



Methicillin-resistant *Staphylococcus aureus* (MRSA) screening of hospital dental clinic surfaces

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ABSTRACT

We assessed the prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) strains on surfaces of hospital dental clinics. Specimens were obtained from 5 clinically symptoms-free patients of five different specialties clinics (Implantology, Pediatric Dentistry, Prosthetics, Restorative Dentistry, and Oral Medicine) of the Dental Clinic Hospital of King Saud University before and after each patient. A Q-tip swabs were used from 10 surfaces in each clinic (Arm rest of dental chair, floor beneath dental chair, sink/faucet, towel dispenser, instrument table handle, light handle, X-ray viewer, paper dental records, head rest, and bench). Specimens were cultured in CHROMagar MRSA medium. Prevalence of MRSA colonization was compared between periods before and after patients visited each clinic for treatment. The results showed that the prevalence of MRSA was remarkably increased after patients visited the area. The results indicate that dental clinics should be considered as possible reservoirs of MRSA in the hospital setting.

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1. Introduction

Staphylococcus aureus is an aerobic Gram-positive coccus that acts as an important opportunistic pathogen in many animals, including humans (Abdalla et al., 2012; Corvaglia et al., 2010; David and Daum, 2010; Haque et al., 2011; Shearer et al., 2011). *S. aureus* is naturally abundant throughout the human body, with asymptomatic colonization of the skin and the oral, respiratory, and gastrointestinal systems being quite common (Olowe et al., 2007). Overgrowth of *S. aureus*, however, can result in life-threatening infection of the blood, gastrointestinal tract, or other organ systems (Al-Anazi, 2009; Den Heijer et al., 2013; Haque et al., 2011; Orji et al., 2012; Pai et al., 2013; Shen et al., 2013).

Infections involving bacterial strains that are resistant to antibiotics are especially concerning from a public health perspective (Perveen et al., 2013). Methicillin-resistant *S. aureus* (MRSA) (Hena and Sudha, 2011; Rajadurai et al., 2006) is a term used to describe *S. aureus* strains with acquired resistance to β -lactam antibiotics, such as methicillin, oxacillin, and cephalosporins

(Al-Anazi, 2009; Hena and Sudha, 2011). These bacteria develop β -lactam antibiotic resistance by acquiring the gene *mecA*. Given their ubiquitous and highly communicative nature (Boone and Gerba, 2007), MRSA strains are responsible for many cases of hospital- and nonhospital (community)-acquired bacterial infection and death (Al-Baidani et al., 2011; Bannerman and Peacock, 2007; Hena and Sudha, 2011; Moussa et al., 2011; Okwu et al., 2012; Peters et al., 2013).

The identification of bacterial reservoirs and adoption of infection control practices are crucial steps to preventing infection. High levels of MRSA colonization have been reported on the clothing of healthcare workers (Boyce et al., 1997) and the hospital linens (Fijan and Sostar Turk, 2012; Miller and Diep, 2008; Sexton et al., 2006; Smith et al., 2010) following contact with MRSA-positive patients. In the community setting, reinfection of patients with the same MRSA strain has been linked to surface presence of MRSA in the home (Boyce et al., 1997; Uhlemann et al., 2011). In light of this background, we sought to analyze the prevalence of MRSA colonies on various surfaces in the dental clinics of our hospital, before and after patients were treated.

2. Materials and methods

Five clinically symptom-free patients were randomly selected from each specialty clinics, on random timings. The dental assistant used a Q-tip swabs to swab the 10 different location assigned

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Table 1
Survey of contamination with MRSA in the surfaces of the dental operatory.

Clinic	Patient no.																													
	Patient 1														Patient 2										Patient 3					
	Implant		Pedo		Prosthetic		Restorative		Oral medicine		Implant		Pedo		Prosthetic		Restorative		Oral medicine		Implant		Pedo		Prosthetic		Restorative		Oral medicine	
Surface	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At
Dental chair arm rest	-	-	-	42	-	2	-	-	-	-	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor beneath the dental chair	-	-	-	-	-	20	-	3	30	-	-	-	-	-	-	-	3	30	47	-	-	-	1	-	-	40	-	-	-	-
The sink/faucet	-	-	-	-	-	-	80	2	20	-	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Towel dispenser	-	-	-	-	-	-	-	6	35	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tools table handle	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	30	-	-	-	-	-	-	-	-	-	1	-	-	9
Light handle	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
X-ray viewer	-	-75	-	-	-	1	-	-	1	-	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Files	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	-	-	-	-	-	-	-	-	-	-	-
Head rest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	58
Bench	-	-	-	-	-	-	-	-	-	21	-	70	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-
Clinic	Patient no.																													
	Patient 4														Patient 5															
	Implant		Pedo		Prosthetic		Restorative		Oral medicine		Implant		Pedo		Prosthetic		Restorative		Oral medicine		Implant		Pedo		Prosthetic		Restorative		Oral medicine	
Surface	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At	Bt	At
Dental chair arm rest	-	-	-	-	-	-	-	-	14	80	-	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	15	-	6	
Floor beneath the dental chair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
The sink/faucet	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	-	-
Towel dispenser	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tools table handle	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	1
Light handle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	95
X-ray viewer	-	-	-	-	-	-	-	1	150	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200
Files	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Head rest	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	25
Bench	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Bt. = Before treatment, At. After treatment.
(-) = No MRSA colonies.

for testing before each single patient gets into the clinic and after the patient leaves the clinic, then the Q-tip swab is capped into the gel for reservation and then collected to be delivered to the lab for processing.

