



SWALLOWING DISORDER IN PARKINSON'S DISEASE - CHARACTERISTICS, EVALUATION AND TREATMENT

POREMEĆAJ GUTANJA KOD PARKINSONOVE BOLESTI – KARAKTERISTIKE, PROCENA I TRETMAN

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ABSTRACT

Parkinson's disease is a degenerative disease of the basal ganglia in the central nervous system, which is caused by the collapse of dopamine receptors. It represents a neurodegenerative disease characterized by tremors, bradykinesia, numbness and loss of reflexes, but also secondary symptoms of dysarthria and dysphagia. Swallowing disorder is one of the symptoms of Parkinson's disease and in certain situations it can be the first symptom that patients experience without being diagnosed with Parkinsonism. Abnormalities in the form of chin rigidity and difficulty holding the head and neck while eating are observed in patients with severe disease. Dysmolarity, impulsive behavior during food intake and impaired tongue motility are also present. The clinical examination is the beginning of the diagnostic procedure where it is important to determine the degree of difficulty in swallowing, that is, which part of the physiological oropharyngeal process is dominantly affected or the esophagus. Dysphagia therapy is carried out with medication or through speech therapy treatment. Speech therapy treatment includes bolus modification, postural strategies, swallowing maneuvers, thermotactile stimulation (TTS), and neuromuscular electrical stimulation (NMES). Early detection and adequate treatment of swallowing disorders can alleviate or avoid complications such as aspiration, malnutrition and dehydration, which increase the degree of mortality and impair the quality of life of patients with dysphagia. Therefore, the treatment of patients with Parkinson's disease should be approached very seriously and in an interdisciplinary manner in order to provide adequate support and improve the quality of life.

Key words: dysphagia, Parkinson's disease, diagnosis, treatment.

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SAŽETAK

Parkinsonova bolest je degenerativno obolenje bazalnih ganglija u centralnom nervnom sistemu, koje je uzrokovano kolapsom dopaminskih receptora. Predstavlja neurodegenerativnu bolest koju karakteriše tremor, bradikinezija, utrnulost i gubitak refleksa, ali i sekundarni simptomi dizartrijske i disfagije. Poremećaj gutanja je jedan od simptoma Parkinsonove bolesti i u pojedinim situacijama to može biti prvi simptom koji pacijenti doživljavaju a da nije dijagnostikovano Parkinsonizmom. Kod pacijenata sa izraženom bolešću uočavaju se abnormalnosti u vidu rigiditeta brade i teškoće držanja glave i vrata tokom jela. Takođe je prisutan dismilitet, impulsivno ponašanje tokom uzimanja hrane i oslabljena pokretljivost jezika. Klinički pregled je početak dijagnostičkog postupka gde je važno utvrditi stepen teškoće gutanja, odnosno koji je deo fiziološkog orofaringealnog procesa dominantno zahvaćen ili ezofagusa. Terapija disfagije se sprovodi medikamentozno ili kroz logopedski tretman. Logopedski tretman obuhvata modifikaciju bolusa, posturalne strategije, manevre gutanja, termotaktilnu stimulaciju (TTS) i neuromuskularnu električnu stimulaciju (NMES). Ranim otkrivanjem i adekvatnim tretmanom poremećaja gutanja mogu se ublažiti ili izbeći komplikacije poput aspiracije, malnutricije i dehidracije, koje povećavaju stepen mortaliteta i narušavaju kvalitet života obolelih sa disfagijom. Stoga tretmanu obolelih od Parkinsonove bolesti treba pristupiti veoma ozbiljno i interdisciplinarno u cilju pružanja adekvatne podrške i poboljšanja kvaliteta života.

Ključne reči: disfagija, Parkinsonova bolest, dijagnostika, tretman.

