

Review Article

Dental management in dysphagia syndrome patients with previously acquired brain damages

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ABSTRACT

Dysphagia is defined as difficulty in swallowing food (semi-solid or solid), liquid, or both. Difficulty in swallowing affects approximately 7% of population, with risk incidence increasing with age. There are many disorder conditions predisposing to dysphagia such as mechanical strokes or esophageal diseases even if neurological diseases represent the principal one. Cerebrovascular pathology is today the leading cause of death in developing countries, and it occurs most frequently in individuals who are at least 60 years old. Swallowing disorders related to a stroke event are common occurrences. The incidence ranging is estimated from 18% to 81% in the acute phase and with a prevalence of 12% among such patients. Cerebral, cerebellar, or brain stem strokes can influence swallowing physiology while cerebral lesions can interrupt voluntary control of mastication and bolus transport during the oral phase. Among the most frequent complications of dysphagia are increased mortality and pulmonary risks such as aspiration pneumonia, dehydration, malnutrition, and long-term hospitalization. This review article discusses the epidemiology of dysphagia, the normal swallowing process, pathophysiology, signs and symptoms, diagnostics, and dental management of patients affected.

Key Words: Deglutition disorders, epidemiology, stroke

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INTRODUCTION

Dysphagia may be defined as difficulty in swallowing food (semi-solid or solid), liquid, or both.^[1] This common condition related with neurological disorders and it involves, the first two phases of swallowing and it is clinically called oropharyngeal dysphagia.^[2] Approximately 7% of population will experience dysphagia with risk equal between genders and increasing with age.

The proportion of older people is growing faster, approximately 600 million people are aged 60 years

and over, and this number is going to be doubled in the next 20 years.^[3] As the population age trend, the incidence of condition influencing dysphagia such as cerebral vascular accident, Parkinson's disease, dementia, multiple sclerosis, gastroesophageal reflux disease, and tumor is also on increasing [Table 1].^[2,3]

Recently, clinical studies have shown that patients affect by neurological diseases, such as stroke, parkinsonism syndromes, and others neurodegenerative pathologies, had an elevated incidence to developed swallowing disorders.^[4-6]

The normal swallowing process involves more than 26 muscles that control facial, palatal, suprahyoid, and pharyngeal structures with action coordinated by the cerebellum. In addition, intact function of the trigeminal (V), facial (VII), glossopharyngeal (IX), vagus (X), and hypoglossal (XII) cranial nerves is required.^[7-9]

The traditional process model of normal swallowing

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Table 1: Predisposing conditions for dysphagia

Disorder	Conditions
Neurological stroke	Dementia, amyotrophic lateral sclerosis, Parkinson's disease, multiplesclerosis, HIV/AIDS, myasthenia gravis, Huntington's chorea, Wilson's disease postpolio syndrome, Guillain-Barre syndrome, brainstem and cerebral neoplasms, poliomyelitis, peripheral neuropathy, achalasia, muscular dystrophy
Mechanical stroke	Acute inflammation of the oropharynx, trauma to or resection of the oral cavity, thyromegaly, neoplasms
Esophageal	Gastroesophageal reflux, stroke, scleroderma, esophagitis, osteoarthritis, strictures, hiatal hernia, esophageal spasm, strictures, lymphadenopathy, thyromegaly, neoplasms

describes the sequential discrete phases: oral preparatory, oral propulsive, pharyngeal, and esophageal. Swallowing can be divided into three moments; subconscious swallowing (which occurs approximately once on every minute), reflexive swallowing (which is an airway-protective mechanism triggered by a sudden stimuli, such as the arrival of refluxate from the stomach or an inadvertent drop of food into the pharynx); and nutritional, or volitional swallowing (which occurs when eating).^[2,8,10] When volition is involved, there is a swallowing network in the cerebral cortex that includes the insula, cingulate gyrus, prefrontal gyrus, somatosensory cortex, and precuneus regions. All of these areas are activated when a person takes a volitional, or nutritional, swallow (in contrast, a reflexive swallow activates only the sensorimotor area.).^[8,11]

The stroke is a condition that usually damaged one or more of these areas which disrupts the swallowing network and debilitates the command center. Therefore, swallowing becomes impaired.

