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Original Research Article

Relation of intraoperative bile culture to the postoperative morbidity in hepatopancreatic and biliary surgeries

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ABSTRACT

Background: The reported incidence of bacteria in bile is extremely variable 8%-42%. Several authors have been able to correlate the bacteria cultured from bile at operations with those subsequently causing wound infections and septicemia in postoperative period.
Methods: This study was a prospective study conducted in Department of Surgical Gastroenterology at Sher-i-Kashmir Institute of Medical Sciences from July 2016 to June 2018. A total of 100 patients were included in study.
Results: Mean age of the patients was 43.7±15.01, The most common organism found in our study was *Escherichia coli (E. coli)* and *Klebsiella pneumoniae (K. pneumoniae)* in 33.9%, *E.coli* and *Enterococcus faecalis* 21%, The monomicrobial infection was due to *E coli* 11.3%, The patients with bactibilia had more of wound infection 54.8% and intra-abdominal collections 17.7%, most common organism from bile was *E. coli* and *K. pneumonia* and same organisms were also cultured from wound sites.
Conclusions: The preoperative intervention group should be considered potentially infected, requires careful operative technique to avoid spillage of bile on wound surfaces to decrease infection rates and morbidity.

Keywords: Hepatopancreatic, Bile cultures, *E. coli*

INTRODUCTION

Hepatopancreatic and biliary surgeries are one the important surgeries being done by surgeons worldwide. The advances in medicine and understanding of pathophysiology of various complications have increased the safety of these surgeries. However these are still associated with serious infections. The presence of bacteria at the time of surgery predisposes to septic complications.[1] The reported incidence of bacteria in bile is extremely variable 8%-42%.[2] Several authors have been able to correlate the bacteria cultured from bile at operations with those subsequently causing wound infections and septicemia in postoperative period.[3] Therefore for hepatopancreatic surgeries an argument was put for routine bile cultures at the time of surgery.[4]

The study was done with the objective to study the relation of bactibilia to postoperative morbidity in Hepatopancreatic and biliary surgeries and to study the effect of preoperative interventions on bile culture results and postoperative morbidity in hepatopancreatic and biliary surgeries.

METHODS

This study was a prospective study conducted in Department of Surgical Gastroenterology at

Sher-i-Kashmir Institute of Medical Sciences from July 2016 to June 2018. A total of 100 patients were included in study. All patients were subjected to various operative procedures and were observed in postoperative period for 30 days. A thorough general physical examination was made. Baseline blood investigations like complete haemogram, coaguloram, Liver function tests etc. were done. Radiological investigations such as trans-abdominal ultrasonography, contrast enhanced computed tomography, magnetic resonance cholangiography were done. As a diagnostic upper gastrointestinal endoscopy and endoscopic retrograde cholangiography, as a diagnostic and therapeutic procedure to visualize disease of liver, bile ducts, and pancreas were are done.

Cultures

Intraoperative bile was taken from common bile duct before any surgical intervention using a sterile disposable syringe. About 5ml of bile was collected in sterile 10 ml syringe and was sent to microbiology department immediately for aerobic and anaerobic cultures.

Inclusion criteria

Patients undergoing major hepatopancreatic and biliary surgeries done electively with consent, majority of patients included were periampullary carcinoma patients including carcinoma of head of pancreas and cholangiocarcinoma, those patients with hepatic resection surgeries for oriental cholangiohepatitis, hepatocellular carcinoma and liver metastasis, who had undergone repair procedures related to bile duct injury, those who have undergone surgeries related to biliary stone disease like cholidocholithiasis and cholidochal cyst and any patient with previous stent placed qualifying other inclusion criteria were included.

Exclusion criteria

Patients with emergency operation performed for cholangitis and sepsis syndrome, simple chole-cystectomy, any hepatopancreatic and biliary malignancy already on neoadjuvant treatment and immuno-compromised patients are excluded.

RESULTS

Age distribution of study patients

The most common age group in our study included middle aged patients i.e., 35-44 years of age. The youngest being 15 years of age and eldest being 65 years of age.

Gender distribution of study patients

The percentage of females was slightly more than males.

Table 1: Age distribution of study patients.

Age (years)	Frequency	Percentage (%)
15-24	9	9
25-34	16	16
35-44	27	27
45-54	20	20
55-64	10	10
≥ 65	18	18
Total	100	100

Mean±SD=43.7±15.01.

Table 2: Gender distribution of study patients.