INTRODUCTION

Parkinson's disease (PD) is a chronic neurodegenerative disease caused by the loss of the neurotransmitter dopamine in the basal ganglia, primarily in the substantia nigra of the mesencephalon (Sardelić, & Fargo, 2012; Vuković, 2019). PD is an idiopathic disorder of the central nervous system with a slow progressive course, the average duration of which is about 15 years. By definition, progressive brain diseases cause movement disorders and tremors. The disease was first described by James Parkins, a doctor from London. In 1817, he published his monograph "An Essay on the Shaking Palsy" as a neurological syndrome manifested by a combination of bradykinesia, rigidity, tremors at rest and loss of reflexes. After Parkinson's description of "shaking paralysis", the doctor and writer Laza Lazarević in 1887 described the syndrome of that disease as "a motor nervousness, characterized by a progressive decrease in strength and tremors of all muscles that do not depend on our will". In the second half of the 19th century, Jean-Martin Charcot, a French neurologist, described the akinetic-rigid form of the disease as a severe form and named it Parkinson's disease in honor of the London doctor who first described it.

Parkinson's disease is divided into three types: Idiopathic Parkinson's disease (caused by a combination of genetic and environmental factors); Secondary Parkinsonism (occurring as a result of head trauma or tumor) and Parkinsonism plus syndrome (degenerative disorder of multiple systems, contains classic symptoms of Idiopathic Parkinson's disease, then progressive supranuclear palsy, corticobasal degeneration, dementia caused by Lewy bodies (DLT) (Mark, 2001). The disease develops insidiously and gradually. In the beginning, the

symptoms are very mild and hard to see, but when they become pronounced, patients show motor difficulties. Difficulties are manifested when walking and performing some simple motor actions. Symptoms of Parkinson's disease can be divided into two groups: physical and speech. Physical symptoms begin with tremors, most often on the peripheral extremities and on the lips. Then bradykinesia (face like a mask, reduced eyelid blinking, avoidance of gaze, difficulty moving from one place to another, clumsiness of hand movements), rigidity (resistance to passive movement) and loss of postural reflexes. In patients with PD, all forms of motor deficits (tremor, bradykinesia, akinesia, muscle stiffness, and postural abnormalities) can adversely affect speech production and lead to dysphonia, dysarthria, and stuttering (Fox, Morrison, Ramig, & Sapir, 2002; Plowman-Prine, Sapienza, Okun, Pollock, Jacobson, Wu, & Rosenbek, 2009). In the domain of Parkinson's disease, depression and some other emotional changes, disorders of swallowing and chewing food, sleep disturbances, various vegetative symptoms, sensory and cognitive difficulties can occur as the disease progresses (Brajković, 2017).

Parkinson's disease depicts compromised voluntary and involuntary control of the orofacial and pharyngeal muscles that can lead to difficulty in chewing (mastication), the reflexive process in which food is prepared for swallowing and digestion. Otherwise, it is a complex physiological process in which, in addition to the teeth, other parts of the masticatory apparatus also participate. The reflex itself causes the presence of food in the mouth, so with the help of the muscles of mastication, its mechanical processing is carried out with the teeth and soaking saliva, which creates a bolus (Carneiro, das Graças Wanderley de Sales Coriolano, Belo, de Marcos Rabelo, Asano, & Lins, 2014; Lui, Su, You, & Wu, 2015). Swallowing disorder is a common symptom of Parkinson's disease and in some cases it can be the first symptom/difficulty experienced by people who have not been diagnosed with Parkinsonism (Bunijevac, & Maksimović, 2019).

The aim of this paper is to examine swallowing assessment, diagnosis and treatment in patients with Parkinson's disease.

MATERIALS AND METHODS

This paper deals with the presentation and interpretation of swallowing disorders in people with Parkinson's disease. The aim of the paper is to present data on the cause of Parkinson's disease, swallowing disorders in these people, diagnosis/evaluation of this disorder and rehabilitation. The following databases were used to search for relevant literature: Library Consortium of Serbia for Coordinated Procurement (KoBSON), PubMed, Scholar and Science Direct. The following terms were used as search keywords: Parkinson's disease, cause of Parkinson's disease, clinical picture in PD, swallowing disorder in PD, diagnosis of PD, assessment of PD and treatment of patients with PD.

