

## STUDY OF BILE LEAK AFTER HEPATIC HYDATID CYST SURGERY IN BASRAH

**Nazar Jawad Sawady\* & Zaki Al-Faddagh#**

\*MB,ChB, Board Candidate, Al-Mawani General Hospital. #CABS, Professor, Chairman of Department of Surgery, Basrah College of Medicine, Basrah University.

### Abstract

Conservative surgery (partial peri-cystectomy and cyst contents evacuation with cavity management by external drainage, omentoplasty or capitonnaige) for uncomplicated hydatid cysts of the liver is known to be safe but is often associated with bile leak in rate of 18.81% and its sequela.

The cause of bile leak is almost always due to cysto-biliary communication, this is usually occult and difficult to be diagnosed pre-operatively, if remain undiagnosed intra-operatively it will be presented as post-operative bile leak.

In this study, several laboratory and radiological predictors used to evaluate those patients having high risk of bile leak after conservative hepatic hydatid cyst surgery. Also it aimed to study the fate of bile leak, it's complications, how to avoid it and the way of management.

This study is a combined prospective (from 2004-2010) & retrospective cases study performed in basrah hospitals, Iraq; (Al-Mawani Hospital, Basrah General Hospital, Al-Sader Teaching Hospital, and some of Private Hospitals); we analyzed records of 183 cases of hepatic hydatid cyst undergoing conservative surgery, of them 15 patient had bile leak intra-operatively and 20 patients had bile leak post-operatively. Patients with intra-biliary rupture of hydatid cyst or obstructive jaundice are excluded from this study.

Bile leak occur in 35 patients (18.81%) from total 183 patients of which intra-operative bile leak seen in 15 patients (43%) and 20 patients (57%) as post-operative bile leak represented as external biliary fistula.

Laboratory predictors of biliary leakage were alkaline phosphatase >250 U/L, total serum bilirubin >17 umol/l, cyst diameter >8 cm, multilocular or degenerative cyst also increase risk of bile leak. Post-operative complications are more in patients with bile leak (57%) than those without bile leak (12%).

Hospital stay is longer in patients with bile leak 4.9 weeks while it is 1.06 week in those without bile leak.

In conclusion, bile leak is not uncommon after hepatic hydatid cyst surgery, it can be predicted by certain laboratory and radiological factors thus indicate the need for additional procedures during operation to detect the cysto-biliary communication and manage the biliary leakage and its complications.

### Introduction

**L**iver hydatid disease is a common health problem in the middle east including Iraq, it is caused by larval stage of a tape worm, *Echinococcus granulosus*, and in 70-80% of cases occur in the liver<sup>1-6</sup>.

Surgery is the mainstay of treatment and it is the only curative approach, medical treatment (albendazol, mebendazol) is of limited use<sup>1-3,6,7</sup>.

The objectives of surgical approach are: inactivate scolices, prevent spillage of cyst contents, eliminate viable daughter cysts and manage the residual cavity by external drainage, omentoplasty or capitonnaige<sup>1,6</sup>.

The safest surgical approach is open partial peri-cystectomy (de-roofing) with endo-cystectomy (complete cyst evacuation) and external drainage,

although this surgery is safe, simple, faster, easier, less blood loss, used in very large cyst and used in management of deep cysts of liver hydatidosis, but it has varieties of complications<sup>1,2,8,9</sup>.

The most common complication is being bile leak from a cysto-biliary communication and its sequels like prolong biliary-cutaneous fistula through the drain placed during surgery<sup>2,7,8</sup>.

Pathophysiology of bile leak: intra-cystic pressure is 30-80mm H<sub>2</sub>O, while normal biliary pressure is 15-20 mmH<sub>2</sub>O so the flow is toward biliary system into duodenum through ampulla of Vater; the pericyst acts as a mechanical barrier, after surgery this pressure gradient will be reversed & bile leak occur if there is cysto-biliary communication<sup>1,4</sup>.

Almost always, cases of the bile leak is due to cysto-biliary communication, the clinical findings and radiological features (U/S, CT-scan, MRI) are non specific and non valuable in detecting occult cysto-biliary communication pre-operatively<sup>2,6</sup>.

The occult cysto-biliary communication may be diagnosed at surgery and managed intra-operatively, but if remain undetected & unrepaired, postoperative bile leak will ensue this will result in prolong biliary drainage and it will increase morbidity & hospital stay<sup>8,9</sup>.

Thus it is important to predict cysto-biliary communication pre-operatively and concentrate on intra-operative diagnosis to prevent post-operative bile leak<sup>8-10</sup>.

