



Oral hygiene: a relevant practice to prevent hospital pneumonia in critically ill patients

Higiene bucal: prática relevante na prevenção de pneumonia hospitalar em pacientes em estado crítico

Higiene bucal: práctica relevante en la prevención de neumonía hospitalaria en pacientes en estado crítico

Isa Rodrigues da Silveira¹, Flávia de Oliveira Motta Maia², Juliana Rizzo Gnatta³, Rúbia Aparecida Lacerda⁴

ABSTRACT

The objective of this article was to update knowledge on the microbiological aspects of the oral cavity and, verify the relation of oral hygiene with the prevention of pneumonia associated with mechanical ventilation. The studies analyzed were in favor of the use of antiseptics for decontaminating the oral cavity and pharynx, although there is still no standardization of procedures on the technique and products used in this process.

Keywords: Oral hygiene; Pneumonia, ventilator-associated/prevention & control; Nursing

RESUMO

Este artigo objetivou atualizar o conhecimento a respeito dos aspectos microbiológicos da cavidade oral e sua relação com a higiene bucal na prevenção da pneumonia associada à ventilação mecânica. Estudos analisados têm sido favoráveis ao uso de antissépticos para descontaminação da orofaringe, embora ainda não exista uma padronização de condutas a respeito da técnica e produtos.

Descritores: Higiene bucal; Pneumonia associada à ventilação mecânica/prevenção & controle; Enfermagem

RESUMEN

Este artículo tuvo por objetivo actualizar el conocimiento sobre aspectos microbiológicos de la cavidad oral y verificar la relación de la higiene bucal con la prevención de la neumonía asociada a la ventilación mecánica. Los estudios analizados se han mostrado favorables al uso de antisépticos para descontaminar la cavidad oral y la faringe, a pesar de que todavía no existe una estandarización de conductas sobre la técnica y de los productos utilizados en ese proceso.

Descriptores: Higiene bucal; Neumonía asociada al ventilador/prevenición & controle Enfermería

¹ Master in Health Science of the Commission to Control Hospital Infection of the University Hospital at Hospital Universitário da Universidade de São Paulo – USP – São Paulo (SP), Brazil.

² Post-graduation student (Ph.D.) in Health Science. Director of the Clinical Nursing Division of the Nursing Department, Hospital Universitário da Universidade de São Paulo – USP – São Paulo (SP), Brazil.

³ Scholar at the Nursing School, Universidade de São Paulo – USP – São Paulo (SP), Brazil. Fellowship holder CNPq/PIBIC.

⁴ Nursing Lecturer Livre-Docente em Enfermagem. Associate Professor at the Nursing School, Universidade de São Paulo USP – São Paulo (SP), Brazil.

INTRODUCTION

Although oral hygiene is a traditional practice in patient care, up to recently there were no scientific evidences of its relevance to prevent hospital infections (HI). So much so that the current guidelines for the control of respiratory infection of the Center for Disease Control and Prevention (CDC) does not consider this practice as a recommendation based on strong evidences⁽¹⁾, although the introduction of a program including oral hygiene for patients in Intensive Care Unit (ICU) is recommended. Several studies have determined oral hygiene as a significant measure to reduce ventilator associated pneumonia (VAP)⁽²⁻¹³⁾.

Traditionally, oral hygiene is part of body hygiene as a whole and it is one of the most important nursing care. Thus, it is necessary to divulge and update on the issue to offer greater capacity building during patient care.

Physiological and microbiological aspects of the oral cavity

The microbiota of the oral cavity is formed by more than 300 species of bacteria which, under normal conditions⁽¹⁴⁾, are balanced and can work as a persistent reservoir of oral and respiratory bacteria⁽¹⁵⁾. However, they can suffer interferences from factors related to the hosts, such as: physical and chemical interactions between enzymes and microorganisms, reduction of saliva and immunoglobulin, increased levels of protease enzymes and neuraminidases associated to a poor oral hygiene and gingivitis, fostering colonization with Gram-negative bacilli. The dental plaque is formed basically by anaerobic bacteria and filaments that adhere to the dental surface, gums, tongue, interior of the oral cavity itself, and dental prosthesis. Aerobic bacteria are not frequent in plaques and they are more commonly found in supragingival surfaces. Patients in critical conditions present high protease levels, which removes from the surface of the teeth a protecting substance called fibronectin (a glycoprotein that inhibits the adherence of Gram-negative bacilli to the oropharynx). The loss of this substance reduces the defense mechanism mediated by the reticuloendothelial cells⁽¹⁴⁾, making it easy for Gram-negative bacilli to fix and changing the normal microbiota, with the presence of *Pseudomonas aeruginosa* in the oral and pharyngeal epithelial cells⁽¹⁶⁾.