Dysphagia can show up in a full blown way, with clinical evident signs such as suffocation or frequent and sudden cough, at the moment of feeding or drinking. It can appear in a less clear way, through an unable protection of the low airway and with possible pathologies ab ingestis.^[3,6,11]

Despite the presence of defensive reflex mechanisms in the low airway, even a silent inhalation may cause a series of pulmonary diseases, which could mine the survival of these patients with decreased immunological defences.^[10,11]

The aim of this article is to give a guide about the dysphagia condition in a brain damage condition, the normal swallowing process, the pathophysiology, signs and clinical symptoms, and diagnostics. Implications for practice also are discussed. Health care providers should be knowledgeable in assessing and diagnosing individuals with or at risk for dysphagia.

Therefore, this review underlines all the possible

clinical conditions arising with this pathologic event. Clinicians should perform a quick diagnosis in order to manage the signs and complications. A series of all the dysphagia-related conditions are presented through the paper in order to help clinicians to have differential diagnosis with similar pathologies.

PATHOPHYSIOLOGY

Dysphagia may involve impairment in any or all phases of the swallowing process. Impairment involving the oral phases of swallowing causes difficulty of bolus retaining in the oral cavity. Moreover, the chewing and the mandibular movement may be involved too at the oropharyngeal level. Impairment involving the pharyngeal phase results in the bolus retaining in the oropharynx and consequent overflow aspiration after swallowing. In this case, the bolus may also be diverted and lead to nasal regurgitation.

Impaired function in the esophageal induces an ineffective movement and retention of the bolus in the esophagus.^[12,13]

SIGNS AND SYMPTOMS

Patients affected by altered cognition such as dementia, severe depression, psychosis, head trauma, and stroke have a high percentage of being involved on dysphagia and those should be assessed on a regular basis.

Signs and symptoms that commonly motivate patients to seek medical care include coughing, choking, drooling, breathlessness, and gurgling during meals; cough between meals; dry oral mucosa; feeling something is stuck in the throat or upper chest; pain on swallowing; weight loss; dehydration; malnutrition; and nasal or esophageal regurgitation.^[12,14]

By anamnesis evaluation of signs and symptoms, health care providers can identify which phase of the swallowing process is involved in the dysphagia [Table 2].

Table 2: Signs and symptoms of dysphagia by swallowing phase

Phases of swallowing	Associated Symptoms
Oral	Droppling, facial asymmetry, pocketing food in the buccal cavity, poor tongue movement, inability to close lips tightly, leakage of food or liquid from mouth, impaired chewing, difficulty initiating swallowing process
Pharyngeal	Nasal regurgitation, inability to swallow, coughing, choking, "wet" voice quality, hoarseness, food sticking in throat
Esophageal	Burping or indigestion resulting from esophageal reflux, recurrent pneumonia (silent aspiration), bad taste in the mouth upon

DIAGNOSTIC EVALUATION

The diagnosis of many swallowing problems is possible through health history, includes nutritional status and current medication.

Drugs administration may cause adverse effects: xerostomia, central nervous system depression, immunosuppression, increased salivation, neuromuscular junction blockage, myopathy, esophageal mucosal injury, and esophageal sphincter.^[14,15]

Complete physical examination should be performed too including neurological and muscular evaluation. An interdisciplinary team should perform this investigation, which includes a health care provider, a nurse, a speech pathologist, a dietician, and a dentist. The head and neck position provides information related flexion or extension abnormalities, inhibiting movements of bolus and about mastication patterns including rotary chew, lateral chew/chomping and jaw jerk reflex, and suck-swallow.^[15]

The most commonly used diagnostic test is a video fluoroscopic investigation. Video-fluoroscopy is used to observe, record, and analyse the swallowing process as the patients swallow contrast materials of different sizes and consistencies.

The equipment required to perform the investigation comprises a fluoroscopic tube large enough to include images of the oral cavity, pharynx, larynx, and upper oesophagus, as well as a high-resolution video recording system. A more recent diagnostic method is the use of a tiny, very narrow video-endoscope traversing through the nostril into the pharynx, so that the physicians can investigate whether the swallowed material enters the airway.^[8,12,15]

The examination, which consists in recording fluoroscopic images, which appears on the monitor during intake by the patient of a radio-opaque bolus, enables a precise evaluation to be made, not only of the morphological features but also the dynamics of the swallowing act, including its three phases: oral, pharyngeal, and oro-esophageal.^[16]

TREATMENT

The objective of the evaluation of dysphagia syndrome is the restitution of lost reflex function and of the physiological mental scheme.

