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# Dysphagia among the elderly: an updated review

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**Abstract:**

**Background:**

Dysphagia can be considered as a geriatric syndrome, since its etiology is multifactorial related to multiple comorbidities and worsens prognosis and quality of life.

**Objective:**

Summarize the current evidence of dysphagia in geriatric population regarding epidemiology, pathophysiology, etiology, clinical presentation, diagnosis, complications and treatment, for integration into a comprehensive and complete healthcare evaluation.

**Methods:**

PubMed database was searched from January 2010 to December 2019 using the next keywords combination: "dysphagia geriatrics"/ "dysphagia geriatrics AND epidemiology"/ "dysphagia geriatrics AND etiology", "dysphagia geriatrics AND pathophysiology"/ "dysphagia geriatrics/clinical presentation"/ "dysphagia geriatrics AND diagnostic"/ "dysphagia geriatrics AND treatment". Primary search thrown 359 articles which were selected for abstract reading of which 77 met the purpose of our review. Exclusion criteria: articles without significant results. Inclusion criteria: Reviews and human clinical trials from January 2010 to December 2019 regarding epidemiology, etiology, pathophysiology, clinical presentation, diagnostic and treatment strategies for dysphagia among geriatric population

**Results:**

In US population 9.44 million people reported symptoms in varying degree. Of these, 22.7% sought medical attention and only 36.9% received a proper diagnosis. $ 4.3 to $ 7.1 billion per year were allocated in additional hospital expenses due to dysphagia related complications and mortality 1.7 times higher. Chronic neurological disorders: Alzheimer's/ other demential states and Parkinson´s/ other extrapyramidal disorders were the most commonly reviewed. Diagnosis process includes screening, clinical and instrumental evaluation. Treatment actions are cost-effective, prevent possible complications and improve life quality of patients.

**Conclusion:**

The increasing aging in population, polypharmacy and chronic neurodegenerative diseases have lead dysphagia as an emerging underdiagnosed and undertreated clinical with uprising morbidity and mortality. Geriatric dysphagia must be integrated into a comprehensive geriatric evaluation in order to reduce costs produced by possible complications.

**Keywords:** Deglutition disorders, Aging, Geriatrics.

**Highlights:**

- Swallowing disorders worsens prognosis and quality of life in geriatrics
- In US 4.3-7.1$ billions were spent because of dysphagia
- An accurate diagnosis requires screening, clinical and instrumental evaluation

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• Diet modification and postural changes during meal can improve swallowing
**Abbreviations:** AD=Alzheimer's disease, PD=Parkinson's disease, OD=Oropharyngeal dysphagia, EAT 10=Eating Assessment Tool, WST=Water Swallow Test, V-VST=Volume Viscosity Swallow Test, VFS=Videofluoroscopic Study, FEES=Flexible Endoscopic Evaluation of Swallowing, MMI=Minimum Massive Intervention

## 1.1 Introduction

Dysphagia is the difficulty for the passage of solids or liquids from the mouth to the stomach. (1) The geriatric population is frequently affected by a higher prevalence of disorders that may cause dysphagia, in addition to swallowing mechanics modifications due to aging, term known as presbyphagia. Also polypharmacy, a very common geriatric syndrome, is reported to interfere with the correct swallowing mechanism (Table 1). (2)

| Drugs | Action mechanism | Effect | Author |
|---|---|---|---|
| Nitrates, calcium channel antagonists | Lower esophageal sfincter relaxation | Acid reflux and esophageal injury | J. Morley "Dysphagia and aspiration" (2017)(3) |
| Antiphsycotics, antidepressants, antianxiety, sedative or hypnotic agents | Dopaminergic receptor antagonist in the nigrostratial system | Rigidity, bradykinesia, acute dystonic reactions, impaired lingual movement, slowed bolus formation, control and transport, also anticholinergic effect | G. Cicala, M. Barbieri, E. Spina et. al. "A comprehensive review of swallowing difficulties and dysphagia associated with antipsychotics in adults" (2019)(4) |
| Anticolinergics, narcotics and diuretics | Hyposalivation | Xerostomia, reduced dental health | A. Dietsch, C. A. Pelletier, N. Solomon. "Saliva Production and Enjoyment of Real-Food Flavors in People with and Without Dysphagia and/or Xerostomia" (2018)(5) |
| Statins, penicilamine, chloroquine, phenytoine, ziduvodine, interferon gamma | Directly or Inmunologic/inflammatory reaction | Myotoxicity, myastenic syndromes worsening | A. Kandlstorfer, R. Pointner. "An appraisal of current dysphagia diagnosis and treatment strategies" (2016)(6) |