Risk factors contributing to changes in the colonization of the oral cavity and the respiratory tract

Colonizing bacteria of the oropharynx, sinuses, nose, dental plaque and gastrointestinal tract can change due to the onset of sinusitis, increase in gastric pH, and the use of antibiotics. Patients who present: acidosis, uremia,

decompensate Diabetes *mellitus*; hypotension, Leukocytosis, leucopenia, and alcoholism frequently present a greater colonization in these regions⁽¹⁶⁾. In addition to the endogenous factors, microbiota changes with the use of contaminated respiratory equipment, poor or absent oral hygiene, enteral diets, direct or indirect contact with other patients (cross-transmission) and low adherence of professionals to hand hygiene⁽¹⁵⁻¹⁶⁾. Colonization of the oral cavity, especially by microorganisms associated to VAP is present in 67% of the secretions of patients with an endotracheal period ≥ 24 h and in the respiratory equipment they use⁽¹⁷⁾.

Lower airways can be colonized by microaspiration or aspiration of secretions from the oropharynx, inhalation of aerosols with viable microorganisms or hematogenous spread⁽¹⁶⁾. Aspiration and the formation of dental plaque stand out as important factors for the development of pneumonia, since the trachea and the lungs can be colonized by microorganisms contained in secretions and dental plaque^(14-15,18). Aspiration of secretions occurs in 45% of the cases during the sleep of healthy people and it can get to 100% in the following situations: deep sleep, alcoholic, patients with lowered level of consciousness, endotracheal intubation, nasogastric tube and supine position^(16,19). Additionally, the dental plaque works as a reservoir that facilitates the colonization by enzyme producing microorganisms that can change the surface of the oral cavity, enabling the adherence of micro-organisms predominantly respiratory⁽¹⁵⁾. A proper oral hygiene and/or absence of mechanical removal of the dental plaque predisposing colonization by aerobic bacteria⁽²⁰⁾.

Oral hygiene based on scientific evidences as prevention for VAP

A systematic review carried out in 2007 with 19 studies on the recommendations for pneumonia and other respiratory diseases identified the levels of evidence and the categorizations. The association between pneumonia and oral health was characterized as level II* and category B*. As for the reduction or frequency of respiratory diseases by decontamination of oral cavity with antimicrobial considered level I* and category A*, regardless of the type of intervention adopted, and the performance of oral hygiene in critical patients as a preventive measure for pneumonia⁽²¹⁾.

The Society of Hospital Epidemiologists of the Americas recommends oral hygiene with antiseptic solution as one of the strategies to prevent pneumonia, categorizing it as IA*. Although its frequency has not been decided, the product instructions are to be followed. Additionally, direct and structured observation of the process to carry out this practice should be used in patients undergoing ventilation⁽²²⁾.

CDC suggests the introduction of a program encompassing oral hygiene and decontamination of the oral cavity with antiseptic solution in patients with acute picture, admitted to institutions of long stay with increased risk for hospital pneumonia (category II)*. As for the antiseptic solution, the recommendation for preoperative oral hygiene of patients undergoing heart surgery is to use chlorhexidine (CHX), classifying this practice as category II*(1).

In 2007, 22 recommendations for the prevention of VAP of four institutions were reviewed and compared regarding categorization of scientific evidences. They were all unanimous to recommend the use of oral and intravenous antibiotics for selective decolonization of the oropharynx and the stomach; this is a complex recommendation due to the impact of antibiotics on microbial resistance, which requires microbiological monitoring of patients during the use(23).

