

# Sarcopenic dysphagia

Daniela Patino-Hernandez, MD,<sup>1,3</sup> Miguel Germán Borda, MD,<sup>1,2,3</sup> Luis Carlos Venegas Sanabria, MD,<sup>1,2,3</sup> Diego Andrés Chavarro-Carvajal, MD,<sup>1,2,3</sup> Carlos Alberto Cano-Gutiérrez, MD<sup>1,2,3</sup>

<sup>1</sup> Instituto de Envejecimiento, Facultad de Medicina, Pontificia Universidad Javeriana. Bogotá, Colombia.

<sup>2</sup> Unidad de Geriátrica, Hospital Universitario San Ignacio, Bogotá, Colombia.

<sup>3</sup> Semillero de Investigación en Neurociencias y Envejecimiento, Pontificia Universidad Javeriana. Bogotá, Colombia.

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## Abstract

Sarcopenic dysphagia is a swallowing difficulty associated with loss of mass, strength and generalized muscular function. Its prevalence is higher among elderly patients and those with malnutrition or with disuse of the swallowing musculature. It is associated with adverse outcomes such as aspiration pneumonia and accumulation of waste in the oropharyngeal cavity after swallowing as well as with poor quality of life and prolonged hospital stays. A review of the literature available on the subject was done in order to provide a guide for early detection and management of this clinical entity which is needed for clinical practice.

## Keywords

Swallowing disorders, sarcopenia, aging.

## INTRODUCTION

Dysphagia affects 11.4% to 38% of the elderly in the community and 40% to 68% of the elderly in long-stay units. (1) Its frequency and severity increase in association with chronic diseases related to age. (2, 3) Dysphagia can be divided into two major groups: esophageal dysphagia and oropharyngeal dysphagia. Esophageal dysphagia is caused by conditions that compromise the structure or function of the esophagus while oropharyngeal dysphagia is a disorder of gastrointestinal motility. (4) It makes it difficult or impossible to move food bolus safely from the mouth to the esophagus and can lead to tracheobronchial aspiration. There is a constellation of heterogeneous etiologies that can cause oropharyngeal dysphagia, the most important of which are listed in Table 1. (5)

Several head and neck muscles are used simultaneously and in conjunction to coordinate swallowing. Any reduction of muscle mass or strength of these muscles can potentially have an impact on the swallowing function. (6) Sarcopenia is

a geriatric syndrome that has been defined by the European Working Group on Sarcopenia in Older People (EWSGOP) as decreasing strength, function and generalized muscle mass and as a potential cause of dysphagia. (7)

**Table 1.** Principal causes of dysphagia (1-2)

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Cerebral vascular pathology
Myasthenia gravis
Parkinson's Disease
Multiple sclerosis
Dementia
Amyotrophic Lateral Sclerosis
Muscular dystrophy
Head and neck tumors
Zenker's Diverticulum
Sarcopenia

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Both dysphagia and sarcopenia are common in the elderly population, but patients with sarcopenia may or

may not suffer from dysphagia. (1) Dysphagia can trigger or promote fragility in elderly people. In addition, there is a clear relationship between changes in nutritional status and adverse health outcomes in this population. (3) Hence, detection and management of this pathology are both important.

## DEFINITION

To define sarcopenic dysphagia it is necessary to differentiate among dysphagia, presbyphagia and sarcopenic dysphagia proper (8). Dysphagia is defined as any disruption in the swallowing process which occurs as the result of physiological or anatomical changes in the mouth, pharynx, larynx or esophagus. (3)

Presbyphagia includes all age-related changes in the swallowing mechanism. These changes can be caused by difficulty in forming and propelling a bolus, a decrease in the pressure of the tongue, obstruction of the passage of the bolus, stoppage of the bolus when swallowing, a decrease in the sensation of smell and taste (which makes swallowing more difficult), and loss of teeth. All these can also make mastication difficult (9).

