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Prevalence and prognostic implications of dysphagia in elderly patients with pneumonia

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Abstract

Background: oropharyngeal dysphagia is a common condition among the elderly but not systematically explored.
Objective: to assess the prevalence and the prognostic significance of oropharyngeal dysphagia among elderly patients with pneumonia.
Design: a prospective cohort study.
Setting: an acute geriatric unit in a general hospital.
Subjects: a total of 134 elderly patients (>70 years) consecutively admitted with pneumonia.
Methods: clinical bedside assessment of oropharyngeal dysphagia and aspiration with the water swallow test were performed. Demographic and clinical data, Barthel Index, Mini Nutritional Assessment, Charlson Comorbidity Index, Fine's Pneumonia Severity Index and mortality at 30 days and 1 year after admission were registered.
Results: of the 134 patients, 53% were over 84 years and 55% presented clinical signs of oropharyngeal dysphagia; the mean Barthel score was 61 points indicating a frail population. Patients with dysphagia were older, showed lower functional status, higher prevalence of malnutrition and comorbidities and higher Fine's pneumonia severity scores. They had a higher mortality at 30 days (22.9% vs. 8.3%, $P = 0.033$) and at 1 year of follow-up (55.4% vs. 26.7%, $P = 0.001$).
Conclusions: oropharyngeal dysphagia is a highly prevalent clinical finding in elderly patients with pneumonia and is an indicator of disease severity in older patients with pneumonia.

Keywords: *deglutition disorders, dysphagia, elderly, functional status, oropharyngeal aspiration, pneumonia*

Introduction

Oropharyngeal dysphagia is a common condition among the elderly but not systematically explored in patients with pneumonia. Although the incidence of pneumonia and dysphagia increases with age and oropharyngeal aspiration has been recognised as an important pathogenetic mechanism leading to pneumonia in the elderly [1–3], little data are available on the prevalence and prognostic significance of dysphagia and aspiration in elderly patients with pneumonia. The incidence of pneumonia, as well as its mortality, increases with age [4, 5]. Several clinical prognostic indexes have been described for pneumonia in the elderly such as the Pneumonia Severity Index (PSI) [6] and the CURB-65 [7]. These prognostic scores emphasise the effect of age and comorbidity but do not consider other factors related to functional status and frailty [8]. Other studies have suggested that functional status is the major determinant of survival following pneumonia [9–11].

The prevalence of oropharyngeal dysphagia is very high in elderly patients but not always systematically explored and detected. It affects >30% of patients with stroke; 60–80% of patients with neurodegenerative diseases, up to 13% adults aged 65 and older and >51% of institutionalised elderly patients [12, 13]. Oropharyngeal dysphagia may give rise to two groups of clinically relevant complications: reduced

efficacy of deglutition leading to malnutrition and/or dehydration and reduced deglutition safety with oropharyngeal aspiration, choking and tracheobronchial aspiration leading to pneumonia. A recent 10-year review found a 93.5% increase in the number of hospitalised elderly patients diagnosed with aspiration pneumonia, while other types of pneumonia in the elderly decreased [14]. Videofluoroscopy (VFS) is the gold standard to study oral and pharyngeal mechanisms of dysphagia and aspiration [2, 3]; however, it is unfeasible to perform a VFS on every older patient with dysphagia, and several clinical screening methods have been developed and validated to recognise patients who are at a risk of aspiration [13–17]. The aim of the present study was to assess (i) the prevalence of clinical signs of oropharyngeal aspiration in a cohort of patients aged 70 years and older with pneumonia and admitted to an acute geriatric unit (AGU) of a general hospital and (ii) the prognostic significance of oropharyngeal aspiration in terms of 30-day and 1-year mortalities.

