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Laparoscopic Management of Hepatic Hydatid Cysts: A Prospective Observational Study from a Tertiary Care Centre in Kashmir

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ABSTRACT

Background: With advances in minimally invasive surgery, laparoscopic management has gained acceptance as a safe and effective modality in selected patients. The purpose of this study is to evaluate the safety, feasibility, and clinical outcomes of laparoscopic management of hepatic hydatid cysts in patients presenting to a tertiary care centre in Kashmir.

Methods: This prospective observational study was conducted on 30 patients diagnosed with hepatic hydatid cysts aged 18–65 years. Diagnosis was established using ultrasonography and/or contrast-enhanced CT scan. Patients with deeply located intraparenchymal cysts, posteriorly located cysts, cysts measuring < 3 cm or >15 cm, and alveolar hydatid disease were excluded. All patients underwent laparoscopic management under general anaesthesia with standard anti-spillage precautions. The procedure included cyst aspiration, instillation of 10% povidone-iodine as a scolicidal agent, deroofing, evacuation of contents, and management of residual cavity by external tube drainage, omentoplasty, or omentopexy. Pericystectomy was performed in selected cases. Postoperatively, patients were started on oral albendazole (15 mg/kg/day) from the second postoperative day for 3 months. Operative details, postoperative complications, biochemical changes, hospital stay, and follow-up outcomes were recorded and analysed.

Results: The mean age of patients was 35.5 ± 14.98 years, with the majority in the 21–30-year age group (33.3%). Female predominance was noted (73.3%). Most patients presented with right hypochondriac pain (80%), while 16.7% were incidentally detected. Single cysts were seen in 73.3% of patients, with right lobe involvement in 83.3%. The most common WHO stage was CE3a (33.3%). Mean cyst size was 9.8 ± 3.6 cm. Cystectomy was the most commonly performed procedure (93.3%), while pericystectomy was done in 6.7%. External tube drainage was the most commonly used method of residual cavity management (71%). Cystobiliary communication was identified intraoperatively in 10% of cases and managed with suturing. The mean operative time was 94.5 ± 20.4 minutes, which increased in cases with multiple cysts and biliary communication. The mean haemoglobin fall was minimal (0.9 ± 0.5 g/dl in cystectomy). Postoperative liver function changes were mild in cystectomy but relatively higher in pericystectomy. Postoperative complications were observed in 5 patients, including port-site infection, residual cavity infection, fever, and one case of persistent bile drainage managed by ERCP. There was no conversion to open surgery and no mortality. The mean hospital stay was 3.4 ± 3.05 days, with 70% patients discharged within 3 days. Mean duration of drain removal was 38.3 ± 19.6 days.

Conclusion: Laparoscopic management of hepatic hydatid cysts is a safe and effective modality in selected patients. It offers the advantages of minimal morbidity, shorter hospital stay, and good postoperative outcomes. With

appropriate patient selection and strict adherence to anti-spillage precautions, it can be considered a reliable approach in endemic regions like Kashmir..

Keywords: Hepatic hydatid cyst; Laparoscopic management; Echinococcosis; Cystectomy; Pericystectomy; Minimally invasive surgery; Kashmir.

INTRODUCTION

Hydatid disease (HD), or echinococcosis, is a widespread zoonotic parasitic disease caused by a tapeworm that continues to be a clinical and public health problem worldwide, especially in areas where animal husbandry and subsistence farming form an integral part of community life. Hydatid disease of the liver has been recognized since ancient times. Hippocrates, around 450 BC, described "livers full of water," referring to such cystic lesions. The term "echinococcus" derives from the Greek word "hedgehog berry," while the word "hydatid" originates from the Greek word for "watery vesicle". Al-Rhazes, about 1000 years ago, wrote about hydatid cysts of the liver [1]. In the 17th century, Francesco Redi illustrated that the hydatid cysts of echinococcosis were of animal origin. The adult *Echinococcus* was described by Hartmann in the small intestine of dogs in 1695 and larval form was recognized by Goeze in 1782. The life cycle of the parasite was described by Dew and colleagues in 1928 [2].