Intra-operative bile leak may be seen when bile stained aspirate is found or swapping of the cavity or direct bile leak seen in the cavity from a small or a large bile ducts after endocystectomy<sup>7,8,11</sup>.

Small intra-operative bile leak is managed by suturing of cysto-biliary communication with external drainage or omentoplasty or captonnaige. Large intra-operative bile leak managed by internal drainage (cysto-enterostomy)<sup>12,13</sup>. These management are successful in prevention of post-operative bile leak in

most cases of intra-operative bile leak<sup>7,8,11-13</sup>.

Post-operative bile leak appears as controlled external fistula in most cases, it may be presented as bilioma (intra-abdominal bile collection) or biliary peritonitis especially when drain is removed. other clinical findings also common like right upper quadrant pain, fever and leucocytosis<sup>7,9</sup>.

There are several laboratory predictors pre-operatively that can predict biliary leakage due to occult cysto-biliary communication these are: alkaline phosphatase >250 u/l; total serum bilirubin >17 umol/l; alanine aminotransferase (ALT) >33.5 u/l; aspartate aminotransferase (AST) >29.5 u/l elevation above these.

Limits are found to be associated with increase post-operative bile leak<sup>6,7,13</sup>;

Certain Radiological features of the hydatid cyst of liver e.g Cyst diameter >8cm; multilocular cyst and degenerative cysts are also associated with high risk of bile leak<sup>7,6,14</sup>.

No relation between bile leak and age, sex, region and symptoms; also no difference was found in terms of nature of cyst whether primary or recurrent; single or multiple; and their location (right, left or both) these did not affect the risk of biliary leakage in most of series<sup>6,15,16</sup>.

The major morbidity of conservative surgery is post-operative bile leak its incidence is ~25%; other complications may occur e.g; wound infection; sub-hepatic abscess; cavity infection and others (pulmonary complications e.g atelectasis or pneumonia)<sup>1,6,7,13,15</sup>.

Fate of post-operative bile leak: most series suggest spontaneous closure of bilio-cutaneous fistula in median time 40-120 days<sup>6,9,13,15,16</sup>.

If fistula did not close or it is of high output (>300ml/day), this suggest a large cysto-biliary communication and it need ERCP for confirmation of diagnosis & treatment by endoscopic sphincterotomy and the success rate 90-100%<sup>7-9</sup>.

Patients with prolonged bile leak may need re-operation for suturing of cysto-biliary fistula if visible; or biliary decompression procedures e.g (t.tube drainage; trans-duodenal sphincterotomy; choledocho-duodenostomy); or may need internal drainage (cysto-enterostomy)<sup>1,3,7,9</sup>.

### Aim of the study

1. Is to evaluate those patients who have bile leak after hepatic hydatid cyst surgery.
2. Predict which of patients have high liability for bile leak by studying different laboratory and radiological predictors pre-operatively.
3. Study the fate and management of bile leak intra-operatively and post-operatively.

### Patients & methods

It is a combined prospective (from Jan. 2004- Apr. 2010) & retrospective cases study performed in Basrah Hospitals, Iraq; (Al-Mawani Hospital, Basrah General Hospital, Al-Sader Teaching Hospital, and some of private hospitals); collecting 183 cases of hepatic hydatid cyst undergoing conservative surgery, of them 15 patient had bile leak intra-operatively and 20 patients had bile leak post-operatively. Patients with intra-biliary rupture of hydatid cyst are excluded from this study.

According to pre-operative laboratory findings, imaging studies or operative findings, patients records were reviewed & results were recorded on a standard form (questionnaire page 18). This includes age, sex, the region, laboratory data, cyst structural study (by imaging) include: cyst size, location (right lobe or left lobe or both lobes); cyst was primary

or recurrent, single or multiple, unilocular or multilocular or degenerative cyst; intra-operative findings; post-operative findings: including time of closure of biliary fistula, complications (morbidity), mortality and duration of hospital stay.

If Bile leak through the drain is <300ml/day this considered as low output biliary fistula, but when its >300ml/day this considered as high output fistula.

The Scolicidal agents used in patient are hypertonic saline 20% or povidone iodine 10%.

Laboratory data include: LFT: upper normal limits (cutoff values) for LFT were as follows: ALP 270 u/l; TSB 20umol/l; ALT 41 u/l and AST 37u/l.