RESULTS AND DISCUSSION

The cause of Parkinson's disease

The cause of this disease is not known, but it is believed that the influence of genetics and the environment in which an individual lives is extremely important for its occurrence. Genes encode certain proteins that are believed to be associated with the development of Parkinson's disease. The most important are alpha-synuclein and parkin. Symptoms of PD appear when 60-80% of dopaminergic neurons in the substantia nigra are lost (Takizawa, Gemmell, Kenworthy, & Speyer, 2016). Dysfunction of the dopaminergic neuronal network affects the supramedullary swallowing system and causes dysphagia in these patients. Lewy bodies in non-dopaminergic areas of the brain (Braak, Tredici, Rüb, de Vos, Jansen-Steur, & Braak, 2003) and alphasynuclein in peripheral motor and sensory nerves innervating pharyngeal muscles (Mu, Sobotka, Chen, Su, Sanders, Nyirenda, Adler, Shill, Caviness, Samanta, Sue, Beach, & Arizona Parkinson's Disease Consortium 2013). Another pathological factor associated with dysphagia in patients with PD is a decreased concentration of neuropeptides in sputum associated with cough and swallowing reflex. Studies show that the concentration of the neuropeptide substance in saliva was significantly lower in PD patients than in healthy subjects with normal swallowing function (Figura, Sitkiewicz, Świdarska, Milanowski, Szlufik, Koziorowski, & Friedman, 2021). We hypothesize that saliva would be a significant biomarker for the early detection of PD, so it would be important to consider this assumption. When it comes to the influence of the environment, research has shown that exposure to pesticides, insufficient movement and exercise, head injuries, and some infections can affect the appearance of this disease (Gašparović, Starčević-Čizmarević, Perković, Antončić, Kapović, & Ristić, 2013). Some studies show that there are large geographical differences in the frequency of the disease, so it is lower in Asian countries, say China and Japan, and higher in Western Europe and North America.

Parkinson's disease, or paralysis agitans, is a neurodegenerative condition that usually develops between the ages of 55 and 65 (Bene, Antić, Budišić, Lisak, Trkanjec, Demarin, & Podobnik-Šarkanji, 2009; Bunijevac, & Trifković, 2018). However, it can occur in 5% of patients between the ages of 21 and 40, while it rarely occurs before the age of 20. Certain epidemiological studies indicate that the disease affects men more often than women (Bunijevac, & Trifković, 2018).

Characteristics of Parkinson's disease

Parkinson's disease is a degenerative disease of the basal ganglia in the central nervous system, which is caused by the collapse of dopamine receptors. It represents a neurodegenerative disease characterized by tremors, bradykinesia, numbness and loss of reflexes, but also secondary symptoms of dysarthria and dysphagia (Bunijevac, & Maksimović, 2019). Swallowing disorder is one of the symptoms of Parkinson's disease and in certain situations it can be the first symptom that patients experience without being diagnosed with Parkinsonism (Suttrup, & Warnecke, 2015; Bunijevac, & Maksimović, 2019), which should be paid more attention to in the future. Dysphagic difficulties are present in 82% of patients with Parkinson's disease, and are most often associated with oral and pharyngeal motor abnormalities. Otherwise, oropharyngeal dysphagia is a common symptom

in patients with neurological abnormalities (Kalf, de Swart, Bloem, & Munneke, 2012; Kwon, & Lee, 2019).

