COMPREHENSIVE ASSESSMENT OF DYSPHAGIA IN PATIENTS WITH NEURODEGENERATIVE DISEASES

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Abstract

Dysphagia in neurodegenerative diseases represents a heterogeneous group of symptoms linked to specific diagnoses, progression, and patient age. This review summarises selected available diagnostic tools for dysphagia in neurodegenerative diseases. The article emphasises the need for individualisation of assessment due to the progressive nature of neurodegenerative diseases. The progressive nature distinguishes this population from other neurological conditions and limits the transferability of some tools.

In addition to clinical swallowing examinations, there are water swallow tests, combined bedside protocols, and tests focused on swallowing different consistencies, which vary in clinical scope, administrator expertise, and equipment requirements. Self-assessment questionnaires provide the patient's perspective on swallowing difficulties, although cognitive impairment must be taken into consideration. The article also refers to the gold standards for assessing swallowing disorders.

The article also presents tools for cognitive screening and nutritional risk assessment as a part of the comprehensive assessment of dysphagia. Given the close relationship between dysphagia and dystussia and their frequent co-occurrence in neurodegenerative diseases, the article also focuses on the importance of cough assessment in the diagnosis of dysphagia. Assessment tools that can be used in speech therapy practice as part of cough assessment are briefly presented.

Keywords

neurodegenerative disorders, swallowing, dysphagia, dysphagia assessment, dystussia, cognitive impairment

Introduction

Neurodegenerative diseases (NDDs) are a large, clinically heterogeneous group of diseases that lead to the progressive loss and death of neuronal populations. They can be hereditary or acquired (Orel, 2023). Alzheimer's disease (AD) is considered to be the most common NDD. In our experience, a speech-language pathologist encounters a number of other neurodegenerative conditions in clinical practice, e.g. people with Parkinson's disease (PD), multiple sclerosis (MS), hereditary ataxias and other diseases. Due to demographic changes associated with population ageing, an increase in NDDs can be expected (e.g. Alzheimer's Disease International, 2015; Dorsey et al., 2018; Alzheimer Europe, 2019; Su et al., 2025), and thus also an increase in the number of these patients within speech-language therapy practice.

Clinically, NDDs manifest with a variety of symptoms, including motor, cognitive, cerebellar and other deficits. Within this wide range of diseases, the speech-language pathologist focuses on motor speech disorders (dysarthria), voice disorders (dysphonia), cognitive and language difficulties and swallowing disorders (dysphagia). The latter is a serious problem that can lead to life-threatening complications such as malnutrition, dehydration and aspiration pneumonia and significantly affects the quality of life of the individual (Tedla and Černý, 2018). Dysphagia is a disorder defined by difficulty swallowing saliva, different dietary consistencies (liquid, mushy and/or solid food), fluids and medications, which can manifest itself in different phases of the swallowing, i.e. in the oral, pharyngeal and esophageal phases of swallowing (Tedla and Černý, 2018). This whole process is coordinated by the central nervous system (Kaulfussová, 2003). Symptoms of dysphagia typical of some NDDs may include

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hypersalivation (sialorrhea) (e.g. Wang et al., 2022), xerostomia (e.g. Verhoeff et al., 2022), drooling (e.g. Kalf, 2009) or dystussia (e.g. Ebihara et al., 2003; Borders et al., 2021; Lowell et al., 2023).

Dysphagia in people with NDD can also be caused or exacerbated by the presence of cognitive deficits. Various difficulties associated with cognitive deficit, e.g. the visual recognition of food, recognizing the food bolus in the mouth – associated among other things with a decreased olfactory and taste sensation, forgetting the bolus in the mouth, deficient sequencing of the motoric plan (so-called swallowing apraxia), and eating habits and behaviours (e.g. overlarge mouthfuls, tendency to eat quickly) have been mentioned in systematic studies (see Alagiakrishnan et al., 2013; Mira et al., 2022; Ueha, 2023). These symptoms are in line with what we observe in our clinical practice in people with NDD.