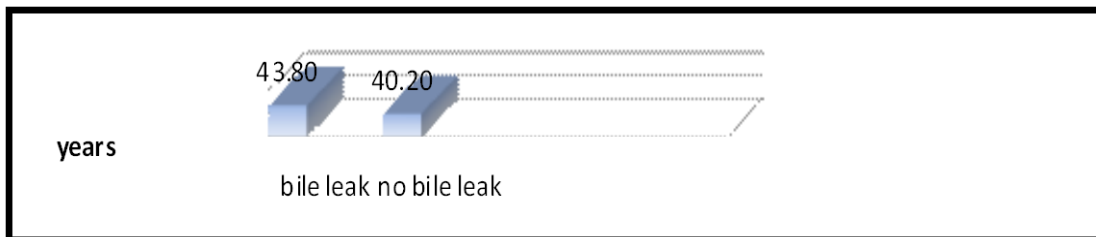
Diagnosis of hepatic hydatid cyst done by U/S & or CT-scan.

The results are presented as mean (and SD) and number (and %); many statistical tests were used like: student t test and x<sup>2</sup> test for variables; significance was set at p<0.05; Demographic , laboratory and radiological variables analysis used to assess the factors associated with biliary leakage. Stastical parameters e.g.' sensitivity, specificity, positive predicative value, negative predicative value, odds ratio and p value done for each variable.

### Results

Total number of patients included in this study is 183 having hepatic hydatid disease underwent surgical removal of hydatid cyst, from them 35 patients (18.81%) have bile leak: 15 patients (43%) intra operative and 20 patients (57%) post-operative; the rest 148 patients have no bile leak; In patients with bile leak mean age was 43.80 year, while in patients without bile leak mean age was 40.20 year ( Figure 1).

**Figure 1: Mean age of patients with and without bile leak**



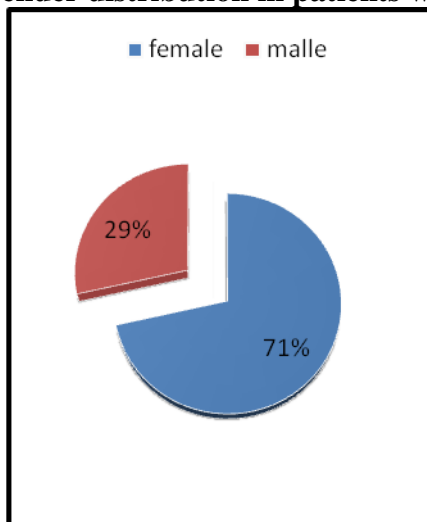
**Table I: Age distribution of patients with & without bile leak.**

Age group (years)	No. (%)of patients with bile leak intra- & post-operative	No.(%)of patients with no bile leak
<15	0 (0%)	2 (1.35%)
15-24	3 (8.5%)	20 (13.51%)
25-34	5 (14.28%)	30 (20.27%)
35-44	8 (22.85%)	38 (25.67%)
45-54	14 (40%)	34 (22.97%)
55-64	3 (8.5%)	22 (14.86%)
+65	2 (5.70%)	2 (1.35%)
<b>Total</b>	<b>35</b>	<b>148</b>

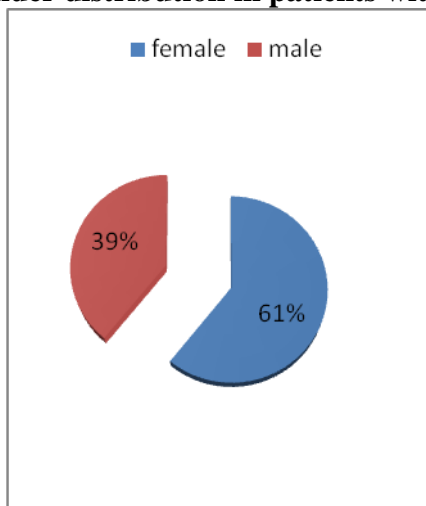
Most Patients with bile leak occur between the age of 25-54 years; the main age groups of patients without bile leak were 24-54 years; no significance difference was found between the two groups in risk of bile leak regarding age p

value >0.05. Of patients with bile leak 25 patients (71%) were females while 10 patients (29%) were males (fig.2), 90 patients (61%) without bile leak were females and 58 patients (39%) without bile leak were males (fig.3).

