Oral Care and the Elderly

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Abstract

The purpose of this report is to review the normal environment of the oropharyngeal cavity, examine its potential role in the development of pneumonia, and examine the beneficial effects of oral care in the prevention of pneumonia among the sick and elderly. The oropharynx is a very diverse environment of structures, functions, and ecology. Normal bacterial florae existing in this environment are limited in their efforts to colonize in the moist oral tissues by immune properties present in saliva and mucous. Lack of oral maintenance or the occurrence of a severe illness may provide an opportunity for these pathogens to colonize and multiply. Aspiration of certain oral pathogens into the lower respiratory tract has been associated with the development of pneumonia leading to illness complications and death in some elderly or sick persons. Oral care using brushes and oral rinses have been shown to significantly reduce pneumonia development and fever in the sick and elderly populations. An important new role of speech-language pathologists is to assert themselves as practitioners and advocates of better oral health with these populations.

Oral Care and the Elderly

Understanding the potential causes of pneumonia development in persons with dysphagia has progressed rapidly over the last 30 years. Better understanding of the multifaceted complexities which underlie pneumonia development has replaced the simple notion that aspirating food into the lower respiratory tract explains its pathophysiology. We now understand that developing pneumonia from aspirates involves or impacts, in some way, nearly every major body system. The environment of the oropharyngeal cavity has become a leading point of interest as the potential source of potentially infectious organisms, or pathogens, which, if aspirated, may colonize and infect the lower respiratory system. Preemptive care and maintenance of the oral cavity have been shown to control the colonization of these pathogens and reduce the incidence of pneumonia development among the sick and elderly. The purpose of this report is to review the normal environment of the oropharyngeal cavities, examine its potential role in the development of pneumonia, and examine the beneficial effects of oral care in the prevention of pneumonia among the sick and elderly.

Normal Oropharyngeal Environment

The environment of the oropharynx is highly complex and ecologically-sensitive. It contains unique properties, such as teeth, saliva, mucous membranes, and a mixture of indigenous pathogens, which work in concert to breakdown and prepare ingested food for digestion, clear the mouth of debris, and maintain a stable and healthy environment. The covering over the oropharyngeal cavities is a shedding outer layer of stratified squamous epithelium and an underlying lamina propria composed of dense connective tissues, glands, and blood vessels (Winning & Townsend, 2000). The teeth have non-shedding surfaces of hard enamel and are embedded in bony sockets in the mandible and maxilla (Marcotte & Lavoie, 1998). Saliva, mucus, and gingival crevicular fluid lubricate these surfaces and help protect them from trauma, harmful chemicals, and pathogens, and excessive water loss, thus contributing significantly to the overall maintenance of the oral cavity's environmental stability.

Over 500 species of endogenous pathogens, known as florae, normally thrive in the warm and moist environment of the oral and pharyngeal cavities. These pathogens are primarily bacteria and are capable of producing disease under the right circumstances. The composition and concentrations of these bacteria are influenced by gender, age, genetics, nutrition, diet, and stress factors of the human host. Pathogen colonization begins during the birth of a new infant. With growth and aging of the host, bacterial types will change. However, the oral florae remain relatively constant in healthy individuals throughout their lives (Todar, 2002). Communities of certain species of oral pathogens attach and cover all surfaces within the cavities and are called biofilms (O'Toole, Kaplan, & Kolter, 2000). These flora-laden biofilms may benefit the hosting oropharynx by stimulating the immune system to protect against colonization and infection by invading microbes and providing certain nutritional and digestive functions (Todar).

Saliva is the predominant oral cavity protector and lubricant. It is composed of serous fluid and mucous. Ninety percent of saliva is secreted by the parotid glands in the face and the submandibular and sublingual glands in the floor of the mouth. The remaining saliva is secreted by hundreds of minor salivary glands distributed over the oral mucosal surface. Serous fluid is rich in proteins containing antimicrobial substances and enzymes that help prevent oral pathogens from attaching and colonizing on the oropharyngeal surfaces. These properties of the serous portion of saliva also assist in preventing oral infections (Gibson & Barrett, 1992; Cassolato & Turnbull, 2003). Mucous contains special proteins, water, and mucin that contribute to oral lubrication and hydration of the epithelial lining. Other salivary proteins, minerals, and enzymes assist with food bolus preparation, initiate digestion, regulate oral pH, remineralize teeth, and coat the surfaces of the teeth to help prevent dental plaque and tooth decay (Vissink, Spijkervet, & Amerongen, 1996; Shay, 2002; Mese & Matsuo, 2007).

