Turk J Phys Med Rehab 2021;67(3):267-274
DOI: 10.5606/tftrd.2021.8427
Available online at www.turkishjournalpmr.com

Invited Review

Dysphagia management during COVID-19 pandemic: A review of the literature and international guidelines

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Received: February 17, 2021 **Accepted:** March 20, 2021 **Published online:** September 01, 2021

ABSTRACT

In this review, we present the safest and most effective diagnosis and treatment approaches to dysphagia during the novel coronavirus-2019 (COVID-19) pandemic in the light of available data, relevant literature, and personal experiences. Evaluations for dysphagia patients should be based on clinical assessment during the COVID-19 pandemic and instrumental assessment should be planned for very few number of patients. The main approach to rehabilitation must depend on compensatory methods, texture-modified foods, and postural strategies. Direct treatment methods should be avoided and home-based exercise programs should be encouraged. It is also obvious that there is a need for the development of new strategies for telemedicine/telerehabilitation practices in the new world order.

Keywords: COVID-19, dysphagia, management, swallowing, treatment.

Since the World Health Organization (WHO) declared the novel coronavirus-2019 (COVID-19) pandemic, many disciplines concerning swallowing disorders, similar to all other health professionals from different fields, have faced problems about the actions to be taken during the process. Guidelines have been developed on dysphagia and in other fields to assist experts in clinical practice. In this regard, an updated road map has been prepared according to the conditions of our country, taking into account the literature and clinical practice.

COVID-19 AND DYSPHAGIA RELATIONSHIP

Severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) responsible for COVID-19 enters into the host cells via the angiotensin-converting enzyme 2 (ACE-2) receptor in human lower respiratory tract. The ACE-2, which is primarily associated with cardiovascular diseases, is a membrane protein expressed in the lungs, heart, kidneys and intestines, leading to disorders mainly in the pulmonary system, as well as the cardiovascular, gastrointestinal and hepatic systems.[1]

Unfortunately, all the conditions and procedures implemented in connection with COVID-19 itself or its treatment such as acute respiratory distress syndrome (ARDS), multiple organ failure, sepsis, neurological complications, loss of smell and taste, sedative agents used in the intensive care, non-invasive mechanical ventilation, oxygen treatment, intubation, tracheostomy, malnutrition and muscle wasting affect swallowing functions negatively.[2] One study conducted in Turkey showed that 20.6% of COVID-19 patients suffered from dysphagia.[3] However, this ratio is considered to increase with further studies to be carried out. In this review, we discuss the relationship between COVID-19 and dysphagia from different aspects in the first place.

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Cite this article as:
Eyigör S, Umay E. Dysphagia management during COVID-19 pandemic: A review of the literature and international guidelines. Turk J Phys Med Rehab 2021;67(3):267-274.

PATIENT CHARACTERISTICS

Although new information is obtained about COVID-19 every day, studies defining the risk factors and risk groups are still insufficient. Studies define such characteristics as old age, presence of additional comorbidities, smoking and being a healthcare professional as risk factors and associate them with severe disease.[4-6]

Old age

In studies including COVID-19 patients, the mortality rate is 18 times higher among patients aged ≥60 years and approximately 70 times higher among those aged ≥80 years.[7,8] The number and size of muscle fibers start to decline with advancing age all over the body, and the increase in muscle loss leads to functional disorders. Sarcopenia, which is characterized by the degenerative loss of muscle mass and strength, is almost an unchangeable condition related to aging. In addition, respiratory muscles get weaker and lose their elasticity, lowering both perfusion and ventilation capacities. Sphincter muscles get weaker and acid secretion decreases in the stomach. Nerve conduction velocities slow down the reflexes. Losses of sensory functions including taste and smell are also among common problems. Changes in the immune system called immunosenescence brings about susceptibility to infection, autoimmunity, and malignity.[9] Such changes cause COVID-19 to have a more severe progression in elderly.

As in all other systems, changes also occur in swallowing functions with aging. Presbyphagia is characterized by the changes in the swallowing mechanism of healthy older adults occurring with the normal aging process. Each phase of deglutition is affected. Changes seen in presbyphagia include bolus control, preparation and damage in its transportation, delayed triggering and initiation of swallowing, delayed opening of the upper esophageal sphincter and weak esophageal peristalsis.[10]

Recent studies have reported that healthy older adults have dysphagia that they are not aware of and, thus, they experience varying degrees of dysphagia in their daily lives.[11] Hence, together with these disorders, which are present at the background, COVID-19 may lead to dysphagia development or increase the severity of existing dysphagia.