Sarcopenic dysphagia, although also associated with age, (10) is diagnosed when there is also difficulty in swallowing due to sarcopenia in the masticatory muscles and other groups of the skeletal musculature. It is characterized by loss of muscle mass and strength of the swallowing muscles including the intrinsic muscle of the tongue and mimetic, masticatory, suprahyoid, infrahyoid, palatine, pharyngeal and esophageal muscles. (1)

## CAUSES

The risk of dysphagia increases with age so much so that prevalence is as high as 74% among elderly people living in long-stay units. (11). The reduction of muscle mass and the elasticity of connective tissue associated with age leads to loss of strength and range of motion of the tongue and other muscles involved in swallowing which negatively affects the swallowing process. (12)

The most frequent cause of oropharyngeal dysphagia is cerebrovascular disease in which case physicians routinely check for swallowing disorders according to protocol. However, this does not occur with sarcopenic dysphagia: it is rarely diagnosed because it has neither defined diagnostic criteria nor standardized methods of evaluation. (1)

The tongue plays a fundamental role in swallowing: it is responsible for formation, movement and manipulation of the bolus. For this reason evaluation of the muscles of the tongue is important for evaluation of swallowing. A study by Maeda et al. has evaluated the relationships among tongue

pressure, aging, nutrition, performance of basic activities of daily life and the appearance of sarcopenic dysphagia. The study found that decreased maximum voluntary pressure and dysphagia are related to sarcopenia. (13)

Another study by Shiozu et al. showed that the swallowing function, nutritional status and level of basic daily life activities among elderly patients who had sarcopenia were all significantly lower than among elderly patients without sarcopenia. (14)

Sarcopenia can cause dysphagia, but dysphagia can also cause sarcopenia by decreasing the dietary supply of amino acids. Once lingual atrophy occurs, secondary malnutrition develops and perpetuates the condition. (12-15) This occurs because swallowing muscles are formed primarily from type II muscle fibers which are more strongly affected by malnutrition and sarcopenia than are type I fibers. (16) In addition, prolonged hospitalizations and consequent periods of immobility, sometimes combined with fasting, accelerate muscle atrophy through disuse which increases sarcopenia. (3) Nevertheless, it has also been observed that sarcopenia is associated with dysphagia among people with no relevant pathological antecedents. As a result, the actual prevalence of sarcopenic dysphagia is unknown. (6)

## CONSEQUENCES

Dysphagia has two principal functional outcomes: aspiration, when food or liquid enters the airway, and accumulation of debris in the throat after swallowing. (17) This increases the likelihood of clogging and aspiration and also of bacterial colonization.

Aspiration pneumonia is a very common complication in patients with oropharyngeal dysphagia: it has been reported in up to 50% of patients in the first year and has a mortality rate close to 45%. (4-10). Weight loss secondary to low intake of food in patients with dysphagia increases the risk of opportunistic infections. (3) When there are signs of possible malignancy such as sudden weight loss, dysgeusia or hemorrhaging in a patient with dysphagia, the patient should be referred for evaluation by otolaryngology. (4) Malnutrition is secondary to limited intake of liquids and food, (18) and decreased intake may also alter the level of consciousness, generate physical weakness and cause poor coordination of the swallowing mechanism. (3)

Other complications associated with dysphagia include hydroelectrolytic disorders, dehydration and cramping. (2, 13, 18, 19) Even mild to moderate dysphagia affects the quality of life of the individual who suffers from it: mild dysphagia causes discomfort and a high probability of cramping which can cause embarrassment, prevent afflicted individuals from feeling comfortable eating in public and reduce the pleasure of eating. (20-22)

In addition, it has a significant impact on the lengths of hospital stays and is an indicator of poor prognosis. (2)

## DETECTION

Diagnosis of sarcopenic dysphagia requires appropriate clinical judgment by a geriatrician and a gastroenterologist who must know about, and be familiar with, this entity. Their evaluations require exhaustive study of dysphagia and sarcopenia. (7, 23)

Screening, physical examinations and complementary tests can all play roles in diagnosis of dysphagia. Several screening tools have been proposed. One of them is the EAT-10 (the 10 item eating assessment tool). This is a questionnaire with ten questions associated with dysphagia. Respondents score each question on a 0 to 4 scale within which 0 signifies “without difficulty” and 4 signifies “severe problem”. A score of 3 or greater suggests swallowing problems (Table 2). (24) This scale has been translated and validated in Spanish and is a good predictor of the risk of aspiration in people with dysphagia. (24, 25) Another scoring system is called the dysphagia severity scale. This is a 7 level scale within which higher levels indicate lesser degrees of compromise of the swallowing function. A score of 1 to 6 indicates dysphagia, whereas a score of 1 to 4 also suggests aspiration (Table 3). (26)

Finally, there are other screening methods for dysphagia such as tests of swallowing water or food, pulse oximetry, and cervical auscultation. (1) The volume-to-viscosity clinical exploration method evaluates both the efficacy and safety of the swallowing function. (5) Once a positive result has been obtained from these tests, it is important conduct videofluoroscopy and/or videoendoscopic evaluations.