A series of systematic reviews(9,13,21-24) and meta-analysis(8-12) have favored the use of antiseptic solution to decontaminate the oropharynx in patients with high risk of VAP, however, the majority has not found significant differences in VAP among the groups studied or established the most appropriate product or technique. Clinical trials have acknowledged the efficiency of CHX(2-4,7,12) and of PVPI 10%(5-6), as an oral antiseptic solution in patients in

critical conditions, especially in heart surgery ICU. Because of the variations in study design in the definitions of PAVM, population, CHX concentration (0.12%, 0.20% and 2%), presentation (gel, solution and tooth paste) and the application technique of the antiseptic solution, the recommendation of antiseptic solution has not been defined yet because there is no single standard for the items mentioned.

FINAL REMARKS

Reviewing preventive practices is essential to reduce pneumonias in patients in critical conditions. Therefore, oral hygiene with antiseptic solution and dental plaque removal play an important role to reduce the microbial load. Care with the oral health goes beyond comfort, techniques and different products have to be used, requiring technical and practical knowledge from nurses. Assessment of the oral cavity should include the most appropriate mode for the patient in nursing prescription, considering the clinical conditions, risk of bleeding, lesions in the oral cavity, mouth opening, sedation and awareness level, presence or absence of teeth, cannulae and probes. Nurses can design protocols that can be used and foster training for other nursing categories, they can also assess later the adherence to these recommendations.

REFERENCES

1. Tablan OC, Anderson LJ, Besser R, Bridges C, Hajjeh R; CDC; Healthcare Infection Control Practices Advisory Committee. Guidelines for the prevention of health-care-associated pneumonia, 2003: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. *MMWR Recomm Rep.* 2004;53(RR-3):1-36.
2. DeRiso AJ 2nd, Ladowski JS, Dillon TA, Justice JW, Peterson AC. Chlorhexidine gluconate 0,12% oral rinse reduces the incidence of total nosocomial respiratory infection and nonprophylactic systemic antibiotic use in patients undergoing heart surgery. *Chest.* 1996;109(6):1556-61.
3. Houston S, Hougland P, Anderson JJ, LaRocco M, Kennedy V, Gentry LO. Effectiveness of 0,12% chlorhexidine gluconate oral rinse in reducing prevalence of nosocomial pneumonia in patients undergoing heart surgery. *Am J Crit Care.* 2002;11(6):567-70.
4. Fourrier F, Dubois D, Pronnier P, Herbecq P, Leroy O, Desmettre T, Pottier-Cau E, Boutigny H, Di Pompéo C, Durocher A, Roussel-Delvallez M; PIRAD Study Group. Effect of gingival and dental plaque antiseptic decontamination on nosocomial infections acquired in the intensive care unit: a double-blind placebo-controlled multicenter study. *Crit Care Med.* 2005;33(8):1728-35. Comment in: *Crit Care Med.* 2005;33(8):1867-8.
5. Mori H, Hirasawa H, Oda S, Shiga H, Matsuda K, Nakamura M. Oral care reduces incidence of ventilator-associated pneumonia in ICU populations. *Intensive Care Med.* 2006;32(2):230-6.
6. Seguin P, Tanguy M, Laviolle B, Tirel O, Mallédant Y. Effect of oropharyngeal decontamination by povidone-iodine on ventilator-associated pneumonia in patients with head trauma. *Crit Care Med.* 2006;34(5):1514-9. Comment in: *Crit Care Med.* 2006;34(5):1572-3.
7. Koeman M, van der Ven AJ, Hak E, Joore HC, Kaasjager K, de Smet AG, et al. Oral decontamination with chlorhexidine reduces the incidence of ventilator-associated pneumonia. *Am J Respir Crit Care Med.* 2006;173(12):1348-55.
8. Pineda LA, Saliba RG, El Solh AA. Effect of oral decontamination with chlorhexidine of the incidence of nosocomial pneumonia: a meta-analysis. *Crit Care.* 2006;10(1):R35. Comment in: *Crit Care.* 2007;11(1):402; author reply 402.
9. Chan EY, Ruest A, Meade MO, Cook DJ. Oral decontamination for prevention of pneumonia in

* Definition by the /Canadian Task Force Methodology/, /levels of evidence. Research design rating/. Categorized according to: **quality of the evidence:** I. At least one random and controlled study; II. At least one analytical cohort study or well designed case-control, preferably carried out by more than one center or research group and III. Opinion from authorities recognized in the field and by the clinical experience, descriptive studies or by specialist committees. **Recommendation Force:** A. Good evidence to support recommendation for the use B. Moderate evidence to support recommendation for the use and C. Poor evidence to support recommendation for the use. [quoted on Jan.05, 2006]. Available at: <http://www.ctfphc.org> <<http://www.ctfphc.org>>.

