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SCIENTIFIC LETTERS

Routine tooth brushing in the intensive care unit: A potential risk factor for oral flora bacteremia in immunocompromised patients

Cepillado de dientes rutinario en la UCI, un factor de riesgo potencial para la bacteremia de la flora bucal en pacientes inmunocomprometidos

Dear Editor,

Intensive care unit (ICU) patients are fragile and highly subject to infections. Respiratory infections and especially ventilator-associated pneumonia (VAP) are the most frequent infectious complications in critically ill patients.[1] Among the main measures to decrease VAP incidence, dental care is recommended in the prevention bundles.[2] Aside from mouthwash with chlorhexidine, tooth brushing is widely used for VAP prevention in routine nursing practice even if its interest has not been fully demonstrated. It is well known that tooth brushing can cause transient bacteremia that are harmless for healthy individuals but can cause serious problems in critically ill patients.

A 38-year old woman was admitted in the ICU with acute respiratory failure. Her main medical history was a mixed connective tissue disease (Sjögren's syndrome) associated to natural killer (NK) cell deficiency. The Sjögren's syndrome had been diagnosed seven years earlier because of strong clinical symptoms associated to positive anti-Ro, anti-La and anti-ribonucleoprotein (RNP) antibodies. The patient had then discontinued medical follow-up as she did not tolerate the treatments.

At admission in the Emergency Department (ED) for serious dyspnea, she presented with acute respiratory failure and anasarca associated to a left ventricular dysfunction. An acute renal failure was biologically evidenced. The patient was directly transferred to the ICU where she was intubated and mechanically ventilated. Diagnostic assessment disclosed a type II cryoglobulinemia with consumption of the complement components and positive anti-Ro and anti-La antibodies. Renal biopsy showed a membranoproliferative glomerulonephritis associated to vascular lesions. An immunosuppressive treatment was started due to the renal cryoglobulinemic vasculitis: high dose corticotherapy including 3 boluses of methylprednisolone (1 g) then replaced by prednisolone (0.5 mg/kg) associated to weekly infusion of rituximab (375 g/m^2) during four weeks.

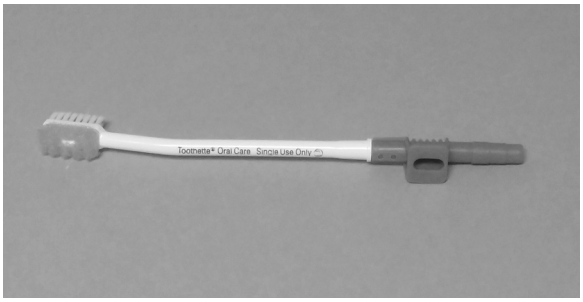

Figure 1 A single-use suction toothbrush. This is a toothbrush that was tested in our unit. These toothbrushes are supposed to be more efficient removing dental plaque while being less traumatic. It sucks out debris and secretions very easily. The small sponge on the back enables cleaning and freshening up the mouth.

The infectious complete checking performed at admission in the ICU (blood cultures, pleural fluid, and urine culture) resulted negative. During the first week of hospitalization, the patient received oral care with chlorhexidine three times a day and tooth brushing with a single-use device newly tested in the unit at that period. It was a single-use untreated suction toothbrush (Toothette®, Sage Products, Cary, IL) (Fig. 1). Of note, dental hygiene was strictly normal without any dental or periodontal lesions.

At D2, because of a 39 °C fever, a distal protected aspirate was performed. The cultures grew positive to methicillin susceptible *Staphylococcus aureus* (MSSA) [10^4 CFU/ml] and *Streptococcus pyogenes* [10^3 CFU/ml]. As radiography showed no infection, it was considered as a bronchial colonization and no antibiotic therapy was started. The blood cultures performed on D2 grew positive to *Parvimonas micra*. In the meantime, an antibiotic treatment with amoxicillin was started. Other blood cultures performed on D6 because of a hectic fever were positive to *Veillonella*

parvula. The antibiotic therapy with amoxicillin lasted 10 days in total. Both bacteremic episodes had no clinical consequences and transesophageal echocardiography (TEE) ruled out endocarditis. Following both bacteremias, tooth brushing was discontinued on D7 until discharge on D43. Mouthwashing with chlorhexidine was maintained. No other bacteremia occurred during the hospitalization (seven blood cultures performed between D7 and discharge).

Mouth has a rich saprophytic flora mainly composed by *Streptococcus viridans*, *Neisseria sp.*, *Haemophilus sp.* and anaerobes from the salivary flora. In ICU patients this flora is modified and patients are often colonized especially by aerobic Gram negative bacilli and *S. aureus*. Dental plaque is then a breeding ground for potential virulent germs. *Parvimonas micra* also called *Micromonas micros* is an anaerobic Gram positive coccus belonging to oral and intestinal commensal florae. It often causes periodontal and bone and joint infections. *Veillonella parvula* is an anaerobic Gram negative coccus from the oral, intestinal and vaginal florae and is responsible for dental plaque especially when associated to *Streptococcus mutans*. It can also cause extremely rare infections such as osteomyelitis, endocarditis, meningitis and cerebral and pulmonary abscesses.

Oral care is provided to all ICU patients whether intubated or not. It is widely admitted as an essential measure of VAP prevention.[3] However, there is no consensus on how the care should be provided. It is usually done with gauze or other devices such as cotton swabs soaked with antiseptic solution such as chlorhexidine and performed every 6–8 h. The role of tooth brushing is not clear and the studies have diverging results. Rello et al.[4] suggested its efficacy showing a tendency for VAP decrease. On the opposite, more studies[5–7] showed neither significant decrease of the risk of VAP, nor a decrease of morbidity–mortality or length of stay for the patients receiving tooth brushing. Tooth brushing can cause bacteremia even in healthy individuals.[8] The gingiva being highly vascularized, the irritation induced by the toothbrush can enable bacteria to go to the systemic circulation. In healthy individuals, bacteremias can be qualified as transient. They occur frequently and have no infectious and clinical consequences as the bacteria are rapidly eliminated. On another hand, immunocompromised patients and especially intubated and mechanically ventilated ICU patients are at high risk of infections. In particular, septicemia could result in complications such as endocarditis, spondyloscitis or visceral abscesses.

