

# Community-Acquired Methicillin-Resistant *Staphylococcus aureus* Severe Infection in Two Healthy Patients with Ear Piercing

Emilce de los Ángeles Méndez<sup>1\*</sup>, María Sol Garberi<sup>1</sup>, María Rosa Baroni<sup>1,3</sup>, María Alejandra Mendosa<sup>1,2</sup>, Glenda Segovia<sup>1</sup>, Sabrina Analí Cristobal<sup>1,2</sup>, Analía Susana Mollerach<sup>2</sup>, Alicia Adela Nagel<sup>2</sup>, Gabriela De Giovanni<sup>3</sup>

<sup>1</sup>Faculty of Biochemistry and Biological Sciences, National University of Litoral, Argentina; <sup>2</sup>Jose María Cullen Hospital-Santa Fe, Argentina; <sup>3</sup>Alassia Hospital-Santa Fe, Argentina

## ABSTRACT

Body piercing is a type of self-expression which is based on creating a hole in the skin, subcutaneous tissue or cartilage in order to be able to insert jewellery. The aim was to report severe CA-MRSA infections in two patients, one adult and one child, from different teaching hospitals, in the same period of time and both of them had penetrating implantation as a risk factor. The two isolates were CA-MRSA PVL (+), spa t019, cassette IV and ST30. Referring to the clonal relationship, PFGE showed that both isolates were closely related, indicating that they were probably part of the outbreak. It was not possible to investigate if the piercing setter was the same person in both cases.

**Keywords:** CA-MRSA; Body piercing; Molecular characterization

## INTRODUCTION

Body piercing is a type of self-expression which is based on creating a hole in the skin, subcutaneous tissue or cartilage in order to be able to insert jewellery; it can also be defined as a factor that causes alteration of local homeostasis and exposure to communicable diseases [1-3]. Now-a-days, piercing has steadily become more popular, particularly among young people as a means of being different [2]. Piercing that is performed under unhygienic conditions, however, can cause certain complications for days, weeks or months after implantation [2,3]. Studies have demonstrated the occurrence of nerve injuries, allergic reactions, cutaneous infections, edema, granuloma, hematoma, bleeding, skin abscess and contact dermatitis [1-4]. Infection severity ranges from local infections (e.g., impetigo and cellulitis) to more extensive or even systemic infections such as osteomyelitis, toxic shock syndrome, bacteremia, Hepatitis B, C and D, human immunodeficiency virus (HIV), syphilis and tetanus [1-3].

*Staphylococcus aureus* is a human opportunistic pathogen, and methicillin-resistant *S. aureus* (MRSA) causes a wide variety of infections worldwide, including hospital-associated MRSA (HA-MRSA) and community-associated MRSA (CA-MRSA)

infections [5,6]. The last ones have the ability to infect people living in a community without personal or associated risk factors, suggesting enhanced bacterial virulence [5-7]. It's a gram positive coccus that can spread from the skin to the lungs, the bloodstream or other body organs, being able to cause primary skin and soft tissue infections, mainly furunculosis and abscesses, but can also cause necrotizing tissue infections and fulminant pneumonia [8-13].

MRSA typing is used to support infection control measures. While pulsed-field gel electrophoresis (PFGE) is a "gold standard" for strain typing of MRSA, DNA sequence-based approaches are becoming more frequently used because sequence data can easily be transferred between laboratories via the Internet [14]. Multi-locus sequence typing (MLST) provides global epidemiology data and it can be used mainly to identify clonal relationship [6,15]. Single-locus DNA sequencing of repeat regions of the *spa* gene (protein A) is especially interesting for rapid typing of MRSA in a hospital setting. There is a good correlation between clonal groupings determined by MLST and the respective *spa* types [14]. Furthermore, most CA-MRSA isolates harbor the virulence factor Panton-Valentine leucocidin

\*Correspondence to: Emilce de los Ángeles Méndez, Faculty of Biochemistry and Biological Sciences, National University of Litoral, Argentina, Tel: 54342156129933; E-mail: emendez@fbc.unl.edu.ar

Received: April 01, 2019; Accepted: April 15, 2019; Published: April 23, 2019

**Citation:** Méndez EA, Garberi MS, Baroni MR, Mendosa MA, Segovia G, Cristobal SA, et al. (2019) Community-Acquired Methicillin-Resistant *Staphylococcus aureus* Severe Infection in Two Healthy Patients with Ear Piercing. J Bacteriol Parasitol. 10:356. doi: 10.4172/2155-9597.1000356

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(PVL) and the *mecA* gene which is carried in the staphylococcal cassette chromosome *mec* (SCC*mec*) type IV or V [11]. The aim was to report two cases of severe CA-MRSA infections in patients from different teaching hospitals, in the same period of time and both of them had piercing implantation as a risk factor.

