CLINICAL SCIENCE

Leakage tests reduce the frequency of biliary fistulas following hydatid liver cyst surgery

Cuneyt Kayaalp,[I] Cemalettin Aydin,[I] Aydemir Olmez,[I] Sevil Isik,[II] Sezai Yilmaz[I]

[I]Turgut Ozal Medical Center, Department of General Surgery, Inonu University, Malatya, Turkey. [II]Department of General Surgery, Ordu University, Ordu, Turkey.

BACKGROUND AND AIM: Biliary fistulas are the most common morbidity (8.2-26%) following hydatid liver surgery. The aim of our study was to reduce the incidence of postoperative biliary fistulas after the suturing of cystobiliary communications by applying a bile leakage test.

PATIENTS AND METHODS: A total of 133 hydatid liver cysts from 93 patients were divided into two groups, according to whether the test was performed. Tests were performed on 56 cysts from 34 patients, and the remaining 77 cysts from 59 patients were treated without the test. In both groups, all visible biliary orifices in the cysts were suture ligated, and drains were placed in all cysts. The visibility of the biliary orifices and postoperative biliary drainage through the drains were recorded. Patients in both groups were also compared with respect to the number of days living with the drains, the length of the hospital stay, and secondary interventions related to biliary complications.

RESULTS: Biliary orifices were more visible in the tested cysts (13% vs. 48%; $P < 0.001$). Fewer biliary complications occurred in the tested patients (8.8% vs. 27.7%, $P = 0.033$). The mean drain removal time (4.1 ± 3.3 days vs. 6.8 ± 8.9 days, $P < 0.05$) and the length of the hospital stay (6.7 ± 2.7 days vs. 9.7 ± 6.3 days, $P < 0.01$) were shorter for the tested patients. None of the patients in the test group required postoperative Endoscopic retrograde cholangiopancreaticography (ERCP) or nasobiliary drainage (0.0% vs. 8.4%, $P = 0.09$). There were no long-term biliary complications for either group after three years of follow-up.

CONCLUSIONS: Identification of biliary orifices with a bile leakage test and the suturing of cystobiliary communications significantly reduced postoperative biliary complications following hydatid liver surgery.

KEYWORDS: .

Kayaalp C, Aydin C, Olmez A, Isik S, Yilmaz S. Leakage tests reduce the frequency of biliary fistulas following hydatid liver cyst surgery. Clinics. 2011;66(3):421-424.

Received for publication on September 7, 2010; **First review completed on** October 7, 2010; **Accepted for publication on** November 22, 2010

E-mail: cuneytkayaalp@hotmail.com / ckayaalp@inonu.edu.tr

Tel.: 90 422341 0660 / 3706

INTRODUCTION

Direct communications with bile ducts are usually asymptomatic and result in postoperative biliary fistulas, which constitute the most common morbidity (8.2-26%) after hydatid liver surgery.[1,2] Invisible bile duct orifices in cyst cavities are the main cause of postoperative biliary fistulas. Previously, the bile leakage test has been used for the prevention of biliary complications after hepatectomies.[3,4] In this study, we aimed to lower the rate of postoperative biliary fistulas at the site of hydatid liver cysts by suturing the communications with the implementation of a bile leakage test.

METHODS

Patient selection:

We used our hydatid cyst databank, the data in which was collected prospectively using standard forms, and only hydatid liver patients who underwent surgery between 1997 and 2007 were evaluated for this study. Our databank included 243 patients from this period, and we constructed two homogenous groups to analyze the effect of using the leakage test. We included only patients with external tube drainage and excluded patients with omentopexy, introflexion, or capitonnage to eliminate effect of the cavity management factor on postoperative biliary complications. We also excluded those patients with biliary decompression (via a T-tube or choledochoduodenostomy) and those who had undergone radical surgery such as a hepatectomy or a total pericystectomy. The remaining patients were divided into two groups depending on whether the leakage test was performed. The group selection was not randomized but was based on the surgeon's preference. All surgeons used

the same technique for hydatid liver surgery, but only two of these surgeons (C.K. and C.A.) performed the bile leakage test routinely to find hidden biliary orifices. All patients were informed of these procedures.

