The Importance of biliary culture and risk factors in biliary surgery

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High morbidity and mortality rates in biliary surgery are major problems confronting surgeons. Risk factors and biliary culture are important in infectious morbidity. 258 patients, who were operated for biliary disease and evaluated for risk factors, their biliary cultures and morbidity-mortality are presented (in this report). Total morbidity and mortality rates were 9.68 % and 3.10 % respectively. Infection and total morbidity rates were significantly higher in high-risk or bactibilia groups than the others. Bactibilia were often in patients acute cholecystitits and who were of high-risk or operated for biliary duct diseases. Mortalities were significantly higher duct diseases. Mortalities were significantly higher in the acute chelocystitis and biliary tract malignancies. [Turk J Med Res 1994; 12(2): 113-117]

Key Words: Biliary surgery, Culture

High morbidity and mortality rates still remain as a serious problem in biliary surgery. Patients undergoing biliary tract operations are at a higher risk of developing septic complications if they have certain risk factors or bactibilia (BB) in their bile at the time of operations. Several authors reported risk factors (RF) that affect morbidity-mortality rates in biliary surgery. These are: patient age over 70 years, jaundice, emergency, operation in 4 weeks after acute crisis, previous bile duct surgery, stricture or stone formation in the biliary ducts, cholangitis, abnormal liver biochemistry, gallbladder nonfunction, and diabetes mellitus. High morbidity rates are commonly due to infectious complications (1-11).

Previous reports have shown that BB is important in infectious morbidity and mortality (1,3,4, 12-16).

258 patients operated for biliary diseases in our clinic are presented in this report . The records were reviewed as relation morbidity and mortality BB and RF prospectively.

MATERIALS AND METHODS

258 patients, operated for biliary disease at Dept. of General Surgery, Medical School of Ondokuzmayis University, between May 1986 - June 1993 are presented. Cholecystectomies were performed on 254 patients by transrectal or subcostal incisions. Bile samples for culture research were obtained by gallbladder needle taps. Cultures from previously cholecystectomised patients (4 cases) were obtained by choledocal needle operation. Bile specimens were inoculated into triptycese-soy broth (BBL). These were incubated for 24 hours before being subcultured aerobically and anaer obically. Histopathological study was done by light microscope. The records were evaluated as age-sex distribution, history of biliary disease, operative histopathological findings, concumittent diseases, surgical procedures, biliary culture (BC), RF, complications, morbidity-mortality rates. Statistical analysis was done by "chi-squared test" and "comparison of proportion in independent samples".

RESULTS

There were 75 male (29.06 %) and 183 female (70.93 %) patients. Mean ages were for the male patients 60.61 years (range 22-88 years), and for the female patients 51.98 years (range 18-84 years). Median age of all patients was 54.39 years.

Chronic cholelithiasis was the clinical diagnosis in 214 (82.94 %) of the patients. A further 20 patients (7.75 %) had chronic acalculous cholecystitis.

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Table 1. Complications and morbidity (n: 23)

Infectious:	
Wound infection	7 (2.71 %)
Pulmonary infection	3(1.16%)
Pancreatic abscess	2 (0.77 %)
Total	12(4.65%)
Noninfectious:	
Biliary leakage-peritonitis	4(1.55%)
Wound dehiscense	2 (0.77 %)
Cerebrovascular disease	2 (0.77 %)
Incisional bleeding	1 (0.38 %)
Atelectasis	1 (0.38 %)
Hepatitis	1 (0.38 %)
Hematobilia	1 (0.38 %)
Angina pectoris	1 (0.38 %)
Total	13(5.03%)
Total morbidity	25 (% 9.68)

15 patients (5.81 %) underwent an emergency operation for acute cholecystitis; of those 3 (1.16 %) had free perforation and bile peritonitis, 2 (0.77 %) had subhepatic and/or pericholecystic abscess, and 1 (0.38 %) had cholecystoduodenal fistula.

In 4 (1.55 %) patients, cholecystectomies were performed 6 months—18 years previously (med. 86 months). They were reoperated for obstructive jaundice.