The rehabilitative treatment must be set by the neurologist with the aid of a speech therapist and with the ear, nose, and throat specialist therapeutic, with the dentist, through the packaging of prosthesis, which can help the patient to perform adequately different moments of the swallowing action.

The main goals of therapy are to prevent aspiration, to maintain swallowing, and to retrieve the nutritional status.^[6,9,17] Through appropriate compensation strategies, with the recruitment of specific postures and with the training, the patient is sent to control the various stages of swallowing [Figure 1]. These measures, called "adaptive", include the change in diet towards firm, thickened, and possibly cold foods, so as to reduce spasticity. Foods must have the characteristics of homogeneity, adequate viscosity, palatability, and nutritional power.^[18,19]

In subjects in whom the neurological damage does not allow adequate active psychological participation, the main objectives are recovery of reflex activity, focusing attention on the oro-pharyngeal sensitivity, and the protection of the airways. The nutritional component therefore cannot be considered as objective as insufficient.^[19]

DISCUSSION

The goal of early assessment and diagnosis is to formulate an intervention plan that provides safe and adequate nutrition for the patients affected by this uncomfortable condition. Research regarding neural plasticity has demonstrated how pathologic variations mediated by recruiting other available neural pathways establish normal function.^[1,3,11] Interventions include maneuvers such as placing the patient in anatomically correct position with head and trunk leaning slightly forward and seat at 90° with the head upright position

during feeding. Moreover, they also include changing consistence and volume of food, avoiding accumulation of dried secretions into the mouth for the prevention of oral infection. Exercises designed to strengthen muscles involved in respiration, phonation, and articulation are important conditions for recovering by swallowing disorders. Respiratory muscle strength training using a pressure threshold of 75% of maximum expiratory pressure produced 50% improvement in muscle asset and control after 3 to 4 weeks of training that in turn is assumed to improve swallowing.^[3,8,11,13,14]

Dysphagia rehabilitation in older adults may become more focused on exercises that affect neural plasticity, producing changes in central neural pathways as well as muscles. The swallowing is a complex physiologic mechanism needed for conveying saliva, liquids, and bolus from the mouth to the stomach, through contractive phenomena of the voluntary oropharyngeal muscles and of visceral esophageal muscles. This cyclical function recurs about 2000 times for day with an average duration of 1 s.^[4,6,17,20]

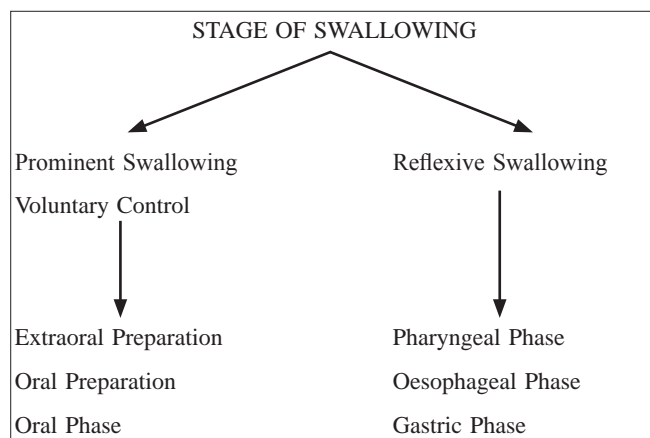


Figure 1: Stage of swallowing

The first phase, said “oral phase”, is totally voluntary and involves transporting, by oral and tongue muscles, of the bolus toward the rear upper in the direction of soft palate and then to the pharynx [Figures 2 and 3]. The second phase, said “pharyngeal phase”, is characterized by involuntary acts and by activation of mechanisms to activities peristaltic reflexes, triggered by the contact between the sensitive areas and receptors with the food bolus [Figure 4]. The muscle lifter the palate veil is positioned to close the pharynx [Figure 5] and the folds are close to each other while the epiglottis stoops covering the entrance to the trachea [Figure 6].^[21,22]

The esophageal phase is supported by peristaltic waves advancing in the direction of the stomach, where the lower esophageal sphincter with its closure prevents reflux. When the LES closes, epiglottis is reopened and breathing starts again.

