

# Oropharyngeal dysphagia profile in early versus late stage dementia

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## Objective

The aim of this study was to evaluate swallowing in early and late stage dementia cases referred to the swallowing clinic with oropharyngeal dysphagia in order to have a comprehensive view about their characteristic oropharyngeal dysphagia profile toward different food textures to address them in their rehabilitation program.

## Patients and methods

Fiber-optic endoscopic examination of swallowing (FEES) was conducted to evaluate formally the oropharyngeal stage of swallowing in 26 individuals diagnosed with early mild Alzheimer dementia and late severe Alzheimer dementia. The FEES protocol included symptoms of presentation, route of feeding, bedside evaluation using different textures followed by evaluation of the oral preparatory stage, and the pharyngeal stage through FEES. In addition to observing the ability of the patient to imitate various oromotor actions and ability to follow commands related to the oral phase of swallowing.

## Results

For early stage dementia, all food consistencies were considered safe except for mixed consistencies, large volumes of thin liquids and jelly, while the safest consistencies to use with the late stage dementia cases for quality of life and pleasurable feeds were thickened liquids and jelly consistency.

## Conclusion

Oropharyngeal dysphagia profiles in early stage Alzheimer dementia is different from late stage Alzheimer dementia indicating that the mechanism behind dysphagia is different in the two groups.

## Keywords:

Alzheimer dementia, fiber-optic endoscopic examination of swallowing, food consistencies, oropharyngeal dysphagia

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## Introduction

Dysphagia and feeding difficulties are common in Alzheimer's disease and other dementias [1,2]. Patients with Alzheimer disease reportedly develop swallowing symptoms earlier in the course of the disease. Different clinical presentations of dementia will result in different swallowing or feeding impairments [3,4]. Most commonly, patients with dementia demonstrate a slowing of the swallowing process that may increase the time taken to finish a meal and increase the risk of poor nutritional status [5].

Furthermore, patients with dementia often have difficulties self-feeding. These difficulties may relate to cognitive impairment, motor deficits such as weakness or apraxia, loss of appetite, and/or food avoidance. As a result, patients with dementia may experience weight loss and increased dependency on feeding. Increased feeding dependency may lead to other dysphagia-related health problems, including pneumonia [5].

The speech–language pathologists and phoniatricians play an important role in the assessment and management of dysphagia in individuals with dementia and can play an important role in the dysphagia care for these individuals at any stage in the disease process. Also, they are helpful in educating and orienting caregivers about the proper feeding strategies and the natural progression of the disease. Knowing the specific characteristics of the nature of the swallowing disorder will enable the determination of proper feeding options (tube or assisted oral feeding) that could be delineated proactively rather than reactively [6].

That will lead to improving feeding and swallowing, nutritional status, and overall quality of life in all stages of the disease. Also, if neurologists are made aware of

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dysphagia in their patients early in the course of their disease, and the problem is managed by a speech pathologist specialized in dysphagia, there is a good chance that the complications of this problem can be postponed [7].

There is no data collected in the Egyptian population regarding the characteristic features of swallowing difficulty experienced by the dementia cases in their early and late stages. Searching in this issue is of great importance to inform phoniaticians, neurologists, and geriatric physicians about the nature of dysphagia in the course of the disease in order to be equipped in advance by the proper management techniques that will lead to improvement of the general condition, progress of the disease, and overall quality of life of the patients.

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### The objective

The objective of this study was to evaluate swallowing in early and late stage dementia cases in order to have a comprehensive view about their characteristic oropharyngeal swallowing difficulty profile toward different food textures to address them in their rehabilitation program.

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### Patients and methods

#### Patients

The participants were 26 individuals diagnosed with early mild Alzheimer dementia ( $n=12$ , ages between 67 and 80 years) and late severe ( $n=14$ , ages between 81 and 93 years) Alzheimer dementia and their 26 caregivers, seeking medical advice at the Feeding and Swallowing Disorders Clinic, at the Phoniatics Unit, ENT Department, Cairo University between January 2018 and July 2018.

Patients were included, provided they had caregivers. There were no restrictions regarding sex, age, or the educational level for patients or caregivers. The study was approved by the Ethics Committee of the Department and each caregiver signed their consent to participate.