Patients and methods

Study design

A prospective observational study with 1-year follow-up was designed in a cohort of patients with 70 years of age and older, consecutively admitted with pneumonia to an AGU with 12 beds and ~300 discharges per year of a 330-bed general hospital. Criteria to be admitted to this AGU were (i) >85 years or (ii) >70 years with, at least, one geriatric syndrome or altered functional or cognitive capacities. The patients were considered to have pneumonia if they presented an acute process associated with one or more of the following symptoms or clinical signs: cough with or without sputum, pleural-type thoracic pain, fever or hypothermia, rales, rhonchi or wheezes in the lung auscultation and radiographic evidence of a new infiltration at the first day of admission. The patients were excluded from the study if they were HIV carriers, immunosuppressed (had received a transplant, were under immunosuppressant treatment, or had neutropenia), had been hospitalised up to 14 days previously or pneumonia was considered a terminal event. The patients were recruited from January 2001 to August 2005. Out of 164 elderly patients initially diagnosed of pneumonia, 24 were excluded because an accurate clinical and radiological review did not confirm the diagnosis of pneumonia and in 6 patients was considered a terminal event. Finally, 134 elderly patients with pneumonia were included in the present study. The study protocol was approved by the Institutional Review Board of the Hospital of Mataró (Mataró, Spain).

Clinical methods

All patients were initially assessed in the emergency department. This included registration of clinical findings, laboratory data and chest x-ray to confirm the diagnosis of pneumonia and calculate the PSI [6]. The diagnosis of aspiration pneumonia was clinically considered in patients who had lost consciousness or reported choking or bronchoaspiration and who also showed radiographic signs in the posterior segments of the upper lobe, the apical segments of the lower lobe or the basal segments of the lower lobe. Antibiotic treatment was started for all patients at the emergency department according to the hospital clinical guidelines: (i) amoxicillin 1 g i.v./8 h, (ii) ceftriaxone 2 g i.v./24 h and clarithromycin 500 mg i.v. or oral/12 h, in cases considered to be severe pneumonia (Fine V), (iii) levofloxacin 500 mg/day for patients allergic to penicillin and (iv) amoxicillin–clavulanic acid, 2 g i.v./8 h if aspiration pneumonia was suspected.

An overall geriatric assessment was carried out on the day of admission to the AGU by a multidisciplinary team and included (i) demographic data (ii) comorbidities (Charlson Index) and presence of geriatric syndromes, (iii) functional capacity pre-admission (2 weeks prior) and on admission, using the Barthel Index [18], (iv) nutritional status using the Mini Nutritional Assessment (MNA 0–30) [19] and (v) a clinical test for oropharyngeal aspiration. The presence of signs of impaired safety of deglutition and oropharyngeal aspiration was clinically assessed by an experienced nurse using an adaptation of a validated method combining subjective bedside swallowing assessment and simultaneous oxygen saturation monitoring of swallowing [15]. This test consisted of giving each patient up to three consecutive sips of 10 mL water and one sip of 30 mL in a progression of increasing difficulty. A subjective assessment of the signs of aspiration on each swallow was made based on the identification of clinical signs of impaired safety of deglutition such as changes in voice quality (including wet voice and hoarse voice), cough during or for up to 1 min after swallow, or a decrease in oxygen saturation >3% measured with a finger pulse-oximeter to detect silent aspirations [16]. Cough and/or fall in oxygen saturation >3% were considered major clinical signs of tracheobronchial aspiration [20], and assessment was interrupted if the patient presented these signs of aspiration. [21]. Patients were followed up for 1 year or until dead. A clinical follow-up was performed in the out-patient department of the hospital 30 days after admission, and a check up by telephone or visit a year after admission. If telephone contact could not be made, the registry of deaths of the regional funeral services was checked.

Data analysis

The overall prevalence of dysphagia with 95% confidence intervals was calculated. For the study of categorical variables, the chi-square test or the Fisher exact test was used. For continuous variables, the Mann–Whitney U test was used. To assess the effect of the various prognostic factors on 30 days and 1 year after admission, logistic regression was used to calculate the odds ratio with 95% confidence intervals. To adjust for possible confounding variables on the effect of oropharyngeal aspiration, two multivariate logistic regression models were created (one for 30-day mortality and another for 1-year mortality). Both models included the clinical variables associated with aspiration and mortality

in the univariate analysis with a $P < 0.10$. Given that immobility, pressure ulcers and Barthel score are closely associated and in order to avoid over-adjustment, only Barthel score was considered in the multivariate model. Survival curves of patients with and without oropharyngeal aspiration were compared using the log-rank test. A level of statistical significance of $P < 0.05$ was considered in all cases.