**Figure 2: Gender distribution in patients with bile leak.**



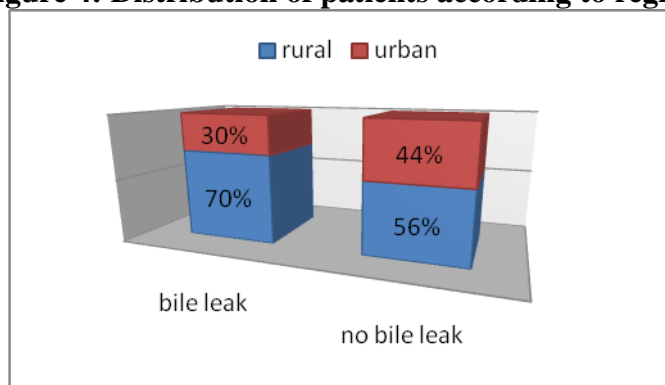
**Figure 3: Gender distribution in patients without bile leak.**



Of the 35 patients with bile leak 24 patients (70%) came from rural areas and 11 patients (30%) were came from urban region; while patients without bile leak that came from rural areas were 83

patients (56%) and those came from urban region were 65 patients (44%) (fig. 4). There is no difference in risk of bile leak between patients came from rural or urban areas p value > 0.05.

**Figure 4: Distribution of patients according to region.**



The demographic characteristics of patients with and without bile leak were compared, we found no differences in age, sex and place of residence between the two groups (p>0.05).

Primary hydatid cyst found in 30 patients (85.72%) of patients with bile leak while 5 patients (14.28%) had recurrent cyst; table II.

In patient without bile leak primary hydatid cysts were 138 patients (93.24%) and 10 patients 6.76% were recurrent cysts. table II.

The frequency of biliary leakage was not affected by cysts being single or multiple (p=0.80), primary or recurrent (p=0.06)

or in which hepatic lobe they occurred (p=0.40); table II.

The mean cyst diameter was 11cm in patients with bile leak and 8cm in patients without bile leak; cyst diameter was significantly higher in patients with biliary leakage (p<0.001). The sensitivity of cyst diameter>8 cm in prediction of post-operative bile leak is 76% and its specificity is 73%. Table II&IV.

Unilocular cysts occurred in 7 patients (20%) in patients with bile leak group, 15 patients (42.86%) are multilocular and 13 patients (37.14%) are degenerative; while in patients without bile leak the unilocular cysts occurred in 74 patients (50%);

Multilocular cysts were 42 patients 28.35% and degenerative cysts were 32 patients (21.65%); table II&IV .

We found that no significant increase in bile leak frequency when cysts are unilocular between the two groups ( $p>0.05$ ); table II.

Multilocular or degenerative cysts were significantly increase the risk of bile leak ( $p=0.010$ ). The sensitivity of degenerative or multilocular cyst in prediction of post-operative bile leak due to occult cysto-biliary communication is 73% and its

specificity is 50%. Table II.

Regarding the structural characteristics of liver hydatid cysts, we found that in right lobe cyst occur in patients with bile leak present in 28 patients 80%, left lobe involved in 6 patients (17.14%), both lobes involved in one patient (2.86%); table II.

Patients without bile leak right lobe cyst present in 120 patient (81.08%) and left lobe cyst is 20 patients (13.51%); both lobes involved in 8 patients (5.41%); table II.

**Table II: Characteristics of hydatid cyst in patients with & without bile leak.**

Cyst features	Patients with bile leak no.(%)20 patient post- operative and 15 intra- operative.		Pt without bile leak no.(%)148patients	
	No.	%	No.	%
Single	29	(82.85%)	130	(87.83%)
Multiple	6	(17.15%)	18	(12.17%)
Right lobe	28	(80%)	120	(81.08)
Left Lobe	6	(17.14%)	20	(13.51%)
Other	1	(2.86%)	8	(5.41%)
Primary	30	(85.72%)	138	(93.24%)
Recurrent	5	(14.28%)	10	(6.76%)
Unilocular	7	(20%)	74	(50%)
Multilocular	15	(42.86%)	42	(28.35%)
Degenerative	13	(37.14%)	32	(21.65%)
Mean cyst diameter. cm	11 cm		8 cm	

The mean values of LFT in patients with bile leak were of upper normal limit (ALP 250 u/l; ALT 33.5u/l, AST 29.5u/l&TSB 17umol/l) table-III. The mean values of LFT in patients without

bile leak were ALP=150u/l, ALT=25u/l, AST=24u/l, TSB= 11umol/l; we found that ALP, ALT, AST, TSB were all significantly increases risk of biliary leakage ( $p<0.001$ ) table-III.

**Table III: LFT values in patients with & without bile leak**

LFT mean values	Patients with bile leak	Patients with out bile leak	P value
ALP* U/L	250	150	P<0.001
ALT* U/L	33.5	25	P<0.001
AST * U/L	29.5	24	P<0.001
TSB* umol/l	17	11	P<0.001

LFT\*: liver function test; ALP\* =alkaline phosphates'; ALT\* = alanine aminotrasferase; AST\* aspartate aminotransferase; TSB\* = total serum bilirubin; Pvalue <0.05 is significant

The most significant laboratory factor, in terms of increasing the risk of biliary leakage due to an occult cysto-biliary communication, was an ALP level greater than 250 u/l( $p<0.001$ ),its sensitivity about

90%, and specificity about 85% other results of sensitivity and specificity of laboratory factors derived using statistical parameters to predict biliary leakage seen in table IV.