Dysphagia means a disease of the swallowing process, which includes difficulty in transporting food or liquid bolus from the mouth through the

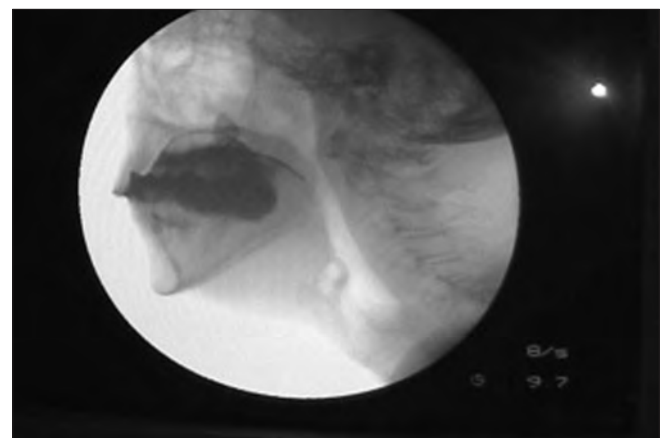


Figure 2: Preparation of oral swallowing: physiology

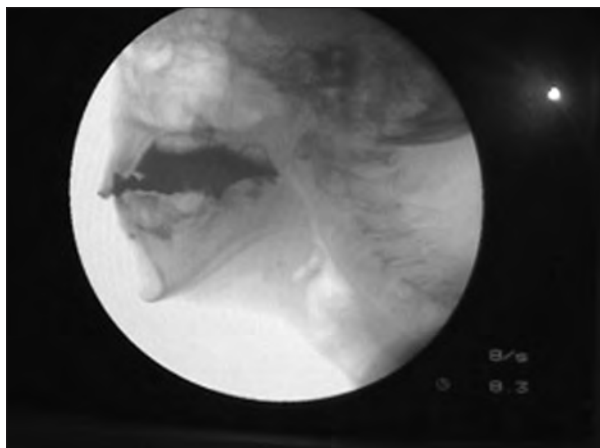


Figure 3: Voluntary transport of the bolus

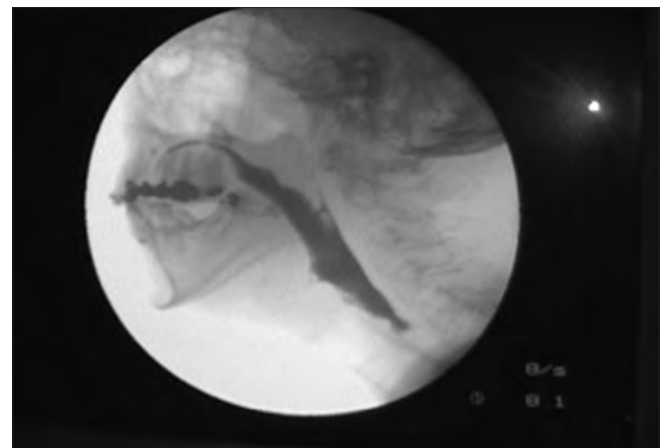


Figure 4: Physiological stage of swallowing throat

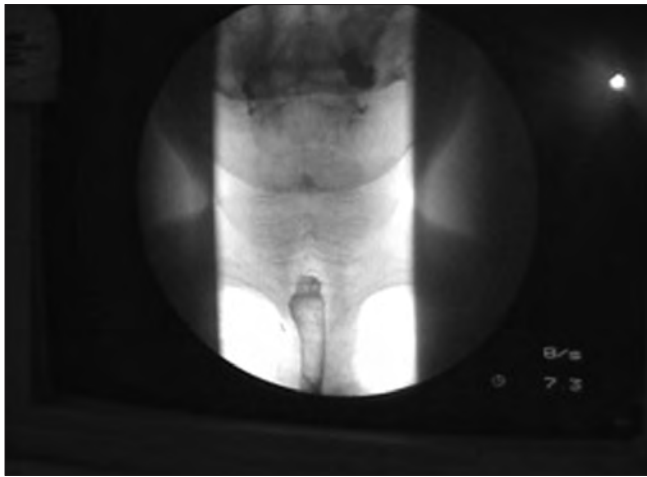


Figure 5: Stage of the esophageal swallowing process

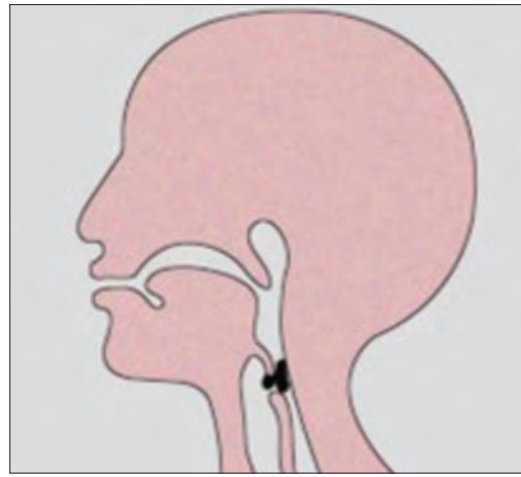


Figure 6: Reduced control of capabilities in the swallowing process