Interesting results regarding the involvement of cognitive and motor processes in the act of swallowing are provided in a study by Kim et al. (2015), who found that while the severity of motor symptoms is associated with all phases of the swallowing act, cognitive difficulties (especially with executive function, memory, and learning) are predominantly associated with the oral phase of swallowing.

In patients with NDD, we speak of neurogenic dysphagia, with the main NDDs in adults causing dysphagia being PD, atypical Parkinsonian syndromes, i.e. progressive supranuclear palsy (PSP), multiple system atrophy (MSA) and corticobasal degeneration (CBD) as well as Huntington's disease (HD), amyotrophic lateral sclerosis (ALS), cerebellar degeneration, i.e. spinocerebellar ataxia (SCA) (Yang et al., 2023) and Friedreich's ataxia (FA) (Vogel et al., 2014), MS (Mrázková et al., 2016), AD and others (see Ciucci et al., 2019; Ueha et al., 2023). Table 1 shows the prevalence of dysphagia in selected NDDs.

Neurodegenerative diseases	Prevalence of dysphagia
Parkinson's disease	36.9% (Gong et al., 2022)[1]
Progressive supranuclear paralysis	79% (Glinzer et al., 2024)[2]
Multisystem atrophy	31–78% (Calandra-Buonaura et al., 2021)
Corticobasal degeneration	96% (Grunho et al., 2015)[3]
Spinocerebellar ataxia	59.9% (Yang et al., 2020)[4]
Amyotrophic lateral sclerosis	at least 70% (Perry et al., 2021)
Huntington's disease	90.5% (Kalkers, 2022)[5]
Multiple sclerosis	44.8% (Mirmosayyeb et al., 2023)
Alzheimer's disease	84–93% (Mira et al., 2022)[6]

[1]Global prevalence. A higher prevalence was observed in instrumental methods (57.3%) compared to all other methods of assessing dysphagia. [2]Prevalence of 56–89% was found depending on the chosen method. The Water Swallow Test was the least conclusive, and instrumental methods were the most conclusive. These were mainly patients with moderate disease severity. [3]Based on the questionnaire, 96% of people with corticobasal syndrome reported difficulty swallowing (six of the subjects were neuropathologically confirmed with chronic kidney disease). [4]Based on a cohort of 237 genetically confirmed patients. [5]Prevalence calculated based on patient assessment of dysphagia symptoms, with more than 90% of the 158 patients in this study reporting at least one symptom of dysphagia. [6]Prevalence in AD patients with moderate to severe dementia.

Table 1: ***Prevalence of dysphagia in selected NDDs***

It should be mentioned that the occurrence of dysphagia is dependent on many factors, including the stage and severity of the disease, associated cognitive difficulties, etc. At the onset of the disease, dysphagia may not manifest itself in all patients. For example, in HD, the incidence of dysphagia, as determined by FEES, was observed in 35% of people in the early phase of the disease, while in the late phase it was recorded in 100% of cases (Schindler et al., 2020). Likewise, a higher incidence of dysphagia with disease progression and worsening cognitive deficit is reported in patients with AD, based on assessment using three diagnostic tools – the EAT-10 questionnaire, the Water Swallowing Test and the objective FEES examination. The likelihood of penetration or aspiration grew as the disease progressed (Parlak et al., 2022).

The tendency to progression of dysphagia is also characteristic of ALS and has been documented for both spinal and bulbar forms in a large research cohort of patients. The incidence of dysphagia in the spinal and bulbar form was 44% and 85%, respectively, one year after enrolment in the study and 64% and 92%, respectively, after two years (Perry et al., 2021).

Meta-analysis by Gong et al. (2022) showed a significant association between the incidence of dysphagia and the duration of the disease in patients with PD, but not with their scores in cognitive testing. With disease progression the swallowing disorder may also worsen, so it needs to be monitored systematically by a multidisciplinary dysphagia team led by an attending speech-language pathologist.

