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The Assessment of Eating and Drinking Functions in Infantile Cerebral Palsy for Speech Therapy Treatment

SUMMARY

One of the most frequent symptoms of infantile cerebral palsy syndrome is eating and drinking difficulties. The functions of eating and drinking are complex processes which, apart from the correct motor functioning of the orofacial area, also require synchronization with breathing, postural stability, including controlling of the head, and a number of other motor skills. Because of cerebral palsy, the functioning of the patient in all these areas may be disturbed, which manifests itself in eating and drinking difficulties, influencing the nutritional status and thereby the patient's somatic and psychological condition. The goal of the study is to present the tool for the assessment of eating and drinking function in cerebral palsy patients, complementary to the systems serving to assess gross motor functions (GMFCS), manual abilities (MACS) and communication (CFCS), which is a significant element in the multi-diagnosis of disorders in the cerebral palsy syndrome, necessary for speech therapy treatment.

Key words: feeding disorders, cerebral palsy, logopedic diagnosis

INTRODUCTION

Cerebral palsy is "non-progressive functional disorders of the developing central nervous system, in particular the central motor neuron, which occurred during pregnancy, childbirth, or during the perinatal period" (Michałowicz 2001, 17).

The clinical picture of disorders in cerebral palsy comprises diverse spectra of symptoms concerning muscle tone, posture, movement, motor coordination, speaking, as well as eating and drinking (Borkowska 1989; Łosiowski 1997; Boksa 2015). Motor disorders may be accompanied by intellectual dysfunctions, sensory disorders, epilepsy and other conditions determining the functioning of the child with cerebral palsy in the biological, mental and social areas (Michalik 2015).

The satisfaction of hunger is one of the basic biological needs of an individual, at the same time it is a significant element of family life, co-creating the tradition and culture of a community. Eating and drinking abilities are necessary to survive and maintain one's state of health. In physiological terms they are complex motor processes involving many organs and senses: their course, if it proceeds correctly, is not consciously controlled.

The activities of eating individuals without disorders in eating and drinking function focus mainly on satisfying hunger or recognizing the esthetic or taste qualities of a meal. Their feelings are not associated with the occurrence of unpleasant sensations, including pain.

EATING AND DRINKING DISORDERS IN THE PICTURE OF CEREBRAL PALSY

On account of cerebral palsy, disorders in eating and drinking function may occur caused by the irregular motor functioning of the initial sections of the alimentary system (difficulties in assuming the correct and safe sitting position when taking food), limitations in fine motor functions (gripping and manipulating cutlery pieces, directing food to the mouth). Swallowing disorders may affect different phases of this function, from the pre-oral phase (postural disorders make it impossible to maintain a correct position and to control the head, they cause the incorrect position of the cervical spine, and thereby the incorrect position of the oral cavity, pharynx and larynx; disorders of the upper limb function, i.e. the limited range of motility and control, prevent gripping or cause the irregular holding of cutlery pieces, and disorders of eye/hand and hand/mouth coordination), to the oral phase (deficit in the strength, selectiveness, coordination, and timing of the work of the muscles of lips, cheeks, tongue, jaw and palate results in disturbances in forming, positioning and passing of the food lump) to the pharyngeal phase (the limiting of the strength, selectiveness and coordination of the muscles of the tongue, palate and larynx results in the lack of protection of the nasal cavity and the respiratory tract against the penetration of food) (Benfer et al. 2015). In children with cerebral palsy the cause of eating and drinking difficulties is damage to the central nervous system. The clinical picture of cerebral palsy embraces the prevalence of positive symptoms (tendon hyperreflexia, presence of

clonuses, co-contractions, and spasticity) and negative symptoms (pareses or paralyses, increased fatigability, and coordination disorders). The consequence of these symptoms is the development of incorrect motor patterns or the absence of development of specific motor skills, which prevents the child from acquiring correct sensorimotor experiences (Rosenbaum et al. 2007; Kułak et al. 2011; Manikowska et al. 2009).