#### Methods

A fiber-optic endoscopic examination of swallowing (FEES) was conducted to evaluate formally the oropharyngeal stage of swallowing. The patient was seated in an upright position on a chair in the swallowing clinic. All steps of the procedure were explained to the patient and his caregiver, then a consent was signed by the caregiver. An examination tray was then placed next to the caregiver on the left

side of the patient while the assessor was seated on the right side and the second assessor was facing the patient. The caregiver then started giving the consistencies according to their order of difficulty from easier to most difficult according to the history of the patient. Observations were then recorded. The second part of the bedside evaluation included five commands including (open your mouth, wiggle your tongue, chatter your teeth, smile, close your mouth); same five actions were performed and the patient was asked to imitate them. After the initial evaluation was performed, the endoscope was then placed inside the patient's nose and passed to the oropharynx to allow static and dynamic evaluation of the oropharyngeal and laryngeal structures. The food was introduced in the same order as the clinical evaluation and the preswallowing and postswallowing findings were recorded. The examination was video-recorded and reviewed by two judges for the variables of interest. The variables included symptoms of presentation either (choking, dysphagia, pneumonia, feeding difficulty), route of feeding (tube or oral feeding), bedside evaluation using different textures [response to water challenge task [8], response to jelly, puree food, solid chewable food (biscuit), and food with mixed consistency (orange)]. Then evaluation of the oral preparatory stage, the pharyngeal stage through FEES assessment in the form of presence of any aspiration or spillage in the pharynx of either fluids, jelly, puree, solid, and mixed consistency food were done, in addition to observing the ability of the patient to imitate and his/her ability to follow commands. Each patient was scored 1 for the presence of each symptom, and 0 for absence of the symptom. The patient scored 1 for using the oral route of feeding and scored 0 for using the tube route of feeding. He/she scored 1 for the normal response to water and food with different textures in the bedside evaluation and scored 0 for the abnormal response. The patient scored 1 for the normal oral preparatory phase and absence of spillage or aspiration in response to fluid and different food textures while he/she scored 0 for any abnormality in the oral or pharyngeal phases. Finally, the patient scored 1 when he/she had normal ability to imitate or follow commands.

After collecting the data, they were tabulated and statistically analyzed.

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### Results

Statistical analysis was done using IBM SPSS Statistics, version 22 (IBM Corp., Armonk, New

York, USA). Numerical data were expressed as mean, SD, and range as appropriate. Qualitative data were expressed as frequency and percentage.  $\chi^2$  test or Fisher's exact test was used to examine the relation between qualitative variables. All tests were two-tailed. A *P* value of less than 0.05 was considered significant.

- (1) Comparison between early and late dementia cases regarding the presenting symptoms Table 1 showed that all the cases of early stage dementia presented with choking, while none of the cases of late stage dementia presented with this symptom. All the cases of late stage dementia presented with dysphagia and feeding difficulties while none of the early stage dementia cases presented with these symptoms. Six (54.5%) cases of early stage dementia and about five (45.4%) cases of late stage dementia presented with pneumonia with no significant difference between the two groups while six cases of early stage dementia and nine cases of late stage dementia did not report any episodes of pneumonia.
- (2) Comparison between early and late dementia cases regarding the route of feeding Table 2 showed that all the early stage dementia cases were orally fed with no use of tube feeding, while nine cases of late stage dementia were tube fed and five cases of late stage dementia were orally fed with no use of tube feeding.
- (3) Comparison between early and late dementia cases regarding items of bedside assessment Table 3 showed that four out of 12 patients of early stage dementia and all the 14 cases of late stage dementia had difficulty with water challenge task with significant difference between the groups. None of the early stage dementia cases and 10 out of 14 of the late stage dementia cases had difficulty with manipulating puree food with significant difference between the groups. Seven out of 12 of the early stage dementia cases and six out of 14 of the late stage dementia cases had difficulty with manipulating jelly with no significant difference between the groups. None of the early stage dementia cases and all of the late stage dementia cases had difficulty with manipulating solid food with significant difference between the groups. Ten out of 12 of the early stage dementia cases and six out of 14 of the late stage dementia cases had difficulty with manipulating food with mixed consistency with significant difference between the groups.
- (4) Comparison between early and late dementia cases regarding items of flexible endoscopic evaluation of swallowing Table 4 showed that none of the

**Table 1 Comparison between early and late dementia cases regarding the presenting symptoms**

| Symptoms           | Early dementia [n (%)] | Late dementia [n (%)] | <i>P</i> value |
|--------------------|------------------------|-----------------------|----------------|
| Choking            | 12 (100)               | 0 (0)                 | <0.001         |
| Dysphagia          | 0 (0)                  | 14 (100)              | <0.001         |
| Pneumonia          | 6 (54.5)               | 5 (45.5)              | 0.462          |
| Feeding difficulty | 0 (0)                  | 14 (100)              | <0.001         |