As part of the management of swallowing disorders, the patient may be advised for example to adjust the quantity and consistency of food and fluid intake, about compensatory strategies and behavioral modifications. In some cases, a non-oral feeding route may be recommended, such as percutaneous endoscopic gastrostomy (PEG) or other forms of nutrition (see Ehler, 2018; Gross et al., 2018; Kala Grofová and Satinský, 2018).

As part of the comprehensive diagnosis of dysphagia in people with NDD, it is advisable to focus not only on the assessment of swallowing itself, but also to reflect on the cognitive status and the ability to cough effectively, which can affect the swallowing process. Accordingly, the following chapters briefly cover not only the diagnostic options for swallowing itself, but also these related difficulties.

Assessment of dysphagia in neurodegenerative diseases

Dysphagia in NDDs presents a broad spectrum of manifestations related to the specific disease, stage of the disease and the age of the patient, factors that must be considered during the diagnostic process (Allen, 2019). In addition to the clinical examination of swallowing, a wide range of scales, questionnaires, tests and objective

methods is available. These, after a comprehensive assessment of their results, play an important role in a comprehensive view and assessment of the swallowing process in the patient, identifying the difficulties facing targeted intervention options geared towards setting up safe nutritional intake (Tosun et al., 2024). In patients with NDD, early recognition of risk signs plays a key role, and thus increases the likelihood of preventing aspiration and other complications such as malnutrition or dehydration (Altman, 2013). At the same time, we need to keep in mind the progressive nature of many NDDs, which distinguish them from post-stroke conditions, and therefore some diagnostic tools for neurogenic dysphagia validated in this population may not be suitable for NDDs, or require modification (Speyer, 2021).

A systematic study focusing in particular on the quality of existing dysphagia screening tools available up to 2021 reports that most of the high-quality screening tools were originally developed for stroke patients (Chang, 2024). These conclusions are confirmed by another systematic review, which reports that the aggregate validation cohorts for selected neurogenic dysphagia screening tools consisted of 34% of post-stroke patients, 13% with mixed neurological/neurosurgical diagnoses, 2% with dementia/Alzheimer's disease, Parkinsonian syndromes and traumatic brain injury; and remaining patients with an unspecified or other disease (Brodsky, 2016). For example, in diseases from among the atypical Parkinsonian disorders, there is a lower prevalence of dysphagia in studies using water swallowing tests (Glinzer, 2024).

In summary, no single dysphagia screening tool is universally applicable across all diseases, and it is always necessary to consider its specifics and suitability for the situation (Speyer, 2021). This statement is supported by Lai (2025) in a narrative review study focused on the selection of a screening tool to suit the specifics of the clinical environment.

At the same time, it should be emphasized that not all diagnostic tools of dysphagia applicable to NDDs are adapted and used in the Czech context despite their potential clinical usefulness. Table 2 lists selected diagnostic tools used in patients with neurogenic dysphagia in the Czech Republic and abroad. They are grouped into:

- tests involving swallowing water,
- tests involving multiple consistencies,
- tests integrating swallowing tasks with additional parameters,
- self-assessment questionnaires focused on swallowing, and
- tools assessing chewing or oral intake status.