Results

One hundred thirty-four patients with pneumonia were recruited (54 women and 80 men) with a mean age of 84.51 ± 6.80 years. The main sample characteristics are presented in Table 1. A typical clinical presentation of pneumonia with fever, cough and pleural chest pain was observed in 11.2% of patients; in contrast, most patients presented unspecific general symptoms (general malaise in 73.7%, asthenia in 63.2% and confusion in 39.6%). In the emergency department, a diagnosis of aspiration pneumonia according to clinical presentation was suspected in 26.4% of patients. The aetiology of pneumonia was established in 17 patients (14.5%). Gram-negative bacilli (*Pseudomonas aeruginosa*, *Escherichia Coli* and *Serratia marcescens*) were identified in six patients; *Streptococcus pneumoniae* in four *Haemophilus influenzae* also in five and *Legionella pneumophila* in two.

Clinical exploration with the water swallow test showed signs of oropharyngeal aspiration in 55.2% of patients (95% CI 46.8–63.6). Table 1 summarises demographic characteristics and clinical data of these patients according to the presence of clinical signs of oropharyngeal aspiration. Patients with clinical signs of oropharyngeal aspiration were older and more frequently nursing home residents. Patients with signs/symptoms of aspiration also showed poor functional capacity, higher prevalence of geriatric syndromes and neurological comorbidities (dementia or previous stroke) and higher consumption of drugs with potential effects on consciousness or swallow response (serotonin reuptake inhibitors, benzodiazepines, risperidone or haloperidol) than patients with safe swallow. Patients with dysphagia presented more severe pneumonia index scores (up to 62.1% of patients with aspiration were included in the Fine Score group V compared with 43.3% of patients without dysphagia; $P < 0.005$). Overall, patients with aspiration showed poorer nutritional status and poorer outcomes with greater mortality during hospital stay, higher rates of residential care after discharge and increased mortality at 30 days and 1 year after admission.

Table 2 summarises the results of the association between the main clinical factors and mortality at 30 days and at 1 year after admission. When selecting age, aspiration, confusion, urea >11 mmol/l, dementia, lymphopaenia (lymphocytes $<0.8 \times 10^9$/l), Barthel scores <60 (patients with total-severe dependence) and Fine score to assess the 30-day mortality by multivariate analysis using a step wise method, only urea >11 mmol/l (OR = 3.73; 95% CI 1.22–11.37), lymphopaenia (OR = 4.32; 95% CI 1.38–13.51) and dementia (OR = 3.60; 95% CI 1.29–10.05) remained in the final model and were significantly associated with mortality. Similarly, when introducing age, malnutrition, aspiration, urea >11 mmol/l, Charlson Index and Barthel score <60 to assess the mortality at 1 year after admission using the stepwise method, only malnutrition (OR = 5.59; 95% CI 2.07–15.09) was significantly associated with mortality.

Figure 1 compares survival curves according to the presence of clinical signs/symptoms of oropharyngeal dysphagia and according to pre-admission functional capacity categories measured by the Barthel score. Survival was significantly decreased in patients with clinical signs of oropharyngeal dysphagia ($P < 0.001$) and patients with Barthel preadmission <40 ($P < 0.001$).

Discussion

This study shows that the prevalence of oropharyngeal dysphagia and aspiration assessed by the water swallow test in elderly patients with pneumonia is as high as 55%. Our study also shows that among elderly patients with pneumonia who were finally diagnosed of oropharyngeal dysphagia, only half of them were initially suspected as being at risk of aspiration pneumonia. Oropharyngeal dysphagia was associated with 30-day and 1-year mortalities in the univariate analysis, but this effect disappeared when adjusting for other prognostic variables.

