

## Research Article

# The Incidence of Microbial Spectra in Gallstone Disease and Effect of Bacteriobilia on Wound Infection in Post Cholecystectomy Patients

Kunal Chowdhary, Muzzafar Zaman\*, Gurinder Kaur, Aliya Shah, Rahul Yadav and Ashih Chowdhary

Department of General Surgery, Maharishi Markandeshwar Institute of Medical Sciences and Research, India

**\*Corresponding author**

Muzzafar Zaman, Department of General Surgery, Maharishi Markandeshwar Institute of Medical Sciences and Research, India, Email: muzzafarzaman@yahoo.com

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**Abstract**

**Introduction:** Biliary calculus disease is commonest disorder affecting the gastrointestinal tract. There is good evidence in the literature to support wound infection post cholecystectomy due to presence of bacteria in bile with reported incidence ranging from 4-10 % in various studies. Some surgeons use the outcome of bile cultures to guide their choice of empirical therapeutic antibiotics for subsequent wound infections. The present study evaluates the microbial spectra of bile in patients of cholelithiasis and association with postoperative wound infection in a rural setup.

**Aim:** To study the incidence of microbial spectra in gallstone disease and effect of bacteriobilia on wound infection.

**Material and methods:** The study included fifty patients of symptomatic gallstone disease including all age group and both the gender. All the patients underwent cholecystectomy laparoscopic or open with or without common bile duct exploration after giving single prophylactic antibiotic dose (Inj. Ceftriaxone 1gm). 2 to 3ml bile was taken for culture either from common bile duct or from the gall bladder for microbiological analysis in a sterile labeled container. Colony morphology was read and confirmed with biochemical reaction. Patient were divided into two groups with group A included patients with positive bile culture, group B having patients with sterile bile culture report. In the postoperative period those patients with positive bile culture were given antibiotics according to culture report. Patient with wound infections were recorded and wound cultures sent and compared with bile culture report for similarities of reports. Statistical analysis of the collected data done using Chi-square test.

**Results:** Bile exhibited positive culture in 14 (28%) case with Escherichia coli 7(14%) as the most common organism encountered followed by Klebsella 2(4%), Citrobacter 2(4%), Diptheroids 1(2%), Enterococcus Faecalis 1(2%), Candida 1(2%). Anaerobic organism growth was not seen in any of the bile culture.

**Conclusion:** Bile spillage during intraoperative period of bile containing bacteria predisposes to post operative wound infection. Prophylactic antibiotic should be administered to all the cases undergoing cholecystectomy.

**INTRODUCTION**

Biliary calculus disease is commonest disorder affecting the gastrointestinal tract and remains the most commonly encountered cause of morbidity [1]. Infective factor seems to be a major cause of formation of gallstones. Evidence in favour of infection includes isolation of Escherichia coli, Bacterium typhosum, Streptococcus from the gallbladder bile and from the centre of the gallstones. Slow growing actinomyces also have been recovered from the bile. These organisms reach the gallbladder via blood stream, from infective focus elsewhere in the body and via lymphatics. There is also good evidence in the literature to support wound infection post cholecystectomy due to presence of bacteria in bile. The reported incidence after cholecystectomy ranges from 4-10 % in various studies. The studies document a strong association between the presence of bacteria in bile

cultures taken at surgery and the occurrence of subsequent wound infection [2-4]. Some surgeons use the outcome of bile cultures and utilize to guide their choice of therapeutic antibiotics for subsequent wound infections [5]. The present study evaluates the microbial spectra of bile in patients of cholelithiasis and association with postoperative wound infection in a rural setup.

