Bile cultures and sensitivity patterns in malignant obstructive jaundice

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Background: Bactiibia is one of the important factors in the development of postoperative septic complications. We undertook this retrospective analysis to identify the organisms present in bile and their antibiotic susceptibility patterns in patients with malignant obstructive jaundice. Methods: Bile specimens were obtained during endoscopic cholangiography (ERC; n=65), by flushing biliary stents (n=15), intra-operatively before incising the common bile duct (n=7) or during percutaneous transhepatic biliary drainage (PTBD; n=1). Eighty-eight samples from 65 consecutive patients were analyzed for their bacterial spectrum and sensitivity to antibiotics. Concomitant septic complications such as wound infection and cholangitis were also assessed. Results: Of 65 patients (hilar block 39, distal block 26), 17 (26.1%) had bactiibia at initial ERC; in addition, 3 of 7 bile specimens obtained during surgery, one collected during PTBD, and 13 of 15 stent flushings grew bacterial organisms. Cholangitis developed in 15 patients (12 with hilar block, 3 with distal block). Blood cultures were positive in 3 cases, and initial bile culture was positive in four patients with cholangitis. The most commonly found organisms were Escherichia coli (36.6%), Klebsiella pneumonia (18.3%), Pseudomonas aeruginosa (8.3%), Proteus vulgaris (8.3%) and coagulase-negative staphylococci (8.3%). The organisms found on ERC were similar to those found at wound cultures in 3 of the 4 cases who developed wound infection. Amikacin, gentamicin, cefotaxime, cefazidime, and cefoperazone-sulbactam combination showed good activity against E. coli and K. pneumonia. Conclusion: Approximately one-fourth of patients with malignant obstructive jaundice have positive bile cultures at initial ERC. Post-ERC cholangitis is common in hilar blocks. [Indian J Gastroenterol 2003;22:16-18]

Key words: Antibiotics, bactiibia, biliary tract, cholangitis, endoscopic stenting, ERC, jaundice, surgery

The effectiveness of antibiotic prophylaxis in biliary surgery is well established.1,2,3 Wound infection rates in such surgery are 10%-25% when antibiotic prophylaxis is not applied.4,7 The choice of antibiotics for prophylaxis should be based on factors such as spectrum of organisms in the bile and their resistance patterns in a particular population. Indian data on these aspects are limited.

We undertook an analysis of bile cultures and corresponding infectious complications like cholangitis and wound infection.

Methods

Patients presenting with malignant biliary obstruction between January 2001 and June 2001 were included in the study. Bile samples were obtained by one of the following methods:

a) During endoscopic retrograde cholangiography (ERC; n=65): Bile was collected after selective cannulation of the bile duct. The catheter was negotiated proximal to the stricture with the help of a guidewire. Bile was collected in sterile test tubes before the radiographic contrast was injected. All patients received a single dose of intravenous ciprofloxacin 200 mg, 30 minutes before the procedure. All patients underwent placement of a 10F plastic stent. In patients with hilar blocks, ciprofloxacin 200 mg intravenous twice daily and amikacin 250 mg intravenous thrice daily were administered for 48 hours. In patients with block in the distal common bile duct, no antibiotic was given after the procedure.

b) Biliary stent flushing: The stents were removed endoscopically in case of cholangitis (n=13) or during surgery (n=2). They were placed in a sterile test tube, 5 mL of sterile saline was flushed through them, and the material obtained was analyzed.

c) Intra-operatively, before incising the bile duct: Bile was aspirated from the common bile duct using a syringe (n=7).

d) Through percutaneous transhepatic biliary drainage (PTBD; n=1): Bile was collected immediately after the liver puncture. This patient had developed cholangitis after ERC and required biliary stent placement for hilar block.

Blood culture specimens were obtained in patients who developed cholangitis, and swabs were collected from infected wounds. The samples were immediately sent for microbiological assessment in sterile containers. For anaerobic cultures, they were sent in thioglycollate broth.
Culture methods and susceptibility tests

**Aerobic cultures:** The samples were plated on blood agar and McConkey's agar and incubated overnight (16-18 hours at 35°C).

**Anaerobic cultures:** The samples were inoculated into thioglycolate medium, incubated for 2 hours, and then plated on neomycin-blood agar with metronidazole disks on it. They were further incubated in gas-packed anaerobic jars over 48 hours at 35°C. The growths obtained were identified by smear and sub-cultured. In case of staphylococci, Mueller Hinton agar was used, and slide and tube coagulase tests were performed; for streptococci, blood agar with optochin-bacitracin disks with bile esculin and 6.5% NaCl was used. Gram-negative organisms were identified by biochemical tests.

Antibiotic susceptibility tests were carried out on all the isolates according to NCCLS guidelines.

**Results**

The 65 consecutive patients studied included 40 men (mean [SD] age 54 [12] years) and 25 women (47 [10] years). Of these, 39 patients had hilar block (28 carcinoma gall bladder, 1 hepatocellular cancer, and 10 etiology not established), and 26 had blockage of distal common bile duct (12 periampullary carcinoma, 6 cholangiocarcinoma, 8 carcinoma pancreas). Twelve patients underwent surgery (pancreatico-duodenectomy 9, resection of Klatskin's tumor 2, hepatico-jejunostomy for gall bladder cancer 1) following ERC or PTBD. The median duration between stenting and surgery was six weeks (range 3-10).

