Oral Health and the Connection to Respiratory Diseases

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482 Oral Diseases: Prevention & Management

Due: November 14th, 2009
Interest has been mounting on the potential connections between oral health and certain systemic conditions. Even though publicity has not been widely available to the public regarding respiratory health and its connection with oral health, substantial literature is building. Over thirty-five million Americans are affected by some form of respiratory disease, ranging from acute pulmonary infections to Chronic Obstructive Pulmonary Disease (COPD) and asthma, accounting for one-third of the most common causes of death among Americans.¹ Pathogens in the mouth may be risk factors for developing a respiratory disease.¹ Therefore, dental hygienists could recognize oral conditions by identifying pathogens that may cause possible infections earlier and intervene to arrest the progression of potential respiratory disease development.

Respiratory diseases are comprised of a myriad of pulmonary conditions, ranging from acute to chronic, and bacterial, fungal and virus based. Respiratory diseases include conditions such as asthma, emphysema, bronchitis, COPD (a chronic condition consisting of both emphysema and bronchitis), and pneumonia. While all of these are considered respiratory diseases, pneumonia has been the most researched in regards to its connection to oral health. Pneumonia is considered an acute respiratory infection presenting signs including coughing, shortness of breath, increased respiratory rate, sputum production, and chest pain.² Pneumonia can be classified into two categories: community-acquired pneumonia (CAP) and nosocomial pneumonia (acquired by those in the hospital for greater than 48 hours).³ Each year an increasing number of Americans, particularly our elderly population, are affected by respiratory diseases. Respiratory conditions are accountable for one in every six United States deaths, and annually affect 35 million Americans.¹ The mortality rate of those
who develop pneumonia is significant. Of those who develop CAP, approximately 7% pass away, and of those who develop nosocomial pneumonia, 20-50% pass away due to their respiratory condition. A branch of nosocomial pneumonia is called ventilator-associated pneumonia (VAP) and is used to diagnose those who are reliant on ventilators and who later develop pneumonia. VAP is the second most common nosocomial infection and is associated with increased morbidity and high mortality rates, affecting approximately 27% of those critically ill.

With such a high incidence, especially regarding the mortality rate of those who develop pneumonia, there is a need to better understand respiratory conditions from all aspects, including its etiology, prevention and possible treatment modalities. With a better understanding of these conditions, those who develop respiratory diseases will hopefully have a better outcome. Current research has suggested oral health and respiratory health may have a common link, both affecting the other. This reasoning has developed as common bacteria found in periodontal pockets have also been found in those with respiratory diseases. Specific factors including living conditions (such as institutionalized care facilities), dentate individuals (versus those who are edentulous), and oral/medical conditions have been primary focuses in understanding a possible link between the two: poor oral hygiene and the development of respiratory conditions. Potential respiratory pathogens include *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Acinetobacter* species and enteric species, all of which can be seen in dental plaque and oral mucosa colonizations; strains of these bacteria have been genetically identical in dental plaque and bronchoscopic cultures from those who have developed respiratory diseases, specifically VAP. With each of these clues, research to identify the
relationship between oral health and respiratory disease development is a topic with much interest.

With dental plaque and biofilm considered as potential factors in the development of respiratory diseases, it is important to understand the role it plays in this association. Over 300 anaerobic and aerobic microorganisms, and also strains of filamentous microorganisms, colonize tooth surfaces, gingival tissues and dental prostheses. Without proper oral home care and mechanical elimination, the microorganisms from these surfaces will continue to proliferate along with subsequent aerobic micro-organisms and inhabit the oral cavity. With poor oral hygiene, these microorganisms will feed off of one another, transferring from healthy bacterial strains to harmful bacterial strains, such as those seen in periodontal disease, which are also considered the strains associated with respiratory diseases. Factors that influence the types of bacteria found within the oral cavity include the level of oral hygiene, periodontal health, dental decay, and the number of teeth present.

Pneumonia is one of the more commonly seen respiratory diseases and is also one of the more researched conditions associated with poor oral hygiene. Pneumonia is commonly seen in infants and elderly populations as well as those with compromised immune systems. Different pneumonia infection’s etiological development are associated with different bacterial strains. While CAP is associated with the bacteria *Streptococcus pneumoniae* and *Haemophilus influenzae*, nosocomial pneumonia is associated with gram-negative and staphlycoccus bacterial strains and is also suspected to be associated with high anaerobic counts. Pathogenesis of pneumonia involves the aspiration of bacteria from the oropharynx into the lungs and a failure of the host defenses to be able to eliminate the bacteria resulting in the
respiratory infection. Knowing these specific pathogens associated with the different pneumonia infections, our understanding of these same pathogens in relation to oral health may provide clearer answers to the possible association between the two.

While we have examined pathogens that may have a potential association, how these pathogens in the oral cavity could affect the respiratory system should be examined as well. Two mechanisms for infection of the lungs, causing respiratory conditions as the infective micro-organisms of the respiratory system, have been noted in research: hematogenous spread and aspiration. While hematogenous spread is a very rare occurrence, aspiration occurs in 45% of healthy people while sleeping and in 70% of those with impaired consciousness. Respiratory infections from aspiration could occur from any of the following: aspiration of periodontal pathogens, respiratory pathogens colonizing in dental biofilm which is then aspirated, or periodontal pathogens could facilitate the colonization of respiratory pathogens which are then aspirated. Knowing a patients’ history can be a key element in allowing the dental hygienist to investigate how a respiratory disease came about.