Surgical technique:

The details of our surgical technique for the treatment of hydatid liver cysts have been described elsewhere.[5] After evacuating the cyst contents, the dome of the cyst was opened widely and the inner surface of the cyst wall was examined meticulously for biliary orifices. If any biliary orifices were visible, they were sutured with 3/0 polyglycolic acid sutures. The remaining cavity was managed with external tube drainage. Drains were placed into each cyst cavity, and an additional drain was placed in the foramen of Winslow. Drains were kept for three days postoperatively and were removed in the absence of bile leakage. If bile drainage occurred, drains were kept in place until the drainage ceased.

The test involved passing a 22 G venous catheter through the anterior wall of the common bile duct or the cystic duct stump if a cholecystectomy had been performed. After occluding the distal part of the common bile duct with a sling, normal saline was injected into the intrahepatic bile ducts slowly with a syringe. Any biliary orifices visualized were sutured with 3/0 polyglycolic acid sutures. The catheter was removed from the common bile duct, and the orifice that it had been inserted through was sutured with 6/0 polyglycolic acid fiber. Cavity management methods, drain placements and postoperative drain removal protocols were the same for the no-test group.

Measured outcomes:

For both groups, we analyzed the age and sex of the patients, the number of cysts, cyst contents and diameter and whether the cysts were primary or recurrent. Complicated and non-complicated cysts were identified in both groups; cysts were defined as complicated if they contained bilious or purulent material. During the surgical procedure, the number of visible biliary orifices in each cyst was recorded. Postoperatively, the biliary drainage through the abdominal drains was monitored. The diagnosis of biliary leakage based on the color of the drainage fluid, and drains were removed if there was no bilious drainage. Patients who exhibited biliary drainage from the abdominal drains for 1-10 days were defined as having temporary biliary leakage, whereas they were considered to have biliary fistulas if leakage persisted for more than 10 days.[1] If there was prolonged biliary drainage (more than 10 days), the treatment plan was determined based on the amount of biliary drainage. If the biliary fistulas (drainage more than 10 days) drained <100 ml daily, the patients were treated conservatively until spontaneous cessation occurred. If the daily drainage was >100 ml, the patient underwent endoscopic retrograde cholangiopancreatography (ERCP) and nasobiliary drainage.

Statistical analysis:

Statistical analyses were performed with SPSS for Windows version 13.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were compared as independent samples using a Student's t-test. Continuous variables were evaluated by their mean and standard deviation. Categorical variables were compared using either a Pearson chi-square test or Fisher's exact chi-square test as appropriate. Values of $P < 0.05$ were considered to be statistically significant.

RESULTS

This study evaluated 133 hydatid liver cysts from 93 patients. The patients were 38 men and 55 women with a mean age of 42 years (range 18-62 years). Sixty-six patients had one cyst, whereas 27 patients had two or more cysts. The mean cyst diameter was 8.5 cm (range 5-20 cm). Thirty-eight cysts contained bilious or purulent material and were defined as complicated cysts. The remaining 95 cysts were defined as non-complicated. Eight patients (7.1%) had undergone previous hydatid liver surgery and had recurrent hydatid cysts. Elevated alkaline phosphatase and gamma-glutamyl transferase levels were found in 21 (23%) patients. Two patients had undergone previous cholecystectomies, and nine patients required a cholecystectomy during the hydatid cyst surgery. Leakage tests were performed for 56 cysts from 34 patients, and the remaining 77 cysts from 59 patients were treated without the test. Data for both groups indicating the number of cysts and the number of patients are summarized in Table I. Generally, the groups were comparable, but there were more cases of multiple cysts and complicated cysts among the test group patients.

Among the cysts that were not tested, 10 visible orifices were detected for 77 cysts (13%). Among the tested cysts, 27 visible orifices were observed for 56 cysts (48%), which was a significant difference ($P < 0.001$).

Overall, 19 (20.5%) postoperative biliary complications occurred among 93 patients. Temporary biliary leakage (drainage for 1-10 days) in the tested and untested groups occurred in 5.9% and 11.9% of patients, respectively ($P = .29$). Fewer cases of persistent biliary drainage (drainage for more than 10 days) were observed in the tested patients (2.9% vs. 14.8%, $P = 0.06$). Overall, fewer postoperative biliary complications occurred in the tested patients (8.8%

Table I - Characteristics of groups.

