Annals of Medical Research
DOI: 10.5455/annalsmedres.2019.02.083 2019;26(5):942-5

Original Article

Effect of cyst volume and other risk factors on biliary leak following liver hydatid cyst surgery

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Abstract

Aim: This study aimed to determine the effect of prognostic factors indicating the presence of cystobiliary communication in the preoperative period and volume values obtained using the magnetic resonance imaging technique on the rate of biliary leak.

Material and Methods: Twenty-six patients surgically treated for hydatid disease were included in the study. Age, sex, number, localization, volume and size of cysts, and liver function test results were statistically compared between the patients with and without biliary leak.

Results: There were no significant differences between the groups with respect to age, gender, and number, volume and localization of cysts ($p>0.05$). However, a significant difference was found concerning the increase in liver function test results and cystobiliary relationship ($p<0.05$).

Conclusion: In conclusion, we found no significant relation between the presence of preoperative cystobiliary communication and localization, volume and size of HD cysts. In the detection of preoperative cystobiliary communication, radiological and clinical findings should be evaluated together.

Keywords: Hydatid Diseases; Cystobiliary Communication; Volume of Cyst.

INTRODUCTION

Hydatid disease (HD) remains an important health problem in endemic areas. HD can occur in any viscera but most commonly affects the liver, and rupture of the liver cysts into the bile duct during the course of the disease is the most frequent complication (1). Communication between the cyst and biliary tree through large and small biliary channels has an incidence of 13%-37% (2,3) and results in postoperative biliary leak, which leads to prolonged biliary drainage, peritonitis, and biliary abscess, and even morbidity that increases with prolongation of hospitalization (2). Biliary leaks detected in the preoperative period help determine both the treatment strategy and decrease the rate of postoperative complications and duration of hospitalization.

In previous studies, it was reported that the rate of biliary leak was related to size and localization of cysts (4). The aim of the present study was to investigate how the volume values obtained using the magnetic resonance imaging (MRI) technique influenced the rate of biliary leak in patients with primary liver HD. In addition, while performing these calculations, we also investigated the relation between biliary leak and the size, number and location of cysts and biochemical values.

MATERIAL and METHODS

Data of Patients

Thirty HD cases that presented to Ankara Numune Education and Research Hospital / General Surgery Clinic between October 2009 and October 2010 and underwent surgical treatment were included in this study. Two patients who could not undergo an MRI examination due to the presence of metal in their body and further two cases with recurrent cyst hydatid were excluded from the study. In the remaining 26 patients, a total of 48 cysts treated by conservative methods were evaluated prospectively. Diagnosis was made in all patients by abdominal ultrasonography and serologically using indirect hemagglutination (IHA) and corroborated

Received: 08.02.2019 **Accepted:** 30.03.2019 **Available online:** 08.04.2019
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with surgical observation. The sex and age data of 26 patients were recorded and all patients underwent routine whole blood count and liver function tests. Abdominal ultrasonography findings were assessed according to the Gharbi classification (5). All patients had type 3-5 HD.

In order to determine the volume, size, localization and number of cysts,a 1.5 whole body MRI system with 33 mT/m maximum gradient capacity (Excite, General Electrics, Milwaukee, Wisconsin) was used. Abdominal MRI examination included axial and coronal T2-weighted FRFSE RTr and axial FAME Multiphase BH Asset sequences. The images were transferred to a computer environment to calculate and analyze the volumes.

The localization of the cysts was determined by preoperative MRI imaging according to right-left lobe involvement and Couinaud's segments. The segments were further classified depending on whether they were close to the hilus (1, 3, 4b, 5, 6) or far from the hilus (2, 4a, 7,8) using the method modified by Drizi et al. (1).

The cysts detected by MRI were evaluated as single or multiple according to their number. The number of cysts varied between 1 and 5. In the present study, in patients with multiple cysts, the volume of each cyst was first obtained separately, and then the overall volume was calculated. The overall number of cysts was 48 among 26 patients. The type of operation to be performed was determined by the surgeon according to the location and type of cysts and the presence of biliary leak. Sixteen patients underwent cystotomy-drainage and 10 patients cystotomy-omentopexy. As a scolicidal agent, 1% cetrimide solution was used (6). The cavity was checked for possible complications, such asbiliary leak and bleeding. If there was biliary sludge, primary suturation was performed. In addition, operations site was drained with a 24f foley catheter. If biliary drainage did not occur, the catheter was withdrawn on the postoperative third day. All patients received 10 mg/kg/daily albendazole prophylaxis starting from seven days before operation until three months after operation (2). Biliary leak was detected at three different times preoperatively by endoscopic retrograde pancreaticocholangiography (ERCP) in patients with hydatid icterus, peroperatively by observing biliary orifice and sludge, and postoperatively by observing biliary drainage from the catheter placed in the cavity.

