

Linking Research to Clinical Practice

Periodontal Disease and Chronic Obstructive Pulmonary Disease

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The purpose of Linking Research to Clinical Practice is to present evidence based information to clinical dental hygienists so that they can make informed decisions regarding patient treatment and recommendations. Each issue will feature a different topic area of importance to clinical dental hygienists with A BOTTOM LINE to translate the research findings into clinical application.

Zhou X, Wang Z, Song Y, Zhang J, Wang C. Periodontal health and quality of life in patients with chronic obstructive pulmonary disease. *Respir Med.* 2011;105(1):67–73.

Objective: To evaluate the association of periodontal health and parameters of quality of life assessed in 306 Chinese patients with chronic obstructive pulmonary disease (COPD).

Methods: Periodontal status and respiratory function in 306 COPD patients were clinically evaluated and their quality of life was assessed using the standardized St. George's Respiratory Questionnaire (SGRQ).

Results: The SGRQ scores were all significantly correlated with major lung function parameters ($r^2=-0.37$ to -0.28 ; $p<0.0001$) and Medical Research Council dyspnea scale ($r^2=0.23$ to 0.30 ; $p<0.0001$). The SGRQ scores also correlated with the 6 minute walk test ($r^2=-0.15$ to -0.13 ; $p<0.05$). Of periodontal health parameters, missing tooth number and plaque index appeared to be related to the scores of quality of life. The age and gender-adjusted Pearson's correlation coefficients between missing teeth and total, symptom and activity score were 0.09, 0.12 and 0.12, respectively ($p<0.05$). The Pearson's correlation coefficients between plaque index and symptom and activity score were 0.09 and 0.09 ($p<0.05$). After adjusting for age, gender, body mass index and smoking status, missing teeth remained significantly associated with symptom and activity score ($p=0.033$, $p=0.030$, respectively), while plaque

index was significantly associated with symptom score ($p=0.007$).

Conclusions: Poor periodontal health as reflected by missing teeth and plaque index was significantly associated with lower quality of life in COPD patients. Our findings indicate the importance of promoting dental care in current public health strategies to improve the quality of life in COPD patients.

Commentary

The focus of this study was to examine whether poor periodontal health and/or oral hygiene is related to quality of life in patients with COPD. Much attention has been focused on the links between oral and systemic diseases in the past decade, and scientists are attempting to identify the processes by which various diseases might be interrelated. One such area of interest is the link between periodontal disease and/or oral hygiene and respiratory diseases. When considering this area of research and its relationship to practice, it is important to review the types of respiratory disease that have been studied in relation to oral diseases. Acute respiratory infections, such as pneumonia, have been studied extensively in elderly individuals who are hospitalized or residing in long-term care facilities. One plausible explanation for the association between respiratory infections and periodontal disease or poor oral hygiene is that oral and respiratory pathogens housed within plaque biofilm are aspirated from the oropharynx into the lungs, causing aspiration pneumonia in susceptible individuals. Another theory re-

lates to systemic inflammatory changes or airway stimuli that are caused by periodontal diseases and respiratory disease. COPD includes 2 main types of diseases: chronic bronchitis and emphysema. The association of COPD and periodontal disease is likely impacted by the shared cofactor of smoking. Nonetheless, studies and systematic reviews have found an association between pneumonia or COPD and periodontal disease, even when statistically controlling for smoking and other common risk factors. No cause and effect relationship has been identified between periodontal disease and respiratory disease.

Patients with COPD have quality of life issues related to impaired respiratory function (i.e., declining airflow in and out of the lungs), a key outcome of the disease. The signs and symptoms of COPD include a chronic cough, shortness of breath (especially with activity), wheezing and chest tightness. These individuals also are susceptible to frequent acute respiratory infections including common colds, influenza and pneumonia. Zhou et al designed this study to determine if quality of life might be related to periodontal disease parameters in 306 Chinese patients with COPD. Subjects who met inclusion and exclusion criteria appropriate to studying these diseases (e.g., ≥ 30 years of age, diagnosed COPD with stable status, no prior major lung surgeries and expected life of at least 6 months) were recruited from 8 hospitals in Beijing. As would be expected for individuals with COPD and periodontal disease, the average age of subjects in this study, approximately 63 years, was higher than the minimum required. These patients were ambulatory, thus they represented typical COPD patients that might be seen in dental practices. The instrument chosen to measure quality of life, the SGRQ, is a questionnaire developed to correlate with medical measurements of chronic airflow limitation to determine if patients perceive improvements or deterioration in status. The SGRQ has been used in many other studies of patients with respiratory diseases, and has been determined to be a valid and reliable measurement instrument. It provides a total score for quality of life based on the individual respondent's self-assessment, and also includes subscales measuring the respondent's perception of symptoms (frequency of coughing, wheezing or sputum production), activity (limited by breathlessness) and impacts (influence of breathing problems on social or psychological functioning).