The incidence of aspiration pneumonia in the elderly increases with advanced age. Up to 10% of patients who normally live at home and are admitted with pneumonia in a general hospital are diagnosed with aspiration pneumonia, and this prevalence increased over 30% for patients living in nursing homes [22]. Oropharyngeal dysphagia has been recognised as the major pathophysiological mechanisms leading to aspiration pneumonia in the elderly [1]. Aspiration observed in VFS is associated with a 5.6- to 7-fold increase in the risk of pneumonia [21]. It is also well known that not all patients who aspirate in VFS develop pneumonia. Impairment in host defences such as abnormal cough reflex [1], impaired pharyngeal clearance, amount and bacterial concentration of aspirate, an impaired immune system and frailty also greatly contribute to the development of aspiration pneumonia [3]. Several clinical screening methods for dysphagia and aspiration have been validated [15–17, 20]. In this study, the Burke's swallow test was used to screen older patients with aspiration as validation studies have shown that this test identified 80% of patients who aspirated during subsequent VFS examinations (sensitivity 76%, specificity 59%) [17]. In addition, we also considered fall in oxygen saturation ≥3% and changes in quality of voice as clinical signs of oropharyngeal aspiration to detect silent aspirations [15, 20]. Other authors have also identified oropharyngeal dysphagia as a risk factor for pneumonia in older patients living in nursing homes [22] and also in older people living in the community [21].

Our study also showed that signs of oropharyngeal aspiration are good indicator of poor prognosis for patients with

Table 1. Demographics and clinical characteristics of patients included in the study, and clinical presentation, severity of pneumonia and outcome of patients according to the safety of swallow during clinical exploration

Groups	Total	Oropharyngeal dysphagia	Safe swallow	*P*-value
Number of patients	134	74 (55.2%)	60 (44.8%)	–
Mean age	84.51 ± 6.8	86.0 ± 6.4	82.7 ± 6.9	0.004
Age >85 years	71 (53%)	45 (60.8%)	26 (43.3%)	0.044
Sex (% males)	80 (59.7%)	43 (58.1%)	37 (61.6%)	0.676
Resident of				
Own home	86 (64.2%)	41 (57.7%)	45 (80.4%)	0.007
Nursing home	41 (32.3%)	30 (42.3%)	11 (19.6%)	
Barthel Index score pre admission	61.5 ± 35.4	44.3 ± 34.2	83.4 ± 22.8	<0.001
Barthel Index score on admission	36.2 ± 33.2	22.4 ± 27.1	54.2 ± 31.8	<0.001
Charlson Comorbidity Index score	2.4 ± 1.4	2.7 ± 1.4	1.9 ± 1.5	<0.001
Geriatric syndromes				
Urinary incontinence	65 (48.5%)	51 (68.9%)	14 (23.3%)	<0.001
Faecal incontinence	43 (32.1%)	37 (50.0%)	6 (10.0%)	<0.001
Pressure ulcers	13 (9.7%)	12 (16.2%)	1 (2.0%	0.005
Immobility	50 (37.3%)	43 (58.1%)	7 (11.7%)	<0.001
Prior falls	36 (26.9%)	32 (43.2%)	4 (6.7%)	<0.001
New or increased confusion	53 (39.6%)	38 (51.4%)	15 (25.0%)	0.002
Depressive syndrome	16 (11.9%)	12 (16.2%)	4 (6.7%)	0.090
Comorbidities				
Chronic pneumopathy	72 (53.7%)	39 (52.7%)	33 (55.0%)	0.791
Heart failure	32 (23.9%)	21 (28.4%)	11 (18.3%)	0.175
Ischaemic cardiopathy	20 (14.9%)	12 (16.2%)	8 (13.3%)	0.641
Diabetes mellitus	41 (30.6%)	24 (32.4%)	17 (28.3%)	0.609
Chronic hepatopathy	4 (3.0%)	2 (2.7%)	2 (3.3%)	0.831
Cancer	17 (12.7%)	10 (13.5%)	7 (11.7%)	0.749
Dementia	45 (33.6%)	37 (50.0%)	8 (13.3%)	<0.001
Cerebrovascular disease	33 (24.6%)	25 (33.8%)	8 (13.3%)	0.006
Chronic renal failure	35 (26.7%)	19 (26.8%)	16 (26.7%)	0.990
Number of drugs usually taken	6.2 ± 3.7	6.9 ± 3.6	5.2 ± 3.6	0.002
Sedative	37 (27.6%)	25 (33.8%)	12 (20.0%)	0.076
Antipsychotic	26 (19.4%)	23 (31.1%)	3 (5.0%)	<0.001
Antidepressant	28 (20.9%)	20 (27.0%)	8 (13.3%)	0.053
Pneumonia Severity Index	134.2 ± 31.8	142.1 ± 31.5	126.7 ± 31.4	0.006
Body mass index	25.3 ± 5.4	24.5 ± 4.2	26.6 ± 6.7	0.055
MNA	19.3 ± 4.4	17.9 ± 4.4	21.5 ± 3.4	<0.001
Malnutrition (<17)	26 (27.4%)	21 (36.8%)	5 (13.2%)	0.004
At risk malnutrition (17–23.5)	52 (54.7%)	31 (54.4%)	21 (55.3%)	
Well nourished (>24)	17 (17.9%)	5 (8.8%)	12 (31.6%)	
Admitted to ICU	9 (7%)	4 (5.6%)	5 (8.6%)	0.508
Mean length of stay	11.9 ± 9.0	13.5 ± 11.0	9.9 ± 4.9	0.025
Destination on discharge				
Nursing home	42 (36.5%)	31 (52.5%)	11 (19.6%)	0.001
Own home	73 (63.5%)	28 (47.5%)	45 (80.4%)	
In-hospital mortality	18 (13.4%)	15 (20.3%)	3 (5.0%)	0.010
Mortality <30 days	22 (16.4%)	17 (22.7%)	5 (8.3%)	0.023
Mortality at 1 year	57 (42.5%)	41 (55.4%)	16 (26.7%)	0.001