Abnormalities in the form of chin rigidity and difficulty holding the head and neck while eating are observed in patients with severe disease. Dysmolarity, impulsive behavior during food intake, and impaired tongue motility are also present (Leopold, & Kagel, 1983). Otherwise, there is no single agreement about the relationship between Parkinson's disease and dysphagia. Some authors believe that dysphagia is a motor symptom, i.e. secondary, after primary and cardinal symptoms, such as tremor, bradykinesia and rigidity. Other authors believe that dysphagia is a non-motor symptom of PD, while others see dysphagia only as a consequence of a pre-existing disease of some type of parkinsonism, which occurs only during the disease and with its progression in the later phase of the disease itself. Thus, Panebianco, Marchese-Ragona, Masiero, & Restivo (2020) point out that although it is indisputable that in PD motor manifestations (tremor, bradykinesia and rigidity, i.e. shaking, slowness of movement and muscle stiffness) are primary, it cannot be disputed the fact that Parkinson himself talked about sleep disorders (constant sleepiness), urinary incontinence, constipation, sialorrhea, dysarthria, and dysphagia. Kolundžić, Vodanović, & Premuž (2018) state that in Parkinson's disease, primarily neurogenic swallowing difficulties are present, in as many as 40% to 100% of cases. He further states that in the domain of oral difficulties food retention occurs in the preparation of the bolus. Characteristics of the pharyngeal phase of swallowing in patients with Parkinson's disease are slower hyolaryngeal elevation, longer bolus transit time with food residues in the valleculae and periform sinuses, aspiration and/or penetration, and nasal and/or oral regurgitation. In the esophageal phase, slower transit time, regurgitation of food into the pharynx and difficulty opening and closing the sphincter are observed. In the later stages of PD, swallowing problems can occur throughout the upper digestive tract. Severe forms of dysphagia occur in the later stages of the disease, usually ten years after the onset of the first symptoms (Fujioka, Fukae, Ogura, Mishima, Yanamoto, Higuchi, Umemoto, & Tsuboi, 2016).

He further states that during the course of the disease, a whole spectrum of other motor manifestations of PB is manifested in the form of gait disturbances and falls, positional deformities, but also speech and swallowing disorders (Tolosa, Wenning, & Poewe, 2006). Janković (2008) also counts dysphagia among the motor symptoms of PD, right after the cardinal symptoms (tremor, bradykinesia, rigidity, postural instability), and together with hypomimia, dysarthria, and sialorrhea, it is counted among the secondary motor symptoms. Kalia, & Lang (2015) state that swallowing problems together with drooling, monotonous and hypophonic speech can be considered as a manifestation of bradykinesia, as a cardinal symptom of PD. Dysphagia can lead to clinical complications, including malnutrition, dehydration, and aspiration pneumonia, which negatively affects the quality of life and ultimately increases the mortality rate of these patients. Early diagnosis of swallowing problems is of great importance, but it is not always easy because dysphagia can be asymptomatic, and the patient's self-awareness is weak (Pfeiffer, 2019).

Evaluation of swallowing in a patient with Parkinson's disease

In the diagnosis of dysphagic disorders, the clinical examination is the beginning of the diagnostic procedure where it is important to determine the degree of difficulty in swallowing, that is, which part of the physiological oropharyngeal process is dominantly affected or the esophagus.

Videofluoroscopic and fiberoptic endoscopic methods are the two most commonly used instrumental methods in the evaluation of swallowing. They are very useful for identifying the difficulty but also for determining the maneuver that would facilitate the swallowing process and prevent possible complications. Videofluoroscopy is a radiological method that can be carried out in a sitting or standing position, where the patient swallows barium sulfate mixed with a certain consistency of food or drink. In this way, a good visualization of the barium through the oral cavity, pharynx and esophagus is possible. The examination is performed in a lateral and frontal position. In many institutions, it is the joint work of radiologists and speech therapists (Kertscher, Speyer, Palmieri, & Plant, 2014). The fiberoptic endoscopic method is carried out using a flexible optical endoscope, a tube with a camera and a light at the end. The endoscope is connected to a computer and a monitor, which enables the visualization of clear structures on the computer monitor). This method is carried out in a team with an otorhinolaryngologist. (Malagelada, Bazzoli, Boeckxstaens, De Looze, Fried, Kahrilas, Lindberg, Malfertheiner, Salis, Sharma, Sifrim, Vakil, & Le Mair, 2015). In addition to these methods, numerous screening tests are used to assess the difficulty of swallowing, after which it is possible to find out whether swallowing is normal or if there are certain difficulties during swallowing. Screening tests are easy to use, and they are designed so that patient safety is taken into account (Begić, Duranović, & Jovanović-Simić, 2018). Various specialized questionnaires can be used to determine the presence of dysphagia symptoms: Swallowing disturbance questionnaire (SDQ), Modified swallowing assessment (MAS), Volume-viscosity swallowing test (V-VST), Toronto bedside swallowing screening test (TOR-BSST), Munich Dysphagia test-Parkinson's disease (MDT-PD), The Dysphagia outcome and severity scale (DOSS), The Dysphagia-specific quality of life questionnaire (SWAL-QOL), Screening test swallowing (GUSS), Eating assessment tool (EAT-10), Dysphagia severity score (DSS) and others.