Other studies have documented an association between health-related quality of life and periodontal disease, and suggested that more severe periodontal disease has a stronger impact on quality of life than less severe disease. This information is

important to dental hygienists who treat periodontal disease on a daily basis and provide patient education to patients about the importance of good oral health. Issues related to quality of life become particularly important to our patients who are elderly or have medically compromising conditions. Results of this study indicated that, in the case of patients with COPD, quality of life might be related to periodontal parameters, such as missing teeth and plaque scores. Previous studies have also documented a relationship between periodontal health and oral health behaviors in COPD patients.

When completing a study to assess the relationship between 2 variables or conditions (in this case COPD and quality of life), researchers must consider other risk factors that might affect quality of life in the subjects being studied. Statistical techniques, such as linear regression analysis, are used to adjust findings after taking these variables into consideration. In this study, after adjusting for age, gender, body mass index and smoking status, the number of missing teeth remained significantly associated with higher symptom and activity scores, while plaque index scores were significantly associated with symptom scores. These SGRQ scores are higher when respondents perceive more problems with breathlessness or greater limitations on activities. Thus, the positive correlation found in this study indicates that more missing teeth and greater amounts of plaque present were related to poorer quality of life in these subjects, based on their perception of their respiratory symptoms and/or activities. The authors concluded that interventional studies are needed to assess the efficacy of oral health care on improving quality of life in COPD patients. By promoting frequent periodontal health care and optimal daily oral hygiene in COPD patients, dental hygienists may play a role in improving their quality of life. Further research is needed to prospectively test outcomes of care, but these results provide interesting information for consideration in treatment and education of individuals with COPD.

Sjögren P, Nilsson E, Forsell M, Johansson O, Hoogstraate J. A Systematic Review of the Preventive Effect of Oral Hygiene on Pneumonia and Respiratory Tract Infection in Elderly People in Hospitals and Nursing Homes: Effect Estimates and Methodological Quality of Randomized Controlled Trials. *J Am Geriatr Soc.* 2008;56(11):2124–2130.

The objective of this study was to investigate the preventive effect of oral hygiene on pneumonia and respiratory tract infection, focusing on elderly people in hospitals and nursing homes, by systematically reviewing effect estimates and methodological

quality of randomized controlled trials (RCTs), and to provide an overview of additional clinical studies in this area. Literature searches were conducted in the Medline database, the Cochrane Library databases and by hand-searching reference lists. Included publications were analyzed for intervention (or topic) studied, main conclusions, strength of evidence and study design. RCTs were further analyzed for effect magnitudes and methodological details. Absolute risk reductions (ARRs) and numbers needed to treat (NNTs) were calculated. Fifteen publications fulfilled the inclusion criteria. There was a wide variation in the design and quality of the studies included. The RCTs revealed positive preventive effects of oral hygiene on pneumonia and respiratory tract infection in hospitalized elderly people and elderly nursing home residents, with ARR from 6.6 to 11.7% and NNTs from 8.6 to 15.3 individuals. The non-RCT studies contributed to inconclusive evidence on the association and correlation between oral hygiene and pneumonia or respiratory tract infection in elderly people. Mechanical oral hygiene has a preventive effect on mortality from pneumonia and non-fatal pneumonia in hospitalized elderly people and elderly nursing home residents. Approximately 1 in 10 cases of death from pneumonia in elderly nursing home residents may be prevented by improving oral hygiene. Future research in this area should be focused on high-quality RCTs with appropriate sample size calculations.

Commentary

This study analyzed previous research linking acute respiratory infections and pneumonia to oral hygiene in patients residing in hospitals and nursing homes. Its focus differs from the previous study discussed in that these patients were institutionalized. Pneumonia occurs commonly in this population, and it is the most common cause of death. A systematic review is a high level of evidence because it identifies, selects, evaluates and analyzes findings from all previous studies related to a well-defined research question. These authors wanted to determine if oral hygiene has an effect on pneumonia and respiratory tract infection in these elderly individuals. They developed a specific method for searching the literature published between 1996 and 2006, and also assessed the studies for type of intervention, main conclusions and strength of the study design. Studies included had to meet specific criteria for inclusion in the analyses. RCTs, which employ a control and experimental group, research controls and randomization, are considered high quality studies for inclusion. Therefore, they were further analyzed for main effects.

