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Oropharyngeal dysphagia in elderly population suffering from mild cognitive impairment and mild dementia: Understanding the link

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ABSTRACT

Purpose: To evaluate the prevalence of oropharyngeal dysphagia in elderly patients suffering from minimal or mild cognitive decline.

Patients and methods: We retrospectively collected the data of patients suffering from mild cognitive impairment or mild dementia and were undergoing management for suspected oropharyngeal dysphagia, in our department. All our patients were subjected to Mini Mental State Examination test, MD Anderson dysphagia inventory and caregiver mealtime and dysphagia questionnaire. We performed a mealtime observation study and endoscopic evaluation of swallowing in all our patients. Following evaluation, we then analysed the data statistically.

Results: Out of 708 patients who visited us for cognitive decline and suspected oropharyngeal dysphagia in the last two years, 52 patients were confirming to the inclusion criteria of this study.

Classification of oropharyngeal dysphagia patients according to ASHA-NOMS scale showed that 32.7% of patients presented with grade 4 of dysphagia followed by another 32.7% with grade 5 and 30.8% presented with grade 6. Only 3.8% of our patients were considered normal (grade 7 of ASHA-NOMS scale). MD Anderson dysphagia inventory could collected swallowing alterations in only 23.1% of the cases. The caregiver mealtime and dysphagia questionnaire showed acceptable caregivers patient management in 53.8% of patients.

Conclusion: Our study underscores the fact that oropharyngeal dysphagia is present in many cases of mild cognitive decline. While patients understate their swallowing problems, the caregivers are not competent enough to manage this situation in a great percentage of cases. Only a mealtime observation by a speech-language pathologist along with FEES is able to identify the true prevalence of the condition.

1. Introduction

Measurable changes in cognition occur with normal ageing. The most important changes are declines in cognitive tasks that require one to quickly process or transform information such as in making a decision, including in measures of speed of processing, working memory, and executive cognitive function [1].

Ageing is associated with a slowing of the swallow response in the pharynx due to both central and peripheral factors. These changes may have an impact on the movement of food bolus. It is well described in the literature that tongue pressure declines with age [2]. Lack of muscle strength complicated by the decline in sensory informations such as olfaction and taste and/or by a poor dental status observed in the elderly makes swallowing more difficult. This scenario is known as presbyphagia and is more commonly seen after the age of 80 [2]. Presbyphagia, in itself, does not give rise to pathological changes in swallowing but it is a risk factor that can lead to Oropharyngeal Dysphagia (OD) [3]. In fact, the prevalence of OD has been calculated in independently living elderly persons with rates between 30% and 40%, 44% in those admitted to geriatric acute care and 60% in institutionalised elderly patients [4–6]. Unfortunately, in a presbyphagic scenario, patients affected by dementia easily develop OD during the course of their disease.

Generally, swallowing impairment in Alzheimer's and other forms of

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dementia is well described for the severe or moderate stages of the diseases [7]. While in the earlier stages it is often underdiagnosed [8]. Dysphagia related to Alzheimer's dementia (AD) is caused by involvement of the cortical areas of the brain for swallowing and due to the presence of delayed swallowing reflex and oropharyngeal problems. Recently, in 2019, Oszurecki reported this in the early stage of disease too [8].

In other forms of severe dementia, OD is caused by various other alterations in the brain. For example, Suh et al. in 2009 reported, that, Vascular Dementia (VAD) patients showed either multiple strokes or periventricular white matter involvement of portions of the brain sometimes which may even be in a single strategic area. (9 Suh). These alterations can lead to motor impairment in swallowing resulting in dysphagia with difficulties in mastication and bolus formation [9].

In addition, in cases of Fronto Temporal Dementia (FTD), it is described that hypothalamic degeneration with the disintegration of connections between the hypothalamus and the orbitofrontal cortex/reward pathways is what causes eating abnormalities.

In subjects suffering from Primary Progressive Aphasia (PPA) presence of high levels of the eating peptides and overall Agouti-related-peptide (AgRP) is observed. Agouti-related-peptide is a strong promoter of food intake [10]. These alterations cause changes in eating habits, hyperorality and disinhibition during the meal [10]. Langmore in 2007 while analysing swallowing behaviours in patients suffering from FTD and PPA showed that these patients presented with compulsive eating behaviours often associated with minimal endoscopic signs of OD. This association favoured an increased risk of aspiration too [11].

Interestingly, the patients who are suffering from Mild Cognitive Impairment (MCI) with seemingly good swallowing or chewing ability, as perceived by their own caregivers [12], also had impairment of oral diadokokinesis and spilling of food. This is caused mainly by impaired oral motor skills such as poor lip function and has been well described for this class of patients [13]. In addition, Delwel reported that MCI patients evaluated in his study showed a limited active maximum mouth opening (< 40 mm) [12] and this fact can play a pathological role in swallowing or chewing.

