Surveillance Culture of Carbapenemase-Producing Enterobacteriaceae in a Tertiary-Care Hospital

Eunyoung Lee, Yangsoon Lee

Department of Laboratory Medicine, Hanyang University College of Medicine, Seoul, Korea

Background: Carbapenem-resistant Enterobacteriaceae (CRE) are increasingly being reported throughout the world, which is a significant problem for patient treatment and infection control. Carbapenem-resistance in Enterobacteriaceae is mainly due to carbapenem-hydrolyzing β-lactamase, which tends to spread through genetic mobile elements. Therefore, the detection of carbapenemase-producing Enterobacteriaceae (CPE) carriers is particularly important for the prevention and epidemiological monitoring of these infections. In this study, we performed surveillance cultures for CPE in patients admitted to the hospital and evaluated the prevalence of CPE.

Methods: Stool cultures were obtained from a total of 228 patients at our tertiary-care hospital between March and May 2017. Stool specimens were inoculated on ChromID CARBA agar (bioMérieux, France) and incubated for 18-24 hours. Suspicious colonies with pink or bluish-green color were screened for CPE by the modified Hodge test (MHT) and carbapenem inhibition test (CIT). We performed PCR to detect five carbapenemase genes, blaKPC, blaIMP, blaVIM, blaNDM, and blaOXA-48.

Results: Among 228 isolates, seven were suspicious for CPE: four Klebsiella pneumoniae, one Escherichia coli, one Enterobacter aerogenes, and one Serratia marcescens. Two K. pneumoniae isolates showed positive reactions in both the modified Hodge test and inhibition test with phenylboronic acid. By PCR, blaKPC was identified in these two K. pneumoniae isolates.

Conclusion: Our results showed a very low prevalence (2/228, 0.9%) of CPE in our tertiary-care hospital based on surveillance culture in a recent three month period. (Ann Clin Microbiol 2018;21:8-11)

Key Words: Carbapenemase-producing Enterobacteriaceae, Healthcare-associated infection, Infection control
Table 1. Isolates suspicious for carbapenemase-producing Enterobacteriaceae on chromogenic agar

<table>
<thead>
<tr>
<th>No. of isolate</th>
<th>Sex/age</th>
<th>Species</th>
<th>Colony</th>
<th>Modified Hodge test</th>
<th>Inhibition test (zone diameter, mm)</th>
<th>CPE gene</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M/71</td>
<td><em>K. pneumoniae</em></td>
<td>Green</td>
<td>−</td>
<td>13 (−) 22 (+) 17 (+) EDTA</td>
<td>ND</td>
</tr>
<tr>
<td>2</td>
<td>F/73</td>
<td><em>K. pneumoniae</em></td>
<td>Green</td>
<td>−</td>
<td>21 (−) 24 (w+) 22 (−) PBA</td>
<td>ND</td>
</tr>
<tr>
<td>3</td>
<td>M/37</td>
<td><em>K. pneumoniae</em></td>
<td>Green</td>
<td>+</td>
<td>14 (−) 22 (+) 16 (−) PBA</td>
<td><em>blaKPC</em></td>
</tr>
<tr>
<td>4</td>
<td>F/80</td>
<td><em>K. pneumoniae</em></td>
<td>Green</td>
<td>+</td>
<td>14 (−) 22 (+) 14 (−) PBA</td>
<td><em>blaKPC</em></td>
</tr>
<tr>
<td>5</td>
<td>M/84</td>
<td><em>E. coli</em></td>
<td>Pink</td>
<td>−</td>
<td>26 (−) 27 (−) 27 (−) PBA</td>
<td>ND</td>
</tr>
<tr>
<td>6</td>
<td>M/68</td>
<td><em>E. aerogenes</em></td>
<td>Green</td>
<td>−</td>
<td>21 (−) 23 (−) 22 (−) PBA</td>
<td>ND</td>
</tr>
<tr>
<td>7</td>
<td>M/74</td>
<td><em>S. marcesens</em></td>
<td>Green</td>
<td>−</td>
<td>27 (−) 28 (−) 28 (−) PBA</td>
<td>ND</td>
</tr>
</tbody>
</table>

*Indicates a positive result when the size difference was 4 mm or more and weakly positive at 3 mm.

Abbreviations: MEM, meropenem; PBA, phenylboronic acid; EDTA, ethylenediaminetetraacetic acid; CPE, carbapenemase-producing Enterobacteriaceae; M, male; ND, not detected; F, female.
tible to colistin and tigecycline.

Jeong et al. [11] suggested that the prevalence and predominant genotypes of CPE in Korea showed hospital-specific differences such as epidemic presence, sporadic presence, and absence. Therefore, they suggested that CPE dissemination is at an early stage in Korea. There are two limitations in this study: the short period of hospital surveillance and the limited number of patients referred to the laboratory for stool culture. The limitation of this study was that the surveillance culture for evaluation the prevalence was not performed for all patients admitted in hospital or intensive-care unit.

In this study, our institute may be a sporadic presence hospital in this time. Our results indicated a very low prevalence (2/228, 0.9%) of CPE in a tertiary-care hospital based on surveillance culture. However, continuous monitoring and infection control for CPE should be performed to prevent transmission of this superbug.

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REFERENCES

카바페넴분해효소 생성 장내세균에 대한 감시배양

한양대학교 의과대학 진단검사의학교실
이은영, 이양순

배경: 카바페넴 내성 장내세균(Carbapenem-resistant Enterobacteriaceae, CRE)은 전세계적으로 점차 증가하고 있으며, 환자의 치료 및 감염관리에 매우 중요하다. CRE의 카바페넴 내성이 주로 이동성을 가진 카바페넴분해 효소 때문인 것으로 알려져 있다. 따라서, 카바페넴분해효소를 분비하는 장내세균(carbapenemase-producing Enterobacteriaceae, CPE)의 보균자 검출은 원내 감염의 예방 및 감시에 중요하다. 본 연구에서는 국내 1개 3차병원에서 CPE 감시배양을 시행하여 발생률을 조사하였다.

방법: 2017년 3월부터 5월까지 1개 3차병원에 내원한 총 228명 환자의 대변배양을 시행하였다. 대변은 ChromID CARBA agar (bioMérieux, France)에 접종하고, 18-24시간 배양하였다. CPE가 의심되는 집락에 대해서 modified Hodge test (MHT)와 carbapenemase inhibition test (CIT)을 시행하였고, blakPC, blakIM, blavIM, blanSM 및 blaoX-48 유전자에 대해서 PCR 및 염기서열을 분석하였다.

결과: CPE가 의심되는 균주는 228균주 중에서 7주로, Klebsiella pneumoniae 4주, Escherichia coli 1주, one Enterobacter aerogenosa 1주, Serratia marcescens 1주였다. K. pneumoniae 2주가 MHT와 CIT에 양성이었고, KPC 유전자가 검출되었다. 본 기관의 최근 3개월간 CPE 발생률은 0.9% (2/228)임을 알 수 있었다.

결론: CPE 감시배양을 통해서 낮은 발생률(2/228, 0.9%)을 확인하였으며, 지속적인 감시배양이 필요함 것으로 사료된다.


교신저자: 이양순, 04763, 서울시 성동구 왕십리로 222-1
한양대학교 의과대학 진단검사의학교실
Tel: 02-2290-9655, Fax: 02-2290-9193
E-mail: yangsoon@hanyang.ac.kr