Of the 228 articles identified by electronic and hand searching of the literature, only 15 met criteria to be included. Four of the RCTs provided primary data that could be combined by the authors of this systematic review for secondary analysis. Findings indicated:

1. Positive effects of oral care on pneumonia or respiratory tract infections in nursing home or hospitalized elderly patients
2. A clinically relevant preventive effect for death from pneumonia for nursing home residents with weekly professional oral hygiene care by dental hygienists (with tooth brushing after every meal, alone, or in combination with 1% povidone iodine scrubbing of the oral pharynx by caregivers or nursing staff)
3. A possible reduction in the incidence of respiratory tract infection in hospitalized elderly patients undergoing heart surgery with use of a preoperative 0.12% chlorhexidine gluconate oral rinse

Non-randomized studies were also evaluated for the systematic review, although these studies are rated as a lower quality of evidence. Retrospective/prospective, longitudinal/cross-sectional or case-control research approaches were employed. Results indicated similar findings to the RCTs – a positive correlation exists between poor oral hygiene or denture hygiene and pneumonia or respiratory tract infection in dependent or frail elderly people. A positive correlation, once again, indicates that as 1 factor or variable increases, the other does as well, and vice versa – as 1 factor worsens, so does the second factor. In this case, poorer oral/denture hygiene was related to higher incidence of pneumonia or respiratory tract infections.

Absolute risk reduction was calculated at 6.6 to 11.7% of pneumonia cases. The authors concluded that mechanical oral hygiene (including weekly scaling by dental hygienists and tooth brushing by caregivers) has a preventive effect on pneumonia in institutionalized elderly. Further, the analysis indicated that 1 in 10 cases of pneumonia may be prevented by improving oral hygiene in these settings. Dental hygienists can make a difference when providing oral health services in long-term care facilities, and many are working in these settings. Practice restrictions and payment issues limit potential impact of dental hygienists in hospitals and nursing homes or long-term care facilities. Further research using well-designed RCTs should be conducted to determine beneficial effects.

The Bottom Line

Each of these studies addressed the link between oral hygiene and respiratory disease: 1 in ambulatory patients with COPD, the other in elderly individuals in hospitals and nursing homes. Although dental hygienists are well aware of the oral health benefits of preventive and periodontal care we provide, it is interesting to note other possible positive outcomes, such as improved quality of life or prevention of acute systemic infections, including fatal pneumonia.

The findings of the first study suggest poor oral hygiene and missing teeth may be related to quality of life in patients with COPD. These individuals often have quality of life issues associated with chronic cough and dyspnea (shortness of breath) that can affect their normal daily activities. Strategies aimed at modifying factors which impact symptoms and enhance activities should significantly improve the well-being of COPD patients. This study would support inclusion of oral hygiene interventions for the prevention of lost teeth and the control of bacterial plaque biofilm in a comprehensive program for individuals with COPD because symptoms of COPD are impacted by missing teeth and higher plaque scores. Previous studies have shown that aspiration of oral bacteria may also exacerbate COPD or recurrent respiratory tract infections. Dental hygienists have the opportunity to educate individuals with COPD about the possible association between periodontal disease and COPD, as well as the possible positive impact of regular professional and daily oral hygiene regimens on their quality of life.

Both of these studies provide support for an association between oral hygiene and respiratory disease. Long-term randomized controlled clinical trials are needed to strengthen this evidence. In the meantime, the following conclusions can be drawn:

- Missing teeth and high plaque scores have been associated with poorer quality of life in patients with COPD – therefore, dental hygienists can dis-

cuss this possible association with these individuals as a part of their education about the need for regular professional dental hygiene/dental care and daily oral hygiene activities

- Residents of nursing homes and hospitalized elderly patients are at risk for pneumonia, and regular professional dental hygiene care provided in these settings can decrease incidence of respiratory tract infections and fatal pneumonia

Summary

Although an association between respiratory disease and periodontal disease has been shown, there is not sufficient evidence to support a causal relationship. Evidence presented in this column indicates quality of life in COPD patients may be related to missing teeth and increased plaque scores. A systematic review also indicated that oral hygiene interventions, such as weekly scaling by dental hygienists and daily tooth brushing with or without povidone iodine swabbing, can reduce deaths from pneumonia and respiratory tract infections in elderly individuals residing in nursing homes. Findings also indicated a positive correlation exists between poor oral/denture hygiene and pneumonia or respiratory tract infection in elderly people who are hospitalized or living in long-term care facilities. This information indicates that oral hygiene and periodontal services for medically compromised patients and the elderly not only are important for improving or maintaining oral health, but also may impact systemic health and quality of life.

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