TEST	DIAGNOSTIC TOOL	ABBREVIATION	AUTHOR YEAR	TEST FOCUS	RESEARCH SAMPLE	SENSITIVITY SPECIFICITY	SPECIFICS	Translation and validation in the Czech environment
TESTS BASED ON SWALLOWING WATER	Three-Ounce Water Swallow Test	3-oz WST	DePippo, K. et al., 1992	assessment of the presence of cough, moist admixture in the voice	post-stroke patients	sensitivity 80% specificity 54%	N/A	NO
	100-ml Water Swallow Test	100-ml WST	Wu, M. et al., 2004	assessment of swallowing rate and presence of cough	the vast majority were post--stroke patients (51 patients, 8 without neurological disorders)	sensitivity 85.5% specificity 50%	N/A	NO
TESTS COMBINING SWALLOWING OF MULTIPLE CONSISTENCIES	Volume-Viscosity Swallow Test	V-VST	Clavé, P. et al., 2008	3 consistencies administered (nectar, liquid, pudding), occurrence of cough, observation of changes in oxygen saturation (3%), changes in voice (Jamróz, 2018)	post-stroke, head and neck cancer or NDD patients	penetration: sensitivity 83.7% specificity 64.7% aspiration: sensitivity 100% specificity 28.8%	N/A	NO
	Swallowing Clinical Assessment Score in Parkinson's Disease	SCAS-PD	Loureiro, F. et al., 2013	12 items focused on the occurrence of deviations in the oral and pharyngeal swallowing phases	patients with PD	sensitivity 100% specificity 87.5% (Branco, 2019)	N/A	NO
	Gugging Swallowing Screen	GUSS	Wu, M. et al., 2007	indirect pre-test examination 3 administered consistencies	post-stroke patients	sensitivity 100% specificity 50%	also states the degree of dysphagia and the subsequent recommendation	YES (Václavík et al., 2015)
TESTS COMBINING SWALLOWING EXAMINATION WITH OTHER PARAMETERS	Mann Assessment of Swallowing Ability	MASA	Mann, G. et al., 2001	24 items (e.g. alertness, speech, respiration, cough, etc.)	post-stroke patients	dysphagia: sensitivity 71% specificity 72% aspiration: sensitivity 93% specificity 55%	also states the severity of dysphagia and recommendations for the suitability per os intake	NO
	Toronto Bedside Swallowing Screening Test	TOR-BSST	Martino, R. et al., 2009	4 items (voice before and after swallowing, tongue movement, water swallowing)	post-stroke patients	sensitivity 91.3% specificity 93.3%	N/A	NO
	Yale Swallow Protocol		Suiter, D. et al., 2013	pre-test balance sheet, brief cognitive screening, oromotor examination, 3-oz WST	mixed group (head and neck post-cancer patients, with TBI, neurological disease or after esophageal surgery)	sensitivity 100% specificity 64%	a short recommendation on how to proceed based on the result	NO
	Sapienza Global Bedside Evaluation of Swallowing	GLOBE-3S	Toscano, M. et al., 2018	combination of TOR-BSST with pulse oximetry and laryngeal elevation measurement	post-stroke patients	sensitivity 100% specificity 77.3%	N/A	NO
	Clinical assessment of dysphagia in neuro-degeneration	CADN	Vogel, A. et al., 2017	anamnestic part (Part 1), administered three consistencies (Part 2)	patients with PD and hereditary ataxias	sensitivity Part 1: 79.3% Part 2: 84.2% specificity Part 1: 70.6% Part 2: 68.9%	states the severity of dysphagia and recommendations on how to proceed based on the result	translation underway
SELF-EVALUATION QUESTIONNAIRES FOCUSED ON SWALLOWING	Eating Assessment Tool-10	EAT-10	Belafsky, P. et al., 2008	10-item questionnaire	mixed group (reflux, voice disorder, head and neck post-cancer patients, post-stroke, PD, ALS, etc.)	N/A	quick administration	YES (translated by Vejrostová et al., 2012 and validated by Mandysová et al., 2014)
	Swallowing Disturbance Questionnaire	SDQ	Manor, Y. et al., 2007	15-item questionnaire	initially patients with PD, then extended to other etiologies (Cohen, 2011)	PD: sensitivity 80.5% specificity 81.3% other etiology (Cohen, 2011): sensitivity 79.7% specificity 73%	N/A	NO
	Sydney Swallow Questionnaire	SSQ	Wallace, K. et al., 2002	17-item questionnaire	patients with dysphagia of neuromuscular etiology	N/A	N/A	NO
	Munich Dysphagia Test –Parkinson's Disease	MDT-PD	Simons, J. et al., 2014	26-item questionnaire	patients with PD	sensitivity 90% specificity 86%	online administration with evaluation and recommendation of further action	NO
	Radboud Oral Motor Inventory for Parkinson's Disease	ROMP	Calf, J. et al., 2011	23-item questionnaire divided into 3 sections (speech, swallowing, saliva)	patients with PD or atypical Parkinsonism	N/A	N/A	NO
	Dysphagia in Multiple Sclerosis Questionnaire	DYMUS	Bergamaschi, R. et al., 2008	10-item questionnaire	patients with MS	N/A	N/A	YES (Kolčava et al., 2020)
	Swallowing Quality of Life Questionnaire	SWAL-QOL	McHorney, C. et al., 2002	44-item questionnaire	mixed group (head and neck post-cancer patients, as well as those with dysphagia, cerebrovascular disease or with NDD)	N/A	reduced form of the original 93-item version, with a second SWAL-CARE questionnaire (McHorney C. et al., 2000)	YES (Černý, 2015, mentioned in Komínek, 2015)
	Dysphagia Handicap Index	DHI	Silbergleit, A. et al., 2011	25-item questionnaire	mixed group (head and neck post-cancer patients, as well as those with dysphagia, CVA, ALS, PD, GERD, etc.)	N/A	N/A	NO
CHEWING AND ORAL INTAKE STATUS FOCUSED TOOLS	Test of Mastication and Swallowing of Solids	TOMASS	Huckabee, M. L. et al., 2017	assessment of chewing and oral processing of solid food in 4 areas	obtaining normative data on healthy individuals	N/A	N/A	NO
	Functional Oral Intake Scale	FOIS	Crary, M. et al., 2005	7-point non-peroral/peroral food intake scale	post-stroke patients	N/A	N/A	NO

