoperitoneum was determined. The 30 o trocars Umbilical port used was 10-mm and other trocars such as 12-mm and 5-mm were used in the epigastrium or the right hypochondrial depending on the geometry of the cyst.

After the abdominal exploration, the field was covered with the help of the gauze that was moistened in 20% hypertonic saline or 10% povidone-iodine to avoid anaphylaxis and secondary seeding. Decompression of the cyst was performed by using a Veress needle, 20% hypertonic saline was injected and re-injected (dwell time: 510 minutes). A LigaSure devise was used to open the cyst wall (Valleylab, Boulder, CO, USA) and items were evacuated with a 10-mm suction device. Peripheral cysts were treated by partial pericystectomy or total cystectomy. Endobag was used to collect the specimens. In instances with small cysto-biliary communications that were detected during operation, laparoscopic sutureing or metallic clipping was done. All the patients had a Nelaton drain placed in the residual cavity.

The key outcomes that were measured were postoperative morbidity (bile leak, wound infection, pulmonary atelectasis) and the hospitalization period. The researcher monitored the patients within two months after surgery by following up on them on a daily basis to check on early recurrence and complications.

The Statistical Package of social Sciences (SPSS) version 22 was used to conduct data analysis. Continuous variables were reported using descriptive statistics as mean, and standard deviation (SD) and categorical variables reported using frequencies (percentages). The Independent sample t -test of mean and the Chi-square test of categorical data were used to conduct a comparative analysis. The expected cell counts amounted to less than 5 (20 percent of the total), and this is why Fisher exact test was used. Any p -value with a value of less than 0.05 was declared significant.

3. Results

This study included 90 patients with liver hydatid cysts (45 patients underwent laparoscopy removal and 45 patients underwent open surgery). There was a significant association between older age patients with hydatid cysts and laparoscopic removal (p=0.03). No significant differences were observed between patients of both study groups regarding gender (p=0.5). (***Table 1***)

Table 1: Distribution of demographic characteristics according to study groups.

Variable	Study groups				P
	Laparoscopic		Open surgery		
	No.	%	No.	%	
Age					
<30 years	4	8.9	10	22.2	0.03*[S]
30-39 years	14	31.1	20	44.4	
40-49 years	12	26.7	10	22.2	
≥50 years	15	33.3	5	11.2	

Gender					0.5*NS
Male	18	40.0	22	48.9	
Female	27	60.0	23	51.1	

** Chi square test, S=Significant, NS=Not significant.*

No significant differences were observed between patients of both study groups regarding WHO classification of hydatid cyst (p=0.7) and ASA classification (p=0.8).There was a highly significant association between patients with peripheral hydatid cyst location and laparoscopic removal (p<0.001). A significant association was observed between larger size of hydatid cyst and open surgery (p=0.01). (***Table 2***)

Table 2: Distribution of preoperative characteristics according to study groups.

Variable	Study groups				P
	Laparoscopic		Open surgery		
	No.	%	No.	%	
WHO classification					0.7*NS
C3A	4	8.9	6	13.3	
CE3B	14	31.1	12	26.7	
CE 4	27	60.0	27	60.0	
ASA classification					0.8*NS
1	2	4.4	3	6.7	
2	18	40.0	16	35.6	
3	25	55.6	26	57.7	
Cyst location					<0.001*S
Central	5	11.1	24	53.3	
Peripheral	24	53.3	12	26.7	
Central & peripheral	16	35.6	9	20.0	
Cyst size					0.01*S
5-10 cm	12	26.7	3	6.7	
11-15 cm	18	40.0	16	35.6	
>15 cm	15	33.3	26	57.7	

** Chi square test, S=Significant, NS=Not significant.*

There was a highly significant association between cystectomy surgical technique and laparoscopic removal of hydatid cyst (p<0.001). Mean duration of surgical operation was significantly shorter for laparoscopy in comparison to open surgery (p<0.001). Mean blood loss was significantly higher for open surgery in comparison to laparoscopy (p<0.001). (***Table 3***)

Table 3: Distribution of intraoperative characteristics according to study groups.

