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A study on evaluation of biliary leaks following hydatid liver surgeries

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ABSTRACT

Background: A high incidence of post-operative bile leaks is reported to be a significant disadvantage of conservative surgical procedures.

Materials and Methods: One hundred patients with 180 cysts were operated upon using conservative surgical techniques from May 2007 to November 2009.

Results: Post-operative biliary leakage occurred in 26 (26%) patients. Independent clinical predictors for post-operative bile leak were raised alkaline phosphatase and gamma-glutamyl transpeptidase levels ($P < 0.05$), cyst content being bilious and/or containing pus ($P < 0.05$), a greater number of cysts ($P < 0.05$), and radiological appearance of cysts whether, multilocular or degenerated ($P > 0.05$). Post-operative complications were seen in 21 patients (21%). Complications were seen in 12 of 26 patients with bile leak (46.16%) and in 9 patients among 74 patients (12.16%) without a bile leak ($P < 0.05$). The mean hospital stay for patients with biliary leakage was 15 days, while the mean hospital stay for patients with no biliary leakage was 8 days. In all patients (22 patients) with low output fistulas (<300 ml/day), the leak was stopped by conservative means in 4 weeks. Among 4 patients with high output fistulas (>300 ml/day), 3 patients were managed conservatively, and in one patient there were no signs of a reduction in bile leakage even after 4 weeks; in this case, endoscopic retrograde cholangiopancreatography with a sphincterotomy was performed, which led to the healing of the fistula 1 week after the endoscopic sphincterotomy.

Conclusion: Biliary leakage is common following conservative surgery and is the main cause of post-operative morbidity. Most of the bile leaks can be prevented by thorough inspection of the cavity peroperatively for cyst-biliary communication. Identifying risk factors preoperatively may help to optimize perioperative management. Most bile leaks heal by conservative management.

Key words: *Biliary leak, conservative surgery, cyst-biliary communications, cystectomy, hydatid liver*

Introduction

Hydatid disease has been known to mankind since ancient times. Hippocrates described hydatid livers as "livers full of water." Hydatid is a Greek word meaning "drop of water." The term echinococcus, which means "hedgehog berry", was coined by Rudolphi in the first decade of the nineteenth century to describe the parasitic tapeworm that causes this disease. The life cycle of the parasite was elucidated by Haubner in 1855, and it was confirmed as a zoonosis in 1862 by Krabbe and Finsen [1]. Hydatidosis caused by Echinococcus granulosus is an endemic parasitic disease in Mediterranean countries, North Africa, Spain, Greece, Turkey, Portugal, the Middle East, Australia, New Zealand, South America, Baltic areas, the Philippines, Northern China and the Indian subcontinent. However, physicians and

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surgeons worldwide may encounter this disease sporadically because of increased travel and immigration [2,3]. In India, hydatid disease is common in most of the states, particularly in Andhra Pradesh and Tamil Nadu [4].

Surgery is the treatment of choice for hydatid disease of the liver. Surgical procedures vary from a radical resective approach (pericystectomy or hepatic resection) to a conservative approach (deroofing of the cyst and management of the residual cavity [5]. The most commonly used surgical approach is a simple cystectomy [6]. Conservative surgeries are simple and useful in the management of uncomplicated hydatid disease of the liver. However, their main disadvantage is a high frequency of post-operative complications, the most common being biliary leaks from cyst-biliary communication (4-28%) and its sequelae and recurrence [7]. In radical surgeries, post-operative biliary leakage and its recurrence are rare [8]. The main objectives of this study were to evaluate the incidence and risk factors responsible for increased post-operative bile leaks, the methods used intra-operatively to localize the cyst-biliary communication so that it can be sutured to prevent post-operative bile leaks, to discuss various management options, and to examine the morbidity and mortality associated with biliary leaks following hydatid liver surgeries.

Materials and Methods

This study was conducted in the Postgraduate Department of General Surgery, S.M.H.S Hospital, an Associate Hospital of Government Medical College Srinagar, Kashmir, India, from May 2007 to November 2009. The study was conducted on 100 patients with 180 ultrasonography - and computerized tomography (CT)-documented hydatid liver cysts. Preoperative evaluation included complete blood counts, bleeding time, clotting time, kidney function tests, liver function tests, gamma-glutamyl transpeptidase (GGT) levels, blood sugar, serum electrolytes, electrocardiogram, chest X-ray, ultrasonography of the abdomen, CT scan of the abdomen, and enzyme-linked immunosorbent assay (ELISA) for detecting IgG antibodies against echinococcal antigen.