Hydatid disease is endemic in large sheep-raising regions such as Europe, Asia, the Mediterranean, South America, and Northern Kenya [3]. Immigration has increased the disease prevalence in Europe, North America, and northwestern China. Hydatid disease is a significant yet neglected public health problem in endemic regions such as India, causing substantial economic and social burden. It predominantly affects rural and economically productive populations, leading to high healthcare costs due to prolonged medical treatment, surgical intervention, and management of complications, along with indirect losses from reduced productivity and loss of wages. The disease also results in economic losses in the livestock sector through organ condemnation and decreased animal productivity. Its chronic course, delayed diagnosis, and potential for disability adversely affect quality of life, with associated psychological stress [4]. There are three main forms of echinococcosis in humans: cystic echinococcosis caused by *Echinococcus granulosus*, alveolar echinococcosis by *Echinococcus multilocularis*, and polycystic echinococcosis caused by *Echinococcus vogeli* and *Echinococcus oligarthus*. The adult worm measures 3-6 mm in length and consists of a scolex, immature proglottid, mature proglottid, and gravid proglottid whereas the egg measures 32-36 micrometer in diameter and contains a hexacanth embryo (oncosphere) with 3 pairs of hooklets. The parasite's life cycle involves two hosts: definitive and intermediate, constituting the sexual cycle leading to primary echinococcosis in humans or animals. Dogs, along with other carnivores such as foxes, wolves, and coyotes, serve as definitive hosts. Sheep, cattle, and rodents are intermediate hosts, whereas humans are accidental intermediate hosts [5]. Hydatid disease most commonly involves the liver (50-70%), followed by the lungs (20%). Less common sites include muscles (5%), bones (3%), kidneys (2%), heart (1%), pancreas (1%), central nervous system (1%), and spleen (1%), ovary (0.2%) [6,7,8,9]. The growth rate (diameter) of the cyst in the liver is variable, ranging from 1 mm to 5 mm per year [10]. Clinical manifestations depend on the affected organ. Uncomplicated hepatic hydatid cysts are often asymptomatic and discovered incidentally on imaging or at surgery, whereas symptomatic patients usually present with vague right upper quadrant pain, dyspepsia, or a slowly enlarging abdominal mass [11]. Clinical latency can be prolonged despite large cysts, but in endemic regions children and adults may eventually develop significant hepatomegaly, pressure symptoms, or a wasting "hydatid cachexia" when cysts are multiple or voluminous. Complicated cysts produce more specific manifestations, including features of pyogenic abscess when secondarily infected, obstructive jaundice and cholangitis when rupturing into bile ducts, or acute abdomen and anaphylaxis after intraperitoneal rupture. The overall burden of complicated disease is substantial, as biliary communication, suppuration, and rupture account for most serious presentations and postoperative morbidity in large surgical series.

MATERIALS AND METHODS

This prospective observational study was conducted in Postgraduate Department of Minimal Access and General Surgery, Government Medical College, Srinagar, from April 2024 to December 2025.

Inclusion Criteria

- Age 18-65 years.
- Patients diagnosed with hepatic cystic echinococcosis on ultrasonography or computed tomography scan.

Exclusion Criteria

- Deeply located intra-parenchymal cyst.
- Posterior located cysts.
- Cyst diameter <3cm and >15cm.
- Alveolar hydatid disease.

Study Setting

In this prospective observational study, a total of 30 patients diagnosed with hepatic hydatid cyst on ultrasonography and CT scan were enrolled. The institutional ethics committee approval was obtained, and informed consent was taken from all patients. The recorded data was compiled and entered into a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc, Chicago, Illinois, USA). Continuous variables were expressed as Mean ± SD and categorical variables were summarized as frequencies and percentages.

OBSERVATIONS AND RESULTS

A total of 30 patients were included in the study. The most affected age group was 21-30 years (33.3%), followed by 31-40 years (20%), <20 years (16.7%), 51-60 years (13.3%). The 41-50-year age group had a distribution of 10% while the 61-65-year age group accounted for 6.7% of cases. The mean age of the study population was 35.5 ± 14.98 years with range of 18-65 years.

A female predominance was observed, with 22 females (73.3%) and 8 males (26.7%), resulting in a male-to-female ratio of 1:2.75.

With respect to socioeconomic and occupational distribution, most of the population belonged to lower socioeconomic groups, with farming being the most common occupation (33.3%), followed by students (26.7%) and homemakers (23.3%), Smaller proportions of patients were shopkeepers (6.7%), labourers (6.7%) and electrician (3.3%).

Clinically, the most common presenting symptom was right hypochondriac pain, observed in 24 patients (80%). Fever was present in only 1 patient (3.3%), whereas incidental diagnosis on ultrasonography was noted in 5 patients (16.7%). Serological evaluation showed hydatid IgG seropositivity in 12 patients (40%), while 18 patients (60%) tested seronegative. On imaging, a single cyst was observed in the majority of patients (73.3%), whereas multiple cysts were present in 26.7% of cases. According to WHO-IWGE classification, CE3a was the most common stage (33.3%), followed by CE2 (23.3%), CE1 (20%), and CE3b (13.3%), while mixed-stage cysts were observed in 10% of patients.