Notes: PD = Parkinson's disease, MS = Multiple sclerosis, ALS = Amyotrophic lateral sclerosis, TBI = Traumatic brain injury, NDD = Neurodegenerative disease, GERD = Gastroesophageal reflux disease

Table 2: ***Overview of selected diagnostic tools applicable to neurogenic dysphagia***

In the Czech Republic, one of the most widely used standardized swallowing screening tools is the **GUSS – Gugging Swallowing Screen** (Trapl, 2007; Václavík et al., 2015), which is also mentioned in the *Návrh jednotného postupu v péči o pacienty s dysfagií na iktových jednotkách* [Proposal for a Uniform Approach to the Care of Patients with Dysphagia in Stroke Units in the Czech Republic] (Solná et al., 2014). However, this test has been validated in stroke patients, for whom it is primarily intended. It is administered by nurses, particularly in intensive care units or stroke units, who can use it to quickly and effectively assess the risk associated with oral intake in a newly admitted patient, especially when there is no possibility of a clinical examination of swallowing by a speech-language pathologist. The tool includes an assessment of the patient's alertness, cough, saliva management and swallowing of three basic consistencies. The procedure differs from most other instruments in that the patient is given a puree first, rather than a liquid (Trapl, 2007).

Another tool used in the Czech environment is **EAT-10 – Eating Assessment Tool** (Belafsky, 2008; Vejrostová et al., 2012; Mandysová et al., 2014) – a self-assessment questionnaire consisting of ten questions aimed to identify swallowing difficulties from the patient's point of view, both in terms of the swallowing function and psychological impact on quality of life. This tool is used internationally across a wide range of disorders and healthcare facilities (Schindler, 2023) and is characterized by its validity, easy-to-understand items and short administration time (approx. 4–5 minutes; Vejrostová, 2012). As already mentioned, in patients with NDD, cognitive status must be considered, and where cognitive impairment is present, the patient's own awareness of swallowing difficulties may be reduced. A study by Parlak (2024) examining the use of EAT-10 shows a low level of agreement between patients with AD and their caregivers regarding the test results, and even the correlation of the caregiver's statements with the findings of objective FEES was insufficient. Other studies also suggest the need for cautious use of EAT-10 in people with various NDDs. Schlickewei (2021) reported a low correlation between the result of a questionnaire assessed by a patient with PD and the findings of an objective swallowing examination. In contrast, in ALS patients, EAT-10 showed good discriminative ability and correlation with objective findings (Donohue, 2022).

