Research Article (Araştırma Makalesi)

A Comparison of Laparoscopic and Open Liver Hydatid Cyst Surgery in Patients Admitted to Our Clinic

Laparoskopik ve Açık Karaciğer Hidatik Kist Ameliyatlarının Kliniğimize Başvuran Hastalar Üzerindeki Karşılaştırılması

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Özet

Amaç: Bu çalışmanın amacı, karaciğer hidatik kistleri nedeniyle laparoskopik ve açık cerrahi uygulanan hastaların klinik sonuçlarını karşılaştırmaktı.

Gereç ve Yöntemler: Çalışma, 9 Ocak 2019 ile 8 Ekim 2023 tarihleri arasında kliniğimizde karaciğer hidatik kisti nedeniyle cerrahi işlem uygulanan 117 hastayı kapsadı. Bu retrospektif çalışmada, cerrahi yöntem, operasyon süresi, postoperatif hastanede kalış süresi, görsel analog skala (VAS) skorları ve postoperatif komplikasyonlar kaydedildi.

Bulgular: Her iki cerrahi teknik arasında postoperatif komplikasyonlar açısından istatistiksel olarak anlamlı bir fark bulunmadı ($p = 0.370$). Bununla birlikte, laparoskopik cerrahi, operasyon süresinde istatistiksel olarak anlamlı bir kısalma sağladı ($p = 0.004$). Laparoskopik yaklaşım, hastanede kalış süresini de kısaltmış olsa da, bu fark istatistiksel olarak anlamlı değildi ($p = 0.39$). Laparoskopik yöntemle, açık cerrahiye göre her bir zaman diliminde VAS skorları istatistiksel olarak anlamlı derecede daha düşük bulundu: 1. saat ($p = 0.044$), 5. saat ($p = 0.00$) ve 10. saat ($p = 0.00$), $p < 0.05$.

Sonuç: Laparoskopik ve açık tekniklerin karaciğer hidatik kistlerinin cerrahi tedavisindeki komplikasyon oranları benzer olsa da, laparoskopik teknik, operasyon süresinin kısalması ve postoperatif ağrı skorlarının azaltılması konusundaki etkinliği nedeniyle tercih edilmiştir.

Anahtar Kelimeler: Cerrahi Tedavi Yöntemleri, Karaciğer, Hidatik Kist

Abstract

Objective: This study aimed to compare the clinical outcomes of patients who underwent laparoscopic and open surgery for liver hydatid cysts.

Materials and Methods: The study included 117 patients who underwent surgery for hydatid liver cysts between January 9, 2019, and October 8, 2023, in our clinic. The surgical method, duration of operation, postoperative length of hospital stay, visual analog scale (VAS) scores, and postoperative complications were recorded in this retrospective study.

Results: There was no statistically significant difference in postoperative complications between the two surgical techniques ($p = 0.370$). However, laparoscopic surgery had a statistically significantly shorter duration of operation ($p = 0.004$). Although the laparoscopic approach also shortened the length of hospital stay, the difference was not statistically significant ($p = 0.39$). The VAS scores were statistically significantly lower with the laparoscopic method compared to open surgery at each time point: hour 1 ($p = 0.044$), hour 5 ($p = 0.00$), and hour 10 ($p = 0.00$), with $p < 0.05$.

Conclusion: Although the complication rates for laparoscopic and open techniques were similar in the surgical treatment of hydatid cysts of the liver, the laparoscopic technique was preferred due to its effectiveness in shortening the duration of the operation and reducing postoperative pain scores.

Keywords: Surgical Treatment Methods, Liver, Hydatid Cyst

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INTRODUCTION

Hydatid cyst (cystic echinococcosis) is prevalent in countries with widespread agricultural and animal husbandry practices. It is usually transmitted to humans and sheep through contact with dog feces and can occasionally be fatal (1). Cystic echinococcosis is a significant concern in Turkey, as in many other parts of the world, due to its impact on both human and animal health as well as its considerable economic implications (2). Hydatid cysts can develop at any age and affect both sexes equally, although they are more prevalent in younger adults compared to the elderly population (3).

Echinococcus granulosus is a zoonotic species complex that causes cystic echinococcosis, with differences in terms of life cycles and host selection. It is of worldwide importance (4). The adult E. granulosus inhabits the small intestines of domestic and wild carnivores, such as jackals, dogs, and wolves, whereas its hydatid cysts, containing larvae, localize in various organs and tissues—especially the liver and lungs—of sheep, goats, cattle, pigs, humans, and many other mammals (5).