Extrahepatic biliary tract malignancies were diagnosed pre- or intra-operatively in 5 (1.93 %) patients.

Choledochal operations were performed in 45 patients (17.44 %). Indications for choledochotomies were stricture (0.38 %), obstructive jaundice (11.24 %), dilatation (4.26 %) and history of obstructive jaundice or cholangitis (1.55 %). Cholecystectomy and/or external drainage of extrahepatic biliary tract, choledochoduodenostomy, sphincteroplasty, choledochojejunostomy were performed in 30 (66.66 %), 12 (26.66 %), 2 (4.44%), 1 (2.22%) respectively.

Non-malignant hepato-splenic and gastrointestinal diseases were coincidentally diagnosed in 12 (4.65 %) patients. The incidence of gastric and pancreatic malignancies was 1.55 %.

25 (9.68 %) complications occurred in 23 patients (8.91 %). Wound infections were the most common complications. 12 (4.65 %) complications were infectious and 13 (5.03 %) of them were noninfectious. A case of hepatitis-B infection diagnosed on 5th postoperative day, was commended as nonsurgical infection; the patient had a blood transfusion one month previously (Table 1).

Histopathological study was carried.out in 254 patients with cholecystectomies. Chronic cholecystitis was the most common finding (92.12 %) followed by acute cholecystitis (5.09 %) and biliary tract malignancies (1.96 %) respectively. Mortality rates for acute cholecystitis and biliary tract malignancies were significantly higher than the chronic cholecystitis group (Table 2).

RF searching: In 120 patients (46.51 %) no RF was found (RFt). Numbers of the patients who had 1 (RF1), 2 (RF2), 3 (RF3) and 4 (RF4) factors were 74 (28.68 %), 41 (15.89 %), 18 (6.97 %) and 5 (1.93 %) respectively. Due to the insufficient number of patients, statistical analysis could not be carried

Table 2. The morbidity and mortality rates (%) of histopathological diagnosis.

	n	Complications			Exitus
	11	Infectious	Noninf.	Total	
Chr. Cholecystitis	234	11 (4.69)	10(4.27)	21 (8.97)	3(1.28)
Acu. Cholecystitis	15	1 (6.66)	1 (6.66)	2(13.33)	3 (20)*
Bill. Tract. Malig.	5		2(40)	2(40)	2 (40)*
Total	254	12	13	25	8

p<0.001

Table 3. Morbidity and mortality rates in RF groups (%)

RF Groups	n	Complications			Exitus
		Infectious	Noninf.	Total	
Low-Risk	194	4 (2.06)	7 (3.60)	11 (5.67)	4 (2.06)
High-Risk	64	8* (12.5)	6 (9.37)	14" (21.87)	4 (6.25)
Total	258	12(4.65)	13(5.03)	25 (9.68)	8 (3.10)

Table 4. Results of biliary culture

Microorganisms	n	%
Alpha Hem. Streptococci	2	4.08
E. coli	26	53.06
Staph, aureus	7	14.28
Enterobacter	6	12.24
Serratia	1	2.04
Klebsiella	1	2.04
Proteus	1	2.04
Pseudomonas	1	2.04
Pseudomonas+enterobacter	1	2.04
Proteus+enterobacter	1	2.04
Pneumococcus	1	2.04
Candida	1	2.04
Total	49	18.99

out for the RF4 groups 194 patints (75.19 %) were in low-risk group (RF- and RF1) and 64 patients (24.8 %) were in high-risk group (RF2-RF4). Infectious and total morbidity rates were significantly higher in high-risk group than low-risk groups. The differences in the mortality rates of all groups were not significant (Table 3). BB was found in 49 patients (18.99 %). E. coli, staph, aureus, enterobacter, Candida were common microorganisms in BC. Table 4 shows BC results.

BB rate was significantly higher in the high-risk group and in the patients with acute cholecystitis or surgical diseases of bile ducts (Table 5).

Infectious and total morbidity rates in the BB group were significantly higher than BC-group (Table 6).