A conservative surgical technique in the form of a partial cystectomy was performed on all patients. An open surgical technique was performed on 74 patients, and a laparoscopic technique was performed on 26 patients. After entering the abdomen, the area around the cyst was carefully isolated by gauze packs soaked in a scolicidal agent (povidone-iodine, 10% cetrimide, 20% normal saline). The cyst was first aspirated by a 50-ml syringe, and the nature of the aspirate was inspected. If the cyst content was clear, the aspirate was replaced with the same amount of scolicidal agent. After opening the cyst wall, all contents, including the germinal membrane, were removed. The cavity was filled with scolicidal agent (povidone-iodine, 10% cetrimide, 20% normal saline) for 10 min and then aspirated. The cavity was then wiped with normal saline-soaked swabs. The interior of the cavity was meticulously inspected for 5 min, and white laparotomy pads were kept in the cavity for 5 min and inspected for evidence of bile staining. In the laparoscopic group, a camera was introduced into the cavity, which was thoroughly inspected for 5 min. Bile leaks on the table were detected in 28 patients who were closed with absorbable sutures. In two patients, bile leaks were large (>5 mm). In these two patients, in addition to closure of the leak with absorbable sutures, a T-tube choledochostomy was performed to decrease the intra-biliary pressure. Additional surgical procedures, such as cholecystectomy, were performed on 21 patients, and common bile duct exploration was performed on 9 patients. A T-tube was inserted into 11 patients, including 9 patients in whom the common bile duct was explored and 2 patients with large cyst-biliary communication. Per-operative cholangiography was performed on 4 patients who had a grossly normal common bile duct during surgery but who had a history of recent jaundice. In 3 of these 4 patients, preoperative cholangiography was normal, while one had a stone at the distal end of the common bile duct.

The residual cavity left after the removal of the cyst was managed by external drainage only in 44 cysts, external drainage with capitonnage in 87 cysts, and external drainage with omentoplasty in 49 patients. A Foley catheter (16 - 18 fr) was kept in the cyst cavity in all patients.

Post-operative drainage through the Foley catheter was monitored for biliary drainage, which was confirmed by a bilirubin assay of the drainage. Thus, any amount of bile from the 1st post-operative day was characterized as a biliary leak. Patients with a post-op-

erative biliary leak were divided into 3 groups:

Group 1: No leak group

Group 2: Low output group in which drainage was <300 ml bile/24 h

Group 3: High output group in which drainage was more than 300 ml bile/24 h

In the present study, we encountered 22 patients with low output biliary leaks and 4 patients with high output biliary leaks. Cavitograms were performed on all patients after variable time periods. Cavity catheters were removed during hospital stays in a few patients, and on an outpatient basis in most patients. Cavity catheters were removed when there was no drainage for 3 days.

Results

A total of 180 cysts were present in 100 patients, 58% of whom were females and 42% were males, with an age range of 2-74 years. 74 patients (74%) were from rural areas, and 26 patients (24%) were from urban areas. 87 patients (87%) had a primary cyst, and 13 patients (13%) had recurrent disease. The most common symptom was abdominal pain (85%), and the most common symptom was tenderness in the right upper abdomen. Serum bilirubin was normal in 88% of patients and raised (1.4-10 mg/dl) in 12 patients. Alkaline phosphatase (ALP) was raised (>127 u/l) in 37 patients and normal in 63 patients. GGT level was raised (>62 u/l for males and >37 u/l for females) in 37 patients (12 males and 25 females), and it was normal in 63 patients. The immunological test that was used in our study was an IgG ELISA for all patients. The IgG ELISA was positive in 87% of patients. One hundred and twenty-seven cysts (70.6%) were located in the right lobe, and 53 cysts (29.4%) were in the left lobe. Cysts were solitary in 53 (53%) patients. There were two cysts in 27 (27%) patients, and there were more than two cysts in 20 (20%) patients. 115 cysts (63.88%) had a diameter of <10 cm. whereas 65 cysts (36.2%) were more than 10 cm in diameter. 36 cysts (35%) were unilocular, 54 cysts (30%) were multilocular, and 63 cysts (35%) were degenerated. Cyst content was bilious and/or contained pus in 40 cysts (22.22%) and clear in 140 cysts (77.78%). 44 cysts underwent external drainage only, 87 underwent capitonnage with external drainage, and 49 cysts underwent omentoplasty with external drainage. Demographic, clinical characteristics, and incidence of bile leaks are given in Table 1.

Table 1. Incidence of bile leaks in hydatid liver surgeries based on demographic and clinical characteristics.

