



ORIGINAL ARTICLE

Empiric antibiotic choices for community-acquired biliary tract infections



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Received 11 April 2013; accepted 17 September 2013

Available online 18 April 2014

KEYWORDS

Antibiotics;
Biliary tract;
Infections

Summary *Background:* The study was conducted to reveal the most appropriate empiric antibiotics for the treatment of community-acquired biliary tract infections (CA-BTI) at a regional hospital in Taiwan.

Methods: The study was performed between October 1, 2010 and October 31, 2012. All positive bile culture results of presumptive community-acquired origins were collected. The associated etiologic microorganisms and their antimicrobial susceptibilities were analyzed. The appropriateness of empiric therapy (defined as the effectiveness of the antibiotics against the etiologic agents) and the subsequent treatment response were examined through the review of medical records.

Results: A total of 115 patients (cholecystitis, 83 cases, 72.2%; cholangitis, 32 cases, 27.8%) and 189 isolates (136 Gram-negative bacilli, 37 Gram-positive cocci, and 16 anaerobes) were analyzed. The most frequent pathogens were *Escherichia coli* ($n = 69$, 36.5%), *Klebsiella* spp. ($n = 37$, 19.6%), enterococci ($n = 29$, 15.3%), and *Bacteroides* spp. ($n = 11$, 5.8%). Penicillin resistance (5.4%) was low in Gram-positive cocci, whereas higher resistance (>20%) to ceftazolin, cefuroxime, and ampicillin–sulbactam was found in Gram-negative bacilli. Anaerobes also demonstrated high resistance to clindamycin (37.5%) but less to metronidazole (12.5%). Appropriate empiric therapy was found in 92 (80%) cases, and among them, 83 (90.2%) were treated successfully. The treatment success rate (69.6%) was significantly lower among the remaining 23 cases with inappropriate empiric therapy (16 of 23 vs. 83 of 92, $p < 0.05$). A high treatment success rate (97.2%) was observed among cases empirically treated with ceftriaxone plus metronidazole.

Conclusion: The combination of ceftriaxone plus metronidazole appears to be the most appropriate empiric antibiotics for the treatment of CA-BTI at this hospital. Because different hospitals may encounter microorganisms of different antimicrobial susceptibilities, similar

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approaches may be followed by other hospitals where appropriate empiric therapy has not yet been established for the treatment of CA-BTI.

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Introduction

Biliary tract infections (BTI), including cholangitis and cholecystitis, usually result from biliary tract obstruction. From the standpoint of medical treatment, the most important approaches may include supportive treatment, administration of antibiotics, and exploring primary sources, such as biliary drainage, operation for removal of biliary tract stones, and cholecystectomy. Among these approaches, primary source control may be the most important. Early and instantaneous primary source control has been shown to be vital for the treatment of severe infections and may help to decrease mortality [1,2]. Furthermore, if biliary obstruction is present, primary source control may facilitate the penetration of antibiotics through the biliary tract, leading to a better bactericidal effect [3,4].

In addition to primary source control, administration of antibiotics is also crucial for the treatment of BTI. The etiologic agents of BTI usually originate from endogenous flora of the gastrointestinal tract, with *Escherichia coli*, *Klebsiella* spp., enterococci, and *Bacteroides* spp. being the most frequent. Hence, antibiotics that are effective against these organisms are usually used empirically to treat BTI [5–10]. However, inappropriate empiric antibiotics may also incur fatal outcomes [11,12].

Because the causative agents of BTI and the associated antimicrobial susceptibility patterns may vary in different hospitals [7–10], the establishment of appropriate therapeutic regimens for the individual hospitals appears necessary. The present study was therefore conducted to reveal the most appropriate empiric antibiotics for the treatment of community-acquired BTI (CA-BTI) at a 600-bed regional hospital in southern Taiwan. The bacteriology and the associated antimicrobial susceptibility patterns related to the CA-BTI were analyzed. To achieve the best therapeutic effects, the penetration ability of the antibiotics through the biliary tract was also considered [13,14].

Methods

Between October 1, 2010 and October 31, 2012, all positive results of bile cultures of presumptive community-acquired origins at a regional hospital in southern Taiwan were collected. Both aerobic and anaerobic cultures were routinely performed for bile specimens at this hospital and were included in the analysis. To prevent from the inclusion of some hospital-acquired pathogens, bile specimens that were submitted more than 3 days after hospitalization as well as those from patients readmitted within 6 months were excluded. In addition, medical records of the patients were reviewed, and information regarding age, sex,

diagnosis, invasive procedures to collect the bile specimens, empiric antibiotics, and treatment response were collected for further analysis.

The appropriateness of empiric antibiotics was evaluated according to the antimicrobial susceptibility testing results. The empiric antibiotics were categorized as appropriate if the etiologic microorganisms demonstrated susceptibility to the antibiotics used. By contrast, if any of the antibiotics used was categorized as resistant in the associated antimicrobial susceptibility testing, the empiric antibiotics would be deemed as inappropriate. Successful treatment was defined as the improvement of the following three clinical conditions: fever subsided gradually, the patient's general condition improved, and laboratory data became normal. If any of the conditions was not achieved, the case would be defined as treatment failure.

Standard laboratory methods were used to perform the bile culture and isolation and identification of microorganisms. Disk diffusion and limited agar dilution methods were used to determine the antimicrobial susceptibility for aerobic and anaerobic bacteria, respectively. The antibiotics tested for Gram-negative bacilli (GNBs) were as follows: cefazolin (30 µg), cefuroxime (30 µg), ceftriaxone (30 µg), ceftazidime (30 µg), gentamicin (10 µg), amikacin (30 µg), levofloxacin (5 µg), and ampicillin–sulbactam (10/10 µg). For Gram-positive cocci (GPCs), penicillin (10 units) and vancomycin (30 µg) were tested. All these antimicrobial disks were purchased from Becton, Dickinson and Company (Franklin Lakes, NJ, USA). Clindamycin (2 µg/4 µg) and metronidazole (8 µg/16 µg) were tested for anaerobes. Both disks were purchased from Creative Media Products, Ltd. (New Taipei City, Taiwan).

Results of the antimicrobial susceptibility testing were interpreted according to the current standards recommended by the Clinical and Laboratory Standards Institute. All intermediate results were regarded as resistant in this study.

The Chi-square test was used for the statistical analysis. A difference was considered statistically significant when the *p* value was <0.05.

Results

A total of 115 patients and 189 isolates were collected in the present study. Among the 115 patients, 66 (57.4%) were male and 29 (25.2%) were aged <60 years. The majority (83, 72.2%) of the patients had cholecystitis, and the remaining (32, 27.8%) were cholangitis. In the 83 patients with cholecystitis, bile specimens were obtained either from percutaneous gallbladder drainage (54, 65.1%) or through operation (29, 34.9%). In the 32 patients with cholangitis, bile specimens were withdrawn by one of the following procedures: percutaneous transhepatic drainage

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