In the high- and low-risk groups infectious and total morbidity were significantly higher in BB group compared to BC - group (Table 7).

8 (3.10 %) patients died in postoperative period the earliest beign 10 hours, and the latest 59 days. They have been summarised in Table 8.

Hospitalization in all patients were 4-63 days (Average 13.90 days).

DISCUSSION

In biliary surgery a major problem confronting surgeons is the high morbidity and mortality rates. The prevention remains controversial because of conflicting assessment of the risk of infection in different risk groups or biliary culture results. The present study addresses this problem by a prospective evaluation.

Several authors have examined risk factors (1-4,9,12,15,17,18). Others (14,16,119,20) also examined body temperature, serum bilirubin levels and WBC as factors affecting morbidity and mortality in acute

Table 5. BB in histopathological diagnosis, surgical procedure and RF groups

		%	BB	
Surgical procedure:				
Cholecystectomy	213	82.55	25	11.73
Biliary duct operations	45	17.44	20	44.44*
Histopathological diagnosis:				
Chronic Cholecystitis	234	92.12	41	17.52 '
Acute Cholecystitis	15	5.09	6	40**
' Bil. Tract. Malig.	5	1.96	2	40
RF groups				
Low-Risk	194	75.19	23	11.85
High-Risk	64	24.80	26	40.62*
Total	258		49	18.99

*p<0.001, "p<0.05 f

Table 6. Morbidity and mortality In BB and BC - groups (n, %) H

	n	Complications			Exitus
		Infectious	Noninf.	Total	
BB	49	11* (22.44)	3(6.12)	14* (28.57)	2 (4.08)
BC	209	1 (0.47)	10(4.78)	11 (5.26)	6 (2.87)
Total	258	12(4.65)	13(5.03)	25 (9.68)	8(3.10)

*p<0.001

Table 7. Morbidity and mortality in BC-RF groups (n, %)

	Low-Risk		High-Risk	
	BC-	BB	BC-	BB
n	171	23	38	26
Complications				
Infectious	—	4* (17.39)	1 (1.63)	7* (53.84)
Noninfectious	5 (2.92)	2* (8.69)	5(8.19)	1* (7.69)
Total	5 (2.92)	6*(26.08)	6 (9.83)	8* (61.53)
Death	4 (2.33)	—	2 (5.26)	2 (7.69)

* $p<0.05$

Table 8. Mortality information*

Age-Sex	RF	BC	Cause of death	Day of death
42-K	0		CVD	59
52-K	1	–	BP-CVD	9
63-K	1		Cardiopulmonary distress	13
67-K	2	+	BP-Wound dehiscense	30
49-E	0		Hepatitis (Fulminant)	9
78-K	3	–	Hemobilia	14
75-E	3		Pulmonary infection	18
70-E	2		Cardiopulmonary distress	10 hours

*: CVD: Ceresrovascular disease, BP: Biliary peritonitis

cholecystitis. In this perspective; all the patients can be divided into two groups:

1. Low-risk group: This group consist of patients who have 1 or no RF.

2. High-risk group: This group consist of patients who have RF greater than 2.

Previous studies have reported bactibilia in 14-35 % and 33-65 % of the patients with uncomplicated cholecystitis and in high-risk patients respectively (1,3,4,12-16). In these reports age (>70 years), presence of jaundice, common bile duct stones, cholangitis, and operation for acute cholecystitis are described as the main risk factors for BB (3, 4, 11). In low-risk cholecystectomy, only 15-30 % of cultures are positive (1-4,6,12,16,19). The rate is approximately 35-65 % in acute cholecystitis (3,4,5,8,12,14,16-18). BB was found as 63 %, 81%, 42% within 24, 48, 72 hours of the onset of symptoms (14,20,21). Wittmann (22) reported that in 22.6 % of the cases BB was associated with a solitary stone, in 32.2 % with multiple biliary calculi, in 68.6 % with stone in the common bile duct and in 45% with cystic duct occlusion. Stubbs (10) reported that BB was 66 % and 88 % in association with choledocholithiasis and obstructive jaundice respectively. Also BB and infectious morbidity were 2 or 3 times greater in patients with an age of 70 years or older than younger patients (1-4, 9, 12, 15, 17,18,21). Sayek (23) found that BB was 21.6 % in chronic cholelithiasis and 75 % in choledocholithiasis, and BB incidence was higher (38.4 %) in patients older than 60, compared to younger age groups: 16.6 % and 20 % 4 th and 5th decade respectively. In 1989, Wells (11) reported that BB was found in 31.6 % of the high-risk patients (1 or more RF) compared to 13.9 % of the low-risk patients. All authors report that BB was high in the patients of cholangitis. It is confirmed that a BB is more often found in high-risk patients than in low-risk patients. Lewis (1) showed that BB was 11 % in low-risk group and 73 % in high-risk group, 67% in the patients of age over 70 years and 20 % in the youngers. In our study: risk of age was limited to 65 years. 120 patients were found as no RF and 194 patients were in low-risk group. Infectious and total morbidity rates were also higher in the high-risk group. Mortality rate was higher in patients with acute cholecystitis than the others. These are in agreement with the literature.

In high-risk patients, it is confirmed that bile contamination is common and the major source of postoperative infections and complex anaerobic contaminations are also more frequent. Anaerobic bacteria which usually present in less than -1 % of bile cultures, was found in 12-23 % of the high-risk patients with or without cholangitis (1,8).

It has been confirmed that coliforms and streptococci are the most common pathogens in the bile

and staphylococci are found less often. Anaerobic? infections are rare (less than 1 %) (1-4,7,14,17,23,24).

Streptococcus pyogenoeus and staphylococci are the most common pathogens of wound infection in BC (.) group of low-risk patients (1,7,19,24). In the present study, E. Coli was the most common bacteria in the bile samples, followed by staphylococci. No anaerobic microoranism was found in BC. These results are comparable with Lewis's, Pyrtek's, Chetlin's Keighley's, Sayek's, and Thompson's series.

In the prior studies it is reported that infectious morbidity and mortality rates are higher in high-risk group and/or in the patients of BB. Wells (11) reported that BB and postoperative infection rates were significantly higher in the high risk patients than in the low-risk group ($p<0.0001$). Wittmann (22) reported that wound infection was found 13.4 % in the group of BB and 6.9 % in the group of BC(-). In our study, infectious morbidity was 22.44 % and 0.47 % on the patients of BB and BC(-) respectively ($p<0.001$). Also, it is proved that the patients of BB in both high-risk and low-risk groups, had higher infection risks than the others ($p<0.05$). So, BB is as important in morbidity-mortality rates as RF.

Bilyer cerrahi girişimlerde safra kültürü ve risk faktörlerinin önemi

Bilyer girişimlerde yüksek morbidité ve mortalité oranları, cerrahinin önemli bir sorunu olarak devam edegelmektedir. Risk faktörleri ve bilyer kültürün pozitif (BC +) olması infeksiyöz morbiditede önemli bir rol oynar. Bu çalışmada biliyer girişim uygulanan 258 hasta sunuldu. Risk faktörleri, bilyer kültür ve morbidite-mortalite oranları araştırıldı. Total morbidité %9.68, mortalité %3.10 bulundu. İnfeksiyon ve total morbidité oranları, yüksek risk grubunda ve BC (+) olan hastalarda yüksek bulundu. BC (+) oranı akut kolesistitli, yüksek riskli ve koledok girişimi uygulanan hastalarda anlamlı olarak yüksek bulundu. Mortalité akut kolesistit ve bilyer sistem malignitesi nedeniyle girişim uygulananlarda yüksek bulundu. [Türk J Med Res 1994; 12(2): 113-117]