Comorbidity

In studies conducted with COVID-19 patients, fatality rates are reported as 0.9% in patients with no comorbidities, 10.5% in the presence of a cardiovascular disease, 7.3% in the presence of diabetes mellitus and chronic obstructive pulmonary disease (COPD), and 6% in patients with hypertension.[12] Hypercoagulability and metabolic acidosis that develop in the aforementioned diseases may cause mortality.

Cardiovascular, metabolic/endocrine and respiratory diseases are potential, *albeit* indirect, risk factors for oropharyngeal dysphagia. According to related studies, the fact that these disease groups cause cerebrovascular diseases is a risk factor for the development of dysphagia.[13] In addition, in cases of COPD, asthma, pulmonary fibrosis, and heart failure, leading to impaired swallowing synchronization, dysphagia and aspiration risk increases.[14,15]

Smoking

While the initial findings about the relationship between smoking and COVID-19 were controversial, a recent meta-analysis have shown that there is a relationship between active cigarette smoking and the disease.[16] The smoking-related decline in the lung capacity and chronic inflammation have been reported to accelerate the lung damage caused by the disease.

Since it inhibits the pharyngeal swallowing reflex and cough reflex, has a direct toxic effect on the ciliary mucus of the respiratory tract, and due to its carcinogenic components, cigarette smoking itself is a risk factor for dysphagia.[17]

CHARACTERISTICS OF COVID-19

Based on the latest data from the WHO, the number of COVID-19 cases worldwide is approximately 110 million of as of February 2021.[18] Since COVID-19 was accepted as a global pandemic, the hospitalization rate was reported as 380.3 per 100,000 population.[12] As the methods to combat the disease improved, the high rates at the breakout fell to 17.8 per 100,000 population as of December 2020. Hospitalization in COVID-19 is usually associated with ARDS occurring due to pneumonia, pulmonary or non-pulmonary reasons.

Tachypnea and dyspnea

Tachypnea and dyspnea are frequent symptoms observed in COVID-19 patients. The increased respiratory rate (>25 breaths/min) and disrupted breathing-swallowing coordination increase the risk of aspiration for both healthy persons and those at risk for dysphagia.[19] This desynchronization becomes more apparent with the disruption of ventilation due

to the alveolar damage and edema and of the perfusion due to hypercoagulability caused by COVID-19, leading to aspiration.[20] Studies have reported that aspiration occurs, particularly with large volumes (100 mL) of liquids in patients with disordered breathing patterns.[19] Besides tachypnea and dyspnea, low oxygen saturation (SpO2) is not always associated with aspiration and <94% SpO_2 is defined as an increased risk for aspiration by relevant studies.[21]

Loss of taste

Taste and smell play an important role in the selection of diet, metabolism, eating habits, and quality of life. Studies have shown that taste/smell dysfunction is among the most common symptoms observed in COVID-19 patients.[22] The prevalence of taste alterations ranges between 11 and 88.8%. As a matter of fact, sudden-onset ageusia (loss of taste) and anosmia (loss of smell) is recognized as the key clinical symptoms of COVID-19.[23] Possible mechanisms for this symptom include a direct damage of the olfactory and gustatory receptors, damage of the ACE-2 receptor in the oral cavity, and decreased interleukin (IL)-6 levels. Improvement is seen 7 to 14 days after the infection, while it may be persistent in some patients. The mechanism responsible for its persistence has not been clearly known, yet. When persistent, it is considered that dysphagia and nutrition problems may be faced in the long-term. Moreover, disruptions in the consumption of salt, sugar, and fat and over consumption leads to the deterioration of accompanying diseases, such as hypertension and diabetes. Thus, nutritional monitoring is recommended for patients with COVID-19-related loss of taste/smell.[24] Therefore, considering the relationship between loss of taste/smell and swallowing disorder, there is a clear need to pay more attention to the issue.[25-27]

Neurological findings

Recent studies have reported neurological findings in COVID-19 patients with moderate-to-severe pneumonia.[28,29] The disturbances in cognitive functions and consciousness defined as delirium develops as a result of a direct infection of the central nervous system, hyperinflammatory cytokine storm, increased oxidative stress, and hypoxemia. These disturbances in the cognitive function affect all the phases of swallowing increasing the risk for aspiration.[28] Similarly, dysphagia may become a critical problem in cases manifested with stroke or Guillain-Barré syndrome.[2]