A single specimen per surface per clinic were collected from 10 different surfaces (arm rest of dental chair, floor beneath dental chair, sink/faucet, towel dispenser, handle to instrument table, handle to light, X-ray viewer, paper dental records, head rest, and bench) in five different departments (Implantology, Pediatric Dentistry, Dental Prosthetics, Restorative Dentistry, and Oral Medicine) of the Dental Clinic Hospital of King Saud University.

The collected specimens were spread onto the surface of CHROM agar MRSA medium (prepared as per manufacturer's instruction); plates were incubated at 30 °C for 18–24 h.

CHROMagar dyes MRSA colonies mauve, whereas colonies of all other bacteria appear colorless or blue and colonies were quantified using colony forming unit. Any MRSA-sensitive bacteria were inhibited or prevented from growing on the medium. To confirm methicillin resistance, presumptive MRSA colonies were isolated and transferred to fresh CHROMagar. Single colonies were selected and transferred to Mueller Hinton agar to generate a lawn of bacteria. Presumptive MRSA colonies were tested for acid fastness and coagulase positivity by using standard methods (Flayhart et al., 2005; Gurran et al., 2002). Isolates were tested for antibiotic sensitivity by incubation at 37 °C with antibiotic test discs (Oxoid), placed at the center of each plate. These experiments were performed in triplicate using a positive and negative control.

3. Results

We tested 10 surfaces for MRSA colonization before and after patients were admitted for treatment to five different departments of a dental hospital. Table 1 shows the numbers of MRSA colonies detected on each sample in each clinic before and after patient treatment. Greater contamination of surfaces with MRSA colonies was observed after patients were treated. The greatest number of MRSA colonies was observed from the paper dental records of patients in the Oral Medicine department.

4. Discussion

The findings of this study suggest the high prevalence of MRSA strains on various surfaces of hospital dental clinics, especially the paper dental records in the Oral Medicine clinic. Therefore, hospital dental clinics should be considered as possible reservoirs of MRSA.

MRSA had occurred in the clinic before patients visited and resulted in significant decrease in MRSA contamination in the surface area. Furthermore, one patient inside in the clinic and might have influenced the results of increased MRSA contamination of the dental clinical surface. These results suggest that patients came into contact with the MRSA-contaminated surfaces, which could be one cause of nosocomial MRSA infection.

Asymptomatic *S. aureus* or MRSA colonization of the oral cavity may be more prevalent than once thought (Didilescu et al., 2005; Smith et al., 2001). One study of more than 5000 oral specimens reported a MRSA prevalence of 6% among 1017 *S. aureus* isolates (Smith et al., 2003). Another study in Sweden connected *S. aureus* to periodontal-implant infections (Renvert et al., 2008). However, patients are not the only reservoir for MRSA transmission in the dental office. Healthcare professionals may transmit MRSA strains from their gloves or uniform, although the importance of such contaminated surfaces in MRSA transmission is debated (Kurita et al., 2006).

Adequate infection control through compliance with validated protocols and standards is the key to preventing MRSA contamination of environmental surfaces in the dental clinic (Baehni et al.,

2005; British Dental Association, 2003; Kohn et al., 2003; Williams et al., 2003). National guidelines for infection control delineate hygiene measures designed to protect individuals from transmission of blood-borne and airborne pathogens. Standard precautions to prevent nosocomial transmission of MRSA in the dental clinic (British Dental Association, 2003; Siegel et al., 2007) include hand disinfection before and after contact with each patient and the use of personal protection equipment (e.g., gloves, mask, gown, eye protection) (Baehni et al., 2005; Siegel et al., 2007).

5. Conclusions

Surfaces in hospital dental clinics can be reservoirs for MRSA transmission, potentially leading to nosocomial infection or colonization. Awareness of and fastidious attention to guidelines for infection control can reduce MRSA contamination on dental clinical surfaces, thereby decreasing nosocomial transmission. The standard infection control guidelines to decrease MRSA in the hospital such as hand hygiene, use of personal protective equipment, respiratory hygiene, sterile instrument and devices, clean and disinfected environmental surfaces.

Further studies are needed for the new e-dental records (using of computer mouse and keyboards) to compare the prevalence of MRSA before and after the patient's visit. Also, all dental clinics/hospitals should enforce and emphasize the importance of infection control measures to dental professions and auxiliaries regarding the MRSA.

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