

Z Gerontol Geriatr 2019 · 52:330–335

<https://doi.org/10.1007/s00391-019-01563-x>

Received: 12 February 2019

Accepted: 8 May 2019

Published online: 28 May 2019

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Dysphagia from a neurogeriatric point of view

Pathogenesis, diagnosis and management

Introduction

Dysphagia is a common syndrome in older people and its prevalence increases with age [27]. Although the reported prevalence estimates across studies were highly variable, it can be assumed that the mean prevalence of dysphagia in community dwelling older people is 15% and up to 30% in those admitted to hospital [13]. The highest prevalence of dysphagia has been observed in neurological patients in up to 64% of those with a stroke and over 80% of those with dementia [1]. Despite its high prevalence, dysphagia is still underdiagnosed and frequently not actively reported by older patients because they may regard swallowing difficulties as a normal process during ageing. Furthermore, dysphagia contributes to a worse outcome, most notably increased risk of malnutrition, pneumonia and a higher mortality as well as increased readmissions and institutionalization [21]. Age-related changes in the mouth, pharynx, larynx, and esophagus together with age-related neurological diseases predispose for dysphagia in older people. Therefore, according to a white paper published by the Dysphagia Working Group, a committee of members from the European Society for Swallowing Disorders and the European Union Geriatric Medicine Society, dysphagia should be classified as a geriatric syndrome [1]. This review provides an overview on (i) age-related changes of swallowing, (ii) the clinical implications and complications, (iii) the

diagnosis algorithm and (iv) the management of dysphagia in neurogeriatric patients.

Age-related changes of swallowing: primary and secondary presbyphagia

The deglutition process can be divided into three sequential phases. 1. Oral phase: during the voluntary preparatory phase the food enters the mouth and the bolus is actively masticated. The bolus is then placed on the anterior tongue and directed toward the posterior part of the oral cavity by a posterior and superior lingual movement (transport phase) 2. Pharyngeal phase: at the beginning of the involuntary pharyngeal phase the soft palate rises to close the nasopharynx and to prevent nasopharyngeal regurgitation. Then the hyoid bone rises, elevating the larynx while the closed epiglottis protects the larynx. At the same time the tongue contacts the pharyngeal wall, the inferior pharyngeal muscles contract, the cricopharyngeal muscle relaxes and the upper esophageal sphincter opens. 3. Esophageal phase: finally, the bolus passes into the esophagus and moves to the stomach with peristaltic movements. These complex mechanisms greatly depend on the correct integration of sensory inputs via the V, VII, IX, and X cranial nerves, cortical central nervous system input and medullary structures.

Age-related changes of swallowing can occur in every deglutition phase

and are summarized under the term primary presbyphagia. Older people can have a prolonged oropharyngeal phase, decreased posterior and superior lingual movement, delayed pharyngeal triggering and initiation of the swallow reflex, smaller swallowing volume, reduced hyolaryngeal movement, delayed opening of the upper esophageal sphincter, increased residual matter in the pharynx and a higher proportion of silent aspiration or penetration [10, 24, 31]. The reasons for these changes are multifactorial and include aspects such as decrement in taste and smell acuity, tooth problems, loss of muscle mass, sarcopenia, decrease of tissue elasticity, cervical spine changes and hyposalivation [17, 29]. These age-related changes are usually compensated and clinically inapparent; however, they can impair the ability to compensate disease-related swallowing dysfunction and lead to clinically significant dysphagia ([17]; **Fig. 1**; **Table 1**). This secondary presbyphagia is the key mechanism in older patients with neurological disorders, such as stroke, Parkinson's disease and dementia [7].

Complications of dysphagia: pneumonia and malnutrition

Dysphagia in older age is an independent predictor of serious complications and is associated with an increased mortality [4, 30]. Dysphagia can double the risk of developing pneumonia [25]. The major-