- mechanically ventilated adults: systematic review and meta-analysis. *BMJ*. 2007;334(7599):889. Comment in: *BMJ*. 2007;334(7599):861-2.
10. Chlebicki MP, Safdar N. Topical chlorhexidine for prevention of ventilator-associated pneumonia: a meta-analysis. *Crit Care Med*. 2007;35(2):595-602.
 11. Kola A, Gastmeier P. Efficacy of oral chlorhexidine in preventing lower respiratory tract infections. Meta-analysis of randomized controlled trials. *J Hosp Infect*. 2007;66(3):207-16.
 12. Tantipong H, Morkchareonpong C, Jaiyindee S, Thamlikitkul V. Randomized controlled trial and meta-analysis of oral decontamination with 2% chlorhexidine solution for the prevention of ventilator-associated pneumonia. *Infect Control Hosp Epidemiol*. 2008;29(2):131-6. Comment in: *Infect Control Hosp Epidemiol*. 2009;30(1):101-2; author reply 102-3.
 13. Beraldo CC, Andrade D. Higiene bucal com clorexidina na prevenção de pneumonia associada à ventilação mecânica [revisão]. *J Bras Pneumol*. 2008; 34(9):707-14.
 14. Gibbons RJ. Bacterial adhesion to oral tissues: a model for infectious diseases. *J Dent Res*. 1989;68(5):750-60. Review.
 15. Scannapieco FA, Stewart EM, Mylotte JM. Colonization of dental plaque by respiratory pathogens in medical intensive care patients. *Crit Care Med*. 1992;20(6):740-5.
 16. Medeiros, EAS, Menezes FG, Valle LMC. Pneumonias bacterianas associadas à saúde. In: Associação Paulista de Estudos e Controle de Infecção Hospitalar – APECIH. Manual de prevenção de infecções hospitalares do trato respiratório. 2a. ed. rev ampl. São Paulo: APECIH; 2005; p.1-17
 17. Schleder B, Stott K, Lloyd RC. The effect of a comprehensive oral care protocol on patients at risk for ventilator-associated pneumonia. *J Advocate Health Care*. 2002;4(1):27-30.
 18. Cardenosa Cendrero JA, Solé-Violán J, Bordes Benítez A, Noguera Catalán J, Arroyo Fernández J, Saavedra Santana P, Rodríguez de Castro F. Role of different routes of tracheal colonization in the development of pneumonia in patients receiving mechanical ventilation. *Chest*. 1999;116(2):462-70. Comment in: *Chest*. 2000;117(4):1216.
 19. Huxley EJ, Viroslav J, Gray WR, Pierce AK. Pharyngeal aspiration in normal adults and patients with depressed consciousness. *Am J Med*. 1978;64(4):564-8.
 20. Fourrier F, Duvivier B, Boutigny H, Roussel-Delvallez M, Chopin C. Colonization of dental plaque: a source of nosocomial infections in intensive care unit patients. *Crit Care Med*. 1998;26(2):301-8. Comment in: *Crit Care Med*. 1999;27(1):225-6.
 21. Azarpazhooh A, Leake JL. Systematic review of the association between respiratory diseases and oral health. *J Periodontol*. 2006;77(9):1465-82. Review.
 22. Coffin SE, Klompas M, Classen D, Arias KM, Podgorny K, Anderson DJ, et al. Strategies to prevent ventilator-associated pneumonia in acute care hospitals. *Infect Control Hosp Epidemiol*. 2008;29 Suppl 1:S31-40.
 23. Lorente L, Blot S, Rello J. Evidence on measures for the prevention of ventilator-associated pneumonia. *Eur Respir J*. 2007;30(6):1193-207. Review.
 24. Berry AM, Davidson PM, Masters J, Rolls K. Systematic literature review of oral hygiene practices for intensive care patients receiving mechanical ventilation. *Am J Crit Care*. 2007;16(6):552-62; quiz 563.