In the case of lesions to the nuclei of cranial nerves IX-XII and corticonuclear tracts running to nuclei IX, X and XII, a bulbar or pseudo-bulbar syndrome may occur: in such cases the dominant symptom is eating and drinking disorders (Książyk et al. 2011). Disorders of muscle tone in cerebral palsy, both in the form of hypotonia found within lip and tongue muscles, but also hypotonia and the weakening of the motor function of the proximal and distal sections of the gastrointestinal tract, result in the absence or weakening of the sucking and swallowing reflexes, and in difficulties in the coordination of the sucking, swallowing and breathing functions (Filipiak, Korzeniewska-Eksterowicz 2010).

Disorders in the ingestion and chewing of food, in its passage from the oral cavity to the pharynx, esophagus and stomach are termed dysphagia (Wiskirska-Woźnica 2016). In the ICD-10 classification, dysphagia is described as a separate diagnostic entity (coded as R13). It is diagnosed in many diseases and denotes a difficulty in the passage of food from the oral cavity through the esophagus to the stomach. Two types of dysphagia are distinguished in literature:

1. Oropharyngeal (upper, pre-esophageal) dysphagia – when swallowing difficulties are connected with the disordered passage of food to the esophagus;
2. Esophageal (lower) dysphagia – when swallowing difficulties pertain to the passage of food lumps through the esophagus.

In children with cerebral palsy, the underlying cause of dysphagia can be different pathomechanisms: the weakness of the cardiac muscle, weak lip closure, hypoesthesia in the oral cavity, the presence of persistent sucking and biting reflexes, occurrence of pharyngeal movement, reduced protective function of the larynx, sensory disorders within the pharynx and larynx, weakened coughing reflex, weakened muscle tone: mainly the lower pharyngeal sphincter, disorders of coordination between the contraction of the lower pharyngeal sphincter and the muscular coat of the esophagus. In the case of consumption of drinks, difficulties are usually caused by the delayed initiation of swallowing, while in the case of eating thick, lumpy solids, dysphagia causes them to remain in the pharynx (Wiskirska-Woźnica 2016; Arvedson 2013).

The result of dysphagia is choking on food, regurgitation of food through the nose, long-lasting or post-prandial cough, apnea, symptoms of the obturation of the airways, overproduction of secretion in the airways, severe recurrent infections of the upper airways, the loss or lack of increase in body weight, and

emaciation of the organism. The occurrence of dysphagia impoverishes diet because of preference for only certain kinds and textures of food, it causes prolonged duration of meals (over half an hour) with resulting tiredness, changes in behavior during feeding (irritation, refusal to eat meals), or loss of interest in the meal (Filipiak, Korzeniewska-Eksterowicz 2010; Wiskirska-Woźnica 2016).

The experience of pain resulting from the restriction of the motor system, unpleasant sensations associated with choking or swallowing in the wrong way during feeding, feeding against the child's will (with the use of coercion) can be a cause of reduced appetite. The food intake disorders in children with cerebral palsy, especially in those with severe forms of the syndrome, are a great emotional burden to their carers. Out of all childcare activities, feeding seems to the most time consuming and stressful occupation (Ansari et al. 2016), which stems from the low level of feeding efficiency, a long time allowed for meals, and from the child's unpleasant experiences associated with eating meals. If this state persists, it can be seen by a parent as a failure to satisfy basic and well-being needs; it may also provoke violence-related behaviors (adverse interactions, frightening of children, forced feeding, feeding in wrong positions, e.g. in the recumbent position, which, the carers believe, increases the effectiveness of the meal).

Since there are diversified mechanisms, symptoms and effects of dysphagia, it is essential to precisely assess the eating and drinking function, the result of which is a condition for selecting the right strategy for therapeutic management.