The purpose of our study was to evaluate whether OD is already present in elderly patients suffering from mild or very slight cognitive decline and if this was related to further risk, even fatal, for the patient.

2. Patients and methods

We collected retrospective data of patients managed in our department for cognitive decline and suspected OD (U.O. Foniatria, Dipartimento di Riabilitazione, ASL Lecce, Italy) in the last two years from 1st of January 2018 to 31st of December 2019.

All patients who were 65 years or older with either minimal or mild cognitive impairment presenting to us with suspected OD were included in the study. Patients who were younger than 65 years, with a clinical history of cervical spine pathologies, those who were unable to move their head due to surgery, those who received chemotherapy or radiotherapy of head and neck region, patients with poor oral health condition, with facial nerve paralysis, with pharyngo-laryngeal diseases like vocal fold paralysis, and patients with gastro-esophageal pathologies, neuromuscular diseases, strokes, severe or moderate cognitive decline and/or psychiatric conditions were excluded from this study.

The suspicion of OD was reported to us by the patients, the caregivers, or more often, emerged during the medical examination or the speech pathologist's evaluation of patients who originally reported to us exclusively with symptoms of cognitive decline.

A detailed ENT evaluation of all the patients was done based on their clinical history. All of them were also evaluated for their oral functions with an assessment of mouth opening, motility of the tongue, soft palate elevation, the presence of pharyngeal reflex, presence of voluntary cough and cough reflex, salivation state, and dental status.

All the patients underwent detailed endoscopic evaluation of the rhino-pharyngo-laryngeal regions including FEES. We adopted a personal modified standardized FEES protocol. Specifically, during the FEES examination, the participants were offered three trials of thin and three trials of thick liquid followed by one small bite-sized banana (soft solid) and cracker (hard solids). Each thin liquid trial contained 10 cc of water and each thick liquid trial contained 10 cc of aquagel (Nestlè Nutricia Nutilis®) and was dyed with blue food colouring. All patients received the same consistencies during FEES evaluation so that the population tested was homogenous and the results were easily comparable. During FEES we studied the patients with their head in normal sitting position (neutral position) and with the head inclined forwards (chin-down posture) in order to obtain a safe swallowing posture for individuals with delayed onset and/or reduced duration of laryngeal vestibule closure [14]. Our FEES results were classified using the Penetration Aspiration Scale (PAS) [15] and divided into no aspiration group (PAS Scores 1–5) and aspiration group (PAS Scores 6–8) [16].

All patients included in the study also underwent evaluation by a speech pathologist along with administration of MD Anderson Dysphagia Inventory (MDADI) [17], Mini Mental State Examination and mealtime observation. Results of mealtime observation were reported on the Amitrano-Crivelli grid [18]. In addition, speech pathologists invited the caregivers to complete the Caregiver Mealtime and Dysphagia Questionnaire (CMDQ) [19].

At the end of the ENT examination and speech pathologists evaluation, the OD was classified using the American Speech-Language-Hearing Association (ASHA) National Outcome Measurement System (NOMS) swallowing scale [20] together with successive indications for diet modifications and swallowing strategies. ASHA-NOMS scale is depicted in detail in Table 1.

We also collected data about all the medicines that were being used by the patient.

Table 1
National Measurement System Results – American Speech-Language-Hearing Association – National Outcomes Measurement System – ASHA NOMS.

ASHA-NOMS Scale	
Level 1	Individual is not able to swallow anything safely by mouth. All nutrition and hydration is received through non-oral means (e.g., nasogastric tube, PEG)
Level 2	Individual is not able to swallow safely by mouth for nutrition and hydration, but may take some consistency with consistent maximal cues in therapy only. Alternative method of feeding is required.
Level 3	Alternative method of feeding required as individual takes < 50% of nutrition and hydration by mouth, and/or swallowing is safe with consistent use of moderate cues to use compensatory strategies and/or requires maximum diet restriction.
Level 4	Swallowing is safe, but usually requires moderate cues to use compensatory strategies, and/or the individual has moderate diet restrictions and/or still requires tube feeding and/or oral supplements.
Level 5	Swallowing is safe with minimal diet restriction and/or occasionally requires minimal cueing to use compensatory strategies. The individual may occasionally self-cue. All nutrition and hydration needs are met by mouth at mealtime.
Level 6	Swallowing is safe, and the individual eats and drinks independently and may rarely require minimal cueing. The individual usually self-cues when difficulty occurs. May need to avoid specific food items (e.g., popcorn and nuts), or require additional time (due to dysphagia).
Level 7	The individual's ability to eat independently is not limited by swallow function. Swallowing would be safe and efficient for all consistencies. Compensatory strategies are effectively used when needed.

