Oral health in older patients with oropharyngeal dysphagia

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Abstract

Background: oropharyngeal dysphagia (OD), aspiration and poor oral health status are potential risk factors in elderly patients with aspiration pneumonia (AP).

Aim: to assess the oral hygiene status and the prevalence of periodontal disease and dental caries in elderly patients with OD.

Patients and methods: fifty elderly patients (79.7 ± 6.64 years) with OD associated with ageing or neurological diseases and 15 elderly patients without OD (77.01 ± 4.51 years) were enrolled in this observational–transversal study. OD and aspiration were evaluated by videofluoroscopy (VFS). Oral health was assessed by: (i) the Simplified Oral Hygiene Index (OHI-S); (ii) a complete periodontal examination, assessing the periodontal pocket depth, clinical attachment loss and bleeding on probing to study periodontal diseases (periodontitis, gingivitis); and (iii) the presence of dental caries.

Results: 8/50 elderly patients with OD presented VFS signs of aspiration, half of them silent; 40/50, signs of penetration into laryngeal vestibule and 16/50, oropharyngeal residue. Prevalence of edentulism and caries was higher in patients with OD. Dentate older patients with OD (30/50) presented the following complications (i) poor oral hygiene in 18 patients (OHI-S 3.1–6), (ii) gingivitis in 2 and periodontitis in 28 and (iii) caries in 16.

Conclusions: older patients with OD presented polymorbidity and impaired health status, high prevalence of VFS signs of impaired safety of swallow and poor oral health status with high prevalence of periodontal diseases and caries. These patients are at great risk of developing AP. We recommend a policy of systematic oral health assessment in elderly patients with OD.

Keywords: Swallowing disorders, elderly, oral hygiene, periodontal diseases, aspiration pneumonia, older people
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Introduction

The incidence and prevalence of aspiration pneumonia (AP) in the community are poorly defined. The pathogenesis of AP presumes the contribution of risk factors that alter swallowing function, causing oropharyngeal aspiration, bacterial colonisation and impaired immunity. The risk of these factors increases with age, underlying diseases and polymorbidity. Surprisingly, in the clinical setting, oropharyngeal dysphagia (OD) and aspiration are not usually considered aetiological factors in older patients with pneumonia [1].

The quantity and type of microbiota in aspirate, greatly affected by oral health, contribute to the development of AP [2]. In healthy mouths, oral biofilm is colonised by commensal microflora which acts as a barrier against the colonisation of respiratory pathogens. Poor oral health reduces these bacteria, allowing the growth of pathogenic populations and changing the balance from a majority of Gram-positive microorganisms in healthy mouths to mostly Gram-negative in patients with periodontitis and caries [3]. Studies have found that impaired oral health status and oral diseases are important risk factors for AP and independent predictors of mortality from pneumonia in the elderly [2–4]. A recent editorial called for systematic screening of OD and Gram-negative bacterial colonisation in polymorbid older patients to prevent AP [5]. The combined effect of comorbidities, frailty, decreased immunological status, OD and poor oral health can lead to AP, hospital readmissions and death [6, 7].

Oral health of elderly dysphagic patients has not been systematically studied. The aim of this observational–transversal study is to assess the oral hygiene status, the prevalence of oral diseases and oral hygiene habits, the health status and comorbidities in this population.

Material and Methods

Patient sample

Population consisted of elderly patients consecutively referred for swallowing evaluation. Main inclusion criteria were age ≥70 and history of swallowing difficulties associated with ageing and/or neurological diseases. A control group of elderly patients with similar age and without OD was also included.

Experimental design

Health status and comorbidities were assessed by the Charlson Comorbidity Index [8], The Eating Assessment Tool (EAT-10) [9], a questionnaire to evaluate the severity of dysphagia symptoms, was collected in all subjects. Patients with swallowing complaints were also evaluated by videofluoroscopy (VFS) [10]. Oral health was assessed by the evaluation of periodontal diseases, dental caries, oral hygiene status and oral health habits. All procedures were performed on the same day.

Dysphagia assessment by VFS

The technical process used for VFS recordings has been described elsewhere [10, 11]. VFS signs of impaired safety were classified according to Penetration–Aspiration Scale [12].

Oral health assessment

Oral examinations were performed by two periodontists and included: (i) number of teeth, (ii) oral hygiene, (iii) periodontal diseases, (iv) caries and (v) oral health habits.

