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RESEARCH ARTICLE

Central venous-catheter related bacteremia: incidence and risk factors in a hospital in western Mexico[☆]

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KEYWORDS

Catheter-related
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Bacteremia;
Central venous
catheters

Abstract

Background: Central venous catheters (CVC) are needed for monitoring and treatment of critically ill patients; however, their use increases the risk of bacteremia. The aim of the study was to quantify the incidence of central venous catheter-related bacteremia (CVCRB) and to identify factors associated with this infection.

Methods: A prospective cohort study was conducted in a concentration hospital of western Mexico. The association of CVCRB and study variables was investigated using multivariate Cox regression analysis.

Results: Two hundred and four patients with CVC were studied. The mean age was 4.6 years; 66.2% were male. Insertion sites of the catheters were subclavian vein 72.5% (n = 148), jugular vein 20.1% (n = 41) and femoral vein 7.4% (n = 15). CVCRB incidence was 6.5 events/1,000 catheter-days; microorganisms identified were gram-positive cocci 37.5% (n = 6), gram-negative bacilli 37.5% (n = 6) and *Candida albicans* 25% (n = 4). It was observed that the increase in catheter manipulations per day was associated with bacteremia (HR 1.14, 95% CI 1.06-1.23), whereas the use of intravenous antibiotics showed a protective effect (HR 0.84, 95% CI 0.76-0.92).

Conclusions: In addition to the strategies of maximum caution when placing or manipulating the catheter, we recommend decreasing, as much as possible, disconnects between the CVC and

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PALABRAS CLAVE

Infección relacionada con catéter;
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Bacteriemia;
Catéter venoso central

the infusion line. Antibiotics showed a protective effect, but the outcome is uncertain and the promotion of antimicrobial resistance should be considered.

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Bacteriemia relacionada con catéter venoso central: incidencia y factores de riesgo en un hospital del occidente de México

Resumen

Introducción. El catéter venoso central (CVC) es necesario para la monitorización y tratamiento de pacientes en estado crítico; sin embargo, su uso incrementa el riesgo de bacteriemia. El objetivo del estudio fue cuantificar la incidencia de bacteriemia relacionada con catéter venoso central (BRCVC) e identificar los factores asociados con esta infección.

Métodos. Se realizó un estudio de cohorte prospectivo en un hospital de concentración del occidente de México. Para conocer la asociación entre BRCVC y las variables en estudio, se realizó un análisis multivariado con regresión de Cox.

Resultados. Se estudiaron 204 pacientes con CVC. La edad promedio fue de 4.6 años; el 66.2% fue del sexo masculino. Los sitios de inserción del catéter fueron la vena subclavia (72.5%, n = 148), la vena yugular (20.1%, n = 41) o la vena femoral (7.4%, n = 15). La incidencia de BRCVC fue de 6.5 eventos por 1,000 días catéter. Los microorganismos identificados fueron cocos Gram positivos (37.5%, n = 6), bacilos Gram negativos (37.5%, n = 6) y *Candida albicans* (25%, n = 4). Se observó que la mayor manipulación del catéter por día se asoció con bacteriemia (RR 1.14, IC95% 1.06-1.23), mientras que el uso de antibióticos intravenosos mostró un efecto protector (RR 0.84, IC95% 0.76-0.92).

Conclusiones. Además de las medidas máximas de precaución al momento de colocar o manipular el catéter, es conveniente disminuir lo más posible las desconexiones entre el equipo de venoclisis y el CVC. Los antibióticos mostraron un efecto protector; sin embargo, se debe considerar el riesgo de favorecer resistencias antimicrobianas.

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1. Introduction

Central venous catheters (CVC) are needed for monitoring and treatment of critically ill patients; however, their use increases the risk of bacteremia (OR 4.51 95% CI 2.49-8.18, $p < 0.001$).¹⁻⁴ The presence of intravascular devices has been the main cause of hospital bloodstream infections, with a mortality rate of 25%.⁵⁻¹¹

Microbial flora of the skin migrates through both outer and inner surfaces of the catheter or enters the bloodstream through contaminated solutions. In short-term intravascular devices, most central venous catheter-related bloodstream infections (CVCRB) are originated by the colonization of the outer surface, while in the long-term catheters infections occur mainly by contamination of the inner surface.^{9,12-14}

An hour after the catheter is colonized, microorganisms can be identified 4 cm away from the site of colonization.^{2,12} Subsequently, pathogens adhere to the catheter surface and form a protective film of extracellular polymers that surrounds bacteria and retains nutrients. Under these conditions, microorganisms may be resistant to antimicrobial treatment and phagocytic activity of the immune system.^{2,15}

Clinical diagnosis of CVCRB is not specific. Microbiological analyses to confirm infections are performed in only 15 to

39% of patients with clinical manifestations. Differential time to positivity of blood cultures allow greater accuracy in diagnosis.^{6,16,17}

Different conditions have been associated with the increased risk of CVCRB: age of the patient (< 10 years), catheter insertion without sterile barriers, difficulties during placement, bacterial colonization of the insertion site, placement in the femoral vein, total parenteral nutrition, blood transfusions and duration of catheter placement > 7 days.^{7,10,11,14,18-23} Since strategic planning for prevention requires understanding the epidemiology of the CVCRB, the objective of this study was to quantify the incidence of CVCRB and to identify the main risk factors in a concentration hospital in western Mexico.

2. Patients and methods

A prospective cohort study was conducted in the Nuevo Hospital Civil de Guadalajara Dr. Juan I. Menchaca (HCGJIM) in Guadalajara, Jalisco, Mexico, from March 18, 2011 to June 24, 2012. The study was approved by the Ethics and Research Committees of the institution.

Patients in the pediatric Intensive Care Unit (ICU) and in the pediatric Emergency Room (ER) who had a CVC placed

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