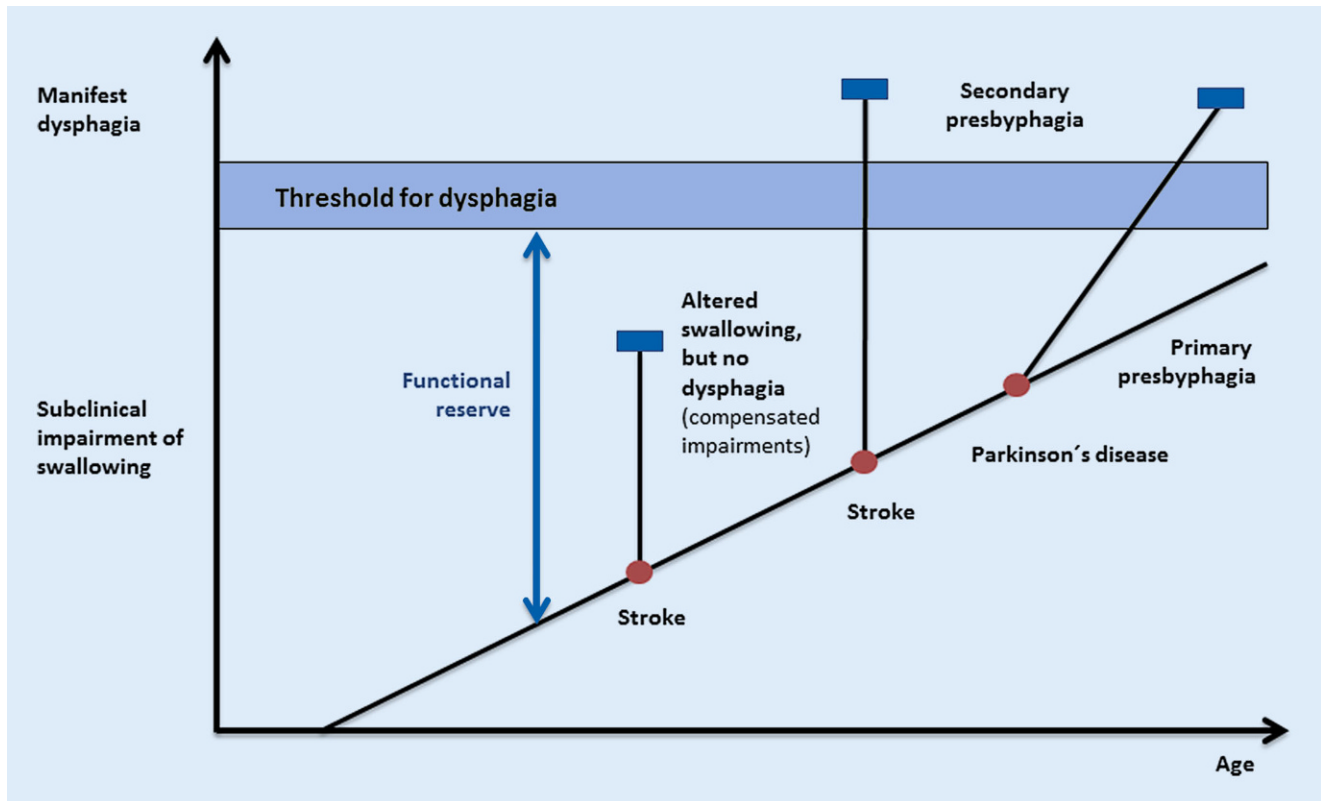


Fig. 1 ▲ Primary and secondary presbyphagia (modified from [17]). Even if the primary presbyphagia itself is clinical asymptomatic, it permanently reduces the compensation reserve of the swallowing act, so that additional disease-related changes can lead to more clinically relevant secondary dysphagia

ity of geriatric patients hospitalized for pneumonia have concomitant dysphagia, which in turn determines the severity and course of the infection [25]. Furthermore, dysphagia is associated with poor oral health, malnutrition and ultimately with reduced physical and mental performance and frailty. In clinical practice, the nutritional intake may be compromised in (1) pure chronic starvation without inflammation, (2) conditions with sustained mild inflammation (e.g. cancer, rheumatoid arthritis) and (3) acute diseases with significant inflammation which elevates resting energy expenditure (e.g. pneumonia) and decreases nutritional intake due to suppressed appetite [20]. Age-related changes that favor malnutrition are usually summarized under the term anorexia of aging and include aspects such as loss of appetite and/or decreased food intake. As a result the compensation of hypocaloric episodes during acute illness is rendered more difficult in old people. Besides age, frailty, excessive polypharmacy and cognitive decline,

dysphagia and signs of impaired efficacy of swallowing were found to be relevant risk factors of malnutrition [21]. Moreover, eating and drinking are integral parts of social interaction and are particularly relevant for making and maintaining friendships and leisure activities. Dysphagia-associated anxiety and stigma is therefore associated with depression, social withdrawal, and reduced quality of life [18].

Diagnostic algorithm

Based on the available data and the recommendations of the white paper from the European Society for Swallowing Disorders and the European Union Geriatric Medicine Society the following standardized diagnostic algorithm for dysphagia in geriatric patients is proposed: (1) dysphagia-specific anamnesis, (2) dysphagia screening, (3) detailed clinical swallowing examination, and (4) instrumental examination methods.