2.1. Statistical analysis

Categorical variables were synthesized as frequencies and percentages. Continuous variables were summarized as mean and standard deviation (SD). All statistical analyses were performed with IBM® SPSS Statistics v 20.0 software (SPSS Inc., Chicago, Illinois, USA). To assess the association between Mini Mental State Examination test and ASHA-NOMS scores, Fisher's exact test was performed.

The statistical significance was set at p-value of < 0.05.

This study followed all the ethical guidelines and rules of our ward.

3. Results

Out of 708 patients who visited us for a decline in cognitive function along with suspected OD in the last two years (from 01 January 2018 to 31 December 2019) only 52 patients were strictly adhering to the criteria of this study. The sample size of 52 is in line with recently published literature as well as giving us an insight into the pathophysiological changes of swallowing seen in persons affected by cognitive decline [21,22]. Mean age of our patients was 75.9 years (± 8.6) range 65–98 years and 51.9% of the patients were males.

The average score of the Mini Mental State Examination test was 20.3 (+ 1.9) when the usual cut off for normal function is considered at 24. All patients described in this study were affected by mild dementia or mild cognitive impairment.

Vascular dementia was seen in 32.7% of our patients, whereas 30.8% had MCI alone, and 26.9% suffered from AD. Primary progressive aphasia was observed in 3.8% and FTD affected 3.8%, 1.9% were suffering from Body Lewy Dementia but without parkinsonisms.

Hypertension was the most common comorbid condition in our study group and it was registered in 38.5% of cases followed by Chronic Obstructive Pulmonary Disease (COPD) (21.2%) and diabetes (19.2%). Table 2 records all the comorbidities of our patients.

Four patients (7.7%) documented a positive history for aspiration pneumonia. MD Anderson Dysphagia Inventory could identify a swallowing alteration in only 23.1% of the cases. The CMDQ showed that caregiver's patient management was reasonable in 53.8%. During the mealtime observation performed by our speech pathologists, one or more symptoms of OD was evident in 80.8% of the patients.

Results of MDADI, CMDQ and mealtime observation on the Amitrano-Crinelli grid are tabulated in Table 3.

All patients underwent FEES and no difficulties were found using this technique of evaluation. Endoscopic Evaluation of swallowing showed only two patients in class PAS-1 (3.8%) and they were considered not to be dysphagic.

Distribution of the PAS score is shown in Table 4.

Classification of OD with ASHA-NOMS scale showed that 32.7% of patients presented a grade 4 OD followed by another 32.7% with grade 5 and 30.8% with grade 6. Only 3.8% of our patients were considered normal (grade 7 of ASHA-NOMS scale).

We found a statistical association between the Mini Mental State Examination test and grading of OD classified in accordance with the ASHA-NOMS scale. When the value of Mini Mental State Examination test score decreased, the severity of the ASHA-NOMS scale of dysphagia increased with a highly significant association $p < 0.001$.

All our patients were receiving polypharmacological therapy for various comorbid conditions. The role of polypharmacological therapy as a cause of OD was not explored as it was beyond the scope of the current study, but we cannot exclude that it may have played a role in

Table 2
Comorbidities of our patients.

Comorbidity	N (%)*
Arthrosis	1 (1.9)
Bladder polyposis	1 (1.9)
Bronchial asthma	1 (1.9)
Bronchiectasis	2 (3.8)
Cardiopathy	7 (13.5)
Cataract	1 (1.9)
COPD	11 (21.2)
CKI	3 (5.8)
Depression	2 (3.8)
Diabetes	10 (19.2)
Dyslipidemia	2 (3.8)
Femur fracture	1 (1.9)
Gout	1 (1.9)
Hashimoto thyroiditis	2 (3.8)
HBV	1 (1.9)
HCV	1 (1.9)
Hearing loss	5 (9.6)
Hypertension	20 (38.5)
Hypothyroidism	1 (1.9)
Liver disease	3 (5.8)
Melanoma	1 (1.9)
Systemic scleroderma	1 (1.9)

COPD: Chronic Obstructive Pulmonary Disease, CKI: Chronic Kidney Insufficiency.

Table 3
Results of MDADI, mealtime observation reported on Amitrano-Crinelli grid and CMDQ.

	N (%)
MDADI	
Negative	32 (61.5)
Positive	12 (23.1)
Missing	8 (15.4)
Amitrano - Crinelli Grid	
Negative	5 (9.6)
Positive	42 (80.8)
Missing	5 (9.6)
CMDQ	
Negative	17 (32.7)
Positive	28 (53.8)
Missing	7 (13.5)

MDADI: MD Anderson Dysphagia Inventory.
CMDQ: Caregiver Mealtime and Dysphagia Questionnaire.