TERMINOLOGICAL DEFINITIONS

The determination of food intake disorders and frequency of their occurrence in individuals with cerebral palsy requires terminological definitions: the distinction between feeding disorders, eating disorders, and nutritional status. Underlying the feeding disorders is the refusal to eat, inability to ingest food, taking too small portions of a meal, selective food ingestion, or the occurrence of complaints during feeding. This condition pertains to children under four years of age, who are fed. In contrast, eating (nutritional) disorders are of mental origin, they are the outcome of conscious decisions to restrict one's food intake and they affect mainly adolescents and adult patients (Socha et al. 2004). A nutritional disorder is defined as the state of health resulting from the usual food consumption, the course of digestive processes, absorption and processing of nutritive components, and the effect of pathological factors on these processes (Charzewska 2010): as such it is a consequence of feeding and eating disorders.

In the case of individuals with cerebral palsy it seems justified to use the term "feeding disorders" although clinical practice confirms cases of deliberate refusal to take meals by moderately retarded patients and those with a severe form of dys-

phagia, particularly in connection with negative experiences in meal ingestion, including painful sensations. In English-language literature, interchangeable terms are used: "oropharyngeal dysphagia" (OPD), "feeding/deglutition disorder", as well as oral "motor dysfunction". In Polish literature, swallowing difficulties resulting from anatomical-physiological conditions are usually termed "dysphagia".

THE WORSENING OF FEEDING DISORDERS IN CEREBRAL PALSY

The frequency of occurrence of feeding disorders in cerebral palsy is not strictly determined. In the Polish survey on the assessment of the worsening of feeding disorders, the personnel in seven out of ten pediatric and neurology centers and speech therapy outpatient clinics recognized cerebral palsy as the main cause of feeding disorders (Rybak et al. 2011). Gisel (2008) found that in 57% of the subjects with cerebral palsy, aged up to one year, there were problems with sucking, in 38% – with swallowing, and in over 90% – there were clinically significant disorders of the motor functions in the oral area. In English surveys, 89% of cerebral palsy patients required feeding by other persons, and 55% continually choked while being fed (Sullivan et al. 2000).

Studies in the group of 130 children with cerebral palsy, aged up to three years (Benfer et al. 2014) showed that in 93.8% there were disorders of the oral phase of swallowing, in 78.5% – intensified salivation, in 70% – biting disorders, and in 65% – chewing disorders. The frequency of prevalence of feeding disorders ranges within from 39% to 85%, depending on the source (Edvinsson, Lundqvist 2016). Similar discrepancies are reported for the assessment of dysphagia prevalence. Recent studies reported its prevalence in 80% (Edvinsson, Lundqvist 2016) and 85% patients with cerebral palsy, respectively (Benfer et al. 2013). Feeding disorders and dysphagia may differ in intensity between individuals, hence they are classified at different levels in the GMFCS and MACS classification systems, the percentage of their prevalence rising from level I to level V, i.e. as the degree of motor function disorders increases (Edvinsson, Lundqvist 2016; Benfer et al. 2013).

DIAGNOSIS OF EATING AND DRINKING DISORDERS IN CLINICAL PRACTICE

The assessment of eating and drinking abilities comprises the patient's medical history, family history, analysis of current medical problems, nutrition history and ways of feeding, physical examination, assessment of physical and psychomotor development, psychological, logopedic and dietary assessments complemented with the observation of the feeding process taking place under conditions

as close to the home ones as possible (Rybak et al. 2011). The tools used in assessing feeding disorders in cerebral palsy are:

- Brief Assessment of Motor Function;
- Oral Motor Deglutition Scale;
- Behavioral Assessment Scale of Oral Functions in Feeding;
- Dysphagia Disorders Survey (DDS);
- Feeding Behavior Scale;
- Functional Feeding Assessment;
- Gisel Video Assessment;
- Oral Motor Assessment Scale;
- Pre-Speech Assessment Scale (PSAS);
- Schedule for Oral Motor Assessment (SOMA) (Benfer, Weir, Boyd 2012).

Of these, DDS, SOMA and PSAS are regarded as the tools with the best psychometric properties and were recommended to be used in children with neurodevelopmental disorders (Benfer et al. 2015).