**MATERIAL AND METHODS**

The study was a prospective hospital based study and conducted on fifty patients of symptomatic gallstone disease including all age group and both the gender, admitted in the department of General Surgery of our hospital during the period from August 2012 to August 2014. The study was conducted after proper ethical clearance. Medically unfit for surgery and who were diagnosed to be a case of acute calculus pancreatitis, gallbladder carcinoma was excluded from the study. Proper

preoperative assessment and fitness all patients were subjected to surgery after single prophylactic antibiotic dose (Inj. Ceftriaxone 1gm). Open or laparoscopic cholecystectomy and choledocholithotomy where ever indicated. During surgery 2 to 3ml bile was taken for culture either from common bile duct or from the gall bladder for microbiological analysis in a sterile labeled container (Figures 1-3). Stones removed were classified according to visual appearance. Bile sample were inoculated on blood agar, macConkey's agar and robertson cooked meat media separately and incubated at 37°C for 18 hrs. For aerobes colony morphology was read on blood agar, macConkeys agar after 18 hrs of inoculation and further subjected to staining and different biochemical reactions for species confirmation and then antibiotic sensitivity testing was done. For anaerobes from Robertson cooked meat media sample was further subcultured on BHI (Brain Heart Infusion) agar with metronidazole. BHI agar with metronidazole was kept in gas pack jar under anaerobic condition and incubated at 37°C for 48 hrs. Colony morphology was read and confirmed with biochemical reaction. In the postoperative period all patients were divided into two groups with group A included patients with positive bile culture, group B having patients with sterile bile culture report. Patients with bile culture report positive for organisms were started antibiotic sensitive to the organism. In clean wounds sutures were removed on 10<sup>th</sup> day. In cases of wound infection regular dressing of the wound was done, wound cultures sent and reports compared with bile culture report for similarities. Those with similar reports were later kept on same antibiotics but those with different report or those whose initial bile culture report was negative was started on antibiotics according to the wound culture report. Once wound becomes healthy either secondary suturing was done or wound was left to heal by secondary intention. Statistical analysis of the collected data done using Chi-square test.

## RESULTS

A total of 50 patients operated had 38(76%) females and 12(24%) males. The majority of patients 30(60%) were in the age group of 40 to 60 years. A total of 14(28%) patients had positive bile cultures including 10 female and 4 male cases. The patients whose bile cultures were positive were considered group A and 36 patients whose bile cultures were negative were considered group B. Pain abdomen, nausea & vomiting on and off were observed in 72%, 16% respectively whereas 32% patients were asymptomatic. 30 patients (60%) underwent open cholecystectomy and 14 patients (28%) underwent laparoscopic cholecystectomy & 6 cases (12%) underwent common bile duct exploration. The most common organism encountered in bile culture was *Escherichia Coli* 7(14%) cases followed by *Klebsella* 2(4%), *Citrobacter* 2(4%), *Diphtheroids* 1(2%), *Enterococcus Faecalis* 1(2%), and *Candida* 1 (2%) (Table 1).

Post -op wound infection is significantly more in group A compared to group B. 47% of patients of group A and 8% of group B had wound infection (Table 2). In 6 cases of CBD exploration, 4 patients showed bile culture positivity of which 3 cases had wound infection in postoperative period, most probably due to the bile spillage which occurred intraoperatively.

Wound culture *Escherichia coli* was the most common organism isolated followed by *Staphylococcus aureus*. Moreover



**Figure 1** Bile being aspirated from gall bladder during laparoscopic cholecystectomy.



**Figure 2** Bile being aspirated from gall bladder during open cholecystectomy.



**Figure 3** Bile aspirated to be sent for microbiological analysis.

it was seen that reports of bile culture and wound culture showed similar organisms in all Group A wound infected cases (Table 3).

Showing the association of Intraoperative Bile spillage with Postoperative Wound Infection. Wound Infection was significantly higher in patients in group A due to bacteriobilia and bile spillage (Table 4).