Adequate diagnosis and assessment provide information on whether there is difficulty in swallowing, to what degree, whether it requires rehabilitation, that is, which method of rehabilitation. An evaluation of the effect of rehabilitation and the quality of life of these patients is also carried out.

Speech therapy treatment of patients with swallowing disorders in Parkinson's disease

Speech therapy treatment of patients with difficulty swallowing is aimed at mastering a specific technique of safe swallowing based on changing the position of the head and body. The main goal of working with a dysphagic patient is based on protecting the respiratory system, preventing malnutrition, preventing dehydration and preventing the development of psychosocial difficulties. The speech therapy assessment includes: the patient's medical status (anamnesis), oral examination, observation of the patient's ability to swallow (whether

swallowing is normal or there are certain difficulties), assessment of cognitive and behavioral status. Quality speech therapy treatment should eliminate, alleviate or slow down the development of dysphagia and thus significantly improve the quality of life of PD sufferers. Treatment of patients with swallowing disorders includes direct, indirect and medical procedures. Direct treatment of dysphagia is a procedure by which liquid or food is placed in the patient's mouth, thereby shaping and achieving the act of swallowing. Indirect treatment of dysphagia involves exercises designed to improve muscle function. Otherwise, dysphagia therapy is carried out surgically, medicinally or through speech therapy treatment. Speech therapy treatment includes the following techniques: bolus modification, postural strategies, swallowing maneuvers, thermotactile stimulation (TTS) and neuromuscular electrical stimulation (NMES). Also, in speech therapy, it is possible to use safe swallowing maneuvers with the aim of increasing the strength of certain structures involved in swallowing, in order to ensure the patient's bolus transport from the oral cavity to the stomach, that is, to prevent food from entering the respiratory tract. By changing the position of the head or body, it is possible to prevent aspiration in more than 70% of patients with dysphagia. Some of them are the Mendelsohn maneuver, which allows the larynx to be raised for three to five seconds after swallowing (Kim, Kim, Lee, Kim, Kim, Kim, & Cho, 2017), Supraglottic swallowing which brings the vocal folds and arytenoids closer together (Zhang, Li, Wu, & Yang, 2022), Swallowing with effort increases the movements of the base of the tongue, i.e. with this maneuver, the patient tries to increase the force acting on the bolus by the structures inside the mechanism (Gandhi, Peladeau-Pigeon, Simmons, & Steele, 2023).

In the therapy of swallowing disorders, vocal therapy is often used. Research has shown that the Silverman method (Lee Silverman, LSVT-Lee Silverman Voice Treatment) results in improved tongue motility, reduced bolus transfer time to the base of the tongue and a reduction in the frequency of food retention, as well as that expiratory muscle strength training is effective in the treatment of dysphagia, as it leads to improvement in hypolaryngeal function and reduction from aspiration (Gašparović, Starčević-Čizmarević, Perković, Antončić, Kapović, & Ristić, 2013; Pu, Huang, Kong, Wang, Chen, Feng, Wei, Weng, & Xu, 2021).

CONCLUSION

Human life expectancy is increasing, which inevitably leads to an increase in the number of diseases of "old age". The high prevalence of dysphagia, on the one hand, and the fact that almost every neurodegenerative disease can cause a swallowing disorder, on the other hand, require that greater attention be paid to theoretical and practical work in the early detection and rehabilitation of these patients. Early detection and adequate treatment of swallowing disorders can alleviate or avoid complications such as aspiration, malnutrition and dehydration, which increase the degree of mortality and impair the quality of life of patients with dysphagia. Therefore, the treatment of patients with Parkinson's disease should be approached very seriously and in an interdisciplinary manner in order to provide adequate support and improve the quality of life.

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