A lesser known oral secretion, gingival crevicular fluid, contributes specifically to tooth maintenance and protection. It is produced as a watery, thin serum in capillary-rich beds surrounding the base of the teeth. This fluid bathes the root of the teeth in the gingival sulci and contains many of the same anti-inflammatory and microorganism-fighting properties found in saliva (Lamster & Ahlo, 2007).

Aging, Disease, and Oral Environment

Normal aging appears to cause few significant changes to the surfaces of the oropharyngeal cavities. Small reductions in the thickness of the epithelium have been shown in persons between the ages of 18 and 96 (Williams & Cruchley, as cited in Winning & Townsend, 2000). Similarly, saliva flow from certain glands may become reduced with aging, but usually remains sufficient to keep the oral tissues moist, particularly among healthy and non-medicated persons (Mese & Matsuo, 2007).

Americans over the age of 65 are retaining more of their natural teeth as they age (Dye et al., 2007). However, changes specific to the root canal system continue to occur, which include a gradual buildup of dense connective tissue within the tooth pulp and a marked reduction in both innervation and vascular supply to the dental ridges and their teeth (Goodis, Rossall & Kahn, 2001). For those 75 years or older, moderate to severe periodontal disease continues to be prevalent (Dye et al.).

Dental diseases, including plaque, caries, gingivitis, and periodontal disease, are the direct result of normal oral pathogens acting upon the tissues of the oral cavity. Dental plaque is a naturally-constructed oral biofilm of specific bacterial cells, salivary compounds, and bacterial byproducts that coats and attaches to the surfaces of the teeth. This particular biofilm may reach a thickness of 300 to 500 cells (Todar, 2002). Dense collections of plaque form in areas between the teeth, in subgingival crevices, and in the pits and fissures along the occlusal surfaces of the teeth (Marcotte & Lavoie, 1998). Dental caries are the result of lactic acid from specific species of oral bacteria accumulating within the dental plaque biofilm and demineralizing the tooth enamel. Periodontal disease is an infection developing out of bacterial plaque accumulating around the base of teeth and the gums. This disease process causes loss of teeth and their support tissues (Guthmiller & Novak, 2002) and is the direct consequence of poor oral and dental hygiene (Scannapieco & Mylotte, 1996). Gingivitis is an inflammatory form of periodontal disease affecting the gums. Without regular and thorough cleaning, this plaque-laden biofilm matures through rapid colonization turning the oral cavity into a heavily-laden reservoir of pathogens (Guthmiller & Novak; Scannapieco & Mylotte). Certain oral bacterial species, such Streptococcus sanguis, Staphylococcus aureus, and Porphyromonas gingivalis, have been associated with local and systemic illnesses, including abscesses, infections, and cardiac disease (Li, Kolltveit, Tronstad, & Olsen, 2000). It is now well-recognized that if large loads of pathogens from the oropharynx are aspirated into the lower respiratory system and reach immune-compromised respiratory bronchioles pneumonia is highly probable. Respiratory infection from aspiration is the second most common infection, behind urinary tract infections, occurring in long-term nursing facilities (Medina-Walpole & Katz, 1999; Mojon, 2002).

Serious Illness Effects on Oral Environment

The ecological balance of the oral environment may also be altered as a result of serious illness, a surgical procedure, or medication effects. These events may be physiologically stressful to the patient, which may alter the stability of some body systems, such as the immune system. Responses to stressful events are regulated by the hypothalamus and the pituitary and adrenal glands. Their actions stimulate the sympathetic nervous system to reduce salivary gland output, which reduces oral immune properties and sets the stage for increased opportunistic bacterial colonization (McEwen & Lasley, 2002). Skerrett, Niederman, and Fein (1989) state that the greater the severity of an illness, the greater the likelihood more bacteria will colonize in the oropharynx. In addition, over 500 medications are known to alter salivary output and its composition causing xerostomia, or drying of the oral tissues (Daniels & Wu, 2000). As a result, antimicrobial protection of the oral tissues and teeth is diminished setting the stage for unabated pathogen colonization and growth.