THE SYSTEM OF ASSESSMENT OF EATING AND DRINKING ABILITY (EDACS) – DESCRIPTION OF THE TOOL

On the basis of the International Classification of Functioning, Disability and Health – ICF), in reference to the current classification systems used in clinical practice: *Gross Motor Function Classification System* – GMFCS (Palisano et al. 1997), *Manual Ability Classification System* – MACS (Eliasson et al. 2006) and *Communication Function Classification System* – CFCS (Hidecker et al. 2011), a tool was created to assess the eating and drinking ability of individuals with cerebral palsy (*Eating and Drinking Ability Classification System for Individuals with Cerebral Palsy* – EDACS) (Sellers et al. 2014), complementary to other tools serving to assess locomotion, fine motor function and communication. The EDACS system is recognized as an accurate and reliable diagnostic tool (Benfer et al. 2017), which can be applied by clinicians, including speech therapists, both in clinical practice and in research, as well as by parents of children with cerebral palsy. The system can be applied to children aged three or more.

The crucial features differentiating individual levels of difficulty in the EDACS system are efficiency and safety. Apart from them, what is assessed is the ability to bite and chew, the texture of the foods eaten, and modifications used (see Table 1). Efficiency is determined by the time and effort needed to eat and drink and the ability to retain food in the mouth. Safety relates to the risk of choking and aspiration of food and drink. On the basis of these features, the classification algorithm was developed (Fig. 1), according to which children with cerebral palsy are classified at one of the five levels:

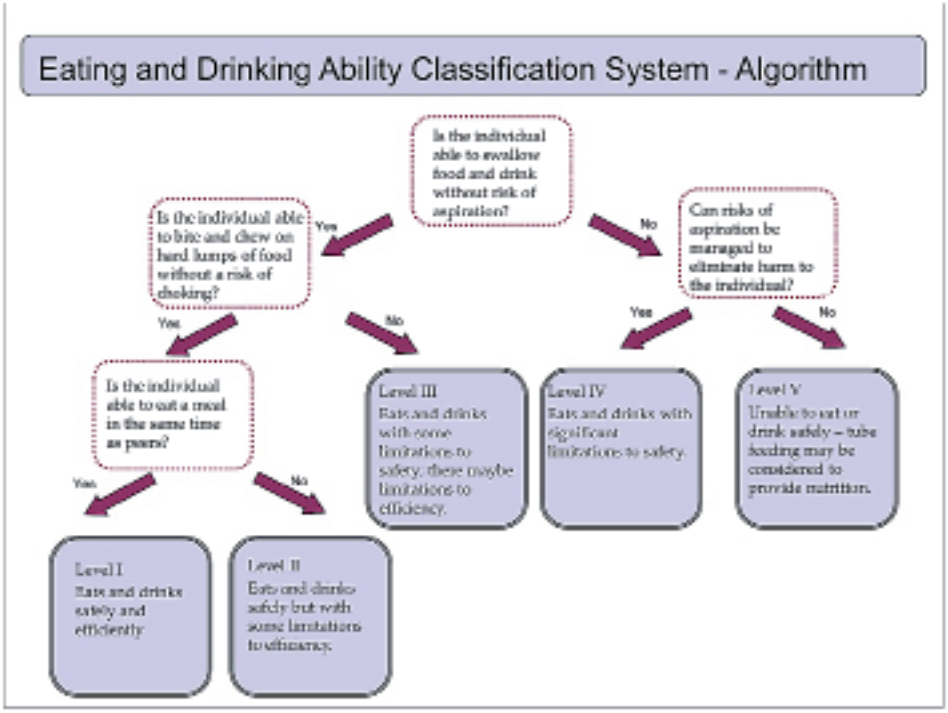

Fig. 1. Algorithm: the assessment of eating and drinking ability according to the EDACS scale (after: Sellers et al. 2014).

I. Eats and drinks safely and efficiently;

II. Eats and drinks safely but with some limitations to efficiency;

III. Eats and drinks with some limitations to safety; there may be limitations to efficiency;

IV. Eats and drinks with significant limitations to safety;

V. Unable to eat and drink safely – tube feeding should be considered to provide an adequate degree of nutrition.

The algorithm is complemented with a detailed description of the terms used, characteristics of individual levels, and the way of their differentiation. The assumption was that the language of EDACS description would be simple and intelligible also to parents or to individuals with cerebral palsy (Sellers et al. 2014).

