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Comparison of Selective and Nonselective Single-Dose Antibiotic Cover in Biliary Surgery


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A prospective randomized trial has compared 2 policies of single-dose antibiotic prophylaxis in biliary surgery. Patients were randomly allocated to 1 of 2 regimens: in group A, all patients received a single dose (2 g) of mezlocillin; in group B, patients were only given a single dose (2 g) of mezlocillin if they could be identified as “high-risk.” The high-risk criteria used in group B patients were: emergency surgery, jaundice, age over 70, recent cholangitis, choledocholithiasis, or previous biliary surgery. Eighty-five patients were randomized (random numbers) to group A and 84 patients to group B. Only 3 (34%) of the 84 patients in group B were high-risk patients and these were the only patients who qualified for antibiotic cover. Septicemia occurred in 1 patient in each group. Wound sepsis occurred in 11 (13%) of the 84 patients in group B compared with only 2 (2.3%) of those in group A (p < 0.02). These findings indicate that it is more advisable to provide single-dose antibiotic prophylaxis to all patients having biliary tract surgery than to adopt a policy of “selective” antibiotic cover to high-risk cases only.

Antimicrobial prophylaxis has been shown to reduce the morbidity of biliary surgery [1-5]. A low incidence of sepsis has been recorded both with the cephalosporins and with the ureidopenicillins [6, 7]. In a multivariate cluster analysis of 181 patients who underwent biliary surgery without receiving antibiotic cover, we identified 8 risk factors associated with high incidence of sepsis in patients having biliary operations: age over 70 years, jaundice at operation, recent rigors, emergency operation, operation within 4 weeks of acute admission with biliary disease, previous biliary operation, stones in the biliary tract, and bile duct obstruction [8]. Similar factors were also recognized in 1973 by Chetlin and Elliott [2]. Many elective operations on the biliary tract, particularly elective cholecystectomy alone, could be classified as clean rather than clean-contaminated operations for which no antibiotic cover might be advised [9, 10]. In order to reduce the cost of antibiotic prophylaxis, we were interested to test the hypothesis that antibiotic cover need only be given to high-risk patients rather than to all patients having biliary surgery. We, therefore, designed a prospective randomized trial in which single-dose antibiotic prophylaxis was allocated randomly either to all patients or selectively to patients with high-risk factors only.

Material and Methods

One hundred seventy-eight consecutive patients entered the trial, which was conducted in 1 surgical unit over 2½ years, and were randomly allocated to 2 groups. In group A, all patients received a single dose (2 g) of mezlocillin. In group B, patients were only given a single dose (2 g) of mezlocillin if they satisfied certain high-risk categories. Allocation to groups A or B was by a series of random numbers. The high-risk criteria used in group B to define patients who were given antibiotic cover were: emergency surgery, jaundice, age over 70, recent cholangitis, choledocholithiasis, or previous biliary surgery. Nine patients were withdrawn from the study because 3 were prescribed the wrong antibiotic, 3 had common bile duct explorations in group B without being given antibiotic cover, and 3 patients received additional antibiotics within the first 48 hours of operation for pyrexia of unknown origin. None of the withdrawn patients developed postoperative sepsis.

One hundred sixty-nine patients were left for analysis. Eighty-five were allocated to group A and all received antibiotic cover irrespective of risk factors. Eighty-four were allocated to group B, and only those with high-risk factors received antibiotic cover. A single intravenous infusion of 2 g mezlocillin was used for antibiotic cover and administered on induction of anesthesia. Rates of postoperative sepsis were monitored during the patient’s hospital stay and after hospital discharge in a follow-up clinic. Septicemia was defined as an episode of fever associated with positive blood cultures. Wound sepsis was defined as the presence of pus in the incision and was graded as “minor” if pus was confined to a single area of the wound without constitutional disturbance, and “major” if there was superficial or deep wound dehiscence, fever, and constitutional disturbance associated with prolonged hospital stay. Postoperative abscess was defined by radiological or laparotomy evidence of pus in the abdominal cavity. Drain sepsis was defined as purulent discharge from a drain site.

The incidences of risk factors in the groups are listed in Table 1. There were slightly fewer patients with 1 or more high-risk factors in group B (the group receiving “selective” antibiotic cover; n = 34) than in group A (n = 37). The underlying

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Table 1. Criteria for selective antibiotic prophylaxis.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 85</td>
<td>All</td>
<td>Selective</td>
</tr>
<tr>
<td>Emergency cholecystectomy</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Jaundice</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Age over 70 years</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Cholangitis within 1 wk of admission</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Choledocholithiasis</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Previous operation on the biliary tract</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Cholecystotomy</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>Total with at least 1 high-risk factor</td>
<td>37</td>
<td>34</td>
</tr>
</tbody>
</table>

Table 2. Diagnosis in 169 patients undergoing biliary surgery.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 85</td>
<td>All</td>
<td>Selective</td>
</tr>
<tr>
<td>Gallstones</td>
<td>68</td>
<td>61</td>
</tr>
<tr>
<td>Common bile duct stones</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Carcinoma of the pancreas</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Carcinoma of the bile duct</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bile duct stricture</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

diagnoses in the groups are listed in Table 2. None of the patients underwent incidental appendicectomy.

Results

Thirty-four (40%) of the patients in group B receiving ‘‘selective’’ antibiotic cover were given perioperative antibiotics because of the presence of 1 or more high-risk factors (Table 3). One case of septicemia occurred in each group. The first was in a patient randomized to antibiotic cover who developed an Escherichia coli septicemia (organism sensitive to mezlocillin) following a cholecystectomy for stones. The second was in a patient with common bile duct stones who developed septicemia following T-tube cholangiography where Klebsiella sp. was identified from the blood cultures (organism sensitive to mezlocillin). Klebsiella sp. was also present in the T-tube. The patient was not receiving antibiotics at the time. No patient developed a postoperative abscess in this trial. There was no postoperative mortality.

Wound infection occurred in 11 (13%) patients in group B receiving ‘‘selective’’ antibiotic cover compared with only 2 (2.3%) in group A in which antibiotic cover was given to all patients. Of the 13 wound infections, only 5 were classified as major. The difference in the incidence of wound infections between group A and B was statistically significant ($\chi^2 = 4.45; p < 0.02$). Six of the wound infections in group B (the group randomized to ‘‘selective’’ antibiotic cover) were in the 34 patients with a high-risk factor who were given mezlocillin. The remaining 5 wound infections were in the 50 patients without risk factors who received no antibiotic cover. In contrast, both wound infections in group A (the group in whom antibiotics were given to all patients) were among the 37 high-risk patients. One patient in each group developed a drain site infection.

The organisms recovered from the postoperative wound infection are listed in Table 4. Eight patients developed staphylococcal wound sepsis, of whom 4 received mezlocillin prophylaxis. Only 5 of the wound infections were due to E. coli, Klebsiella sp., or streptococci. Five of the staphylococcal wound infections occurred within 3 weeks of each other, all of which were in the group receiving selective antibiotic cover; 2 were from Staphylococcus aureus, and 3 were associated with S. epidermidis. Phage typing of these isolates failed to demonstrate a common pathogenic strain.

Discussion

This trial has demonstrated that a ‘‘selective’’ policy of antibiotic prophylaxis is associated with a significantly higher rate of