The patients with postoperative biliary drainage from the cavity were considered to have biliary leak irrespective of the amount of drainage. Even though biliary drainage caused by communication was self-limiting, potential complications, such as prolonged biliary drainage were treated with ERCP where necessary.

Possible risk factors for biliary leak were analyzed as potential predictors of cystobiliary communication.

Statistical Analysis

In order to compare the groups with and without biliary leak in terms of laboratory and radiological parameters, suitable non-parametric tests were employed. The differences between the two groups in the number and localization of the cysts, and their proximity to the hilar region were analyzed by Pearson's chi-square test and the difference between the volume and biochemical parameters by the Mann-Whitney U test. In calculations, SPSS statistics program v. 13 was used. A P value of <0.05 was considered significant. The test that best showed the presence of fistula was determined by the receiver operating characteristic (ROC) curve analysis, followed by area under the curve test. The variables that were not found to have a significant relation with biliary leak according to Pearson's chi-square test were evaluated using logistic regression analysis.

RESULTS

The age range of the patients was 22–71 years, with a mean age of 48.63± 3.11. The mean age was calculated as 46.5±4.14 years in the group without biliary leak and 51.50± 4.82 years in the group that developed this complication. Of all patients, 61.5% were female, and the two groups were matched for age and sex. The demographic and clinical characteristics of the patients with and without intraoperative and postoperative biliary leak are given in Table 1.

No significant difference was found between biliary leak and the gamma-glutamyl transpeptidase (GGT) and bilirubin levels. Aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) tests displayed significant differences in the presence of biliary leak in the area under the ROC curve (Table 1).

Table 1. Demographic and clinical characteristics of the patients with and without intraoperative and postoperative biliary leak

Variable	No biliary leak n=16	Biliary leak present n=10	p value
Mean (SD) age	46.5±4.1	51.5±4.8	0.287
Sex, F/M	10/6	6/4	0.582
Mean liver function test levels, cyst size and cyst volume			
AST	17	81.6	0.001*
ALT	19.2	99.9	0.019*
ALP	68.2	140.5	0.022*
GGT	35	78.5	0.108
Bilirubin	0.5	2.1	0.343
Size (mm)	74.2±6.7	77.0±12.6	0.445
Volume (cm^3)	250±88.1	141±47.3	0.463

Sixteen patients were found to have a single cyst (61.5%) and 10 had (38.5%) multiple cysts. No significant relation was found between the number of cysts and the presence of biliary leak (p=0.339). The mean volume was 132.1 (min: 16–max: 745) cm^3 in the single cyst group and 436.1 (min: 79–max: 1500) in multiple cysts with a p value of 0.007. The volume was significantly higher in multiple cysts than in the single cyst group. The size of the cyst was minimum 35 mm and maximum 180 mm with a mean value of 75.38± 6.4. The cyst size was 77.0 ± 12.64 and 74.21± 6.75 in the groups with and without biliary

leak, respectively, but there was no statistically significant difference (Table 2).

Table 2. Comparison of the number of cysts, lobe localization, proximity to the hilar region, and mean volumes between the groups with and without biliary leak (chi-square and Mann- Whitney U tests)

	No biliary leak	Biliary leak present	p value	Volume	p value
Number of cysts					
Single	11	5	0.339	132.1	0.007*
Multiple	15	5		436.1	
Lobe localization	4	3	0.780	573.6	
Right	12	7		129.3	0.001*
Left					
Hilar region					
Near	10	6	0.530	214	0.999
Far	6	4		313.3	

The cyst was located in the right lobe for seven patients (26.9%) and in the left lobe for 19 patients (73.1%). No relation was found between the localization of the cyst (right or left) and the presence of biliary leak (p=0.780). The mean cyst volume was 573.6 (min:114– max:1500) cm3and 129.3 (min:16–max:745) cm^3 in cysts located in the right and left lobes, respectively with a statistically significant difference (p= 0.001*) (Table 2).

For the Couinaud classification, each cyst was evaluated separately. Astatistical evaluation could not be undertaken due to relatively small size of the sample. Biliary leak was present in 11 of the 24 cysts near the hilar region and all the 12 cysts located far from the hilar region. There was no significant difference between the cysts in terms of biliary leak.

When the evaluation was performed separately for each patient, biliary leak was detected in six of the 16 patients with cysts near the hilar region and four of the 10 patients with cysts far from the hilar region, with no statistically significant difference. Considering proximity together with volume, there was also no significant difference between the two groups in terms of volume (Table 2).

After performing whole body MRI with 33mT/m maximum gradient, the images were transferred to a computer environment to calculate and analyze the volumes, and the results were compared using the Mann-Whitney U test. The minimum, maximum and mean volume values were determined as 16 cm^3, 1173 cm^3, and 205.04± 55.29 cm^3, respectively. The mean volume was 141±47.36 cm^3 and 250±88.18cm^3 and in the groups with and without biliary leak, respectively. There was no statistically significant difference between these two groups (p>0.05) (Table 2).