**Table IV: Sensitivity & specificity of laboratory and radiological factors to predict bile leak**

Laboratory&radiological factor	Statistical parameter %		
	Sensitivity%	Specificity%	P value
ALP>250u/l	90	85	<0.001
TSB>17umol/l	78	73	<0.001
Cyst diameter>8cm	76	73	<0.001
ALT>33.5u/l	75	60	<0.001
AST>29.5u/l	73	70	<0.001
Degenerative or multilocular cyst	73	50	<0.01

ALP=alkalinephosphatase; ALT=alanineaminotrasferase; AST=aspartate aminotranfer-ase; TSB=total serum bilirubin; p<0.05 is significant.

The common features of intra-operative bile leake are bile stained aspirate during surgery 6/15 (40%) and bile leaking (small or large) in the cavity after cyst evacuation 9/15 (60%); The common

features of post-operative bile leak were biliary leakage through the drain in 20 patients (100%)of them 16 patients (80%) had low output fistula and 4 patients (20%) had high output fistula; see table-5.

**Table V: Clinical features of post-operative Bile leak**

Clinical feature	No.& (%)
<b>Bile leak through drain</b>	<b>20 (100%)</b>
<300ml/day	16 80%
>300ml/day	4 20%
<b>Right upper quadrant pain</b>	<b>17 85%</b>
<b>Fever</b>	<b>9 45%</b>
<b>Leucocytosis</b>	<b>0-</b>
<b>Biliary peritonitis</b>	<b>0-</b>

Four patients (26.6%) had Intra-operative bile leak managed by suturing of cysto-biliary communication with external drainage, 2 patients (13.4%) of intra-operative bile leak managed by external drainage only, 4 patients 26.6% by

suturing of communication with capitonnage, 4 patients (26.6%) of intra-operative bile leak managed by suturing of communication with omentoplasty. one patient (6.8%) treated by internal drainage (cysto-enterostomy) table-VI.

**Table (VI): Management of intra- operative bile leak**

Management of intra-operative bile leak (15) patients.	No. of patients	% of patients
<b>Suturing of cysto-biliary communication with external drainage</b>	<b>4</b>	<b>26.6%</b>
<b>Only external drainage</b>	<b>2</b>	<b>13.4%</b>
<b>Suturing withCyst evacuation+capitonnage</b>	<b>4</b>	<b>26.6%</b>
<b>Suturing, Evacuation with omentoplasty</b>	<b>4</b>	<b>26.6%</b>
<b>Internal drainage (cysto-enterostomy)(Large amount)</b>	<b>1</b>	<b>6.8%</b>

Sixteen patients (80%) of post-operative bile leak were managed by conservative approach (spontaneous closure); one patient (5%) was treated by endoscopic sphincterotomy; one patient (5%) treated

by internal drainage (cysto-enterostomy); one patient (5%) managed by Common Bile Duct exploration with t-tube drainage; one patient (5%) treated by trans-duodenal sphincterotomy.Table-VII

**Table VII: Management of post-operative patients with bile leak**

Management of post-operative bile leak (20)		No.& (%)
Conservative(spontaneous closure) external drainage		16 (80%)
endoscopic	ERCP sphincterotomy	1 (5%)
reoperative:	Cysto-enterostomy	1 (5%)
	CBD exploration+t.tube	1 (5%)
	Transduodenal sphincterotomy	1 (5%)

The rate of bile leak after hepatic hydatid cyst surgery was about 18.81% in this study (35 patients from 186). The Rate of post-operative complications were much higher in the patients with bile leak than those with out, which were 20 patients (57%) and 12 patients (8%)

respectively( $p < 0.05$ ), the most common post-operative complication was being wound infection 14 patients (40%) in patients with bile leak ,which is only 4 patients (2.70%) in patients without bile leak( $p < 0.001$ ). Table VIII