## CASE REPORTS

On October 11, 2016, a 17-year-old woman was admitted to an adult hospital with symptoms that led to suspicion of meningitis and sepsis. The patient had no risk factors associated with hospital infection, or previous MRSA colonization/infection but she had an ear piercing. She was not a drug addict, neither had history of skin disease nor other illness. Because of her medical condition she was transferred to the Intensive Care Unit (ICU) where blood cultures were requested. She was empirically treated with vancomycin plus clindamycin. Once the patient stabilized, a cerebrospinal fluid (CSF) sample was also taken. MRSA (MRSA-1) was recovered from both blood and CSF. On the fourth day, the antibiotic treatment was switched to vancomycin plus daptomycin. Because of a periorbital cellulitis appearance, daptomycin was replaced by linezolid. After both samples were negativized, the patient continued with daptomycin, linezolid and rifampin. A week later, the patient was discharged.

In the same city, on the same day, a previously healthy 14-year-old boy with an ear piercing, was admitted to a children's hospital. He had a painful hip and fever that made him nearly impossible to walk. Due to the clinical observations, he was transferred to the hospital temporary care room where several studies were carried out, including a hip ultrasound, which showed fluid collection in the left femoral coxus joint. Urine, blood and joint fluid cultures were requested. MRSA (MRSA-2) was recovered from blood and joint fluid but not urine. Because of the patient's condition continued to worsen, he was transferred to the Intensive Care Unit (ICU) where he was intubated and ventilated. He developed septic shock secondary to MRSA arthritis. Considering the culture results, antibiotic therapy was intravenous vancomycin plus clindamycin. After two days, the patient continued hemodynamically unstable, presenting refractory hypotension, and high doses of inotropes were required. In addition, he developed refractory hypoxemia caused by necrotizing pneumonia. On the 3rd day of hospitalization, the patient became agitated and suffered a cardiac arrest. He underwent cardiorespiratory resuscitation for over 45 min, but unfortunately died.

## Bacteriological studies

Biological specimens were cultured using standard methods: The identification and the antibiotic susceptibility were performed by different automatized systems in adult and children's hospitals, Phoenix (BD Phoenix™) and Vitek 2C System, respectively. Both isolates were methicillin resistant *Staphylococcus aureus*.

MRSA-1 and MRSA-2 showed identical antibiotic susceptibility profile and the same MIC value to vancomycin; they were categorized as susceptible to erythromycin, ciprofloxacin,

gentamicin, rifampin and linezolid. Daptomycin was tested by epsilometric method.

**Molecular characterization:** Polymerase chain reaction (PCR) was used to detect the presence of the Panton-Valentine leucocidin and the SCC*mec* and *spa* type [14,16,17]. MLST was performed to detect sequence type (ST) [15]. Both *spa* and ST were sequenced in Korea (Macrogen).

In both isolates, detection of *pvl* gene was positive and the *spa* type t019. MRSA-1 and MRSA-2, harbored the SCC*mec* type IV and the ST was ST30. The clonal relationship determined by pulsed field gel electrophoresis (PFGE) using *Sma*I enzyme for genomic DNA digestion showed that both isolates were closely related, indicating that they were probably part of the outbreak [18].

## DISCUSSION AND CONCLUSION

These results confirmed the genetic relationship between both isolates of CA-MRSA, and the important fact of belonging to the same clonal complex.

According to Egea et al. which reported that in Argentina, most CA-MRSA belonged to two major clones: ST30-SCC*mec*IVc-t019-PVL+ and ST5-IV-SCC*mec*IVa-t311-PVL+, our isolates were defined as ST30 by MLST typing. In accordance with Balci et al. the practice of piercing is steadily becoming more widespread in Western societies. Studies have indicated differing prevalence rates from 26% up to 60%; in Argentina there are few papers that communicate piercing infection prevalence. These authors also express that the parts most commonly showed piercing is ear cartilage as the two patients presented in this report.

Due to adult patient's reluctance and boy's death it was not possible to investigate if the piercing setter was the same person in both cases. The clinical impact of this report was that two isolations, from different hospitals of the same city were molecularly characterized as ST30, *spa* t019, PVL (+), cassette IV. We conclude that in both cases, the epidemiological investigation showed none of the patients had any risk factors, other than, piercing implantation. Therefore, we assume it could be the starting point for CA-MRSA infection.

## ACKNOWLEDGMENT

This work was partly supported by research grants from the Universidad Nacional del Litoral, Santa Fe, Argentina (CAI+D 2016).

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