DISCUSSION

HD in the liver is an important public health problem in many parts of the world where it is endemic (1). Recently, there has been an important change in the treatment of HD, which was previously only treated by surgery. Although the PAIR (Puncture, Aspiration, Injection, Reaspiration) technique, which has been used for the last 15 years with the development of radiology, has an efficacy rate of 96%, type 3-5 undrained cysts, ruptured cysts, and inaccessible cysts are still only treated by surgery (7,8). The aims of surgical treatment are to inactivate scolices, prevent the spread of cyst content, eliminate all intact tissues of the cysts, and make the residual cavity of the cyst smaller. The most common complication of HD surgery is biliary leak, in which there is communication between the cavity of residual cysts and biliary tree (5,8). The incidence of cystobiliary communication ranges between 13 and 37%, and we determined it as 38.46% in the present study. This communication is determined in three ways: preoperatively, peroperatively, and postoperatively. The detection of cystobiliary communication in the preoperative period decreases the incidence of complications, such as prolonged biliary drainage, biliary abscesses, billiary peritonitis, and duration of hospitalization. In a study by Demircan et al. (2), the rate of complications was found to be 10% in patients without biliary leak and 53.7% in those with biliary complications. In various studies, it has been established that postoperative biliary leak protracts the duration of hospitalization. For example, Kayaalp noted that the prolongation of hospitalization was significant, ranging from six to 16 days (1). Moreover, preoperative detection of cystobiliary communication guides the selection of the ideal treatment procedure and scolicidal agent (9).

Following selective preoperative ERCP carried out in accordance with clinical and radiological criteria, a pronounced fall in the incidence of postoperative leakage was demonstrated (9). Although it has been suggested that preoperative endoscopic sphincteromy minimizes the development of leakage after surgical intervention, there is no published data supporting the routine use of ERCP preoperatively in patients with cyst hydatid without biliary communication (10). Even though ERCP is minimally invasive, in view of its complications, it is more reasonable to perform ERCP preoperatively in patients that are likely to develop fistulas. In patients with cystobiliary communication, performing ERCP at the perioperative period, before cystic pressure on leakage or fistula drops, will be more

effective than carrying it out at the postoperative period. Therefore, detecting patients that might develop biliary fistulas in the preoperative period will not only help determine the best treatment strategy but also minimize the rate of postoperative complications and morbidity, as well as the duration of hospital stay. Therefore, in the present study, we attempted to determine which parameters indicating cystobiliary communication in the preoperative period were prognostic. Although a cyst size of over 7.5 cm and 10.5 cm was considered independent parameters prognostic of occult cystobiliary communication in previous studies by Kilic et al. and Atli et al., respectively, we found no relation between cyst size and cystobiliary communication (2,4,7).

In the present study, the volume analysis using MRI did not

present as a risk factor for cystobiliary communication. At the onset of the study, we expected according to the Laplace law that the pressure would-be maximum at the location where the volume was largest and biliary leakage would increase with the effect of the increasing pressure. However, the volume was nota significant prognostic factor for cystobiliary communication. In cystobiliary communication, due to the intracystic pressure (30–80 cmH_2O) being higher than that in the biliary system (15–20 cmH_2O) raises the question of whether the volume was lower due to the drainage of the cyst fluid into the biliary system.

When the relation between cyst location and cystobiliary communication is considered, Kayaalp et al. (1) found that in cysts in the segments closer to the hilus, there was a significant difference between the patients with and without cystobiliary communication; however, we found no such significant difference in the present study. This may originate from the fact that our number of patients was lower or statistical power was not sufficient to demonstratesuch differences.

Although there was no statistically significant difference between the groups with and without biliary leak in terms of the number, size and location of the cysts, the logistic regression analysis revealed the presence of significant relationship between the number of cysts and proximity to the hilar region t, which may shed light on future studies.

When biochemical parameters were compared between the groups with and without biliary leak, a significant difference was observed in terms of ALP, AST and ALT values, but there was no significant difference in GGT and bilirubin levels. The difference was most significant in AST values. In a study by Demircan et al. (2), increased ALP, GGT and bilirubin levels were found to be independent prognostic markers for occult biliary leak. Similarly, in a case report presented by Kayaalp et al. (11), the bilirubin, AST, ALT, GGT and ALP values were determined to be higher in of the presence of a cystobiliary relationship.

CONCLUSION

In conclusion, we found no significant relation between the presence of preoperative cystobiliary communication and localization, volume and size of HD cysts. However, the AST, ALT and ALP values presented as significant markers of cystobiliary communication. In conclusion, in the detection of preoperative cystobiliary communication, radiological and clinical findings should be evaluated together.

Competing interests: The authors declare that they have no competing interest.
Financial Disclosure: There are no financial supports
Ethical approval: Ethical approval was not compulsory in retrospective studies at that time of the study designed.

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