Risk factors	Number	%	Bile Leaks	Chi-square	*P* value
Male	42	42	11	0.001	0.97
Female	58	58	15		
Recurrent	13	13	4	0.13	0.91
Primary	87	87	22		
Urban	24	24	6	0.016	0.89
Rural	76	76	20		
ALP/GGT (Raised)	37	37	13	19.56	0.000
ALP/GGT (Normal)	63	63	13		
Cyst location					
Right lobe	127	70.6	19	0.093	0.76
Left lobe	53	29.4	7		
Unilocular cysts	63	35	5	3.79	0.15
Multilocular cysts	54	30	10		
Degenerated cysts	63	35	12		
Cyst number					
1	53	53	9	6.17	0.04
2	27	27	8		
>2	20	20	9		
Cyst content					
Bilious and/or pus	40	30	23	77.14	0.000
Clear	140	70	3		
Cyst diameter					
<10 cm	115	64	16	0.073	0.70
>10 cm	65	26	10		
Operative technique					
Laparoscopic	26	26	6	0.006	0.93
Open	74	74	20		
External drainage only	44	24.4	7	0.28	0.86
Capitonnage with drainage	87	48.3	13		
Omentopexy with drainage	49	27.3	6		

ALP: Alkaline phosphatase, GGT: Gamma-glutamyl transpeptidase

Seventy-four patients were operated upon using an open surgical technique, and 26 patients were operated upon using a laparoscopic technique. Bile leaks, which were closed by suturing with absorbable sutures, were detected on the table in 28 patients. In two patients with large cyst-biliary communication (>5 mm), closure of the leak was not satisfactory by suturing. Thus, in these patients, in addition to suturing, a T-tube choledocostomy was performed to decrease the intrabiliary pressure. In 74 patients operated upon using an open technique, thorough inspection of the cavity af-

ter evacuation of cyst content was performed to localize the bile leak for a period of 5 min. After thoroughly washing the cavity with normal saline, a white laparotomy pad was kept in the cyst cavity for 5 min, which was then checked for bile staining. In 26 patients operated upon using a laparoscopic technique, after evacuation of the cyst contents and thoroughly washing the cavity with normal saline, a video camera was introduced into the cyst cavity to search for bile leaks. 26 patients developed post-operative biliary leaks, which were divided into a low output group when drainage was <300 ml/24 h and a high output group when drainage was >300 ml/24 h. 22 patients had low output fistulas (<30 0 ml/24 h) and 4 had high output fistulas (>300 ml/24 h). Leakage of bile was confirmed by bilirubin assays of the drained fluid.

There was no difference in the incidence of post-operative biliary leakage in our study as per gender, residence, the cyst being primary or recurrent, cyst location (whether in the right or left lobe), cyst diameter, the method of cavity management, and the operative technique (whether open or laparoscopic). Risk factors for post-operative biliary leakage found in our study were raised preoperative ALP and GGT levels ($P < 0.05$), cyst content being bilious and/or containing pus ($P < 0.05$), a greater number of cysts ($P < 0.05$), and radiological appearance of cysts, whether multilocular or degenerated ($P > 0.05$).

In all patients with low output fistulas (<300 ml/day), the leak was stopped by conservative means, which included: Daily quantifying the amount of the bile leak, replacing fluid and electrolytes, use of antispasmodics (anticholinergics), which decrease the sphincter of Oddi pressure and, hence, intra-biliary pressure. In all these patients, the leak stopped within 4 weeks.

Among 4 patients with high output fistulas (>300 ml/day), 3 patients were managed conservatively, and in one patient there was no sign of a reduction in the bile leak, even after 4 weeks. In this patient, an ERCP with sphincterotomy was performed, which led to the healing of fistula 1 week after the endoscopic sphincterotomy. Bile leaks in 58% of patients stopped in 14 days. A cavitogram was performed on all patients after the bile leak had stopped to look for residual cavity and cyst-biliary communications. Post-operative complications were seen in 21 patients (21%). Complications were seen in 12 of 26 patients with bile leaks (46.16%) and in 9 patients among 74 patients without a bile leak (12.16%). Complications included wound infection, drain site cellulitis, cavity infection, pulmonary complications, and urinary tract infection. There was no mortality in our study. The mean hospital stay for patients with biliary leakage was 15 days, while the mean hospital stay for patients with no biliary leakage was 8 days.

Discussion

Surgical procedures for hepatic hydatid disease range from a radical resective approach (pericystectomy or hepatic resection) to a conservative approach (deroofing of the cyst and management of the residual cavity) [5].

Conservative surgeries are simple and useful for the management of uncomplicated hydatid disease of the liver. However, their main disadvantage is a high frequency of post-operative complications, the most common being biliary leaks from cyst-biliary communication (4-28%) and its sequelae and recurrence [7].

In hepatic liver diseases, intra-cystic pressure ranges from 30 cm to 80 cm of water, but normal biliary system pressure ranges from 15 cm to 20 cm of water. Therefore, the flow is toward the biliary system, and bile may not be present in the cyst cavity despite occult cyst-biliary communication. Once the cyst is drained, the pressure gradient is reversed, which facilitates bile flow into the residual cavity, rather than through the ampulla of Vater [8].