There is an ongoing discussion on the fact that the virus targets the cerebral cortex, subcortex and brainstem structures, peripheral nerves and muscles, as well as the complete swallowing network. These are the hypotheses that the virus is neurotrophic and affects the cranial nerves (vagus, hypoglosus) involved in swallowing and about the effect of the virus on the sensitivity of the pharynx and larynx.[26,30]

Malnutrition

The relationship of nutrition with muscle mass and dysphagia is discussed in many diseases primarily geriatric syndromes.[31] The elevated doses of sedatives and opioids during intensive care have been found to contribute to intestinal dysmotility, weight loss, and cachexia in COVID-19 patients. Moreover, the cytokine storm in COVID-19 is associated with muscle mass loss, weakness, and fatigue.[32] Swallowing problems are listed among the determining factors for malnutrition.[30,33] Malnutrition and muscle wasting seen in COVID-19 patients contribute to the development of dysphagia.[31] All types of potential muscle losses and nutritional disorders to develop in COVID-19 patients are intertwined with many clinical conditions mentioned in this section and pose a risk for dysphagia.

CHARACTERISTICS OF COVID-19 TREATMENT

High-flow oxygen therapy (nasal high-flow oxygen therapy-HHO_2)

Nasal HHO_2 used in the treatment of hypoxemia secondary to lung involvement in COVID-19 patients is an effective method which is more reliable than interventions of invasive ventilation.[34,35] The HHO_2 improves patient comfort, generates a continuous positive airway pressure effect, decreases the resistance in respiratory tracts, and improves secretion clearance. However, this stable positive pressure affects the chemo- and mechanoreceptors in the pharynx and larynx causing a delayed swallowing reflex, hypoesthesia in these areas, laryngeal adduction, a weakened retching and cough reflex, and a disrupted respiratory-swallowing pattern.[36,37]

ARDS, intensive care and endotracheal intubation

In COVID-19, patients who are resistant to oxygen supportive therapy and develop ARDS are required to be transferred to the intensive care unit (ICU) and intubated. Intensive care, itself, is a risk factor for dysphagia. In addition to the muscle and nerve

injuries due to the direct trauma of orotracheal and tracheostomy tubes to the vocal cord, tongue base, epiglottis, arytenoids, and the local effects such as sensory losses caused by edema and lower input, critical illness neuromyopathy, diffuse atrophy due to the general sedation-related muscle immobilization throughout the body pave the way for the development of dysphagia, as well.[38,39]

Intubation in the ICU and extended mechanical ventilation are the most important independent risk factors for dysphagia.[36,40] Local mucosal injuries that occur due to endotracheal intubation, muscle atrophy, and sensory loss cause the development of silent micro-aspirations. Studies conducted in ICUs report that 83 to 94% of laryngeal injuries are seen after the average one-week intubation and that half of the patients develop resulting dysphagia.[41,42] It has been also demonstrated that this condition usually continues for nearly one week following extubation, while it may be prolonged up to one to three months.[43] Each intubation of two days or longer is stated as a risk factor for chronic dysphagia.[44] The first 24-h post-extubation is defined as the most critical period, when silent aspirations are the most frequent.[43] The risk of saliva and secretion aspiration increases in the prolonged prone position implemented in the follow-up of COVID-19 ARDS, which causes difficulty in terms of oral hygiene.[36] Similarly, implementation of a tracheostomy increases the risk for dysphagia and aspiration in this patient group. The presence of a tracheostomy leads to laryngeal and pharyngeal dysfunction during swallowing in 87% of cases.[45,46]

Dysphagia-related tracheostomy complications include reduced laryngeal activity, muscle atrophy, vocal cord paralysis, esophagus obstruction, and development of tracheoesophageal fistula due to the reduced coughing reflex and swallowing frequency and inflated cuff as a result of the laryngopharyngeal sensory loss, glottal closure insufficiency and subglottal pressure decrease depending on the duration and volume of the tracheostomy and cuff inflation pressure.[45,47]

Drugs used in the ICU setting

Sedative agents and opioids used in the ICU are associated with an increased risk of neuromuscular muscle weakness, disruption of the pharyngeal and/or lingual propulsion of the bolus and stasis, pharyngeal dysfunction, and breathing-swallowing coordination disturbance.[2,26] There is also an increased possibility of gastroesophageal reflux due to the lying position and sedative agents.[26] The presence of reflux is considered as a risk factor for dysphagia and aspiration.[48-50]

To sum up, factors that lead to a severe progression of COVID-19, changes caused by the disease in the body and treatments implemented may all be risk factors for dysphagia. The possibility of dysphagia development should be kept in mind for COVID-19 patients, particularly for those hospitalized with a severe progression of the disease. Unfortunately, clinicians do not have a sufficient level of awareness of the subject, yet.[30,51]