Effects of Proper Oral Care

Oral health status of hospitalized elderly patients is reported to be significantly worse than that of home-dwelling patients (Pajukoski, Meurman, Snellman-Grohn, & Sulkava, 1999). Morbidity, mortality, length of hospital stay, febrile days, and health costs are directly affected by good oral care programs. Mori et al. (2006) compared two large groups of ICU, mechanically ventilated patients. Twelve hundred and forty eight patients received prescribed oral care three times daily or once in every nursing shift. Six hundred and thirty seven patients had not received oral care during an earlier hospital period of stay and were used as historical controls. The incidence of ventilator-associated pneumonia was significantly reduced for the oral care group compared to the non-oral care control group (3.9 versus 10.4). Yoneyama et al. (2002) reported that five minutes of oral care following each meal significantly reduced the incidence of aspiration pneumonia, febrile days, and death from pneumonia in a large randomized group of residents from 11 nursing facilities. Finally, Adachi and colleagues (Adachi, Ishihara, Abe, Okuda, & Ishikawa, 2002) reported a significant reduction of fever and the incidence of fatal pneumonia among 141 nursing home residents while receiving weekly oral care from dental hygienists. These studies demonstrate that using good oral hygiene practices in nursing homes and hospitals significantly reduces the incidence of fever, aspiration pneumonia, and death from pneumonia.

Oral Care Practices

Proper oral care of the frail elderly and those approaching the end of life in nursing institutions is lacking. Cohen-Mansfield and Lipson (as cited in Jablonski, Munro, Grap, & Elswick, 2005) call the current situation, “deplorable.” Surveys of community-dwelling elderly people rate mouth care as the most important personal hygiene issue followed by toileting, bathing time, bath process, and bathing environment (Cohen-Mansfield & Jensen, 2005). While concerted programs of oral hygiene and their effects have been reported, standardized practices and protocols across care facilities have not been adopted nationally. Many facilities have informal cleaning practices that vary from patient-to-patient and do not stress the quality or the regularity of the oral cleaning practices. Other facilities, and particularly in intensive care units, have adopted very stringent oral care policies. Agencies and organizations, such as the American Dental Hygienists’ Association and state departments’ of public health, have developed oral care protocols, but uniformity of practice guidelines has not been demonstrated. The Hospice of the Florida Suncoast (2006) provides a detailed assessment checklist for the caregiver which can be found on the company’s Web site. In most settings, nurses and nursing assistants are generally considered the responsible parties for seeing that oral hygiene care is carried out properly. Surveys of nurses and their documentation of oral care differ significantly. Intensive care nurses surveyed reported they administered oral care 2 to 5 times per day per patient; however, review of patient flow sheets indicated oral care was provided only 1.2 times per day (Grap, Munro, Ashtiani, & Bryant, 2003). These findings suggest that oral care, while considered a normal and necessary part of patient care, is often neglected by a busy staff. Nursing assistants in long-term care facilities have been reported to be less than diligent with oral care for their patients. They report their reluctance to provide proper care, because they have received little to no formal instruction in providing oral care to others; they fear being bitten by patients or sprayed with potentially infectious oral fluids; they cite other competing patient care obligations for which under-performance is punished; and they cite personal distaste for cleaning someone's mouth. It is clear that, while oral care is considered an important duty by the nursing staffs, its performance regularity suffers from lack of educational training and management commitment (Shay, 2007). Based on these reports, speech-language pathologists need to step forward and provide expertise and training in nursing facilities. Knowledge of the oral environment, knowledge of its potential changes following illness, and knowledge of the oral cavity as the chief suspect in pneumonia development pushes the speech-language pathologist to the forefront as a primary provider of and advocate for proper oral care among the ill and the elderly

Oral Care Procedures

Current oral care procedures encompass the use of mechanical care and/or pharmacological regimens. Mechanical care may include the uses of toothbrushes, foam swabs, lemon glycerine swabs, rinses, and other devices to clean the mouth. For most elderly patients, toothbrushing is the most common practice (Grap et al., 2003). However, elderly patients with poor hand function develop significantly more dental plaque, including those who wear dentures (Padilha, Hugo, Hilgert, & Dal Moro, 2007). Soft, manual, pediatric bristle brushes may be effective in removing some oral pathogens and debris (Trieger, 2004), but powered, rotary toothbrushes have been shown to remove plaque, to reduce gingivitis, and reduce dental caries more effectively than manual brushes (Verma & Bhat, 2004; Robinson et al., 2005; Papas et al., 2007). These rotary devices also reduce the time required for oral care by caregivers (Wolden, Strand, & Gjellestad, 2006). In addition, toothbrushes with suction attachments more efficiently clear the mouth of secretions, cleaning agents and debris during the cleaning process (Sumi, Nakajima, Tamura, Nagaya, & Michiwaki, 2003).