Variable	Study groups				P
	Laparoscopic		Open surgery		
	No.	%	No.	%	
Surgical techniques					**<0.001*S**
Partial pericystectomy	15	33.4	36	80.0	
Total cystectomy	2	4.4	4	8.9	
Cystectomy	20	44.4	0	-	
Partial pericystectomy & total cystectomy	8	17.8	5	11.1	
Duration of surgical operation					**<0.001*S**
Mean±SD (minutes)	55±10		76±14		
Blood loss					**<0.001*S**
Mean±SD (ml)	63±8		79±10		

** Independent sample t-test, S=Significant.*

There was a highly significant association between postoperative morbidity and open surgery (p<0.001). A significant association was observed between wound infection and open surgery (p=0.001). Mean hospitalization duration was significantly longer for open surgery in comparison to laparoscopy (p<0.001). No significant differences were observed between patients of both study groups regarding recurrence (p=1.0), bile leak (p=0.1) and lung atelectasis (p=1.0). (***Table 4***)

Table 4: Distribution of postoperative complications according to study groups.

Variable	Study groups				P
	Laparoscopic		Open surgery		
	No.	%	No.	%	
Morbidity					**<0.001*S**
Yes	2	4.4	18	40.0	
No	43	95.6	27	60.0	
Recurrence					1.0*NS
Yes	1	2.2	1	2.2	
No	44	97.8	44	97.8	
Bile leak					0.1*NS
Yes	1	2.2	6	13.3	
No	44	97.8	39	86.7	
Wound infection					**0.001*S**

Yes	0	-	10	22.2	
No	45	100.0	35	77.8	
Lung atelectasis					1.0*^{NS}
Yes	0	-	1	2.2	
No	45	100.0	44	97.8	
Duration of hospitalization					**0.003****^{S}
Mean±SD (days)	2±1		3±2		

** Fishers exact test, **Independent sample t-test, S=Significant, NS=Not significant.*

4. Discussion

The hydatid liver cysts are highly endemic surgical cases in Iraq commonly affecting young and middle age population with predominance of female gender patients. High incidence rate of these cysts required modernization of surgical techniques characterized by efficacy and safety[16].

The present study showed a significant association between older age patients with liver hydatid cysts and laparoscopic removal (p=0.03). This finding is similar to results of Jaén-Torrejimeno et al [17] retrospective cohort study in Spain which revealed that laparoscopy was effective and safe for elderly age patients with liver hydatid cysts. Due to intra-operative and postoperative complications, the surgeons selected the laparoscopy on open surgery for management of liver hydatid cysts to lower the morbidity and mortality rates [18]. Although higher proportion of female patients underwent laparoscopy in our study, there was no significant difference between patients with liver hydatid cyst of both study groups regarding gender (p=0.5). This finding coincides with results of Elmoghazy et al [19] retrospective review study in Egypt which reported no significant difference between patients underwent open surgery and patients underwent laparoscopy regarding gender of patients. In India, a case report study conducted by Gorad et al [20] stated high desire of female patients to implement removal of liver hydatid cyst by laparoscopy.

The current study found a highly significant association between patients with peripheral hydatid cyst location and laparoscopic removal (p<0.001). This finding is consistent with results of Gupta et al [21] retrospective analysis study in India which found a relationship between peripheral location of liver hydatid cyst and higher use of laparoscopy. The location of hydatid cyst in liver is important in selecting the best surgical technique to prevent the spillage of cyst fluids [22]. In our study, a significant association was observed between larger size of hydatid cyst and open surgery (p=0.01). This finding is similar to results of Bayrak and Altıntas study [1] in Turkey which reported that open surgery was suitable for larger size of liver hydatid cysts than laparoscopy. However, our study showed no significant differences between patients with liver hydatid cysts underwent open surgery and patients underwent laparoscopy regarding WHO classification of hydatid cyst (p=0.7) and ASA classification (p=0.8). These findings are in agreement with results of Zaharie et al [18] study in Romania which revealed no differences in ASA and WHO classifications between patients underwent either laparoscopy or open surgery for removal of liver hydatid cysts.