REFERENCES

1. Lewis RT, Goodall G, Marien B, et al. Biliary bacteria, antibiotic use, and wound infection in surgery of the gallbladder and common bile duct. Arch Surg. 1987; 122: 44-7.
2. Pyrtek U, Bartus SA. An evaluation of antibiotics in biliary tract surgery. Surg Gynecol Obstet. 1967; 125:101-105.
3. Chetlin SH, Elliot DW. Preoperative antibiotics in biliary surgery. Arch Surg. 1973; 107: 319-23.
4. Keighley MRB, Flinn R, Alexander-Williams J. Multivariate analysis of clinical and operative findings associated with biliary sepsis. Br J Surg. 1976; 63: 528-31.
5. Edlund YA, Mollstedt BO, Ouchterlony O. Bacteriological investigation of the biliary system and liver in biliary tract disease correlated to clinical data and microstricture of the gallbladder and liver. Acta Schir Sand. 1958-9; 116: 461-76.
6. Lewis RT, Allan CM, Goodal RG, et al. The conduct of cholecystectomy. Can I Surg. 1982; 25: 304-7.
7. Morran CG, Thompson G, White A, et al. Wound sepsis after low-risk elective cholaystectomy: The effect of cefuroxime. Br J Surg. 1984; 71: 540-2.
8. Shimada K, Noro T, İnamatsu T, et al. Bacteriology of acute obstructive suppurative cholangitis of the aged. J Clin Microbiol. 1981; 14: 522-6.
9. Khang KU, Beaton HL. Infectious complications of biliary surgery in the antibiotic era. Infect Surg. 1985; 4: 453-8.
10. Stubbs RS, McLoy RF, Blumgart LH. Cholelithiasis and cholecystitis: surgical treatment. Clin Gastroenterol. 1983; 12: 179-201.
11. Wells GR, Taylor EW, Lindsay G, et al. Relationship between bile colonization, high-risk factors and postoperative sepsis in patients undergoing biliary tract operations while receiving a prophylactic antibiotic. Br J Surg. 1989; 76: 374-
12. Chetlin SH, Elliot DW. Biliary bacteremia. Arch Surg. 1971; 102: 303-7.
13. Keighley MRB, McLeish AR, Bishop HM, et al. Identification of the presence and type of biliary microflora by immediate gram strains. Surgery. 1977; 81: 469-72.
14. Thompson JE, Bennion RS, Doty JE, et al. Predictive factors for bactibilia in acute cholecystitis. Arch Surg. 1990; 125: 261-4.
15. Pitt HA, Postier RG, Cameron JL. Biliary bacteria: significance and alterations after antibiotic therapy. Arch Surg. 1982;117:445-9.
16. Truedson H, Elmson T, Holm S. The incidence of bacteria in gallbladder bile at acute and elective cholecystectomy. Acta Chir Scand. 1983; 149: 307-13.
17. Mason R. Bacteriology and antibiotic selection in biliary .surgery. Arch Surg. 1968; 97: 533-7.
18. Gunn AA. Antibiotics in biliary surgery. Br J Surg. 1976; 63: 627-30.
19. Stone AM, Tucci VJ, Isenberg HD, et al. Wound infection: Acute versus chronic cholecystitis. Am J Surg. 1977; 133: 285-8.
20. Jarvinen HJ. Biliary bacteremia at various stages of acute choleystitis. Acta Chir Scand. 1980; 146: 427-30.
21. Glaesson B, Holmlund D, Matzsch T. Microflora of the gallbladder related to duration of acute cholecystitis. Surg Gynecol Obstet. 1986; 162: 531-5.
22. Wittmann DH, Koltowski P, Oleszkiewiz J, et al. Infectious complication after 809 biliary tract operations and results of a prospective randomized single-blind study comparing cefoxitin versus ampicillin plus an inhiitor of beta lactamases. Infection. 1990; 18: 41-7.
23. Sayek İ, Akalın HE, Sanaç Y. Kronik kolesistitte safra kültürleri ve klinik önemi. TGED. 1980; 2: 301-5.
24. Cünha BA, PrytekLJ, Quintiliani R. Prophylactic antibiotics in cholecystectomy. Lancet. 1978; 1: 207-8.