Liver involvement showed a clear predominance of the right lobe, with right lobe involvement in 83.3% of patients, compared to left lobe involvement in 10%, and bi-lobar involvement in 6.7%. Segmental analysis showed that segment VI was the most commonly involved, followed by segments VII, VIII, and V, while left lobe segments were less commonly affected. Preoperative MRCP was performed in 5 patients for suspected cystobiliary communication.

Cyst size ranged from 4 cm to 14 cm, with a mean diameter of 9.8 ± 3.6 cm. Most patients had cysts measuring >5 cm and ≤10 cm (46.7%), followed by >10 cm (33.3%) and ≤5 cm (20%).

Regarding surgical management, cystectomy was the most commonly performed procedure (93.3%), while pericystectomy was performed in 6.7% of cases. Among cystectomy patients, external tube drainage was the most frequently used method of residual cavity management (71.4%), followed by omentoplasty (17.9%) and omentopexy (10.7%).

The majority of patients (n=22) had a single cyst, while 8 patients had two cysts. The mean operative time was shorter in single-cyst cases (90 ± 21.5 minutes) compared to patients with two cysts (105 ± 16.3 minutes). Cystectomy alone had a mean operative time of 92.5 ± 20.85 minutes, which increased slightly with additional procedures such as omentoplasty/omentopexy (95 ± 24.83 minutes) and was highest in pericystectomy cases (112 ± 24.75 minutes). The overall mean operative time was 94.5 ± 20.4 minutes.

Intraoperatively, cystobiliary communication was identified in 3 patients, which was managed with Vicryl 3-0 sutures. These cases had a longer mean operative time (113.3 ± 24.7 minutes) compared to those without biliary communication (91.9 ± 20 minutes).

Postoperative haemoglobin reduction was greater in pericystectomy cases (1.1 ± 0.9 g/dL) compared to cystectomy-based procedures (0.9 ± 0.5 g/dL).

Postoperative liver function changes showed mild alterations in cystectomy patients, including a mean bilirubin rise of 0.45 ± 0.70 mg/dL, increase in AST (29.93 ± 80.32 IU/L), and ALT (16.98 ± 58.08 IU/L), with a reduction in ALP (52.86 ± 137.38 IU/L). In contrast, pericystectomy was associated with more pronounced biochemical changes, including a bilirubin rise of 3.05 ± 1.06 mg/dL, and marked increases in AST and ALT levels, with a lesser reduction in ALP.

Postoperative complications were observed in 5 patients during a follow-up period of 3 months, including residual cavity infection in 1 patient, port site infection in 2 patients, fever in 1 patient, and persistent biliary drainage in 1 patient, which was subsequently managed with ERCP.

The majority of patients (70%) had a hospital stay of 1–3 days, followed by 4–8 days in 23.3%, and >8 days in 6.7%, with a mean hospital stay of 3.4 ± 3.05 days (range 1–17 days). The mean duration of drain removal was 38.3 ± 19.6 days (range 14-90 days).

Table 1: Demographic and Clinical Profile of Study Population (n = 30)

Parameter	Category	Number (n)	Percentage (%)
Age (years)	18-20	5	16.7
	21-30	10	33.3
	31-40	6	20
	41-50	3	10
	51-60	4	13.3
	61-65	2	6.7
	Mean ± SD (Range)	35.5 ± 14.98 years (18–65 years)	—
Sex	Male	8	26.7
	Female	22	73.3
Occupation	Farming	10	33.3
	Student	8	26.7
	Homemaker	7	23.3
	Others*	5	16.7
Clinical Presentation	RHC Pain	24	80
	Fever	1	3.3
	Incidental	5	16.7
Hydatid IgG	Positive	12	40
	Negative	18	60

