The lower detection of MBEC and MBEC/MIC values of daptomycin compared to the same values of vancomycin suggested that daptomycin might be effective at lower doses than vancomycin in the treatment of biofilm infections” Öcal et al (2017).

Abstract:

Coagulase-negative staphylococci (CNS) are one of the primer agents of blood stream infections (BSI) and catheter-related bloodstream infections (CR-BSI) which are associated mostly with the usage of central venous catheters and, important causes of morbidity and mortality despite the usage of antibacterial and supportive treatment.

It is important to determine the properties of these causative microorganisms in order to make appropriate treatment of such infections. The aims of our study were to evaluate the biofilm formation of coagulase negative staphylococci (CNS) which were causative agents of bloodstream (BSI) and catheter related bloodstream infections (CR-BSI), to determine the minimum inhibitory concentration (MIC) of planktonic forms and minimal biofilm eradication concentration (MBEC) of sessile forms for vancomycin and daptomycin and to evaluate the efficacy of these antibiotics in infections with biofilm-forming isolates in vitro. A total of 65 CoNS (n= 26 catheter colonizers, n= 28 CR-BSI, n= 11 BSI agents) were identified by conventional methods and also with BD Phoenix (Becton Dickinson, USA) and Bruker Microflex MS (Bruker Daltonics, Germany) systems. Meticillin resistance was determined by the presence of mecA gene with PCR. MIC values of vancomycin and daptomycin were investigated by broth microdilution, for daptomycin medium containing 25 and 50 μg/ml Ca++ were used. Assessment of biofilm formation and detection of MBEC were determined by microplate method. The clonal relationship was investigated by the PFGE method. A total of 65 isolates; 26 catheter colonizers, 28 CR-BSI agents and 11 BSI agents were evaluated and identified as Staphylococcus epidermidis (n= 33), Staphylococcus haemolyticus (n= 16), Staphylococcus hominis (n= 15), and Staphylococcus
capitis (n= 1). 81.5% of the isolates were found to be methicillin resistant and all of them were found to be sensitive to vancomycin (MIC= 0.125-4 μg/ml) and daptomycin (MIC= 0.062-0.25 μg/ml in 25 μg/ml Ca++ and MIC= 0.031-0.50 μg/ml in 50 μg/ml Ca++ containing medium). MIC values were lower in medium containing 50 μg/ml Ca++ for daptomycin. As it is known that the efficacy of daptomycin depends on the physiological levels of Ca++, which causes conformational changes in the structure of these antibacterials. Our findings also suggested that high levels of Ca++ are needed to ensure the efficacy of daptomycin. All of the isolates produced biofilm at different strengths of positivity (n= 12/18.5% weak, n= 35/%53.8 moderate, n= 18/%27.7 strong). MBEC and MBEC/MIC values for vancomycin were found to be higher than daptomycin (p< 0.001). Strong biofilm producers had higher MBEC and MBEC/MIC, MBEC50/MIC50 ve MBEC90/MIC90 values (p< 0.05). Especially in infections with biofilm forming isolates, the detection of only MIC values are not always sufficient in the treatment of biofilm-related infections as they reflect the sensitivity of planktonic bacteria. The inconsistency between the MIC and MBEC values and the high rates of MBEC/MIC found in our study supported this prediction. The lower detection of MBEC and MBEC/MIC values of daptomycin compared to the same values of vancomycin suggested that daptomycin might be effective at lower doses than vancomycin in the treatment of biofilm infections.

Reference:


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