Patient characteristics	Test group	No-test group	Total	P
Number of patients	34	59	93	-
Female (%)	22 (65)	33 (56)	55 (59)	0.41
Mean age of patients, years (range)	43 (25-62)	41 (18-63)	42 (18-63)	0.38
Elevated ALP & GGT (%)	10 (29)	11 (19)	21 (23)	0.46
No. of cysts per patient:				
One (%)	19 (56)	47 (80)	66 (71)	
Multiple (%)	15 (44)	12 (20)	27 (29)	0.02
Recurrent cases (%)	2 (6)	6 (10)	8 (9)	0.38
Cholecystectomy (%)	4 (12)	7 (12)	11 (12)	1.00
Cyst characteristics				
Number of cysts	56	77	133	-
Cyst diameter (cm)	8.6 ± 3.7	8.4 ± 3.8	8.5 ± 3.7	0.71
Location of the cyst Left lobe (%)	12 (21)	24 (31)	36 (27)	0.24
Right lobe (%)	44 (79)	53 (69)	97 (73)	
Type of cyst				
Uniloculated (%)	33 (59)	49 (63)	82 (62)	0.34
Multiloculated (%)	18 (32)	16 (21)	34 (25)	
Degenerated (%)	5 (9)	12 (16)	17 (13)	
Complicated cysts (%)	23 (41)	15 (19)	38 (28)	0.01

ALP: Alkaline phosphatase
GGT: Gamma-glutamyl transferase

vs. 27.7%, P = 0.03; Table 2). There were no complications as a result of direct bile duct puncture and suture closure of the puncture site. This was determined by the absence of biliary drainage from the drain in the foramen of Winslow.

Nine of the 19 biliary complications occurring in these patients resolved spontaneously within 10 days (temporary biliary leakage), whereas 10 patients presented with biliary drainage for more than 10 days and were considered to have persistent fistulas. In four patients, the biliary fistulas drained <100 ml daily, and these patients were treated conservatively until spontaneous cessation occurred. In the remaining five patients, the daily drainage was >100 ml, and these patients underwent endoscopic retrograde cholangiopancreatography (ERCP) and nasobiliary drainage. The last patient had daily drainage >100 ml, but this individual refused ERCP and was treated conservatively. All of the fistulas closed between 2-10 weeks without surgery. The mean time before drain removal was longer in the untested patients (4.1 ± 3.3 vs. 6.8 ± 8.9, p = 0.0456). ERCP and nasobiliary drainage was performed in 5 of the 59 patients in the no-test group, but none of the patients required ERCP in the test group (0.0% vs. 8.4%, p = 0.09). The length of the hospital stay was shorter in the tested patients (6.7 ± 2.7 vs. 9.7 ± 6.3, p = 0.009). There were no long term biliary complications for either group of patients after a three year follow-up.

DISCUSSION

Hydatid disease can be treated surgically using many different techniques, which range from simple evacuation to major liver resection. These techniques can be subdivided into the two following groups: radical or conservative. Radical methods involve total excision of the cyst, while conservative methods involve removal of the cyst contents and inactivation of the protoscoleces. Some surgeons favor pericystectomy or hepatectomy whenever possible. Other surgeons, especially in endemic areas, prefer conservative surgery in most cases. Radical surgical methods have been reported to have fewer biliary complications;[6,7] however, such methods usually require a surgeon experienced with liver resections and sometimes require special surgical equipment. Moreover, these surgeries are difficult and are not suitable for every cyst, especially for cysts that are adherent to major vessels of the hepatic vasculature. In contrast, almost all hydatid liver cysts can be treated using a conservative surgical approach, and a general surgeon can perform successful conservative surgery with standard surgical equipment. However, the incidence of biliary fistulas and cavity-related complications is greater after conservative surgery because of invisible bile duct orifices in the hydatid cyst cavity. Postoperative transient biliary leakage or persistent fistulas after conservative surgery occur in 8.2-26% of cases.[1,2] The risk of a postoperative biliary fistula is higher for bile-stained cysts,[8] large cysts,[9,10] cysts located in the liver hilum,[11] and in patients with elevated liver function tests.[1,9,10]