Results are expressed as mean values ± standard deviation and per cent of patients in each group.
ICU, intensive care unit. Sedatives: benzodiazepines. Antipsychotic: haloperidol and risperidone. Antidepressants: selective serotonin reuptake inhibitors (paroxetime, sertraline, fluoxetine, mirtazapine).

pneumonia. Our findings coincide with those of other studies in that pre-admission functional status was also a highly relevant prognostic factor of mortality in elderly patients with pneumonia [9–11]. Our study also showed a close relationship between dysphagia and functional capacity, to the extent that it is very difficult to differentiate the independent effect of each of these factors on mortality and indeed they probably have an interdependence that becomes a vicious circle [2, 11]. Some studies, moreover, have observed interaction between dysphagia and functionality in which dysphagia was a serious risk factor of aspiration pneumonia only if accompanied by advanced functional dependence [23]. According to our results, the prognosis of pneumonia in elderly people seems to be more related to their functional capacity, geriatric syndromes or dysphagia than to their comorbidity. Some authors [9–11] have pointed out the prognostic importance of pre-admission functional status and functional decline in acute pneumonia, and they recommended that these variables be included in mortality indexes. Malnutrition has also been described as a factor of poor

Table 2. Factors and the relative risk ratio (odds ratio) associated with <30-day and 1-year mortalities