Like in the GMFCS, MACS and CFCS systems, the degrees of disorder intensity for each level were distinguished (from I to V). What distinguishes the EDACS from other systems is, however, the introduction of a separate assessment of the level of the subject's independence in food intake (independent, assistance required, totally dependent). The term "independent" (IND) means that an individual is able to put food in his/her mouth by him/herself, without the help of

a third party. It does not mean, however, that s/he is able to process food to produce the required and safe food texture, or to eat and drink efficiently. The term "assistance required" (AR) means that an individual needs assistance in delivering food to the mouth, provided by a third party or by using appropriate equipment. Help may be required with putting food on the spoon, putting food into the hand, or guiding the hand to the mouth, or holding a cup firmly; it can be also administered as supervision or oral advice. The term "totally dependent" (TD) means that an individual is totally dependent on other people for the delivery of food and drink to the mouth. That is why an EDACS classification notation should consist of a digit (levels ranging from I to V) and letters (abbreviations IND, AR, or TD).

The EDACS classification system enables the assessment of eating and drinking ability, made from the perspective of the patient's general activity. It does not replace the detailed assessment of feeding disorders but complements it with a functional approach. The system can be used to create a common ground for perceiving disorders in eating and drinking function by specialists in different fields, parents, and by patients. It serves to identify the patient's problems and needs, and reduce the risk of prevalence of nutritional status disorders.

CONCLUSIONS

Studying the eating and drinking functions in children with cerebral palsy is an important element of both the clinical and logopedic assessment of a cerebral palsy child. In speech therapy literature the problem of dysphagia in cerebral palsy has not yet been adequately described. The presented tool, EDACS, which enables determination of the range and severity of feeding disorders, may be a useful scale in assessing the primary functions within the orofacial area in children with cerebral palsy aged over three years. The results of this assessment have an impact on the child's somatic condition, the risk of feeding complications, and on the ability of verbal communication, thereby determining the forms of multi-specialist treatment of the child, the ways of daily care of him/her, as well as therapeutic goals and techniques.

Table 1. A brief description of EDACS levels

	Level I	Level II	Level III	Level IV	Level V
Choking	The individual chokes when eating food with hard texture.	Coughs and chokes when eating new foods and foods with a hard consistency or when tired.	Coughs and chokes when drinking a quickly-flowing liquid or when takes too much liquid into the mouth at once.	May choke on larger lumps of food. May have problems with coordination of swallowing and breathing.	High likelihood. Unable to swallow food because of limitations to coordination of swallowing and breathing.
Holding food in the mouth	Holds most solids and liquids in the mouth.	Small amounts of food fall from the mouth while eating.	Falling of food from the mouth is frequent.	Falling of large amounts of food from the mouth.	–
Ability to bite and chew	Has problems with foods that need to be strongly bitten and chewed.	Has problems biting hard and chewing intensely. Slowly moves food in the oral cavity.	Bites and chews food of soft consistency. Has problems moving and holding food in the oral cavity, and safely biting and chewing.	Finds it difficult to move food in the oral cavity, to open and close the mouth, swallow, bite and chew.	–
Food texture	Eats a wide range of foods with a different texture appropriate for his/her age.	Eats products with a different texture appropriate for his/her age.	Eats puree and mashed foods.	Eats puree and well-mashed foods.	May take small amounts of food to obtain gustatory and olfactory sensations.
Duration of a meal	In the same time as peers.	Takes more time to have a meal than peers do.	Prolonged duration.	Prolonged duration.	–
Adjustments	Not required.	Slight modifications concerning mainly food consistency.	Requires special food consistency and positioning it in the proper place in the oral cavity.	Requires adjustment of food consistency and thickness of liquids, and the use of proper feeding techniques, qualified care, appropriate body position, and adjustment of the environment.	Alternative ways of feeding should be considered, such as tube feeding.

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