Foam sponge swabs are more commonly used with patients unable to provide their own care. Grap et al. (2003) reported that nurses in medical respiratory, surgical trauma, and neurological intensive care units used foam swabs during mouth cleaning for 54.4% of non-intubated patients and 91.5% of intubated patients. Foam swabs dipped in either water or mouthwash is a standard clinical practice. However, a number of studies have shown that foam sponges provide mucosal stimulation, but do not adequately remove dental plaque and should not be used for that purpose (Munro & Grap, 2004).

Use of lemon glycerine swabs to moisten the oral mucosa has a confusing history. Studies from the 1970s through the 1990s provide mixed reviews of the effectiveness of these products. They report that lemon-glycerine swabs moisten the mouth initially, but the citrus-acidity causes mucosa drying with repeated use. Less erosive oral moisteners have been advocated after reports that lemon-moistened swabs significantly soften tooth enamel in bovine models (Meurman et al., 1996). Contrary to these reports, Foss-Durant and McAfee (1997) found that use of lemon-treated glycerine swabs indeed initially dried the oral mucosa, but, with continued use, the mucosa began to respond with increased secretions between day 4 and 5. They also reported that patient satisfaction increased as xerostomia decreased following use of the swabs.

Pharmacological agents used in oral care are antigingivitis and antiplaque products and are administered as a dentifrice or mouth rinse. Most over-the-counter products contain active ingredients including tricolsan and stannous fluoride (dentifrices) and a combination of essential oils and cetylpyridinum chloride (mouth rinses; Gunsolley, 2006). Many of these commercial mouth rinses also contain alcohol as an antibacterial agent and may contribute to xerostomia (Garcia, 2005). However, results of a meta-analysis by Gunsolley of 50 studies indicate that dentifrices with stannous fluoride have marginally-significant clinical effects as an antiplaque, but highly significant clinical effects as an antigingivitis agent. Use of mouth rinse products containing essential oils, such as Listerine, has the largest number of studies supporting their use as antigingivitis and antiplaque agents.

Chlorhexidine is a broad-spectrum antibacterial prescription drug and is effective with reducing oral bacteria. It is not absorbed through skin or mucous membranes, and allergic reactions are extremely rare. One drawback, however, is that with long-term use, teeth become discolored and appear similar to the discoloration associated with coffee, tea, smoking, or wine (Munro & Grap, 2004). Use of 0.12% chlorhexidine has shown mixed results in its effectiveness in reducing oral bacterial load and pneumonia. DeRiso, Ladowski, Dillon, Justice, and Peterson (1996) and Houston et al. (2002) report that respiratory infection rates are reduced in coronary artery bypass and other open heart patients using chlorhexidine oral rinse. Similar results have been reported with intubated critical care unit patients (Bopp, Darby, Loftin, & Broscious, 2006) and patients on mechanical ventilators (Fourrier et al., 2000). However, a meta-analysis of 1251 studies by Pineda, Saliba, and El Solh (2006) identified only four randomized controlled trials using chlorhexidine during oral care. They report that chlorhexidine use, as an oral decontaminate, did not affect the incidence of aspiration pneumonia or the mortality rate among ventilator patients.

In summary, the oropharynx in healthy elderly persons is not significantly affected by the natural aging process. The oral and pharyngeal cavities are ever-changing and renewing environments striking balances between normal flora and harmful pathogens. These environments become altered with the effects of disease or medications allowing increased pathogen colonization. Impaired laryngeal valve function, in conjunction with increased populations of upper respiratory pathogens, sets the potential for the affected patient to develop aspiration pneumonia. Ample evidence suggests that routine daily oral cleaning using a mechanically powered toothbrush, toothpaste containing stannous fluoride, and mouth rinses containing essential oils or 0.12% chlorhexidine will reduce bacteria-laden plaque and reduce gingivitis in the oral cavities of elderly persons. Speech-language pathologists working with the elderly must assert themselves as practitioners and advocates of better oral health with this population.

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