Now available in the Czech setting, translated and validated, is the self-assessment questionnaire **DYMUS – DYsphagia in MUltiple Sclerosis** (Bergamaschi, 2008; Kolčava et al., 2020), aimed at the assessment of swallowing in patients with multiple sclerosis, in whom dysphagia is a relatively common (Kolčava et al., 2020). The questionnaire is brief, easy to administer, easy to understand and focused on the assessment of swallowing liquids and solids, the need to modify one's diet, the presence of coughing or choking, the need for repeated swallowing, sensation of food getting stuck in the throat, and weight loss (Bergamaschi, 2008).

Another internationally recognized tool **SWAL-QOL – Swallowing Quality of Life** (McHorney, 2000; SWAL-QOL-CZ, Černý, 2015) is a self-assessment questionnaire that evaluates the impact of swallowing difficulties on the patient's quality of life. The revised version of the questionnaire contains 44 items, and takes approximately 15 minutes to administer. The questions focus on swallowing, self-feeding, eating habits, appetite, alternative nutrition and the impact of swallowing difficulties or fear related to swallowing on social functioning and social life (McHorney, 2002).

Among objective instrumental methods for the objective assessment of swallowing, two methods are considered the gold standard, namely the **VFSS** – Videofluoroscopic Swallow Study and the **FFES – Flexible Endoscopic Evaluation of Swallowing**. Both methods complement each other. FFES involves transnasal insertion of the endoscope and allows evaluation of anatomical and physiological conditions as well as the function of the velopharyngeal closure, epiglottis, tongue base, valeculae, pyriform sinuses and vocal cords with subsequent assessment of direct swallowing of various consistencies and aspiration risk. Its limitations include visualization restricted to the pharyngeal phase and a transient loss of image, known as the white-out phase, caused by pharyngeal constriction during swallowing (Dubová, 2019). Conversely, VFSS is a dynamic radiological method that records all phases of swallowing, including the esophageal phase, and allows evaluation of their dynamics and duration, including the timing of the swallowing reflex. Thanks to the contrast agent, it is also possible to observe microaspirations into the airway (Zeinerová, 2020). In both examinations, the eight-point Penetration-Aspiration Scale according to Rosenbek can be applied to assess penetration and aspiration during swallowing, which is a standardized and reliable tool (Rosenbek, 1996).

We briefly present **CADN – Clinical Assessment of Dysphagia in Neurodegeneration** (Vogel, 2017), as the translation and adaptation of the test at our institution is currently underway, with validation for the Czech environment planned. CADN is a valid, reliable, quantifiable and easy-to-administer tool for dysphagia examination in people with NDD. Its aim is to quantify the manifestations of dysphagia, identify risky feeding behaviour and predict aspiration risk, and to support decisions regarding the need for an instrumental swallowing examination. It combines the anamnesis part, focusing on a more detailed information about swallowing and self-feeding from the patient, and the part focused on the clinical assessment of swallowing across various consistencies. The tool uses a scoring scale that was compared with the results of FEES and SWAL-QOL in 125 patients with PD and degenerative ataxia (Vogel, 2017). The sensitivity and specificity of the tests for both groups are shown in Table 2.

In decisions regarding oral intake and possible dietary modification, the seven-point FOIS (Functional Oral Intake Scale) is worth mentioning, which evaluates the functional level of oral intake from *non per os* (nothing by mouth, 0 points) to *per os* intake without restrictions (7 points) (Crary, 2005). However, the scale is not officially translated and validated for the Czech environment.