**Table 1:** Drugs related to geriatric dysphagia

Swallowing is a complex mechanism that involves proper coordination of the cortex and brain stem, its primary objective is the protection of the airway and transport of the food bolus. (7) As consequence of population´s aging, swallowing disorders have appeared as an emerging entity to be treated by health professionals, especially for those who treat older adults. (8)

Also dysphagia can be considered as a geriatric syndrome, since it is considered multifactorial, related to multiple comorbidities and worsens the prognosis and quality of life. (9) Among the main complications are malnutrition, dehydration and increased risk of bronchial aspiration with the development of aspiration pneumonia (10).

## 1.2 Epidemiology

The prevalence depends on the phenotype, age, diagnostic method and specific comorbidities of each patient. (11) In the US it was found that 9.44 million, 4% of the adult population, reported symptoms in different degrees; of these, only 22.7% sought medical attention and only 36.9% received a proper diagnosis. (12) D. Melgaard et al. found that among 313 Danish patients admitted for acute process, 50% had symptoms; being related to low weight, lower arm circumference, increased length of stay and 180 days mortality about 33%. (13) In a series of Irish patients, E. Horgan et. al observed that 35% of hospitalized patients sent to nursing homes still had symptoms at the time of discharge. (14)

S. Attrill et. al. evaluated the global economic impact, finding that the management and prognosis of patients with dysphagia was 40.36% more expensive than those who did not present it, with increasing length of stay between 2-8 extra days. (15) In the US, over a period of 5 years, $ 4.3 to $ 7.1 billion per year were allocated in additional hospital expenses secondary to an increase of 3.8 days of stay and a mortality 1.7 times higher than controls. (16)

## 1.3 Pathophysiology and Etiology

Accurate coordination is required between different areas of the central nervous system, 6 cranial nerves with sensory and motor function and about 40 voluntary and involuntary muscles innervated bilaterally to perform the 4 phases of swallowing: preparatory oral, propulsive oral, pharyngeal and esophageal. (17) In the preparatory oral phase food is crushed and held in the anterior part of the oral cavity by a soft palate seal against the tongue; then during the propulsive oral phase, the bolus passes through the isthmus of the jaws towards the oropharynx and the esophagus by pushing the tongue against the soft palate. (18) The swallowing reflex is triggered during the pharyngeal phase; many consecutive events happen in a short period of time. The larynx is positioned up and forward, the nasal and oral cavities are sealed by the upward movement of the soft palate and posterior movement of the tongue, the epiglottis covers the airway closing the laryngeal vestibule, the vocal cords close, the pharyngeal walls contract generating pressure to move the bolus through the upper esophageal sphincter opened by cricopharyngeal relaxation and movement of the larynx. (19)

Generally, age-related changes in swallowing are not enough to cause symptoms; the risk increases if there are underlying comorbidities or intake of associated medications. The most frequently observed changes are prolonged oral phase, decrease in the maximum isometric pressure of the tongue, increasing time required to activate the swallowing reflex, late laryngeal closure and increasing presence of food waste. (20) It is likely that older adults alter their eating habits in order to adapt to these changes so that any condition affecting functional reserve results in the appearance of symptoms. (21)

Given the complexity and the various systems involved there are a wide variety of entities that can cause symptoms. The most frequent structural causes are tumors, head and neck surgical interventions, cervical osteophytes and pharyngoesophageal diverticula. (22,23) Among diverticula, Zenker's diverticulum is the most frequently related with dysphagia due to the mass effect on the cervical esophagus, it is associated with dysfunction of the cricopharyngeus muscle and gastroesophageal reflux disease. (24,25) The most frequently associated surgical procedures are anterior cervical spine surgery, partial or total thyroidectomy (by damage to the recurrent laryngeal nerve), interventions of the larynx, esophagus, lung, heart, bariatric, posterior fossa or cortical involvement surgery. (26) Ventilatory support and prolonged periods of intubation are also related. (27)

