

Pneumonia in nonambulatory patients


The role of oral bacteria and oral hygiene

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Considerable evidence is available to support the belief that a relationship exists between poor oral health, the oral microflora and bacterial pneumonia. Together, pneumonia and influenza constitute the sixth most common cause of death in the United States and in most developed countries.^{1,2} These conditions are the most common cause of infection-related mortality.

Pneumonia can be divided into two general categories: community acquired and nosocomial. Community-acquired pneumonia develops in noninstitutionalized people, while nosocomial pneumonia is observed in patients 48 hours after admission to an institution, such as a hospital or nursing home. While both forms of the disease often are polymicrobial, a distinction exists between the two forms regarding their microbial etiology.

Community-acquired pneumonia often is caused by organisms considered to be common residents of the upper airway, including the following: *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, *Legionella pneu-*



Background. Considerable evidence exists to support a relationship between poor oral health, the oral microflora and bacterial pneumonia, especially ventilator-associated pneumonia in institutionalized patients. Teeth or dentures have nonshedding surfaces on which oral biofilms (that is, dental plaque) form that are susceptible to colonization by respiratory pathogens. Subsequent aspiration of respiratory pathogens shed from oral biofilms into the lower airway increases the risk of developing a lung infection. In addition, patients may aspirate inflammatory products from inflamed periodontal tissues into the lower airway, contributing to lung insult.

Types of Studies Reviewed. The author reviewed laboratory studies, clinical trials and review articles.

Conclusions. A number of studies have shown that the mouth can be colonized by respiratory pathogens and serve as a reservoir for these organisms. Other studies have demonstrated that oral interventions aimed at controlling or reducing oral biofilms can reduce the risk of pneumonia in high-risk populations. Taken together, the evidence is substantial that improved oral hygiene may prevent pneumonia in vulnerable patients.

Clinical Implications. Institution of rigorous oral hygiene regimens for hospitalized patients and long-term-care residents may reduce the risk of developing pneumonia.

Key Words. Nosocomial pneumonia; ventilator-associated pneumonia; chlorhexidine rinse.

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the day of admission, 39 percent on day 5 and 46 percent on day 10. Twenty-one (37 percent) of the patients in the medical ICU developed an infection, and having plaque colonized by respiratory pathogens was highly predictive of the development of pneumonia.

ORAL HYGIENE

Poor oral hygiene itself appears to be related to subsequent lung infection. Abe and colleagues⁹ conducted a study of 145 Japanese patients living in nursing homes. They evaluated dental and tongue plaque indexes, the number of viable microorganisms in the saliva of each subject and the relationship of these microorganisms to episodes of pneumonia during a one-year period. The authors found a significantly higher number of febrile days ($P = .0012$) and a greater number of patients who developed pneumonia ($P < .01$) among dentate patients with poor hygiene scores compared with those with good hygiene scores.

Limeback^{10,11} suggested that poor oral hygiene also has a negative impact on the overall health of patients receiving long-term care (for example, in a nursing home). He suggested that poor oral hygiene among residents of long-term-care facilities increases exposure to pathogenic microorganisms found in the mouth, which together with reduced host defense mechanisms leads to an increased incidence of systemic disease.

Russell and colleagues¹² reported that 14 percent of institutionalized elderly people had dental plaque that became colonized by a respiratory pathogen, while no one in a cohort of dental outpatients did. In patients whose plaque was colonized, a significant proportion of the plaque flora was composed of one or more species of respiratory pathogens.

These studies support the notion that institutionalized subjects, especially those in hospital ICUs and nursing home settings, are at greater risk of developing dental plaque colonization by respiratory pathogens than are community-dwelling subjects. The former subjects also tend to have poorer oral hygiene than do community-dwelling subjects. Thus, oral biofilms likely serve as reservoirs of respiratory pathogens that sub-

sequently can infect the lungs. This suggests that oral intervention to reduce or control the amount of dental plaque may be a simple, cost-effective method of reducing pathogen colonization in high-risk populations.

ORAL INTERVENTIONS

A number of studies have been conducted to test the hypothesis that oral interventions reduce the risk of pneumonia in high-risk populations.¹³⁻²⁴ A recent systematic review of the literature²⁵ examined the association between poor oral hygiene and the risk of nosocomial pneumonia and chronic lung disease. The authors found that interventions aimed at improving oral hygiene can significantly reduce the incidence of pulmonary disease.

Chlorhexidine rinse. DeRiso and colleagues¹⁶ conducted a prospective study that is an example of a well-designed intervention that demonstrates the potential for improved oral hygiene to prevent pneumonia. The authors examined two groups of subjects who were admitted to a surgical ICU: a test group of 173 people who received a 0.12 percent chlorhexidine oral rinse twice a day and a control group of 180 subjects who received a placebo rinse.¹⁶ The incidence of pneumonia in the chlorhexidine group was 60 percent lower than that in the control group.

Chlorhexidine gel. A subsequent study by Fourrier and colleagues¹⁷ found that use of a 0.2 percent chlorhexidine gel twice a day in 30 subjects in the ICU resulted in a 60 percent reduction in the incidence of pneumonia compared with that in a placebo control group of 30 matched subjects. Yoneyama and colleagues²⁰ compared 184 test patients living in a nursing home with 182 control patients. The intervention consisted of supervised toothbrushing three times a day plus use of povidine iodine mouthrinse once a day. Subjects in the control group followed their routine oral care regimen. The authors found that the incidence of pneumonia in the test group was 39 percent lower during a two-year period than it was in the control group.

Meta-analysis. Scannapieco and colleagues²⁵ conducted a meta-analysis of all studies published from 1966 until 2002 (summarizing data from almost 500 subjects) that used various

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