Table 2: Postoperative Biochemical Changes According to Type of Surgery

Parameter	Surgery Type	Preoperative Mean ± SD	Postoperative Mean ± SD	Mean Change ± SD
Haemoglobin (g/dL)	Cystectomy	12.14 ± 1.6	11.18 ± 1.5	−0.9 ± 0.5
	Pericystectomy	13.4 ± 2.6	12.1 ± 1.7	−1.1 ± 0.9
Bilirubin (mg/dL)	Cystectomy	0.73 ± 0.37	1.19 ± 0.82	+0.45 ± 0.70
	Pericystectomy	0.90 ± 0.57	3.95 ± 1.63	+3.05 ± 1.06
AST (IU/L)	Cystectomy	36.07 ± 23.53	66 ± 77.52	+29.93 ± 80.32
	Pericystectomy	23.50 ± 2.12	137 ± 108.89	+113.50 ± 111.02
ALT (IU/L)	Cystectomy	36.52 ± 30.89	53.50 ± 68.55	+16.98 ± 58.08
	Pericystectomy	17.50 ± 3.54	156 ± 131.52	+138.50 ± 135.06
ALP (IU/L)	Cystectomy	147.54 ± 164.19	94.68 ± 35.76	−52.86 ± 137.38
	Pericystectomy	100 ± 7.07	84.50 ± 6.36	−15.50 ± 0.71

Table 3: Radiological, Operative and Postoperative Outcomes

Parameter	Category	Number (n)	Percentage (%) / Value
Cyst Number	Single	22	73.3
	Multiple	8	26.7
WHO Stage	CE1	6	20.0
	CE2	7	23.3
	CE3a	10	33.3
	CE3b	4	13.3
	Mixed	3	10.0
Liver Involvement	Right lobe	25	83.3
	Left lobe	3	10.0
	Bilobar	2	6.7
Most Common Segments	Segment VI	15	—
	Segment VII	13	—
	Segment VIII	13	—
Cyst Size	≤5 cm	6	20.0

	>5 to ≤10 cm	14	46.7
	>10 cm	10	33.3
	Mean ± SD (Range)	—	9.8 ± 3.6 cm (4–14 cm)
Surgery Type	Cystectomy	28	93.3
	Pericystectomy	2	6.7
Residual Cavity Management (Cystectomy patients)	ETD	20	71
	Omentoplasty	5	18
	Omentopexy	3	11
Operative Time (min)	Single cyst	—	90 ± 21.5
	Multiple cyst	—	105 ± 16.3
	Overall mean	—	94.5 ± 20.4
Cystobiliary Communication	Present	3	—
	Absent	27	—
Complications	Total cases	5	—
Hospital Stay	1-3 days	21	70
	4-8 days	7	23.3
	>8 days	2	6.7
	Mean ± SD (Range)	—	3.4 ± 3.05 days (1–17 days)
Drain Removal (days)	Overall mean	—	38.3 ± 19.6

DISCUSSION

Hepatic hydatid disease remains a significant surgical problem in endemic regions such as the Kashmir valley. With advances in minimally invasive surgery, laparoscopic management has gained acceptance as a safe and effective modality in selected patients. The present hospital-based prospective observational study evaluates the outcomes of laparoscopic management of hepatic hydatid cysts, with particular emphasis on operative parameters, postoperative complications, and hospital stay.

In the present study, the mean age of patients was 35.5 ± 14.98 years, with the majority belonging to the 21–30-year age group (33.3%). This age distribution is comparable to laparoscopic series reported by Palanivelu et al. [12], Aftab S. Shaikh et al. [13], Wang Chen BA et al. [14], and Rubul Das et al. [15], where most patients were in the third to fourth decades of life. The delayed presentation may be attributed to the slow-growing nature of hydatid cysts, which often remain asymptomatic for years.

A clear female predominance was observed in our study, with 73.3% females and 26.7% males. Similar female preponderance has been reported in laparoscopic series by Aftab S. Shaikh et al. [13], Bickel A et al. [16], Rooh-ul-Muqim et al. [17], Mehmet Bayrak et al. [18], and Devdas S. Samala et al. [19]. The variation in sex distribution across studies is likely influenced by regional lifestyle and occupational exposure, particularly in endemic areas where women are more frequently engaged in livestock handling.

The most common presenting symptom in our study was right hypochondriac pain (80%), followed by incidental detection on imaging, while fever was uncommon. Similar clinical presentations have been documented in laparoscopic studies by Aftab S. Shaikh et al. [13], Rooh-ul-Muqim et al. [17], Omar Ahmed SM et al. [20] and Shamsul Bari [21], where abdominal pain was the predominant symptom.

Hydatid immunology (IgG) was positive in 40% of patients, which is consistent with observations reported in earlier studies by Sandhu et al. [22] and Yener Aydin et al. [23], highlighting the limited sensitivity of serological tests, particularly in intact or inactive cysts. Hence, imaging remains the primary diagnostic modality, with serology serving a supportive role.