Among the functional causes, neurological disorders are the most studied, being Stroke, Alzheimer's disease (AD) and other demential states, Parkinson's disease (PD) and extrapyramidal disorders the most common causes. (28) At least 47% of adults diagnosed with dementia have some degree of dysphagia, although in some series figures above 80% of the population. (29) In AD there is involvement of cortical areas responsible for swallowing.(30) In moderate to severe degree, autonomous feeding disability is associated with cognitive and motor impairment, lack of appetite and loss of interest in food. (31) PD reports a prevalence of dysphagia ranging from 11% to 87% depending on disease stage and the methods used for dysphagia assessment (32) The underlying pathophysiological process is not yet well understood, but it is believed that degeneration in the brainstem and black substance, as well as alterations in the dopaminergic and non-dopaminergic neural network plays a central role. (33) M. Arnold et. al. reported that the location of the lesion was not a reliable predictor of dysphagia, contrary to the belief that it is more frequent in infratentorial and brainstem disease; it was observed that the severity and extent were the most important risk and prognosis factors. (34) Recovery occurs by cortical reorganization, depending on the existence and severity of the lesion in the dominant swallowing center. (35)

### 1.4 Clinical presentation

Although there are objective tests to perform a detailed evaluation, they do not reflect correct daily function of the swallowing mechanism. Observing meal intake, dental apparatus, muscle weakness, decreased movements of the jaw and soft palate, food waste in the oral cavity; as well as the existence of signs such as sialorrhea, rinsing or gargling impairment represent early clinical screening. (36) It is important to question intentionally for symptoms such as delayed swallowing, postnasal regurgitation, cough and foreign body sensation in the oropharynx to differentiate oropharyngeal (OD) from esophageal dysphagia. (37)

### 1.5 Diagnosis

An adequate approach consists in 3 stages: screening, clinical and instrumental evaluation. The purpose of screening is to identify individuals with dysphagia,

at risk of developing aspiration pneumonia or malnutrition in the first level of care who need a more detailed clinical evaluation. (38) In this section, tests with more sensitivity rather than specificity are sought to avoid life-threatening complications and further costs. (39) The most world-wide used screening tests are the Eating Assessment Tool (EAT-10), Sidney Swallow Questionnaire, Swallowing Disturbance Questionnaire, Dysphagia Screening Questionnaire, Dysphagia Screening Tool, etc. The EAT-10 is a fast, easy and self-applying test with excellent validation and reproducibility with high sensitivity (85%) and specificity (82%); it consists of 10 items scored from 0 (without handicap) to 4 (severe handicap) taking a score ≥3 as swallowing alterations, related to nutritional alterations and difficulty in performing activities of daily routine. (40) The Sydney Swallow Questionnaire is a 17 item tool valued by means of a Visual Analogue Scale; it has high reproducibility and sensitivity to detect symptomatic individuals. (41) The Swallowing Disturbance Questionnaire was designed for patients with PD, it consists of 5 items that evaluate oral phase and 10 items for pharyngeal phase, in which a score of ≥12.5 is a predictor of the presence of dysphagia caused by different causes. (42)

The clinical evaluation consists of identifying alterations in the efficacy and safety of swallowing. Efficacy alterations are associated with weakness in the oropharyngeal musculature causing an incorrect intake of fluids and nutrient, safety alterations are related to neurological diseases that cause late closure of the laryngeal vestibule, which increases the risk of penetration and aspiration into the airway, respectively. (43) The elements to be evaluated before performance, are a complete medical history, laryngeal, pharyngeal and cranial nerve correct function, cognitive evaluation and communication skills. (44) The Water Swallow Test (WST) has been used as a dynamic evaluation in which the patient drinks different amounts of water depending on the patient condition looking for signs such as increased swallowing time, wet gurgly voice, cough, ≥3% decrease in pulse oximetry, asphyxia or aspiration; which become more evident with greater ingested volume. (45) Due to the heterogeneity of these tests, the sensitivity and specificity is variable. In a recent meta-analysis, M. Brodsky et. al. indicated that small sips in tests with low (1-5ml) and high (6-20ml) liquid intake have greater specificity (low 90% - high 90%) than sensitivity (low 71% - high 63%). Continuous sips of a larger volume (90-100ml) have a greater sensitivity (91%) than specificity (53%). A combination of both modalities could increase sensitivity and specificity. (46,47) P. Chen et. al. found in a recent review that the general sensitivity and specificity of the WST was 72%, with a correlation of higher volumes with higher sensitivity. (48)