Gender	Frequency	Percentage (%)
Male	42	42
Female	58	58
Total	100	100

Surgical procedure in patients

The patients diagnosed as periampullary carcinoma underwent pylorus preserving pancreaticoduodenectomy. The patients diagnosed as cholidocholithiasis underwent cholecystectomy with common bile duct exploration. The patients diagnosed as oriental cholangiohepatitis underwent cholecystectomy with left lateral segmentectomy. The patients diagnosed as cholidochal cyst underwent excision of cyst with Roux-en-y hepaticojejunostomy. The patients diagnosed as common bile duct injury underwent Roux-en-y hepaticojejunostomy. The patients diagnosed as chronic calcific pancreatitis underwent Frey's procedure.

Table 3: Showing surgical procedure in study patients.

Surgical Procedure	Frequency	%
PPPD	50	50
Cholecystectomy with CBD exploration	17	17
Cholecystectomy with left lateral segmentectomy	5	5
Excision of cyst with Roux-en-y HJ	9	9
Roux-en-y HJ	5	5
Frey's procedure	14	14
Total	100	100

Table 4: Showing inter-operative bile culture in study patients.

Bile culture	Frequency	Percentage (%)
Positive	62	62
Negative	38	38
Total	100	100

Table 5: Preoperative intervention among study patients.

Pre-operative intervention	Frequency	%
ERCP	41	41
Stent	25	25
PTBD	11	11
No intervention	23	23
Total	100	100

Table 6: Showing impact of intervention on bile culture in study patients.

	Bile culture positive		Bile culture negative		Total
	N	%	N	%	
Intervention	56	72.7	21	27.3	77
No Intervention	6	26.1	17	73.9	23
Chi-square=16.35; p value<0.001*					

*Statistically significant difference (p value<0.05).

Interoperative bile culture

The intraoperative bile culture was found to be positive in 62% of patients in our study group.

Preoperative intervention

In our study group 36% of patients had undergone preoperative biliary drainage and 23% of patients were directly operated.

Intervention on bile culture in study patients

The patients with intervention had more of bactibilia compared to non-intervention group showing that intervention was associated with increased risk of biliary infection.

Microorganism cultured from wound

Post-operatively 46 patients had wound infection. Wound swab was taken and was sent for wound culture and sensitivity. The most common organism cultured was *E coli* and *Klebsiella* spp.

Table 7: Microorganism involved in positive bile culture.

Organism involved	Frequency	%
E. coli* and *K. Pneumonia	21	33.9
E. coli* and *Enterococcus faecalis	13	21.0
Enterococcus faecalis* and *K. oxytocia	16	25.8
P. aerogenosa* and *E. coli	5	8.1
E. coli	7	11.3

Table 8: Microorganism cultured from wound.

Organism involved	Frequency	%
E. coli* and *K. Pneumonia	22	47.8
E. coli* and *Enterococcus faecalis	19	41.3
Enterococcus faecalis* and *Staphylococcus	5	10.9
Total	46	100

Table 9: Microorganism from intra-abdominal collection.

Organism involved	Frequency	Percentage
E. coli* and *K. Pneumonia	7	50.0
E coli* and *Enterococcus faecalis	5	35.7
K. Pneumonia	1	7.1
Staphylococcus aureus	1	7.1

Microorganism involved in positive bile culture

The most common microorganisms found in bile were *E. coli* and *Klebsiella* spp., 33.9% of patients. The polymicrobial infection was commonest.

Table 10: Postoperative complications in patients with and without preoperative intervention and with bile culture results.

	Preoperative intervention		No preoperative intervention		Bile culture positive		Bile culture negative	
	No.	%	No.	%	No.	%	No.	%
Wound infection	41	53.2	5	21.7	34	54.8	12	31.6
Intra-abdominal collection	11	14.3	3	13.0	11	17.7	3	7.9
Pancreatic fistula	2	2.6	1	4.3	2	3.2	1	2.6
Biliary fistula	1	1.3	0	0.0	1	1.6	0	0.0
Complications	55	71.4	9	39.1	48	77.4	16	42.1
Chi-square; P value	8.02; 0.005				12.75; <0.001			

Microorganism from intra-abdominal collection

Post-operatively 14 patients developed intra-abdominal collection that was sent for microbiological analysis. The intraabdominal collection was dealt with pig tail drainage in 9 patients and in 4 patients aspiration was done under radiological guidance.

In our study the postoperative complications developed more in intervention group compared to nonintervention group and those with bactibilia. The intervention group had 72.7% bile culture results positive with p<0.001 statistically significant. The patients with bactibilia had more of wound infection 54.8% and intra-abdominal collections.

DISCUSSION

The study entitled "Relation of Intraoperative Bile Culture to the Postoperative Morbidity in Hepatopancreatic and Biliary Surgeries" was a prospective study conducted in Department of Surgical Gastroenterology at Sheri-i-Kashmir Institute of Medical Sciences. The study was conducted from July 2016 to June 2018. A total of 100 patients were included in study. Mean age of the patients was 43.7±15.01 with the youngest being 15 and oldest being one of 65 (Table 1).