On the other hand, sarcopenia should be evaluated according to the diagnostic criteria defined by the EWSGOP

mentioned above. (7) Muscle mass is evaluated by DEXA (dual energy X-ray absorptiometry), bioelectrical impedance analysis (BIA), CT scan, MRI, ultrasonography or anthropometry (perimeter of calf or arm). Muscular strength is evaluated through manual dynamometry or measurement of flexion and extension of the knee. Muscle function is measured through gait speed, the get-up-and-go test, or short battery of physical performance. (7)

Sarcopenia of the muscles involved in swallowing can be assessed by measuring the muscle mass of the geniohyoid muscle, by measuring the width of the tongue, or by lifting the head. (18) Tamura and colleagues described the measurement of the width of the central portion of the tongue through ultrasonography as an indirect way to measure lingual sarcopenia. This technique is useful because it is easy and is not invasive. (12) Another method of detection described by Yoshida et al. is measurement of lingual pressure in patients who can communicate. (13) Although decreased lingual pressure is associated with age, it has been suggested that the underlying mechanism may be sarcopenia in the musculoskeletal system of the head and neck. In addition, lower tongue pressure is associated with decreases in the cough reflex to avoid asphyxia, which is why evaluation is important. (13)

Computed axial tomography (CT) to measure swallowing muscle mass has also been described. Feng et al. found that the area of the cross-section of the geniohyoid muscle decreases in proportion to a person’s age, and that this diameter is smallest in patients who suffer aspiration. (27) Nevertheless, standardized methods for adequate measurement have not yet been clearly elucidated in the literature. (1)

On the other hand, during the Nineteenth Annual Meeting of the Japanese Society of Dysphagia Rehabilitation a consensus was reached regarding diagnostic criteria for sarcopenic dysphagia. The following factors are considered:

**Table 2.** EAT-10 Scale for Dysphagia Screening. 2011 SENPE National Congress (25)

Score each question on a scale of 0 to 4: 0 is no problem and 4 is a serious problem.					
My swallowing problem has resulted in weight loss	0	1	2	3	4
My swallowing problem interferes with my ability to eat away from home	0	1	2	3	4
Swallowing liquids requires an extra effort	0	1	2	3	4
Swallowing solids requires an extra effort	0	1	2	3	4
Swallowing pills requires an extra effort	0	1	2	3	4
Swallowing is painful	0	1	2	3	4
The pleasure of eating is affected by my swallowing problem	0	1	2	3	4
When I swallow, food sticks in my throat	0	1	2	3	4
I cough up when I eat	0	1	2	3	4
Swallowing is stressful	0	1	2	3	4

**Table 3.** Scale of outcomes and severity of dysphagia

<b>Normal diet: complete oral diet</b>	
Level 7: normal in all situations	
Normal diet	
No additional strategies or time is required	
Level 6: within normal limits/modified independence	
Normal diet, functional swallowing	
The patient may have mild oral or pharyngeal delay, retention or epiglottic undercoating, but with independent and spontaneous compensation/clearance	
May require additional feeding time	
No aspiration or penetration resulting from consistency	
<b>Modified diet and/or independence: complete oral diet</b>	
Level 5: Mild dysphagia: distant monitoring, may require restriction of consistency in diet	
One or more of the following may occur:	
Aspiration of thin liquids only, but with strong cough reflex to completely clear liquids	
Penetration midway through the airway up to the vocal cords with one or more consistencies or vocal cords with a consistency, but with spontaneous clearance	
Retention in the pharynx that clarifies spontaneously	
Mild oral dysphagia with reduced chewing and/or oral retention that is spontaneously cleared	
Level 4: Mild-moderate dysphagia: intermittent monitoring, one or two restricted dietary consistencies	
One or more of the following may occur:	
Retention in pharynx clarified with signal	
Retention in oral cavity clarified with signal	
Aspiration with one consistency, with weak or non-reflexive pips, or penetration of the airway to the level of the vocal cords with coughing with two consistencies, or penetration of the airway to the level of the vocal cords without coughing with one consistency	
Level 3: Moderate dysphagia: total attendance, supervision or strategies. Two or more restricted diet consistencies.	
One or more of the following may occur:	
Moderate pharyngeal retention, rinsing with signal	
Moderate retention in the oral cavity, rinsing with signal	
Penetration to the vocal cords without coughing with two or more consistencies, or aspiration with two consistencies, with weak or non-reflexive coughing reflex, or aspiration with one consistency, without coughing and penetration of the airway to the vocal cords with one consistency, without coughing	
<b>Non-oral nutrition needed</b>	
Level 2: moderately severe dysphagia: maximum attendance or use of partial oral strategies only (tolerates at least one consistency in a safe manner with total use of strategies)	
One or more of the following may occur:	
Severe retention in the pharynx, unable to clear or requires multiple signals	
Severe bolus loss or retention in the oral stage, unable to clear or requires multiple signals	
Aspiration with two or more consistencies, no cough reflex, weak voluntary coughing, or aspiration with one or more consistencies, no coughing and airway penetration to the vocal cords with one or more consistencies, no coughing	
Level 1: severe dysphagia: unable to tolerate any oral ingestion safely	
One or more of the following may occur:	
Severe retention in the pharynx, unable to clear	
Severe bolus retention or loss in the oral phase, unable to clear	
Silent aspiration with two or more consistencies, voluntary cough that is not functional or incapable of swallowing	