Specifics of assessment in patients with dementia

In patients with NDD, an essential factor in the comprehensive assessment of deglutition is also the assessment of cognitive status, which plays a crucial role in the context of swallowing and overall self-feeding. Therefore, cognitive function should be assessed using the MoCA (the Montreal Cognitive Assessment scale; Nasreddine, 2005; Czech adaptation by Reban, 2006), Mini-Cog (Borson et al., 2000; Czech version Bezdíček, 2022) and others.

In patients with dementia it is possible to observe a slowing of the swallowing process, increased time needed for self-feeding, difficulties in self-care during deglutition, reduced appetite or changes in dietary preferences, all contributing to an increased risk of malnutrition (Groher, 2020). In Czechia, malnutrition can be detected using screening tools such as the MNA-SF (Mini Nutritional

Assessment-Short form; Rubenstein, 2001) (Bielaková, 2018), which is considered to be the most valid and widely used tool for assessing nutritional risk in geriatric patients in the Czech Standard of Nutritional Care in Geriatrics (Vágnerová, 2020). Abroad, tools such as the CNAQ – Council on Nutrition Appetite Questionnaire (Wilson, 2005) or the ALOC screening scale (*A novel appetite loss in older adults with and without cognitive impairment*) (Rudzińska, 2025) are also used to assess loss of appetite in the elderly. Although the subject area of malnutrition or reduced appetite falls primarily under the area of interest of nutritional therapy, dietetics and internal medicine, interdisciplinary cooperation with a speech-language pathologist is crucial.

EdFED – The Edinburgh Feeding Evaluation in Dementia scale (Watson, 2001) is a validated observational scale created to identify eating and feeding difficulties and to determine the level of assistance needed in patients with dementia. Use of the scale is found especially in inpatient nursing care, where it can positively influence the approach of nursing staff to a given patient. It consists of eleven items dealing with the need for supervision in self-feeding, physical assistance in eating, failure to finish meals, refusal of food by bowing the head, refusal to open the mouth, spitting out food or refusal to swallow, etc. (Batchelor-Murphy, 2019). Use or adaptation of this observational scale in the Czech Republic has not been evidenced, but it is a tool with potential benefits in patients with a more advanced stage of dementia in the Czech environment as well.

Cough evaluation in patients with dysphagia

Another area that needs close attention when assessing swallowing in patients with NDD is coughing/dystussia. Cough is a natural and defensive mechanism the primary function of which is to protect the airway from aspiration and to remove foreign or endogenous material from the airway (Jakusova and Brozmanova, 2023). Three basic types of cough are distinguished – reflex, voluntary and evoked cough (Eccles, 2009; Al-Biltagi et al., 2022). The close relationship between dysphagia and dystussia and their frequent concurrence emphasize the importance of including cough evaluation as a standard component of assessment by a speech-language pathologist (Watts et al., 2016).

Evaluating voluntary coughing is used as a valuable screening tool for detection of respiratory protection deficits and possible prediction of aspiration risk. However, it remains unclear whether the voluntary cough deficit is directly linked to the ability to effectively clear the airways. Nevertheless, several studies support the clinical usefulness of the examination of voluntary cough and mention the association of airflow in voluntary cough with the expectoration of aspirate from subglottic region, although the amount and depth of aspiration play an important role in this relationship (Borders and Troche, 2022). In the case of overt aspirations, the presence of reflex cough can serve as feedback in the verification of compensatory strategies and positional manoeuvres in the practice of a speech-language pathologist.

Cough evaluation is an important element in the differential diagnosis of neurological deficits. Increased reflex cough sensitivity may be present in cases of expansive lesion of the brainstem, Tourette's syndrome or neurodegenerative cerebellar disorders. Conversely, reduced sensitivity of reflex cough is observed in patients with MS, PD, dementia with Lewy bodies, ALS, and peripheral neuropathy (Al-Biltagi et al., 2022).