Biliary decompression with a T-tube,[12] cystoenteric anastomosis,[13] cavity obliteration with omentum,[14] or fibrin glue[15] are methods for reducing postoperative biliary fistulas in hydatid liver cysts. Silva et al.[12] examined the effects of temporary biliary drainage in patients with complicated hydatid cysts and reported a greater incidence of postoperative bile leakage if the biliary system was not drained temporarily (14% vs. 75%). Although a T-tube in the common bile duct decreases the number of biliary complications, there is still a 14% risk of a postoperative biliary fistula. In addition, similar rates of biliary fistulas and cavity-related complications (13.7%) have been reported after hydatid surgery with a T-tube or choledochoduodenostomy.[16] Biliary decompression alone, without cystobiliary disconnection, does not effectively decrease the incidence of biliary fistulas or cavity-related complications. However, suturing the biliary orifices in addition to T-tube drainage may increase the success rate in terms of the occurrence of biliary fistulas. We found that suturing after performing the leakage test decreased the rate of persistent biliary fistulas to 2.9%, even in cysts drained without a T-tube. Low rates of persistent biliary fistulas eliminate the routine use of a T-tube, which itself increases the morbidity and postoperative hospital stay length.

Generally, obliteration of the cyst cavity has been reported to have better results than external drainage for hydatid liver surgery, and omentoplasty is a popular and effective method for this purpose. However, even with omentoplasty, biliary-related complications occur in 13.5-89.4% of cases, particularly among those with complicated cysts.[14,17] In addition, obliteration with omentum tissue can be unsatisfactory if the volume of the omentum is inadequate (often the omentum has thinned in thin patients and in patients who have undergone a previous omentectomy) or if multiple cysts exist. Overall, we believe that simply filling the cavity with omentum without suturing the biliary orifices does not completely prevent biliary leakage or cavity infections.

Internal drainage with a Roux-en-Y cystojejunostomy has been described as a valid technique for treating some hydatid liver cysts. However, the application of this procedure to cysts located posteriorly and to multiple cysts is difficult, and cavity infections after a cystojejunostomy are not uncommon despite decreased biliary fistula rates.[13] Obliteration of the hydatid cavity with fibrin glue has also been reported to be an effective method of avoiding biliary leakage.[15] The routine use of fibrin glue in hydatid cavities is expensive, which is particularly important in developing countries where hydatid disease is endemic. Moreover, a recent study of 300 patients demonstrated that the application of fibrin glue to the hepatectomy surface does not seem justified for the prevention of biliary complications.[18] Therefore, we did not used fibrin glue in the treatment of our patients.

This study evaluated the role of the leakage test in hydatid liver surgery and found that thus use of this test effectively decreased biliary complications, particularly in cases of

Table II - Results from both groups of patients.

		Transient biliary leakage*	Persistent biliary leakage**	Total biliary complications***
Intraoperative leakage test	Performed (%)	2/34 (5.9)	1/34 (2.9)	3/34 (8.8)
	Not performed (%)	7/59 (11.9)	9/59 (14.8)	16/59 (27.7)
	Total (%)	9/93 (9.7)	10/93 (10.8)	19/93 (20.5)

*P = 0.29
**P = 0.06
***P = 0.03

persistent biliary fistulas. The leakage test did not prevent biliary leakage completely because small segmental biliary orifices could still cause bile drainage, but the leakage in these cases was usually self-limiting and ceased within several days. Prolonged high-volume biliary drainage generally originates from major cystobiliary communications, and suturing these communications decreases the incidence of persistent fistulas. This testing method can be applied to every hydatid liver cyst without any selection criteria and can be used in combination with other methods, such as omentoplasty and T-tube drainage if necessary. We believe that the intraoperative identification and suturing of cystobiliary communications is an important step in hydatid liver surgery.

CONCLUSIONS

This study revealed that identification of biliary orifices with the bile leakage test and the subsequent suturing of cystobiliary communications reduced postoperative biliary complications following hydatid liver surgery.