In present study, there was a highly significant association between cystectomy surgical technique and laparoscopic removal of hydatid cyst (p<0.001). This finding is parallel to reports of Wan et al [23] review study in China which documented high preference of cystectomy technique use with laparoscopic surgical removal of liver hydatid cysts. This study showed that mean duration of surgical operation was significantly shorter for laparoscopy in comparison to open surgery (p<0.001). This finding is consistent with results of many literatures such as Ahmed et al [24] prospective clinical trial study in Iraq and Gajanan et al [25]

prospective observational study in India which all reported shorter operative time for laparoscopy removal of hydatid cysts in comparison to open surgery. Our study also found that mean blood loss was significantly higher for open surgery in comparison to laparoscopy ($p<0.001$). This finding is similar to results of Nagasbekov et al [26] retrospective study in Kazakhstan which found a significant higher blood loss during open surgery removal of liver hydatid cyst as compared to laparoscopy technique.

In the present research, the presence of a very significant correlation between postoperative morbidity and open surgery was found ($p<0.001$). This observation is in agreement with the findings of other literatures like Al Harbawi et al [27] retrospective analysis study in Iraq and Zaharie et al [5] study in Romania that found high rates of postoperative morbidity in patients who had liver hydatid cysts and underwent open surgery compared to patients who had laparoscopy. Conversely, Omar et al [28] Egyptian retrospective study established no significant difference between laparoscopy and open surgery in close postoperative morbidity as a result of removing liver hydatid cysts and advised the use of the open surgery in instances of recurrence, multi-organ cysts, multiple cysts, larger cysts, deep intraparenchymal location, and cysts in blinded areas. This research study demonstrated that there was a significant correlation between wound infection and an open surgery ($p=0.001$). The same finding is parallel to the results of Ahmad et al [29] randomized trial study in Pakistan who documented higher frequency rate of wound infection after open surgery as compared to laparoscopy removal of liver hydatid cyst. The average length of stay in our research study was much higher in open surgery as compared to laparoscopy ($p<0.001$). This observation is consistent with the findings of Bektasoglu et al [30] retrospective study in Turkey where the length of stay of patients with hepatic hydatid cysts who received open surgery was longer than the length of stay of patients who received laparoscopy. The findings did not find any significant difference between the patients who have liver hydatid cysts underwent open surgery and those who underwent laparoscopy on recurrence ($p=1.0$), bile leak ($p=0.1$) and lung atelectasis ($p=1.0$). These are similar to the findings of Wang et al [31] systematic and meta-analysis of cohort studies in China that found no significant difference between the patients and liver hydatid cysts underwent either open surgery or laparoscopy with respect to recurrence, bile leak and atelactasis of the lung.

5. Conclusions

As the results of this comparative study suggest, we can state that laparoscopic vs. open liver surgery in the situation of the removal of hepatic hydatid cysts is characterized by much less overall morbidity. The laparoscopic technique proves to have better perioperative outcomes, which are a shorter operative time, less blood loss during the operation, no wound infection, and a very shorter period of stay in hospital. On the approach to surgery, a clear trend was a noted cystectomy was the most common modality used in the process of laparoscopy, but partial pericystectomy was the normal modality used during open surgery.

The choice of the patient is still a significant issue when it comes to deciding on the best course of surgery. Laparoscopy is considered to be more suitable in older patients who appear with small and peripherally located cysts as it is less invasive and in the meantime, the recovery is quicker. On the other hand, open surgery is still the mode of choice to use in young and middle-aged patients and more so those patients who have large cysts or are located centrally within the liver parenchyma and might need radical resection.

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