The Brazilian Journal of
INFECTIOUS DISEASES

www.elsevier.com/locate/bjid

Original article

Risk of vancomycin-resistant enterococci bloodstream infection among patients colonized with vancomycin-resistant enterococci

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ARTICLE INFO

Article history:
Received 29 May 2014
Accepted 17 September 2014
Available online 18 December 2014

Keywords:
Bloodstream infections
Colonization
Immunosupression
Vancomycin-resistant enterococcus

ABSTRACT

Background: Vancomycin-resistant enterococci colonization has been reported to increase the risk of developing infections, including bloodstream infections.
Aim: In this study, we aimed to share our experience with the vancomycin-resistant enterococci bloodstream infections following gastrointestinal vancomycin-resistant enterococci colonization in pediatric population during a period of 18 months.
Method: A retrospective cohort of children admitted to a 400-bed tertiary teaching hospital in Izmir, Turkey whose vancomycin-resistant enterococci colonization was newly detected during routine surveillances for gastrointestinal vancomycin-resistant enterococci colonization during the period of January 2009 and December 2012 were included in this study. All vancomycin-resistant enterococci isolates found within 18 months after initial detection were evaluated for evidence of infection.
Findings: Two hundred and sixteen patients with vancomycin-resistant enterococci were included in the study. Vancomycin-resistant enterococci colonization was detected in 136 patients (62.3%) while they were hospitalized at intensive care units; while the remaining majority (33.0%) were hospitalized at hematology-oncology department. Vancomycin-resistant enterococci bacteremia was present only in three (1.55%) patients. All these patients were immunosuppressed due to human immunodeficiency virus (one patient) and intensive chemotherapy (two patients).
Conclusion: In conclusion, our study found that 1.55% of vancomycin-resistant enterococci-colonized children had developed vancomycin-resistant enterococci bloodstream infection among the pediatric intensive care unit and hematology/oncology patients; according to our findings, we suggest that immunosupression is the key point for developing vancomycin-resistant enterococci bloodstream infections.

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http://dx.doi.org/10.1016/j.bjid.2014.09.010
1413-8670/

Introduction

The emergence and spread of vancomycin-resistant enterococci (VRE) as a nosocomial pathogen represent a major health problem since its first isolation in the United Kingdom and in France.[1,2] Recent articles reported a double digit number of hospitalizations for VRE infections between 2003 and 2006.[3]

Colonization is the key point for VRE infections. Infections generally follow VRE colonization mostly in gastrointestinal tract.[4] VRE colonization was reported to increase a patient's risk of developing infections, such as bloodstream infections (BSIs).[5,6] Another study reported a 5- to 10-fold increased risk of infection once a patient was colonized with VRE.[7] The VRE infection rates were highest in hematologic–oncologic patients, organ transplant recipients and patients in intensive care units while it is reported to be nearly zero in immunocompetent patients. However, studies including children with VRE infections following gastrointestinal VRE colonization were rare and most data were adopted from adult studies.[5,6,8–11]

In this study, we report our experience with the VRE bloodstream infections following gastrointestinal VRE colorizations for an 18-month period.

Materials and methods

This retrospective study was conducted in Dr. Behçet Uz Children's Hospital, a 400-bed tertiary teaching hospital in Izmir, Turkey, between January 2009 and December 2012. Patients with newly detected VRE colonization during routine surveillances for gastrointestinal VRE colonization were included in this study.

In our center; rectal sample screening for VRE was performed at admission and weekly in all intensive care units (ICUs); hematology–oncology department and neonatal intensive care unit using conventional cultures and molecular diagnostic techniques. The "red flag" precautions for patients with VRE colonization were also performed and strict infection control policies as part of patient management were applied in our center.

Using the VRE colonized patients cohort, we observed all the patients during 18 months after initial detection using in-patient and outpatient medical records at the same institution. The patients' age, gender, service where patient was hospitalized, re-hospitalization, episodes of bacteremia, and isolated microorganism were recorded. Medical records were reviewed to identify the body site that had been colonized or infected when the initial VRE-positive culture sample was obtained and whether the detection represented colonization or infection on the basis of the Centers for Disease Control and Prevention criteria.[12]

All VRE isolates found within 18 months after initial detection were evaluated for evidence of discrete infection. Two trained reviewers separately verified whether infections represented distinct and unrelated events. Subsequent infections were described according to the infection site and days since initial detection. We determined the proportion of patients who subsequently developed VRE infection within the study cohort. The investigators obtained further information about the patients' complaints by calling the patients' family.

VRE detection: rectal swabs were directly inoculated onto a chromogenic agar plate (ChromID VRE agar bioMérieux, France) containing 8 mg of vancomycin ml^{-1} and incubated at 36 °C aerobically for 72 h. Identification and antibiotic susceptibility tests were performed using the automated VITEK-2 system (bioMérieux, France) via Gram positive identification card, AST-P592, a supplementary E-test (bioMérieux, Durham, NC) and disk diffusion test according to the manufacturer's instructions. Van A and Van B resistance phenotypes were reported by the system on the basis of MIC values.

Statistical analysis was performed by using the Statistical Package for the Social Science (SPSS) software. Distribution of numeric variables was tested by both graphical methods and Shapiro–Wilk test. The difference between means of numeric variables was tested by Student's *t* test or Mann–Whitney *U* test, where appropriate. The difference between proportions was tested by Chi-Square or Fisher's exact test. $p < 0.05$ was considered statistically significant.

Results

Two hundred and sixteen patients with VRE colonization were included in the study. The median age of the patients was two months ranging from 14 days to 16 years. One hundred and forty patients were male (64.2%).

Colonization was detected in 136 patients (62.3%) while they were hospitalized at ICUs, and 71 patients (33.0%) were hospitalized at the hematology–oncology department.

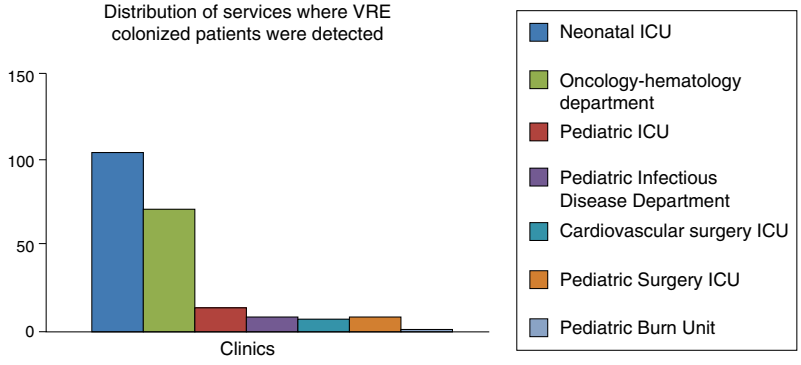

Fig. 1 – Distribution of the causative agents of bacteremia during the study period.