

PERSPECTIVE

Oral Hygiene Reduces the Mortality from Aspiration Pneumonia in Frail Elders

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History

Historically, the oral hygiene routine for frail elders who live in institutions was equivalent to placing a set of full dentures in a glass of water with an effervescent denture cleanser. Rarely, the mouth was rinsed and the oral mucosa or even the tongue was scrubbed. Nowadays, more and more natural teeth are retained until later in life, leading to an increased prevalence of fixed and partial dental prostheses among elders. Such dentitions require more sophisticated and time-consuming cleansing procedures that often exceed the competence of the caring staff and the time frame for oral hygiene in a patient's individual nursing plan. The elders themselves may be uncooperative or show little motivation, especially when more severe general health issues overshadow the concerns for the mouth. Furthermore, they may lack dexterity and vision to perform oral hygiene measures adequately without assistance. Consequently, we often find a substantial bacterial load in elder persons' mouths,

which presents a considerable risk for infections and periodontal disease. Some 20 y ago, colleagues from Japan associated for the first time bacteria from the oropharyngeal tract with the incidence of aspiration pneumonia, thus introducing an additional aspect underlining the importance of oral health for the general well-being of elderly and fragile adults.

Pneumonia: The Leading Cause of Death from Infection in Elders

Pneumonia is a major threat to the older population, with an estimated incidence per 1,000 of between 25 and 44 in community-dwelling elders and from 33 to 114 in institutionalized elders (Janssens and Krause 2004). Community-acquired pneumonia (CAP) and nursing-home-acquired pneumonia (NHAP) have to be distinguished. Pneumonia accounts for 13 to 48% of all infections in nursing homes and is the leading cause of death from infection in patients aged 65 y and older (El-Solh 2011). Reported mortality rates vary from 1 to 48% and are associated with age, comorbidities, and the severity of the disease (Welte et al. 2012). Clinically, patients feel very unwell and present with cough, purulent sputum, fever, sweats, pain, and suffocation hazard.

Very old persons often lack these classic symptoms and rather present with falls and confusion (Janssens and Krause 2004).

Aspiration pneumonia is caused by foreign material descending into the bronchial tree and the lung alveoli, which, when originating from the oral cavity, may most commonly consist of food debris, saliva, biofilm, or a combination of these. Healthy adults may also aspirate some oropharyngeal secretions during sleep, but with coughing and ciliary transport as well as intact immune mechanisms, the airways are protected. With age and functional decline, these defense mechanisms become impaired, which renders fragile elders more vulnerable to developing aspiration pneumonia. Cognitive impairment, stroke, or other conditions that imply incompetent swallowing are the main risk factors for aspirating foreign material (van der Maarel-Wierink et al. 2011). Ventilated patients are also at risk, even when not aged (Scannapieco et al. 2003). In a prospective study, 10% of 1499 community-dwelling patients who were hospitalized for pneumonia presented with aspiration pneumonia, whereas this percentage rose to 30% in 447 institutionalized pneumonia patients from the same study (Shariatzadeh et al. 2006).

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The Role of Oral Pathogens

In samples of bronchoalveolar lavages from hospitalized pneumonia patients, microorganisms of denture plaque or associated with periodontal disease were found (Imsand et al. 2002). Quagliarello and coworkers described poor oral hygiene to be among the most common risk factors of pneumonia in nursing home residents (Quagliarello et al. 2005). From 9 modifiable risk factors, they identified only for inadequate oral care [hazard ratio (HR), 1.60; 95% confidence interval (CI), 1.06–2.35; $P=0.024$] and difficulty swallowing (HR, 1.65; 95% CI, 1.04–2.62; $P=0.033$), a significant association with the risk of developing aspiration pneumonia. In agreement with these findings, patients with 10 or more natural teeth and periodontal probing depths >4 mm showed a 3.9-fold greater risk of dying from pneumonia than those without periodontal pockets (Awano et al. 2008). Oral pathogens may even persist after extraction of the natural teeth; hence, in edentulous subjects, tongue coating has been identified as a risk indicator for aspiration pneumonia (Abe et al. 2008).

Effectiveness of Oral Care in Reducing the Risk of Pneumonia

Assuming that oral pathogens are at the origin of aspiration pneumonia, the question arises whether oral hygiene measures reduce the risk inherent to oral biofilm. Only a few randomized controlled trials have investigated the effect of oral hygiene measures on the incidence of pneumonia. One of the first studies was conducted by a Japanese group and reported on 417 residents from 11 nursing homes who were randomly allocated to an oral care or non-oral care group (Yoneyama et al. 1999, 2002). The intervention comprised 5 minutes of tooth brushing after every meal and professional hygiene provided once a week. When considered necessary, the regimen was complemented by povidone iodine swabbings. During the observation period of 2 y, new pneumonia had occurred

in 34 of 182 elders of the non-oral care group, versus 21 of 184 residents who had received the intervention [relative risk (RR), 1.67; 95% CI, 1.01–2.75; $P=0.04$]. Subsequent studies with various levels of evidence and different methodologies more or less confirmed these findings (Adachi et al. 2007; Bassim et al. 2008). Whereas mechanical hygiene measures consistently seem to reduce the pneumonia incidence, the use of chemical agents alone yielded inconsistent improvement of the incidence of respiratory tract infections (El-Solh 2011). Van der Mareel-Wiernik et al. recommended tooth brushing after each meal, cleaning removable prostheses once a day, and professional oral health care once a week as the best regimen to reduce the incidence of aspiration pneumonia (van der Mareel-Wiernik et al. 2013). A systematic review concluded from 4 RCTs that 1 in 10 deaths from pneumonia in elderly nursing home residents may be prevented by improving oral hygiene (Sjogren et al. 2008).

What's New?

Toshimitsu Iinuma and his group from Tokyo evinced for the first time that denture wearing during sleep doubles the risk of pneumonia in very old persons (Iinuma et al. 2014). The beauty of this finding is that this risk factor can be modified easily by a simple and straightforward clinical recommendation. It can be implemented by the patients themselves and requires neither manpower nor public funds. It enables patients to participate in infection control, even when impaired manual dexterity and vision preclude full autonomy in oral hygiene measures. The decision of whether to wear a dentures during the night has many facets. Generally, it is recommended to store removable dentures dry to prevent denture stomatitis, but psychosocial, functional, or mechanical aspects may influence the patient to still wear the dentures during sleep. Obviously, the risks of aspiration pneumonia and death, which seem to be associated with nocturnal denture

wearing, add a new dimension to the pros and cons of wearing dentures while sleeping.

Conclusion

The available scientific evidence suggests that mechanical oral hygiene decreases the incidence of pneumonia in fragile elders. Hence, oral hygiene regimens for dependent elders should be rigorously implemented because they promise to reduce the morbidity and mortality from aspiration pneumonia. When possible, denture wearing during the night should be discouraged in geriatric patients.

Author Contributions

F. Müller, contributed to conception, design, data acquisition, analysis, and interpretation, drafted and critically revised the manuscript. The author gave final approval and agrees to be accountable for all aspects of the work.

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