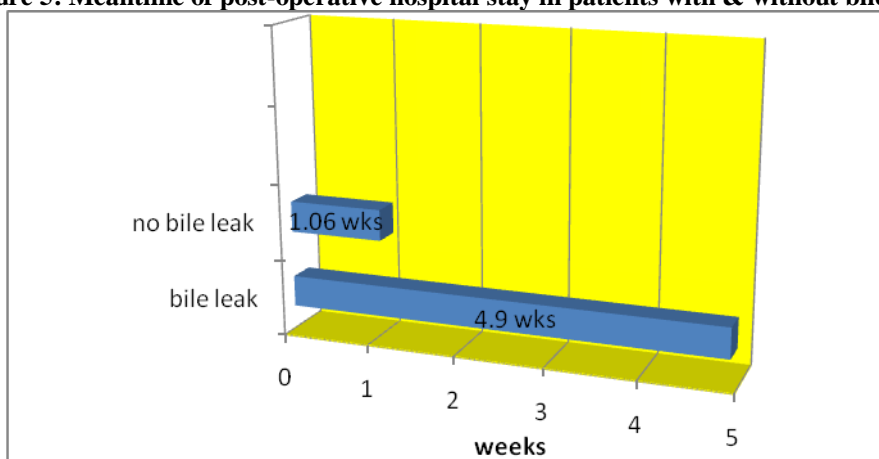
**Table VIII: Post-operative complications in patients with and without bile leak**

Complications		No. of patients with bile leak	%	No. of patients without bile leak	%
Wound infection	Abdominal.wall abscess	6	17%	2	1.35%
	Abdominal wall cellulitis	6	17%	2	1.35%
	Wound dehiscence	2	6%	0	-
Perihepatic abscess		1	3%	0	-
Others		5	14%	8	5.30%
Total		20	57%	12	8%

The mean post-operative hospital stay in patients with bile leak was 4.9 weeks; while it was 1.06 week in patients without

bile leak as in figure 5 the mean time is much greater in patients with bile leak ( $p < 0.001$ ).

**Figure 5: Meantime of post-operative hospital stay in patients with & without bile leak**





## Discussion

Partial pericystectomy with cyst evacuation followed by cavity management (external drainage, capitonnage or omentoplasty) consider simple and safe conservative technique in management of hepatic hydatid cyst, however their main disadvantage is high frequency of biliary leakage from a cysto-biliary communication which is about 18.81% in this study; which is found to be 20-25% in other series<sup>1,6,7,9,11,15</sup>.

In this study Females are more affected than male by hydatid liver disease this probably due to females deal with infected vegetables this explain why bile leak is more in females than in males. We found no significant difference in incidence of bile leak regarding sex factor between patients with and without bile leak p value >0.05. Hepatic hydatid cyst is more common in patients from rural areas this because people in rural areas their job involves dealing with animals and they don't care to disinfection of their food, this explain why bile leak was more in patients came from rural regions p value >0.05.

In this study no significant differences were found between patients with and without bile leakage in terms of sex, age, and place of residence (rural or urban) this finding is similar to other studies, Demircan et al<sup>6,7,17,18</sup>.

The nature of cyst whether it is primary or recurrent; single or multiple; and the location of cyst (right, left or both) did not affect the risk of biliary leakage in patients with hepatic hydatid cyst surgery p value >0.05, these findings are consistent with those of other studies<sup>6,12,15,18-20</sup>.

We study certain laboratory predictors that can predict biliary leakage due to occult cysto-biliary communication these are ALP>250u/l; ALT>33.5u/l; AST>29.5u/l; TSB>17umol/l ;and we found that these factors when present they associated with occult cysto-biliary communication presented as biliary

leakage, these findings are similar to other studies, Demircan et al<sup>6,7,17,18</sup>. in this study ALP level is the most important factor associated with biliary leakage (sensitivity 90%).The explanation is high intra-cystic pressure causing intermittent passage of cyst fluid, scolices and minor fragments into biliary system can cause elevated ALP, ALT, AST and TSB, these findings are similar to several studies reported by Kayaalp&colleages<sup>17</sup>; and, Atli&colleagues<sup>18</sup>.

We found that certain radiological features of liver hydatid cyst have relation with occult cysto-biliary communication like mean cyst diameter 11cm (sensitivity 76%) and this was significant predictor of biliary leakage, this is because sudden drop of intra-cystic pressure after evacuation of the cyst; Atli and colleagues<sup>18</sup> found that cysts above 13cm was an significant laboratory predictors of biliary leak due to occult cysto-biliary communication.

Kaayalp and colleagues<sup>17</sup> found that that 65% of cysts <10cm causing biliary leakage.

We found that biliary leak is more common with multilocular cysts and degenerative cysts (sensitivity is 73%) and p <0.01 which are similar to findings of Bedrili and colleagues<sup>21</sup>, Our aim is to diagnose occult cysto-biliary communication during operation that can not be demonstrated pre-operatively by imaging studies to decrease pos-operative bile leak; and clear cystic fluid aspirate does not exclude cysto-biliary communication consequently we should inspect cyst contents and the openings of communication with biliary tree are sought<sup>19,13,24</sup>, the usual method used in our hospitals is filling the evacuated cyst cavity by saline with pericystic packing and waiting for bile stains if present.