DYSPHAGIA MANAGEMENT DURING THE COVID-19 PANDEMIC

Methods involving the diagnosis and treatment of dysphagia include evaluations concerning the fact that the risk of infection of the virus is considerably high. The most common questions that clinicians ask in the clinical practice are how to approach dysphagia patients during the COVID-19 pandemic and what needs to be considered in requiring further examination and treatment. Recommendations for approaches to be used in the clinical practice for COVID-19 are made in different fields by different disciplines and different countries.[2,52-59] The most prominent of all these concerns is the use of personal protective equipment (PPE) by the healthcare staff. Protection of the clinician has to come first.

Although a specific strategy has not yet been developed as to which patient to examine, examination is recommended for patients who are intubated for more than 48 h, particularly for COVID-19 patients. It is suggested that the examination is performed by a nurse or speech language pathologist.[40] Bedside assessment is recommended rather than a detailed instrumental examination. Variable examination timepoints are recommended (e.g., one to five days after extubation). Elective and non-urgent cases could be deferred. Assessment should be restricted to patients with a serious condition such as aspiration pneumonia, malnutrition or sepsis, those having dysphagia of unknown origin or a life-threatening disease such as head-neck cancer or neuromuscular disorders or those who are unable to take sufficient nutrition.[52]

In addition, methods such as the screening tests can be used asking questions to the patient or his/relatives.[60] Non-invasive interventions should be the first choice as far as possible -including a detailed medical history, Eating Assessment Tool-10 (EAT-10) for dysphagia symptoms), and cranial nerve

examination.[59,61,62] The use of such tools as Toronto Bedside Swallowing Screening Test (TOR-BSST), Yale Swallow Protocol, Volume Viscosity Swallow Test (V-VST), and Mann Assessment of Swallowing Ability (MASA) is recommended for screening oropharyngeal dysphagia; however, it must be remembered that swallowing screening has not yet been validated for COVID-19 patients.[54]

Clinical examination

It is advocated that each patient must be considered a potential COVID-19 patient, unless proven otherwise.[63] It is recommended that sufficient information should be obtained about the patient, and such assessments should be made by a multidisciplinary team and only conscious patients with a stable respiratory status should be assessed.[2]

A particular attention must be paid to the use of aerosol-generating procedures and the donning/doffing PPE procedure. The donning of PPE (N95 or FFP2-3 masks, gown, face shield/goggles and gloves, bone with COVID(+) patients; surgical masks, goggles, face shields and gloves with COVID(-) patients) is considered mandatory.[2,52] Hand hygiene is strongly recommended before and after contact with patients and after doffing off the PE.[59]

Practitioners should be positioned at a 1 to 2-m distance to the side of the patient, instead of face-to-face examination. Gag reflex and voluntary control of coughing are not recommended. It is suggested that orofacial muscle and cranial nerve examinations should be performed, while speaking and resting, and oral cavity examinations should be avoided and the use of light is necessary. Assessment through self-feeding is recommended. Examination times should be limited to a maximum duration of 10 to 15 min keeping the number of repeated swallows low. Vocal quality, aspiration signs, oral stasis-residue, triggering of the swallow response, laryngeal and hyoid movements must be monitored by maintaining follow-ups from a distance from the patient. Laryngeal palpation and hyoid movement assessments are advised not to be performed according to a majority of authorities.[2]

Instrumental examination

Evaluations must be based on clinical assessment.[2] Such practices as flexible fiberoptic endoscopic evaluation of swallowing (FEES), videofluoroscopy (VF), pharyngoesophageal manometry, and electroneuromyography (ENMG) should be performed only in case of life-threatening conditions. They should be planned, only if clinical assessment is not sufficient for treatment or if the clinical condition of the patient is not appropriate for postponing assessment. It must be guaranteed that all persons present in the environment of practices and those using the same instrument are COVID-19 free.[52]

Instrumental assessment is recommended for a very limited group.[40] It must be planned by a multidisciplinary team only in the presence of silent aspiration and excessive secretion, insufficient clinical evaluation, risk of dysphagia-related dehydration, malnutrition or aspiration, and if the intervention cannot be deferred or alternative nutrition cannot be provided.[40] Due to working in a short distance and the risk of coughing-sneezing during the procedure, FEES implementation poses the clinician at high risk for viral load.[52,54]