**Table 1:** Organism Isolated in Bile Culture.

Bile Culture	No. of Cases	%
Growth	14	28
Escherichia Coli	7	14
Enterococcus Faecalis	1	2
Klebsiella	2	4
Candida	1	2
Citrobacter	2	4
Diphtheroids	1	2
Anaerobes	0	

**Table 2:** Wound Infection.

Wound infection	Group A		Group B	
	No.	%	No.	%
Yes	6	47	3	8
No	8	53	33	92
Total	14	100	36	100

**Table 3:** Wound Culture.

Wound Culture	No. of cases (n=9)	%	Group	Bile culture
Staphylococcus aureus	2	22.2	B	Sterile
Escherichia Coli	3	33.5	A	Escherichia coli (all cases)
Citrobacter	1	11.1	A	Citrobacter
Klebsella	1	11.1	A	Klebsella
Enterococcus faecalis	1	11.1	A	Enterococcus faecalis
Enterobacter	1	11.1	B	Sterile

**Table 4:** Co-Relation of Intraoperative Bile spillage with Postoperative Wound Infection.

	Total Pat.	Bile spillage	Wound Infection
Group A	14	5(35.7%)	6(42.8%)
Group B	36	13(36%)	3(8.3%)

**Table 5:** Co-Relation between Stone Type & Bile culture.

Gallstone	No. of Patients	Bile Culture
Cholesterol	32 (64%)	3 (21%)
Pigment	18 (36%)	11(79%)
Total	50(100%)	14(100%)

Anaerobic organism couldn't be grown in the bile culture. Bile culture was positive in 11 cases with pigment stone as compared to 3 cases with cholesterol stone (Table 5). A positive gallbladder bile culture strongly predisposes to development of postoperative wound infection with the same organism as in our study this rate was 42.8%. Bile spillage during intraoperative period of bile containing bacteria predisposes to post operative wound infection as was seen with 50% cases in present study.

## DISCUSSION

Incidence of positive bile culture in patients with chronic cholecystitis who underwent elective operations is lower, at about 11- 43% [6-8]. Aspiration and culture of bile at the time of surgery for biliary tract diseases has provided a unique opportunity to study the bacterial flora, as this may have diagnostic, prognostic

or with therapeutic implications. In our study wound infection rate were lowest in laparoscopic cholecystectomy patient due to the small incision and minimal or no bile spillage. In open cholecystectomy and CBD exploration patient wound infection was found to be high due to the spillage of bile an larger incision which is in similarity to other studies like Gupta et al. [9], Shindholimath et al. [10], Tocchi et al. [11], Siddqui et al. [12], in their study observed that frequency of wound infection was three times (6%) common in OC as compared to LC (2%) in acute cholecystitis.

The overall bacterial isolation rate in the present study was 28% which is on lower side if compared with other studies like Ballal et al. [13], Wattoo et al [6]. Some studies have shown bacterial isolation rate between 23 to 47% in cases of chronic cholecystitis with cholelithiasis [14]. Escherichia Coli is the most

common organism found in our study in almost 50% cases in group A. The importance of the predominance of *Escherichia coli* is seen by the fact that studies by Maki (1966) has shown that glucosidase enzymatic activity of *Escherichia coli* may have a role to play in calcium bilirubinate gall stone formation. Enteric organisms have often been suspected of causing cholelithiasis, and intestinal flora has frequently been recovered following interventions on the biliary tree [15]. Ballal et al. [13], concluded *Escherichia Coli* as the commonest organism in their study. Post operative wound infection in the biliary surgery is due to the endogenous contamination produced by opening of the biliary tract with bacteriobilia. Both post operative wound infection and septicemia are caused by the same organism. This observation was also seen in the present study where accidental contamination of wound with bile having bacteria showed post operative wound infection. In Group A cases bile spillage was seen in approx 35.7% cases with wound infection in 42.8% cases suggesting the association of bacterial isolates in bile with wound infection.

Study also showed association of pigment stones with bile culture positivity. Pigment stone were seen in 36% cases with bile positivity seen in 79% cases. This result is similar to study conducted by others like Wattoo et al [16].

## CONCLUSION

The study depicts a clear association that patients with stones in the gallbladder have infected bile and it may predispose the wound for infection after cholecystectomy so prophylactic antibiotics are recommended in these cases as bacteriobilia cannot be predicted preoperatively and it carries risk of wound infection. Bile spillage during surgery is also a strong predictor for post operative wound infection and needs antibiotic coverage.

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