However, there is a high risk of aspiration using rapid and continuous water consumption tools, so in order to look after the patient´s security, using tests with smaller volumes or different viscosities is mandatory. In the Modified WST the patient is asked to drink 3ml of water, it has good specificity, although the swallowing reflex is difficult to trigger with such a low volume intake. (48) The Volume Viscosity Swallow Test (V-VST) is a method to evaluate efficacy and safety of swallowing, choosing which volume and bolus viscosity are the most appropriate for the patient. The test begins with nectar and low volumes, with increasing intake, passing to liquid and finally pudding texture, in that order of progression to protect the patient from a probable aspiration. (49) It has a high diagnostic sensitivity to detect aspiration of 88.2%; in addition to a high negative predictive value (92.6%) for aspiration, so a patient with negative V-VST does not require further evaluation for aspiration. (50) Another validated instrument is the Toronto Bedside Swallowing Screening Test consisting of an evaluation of the voice and movements of the tongue and drinking 10 consecutive tablespoons of water, followed by a sip cup for those who have managed to take 10 tablespoons previously; it has increasing sensitivity according to the number of tablespoons ingested (5, 8 and 10 tablespoons, reporting 79%, 92% and 96%). (51)

Patients with a positive clinical evaluation or those who were not able to carry out clinical testing require instrumental evaluation. The Videofluoroscopic Swallowing Study (VFS) uses an X-ray tube with fluoroscopy with a video recorder that generates high resolution images in which oropharynx and hypopharynx´s motility is evaluated; it also indirectly identifies structural mucosa abnormalities and essential steps for proper swallowing, such as bolus control and propulsion, pharyngeal transport, coordination and swallowing timing, as well as penetration and aspiration depth. (52) 3-20 ml of bolus mixed with barium or water-soluble contrast are ingested starting with thick consistencies and low volumes; it is visualized on a lateral projection, although a frontal, oblique view or valsalva maneuvers can be performed in search for asymmetry. Suspecting a neurological or functional cause, we look for signs such as tongue pumping (repetitive backward-forward movements of the tongue), pathognomonic of PD, vestibular penetration defined as contrast capture beyond the laryngeal vestibule without passing the glottis, related to delay in the vestibular closure with the arrival of bolus and retroversion of the epiglottis, aspiration, defined as the entrance of foreign material beyond the true vocal cords and residues in the valleculae or piriform sinuses, indicating weakness in propulsion or improper closure of the upper esophageal sphincter. (53)

When VFS fails to show a clear visualization of the nasopharynx, oropharynx and larynx or when patients are unable to follow orders the use of Flexible Endoscopic Evaluation of Swallowing (FEES) is recommended. This method can be performed bedside and has a greater tolerability and compliance than the VFS. (54) A flexible laryngoscope is introduced through the nose to visualize hypopharynx and larynx, evaluating anatomy, motility patterns, asymmetry and secretion management prior testing with different bolus viscosities dye marked checking for penetration, aspiration or post-swallowing residues. (6)

VFS has traditionally been described as the gold standard diagnostic method, although there are some authors considering FEES as a better tool. In a recent metanalysis, L. Giraldo et. al. reported that FEES has greater sensitivity to detect aspiration, penetration and laryngopharyngeal residues in patients with functional oropharyngeal dysphagia, without having a significant difference in the specificities of both tests. (55)

## 1.6 Complications of dysphagia: Malnutrition, pneumonia and dehydration

Dysphagia in the elderly is a predictor of several complications such as malnutrition, dehydration (25-75%), and tracheobronchial aspiration (30-50%), leading to pneumonia in 50% of cases, with an associated mortality of up to 50%. (56)