Current treatment modalities for hydatid cysts of the liver include medical therapy, surgical treatment, percutaneous interventions, and surveillance (watchful waiting). Most patients are treated using multimodal approaches that combine several of these treatment modalities. Today, the use of combined treatment regimens has increased, driven by greater experience with minimally invasive approaches (6).

Surgical treatment aims to completely remove the germinative membrane to prevent intra-abdominal infection, neutralize parasites, eliminate the residual cavity, and prevent subsequent hepatobiliary complications (7). Currently, the most frequently used surgical technique is the "partial pericystectomy" approach, which involves resecting the pericyst, especially the portion that protrudes from the liver tissue, and draining the cyst contents. This procedure can be performed using either an open technique or a laparoscopic approach (8).

There is a limited number of studies in the literature that evaluate the postoperative outcomes of open and laparoscopic surgical techniques (7,9). Although both approaches are widely used in clinical practice, comparative data regarding their effectiveness, recovery times, complication rates, and long-term results remain scarce. Further research is needed to provide a more comprehensive understanding of the advantages and potential drawbacks of each technique. Such studies would help refine surgical strategies and contribute to evidence-based clinical decision-making.

The primary endpoint of this study was to compare the postoperative complication rates between the two surgical techniques. The secondary endpoints included the duration of the operation, postoperative length of hospital stay, and Visual Analog Scale (VAS) scores at postoperative hours 1st, 5th, and 10th to assess postoperative pain levels.

This study aimed to compare the postoperative outcomes of open and laparoscopic surgical approaches in patients undergoing surgical treatment for hydatid cysts.

MATERIALS AND METHODS

The study received ethical approval from the Ethics Committee of Harran University, under session number 15, dated August 21, 2023. Data from patients who underwent partial pericystectomy, either laparoscopically or via an open technique, in our clinic between January 9, 2019, and October 8, 2023, for hydatid cysts of the liver were retrospectively recorded from archival data. Patients who met any of the following exclusion criteria were not included in the study: reoperation, conversion from laparoscopic to open surgery, concomitant surgical procedures, emergency surgery for cyst rupture or other reasons, surgery with a technique other than partial pericystectomy, cysts located outside the liver, or patients under 18 years of age.

The collected data included patient age, sex, diagnostic methods, cyst size, number of cysts, Gharbi classification, surgical treatment methods, duration of operation, length of hospital stay, visual analog scale (VAS) scores at postoperative hours 1, 5, and 10, and postoperative complications. The VAS scores were recorded by the patient's attending physician. Postoperative biliary fistula, pleural effusion, bilioma, and abdominal abscess formation were considered complications secondary to surgery.

In the laparoscopic approach, patients were generally placed in a supine position with an inverted Trendelenburg position following general anesthesia. Entry into the abdomen was performed using a Veress needle in the lower abdomen with a closed technique in a controlled manner to establish a pneumoperitoneum. The intra-abdominal pressure was maintained within the range of 12-14 mmHg. Subsequently, a 10 mm camera trocar was placed at this site. The number and placement of additional trocars were carefully determined based on the location, number, and size of the cysts. To prevent contamination of surrounding tissues, medical

gauze soaked in a 20% hypertonic saline solution was placed around the cyst. The Veress needle was then re-inserted into the abdomen at a site where the cyst could be easily accessed and advanced into the cyst. The cyst contents were aspirated. A scolicidal solution (20% NaCl), equal in volume to the aspirated cyst fluid, was then injected into the cyst through the Veress needle and left for 10 minutes before re-aspiration. The cyst wall, outside the liver parenchyma, was carefully excised using a hook and energy devices. The germinative membrane layers within the cyst lumen were removed in one piece, and the excised cyst wall was retrieved using an endo-bag. The cyst cavity was inspected for residual tissue and biliary fistula using the laparoscope. After placing a drainage catheter in the cavity, the gauze used to protect the surrounding organs was removed, and the procedure was concluded.

In the open approach, all patients underwent laparotomy under general anesthesia via either a midline or right subcostal incision, depending on the cyst's location. Intra-abdominal exploration was performed, and similar to the laparoscopic approach, surrounding tissues were protected from contamination. The cyst wall was excised using cautery, and the germinative membrane layer was removed in one piece. A drainage catheter was placed into the cyst cavity to ensure continuous drainage, and the procedure was concluded.

In all patients included in the study, 100 mg of tramadol hydrochloride was routinely administered by the anesthesia team upon emergence from general anesthesia to provide analgesia. Additionally, to maintain postoperative analgesia, patients were prescribed 3 doses of 25 mg of dexketoprofen trometamol in the postoperative care unit. For rescue analgesia, 100 mg of morphine sulfate was available and administered when necessary.

Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) Version 21 (SPSS Inc, Chicago, IL, USA). Data are presented as mean ± standard deviation and percentage. Non-numerical data are presented as median values. The Kolmogorov–Smirnov test was used to test the normal distribution hypothesis for numerical data. The independent samples t-test was used for comparing paired groups of normally distributed numerical data, and the Mann–Whitney U test was used when the normal distribution hypothesis was not met. One-way ANOVA was used for comparing three or more groups with normally distributed numerical data, and the Bonferroni test was applied for post-hoc analysis when significant differences were detected. The Kruskal–Wallis H test was used for comparing three or more groups without normal distribution, with the Mann–Whitney U test for pairwise comparisons. The Pearson correlation test was used to analyze correlations between numerical data. A p-value below 0.05 was considered statistically significant.

RESULTS

The study included 117 patients who underwent surgery for hydatid cysts of the liver and met the inclusion criteria. Of these, 40 (35%) patients were male, and 77 (65%) were female. The mean age of the patients was 34.82 ± 13.35 years. Imaging methods included computed tomography (CT) for 102 patients, ultrasound (US) for 71 patients, and magnetic resonance imaging (MRI) for 15 patients. Of the 117 patients, 98 (83.8%) had a single cyst, whereas 19 (16.2%) had two or more cysts. A total of 59 (50.4%) patients underwent laparoscopic surgery, whereas 58 (49.6%) patients underwent open surgery. The mean duration of operation was 101.15 ± 49.53 minutes, and the mean postoperative length of hospital stay was 5.32 ± 3.52 days.

Based on the Gharbi classification, 42 patients had stage 1 cysts, 36 patients had stage 3 cysts, and 35 patients had stage 2 cysts. There were two patients each in Stages 4 and 5. Two cases of stage 4-5 hydatid cysts were surgically treated due to the suspected relationship between the cysts and the bile ducts, as indicated by radiological findings.

Regarding cyst size, most patients (n=59) had cysts measuring 5–9 cm, followed by those with cysts ≥10 cm. Only one patient had a cyst smaller than 5 cm, and this case required surgery due to symptoms.

In the open surgical treatment group, the mean age was 35.83 ± 14.72 years, the mean number of cysts was 1.4 ± 0.99, the mean cyst size was 10.33 ± 2.38 cm, the mean duration of operation was 122.22 ± 56.01 minutes, and the mean postoperative length of hospital stay was 6.17 ± 3.91 days. In the laparoscopic surgical treatment group, the mean age was 33.83 ± 11.98 years, the mean number of cysts was 1.17 ± 0.59, the mean cyst size was 9.34 ± 2.93 cm, the mean duration of operation was 80.44 ± 30.71 minutes, and the mean postoperative length of hospital stay was 4.49 ± 2.89 days. There was no statistically significant difference between the groups in terms of age, mean cyst size, or length of hospital stay ($p > 0.05$ for each parameter). However, the duration of operation was shorter, and the mean number of cysts was lower in the laparoscopy group ($p = 0.004$ and $p = 0.007$, respectively).

Table 1. A Comparison of Open and Laparoscopic Surgical Techniques

	Age (years)	Number of Cysts	CD (centimeter)	DO (Minutes)	LHS (Days)	VAS Score at Hour 1	VAS Score at Hour 5	VAS Score at Hour 10	Complication
Open	35.83±14.71	1.40±0.99	10.33±3.38	122.22±56.01	6.17±3.91	7.64±1.18	3.52±0.82	1.64±0.58	17 (56.6%)
Laparoscopic	33.83±11.98	1.17±0.59	9.34±2.94	80.44±30.71	4.49±2.89	4.25±0.92	1.78±0.61	1.07±0.25	13 (43.4%)
p-value*	0.063	0.007	0.700	0.004	0.390	0.044	<0.001	<0.001	> 0.05

CD: cyst diameter, DO: duration of operation, LHS: length of hospital stay, VAS: visual analog scale, *Independent samples t-test

When comparing postoperative VAS scores between the groups, the VAS scores were significantly lower in the laparoscopy group at hours 1, 5, and 10 **(Table 1)**.

