Short Communication

Molecular Characterization of Methicillin-Resistant *Staphylococcus aureus* Clones from a Teaching Hospital in Tehran

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SUMMARY: A total of 52 methicillin-resistant *Staphylococcus aureus* (MRSA) clinical isolates were collected from patients attending the teaching hospital of Tehran University of Medical Sciences. Disks containing antibiotics were used to determine the susceptibility of MRSA isolates. Analysis of Smal macrorestriction profiles of the 52 MRSA isolates were grouped into three PFGE types. The majority of isolates (n = 49) were clustered into only one major PFGE type, designated as pulsotype A; these belonged to SCCmec type III or IIIA and showed resistance to ampicillin, ciprofloxacin, cotrimoxazole, erythromycin, gentamicin, and tetracycline. The remaining isolates fell into pulsotypes B and C, both belonging to SCCmec-type IV. All MRSA isolates were susceptible to vancomycin, teicoplanin, quinupristin-dalfopristin, linezolid, and tigecycline. The present study shows that a MRSA clone similar to the Brazilian clone (ST 239) of MRSA, which is a multiresistant MRSA clone with a high level of methicillin resistance, is very common in this teaching hospital in Tehran.

Different clones of methicillin-resistant *Staphylococcus aureus* (MRSA) have appeared in different countries (1,2). The Brazilian epidemic clone was first described to be widespread in Brazilian hospitals in 1995 (3). This clone was also found to be disseminated in South America and Europe (4). Other epidemic MRSA clones (EMRSA) such as Iberian, New York/Japan, Pediatric, Berlin, EMRSA-15, and EMRSA-16 have also been identified (5-8). Pulsed-field gel electrophoresis (PFGE) has been reported as the “gold standard” for studying the molecular epidemiology of infections with MRSA (6,7). This paper reports the first study on the common MRSA clone as determined by PFGE in Iran, where MRSA has recently emerged as important pathogen (1,9).

A total of 52 MRSA clinical isolates were cultured from patients attending the teaching hospital of Tehran University of Medical Sciences between January 2006 and March 2007. Only one isolate per patient was included. Isolates were identified at the species level using standard biochemical methods (10). To detect the MRSA strains, the susceptibility of isolates to oxacillin was assessed using the disk diffusion method (11). The MRSA isolate HU25, representing the Brazilian clone, was included for comparison (3).

PFGE analysis of 52 MRSA isolates by FIGE produced three distinct pulotypes designated as pulotypes A-C (Fig. 1A). The majority of isolates (n = 49) were clustered into pulotype A. Analysis by the CHEF DR II apparatus revealed that pulotype A contained two isolates that differed slightly from pulotype A (pulotypes A1 and A2, Table 1). All isolates in pulotype A belonged to SCCmec type III or IIIA. The majority of SCCmec type III and IIIA isolates were resistant to ampicillin, ciprofloxacin, cotrimoxazole, erythromycin, gentamicin, and tetracycline. In this study, SCCmec typing correlated well with major antimicrobial susceptibility patterns.

PFGE pattern and antibiogram of nine strains with SCCmec type IIIA were identical to strains with SCCmec type III. Therefore, they might have originated from the same ancestor, probably through the deletion of a portion including pT181 (12). Based on the visual comparison of banding patterns, the similarity of this clone with the Brazilian/Hungarian clone found in India, Taiwan, China, and Georgia (13-15) was >80%.

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Three isolates, belonging to SCCmec type IV, fell into pulsotypes B and C. Of the three isolates with SCCmec type IV, two were isolated from the wounds of nonhospitalized patients (pulsotype B). The third strain, pulsotype C, was isolated from the blood of a hospitalized patient. Based on the differences in the number of restriction fragments, these isolates showed differences in up to six DNA bands from pulsotype A.

Previous studies have shown that SCCmec type IV status is a characteristic of community-acquired (CA)-MRSA strains, which are generally susceptible to non-β-lactam antibiotics and are typically more susceptible to antibiotics than hospital-acquired (HA)-MRSA strains (16,17). However, our three SCCmec type IV isolates were resistant to other antibiotics. This finding is in accordance with those of other studies suggesting that SCCmec type IV strains can acquire resistance to non-β-lactam antibiotics in order to survive in the hospital environment (2) or through exposure to antibiotics (18).

In conclusion, the present study shows that the Brazilian clone of MRSA, which is a multi-resistant MRSA clone with a high level of methicillin resistance, is very common in this teaching hospital in Tehran. We do not know the representation of this clone in other settings. Although there is one report on the molecular epidemiology of MRSA in Iran using the PCR method (19), this is the first published study using PFGE in Iran.

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REFERENCES