Diagnostic tools validated in the Czech environment, which also focus on the presence of cough during oral intake or saliva swallowing in the diagnosis of dysphagia, are already mentioned above – the EAT-10, DYMUS, SWAL-QOL or GUSS (see Table 2).

Assessment of the effectiveness of cough is important in speech therapy practice not only for the evaluation of the ability to effectively clear the airways of aspirated material, but also for the ability to effectively expectorate under a higher degree of congestion, which is very often associated with dysphagia (Solná et al., 2014). In some NDDs, such as HD, ALS or MS, respiratory dysfunction is common and patients tend to have trouble coughing up secretions. One reason may be for example respiratory muscle weakness or bulbar syndrome (Jones et al., 2011).

Cough strength testing is most often used in practice to objectively assess the effectiveness of cough and the strength of the respiratory muscles. One of the options is to evaluate reflex cough induced by inhalation of an aerosol mixture of citric acid or capsaicin, allowing measurement of both cough threshold, as well as the maximum peak cough airflow (Morice et al., 2007). A more accessible and cheaper option is the use of peak expiratory flow meters, which are a reasonable alternative to the pneumotachograph. Measuring airflow in voluntary cough can serve as a suitable non-invasive means for aspiration risk assessment (Silverman et al., 2014).

However, in an outpatient setting the use of the above methods may be limited. Therefore, cough examination by audioperceptual analysis is used, such as cough sound evaluation, which correlates with physiological measurements and subjective perception of cough strength (Lee et al., 2017). Other acoustic parameters that can be assessed by audioperceptual analysis include cough strength, sharpness, tension, duration, coordination, efficiency, cough normality, or type of exhalation (persistent coughing, throat clearing, sharp exhalation, or other) (Curtis et al., 2024). However, the qualitative assessment of these parameters always depends on the experience and skills of the speech-language pathologist.

Discussion

There is no universal diagnostic tool for assessing dysphagia with sufficient informative value across all NDDs; the choice of instruments must reflect the diagnosis and the patient's current condition, including their cognitive functions, the functional status of the oral intake and the context of care. However, most of the existing diagnostic tools assessing swallowing are validated on stroke patient populations, which is not ideal due to the specifics of NDD. It is also not entirely informative to assess the swallowing of only one consistency, usually water, since we cannot gauge the swallowing of a mushy or solid consistency, which is a necessary consideration for setting an adequate diet.

Self-assessment questionnaires undoubtedly have their irreplaceable place, especially with regard subjective experience of swallowing difficulties and their impact on the quality of life, but we need to take into account their subjectivity, possible reduced insight into one's difficulties and the changing informative value in the deterioration of cognitive functions that is usually present in people with NDD. FEES and VFSS remain the gold standard for objective assessment of swallowing, but due to their limitations it is advantageous to have valid and reliable tools available to monitor the course of dysphagia in NDDs.

The CADN tool, which was developed specifically for people with NDD and which combines the anamnesis part with a clinical swallowing assessment, may

serve this purpose. Its ongoing translation and planned validation will expand the repertoire of diagnostic tools targeted at the specific difficulties in the specific population that a speech-language pathologist may encounter in their practice. The aim is early identification of risks and establishment of safe nutritional intake with regular re-evaluation during the progression of the disease. An indisputable advantage of the test is the simplicity of its administration and the quantifiability of the findings.

Conclusion

Dysphagia in NDDs is characterized by its heterogeneity and progressiveness and thus requires a comprehensive assessment that combines clinical examination with appropriately selected screening tools, self-assessment questionnaires and instrumental methods. A comprehensive assessment of deglutition in NDD patients should also include cognitive screening and malnutrition risk assessment in collaboration with a nutritional therapist. A supporting part of the comprehensive diagnosis of dysphagia in patients with NDD should also include a cough evaluation, which can serve as a tool for detecting respiratory protection deficits and possible prediction of aspiration risk.

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