A single hepatic cyst was observed in 73.3% of patients, while 26.7% had multiple cysts, which is in agreement with the laparoscopic series reported by Bickel A et al. [16], Rooh-ul-Muqim et al. [17], Mehmet Bayrak et al. [18], and Shamsul Bari [21] where single-cyst involvement predominated.

According to the WHO-IWGE classification, CE3 cysts were most common in our study (46.6%), followed by CE2 and CE1. Similar findings have been reported by Mehmet Bayrak et al. [18]. However, studies by Devdas S. Samala et al. [19] and Aroosa Zia et al. [24] reported CE2 predominance, while Tuerhongjiang Tuxun et al. [25] observed CE1 as the most frequent stage. These variations may be explained by differences in study design, regional endemicity, and healthcare access.

The right lobe of the liver was involved in 83.3% of patients, which is in agreement with most laparoscopic series, including those by Aftab S. Shaikh et al. [13], Rooh-ul-Muqim et al. [17], Shamsul Bari [21], and Aroosa Zia et al. [24]. Segment VI was the most frequently involved segment, followed by segments VII and VIII, reflecting portal venous flow patterns and liver anatomy.

The mean cyst diameter in our study was 9.8 ± 3.6 cm, similar findings were reported by Aftab S. Shaikh et al. [13], Wang Chen BA et al. [14], Rooh-ul-Muqim et al. [17], and Omar Ahmed SM et al. [20], indicating that larger cysts are not a contraindication to laparoscopic management when appropriate expertise and precautions are employed.

Cystectomy was the predominant surgical procedure (93.3%), with pericystectomy performed selectively (6.7%). Residual cavity management among cystectomy patients was most commonly achieved using external tube drainage, followed by omentoplasty and omentopexy. Preoperative MRCP was performed in 5 patients, and intraoperative cystobiliary communication was identified in 3 patients and closed with Vicryl 3-0 sutures. Similar findings have been reported by Palanivelu C et al. [12], Aftab S. Shaikh et al. [13], Bickel A et al. [16], Shamsul Bari [21], and Khoury G et al. [26], emphasizing conservative cavity management in laparoscopic surgery.

The mean operative time increased in cases with multiple cysts, pericystectomy, and cystobiliary communication. The operative times observed in the present study are comparable to laparoscopic series by Wang Chen BA et al. [14], Shamsul Bari [21], Ashok Kumar II et al. [27], and Y Yagmur et al. [28], where slightly prolonged operative durations were attributed to meticulous dissection, anti-spillage precautions, and careful identification of biliary communication.

Postoperative complications were minimal in our study. Port-site infection was most common, followed by transient fever, residual cavity infection, and persistent bile drainage, which was successfully managed by ERCP. No conversion to open surgery or mortality was observed. These findings are consistent with laparoscopic series by Palanivelu et al. [12], Aftab S. Shaikh et al. [13], and Shamsul Bari [21], Tuerhongjiang Tuxun et al. [25], and Ertem et al. [29], which also reported low morbidity rates.

The mean postoperative hospital stay was 3.4 ± 3.05 days, with the majority of patients discharged within three days. This is comparable to previously published laparoscopic series and highlights one of the major advantages of laparoscopic management over open surgery.

Postoperative biochemical parameters were systematically evaluated. A modest mean haemoglobin fall of 0.9 ± 0.5 g/dl was observed following cystectomy-based procedures, whereas a slightly higher decline of 1.1 ± 0.9 g/dl was noted after pericystectomy. Patients undergoing cystectomy showed mild elevations in bilirubin, AST, and ALT, whereas pericystectomy demonstrated comparatively greater biochemical alterations, indicating increased hepatocellular stress. Notably, most published laparoscopic hydatid cyst series focus primarily on operative and clinical outcomes, with limited reporting of detailed postoperative haemoglobin and liver function changes, which represents an important contribution of the present study. The mean duration of drain removal was 38.3 ± 19.6 days.

The limitations of the present study include the small sample size, single-centre design, and relatively short follow-up period which limits assessment of long-term recurrence. Larger multicentric studies with long-term follow-up are required to validate these findings.

CONCLUSION

Our study demonstrates that laparoscopic management of hepatic hydatid cysts is a safe, effective, and minimally invasive treatment option in selected patients. It offers the advantages of acceptable operative time, low complication rates, shorter hospital stay, and satisfactory postoperative outcomes. With appropriate patient selection, meticulous surgical technique, and adherence to anti-spillage precautions, laparoscopic surgery represents a reliable modality for the management of hepatic hydatid disease in endemic regions.

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