Biliary leaks represent the main source of immediate post-operative complications, and if not properly drained, they may result in abscess formation in the residual cavity or passage into the peritoneal cavity and biliary peritonitis. If drained effectively outward, an external biliary fistula develops, representing the most common complication of this operation [9]. In our study, 26 patients (26%) developed a post-operative biliary leak. In our study of 100 cases, post-operative complications, excluding external biliary fistulas, were seen in 21 patients (21%). Complications were seen in 12 of 26 patients with a bile leak (46.16%) and in 9 patients among 74 patients without a bile leak (12.16%).

Complications included wound infection, drain site cellulitis, cavity infection, pulmonary complications, and urinary tract infection. Demircan Orhan et al. (2006) [8], in their study of 191 patients, found complications in 37 patients (19.4%), 22 (53.7%) of which were in the bile leakage group and 15 (10%) of which were in the no leak group.

To reduce post-operative bile leaks, all efforts should be made during surgery to detect cyst-biliary communication. In patients operated upon using an open technique, thorough inspection of the cavity after evacuation of the cyst content should be performed to localize the bile leak for a few minutes. After thoroughly washing the cavity with normal saline, a white laparotomy pad should be kept in the cyst cavity for a few minutes, which should be then checked for bile staining. In patients operated upon using a laparoscopic technique, after evacuation of the cyst contents and thoroughly washing the cavity with normal saline, a video camera should be introduced into the cyst cavity to search for bile leaks. Bile leaks, if detected on the table, should be closed by absorbable sutures. Silva et al. (2004) [10] performed a thorough inspection of the cyst cavity to localize the bile leak. Fillippou et al. (2004) [11] used clean gauzes inside the cyst cavity after evacuation of the cyst content to identify the bile leak. Rehani et al. (2005) [12] laparoscopically treated six patients with a solitary hydatid cyst liver. After evacuation of the cyst fluid and germinal membrane, the cyst cavity was explored under direct view, with a camera inserted inside the cyst cavity to exclude biliary communication.

In most cases, external biliary fistulas close spontaneously, provided intra-biliary pressure is not high. The reduction of such pressures by endoscopic sphincterotomy, the removal of any intra-ductal pathology, if present, and the insertion of an endoprosthesis promote healing. In all patients with low output fistulas (<300 ml/day) in our study, the leak was stopped by conservative means, which included daily quantifying the amount of the bile leak, replacing fluid and electrolytes, use of antispasmodics (anticholinergics), which decrease the sphincter of oddi pressure and, hence, intra-biliary pressure. In all these patients, the leak stopped within 4 weeks. Among 4 patients with high output fistulas (>300 ml/day), 3 patients were managed conservatively, and in one patient there were no signs of a reduction of the bile leak even after 4 weeks; in this patient, an ERCP with sphincterotomy was performed, which led to healing of the fistula 1 week after the endoscopic sphincterotomy. No guidelines are available regarding the most appropriate timing of endoscopic intervention. Some authors have classified post-operative biliary fistulae into low output and high output categories to help in making treatment decisions.

Risk factors for post-operative biliary leakage found in our study included raised preoperative ALP and GGT levels ($P < 0.05$), cyst content being bilious and/or containing pus ($P < 0.05$), a greater number of cysts ($P<0.05$), and radiological appearance of cysts, whether multilocular or degenerated ($P > 0.05$).

There was no difference in the incidence of post-operative biliary leakage in our study as per gender, residence, the cyst being primary or recurrent, cyst location (whether in right or left lobe), cyst diameter, the method of cavity management, and operative technique (whether by open or laparoscopic). Kayaalp Cuneyt et al. (2002) [13] found that preoperative raised ALP and GGT levels ($P > 0.05$), cyst number ($P > 0.05$), pus and/or bilious cyst content ($P < 0.05$), and radiological appearance of the cyst, whether multilocular or degenerated, ($P > 0.05$) are associated with increased incidence of bile leaks. No association of biliary leakage was found as per residence, location of the cyst, size of the cyst, and mode of cavity management. Demircan Orhan et al. (2006) [8] found that clinical predictors for biliary leakage were raised ALP and GGT levels ($P < 0.05$), and multilocular and degenerated cysts ($P > 0.05$). There was no difference found regarding sex, place of residence, age, and location of cysts, whether in the right or left lobe. Observations made in our study are comparable with the observations made by the above-mentioned authors.

Conclusion

Identifying risk factors pre-operatively may help to optimize the perioperative management of biliary leaks in patients with hydatid liver disease. Post-operative biliary leaks can be predicted by the serum levels of ALP, GGT, the nature of the cyst content, cyst number, and radiological appearance of cysts, whether multilocular or degenerated. Most of the bile leaks can be prevented

by a thorough inspection of the cavity peroperatively for cyst-biliary communication.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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