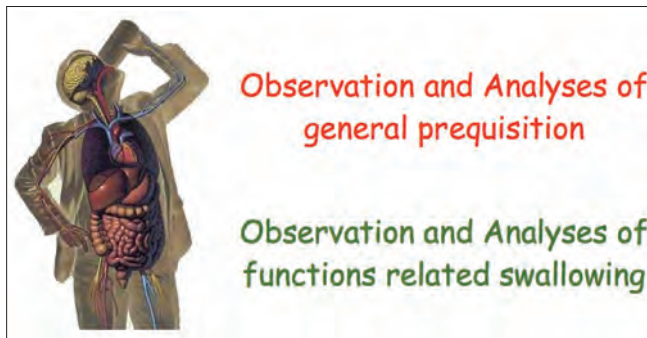


Figure 7: Clinical evaluation of the dysphagia signs

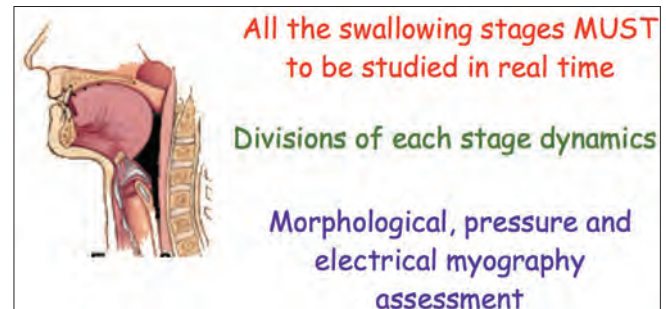


Figure 8: Instrumental investigation used for performing diagnosis

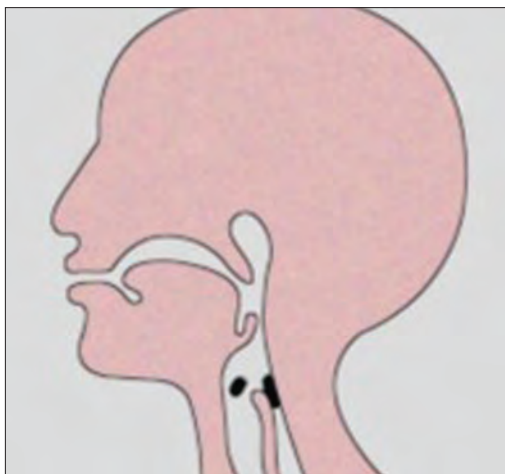


Figure 9: Delayed or absent pharyngeal reflex stimulation

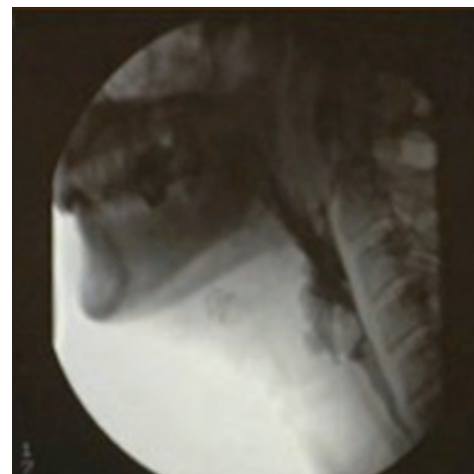


Figure 10: Moment of videofluoroscopy

pharynx and esophagus into the stomach. Causes of this disease can be divided into oropharyngeal and esophageal, according to the anatomical distinction, or neurological, neuromuscular, or muscular for the etiology [Figures 7 and 8].^[23-25]