**Table 2 Comparison between early and late dementia cases regarding the route of feeding**

| Route of feeding | Early dementia [n (%)] | Late dementia [n (%)] | <i>P</i> value |
|------------------|------------------------|-----------------------|----------------|
| Tube feeding     | 0 (0)                  | 9 (100)               | 0.001          |
| Oral feeding     | 12 (70.6)              | 5 (29.4)              | 0.001          |

**Table 3 Comparison between early and late dementia cases regarding items of bedside assessment**

| Bedside                           | Early dementia [n (%)] | Late dementia [n (%)] | <i>P</i> value |
|-----------------------------------|------------------------|-----------------------|----------------|
| Difficulty with water challenge   | 4 (22.2)               | 14 (77.8)             | <0.001         |
| Difficulty with puree             | 0 (0)                  | 10 (100)              | <0.001         |
| Difficulty with jelly             | 7 (53.8)               | 6 (46.2)              | 0.431          |
| Difficulty with solid             | 0 (0)                  | 14 (100)              | <0.001         |
| Difficulty with mixed consistency | 10 (62.5)              | 6 (37.5)              | 0.034          |

**Table 4 Comparison between early and late dementia cases regarding items of flexible endoscopic evaluation of swallowing**

| FEES                                     | Early dementia [n (%)] | Late dementia [n (%)] | <i>P</i> value        |
|------------------------------------------|------------------------|-----------------------|-----------------------|
| Difficulty with oral preparation         | 0 (0)                  | 10 (100)              | <0.001                |
| Aspiration/spillage on fluids            | 0 (0)                  | 7 (100)               | 0.006                 |
| Aspiration/spillage on solids            | 0 (0)                  | 14 (100)              | <0.001                |
| Aspiration/spillage on jelly             | 9 (64.3)               | 5 (35.7)              | 0.045                 |
| Aspiration/spillage on puree             | 0 (0)                  | 0 (0)                 | Constant/<br>no score |
| Aspiration/spillage on mixed consistency | 10 (41.7)              | 14 (58.3)             | No <i>P</i> value     |

FEES, fiber-optic endoscopic examination of swallowing.

early stage dementia cases and 10 out of 14 of the late stage dementia cases had difficulty with the oral preparatory phase with significant difference between the groups. None of the early stage dementia cases and seven out of 14 of the late stage dementia cases had aspiration/spillage with fluid with significant difference between the groups. None of the early stage dementia cases and all of the late stage dementia cases had

aspiration/spillage with solid with significant difference between the groups. Nine out of 12 of the early stage dementia cases and five out of 14 of the late stage dementia cases had aspiration/spillage with jelly with significant difference between the groups. None of the early stage dementia cases and all of the late stage dementia cases had aspiration/spillage with puree consistency. Ten out of 12 of the early stage dementia cases and all of the late stage dementia cases had aspiration/spillage with food with mixed consistency.

- (5) Comparison between early and late dementia cases regarding imitation and following commands ability showed that all the late stage dementia cases had inability to imitate and inability to follow commands, while all the early stage dementia cases had good ability to imitate and follow commands.

## Discussion

Dysphagia is common in patients with dementia and often results in serious health consequences, including malnutrition, dehydration, aspiration pneumonia, and even death. Due to progressive cognitive and functional decline, patients with dementia experience difficulties throughout the eating process which encompasses all aspects of self-feeding (transferring food from the table to the mouth) in addition to swallowing function (transferring food from the mouth into the stomach) [9]. This inability to eat safely and efficiently is the most life threatening of all functional impairments for these patients [10,11].

This study aimed at collecting data about the oropharyngeal dysphagia profiles in dementia cases and if there is any distinct feature specific to their stage of the disease.

In the current study as shown in Tables 1–4, early stage cases under study showed a prevalence of choking symptoms more than those with the late stage. It was quite striking how choking was the leading cause for referral in the early stage group while it was almost absent in the late stage group. This finding can be explained by the fact that the sensory system is usually intact in the early stage and therefore the cough reflex and the choking mechanism itself can be an alarming sign to the caregiver and the patient himself, while in the late stage the affection is of a multiple system affection type and therefore even though the aspiration was seen in FEES, it was mostly silent for the late stage group. Another

possible explanation of this huge discrepancy seen between both groups is the fact shown in the second table that all early cases are orally fed and therefore are at a higher risk of choking and aspiration while most of the late cases were tube fed which could have caused this biased result and this finding should be further studied in a larger population of orally fed late stage patients.

During the caregiver interview, it was noticed that absence of dysphagia as a symptom in the early stage group gave the impression that caregivers were unaware of the dysphagia and that the irritating symptom that made them seek advice is choking while with progression of dementia, the dysphagia became more obvious in the later stages and became the leading cause of referral for the swallowing assessment.

