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Identification of KPC-Producing *Pseudomonas aeruginosa* and *Acinetobacter baumannii* in a Burned Infant: A Case Report

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ABSTRACT

The objective of this study was to determine the phenotypic characteristics of KPC-producing *Pseudomonas aeruginosa* and *Acinetobacter baumannii* isolates. A case report study was performed at a tertiary burn care centre in Tehran, Iran. Nine isolates of *Pseudomonas aeruginosa* and *Acinetobacter baumannii* from a hospitalized case were isolated. The identity of isolates was confirmed and their antibiotic susceptibility testing was performed. Eight out of nine *Pseudomonas aeruginosa* and *Acinetobacter baumannii* isolates were resistant to Imipenem. Three out of 8 imipenem resistant isolates were also positive for KPC test. Findings of this study highlight the importance of implementation of an effective infection control strategy in order to prevent and reduce the emergence and spread of gram negative Carbapenemase-producing organisms in Iran.

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Introduction

Increasing beta-lactam antibiotics resistant strains among nosocomial pathogens such as *Pseudomonas aeruginosa* and *Acinetobacter baumannii* have become a serious problem worldwide (1). This is particularly important considering the increase of resistance to broad spectrum antibiotics such as Cephalosporins, Carbapenems and Monobactems (1). Resistance to Carbapenems can be related to producing carbapenemase enzymes such as *Klebsiella pneumoniae* carbapenemase (KPC) and Metallo beta-lactamases (MBLs) (2). Carbapenems resistance due to KPC and MBLs can rapidly spread among gram negative bacteria, because these enzymes are encoded typically on mobile genetic elements (1-0). Such strains are usually resistant to many existing antibiotics (5). In this report, we described a case of infection with KPC and MBL producing *P. aeruginosa* and *A. baumannii* strains in Tehran, Iran.

Case Report and Discussion

A 22-month-old male infant with chemical burn by acid was admitted to Motahari hospital, Tehran, Iran, on October 6, 2011. He was a case of 2nd and 3rd degree of burn and his Total Burn Surface area (TBSA) was 80%. Patient was undergone fluid therapy and escharotomy upon arrival at hospital. On admission, he was alert with a temperature of 37^{o}C. The patient blood pressure was 100/61 mmHg with 118/min pulse and 26/min respiratory rate. The patient was immediately treated by fluid and antibiotic therapy with Amikacin, Tazocin and Vancomycin. The bandage was changed every day and further interventions such as debridement were performed on burn wounds. Blood culture of patient was negative on the first day of hospitalization while Tazocin was replaced by Meropenem on day 13.

Antibiotic susceptibility testing was carried out by disk diffusion method according to Clinical and Laboratory Standards Institute (CLSI) guidelines using following antibiotic disks on the Mueller Hinton agar: Cefotaxime (30µg), Ceftazidime (30µg), Aztreonam (30µg), Imipenem (10µg), Piperacillin (100µg), Piperacillin-Tazobactam (100/10µg), Ticarcillin (75µg), Ticarcillin-Clavulanic Acid (75/10µg), Gentamicin (10µg), Amikacin (30µg), Tobramycin (10µg) and Ciprofloxacin (5µg) (MAST Company, UK).

The results of susceptibility testing of strains are shown in Table 1. Strains A_1, A_2, A_3, P_1 and P_2 were resistant to Imipenem, examined by Modified Hodge Test using *E. coli* ATCC 25922 and Ertapenem disk (10 µg) for detecting KPC. Moreover, combination disk method with Imipenem and Imipenem + EDTA disk was performed for MBL conformation.

A_2, A_3 and P_1 isolates were confirmed to be KPC-producer strains and P_2 was identified as positive for MBL. Despite of therapeutic measures and antibiotic therapy with Amikacin, Tazocin and Meropenem, unfortunately, the patient died on November 5, 2011. This was due to sepsis penetrated to deep chemical burn wounds and infection with resistant gram negative bacteria.

A case report from Korea in 2011 indicated a KPC producer *Klebsiella pneumonia* which was

isolated from Urinary Tract Infection (UTI) (6). Two *Klebsiella pneumonia* positive for blaKPC were isolated among 153 MDR enterobacteriaceae in Japan, 2012 (7).

Empiric therapy in burned patients in combination with inadequate prevention protocols and excessive use of extended spectrum antibiotics can lead to the emergent of Multi Drug Resistant (MDR) microorganisms especially that of KPC and MBL producing.

It is very necessary to conduct Infection Prevention and Control Measures in hospitals and health care centers because of the significance of emergence and spread of multi-drug resistance among the members of gram negative bacteria.

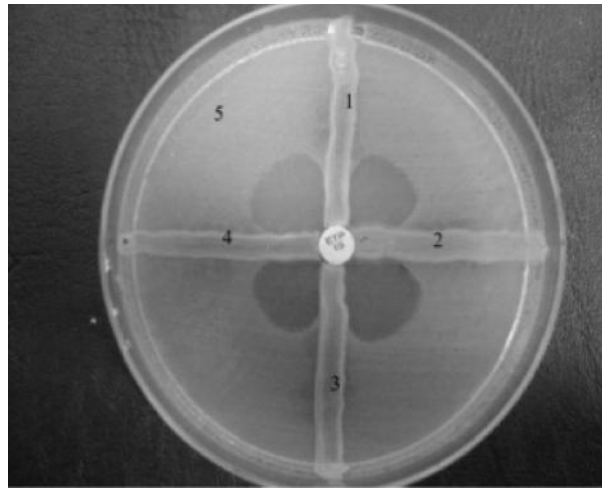

Figure 1. Modified Hodge Test. 1, Positive Control; 2, *Pseudomonas aeruginosa* (P_1); 3, *Acinetobacter baumannii* (A_3); 4, *Acinetobacter baumannii* (A_2).

Table 1. Results of antibiotic susceptibility testing during hospitalization of burn wound

No.	Hospitalization Time (day)	Strain	Antibiotic susceptibility testing													Comments
			CTX	CAZ	AT	IMP	PTZ	PRL	TC	TC-C	GM	AK	TO	CI	CO	
1	3	*E. coli*	S	S	S	S	S	S	S	S	S	S	S	S	S	
2	5	*A. baumannii* (A_1)	R	R	R	R	R	R	R	R	R	R	R	R	S	MDR
3	12	*A. baumannii* (A_2)	R	R	R	R	R	R	R	R	R	R	R	R	S	MDR
4	19	*P. aeruginosa* (P_1)	R	R	R	R	R	R	R	R	R	R	R	R	S	MDR
5	25	*A. baumannii* (A_3)	R	R	R	R	R	R	R	R	R	S	S	R	S	
6	25	*P. aeruginosa* (P_2)	R	R	R	R	R	R	R	R	R	R	R	R	S	MDR
7	26	*A. baumannii* (A_2)	R	R	R	R	R	R	R	R	R	R	R	R	S	MDR
8	27	*P. aeruginosa* (P_2)	R	R	R	R	R	R	R	R	R	R	R	R	S	MDR
9	29	*P. aeruginosa* (P_2)	R	R	R	R	R	R	R	R	R	R	R	R	S	MDR

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