Neurological and neuromuscular causes may localize to different levels (supra-nuclear level, level of motor

and sensory nuclei taking part in swallowing process, peripheral nerves level, and muscle level) and include: stroke, brain tumors, bulbar and pseudobulbar paralysis, neurodegenerative diseases (amyotrophic lateral sclerosis, multiple sclerosis), Tabes dorsalis, Parkinson's disease, Huntington's disease, Myasthenia and myasthenia syndromes, myopathies, and peripheral neuropathies.^[24,25]

Recent research studies have revealed how 67% of the patients suffering from stroke develop swallowing disorders at 72 h from the cerebrovascular accident; moreover, 8 years after diagnosis 45% of Parkinson patients present dysphagia is more or less evident.^[25]

Moreover, the important data are related to the finding of 40% of deaths on patients affected by acquired brain damages, which is due to the septic infective complications of swallowing. It is essential for careful clinical evaluation of swallowing capacity and also more nuanced symptomatology relating to. Frequent resulting of cough reflex at nutrition or hydration represents the first signals. The lack of tactile sensitivity in the oral cavity gives these patients having difficulty on control the liquids. For this reason, those patients are conducted to avoid these substances, risking dehydration and emaciation [Figure 9].^[21,26]

Aspiration is the most frightening event and it can be occurred before swallowing. The main cause is the reduced lingual control function, or lack of sensitivity. Aspiration is related to the altered lingual mobility or delayed or absent pharyngeal reflex stimulation too.

Aspiration occurs just after swallowing for the retention of food residue in the pharynx. In this event, parts of the food are aspirated into the airways from a subsequent inhalation.^[12,14,17,21,26]

The liquids aspiration or the solids stagnation into the airways induces an increase of microbial populations (mainly negative gram) causing infectious processes by ab ingestis diseases. Therefore, a type fever of septic nature may occur with post - prandial remitting.

During the assessment, the analysis of the patient eating habits and a careful analysis of swallowing reflexes should be made.^[13,16,21] It is important to assess the validity of this reflection, monitoring the amount of food reflux in the mouth after swallowing, which then could be perceived like foreign body and be aspired.

Moreover, the physician should check by using the responsiveness test, the posture in the various plans of the area; whether the patient is able to effectively monitor the movement of head and especially the ability to produce a voluntary effective cough.^[7,24]

Dysphagia can develop into aspiration pneumonia with an increase in the catabolic condition of the patient and requires more energy and an increase in nutritional demands.

Rapid diagnosis and management of the swallowing disorder should be directed to the early identification of those patients with dysphagia presenting risk of aspiration. The exclusion of the presence of structural alterations of the organs involved in swallowing and the characterization of the alteration of the swallowing mechanism responsible for the dysphagia are the two parameters that clinician should underline during the diagnosis. Then, a specific therapeutic strategy, which includes the choice of the type of food to be given and/or planning of the rehabilitative logopedic treatment, should be performed. The main diagnostic tests are the pH-metry in 24 h, ultrasound, esophagography, videofluoroscopy, endoscopic examination, and scintigraphy. Through the fiberoptic endoscopic evaluation of swallowing (FEES), we can then identify the time of swallowing deficit [Figure 10].^[11,27]

CONCLUSIONS

Early diagnosis of dysphagia syndrome is important to improve the living conditions and survival of affected patients. To achieve this, diagnosis and treatment should involve many professional figures, ranging from basic physicians to neurologists, speech therapists, nose and throat specialists, and even the dentists, who should cooperate in the service of screening for these diseases. As discussed throughout the article, the cooperation between several specialists is fundamental to solve all the dysphagia signs and symptoms as soon as possible.

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