There was no statistically significant difference between the early and late stage cases when comparing the number of patients who had a history of pneumonia. This highlights the fact that dementia cases in both stages are prone to pneumonia, the early stage cases as a result of the unawareness of their caregivers of the problem (swallowing difficulty) with continuation of oral feeding and less emphasis on oral hygiene while in the late stage cases, pneumonia was the leading cause of change of the route of feeding into tube feeding and that tube feeding lowered the risk of pneumonia within the group of late stage.

The results of this study have shown that most cases of late stage dementia are tube fed; a larger scale study is needed to shed more light on this fact and on the type of feeding tube used. Nasogastric tube was the choice of most cases in the late stage dementia group in this study. It was inserted to ensure swallowing safety providing adequate nutrition and hydration. This can be explained by the fact that patients not oriented to person, place, or time are at a 31% increased risk of liquid aspiration [12]. There is a debate in the literature of using tube feeding as they can be used with the aim of maintaining hydration, muscle mass, and avoiding micronutrient deficiency. However, tubes are uncomfortable and not well tolerated by those who do not understand their purpose such as late dementia cases. Insertion may be resisted, they are often dislodged, and do not represent a practical option outside of the hospitals (where they can be replaced if necessary). Inserting a gastrostomy, either endoscopically or radiologically, is relatively straightforward [13].

When analyzing the results of this study, the discrepancy between both groups was clear as regards the water challenge test. Few cases of the early stage dementia group and all the cases in the late stage dementia group showed difficulty with water challenge tests. This could be interpreted by the difficulty faced by those patients in providing the appropriate speed and coordination to manage safely and successfully multiple sequential large volume water swallows. This is how the test was modeled and therefore many patients found it highly challenging particularly the ones suffering from oromotor difficulties and oral apraxia. It also indicates the need for using thickeners and thick liquids to hydrate patients with dementia instead of thin fluids even during the early stages of the disease. Increasing the viscosity of a fluid can lead to a reduced rate of liquid bolus transit and increased sensory awareness [14]; it can also influence opening of the upper esophageal sphincter [15]. This reduced rate of bolus movement and the increase in sensory awareness may enhance the safety and efficiency of swallowing, thus reducing the risk of aspiration or penetration of fluid into the airway. It is believed that increasing the viscosity of the fluid bolus by altering its consistency allows individuals a better opportunity to swallow with a reduced risk of airway compromise.

Early stage cases of dementia showed no difficulty with manipulation of puree food and solid food indicating that they were the easiest and safest types of food to handle in such patients, while 10 of 14 cases of late dementia showed difficulty to manipulate puree food and all of them showed difficulty with manipulating solid food with large amounts of residue and pocketing of food remnants as well as anterior oral spill. This could be interpreted mainly by the difficulty with the oral phase and lack of oral muscular coordination.

Nearly half of the cases of both early and late dementia group showed difficulty with manipulating jelly. This could be justified, as this type of consistency changed into watery fluid and trickled quickly into the valleculae and lateral laryngeal gutter at the speed of thin fluids as the jelly used was home prepared not specially cooked for the patients. This brings us again to the fact that dementia cases cannot provide the proper speed, coordination, and control for multiple fast coordinated swallows.

Nearly all the cases of the early stage dementia (10 out of 12) showed difficulty with manipulating food of

mixed consistency as it needs high level of coordination and intact multiple executive functions needed to control each consistency (solid mixed with watery) to form a single bolus. This result indicates that dysphagia toward mixed consistency could be considered the earliest sign of dysphagia in the early stage dementia cases under study. The result of the current study showed that mixed consistency was not considered of great difficulty to handle in late stage cases as the fluids elicited some reflexive swallows, while the solid particles were seen to pocket in the cheeks and gums, so actually it was more of a consistency splitting mechanism due to defective chewing; therefore, the swallowing system was only challenged by one consistency at a time. However, collection of food particles in the mouth may be dangerous as well with high risk of postswallow aspiration, poor oral hygiene, and pneumonia due to postswallow aspiration as well as bacterial growth due to over-colonization of the oral cavity and migration down the respiratory tract.

When comparing the results of the flexible endoscopic evaluation of swallowing (FEES) for both groups in this study, a significant difference was found regarding the oral phase. There was a marked difficulty with the oral preparatory phase in most of the late stage dementia cases, while there was no difficulty seen in the early stage cases. This is again explained by the severe cognitive decline and the limited oral praxis seen in the late stage cases were behind the difficulty seen in the oral phase.