Oral hygiene

We used the Simplified Oral Hygiene Index (OHI-S), composed of two indexes: the Debris Index (DI-S, dental plaque,) and the Calculus Index (CI-S, mineralised debris). The CI-S and DI-S values range from 0 to 6 [13] (Figure 1).

Periodontal diseases

Periodontal diseases were assessed by introducing a periodontal probe along the soft tissue wall at the gingival sulcus/pocket. Diagnosis was made using an established protocol [14].

Caries

Caries were assessed at each dental surface (four surfaces for incisors and canines; five for premolars and molars). We measured the percentage of teeth with caries and surfaces affected [15].

Oral hygiene habits

A questionnaire was used to determine tooth-brushing frequency, use of mouthwash, use of dentures and last visit to the dentist.

Data management and statistical analysis

Qualitative data are presented as relative frequencies and analysed by the $\chi^2$-test and continuous data are presented as mean ± SD and compared with the Mann–Whitney U-test. Safety and efficacy of deglutition were assessed by prevalence of clinical or VFS signs. P-values of <0.05 were considered significant.

Results

Demographics and health status

We studied 50 consecutive elderly patients with swallowing impairment between January and May 2011, (27 women) with a mean age of 79.7 ± 6.64 years. OD was associated with stroke (29/50), ageing (16/50) and neurodegenerative diseases (5/50). The mean Charlson comorbidity score was 2.98 ± 1.83 [8] and the mean EAT-10 score was 10.5 ± 7.6. Mean number of drugs taken by patients was 7.56 ± 2.97.

In addition, a group of 15 elderly controls (six women) with a mean age of 77.09 ± 4.51 years without OD was studied. The mean Charlson comorbidity score was 2.98 ± 1.83 [8].
1.4 ± 1.12 ($P = 0.0023$ versus OD) and the mean EAT-10 score was 0.23 ± 0.6 ($P < 0.0001$ versus OD).

**VFS signs of OD**

VFS showed that prevalence of signs of impaired safety (29/50) and efficacy (38/50) of deglutition in the group with OD was very high. According to the Penetration–Aspiration Scale [12], 21/50 OD patients presented mild penetrations (scores 2–3); 15/50, severe penetrations into the laryngeal vestibule (scores 4–5); and 8/50, aspirations into the airway (scores 6–8) (Supplementary data are available in *Age and Ageing* online, Appendix Figure S2). A total of 9/50 patients also presented chewing difficulties (Supplementary data are available in *Age and Ageing* online, Appendix 1).

**Oral health**

**OD patients**

20/50 patients presented edentulism and needed dentures to eat with. The following results are for dentate patients (30/50): (i) mean number of teeth was $17 \pm 8.3$; (ii) OHI-S results showed high prevalence of patients with poor oral hygiene ($3.86 \pm 1.51$) (Figure 2); (iii) a total of 28 dentate patients presented periodontitis (6, mild; 11, moderate; and 11, severe), two had gingivitis and none had healthy clinical oral status ($P < 0.0001$). More than half (16) had caries with up to $23.05\% \pm 0.16$ of dental pieces affected in each patient and $8.21\% \pm 5.14$ of the surfaces of each tooth affected.

Only 33 patients reported cleaning their teeth or dentures at least once a day and only 11 patients had visited the dentist during the previous year.

**Control patients**

Only 1/15 patient presented edentulism ($P = 0.0249$ versus OD) and mean number of teeth was $18.1 \pm 8.8$. Among patients with teeth (14), OHI-S mean value was $3.25 \pm 1.35$ (Figure 2), 13 presented periodontitis and only 3, caries ($P = 0.0456$ versus OD) with a smaller percentage of teeth affected than patients with OD ($7.63\% \pm 3.5, P = 0.022$) (Supplementary data are available in *Age and Ageing* online, Appendix Table S1 and Appendix 3 and 4).

Figure 1. Descriptors for the evaluation of the Simplified Oral Hygiene Index (OHI-S), periodontal disease and caries: the upper image shows the clinical criteria for the evaluation of the OHI-S. The numbers indicate the score for the debris or calculus index based on its accumulation (from 3 to 0 in each index). The lower image shows the clinical signs of different oral health status; from healthy gums with no inflammation or bone loss, gingivitis with gum inflammation, periodontitis with gum inflammation and alveolar bone loss and caries with tooth demineralisation. Note the progressive loss of tissue and progressive biofilm accumulation according to the progression of the diseases.
Main results from this study show that older OD patients were at high risk of AP as they presented high prevalence of VFS signs of impaired safety of swallow, poor oral health status with high prevalence of periodontal diseases and caries, and impaired health status with prevalent comorbidities and polymedication.