Mortality	30 days		1 year	
	OR	IC 95%	OR	IC 95%
Age	1.04	0.97–1.12	1.05	0.99–1.10
Sex (woman)	1.03	0.41–2.61	0.78	0.38–1.57
Nutritional and functional status				
Malnutrition (MNA <17)	3.87	0.95–15.7	4.97	1.89–13.0
MNA	0.86	0.74–1.00	0.83	0.74–0.93
BMI	0.99	0.86–1.12	0.98	0.90–1.06
Barthel index preadmission ≤40	3.43	1.34–8.79	7.99	3.43–18.6
Barthel index pre admission	0.98	0.96–0.99	0.97	0.95–0.98
Barthel index on admission	0.95	0.93–0.98	0.96	0.95–0.98
Oropharyngeal dysphagia	3.28	1.13–9.50	3.42	1.64–7.11
Comorbidities				
Charlson Index	1.23	0.89–1.70	1.37	1.06–1.76
Cancer	1.69	0.50–5.78	1.23	0.44–3.42
Chronic hepatopathy	1.73	0.17–17.4	1.36	0.18–9.98
Chronic heart failure	1.08	0.36–3.20	0.79	0.36–1.76
Cerebrovascular disease	1.54	0.57–4.19	1.91	0.86–4.22
Chronic renal failure	1.35	0.50–3.65	1.76	0.81–3.85
Chronic pneumopathy	1.20	0.48–2.99	0.84	0.42–1.68
Dementia	3.61	1.41–9.28	3.41	1.61–7.20
Fine score	1.02	1.00–1.04	1.03	1.01–1.04
Geriatric syndromes				
New or increased confusion	2.60	1.02–6.61	2.01	0.99–4.06
Pressure ulcers	8.24	2.44–27.8	8.97	1.90–42.3
Depression	1.85	0.54–6.39	2.52	0.86–7.39
Faecal incontinence	2.50	0.99–6.34	6.46	2.88–14.5
Immobility syndrome	6.12	2.20–16.9	7.71	3.45–17.0
Urinary incontinence	2.09	0.81–5.38	5.66	2.67–12.0
Biochemical analyses				
Urea >11 mmol/l	4.80	1.65–13.9	3.11	1.52–6.36
Creatinine >150 μmol/l	3.63	0.57–23.1	5.74	0.62–52.8
Albumin < = 30 mg/dl	2.43	0.85–6.99	1.69	0.82–3.51
Cholesterol < = 160 mg/dl	3.43	0.94–12.5	1.01	0.48–2.14
Lymphocytes < = 800/μl (0.8×10^9/l)	4.07	1.40–11.8	1.29	0.65–2.56

MNA, mini nutritional asessment; BMI, body mass index.

prognosis associated with a higher mortality rate at 30 days [24]. In our study, malnutrition is clearly associated with mortality at 1 year and is very closely associated with the presence of oropharyngeal dysphagia. Thus, as also indicated by other authors dependence, dysphagia, malnutrition and immune status must be considered as major prognostic indicators in elderly patients with pneumonia [25]. Lymphopaenia has frequently been related to malnutrition and some authors have used it as a prognostic factor in nursing home residents with respiratory infections [25]. Lymphopaenia is associated with early mortality [26] and in our study was an independent factor closely associated with mortality at 30 days.

The presence of dysphagia in elderly subjects with pneumonia suggests an aspiration pneumonia which has important implications in the clinical management. Implementation of some preventative measures such as oral hygiene and changes in the diet texture may be necessary. Moreover, in these patients, empirical treatment should include antibiotics against not only anaerobic bacteria but also aerobic multiresistant bacteria such as gram-negative bacilli and meticillin-resistant *Staphylococcus aureus*, because these are common microorganisms that colonise the mouth of the elderly particularly in those coming from nursing homes.

Finally, our study had some limitations. First, the study population was not representative of the overall general population over 70 years old. Thus, the results of the present study can only be generalised to patients admitted in an AGU, who use to have a high degree of frailty and dependence, which may explain the high prevalence of oropharingeal dysphagia observed in the present study. Second, patients in the present study may have either community-acquired pneumonia or pneumonia acquired in nursing homes which has been classified since 2005 as healthcare-associated pneumonia [27]. However, we did not find differences in the mortality rates between these two groups. Third, the clinical assessment of impaired swallowing has evident limitations and a VFS examination would be preferable. However, it is not feasible to perform a VFS in all patients and the combination of clinical examination and oximetry changes increased the diagnostic sensitivity, and thus, the probability of identifying patients with silent aspirations [16]. We believe patients with a positive test should undergo VFS to assess the