Aerosol-generating procedures and donning/doffing PPE procedures must be followed under very strict conditions of protection. Instrumental assessment should be made by a minimum number of healthcare providers, as possible. It should be planned in the ICU, in a negative pressure isolation room with air filter, but not face-to-face and using disposable fluoroscopy, if available. The room must be disinfected afterwards. Laryngeal sensitivity test is contraindicated in these patients. Two different viscosity-consistency and maximum two trials are recommended in the FEES protocol. Standardized scales such as the Penetration Aspiration Scale (PAS) and Yale Residue Scale (YRS) should be used.[2] Endoscopy must be removed carefully to avoid coughing and sneezing. The primary physician must be informed in case of a laryngopharyngeal reflux or excessive secretion.[52]

The VF is considered to be a relatively safe procedure. However, the areas, corridors, and elevators through which the patient passess while being transferred to the procedure room pose a risk for contamination. Recommendations are made for the disinfection of the environment, presence of an air filter, and a low number of healthcare providers inside. Sufficient time must be allocated for cleaning between implementations. Indications of VF implementation are similar to FEES, while it must be performed in only a limited number of cases. Similar recommendations are made for pharyngoesophageal manometry, as well.

Rehabilitation

Considering the recommendations of international societies of dysphagia, variances among the duration, frequency, and environment of treatment in dysphagia rehabilitation attract attention.[52,54,59,64]

The use of compensatory rehabilitation methods is advocated. It is recommended that durations of treatment should be shortened. Risky approaches in terms of virus load such as thermal tactile simulation and expiratory and inspiratory muscle strength training must be avoided. Similarly, face-to-face breathing exercises by the patient and therapist and special swallowing maneuvers that require coughing are not recommended.[52] On the other hand, tongue, lips, neck, and temporomandibular joint range of motion and tongue, lips, neck and temporomandibular joint strengthening exercises, and Shaker exercises are recommended due to the low infection risk they pose.[59]

Patient and their caregivers should be informed about following oral hygiene directions.[2,52] Since chlorhexidine frequently used in clinical practices is not effective in COVID-19, 0.2% povidone or 1% hydrogen peroxide can be used for mouth washing/rinsing.[59]

After patient information and teaching the exercises, aerosol-generating procedures and donning/doffing PPE procedures must be complied (both by following the rules during education and cleaning around after the patient). Recommendations are made in a well-ventilated room, being physically distant and wearing masks, and the presence of the patient and his/her attendant only, if possible. All the procedures must be completed as soon as possible (10 to 15 min).

It is advocated that treatments such as electric stimulation and transcranial magnetic stimulation should be deferred.[2] However, recommendations of the Society of Swallowing and Dysphagia of Japan (SSDJ) include the use of electric stimulation therapy.[59]

Non-oral nutrition is recommended in the presence of cough after swallowing liquid and thickened liquid, while nutrition with thickened fluids is recommended in the presence of cough with liquids only. A nasogastric (NG) tube or percutaneous endoscopic gastrostomy (PEG) is required, if oral nutrition is not safe. The latter is preferred to NG owing to its simplicity of insertion and the reduced risk to both patient and healthcare providers.[40]

Telepractice-telemedicine and telehealth consultation methods are frequently encountered among the recommendations made by the societies and organizations related to dysphagia treatment in the literature. Telemedicine consultation systems have been reported to be effective in patients who develop dysphagia during the COVID-19 pandemic.[65] The system is particularly recommended for the diagnosis and follow-up of patients who have neurological disorders including stroke and head and neck cancer in which dysphagia is frequently seen.[2,52,53]

However, the use of telemedicine methods requires certain criteria.[53] It is reported to be suitable for patients, who have the cognitive capacity to understand the system, be positioned in front of a camera and maintain this position for a while, and hear, see and comprehend visual/audial stimulants and who have a family/caregiver support.[53]

In concussion, this review provides a brief summary of the safest and most effective diagnosis and treatment approaches to dysphagia during the COVID-19 pandemic in practical terms based on the available data, relevant literature, and personal experiences. Considering the viral mutations, absence of an effective treatment for COVID-19, and difficulties to reach the vaccines, it is evident that we must follow such recommendations for a while. Evaluations for dysphagia patients must be based on clinical assessment during the COVID-19 pandemic and instrumental assessment should be planned for very few number of patients. The main approach to rehabilitation must depend on compensatory methods, texture-modified foods and postural strategies. Direct treatment methods should be avoided and home-based exercise programs should be encouraged. It is also obvious that there is a need for the development of new strategies for telemedicine/telerehabilitation practices in the new world order.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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