Research Paper Medical Science

BORSA May Be Misidentified as MRSA in Disk Diffusion Technique Without MIC Testing

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ABSTRACT

Nowadays community-based, nosocomial or hospital acquired infections are most common and one of the important causative organism is Staphylococcus aureus which is resistant to β-lactum antibiotics. They show resistance to these groups of antibiotics mainly due to two reasons – 'Production of β-lactamase' and 'Presence of 'mecA gene'.

Disk diffusion technique is widely used in maximum clinical laboratories for detection of methicillin resistance in Staphylococcus aureus.

In this study, 100 clinical isolates of Staphylococcus aureus were obtained in pure culture from pus, abscess etc. 88% of them were meeting the criteria to be suspected as BORSA (Borderline Oxacillin Resistant Staphylococcus aureus) i.e. intermediate susceptible or resistant to oxacillin but susceptible to amoxicillin-clavulinic acid upon disk diffusion testing. Further study was done to differentiate BORSA (Borderline Oxacillin Resistant Staphylococcus aureus) from MRSA (Methicillin-Resistant Staphylococcus aureus).

Studies revealed 60 strains (68.18%) consistently met BORSA criteria and had average β-lactamase levels six- to seven-fold higher than oxacillin-susceptible controls (ATCC 29213 of Staphylococcus aureus). 10 strains (11.36%) showed resistance to both the antibiotics while 18 strains (20.45%) showed oxacillin-susceptibility on repetitive testing.

Cefoxitin (30 mc) and Vancomycin (30 mcg) discs were also used. To elicit intrinsic methicillin resistance in Staphylococcus aureus under normal condition, a large number of BORSA strains appeared resistant to amoxicillin-clavulanic acid.

This study clearly revealed that BORSA may be misidentified as MRSA while testing by disk diffusion method.

KEYWORDS

INTRODUCTION

Staphylococci are most important cause of nosocomial infection or community-acquired infection with high morbididty and mortality rates worldwide. Staphylococcus aureus strains emerged that were resistant to the penicillins through two mechanisms - 'Production of β-lactamase enzyme' and 'Presence of 'mecA gene'. The mecA product, Penicillin-Binding-Protein (PBP) 2a, mediates oxacillin resistance. These strains were termed as 'MRSA (Methicillin-Resistant Staphylococcus aureus)'. Most of the strains produce β-lactamase and are thus resistant to penicillins. Some of these strains produce excessive amount of the enzymes which make them appear BORSA and they can be difficult to differentiate from classic MRSA.

MATERIALS AND METHODS

The clinical specimens like pus, wound swabs, abscesses etc were inoculated on three different media namely Nutrient Agar, Blood Agar and Mannitol Salt Agar Slants. Then, the colonies were subjected to morphological and biochemical studies such as microscopic examination, Gram's staining, motility test, catalase, slide and tube coagulase for confirmation of identification. Then, the organisms were subjected to AST by 'Kirby-Bauer Disk Diffusion' method.using 0.5 McFarland standard suspension of the isolates on Mueller Hinton Agar Plates with antibiotic discs such as Oxacillin (1 mcg), Cefoxitin (30 mcg), Vancomycin (30 mcg) and Amoxy-Clav (30 mcg). Plates were incubated for 24 hours at 37^0C and the zone diameters were measured eg. An inhibition zone diameter of £ <= 17 mm was reported as oxacillin resistant and ³ >= 20 mm was considered as oxacillin sensitive.

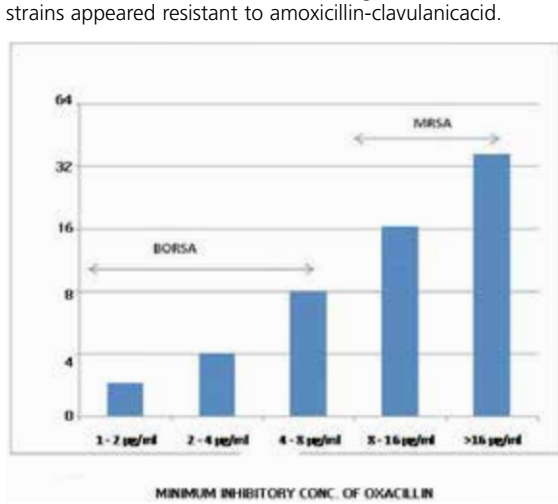
The resistant isolated strains were again subjected to phenotypic method to screen and confirm MRSA and to differentiate them from BORSA by oxacillin screen agar and cefoxitin disk diffusion method using ATCC 29213 of ***Staphylococcus aureus*** as negative control. The tubes were incubated for 24 hours at 37^0C and was observed for visual turbidity. The lowest concentration of oxacillin that inhibited bacterial growth visuaized by the absence of visual turbidity was determined as the 'Minimum Inhibitory Concentration' (MIC). Strains with MIC level 1-8 mcg/ml and MIC of oxacillin more than 8 mcg/ml was considered BORSA and MRSA strains respectively.

RESULT AND DISCUSSION

100 clinical isolates of ***Staphylococcus aureus*** were obtained in pure culture from pus, wound swab, abscess etc. 88% of them were meeting the criteria to be suspected as BORSA (Borderline Oxacillin Resistant ***Staphylococcus aureus***) i.e. intermediate susceptible or resistant to oxacillin but susceptible to amoxicillin-clavulinic acid upon disk diffusion testing. Further study was done to differentiate BORSA (Borderline Oxacillin Resistant ***Staphylococcus aureus***) from MRSA (Methicillin-Resistant ***Staphylococcus aureus***).

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Cefoxitin (30 mcg) and Vancomycin (30 mcg) discs were also used. To elicit intrinsic methicillin resistance in Staphylococcus aureus under normal condition, a large number of BORSA strains appeared resistant to amoxicillin-clavulanicacid.



CONCLUSION

This study clearly revealed that BORSA may be misidentified as MRSA while testing by disk diffusion method. Differentiation of BORSA from MRSA by 'Minimum Inhibitory Concentration' (MIC) of oxacillin by Broth Macrodilution method or by oxacillin screen agar method is required for proper antimicrobial chemotherapy.

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CONFLICT OF INTERESTS

The author declares that there is no conflict of interests regarding the publication of this paper.

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