Seventeen of 65 bile samples (26.1%) collected during initial ERC and 13 of 15 stent flushings (86.6%) were positive for various organisms. Three of 7 bile samples collected during surgery and the lone sample collected during PTBD were positive. Overall sixty organisms were isolated (Table 1); of these, 22 (36.6%) were *Escherichia coli* and 11 (18.5%) were *Klebsiella pneumoniae*. Their sensitivity patterns are shown in Table 2.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Total</th>
<th>Ac</th>
<th>Max</th>
<th>Cpo</th>
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<th>Cz</th>
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<th>Caz</th>
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<tr>
<td><em>Escherichia coli</em></td>
<td>22</td>
<td>12</td>
<td>11</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>12</td>
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<td>-</td>
<td>8</td>
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<tr>
<td><em>Klebsiella pneumonia</em></td>
<td>11</td>
<td>5</td>
<td>4</td>
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<td>-</td>
<td>5</td>
<td>11</td>
<td>3</td>
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<td><em>Klebsiella oxytoca</em></td>
<td>3</td>
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<td><em>Pseudomonas aeruginosa</em></td>
<td>5</td>
<td>3</td>
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<tr>
<td>Coagulase-negative staph</td>
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<td>4</td>
<td>4</td>
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<td>3</td>
<td>4</td>
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<tr>
<td><em>Proteus vulgaris</em></td>
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<td><em>Proteus mirabilis</em></td>
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<td><em>Citrobacter freundii</em></td>
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<td><em>Klebsiella spp</em></td>
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<tr>
<td><em>Streptococci</em></td>
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<td><em>Diphtheroids</em></td>
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<tr>
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Cholangitis developed in 15 patients; 12 of them had hilar block and three had distal block. Of the 15 patients with cholangitis, 13 were treated with stent exchange within a median duration of 3 weeks (range 5 days to 6 weeks); in the other two patients, cholangitis subsided within 72 hours of starting antibiotics. Blood culture reports were available in nine patients. In the other six patients management was done depending on the bile/stent material culture and sensitivity reports.

Blood culture was positive in 3 patients, showing *E. coli, Pseudomonas aeruginosa* and *Citrobacter freundii* in one patient each. One blood culture and the corresponding ERC bile showed *P. aeruginosa*. Among the six blood-culture-negative patients, three showed bacteraemia in the form of *E. coli*, coagulase-negative staphylococci, and diphtheroids on ERC bile. Culture of flushed material from the stents showed organisms in all 13 patients. Thus while bile culture at initial ERC was positive in only four patients, all the stents retrieved subsequent to cholangitis showed organisms.

After surgery, wound infection developed in 4 cases. In 3 cases, the species and antibiotic sensitivity pattern of the organism (*E. coli*) in bile aspirated from the common bile duct at surgery was identical to that found in the wound culture. Four patients showed the same or...
organisms (E. coli, Klebsiella oxytoca, K. pneumonia) in the bile obtained at ERC and the stent cultures later on.

Discussion

In our study, 17 of 65 (26.1%) bile specimens obtained during initial ERC grew various organisms. In previous studies, factors associated with bactibilia were age >65 years, jaundice, cholelithiasis, acute cholecystitis and previous cholangitis. When any of these factors was present, more than 50% of cases had positive bile cultures. In comparison, among patients in whom none of these factors was present, only 15% had bactibilia.

Postoperative wound infection in biliary surgery is due to endogenous contamination produced by opening of the biliary tract in patients with bactibilia. Both postoperative wound infection and sepsis are frequently caused by the same bacteria. This observation was corroborated in our study where the organisms in the bile and wound culture were similar in 3 of 4 cases with wound infection. Accidental contamination of the operative field may also be responsible for wound infection and intra-abdominal sepsis. The incidence of wound infection or intra-abdominal sepsis was 22% in patients whose bile cultures were positive, and only 2% among patients with sterile bile. Infection after ERC in patients with obstructive lesions most often results from organisms already present in the obstructed tract. Also nosocomial pathogens may contaminate endoscopic devices and irrigation solutions.

A majority of patients with cholangitis in our study had hilar blocks. The high incidence of post-ERC cholangitis in such patients is well documented. It is possible due to introduction of organisms during the procedure and inability to drain all the biliary radicles. In our study, initial bile cultures were positive in only four of 15 patients who subsequently developed cholangitis, while all stents retrieved following cholangitis showed organisms.

The most commonly found organisms in infected bile are gram-negative enteric aerobes like E. coli, Klebsiella and Proteus. Similar results were found in our study, which showed E. coli (36.6%), K. pneumonia (18.3%), P. aeruginosa (8.3%), P. vulgaris (8.3%), and coagulase-negative staphylococci (8.3%). Amikacin, gentamicin, cefotaxime, ceftazidine, and cefoperazone-sulbactam combination showed good activity against the commonly found organisms.

We conclude that bile culture positivity is common in patients with malignant obstructive jaundice.

References


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