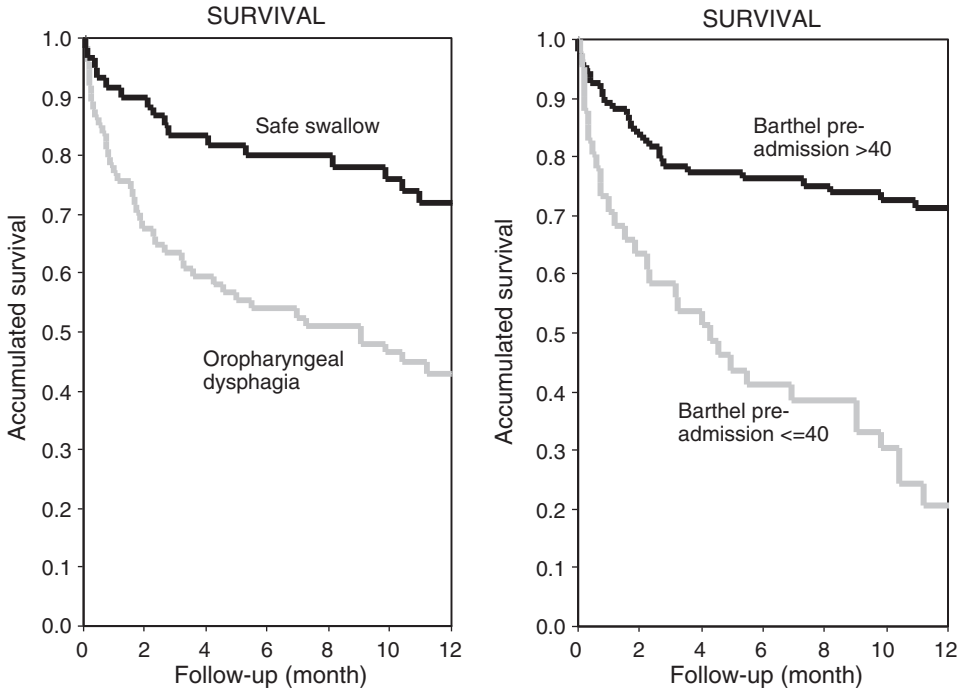

Figure 1. Accumulated survival at 1 year according to the presence of clinical signs of oropharyngeal dysphagia and the functional status (preadmission Barthel score).

severity and the physiopathology of the swallow disorder which may orientate the treatment. As the cost of a false-negative diagnosis of a patient with aspirations is high (aspiration pneumonia) and the cost of a false-positive diagnosis is low (an unnecessary VFS study), we believe clinical assessment methods should favour diagnostic sensitivity. It should be noted that the swallow test was done by a trained nurse and in the case of doubt, the test was repeated by a speech-swallow therapist. Finally, although it would have been interesting to know the persistence of dysphagia after the acute episode of pneumonia, it is possible that the presence of delirium or other acute mental disorders on admission could affect swallowing, resulting in an overestimation of the prevalence of dysphagia in this aged population. Unfortunately, swallowing assessment on discharge or after recovery was not repeated. However, our results are in accordance with other studies which also show a high prevalence of oropharyngeal dysphagia in this population [12, 13, 28].

In conclusion, oropharyngeal aspiration is common in elderly patients with pneumonia, being an indicator of disease severity and poor prognosis. We suggest that an accurate diagnosis and treatment of oropharyngeal dysphagia and aspiration should be routinely included in the clinical management of older patient with pneumonia [29, 30].

Key points

- Oropharyngeal dysphagia is a highly prevalent clinical finding in elderly patients with pneumonia.
- Oropharyngeal dysphagia an important indicator of disease severity and poor prognosis for the older with pneumonia.
- The prognosis of pneumonia in elderly people seems to be more related to their functional capacity, geriatric syndromes or dysphagia than to their comorbidity.

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Conflicts of interest

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