In our study out of 100 patients 62% had positive intraoperative bile culture. The most common organism found in our study was *E. coli* and *K. pneumonia* in 33.9%, *E coli* and *Enterococcus faecalis* 21%, the monomicrobial infection was due to *E. coli* 11.3% (Table 4). Grizass et al studied etiology of bile infection and its association with postoperative complication following pancreatico-duodenectomy.[5] The dominant organisms were *E. coli* and *Enterococcus* in bile culture without preoperative biliary drainage, whereas *Klebsiella* was found along side with earlier mentioned bacteria after preoperative biliary drainage. The polymicrobial infection was common in our study. In our study polymicrobial infection was found in 55 patients and 7 patients had monomicrobial infection in total of 62 patients i.e., 88.8%. Preoperative intervention and bile culture results: The preoperative biliary drainage was done to relieve obstruction in periampullary carcinoma and endoscopic retrograde cholangiography as diagnostic tool (Table 5). In 41% ERCP was done 25% had stent and 11% had PTBD in place. Preoperative stented patients had 88% of bactibilia. This is in concordance with the study of Jethwa et al.[6] In his study he found stented patients had significantly increased rates of bactibilia i.e., 85%.

In our study we have found that intervention group had increased risk of bactibilia compared to nonintervention group (Table 6). Out of 100, 77% of patients had undergone preoperative intervention. 72.7% of patients had bactibilia in intervention group compared to nonintervention group where only 26.1 % had bactibilia. Thus showing intervention increases risk of bactibilia with significant difference p value <0.001.The pre-operative biliary drainage significantly increases the rate of bactibilia are in accordance with the following studies, Povoski et al studied association of preoperative biliary drainage with postoperative outcome following pancreatico-duodenectomy.[7] They retrospectively analyzed 161 patients undergoing pancreatico-duodenectomy in whom intraoperative bile cultures were performed. Microorganisms were isolated from 58% of these intraoperative bile cultures, with 70% of them being polymicrobial. Limongelli et al, found preoperative biliary drainage predisposes to positive bile culture.[8]

Sudo et al found the incidence of positive bile cultures was significantly high in internal PBD (85%) and external PBD (90%) than in non PBD cases (26%).[9]

Relation of bactibilia and intervention on postoperative morbidity

In our study the postoperative complications developed more in intervention group compared to nonintervention group and those with bactibilia (Table 10, 11 and Figure 2). The intervention group had 72.7% bile culture results positive with p<0.001 statistically significant. The patients with bactibilia had more of wound infection 54.8% and intra-abdominal collections 17.7%. These findings are in agreement to the host of previous studies. Nomura et al in their series found septic complications in 42% patients, with higher number of complications in patients with contaminated bile.[10] Khan et al studied the relation between contaminated bile and post-operative septic complications in biliary surgeries and need for antibiotic prophylaxis.[11] 42/121 were bile culture positive (B+) group while 79/121 were bile culture negative B (-) group. 14 patients in B (+) group developed septic complication compared to only 3 patients in B (-) group. In our study the most common organism from bile was *E. coli* and *K. pneumonia* and same organisms were also cultured from wound sites. This is in accordance with following series. Nomura et al, bacteria found in pre-operative ductal bile were also detected in infected sites of 80% of patients with septic complications.[10] Khan et al studied the relation between contaminated bile and post-operative septic complications.[11] 42/121 were bile culture positive (B+) group while 79/121 were bile culture negative B (-) group. 14 patients in B (+) group developed septic complication compared to only 3 patients in B (-) group. In B (+) group bacteria found in bile was also found in infective sites of 85%of patients with septic complications. In B (+) group bacteria found in bile was also found in infective sites of 85%of patients with septic complications.

CONCLUSION

In our study we have found middle aged females were mostly affected with hepatopancreatic and biliary diseases. The preoperative biliary stenting is associated

with increased risk of bactibilia and bactibilia leads to increase in postoperative morbidity in pancreatic biliary surgeries. Thus preoperative biliary stenting should be done in selective patients. The preoperative intervention group should be considered potentially infected, requires careful operative technique to avoid spillage of bile on wound surfaces to decrease infection rates and morbidity. Gram-negative bacilli predominate in biliary tree. The polymicrobial infection being the commonest. *E. coli* and *Kleibsella* predominated in bile. Similar microorganisms predominate in wound cultures and intraabdominal collections. *E. coli* were found to be resistant to most of the commonest drugs.

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