Intra-operative methods used to detect bile leak in the residual cyst cavity are packing the cyst with gauze soaked in hypertonic saline and wait for bile stains to appear or filling the cavity with normal

saline and /or injection of air from cystic duct or injection of methylen blue from gall bladder; these reveal bubbles or bile stained saline or methylen blue from an occult openings, Jabbour & colleagues<sup>8</sup>.

Ozmen & Coskun<sup>20</sup>, describe easy and reliable technique by using telescope for visualization of the cavity after conservative surgery of hepatic hydatid cysts especially when openings are difficult to be seen.

In our study 4/15 patients (26.6%) have the opening of occult cysto-biliary communication is found during operation it was sutured with absorbable sutures and externally drains the cyst cavity; 2/15 patients (13.4%) no biliary opening is seen while bile is still leaking in the cyst cavity in small amount these treated by external drainage only, 4 patients (26.6%) treated by capitonage and 4 patients (26.6%) treated by omentoplasty; one patient (6.8%) treated by cysto-enterostomy because of large bile leak which can not be sutured., these similar to other series, 20 Few series suggest routin common bile duct exploration plus t-tube in large bile leak and unavailability of ERCP<sup>7</sup>. We did not do this because it increase morbidity and usually it needs cholecystectomy, 20/35 patients (57%) of patients have post-operative bile leakage after hepatic hydatid cyst surgery presented as external biliary fistula through the drain in this study, 16/20 patients (80%) with low output fistula were dealt with conservatively for spontaneous closure in median time about 40-90 days, this is corresponding to other series<sup>6,7,13</sup>, 4 patients (20%) with persistent or high output post-operative bile leak need intervention for biliary decompression procedures to facilitate fistula closure as follow: one patient (5%) referred for ERCP sphincterotomy; one patient (5%) treated by common bile duct exploration with t-tube drainage; one patient (5%) treated by trans-duodenal sphincterotomy and one patient (5%) treated by internal drainage (cysto-enterostomy) these done

because of high output fistula. These findings are similar to other series<sup>6,9,21-23</sup> except in rate of endoscopic sphincterotomy which is higher than our rate; unfortunately, this because unavailability of ERCP in our city, also these series used ERCP for diagnosis and treatment of biliary fistula (papillotomy or stenting) after hydatid surgery in most of patients with bile leak<sup>22</sup>, 20/35 patients (57%) of patients with bile leak have post-operative complications this is significant  $p < 0.05$ . In patients without bile leak the rate of complications were 12/148 patients (8%); the most prevalent post-operative complication in patients with bile leak were wound infection which is seen in 14 patients (40%) while in patients without bile leak it is only seen in 4 patients (2.7%) this is similar to other series<sup>24,25</sup>.

The mean post-operative hospital stay is about 4.9 weeks in patients with bile leak this longer than that for patients without bile leak this is due to higher rate of post-operative complication in patient with bile leak this is similar to other series<sup>7,13</sup>. There was no mortality in our study.

## Conclusion

Cysto-biliary communication is almost always presented in patients with biliary leakage after hepatic hydatid cyst surgery; it may be occult but can be predicted by several laboratory and radiological predictors of hepatic hydatid cyst e.g ALP, ALT, AST, TSB, cyst diameter, multilocular or degenerative cysts.

Post-operative bile leak associated with high rate of post-operative complications, prolong hospital stay and increase morbidity.

Additional procedures performed in the intra-operative period help to prevent biliary leakage and its morbid complications.

When post-operative biliary fistula developed, it should be treated first by conservative methods regarding that the

amount of bile leak is decreasing and the patient general conditions are well as we do in our hospitals, if the conservative treatment is failed or the patient general conditions are unwell or the fistula of high output then intervention done.

### Recommendations

Patients with certain laboratory and radiological features of hepatic hydatid cyst pre-operatively should alert to an occult cysto-biliary communication intra-operatively.

Intra-operative bile leak should be carefully sought with meticulous inspection of residual cyst cavity after evacuation of cyst contents by placing a white laparotomy pad in the cavity for few minutes or using a telescope. Avoid usage of coloured scolicidal agents,

because it may interfere with visualization of cysto-biliary communication that presented with bile leak.(masking effect).

Low output biliary fistulae usually treated by conservative treatment.