Regarding postoperative complications, 30 (25.6%) patients experienced complications, whereas 87 (74.4%) did not. Laparoscopic surgery was performed in 13 (43.4%) and open surgery in 17 (56.6%) of the patients with postoperative complications, with no statistically significant difference between the two groups ($p > 0.05$). Among the 30 patients with complications, biliary fistula was observed in 18 patients, whereas 5 patients had bilioma and 5 had an abscess. Two patients experienced pleural effusion. The number of patients who underwent endoscopic retrograde cholangiopancreatography (ERCP), percutaneous drainage, and both ERCP and percutaneous drainage was 15, 4, and 3, respectively. Additionally, pleural effusion drainage was performed in two patients. A T-tube was placed in two patients, and two patients were managed medically, with spontaneous resolution of biliary fistula in both cases. There was no postoperative mortality among the patients included in this study.

DISCUSSION

A review of previous studies indicates that hydatid liver disease is more commonly observed in women in Turkey (9). This higher prevalence may be attributed to women having greater contact with animals that serve as hosts and being more involved in farming activities (10). Yücel et al.11 reported a rate of 66.1% for females in their study involving 425 patients. Consistently, in the present study, 35% of the patients were male, and 65% were female.

Serologic and molecular methods are less frequently used for diagnosing hydatid cysts and are typically reserved for suspected cases, given the high effectiveness of imaging techniques. The US is considered the most commonly used imaging modality for the evaluation and classification of hydatid lesions in the liver. Although the US is adequate for diagnosing most cases, multislice CT (MSCT) may occasionally be required for confirmation (12). MRI is also used for diagnostic purposes to visualize the cyst contents in suspected cases. Additionally, MRI has become the imaging tool of choice for follow-up after percutaneous treatment because it does not involve radiation exposure (13). In the present study, CT was used in 87.2% of cases, followed by US in 60.7%, and MRI in 12.8% for diagnostic purposes.

Previous studies have suggested that the size and number of cysts are important factors in determining the type of surgery (14). The number of cysts also directly affects the duration of the operation. Yavuz *et al.* (15) reported that 9 out of 11 patients with hydatid liver cysts who underwent laparoscopy had a single cyst or two cysts, while two patients had six cysts. The average cyst size in their study was 11 cm. Another study found that 36 out of 58 patients had multiple cysts, while 44 had a single cyst (16). The mean cyst size was 8.45 ± 4.20 cm, and the mean duration of surgery was 76.24 ± 19.36 minutes. In the present study, the mean number of cysts was 1.28 ± 0.82. Of the 117 patients, 98 had a single cyst, while the remaining patients had two or more cysts. A statistically significant difference was observed in the number of cysts between patients who underwent open surgery and those who underwent laparoscopic surgery. This finding suggests a tendency to perform open surgery in patients with multiple cysts, which could explain

the shorter duration of operation observed in the laparoscopic cases. Furthermore, the mean duration of operation in the present study was 101.15 ± 49.53 minutes.

A study by Shabani *et al.* (16) reported a mean postoperative length of hospital stay of 5.6 days. In the present study, the mean length of hospital stay was 5.32 ± 3.52 days, consistent with that reported in previous studies. Additionally, there was no statistically significant difference in the length of hospital stay between the surgical techniques.

Previous studies have reported that the rate of complications following surgical treatment, including bleeding, infection of the cyst cavity, biliary fistula, and bilioma, ranges from 8% to 80% (17). In the present study, postoperative complications occurred in 30 (25.6%) patients. When comparing these complications between the two surgical techniques, no significant difference was observed.

The limitations of the present study include the relatively small sample size, its single-center and retrospective design, the lack of evaluation for recurrence, and the fact that the surgical procedures were not performed by a single surgeon.

In conclusion, although there is ongoing debate about the role of laparoscopy in the treatment of hydatid cysts of the liver, limited studies are available due to the endemic nature of the disease. In the present study, the shorter duration of operation and lower postoperative VAS scores in the laparoscopic group were identified as advantages. Although not statistically significant, the postoperative length of hospital stay was slightly shorter in patients who underwent laparoscopic surgery. No significant difference was observed between the two methods in terms of postoperative complications, suggesting that the choice of surgical method depends on the surgeon's experience. Laparoscopic surgery for hydatid cysts may be considered the method of choice for improving patient comfort, as it was associated with shorter operation times and lower VAS scores. Further studies with larger sample sizes could help generalize the results of this study.

Conflict of Interest and Financial Status: Our study has not been funded by any institution. In this study, there is no conflict of interest among the authors on any subject.

Ethical Approval: The study was approved by Harran University, Clinic Research Ethics Committee, date: 21.08.2023/ no: HRÜ/23.15.17. The International Principles of Helsinki were followed in the study.

Author contribution: This study is derived from the 'Medical Specialization' thesis, dated 2024, and numbered 10665113.

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