REFERENCES

1. Kayaalp C, Bzeizi K, Demirbag AE, Akoglu M. Biliary complications after hydatid liver surgery: incidence and risk factors. J Gastrointest Surg. 2002;6:706-12, doi: 10.1016/S1091-255X(02)00046-X.
2. Balik AA, Basoglu M, Celebi F, Oren D, Polat KY, Atamanalp SS, et al. Surgical treatment of hydatid disease of the liver: review of 304 cases. Arch Surg. 1999;134:166-9, doi: 10.1001/archsurg.134.2.166.
3. Ijichi M, Takayama T, Toyoda H, Sano K, Kubota K, Makuuchi M. randomized trial of the usefulness of a bile leakage test during hepatic resection. Arch Surg. 2000;135:1395-1400, doi: 10.1001/archsurg.135.12.1395.
4. Suehiro T, Shimada M, Kishikawa K, Shimura T, Soejima Y, Yoshizumi T, et al. In situ dye injection bile leakage test of the graft in living donor liver transplantation. Transplantation. 2005;80:1398-1401, doi: 10.1097/01.tp.0000181166.63783.69.
5. Kayaalp C. Hydatid cyst of the liver. In: Blumgart LH, Belghiti RJ, DeMatteo RP, Chapman WC, Büchler MW, Hann LE, et al., eds. Surgery of the Liver, Biliary Tract, and Pancreas. 4th ed. Philadelphia: Saunders Elsevier, 2007. p. 952-70.
6. Yagci G, Ustunsoz B, Kaymakcioglu N, Bozlar U, Gorgulu S, Simsek A, et al. Results of surgical, laparoscopic, and percutaneous treatment for hydatid disease of the liver: 10 years experience with 355 patients. World J Surg. 2005;29:1670-9, doi: 10.1007/s00268-005-0058-1.
7. Agaoglu N, Türkyilmaz S, Arslan MK. Surgical treatment of hydatid cysts of the liver. Br J Surg. 2003;90:1536-41, doi: 10.1002/bjs.4313.
8. Kayaalp C, Sengul N, Akoglu M. Importance of cyst content in hydatid liver surgery. Arch Surg. 2002;137:159-63, doi: 10.1001/archsurg.137.2.159.
9. Atli M, Kama NA, Yuksek YN, Doganay M, Gozalan U, Kologlu M, et al. Intrabiliary rupture of a hepatic hydatid cyst: associated clinical factors and proper management. Arch Surg. 2001;136:1249-55, doi: 10.1001/archsurg.136.11.1249.
10. Demircan O, Baymus M, Seydaoglu G, Akinoglu A, Sakman G. Occult cystobiliary communication presenting as postoperative biliary leakage after hydatid liver surgery: are there significant preoperative clinical predictors? Can J Surg. 2006;49:177-84.
11. Kayaalp C, Bostanci B, Yol S, Akoglu M. Distribution of hydatid cysts into the liver with reference to cystobiliary communications and cavity-related complications. Am J Surg. 2003;185:175-9, doi: 10.1016/S0002-9610(02)01202-3.
12. Silva MA, Mirza DF, Bramhall SR, Mayer AD, McMaster P, Buckels JA. Treatment of hydatid disease of the liver. Evaluation of a UK experience. Dig Surg. 2004;21:227-33, doi: 10.1159/000079492.
13. Sayek I, Yalin R, Sanaç Y. Surgical treatment of hydatid disease of the liver. Arch Surg 1980;115:847-50.
14. Dziri C, Paquet JC, Hay JM, Fingerhut A, Msika S, Zeitoun G, et al. Omentoplasty in the prevention of deep abdominal complications after surgery for hydatid disease of the liver: a multicenter, prospective, randomized trial. French Associations for Surgical Research. J Am Coll Surg. 1999;188:281-9, doi: 10.1016/S1072-7515(98)00286-5.
15. Hofstetter C, Segovia E, Vara-Thorbeck R. Treatment of uncomplicated hydatid cyst of the liver by closed marsupialization and fibrin glue obliteration. World J Surg. 2004;28:173-8, doi: 10.1007/s00268-003-6932-9.
16. Elbir O, Gundogdu H, Caglikulekci M, Kayaalp C, Atalay F, Savkilioglu M, et al. Surgical treatment of intrabiliary rupture of hydatid cysts of liver: comparison of choledochoduodenostomy with T-tube drainage. Dig Surg. 2001;18:289-93, doi: 10.1159/000050154.
17. Rakas FS, el-Mufti M, Mehta PM, Abuthina H, Challeni CR. Omentoplasty or tube drainage for the management of the residual cavity following the removal of an hepatic hydatid cyst. Hepatogastroenterology. 1990;37:55-7.
18. Figueras J, Llado L, Miro M, Ramos E, Torras J, Fabregat J, et al. Application of fibrin glue sealant after hepatectomy does not seem justified: results of a randomized study in 300 patients. Ann Surg. 2007;245:536-42, doi: 10.1097/01.sla.0000245846.37046.57.