Table 4
Results of PAS score and score classification with description.

Distribution of PAS score	N (%)
PAS 1	2 (3,8)
PAS 2	19 (36,6)
PAS 3	14 (26,9)
PAS 4	3 (5,8)
PAS 5	1 (1,9)
PAS 6	13 (25,0)
PAS 7	0 (0)
PAS 8	0 (0)

PAS 1 None - No entry of material into the larynx or trachea.
PAS 2 Penetration - Entry of material into the larynx with clearing.
PAS 3 Penetration - Entry of material into the larynx without clearing.
PAS 4 Penetration - Material contacts the true vocal folds with clearing.
PAS 5 Penetration - Material contacts the true vocal folds without clearing the larynx.
PAS 6 Aspiration - Material enters the trachea and is spontaneously cleared into the larynx or pharynx.
PAS 7 Aspiration - Material enters the trachea and is not cleared following attempts.
PAS 8 Aspiration - Material enters the trachea with no attempt to clear.

these patients even if it is often difficult to define [8].

4. Discussion and conclusion

On the basis of the MDADI results observed in our study, it was clear that most of our patients were unable to recognise their swallowing disabilities although the degree of cognitive decline was very mild. Because of this, there were no limitations in the daily activities and food intake of these patients. All the patients described in this study were referred to our department principally for a minimal decrease in memory functions or difficulties in the semantic production of the language but not for OD. Inability to notice dysphagia was not limited to patients affected by MCI alone as reported by Delwel [12]. In our present study it involved 61.5% of our patients and was well distributed across all pathologies.

However, dysphagia easily presented itself during the mealtime observation. Speech pathologists were able to detect swallowing impairment in 80.8% of these patients during their observation sessions. All the difficulties in the formation and management of the bolus as well as all the behavioural disorders or posture errors during a meal were specifically evident during the mealtime observation. This important role of mealtime observation by speech pathologist was described by Steele [23] in the past and it should always be compared with mealtime observation/management delivered by the caregiver. Unfortunately, our study results of CMDQ showed that only 53.8% of the caregivers were able to manage the dysphagic patients well.

Endoscopic signs of OD were recorded during FEES evaluation. In 25.0% of the cases, we found a significant OD with aspiration graded as PAS 6 score. In 36.6% and 26.9% patients respectively, a mild OD without aspiration graded as PAS 2 or PAS 3 score was noted. Lower percentages involved the PAS 5 (1.9%) and PAS 4 (5.8%) group. There were no patients classified as PAS 7 or PAS 8.

We hypothesized that the absence of these last and very serious categories was due to the fact that eating and swallowing requires cognitive awareness, visual recognition of food, physiologic response, motor planning and execution and patterned sensorimotor responses [24] that decrease with the severity of cognitive impairment. They were weakened but not completely altered in our patients suffering for mild or very slight dementia. In addition patients with such severe aspiration would be easily detected by any caregiver and be institutionalised for care quickly.

The caregivers, as per our observations, were often the husband or wife of the patient and they were elderly and lived alone without help from younger family members or assistants. A large percentage of the caregivers (32.7%) proved to be unable to manage or were not attentive enough to the patient's swallowing problems. It could prove to be a cause of health hazard to the patients themselves. The necessity to instruct the caregivers has been described in literature [25,26] but as of today it still remains a challenge. Ideally, the training of the caregivers should involve many other professionals like general practitioners, nurses, speech pathologists, dietitians, psychologists and ENT and/or other specialists.

All our patients were suffering from various comorbidities. Chronic obstructive pulmonary disease being the second most common comorbidity as noticed in our series, aspiration or penetration of food into the lower airways may have serious or fatal consequences. In fact 7.7% of our patients had a positive history for aspiration pneumonia. Only in a small 3.8% of our patients we did not find a need to change the oral diet, while in another 33.7% of the cases an exclusive semi-solid feeding with thickened liquids was recommended (OD grading ASHA-NOMS 4).

Our study underscores that OD is present in most cases of mild or very slight cognitive decline. Often the patients understate the swallowing problem and the caregiver is not able to adequately compensate for this situation. The severity of OD reported by ASHA- NOMS scale and related potential risk of aspiration pneumonia is linked to the increase in cognitive impairment tested by Mini Mental State Examination.

It is very important to subject all patients suffering from mild cognitive decline to an accurate evaluation of swallowing with a mealtime observation performed by a speech pathologist and an endoscopic evaluation of swallowing performed by an Otolaryngology expert in OD. The caregiver should be seriously educated about the management and potential health risks associated with OD. Caregiver education must necessarily be a multidisciplinary approach in which doctors, speech pathologists, dietitians, psychologists, and nurses should continuously monitor the evolution of the disorder over time.

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