High output fistulae better to be treated by endoscopic sphincterotomy which is the most important diagnostic and therapeutic tool, endoscopic stenting or papillotomy reduces the high intra-biliary pressure and promote early closure of fistulae even in absence of distal common bile duct obstruction.

In order to reduce bile leak and its morbid complications: recent reports suggest routine decompression with t-tube in patients with cysto-biliary communication especially when ERCP not available.

### References

- 1- Michael.J. Zinner, Maingot's abdominal operations, Mc Graw HILL Publisher, 11th edition, 2007; 28:768-75
- 2- Farquharson's & Moran. Farquharson's text book of operative surgery, Hodder Arnold Publisher, 9th edition, 2005; 20: 370-1
- 3- Brunicaudi Anderson. Schwartz's principles of surgery, Mc Graw Hill Publisher, 9th edition, 2010; 31:1116.
- 4- Norman's S William's, Christopher J. K. Bulstrode, P. Ronan O'Connell; Baily & Love's, Short practice of surgery, Hodder Arnold Publisher, 25th edition, 2008; 5:56-9.
- 5- Genetzakis et al. Surgical removal of intact germinal layer. Amr. Jou. Surg. March 2007; 3; 65-9
- 6- Orhan Demircan et al. Occult cysto-biliary communication presenting as postoperative biliary leak after hepatic hydatid cyst surgery: value of preoperative predictors. Can J Surgery, June 2006; 3; 45-9.
- 7- Shaleen Agarwal, Sadiq Saleem, Ashok Kumar. Bile leaks following surgery for hepatic hydatid cyst disease, Indian society of gastro-enterology. 2005; 24:57-8.
- 8- Jabbour N, Shirazi SK, Genyk Y, et al. Surgical management of complicated hydatid disease of liver. Am Surg 2002; 68:984-8.
- 9- Buttenschoenk. Carli Buttenschoek. Echinococcus granulosus infection challenge of surgical treatment. Langenbecks Arch Surg, Germany, 2003; 388:218-30-3.
- 10- Silva MA, Mirza D F, Bramhall S R, Mayer AD. Treatment of hydatid disease of liver. Digest surgery 2004; 21:227-34.
- 11- Menezes Da saliva A. Hydatid cyst of liver-criteria for selection of appropriate treatment. Acta Trop 2003; 85:237.
- 12- Kaylaap C. Evacuation of hydatid liver cysts. World J Surgery 2002; 26:1324-7. 13- Aswini k Pujahari. Prevention of bile leak after liver surgery. Saudi. Jou. of G.E, 2009; 15: 128-30.
- 13- Skroubis G, Vagianos C, polydorou A, Androulakis J. Significance of bile leaks complicating conservative surgery for liver hydatidosis. World J Surg 2002; 26:704-8.
- 14- Kayaalp C, Bostanci B, Yol S, et al. Distribution of hydatid cysts into the liver with reference to cysto-biliary communications and cavity related complications. Am J Surg 2003; 185:175-9.
- 15- Mohammadi Asl, Sarmast M.H. Comparison of different surgical techniques in the hepatic hydatid cyst management. MJH; July 2003; 1:37-39.
- 16- Kayaalp C, Sengul N, Akoglu M. Importance of cyst contents in hydatid liver surgery. Arch surg 2002; 137:159-63.
- 17- Atli M, Kama NA, et al. Intra-biliary rupture of hepatic hydatid cyst, associated clinical factors and proper management. Arch Surg 2001; 136:1249-55.
- 18- Frena A, Martin F. How to improve bilio-stasis in liver surgery, Saudi Jou of G.E 2009; 15: 125-3.
- 19- Ozmen M, Coskun F. New technique for finding the ruptured bile duct into liver cyst: scope in the cave. Surg Laparosc Endosc Technique 2002; 12:187-9.
- 20- Bedirli A, Sakrak O, Sozuer EM, et al. Surgical management of spontaneous intra-biliary rupture of hydatid liver cysts. Surg Today 2002; 32:594-7.
- 21- Bilsel Y, Bulut T, Yamaner S, et al. ERCP in the diagnosis and management of complications after surgery for hepatic echinococcosis. Gastro-intest Endosc 2003; 57:210-3.
- 22- Hamamci EO, Besim H. Usual locations of hydatid disease of liver and surgical approach. ANZ J Surgery 2004; 5:356-60.
- 23- Smego RA Jr, Sbanego P. Treatment options for hepatic cystic echinococcosis. Int J Infect Dis 2005; 9:69-76.
- 24- Frena A, Martin. How to improve bilio-stasis in liver surgery. Chir Itali 2006; 58:793-5.