OD is a risk factor for developing malnutrition and dehydration in patients with stroke or neurodegenerative diseases although it is probably less recognized because the slow chronic course of this functional disorders. (57,58) Patients with malnutrition have lower levels of albumin and cholesterol as reported in a cohort study which showed a prevalence of 45.3% of malnutrition in patients over 70 years with OD regardless of functional status and comorbidities. (59)

Patients with dysphagia have a high risk of aspirating secretions, liquids, or food particles, consequently developing aspiration pneumonia. (60) OD is a risk factor for aspiration pneumonia in institutionalized fragile patients with cerebrovascular or neurodegenerative diseases. Aspiration pneumonia is a major cause of mortality in patients who suffered stroke, being responsible for the 35% of post-stroke deaths. (61) A study has shown that patients with dementia will inevitably develop dysphagia, therefore they have a high risk of death by aspiration. (62) In nursing homes, 50-75% of the residents have dysphagia, half of them will aspire and a third will develop pneumonia. (63) Therefore, clinicians most rule out swallowing disorders in institutionalized frail patients with repetitive unexplained low airway infections.

## 1.7 Treatment

Treatment must be individualized for each patient. Multidisciplinary collaboration between geriatrics, neurologists, speech and language therapists, nutritionists, nursing staff and psychotherapists is necessary.

Recently a cost-effective strategy, the minimum massive intervention (MMI) has been developed, in order to reduce nutritional and respiratory complications in elderly hospitalized patients. MMI consists in clinical evaluation of OD, nutritional evaluation and triple adaptation of food (texture, proteic and organoleptic calories) and evaluation and treatment of hygiene and health to avoid reducing the colonization of oral cavity by respiratory pathogens. (64)

The traditional treatment is a multidimensional focus strategy which consists in oral care, postural changes during mealtime, swallowing maneuvers, dietary strategies and modifications in bolus intake. (65) In a metanalysis, oral care interventions reduced the risk of pneumonia, although a high bias risk was present. (66)

Postural changes such as chin placement toward the chest or turning the head over the right or left shoulder have shown to change pressure generation and speed during swallowing, thus reducing the aspiration risk. (67,68) Studies available are limited and with small samples, so further investigation is needed. (69,70) The maneuvers improve swallowing biomechanics by performing different coordinated exercises or movements. Mendelsohn Maneuver has benefited patients with OD. This maneuver is intended to relax and increase the opening of the upper esophageal sphincter. The patient has to voluntarily hold the larynx in its highest position for 2-3 seconds before swallowing. (71) There are exercises based on swallowing rehabilitation such as Lingual resistance Focus, Shaker / head-lift, Expiratory Muscle Strength Training, McNeill Dysphagia Therapy Program, each one with different approaches and benefits to improve swallowing. (72)

Diet modification is an international standardization treatment initiative worldwide used. (73) It has been suggested that thicker liquids may improve some swallowing and aspiration measures. Although some studies in which the diet has been modified to evaluate the incidence of aspiration are poor quality and inconclusive. (74) A recent review found no qualitative studies related to the alteration of food consistency. Two studies evaluated the use of thick honey or nectar fluids versus regular fluids with changing chin posture in patients with PD or dementia. They found that thick liquids such as nectar and honey reduced VFS aspiration compared to thin fluids, but increased rates of dehydration. Therefore, there is limited evidence to underestimate the alteration of the consistency of liquids and food, on important clinical results. (75) To reduce the risk of aspiration in patients with OD, a feeding tube is often used, however studies show that it does not improve swallowing or reduce aspiration pneumonia. (76) Feeding probes have been associated as a risk factor for aspiration pneumonia. (77)

## 1.8 Conclusions

The increasing aging in population, polypharmacy and chronic neurodegenerative diseases have lead dysphagia as an emerging underdiagnosed and undertreated clinical burden that may cause uprising morbidity and mortality in the elderly. OD must be integrated into the comprehensive geriatric evaluation in order to reduce related expenditures and costs produced by future complications. The treatment of dysphagia is simple, cost-effective and if applied in time can avoid high costs and increase life quality of patients. A multidisciplinary collaboration between geriatrics, neurologists, speech and language therapists, nutritionists, nursing staff and psychotherapists is essential to assess a complete rehabilitation.

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