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| <ol style="list-style-type: none"> <li>1. Presence of dysphagia</li> <li>2. Presence of generalized sarcopenia</li> <li>3. Consistent imaging with loss of muscle mass</li> <li>4. Exclusion of causes of dysphagia other than sarcopenia</li> </ol> | <ol style="list-style-type: none"> <li>5. The main cause of dysphagia is considered to be sarcopenia if there are co-morbidities causing sarcopenia.</li> </ol> <p>A diagnosis of sarcopenic dysphagia is definitive if criteria 1 to 4 are met, a diagnosis is likely if criteria 1, 2 and 4 are</p> |
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met, and a diagnosis of sarcopenic dysphagia is possible if criteria 1, 2 and 5 are met (Table 4). (1)

**Table 4.** Diagnostic consensus for sarcopenic dysphagia

1. Dysphagia
2. Generalized sarcopenia (loss of skeletal muscle mass and strength)
3. Imaging results (CT, MRI, or ultrasonography) are consistent with loss of mass in swallowing muscles
4. Exclusion of other causes of dysphagia, except sarcopenia
5. Main cause of dysphagia is considered to be sarcopenia

Diagnosis is definitive if criteria 1 to 4 are met. Diagnosis is probable if criteria 1, 2 and 4 are met. Diagnosis is possible if criteria 1, 2 and 5 are met

MRI: magnetic resonance imaging, CT: computerized axial tomography

## TREATMENT

Both sarcopenia and dysphagia should be treated for proper management of sarcopenic dysphagia. Dysphagia rehabilitation should include oral health care (brushing of postprandial teeth, appropriate cleaning of dental prostheses, etc.) because it contributes to reduced incidence of aspiration pneumonia. (28) Although the effectiveness of dysphagia rehabilitation techniques appears to be limited, muscular strength training of the swallowing muscles is of great importance. (29) Similarly, the technique of head elevation improves the swallowing function and symptoms of dysphagia. (30)

In addition, it compensatory procedures such as the modification of the texture of solid foods and the thickness of liquids can be implemented. (27) Foods can be cut into small pieces or puréed, while liquids can be thickened to slow transit through the oral and pharyngeal phases of swallowing to avoid aspiration. (1)

Finally, sarcopenia should be treated with a combination of rehabilitation training and nutrition. The type of feeding should be based on the causes of malnutrition, sarcopenia and dysphagia for each individual patient. (16) Although the type of exercise recommended for patients with sarcopenia is still under discussion, an essential component is a minimum of three 30 minute sessions every week. It has also been suggested that physical exercise has a role beyond simply increasing muscle mass because it generates a reduction of inflammation, helps infiltration of fat into the muscles, and increases the presence of muscle satellite cells. (31) Dietary supplements that include amino acids or protein before exercise has also been described, and avoidance of cigarette smoking is recommended. In addition, underlying pathologies that cause or worsen sarcopenic dysphagia should be treated. (1)

## CONCLUSIONS

Sarcopenic dysphagia is a common clinical entity whose prevalence increases as the average age of population increases. It is associated with risks of malnutrition, aspiration pneumonia, hydroelectrolytic disorders, poorer quality of life and longer hospital stays. Therefore, early detection and timely intervention is necessary to reduce morbidity and mortality in the elderly population.

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