OD should be recognised as a major geriatric syndrome as its prevalence is very high in elderly patients and leads to multiple diseases and risk factors [8]. Studies on healthy elderly over 80 years found that ageing delayed and prolonged swallow response and increased oropharyngeal residue [16]. Impaired swallow response is caused by neurological diseases as well as the neurodegenerative process related to ageing [17], drugs with detrimental effects on consciousness or swallow response [18] and reduced tongue strength caused by sarcopenia [9]. In addition, many of our patients presented chewing difficulties. We have recently found that OD is an independent risk factor for the development of respiratory tract infections and community-acquired pneumonia in elderly patients [6, 19]. Thus, the elderly, polymorbid, polymedicated and frail phenotype are at high risk for AP as they present high prevalence of oropharyngeal aspiration, impaired resistance to infections and poor oral health, the three pathophysiological factors associated with AP [10]. Comorbidities and frailty are strongly related to impaired immunological status, periodontal diseases and oral colonisation by respiratory pathogens [7, 8, 10, 18]. In addition, immune function in the oral cavity can be affected by oral residue after swallow and xerostomia [20].

The oral health status of our OD patients was very poor. Prevalence of edentulism, the final complication of periodontal disease, was found to be higher (40%) in our OD...
patients compared with different studies on European senior citizens of similar ages [21–23] and with our control group. In addition, OD patients had more caries than controls. Both groups of patients presented high OHI-S values caused by poor oral healthcare, periodontitis and caries [13, 24], slightly poorer in OD patients. In this process, the total number of bacteria is greatly increased from $10^2$–$10^3$ bacterial cells in a healthy gingival sulcus to $10^5$–$10^9$ bacteria with periodontitis [3]. Periodontal pathogens may facilitate the colonisation of the oral cavity by common pneumonia pathogens [4], and poor oral health has been associated with the appearance, severity and mortality of AP [2, 25, 26].

The DI-S index measures the amount of the soft and fresh part of the biofilm while the CI-S describes the mineralised debris [27]. Our results suggest that daily tooth brushing would decrease OHI-S by 50% in OD elderly patients and controls (Figure 2). A recent review found a preventive effect of mechanical oral hygiene on pneumonia and respiratory tract infection in elderly people in hospitals and nursing homes [28] and we can hypothesise that this effect would be greater among patients with OD with a higher risk for aspiration. Recently, the World Health Organization has recommended improving the oral health of the elderly. Furthermore, the US Centers for Disease Control recognises aspiration of oropharyngeal organisms as an important aetiological route for the development of AP in elderly patients and recommends the implementation of ‘comprehensive hygiene programs’ [15]. We suggest two targets to reduce the risk of AP among frail elderly patients and the consequent high morbidity and mortality: (i) early screening, identification and treatment of patients with OD and aspiration using clinical methods applicable in all medical centres [11, 19] and (ii) routine assessment of oral health, improvement of oral hygiene and appropriate treatment of oral diseases. In addition, due to the high prevalence of edentulism, chewing as-ssessment could help to select the most appropriate dietary adjustment for these patients.

**Key points**

- Elderly patients with OD present high prevalence of VFS signs of impaired safety of swallow and aspiration.
- Elderly patients with OD present poor oral health with poor oral hygiene and high prevalence of edentulism, periodontal diseases and caries.
- Elderly patients with OD are at high risk of developing AP.
- We recommend a policy of systematic evaluation and treatment of oral health among this population.

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**Conflicts of interest**

PC. has served as consultant and received research funding from Nestlé Health Science. O.S. is employed by Nestec SA.

**Supplementary data**

Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

**References**

Prevalence of chronic illnesses and characteristics of chronically ill informal caregivers of persons with dementia

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Abstract

Objectives: to examine the prevalence of and the link of chronic illnesses (CIs) to informal caregivers of persons with dementia (PWDs), as well as to identify characteristics of caregivers with CIs.

Methods: the sample included 124 caregivers of PWDs from a caregiver programme of research. Sociodemographic information and caregivers CIs were collected by an in-person interview. Descriptive statistics, t-tests, chi-square analysis and binary logistic regressions were performed for data analysis.