Oral care in healthy individuals is based on tooth brushing. Since oral care proved its efficacy in VAP prevention, it could seem right to brush the teeth of ICU patients as well. Nevertheless, most studies do not prove the superiority of the association of tooth brushing and mouthwashing with chlorhexidine compared to mouthwashing alone. Despite the lack of evidence, tooth brushing remains a common practice which tends to increase with the introduction of new devices such as single-use suction toothbrushes. These toothbrushes are supposed to be more efficient on removing dental plaque and sucking out debris and secretions while being less traumatic.

This case report confirms that tooth brushing can cause bacteremias that are transient and harmless in healthy individuals, but can result in infections in immunocompromised patients. Since it is increasingly used in the ICU despite this risk, the benefit–risk ratio of tooth brushing associated to conventional oral care with chlorhexidine in the prevention of VAP must be carefully reconsidered.

Authors' contribution

ML, BF (1) acquisition and interpretation of data and (2) article drafting; EB, OB, MM (1) acquisition of data and (2) article revision. All authors read and approved the final manuscript.

Conflict of interest

None declared.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

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Toward a personalized response approach in sepsis 4.0

Hacia una estrategia de respuesta personalizada en sepsis 4.0

Dear Editor,

Sepsis is one of the leading causes of mortality worldwide.[1] However, mortality rates widely vary among different countries when patients have been enrolled in prospective septic shock trials.[2] For this and other reason, including sepsis recognition, new definitions of septic shock were launched. Now, shock is a clinical condition defined by a vasopressor requirement to maintain a mean arterial pressure of 65 mm Hg or greater and serum lactate level greater than 2 mmol/L (>18 mg/dL) in the absence of hypovolemia.[3] Our hypothesis is that lactate level is not sufficient for defining shock progression but timing within the first 24 h of resuscitation. The aim of the present study is to determine the prognostic value of a predefined lactate clearance in the first 24 h of sepsis. A total of 544 consecutive patients with sepsis were included from a tertiary University Hospital (Parc Tauli Hospital, Sabadell, Spain). The vast majority presented an abdominal (37.9%) or respiratory source of sepsis (31.3%) and 62.8% were admitted through emergency department. Patients presented were 66.6 (SD 14.8) years old, 63.2% male and presented an APACHE II score of 18.4 (SD 7.7) with a mortality rate of 29.8%. We calculated the optimal cutoff for a lower mortality during the first 24 h of sepsis using the Youden index. With our data, this optimal cutoff was 10%, with a sensitivity of 51% and specificity of 71%. Patients with a lactate clearance $\geq$ 10% within the first 24 h of sepsis had a lower mortality in a univariate analysis than patients without that clearance (21.2% vs. 39.1%; $p < 0.001$). We adjusted lactate clearance for confounding factors, as initial lactate value and severity (APACHE II score), and we observed that lactate clearance $\geq$ 10% during the first 24 h of sepsis was identified as a protective factor for mortality (OR 0.49: 95% CI 0.30–0.81; $p < 0.05$) (Fig. 1). We, therefore, analyzed the relationship between lactate clearance and the fulfillment of the Surviving Sepsis Campaign (SSC) bundles. The group of patients with a lactate clearance $\geq$ 10% trended toward a better fulfillment of SCC bundles (5.1% vs. 2.2%; $p = 0.12$). We performed a multivariate analysis including all the SCC bundles (antibiotic treatment, fluid administration, vasopressors and initial lactate value and fluid administration) and lactate clearance $\geq$ 10% (OR 6.41; 95% CI 2.01–20.45; $p < 0.05$) was associated independently with a lower mortality. Despite the new incorporation of serum lactate levels for shock definition, we consider that the most important approach to reflect current ICU mortality would be the use of lactate clearance in the definition.[4] Therefore, a personalized approach is lacking in the current definitions and a lactate clearance equal or greater than 10% within the first 24 h of sepsis evolution is independently associated with lower mortality. Nguyen et al.[5] discovered that early lactate clearance within the first 6 h was associated with a decrease mortality however the 10% decrease was chosen after analyzing sensitivity and specificity of different thresholds. In our study, the implementation of a mathematical model (Youden index) helped us to find the ''ideal threshold''. Interestingly, in accordance with recently published studies, in our cohort, fluid administration during the first hours of sepsis is independently associated with lactate clearance.[6] Effort should be done to identify patients with shock and determinant of response, rather than to flag them only shocked.

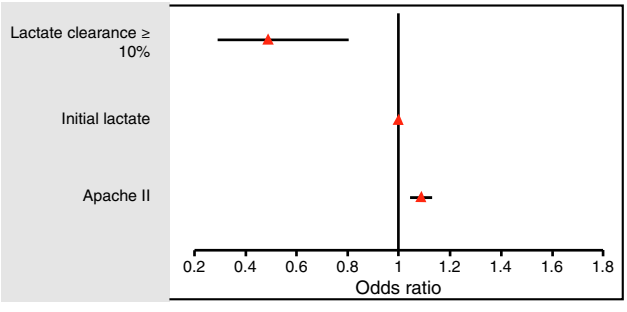

Figure 1 Odds ratio for mortality in patients included in the study. *Abbreviation*: OR, odds ratio.