There was also a significant difference regarding FEES results for fluids. None of the early stage group showed aspiration while a significant number of the late stage was aspirated. This is in accordance with the results shown in the bedside clinical evaluation regarding aspiration/spillage on oral intake of thin fluids in half of the late stage dementia cases, while there was no aspiration seen in the early stage dementia cases. The difficulty seen in the bedside evaluation during the water challenge test in few cases of early stage dementia cases pointed to that they might face difficulty on larger fluid volumes and that smaller amounts of water will be safer in this group, while water and thin fluids even in small volumes were not safe in the late dementia cases, which highly suggest that thickening and small volumes of fluids will be the safest approach in both groups.

The FEES findings also showed that none of the early stage dementia cases and all of the late stage dementia cases had aspiration/spillage on solids. These findings

could be explained by mainly the oral phase difficulties. Regarding solids, they are considered the most challenging for late stage as they either remain in oral cavity without preparation or evacuation or some of their pieces would fall behind without triggering the swallowing rendering the late stage cases at high risk of preswallow or postswallow aspiration.

As regards puree consistency, there was discrepancy between bedside evaluation and FEES findings. It is considered the stickiest consistency and thus it is considered the hardest to clear from oral cavity and the most challenging consistency with oral apraxia in late stage dementia. When pureed consistency was introduced through a wide bored syringe to the back of the mouth, reflexive pharyngeal swallows were elicited and partial clearance was seen with no risk of aspiration.

Jelly was a risky consistency in early as well as in late stage cases and a large percentage of population of both groups aspirated on this consistency. This could be justified by the fact that it needs high degree of coordination, oral control, and multiple successive swallows for each bolus while in the late stage, there is a slowed oral phase and delay in triggering which gives more time for bolus of jelly to reach the vallecula in time with appropriate closure.

Mixed consistency was one of the most challenging and risky consistencies in both early and late stage dementia cases as it caused aspiration in nearly all the early stage dementia cases and all the late stage dementia cases and this was in accordance with the previous finding of the bedside evaluation.

This study suggests modification of the diet in cases of dementia showing dysphagia. However, many studies are still needed to investigate the effectiveness of the dietary modification to confirm to the national standards and practices. In his narrative review, O'Keeffe [16] presented the argument in the literature for and against the use of modified diets. One of the arguments is that modifying diets has a rational pathophysiological basis. The pros are dietary modifications make swallowing easier and safer in those with dysphagia; the risk of aspiration in instrumental studies is often reduced by dietary modification in addition to the fact that similar dietary modifications in everyday life might reduce aspiration pneumonia. The cons are many physiologically rational health-care interventions have ultimately been shown not to benefit patients,

**Table 5 Comparison between early and late dementia cases regarding imitation and following commands ability**

| Praxis                             | Early dementia | Late dementia | P value |
|------------------------------------|----------------|---------------|---------|
| Difficulty with imitation          | 0 (0)          | 14 (100)      | <0.001  |
| Difficulty with following commands | 0 (0)          | 14 (100)      | <0.001  |

aspiration pneumonia is not a direct and inevitable consequence of aspiration, modifying diets will not influence the aspiration of saliva and secretions and instrumental swallowing assessment bears little resemblance to eating in real life.

The results in Table 5 show that the difficulty in swallowing faced by late stage dementia cases could be explained by the sort of oral apraxia they had as they showed poor response to following commands and imitation. On the contrary, early stage dementia cases were responsive to following commands and imitation pointing to the difference in the mechanism beyond dysphagia in the two groups. The results of the bedside evaluation as well as the FEES findings are in agreement with the findings shown in Table 5. During the evaluation, self-feeding in the late stage was very difficult to elicit as the process of eating encompasses cognitive awareness of the eating situation, visual recognition of food, and physiologic responses to the smell and presence of food that all lead up to the act of swallowing [9]. Self-feeding, in terms of recognition of appropriate items to eat, planning the execution of what should be transported to the mouth, how it will be transported, and in what amount comprises a critical skill set within this eating process [9,17]. For this reason, during evaluation, the introduction of food was by the help of the caregiver and some consistencies were introduced through a syringe. This study provided a closer picture to the reality of the swallowing behavior and profiles toward different food consistencies in the early versus late stage dementia cases. In the scope of this study, all food consistencies were considered safe except for mixed consistencies, large volumes of thin liquids and jelly in the early stage dementia cases, while the safest consistencies to use with the late stage dementia cases for quality of life and pleasurable feeds were thickened liquids and jelly consistency.

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Nil.

#### **Conflicts of interest**

There are no conflicts of interest.

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