Patient assessment can allow the clinician to properly identify possible risk factors and make connections as to how or why the patient could have possibly obtained a respiratory disease. Performing a thorough patient assessment prior to any form of treatment or analysis of a condition is critical to ensure a suitable diagnosis or plan of action. Possible risk factors that should be known due to having a correlation with respiratory diseases: presence of cariogenic and periodontal pathogens, dental decay, and poor oral hygiene. Presence of dental decay, for instance, is significantly related to the incidence of the respiratory disease, aspirated pneumonia. Even gender and ethnicity are important factors that could possibly
affect patients’ health status. Pneumonia rates are higher for men than they are for women and higher in African Americans as opposed to Caucasians. Evidence is accumulating on how poor oral health may influence lung infections, or pneumonia, especially in patients who are considered high risk, such as nursing home residents, hospitalized patients, and those who require mechanical ventilation. Recognizing risk factors is necessary to provide proper care, as well as measurable information.

Measurements that are recommended to acquire in order to make connections between health and respiratory disease include demographic and medical data, health-related behaviors (i.e. tobacco use, alcohol use, etc), dental care utilization, salivary assays, and cultures of dental plaque. A health-related risk factor such as smoking has been linked to both periodontal disease and COPD. Therefore, when dental hygienists gain knowledge of health-related behaviors, such as tobacco use, they are able to include smoking cessation into their patient care. Cessation of smoking will lower the risk for periodontal disease, therefore lowering the risk of acquiring a respiratory disease. Assessment should also include a salivary assay which recognizes oral pathogens that are prominent in subjects with poor oral hygiene. Pathogens can include periodontal or cariogenic organisms. Some pathogens, such as A. actinomycetemcomitans and P. gingivalis, are commonly found in the saliva of those with periodontal disease and, if aspirated directly into the lung, could cause a respiratory disease. Identifying these risk factors and obtaining these measurements allow dental hygienists to take appropriate action and forms of treatment.

Current research is advocating the use of various antibiotics and methods for intervention of respiratory disease-causing bacterial agents in the oral cavity. Randomized,
double-blind, placebo controlled studies concluded results that a 0.12% chlorhexidine gluconate rinse reduced gram-negative microorganisms (*S. aureus*) that are prone to causing respiratory infections. Another randomized, double-blind, placebo controlled study gave results that chlorhexidine combined with colistin reduced the risk for patients with increased risk to VAP development. Basic methods recommended to intervene with the development of respiratory infections include: elevating the head of the patients’ bed, helping to reduce the incidence of aspiration pneumonia in elderly patients, and providing dental care to reduce the amount of plaque bacteria, causing periodontal disease and dental decay. Intervention allows dental hygienists to control this disease process from progressing. Not only is intervention critical to provide palliative care to the patient, but also to manage their condition. Dental hygienists have an important role in managing patients with respiratory diseases as well. The article *Exploring the Connection* discusses the need to manage patient care among nursing colleagues to develop and implement oral hygiene protocols, especially in settings such as nursing homes and ICU’s where patients are more susceptible to developing a respiratory infection. Working with other health care professionals, such as nurses and caregivers, increases the quality of oral health as well as general health.

Prevention should always be a top priority for dental hygienists to teach their patients. Informing clients on how they can implement prevention methods into their daily care and awareness may help prevent respiratory diseases from occurring due to oral infections. Meticulous oral health care should be performed by patients twice daily to prevent accumulation of oral bacteria that may lead to respiratory diseases. A study was conducted that included fifty subjects, twenty-eight of whom were dentate. Results showed a higher
presence of *P. gingivalis* and *S. sobrinus* in cultured dental plaque in dentate patients over edentulous patients. Therefore, proper oral hygiene habits are important to lower the bacteria that are common to cause aspiration pneumonia. For instance, patients who still have their dentition and have poor oral hygiene showed significantly higher salivary bacterial counts than those who have good dental hygiene habits.

Various other methods have been proven helpful in the prevention of pneumonia in institutionalized patients as well. Some examples include attention to aseptic technique, the use of barriers, and strict infection control practices. Patients should also strive for optimal general health to ensure a healthy respiratory tract, which aids in the elimination of aspirated bacteria from the lower airway. Having favorable health conditions assist the patient’s defense mechanisms to function properly. One’s defense mechanism can be altered by: malnutrition, smoking, COPD, diabetes, and corticosteroid use. Consequently, educating patients about how oral health and systemic health are interconnected is important.

One last method that may help in the prevention of respiratory diseases from oral bacteria is the use of tongue scrapers. An investigation was performed using a tongue-plaque index (TPI) to measure the amount of coating, therefore the number of oral bacteria present.

An article discussing tongue coating by Abe S stated:

“The number of elderly patients developing aspiration pneumonia was larger (p < 0.005) in patients with TPI-based poor scores (average TPI > 0.5) than in those with TPI-based good scores. The relative risk of developing pneumonia in the good tongue hygiene group compared with in the poor tongue hygiene group was 0.12, 95% confidence interval (CI): 0.02–0.9. The results demonstrate that tongue-coating is associated with number of viable salivary bacterial cells and development of aspiration pneumonia, suggesting that tongue-coating is a risk indicator of aspiration pneumonia in edentate subjects.” Prevention of this tongue build up, therefore, could be the use of tongue scrapers to reduce
Respiratory disease-causing bacteria.

With mounting evidence on the association between oral health and respiratory disease, oral health care professionals’ responsibility for top quality care is unmistakable. By staying up-to-date and utilizing research available, dental hygienists will have the knowledge and skills to perform proper patient assessment, intervention, management, and prevention. With this knowledge and clinical skill set, the dental hygienist will be able to educate patients, discussing specific risk factors for developing respiratory diseases and prevention methods to avoid development, and will be able to identify and manage those with suspected associated problems. Dental hygienists should stay abreast on current research as it is made available, therefore and a clearer connection is identified allowing them to educate the public and patients.