I. Anamnesis. A structured anamnesis interview should systematically assess causative underlying diseases, comorbidities, drug history [28], onset and progression of disease, current diet, social situation, previous diagnosis and therapeutic trials. Subsequently, dysphagia-specific issues should be evaluated, in particular changes in eating and drinking habits, avoidance of certain foods and consistencies, time required for eating, posture during eating, difficulty in chewing, food residues after swallowing in the mouth or throat, globus sensation, altered voice, throat clearing, coughing or dyspnea during eating, leakage of food or liquids from the nose, etc. In addition, there is a specific need to ask about possible complications of dysphagia, such as the occurrence of pneumonia, dehydration and weight loss. Special questionnaires may be used to record dysphagia symptoms and to assess the dysphagia risk. The swallowing disturbance questionnaire (SDQ), originally designed for use in Parkinson's disease

[14] has now been tested with satisfactory results in a mixed etiology dysphagia collective [6]. For a less time-consuming assessment of dysphagia symptoms the 10 questions eating assessment tool (EAT-10) was developed [3, 32]; however, based on the currently available data the authors recommend the SDQ for neurogeriatric patients. To assess the health-related quality of life caused by dysphagia, the swallowing quality of life (SWAL-QOL) questionnaire can be used [16]

II Dysphagia screening. Most of the published test protocols have been evaluated in patients with stroke and are characterized by a relatively high sensitivity (>80%, sometimes >90%) and at best moderate specificity (usually <60%) [9, 11]. Methodologically, the screening methods can be differentiated into the following two categories: (i) water swallowing tests (e.g. 50, 70 or 90 ml water test, timed water swallow test, Toronto bedside swallowing screening test, TOR-BSST) and (ii) tests with multiple food consistencies (Gugging swallowing screen, GUSS; volume viscosity test, VVST; semisolid bolus swallow test); however, only multiple food consistency tests allow differentiated recommendations regarding diet and therapeutic procedures. According to the available data so far, the VVST seems to be particularly suitable for the use in neurogeriatric patients [1, 5]. The test has a sensitivity of 88.2% and a specificity of 64.7% for the detection of penetration or aspiration [5]. It has the advantage in older, frail people, for whom extended instrumental dysphagia diagnostics are sometimes not available or are not desired to be performed, that nevertheless an adequate compensatory treatment strategy can be derived from the results [23]. The aim of the VVST is not only to detect an aspiration risk but also to find a safe diet.

III: The detailed clinical swallowing examination. This falls within the scope of appropriately trained speech and language therapists. In addition to the assessment of the aspiration risk, it also includes the accurate determination of the pattern and severity of neurogenic

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Dysphagia from a neurogeriatric point of view. Pathogenesis, diagnosis and management

Abstract

Dysphagia is becoming increasingly more common in aging societies and, like the classical geriatric syndromes, it is a relevant functional impairment. The prevalence of dysphagia is highest in the group of old patients with neurological disorders, particularly in patients with stroke, dementia and Parkinson's disease. In the various neurological diseases of older people disease-specific factors often have a decisive influence on the clinical management of dysphagia. In addition, the concept of primary and secondary presbyphagia plays an important role in understanding age-related dysphagia. Whereas at the organ level of the International Classification of Functioning, Disability and

Health (ICF) model, the diagnosis and treatment of dysphagia in neurogeriatrics have already made progress, more research is needed on the levels of activity/mobility, social environment, personal factors and the environment. This article summarizes the pathophysiological aspects as well as the current evidence for diagnosis and treatment of neurogeriatric dysphagia. Due to its high clinical relevance dysphagia should be added to the geriatric syndromes as "impaired swallowing".

Keywords

Deglutition disorders · Malnutrition · Presbyphagia · Stroke · Dementia

Dysphagie aus neurogeriatrischer Sicht. Pathogenese, Diagnostik und Management

Zusammenfassung

Schluckstörungen (Dysphagien) werden in alternden Gesellschaften zunehmend häufiger und stellen wie die klassischen geriatrischen Syndrome eine relevante funktionelle Beeinträchtigung dar. Am höchsten ist die Prävalenz von Dysphagien in der Gruppe alter Patienten mit neurologischen Erkrankungen, insbesondere im Rahmen eines Schlaganfalls, einer Demenz oder eines Morbus Parkinson. Bei den verschiedenen neurologischen Erkrankungen des älteren Menschen haben krankheitsspezifische Faktoren oft einen entscheidenden Einfluss auf das klinische Management von Dysphagien. Darüber hinaus kommt dem Konzept der primären und sekundären Presbyphagie eine wichtige Rolle für das Verständnis altersassoziierter Schluckstörungen zu. Während auf der Organebene

des ICF-Modells die Diagnostik und Therapie von Schluckstörungen in der Neurogeriatrie bereits Fortschritte erzielt hat, gibt es auf den Ebenen Aktivität/Mobilität, soziales Umfeld, persönliche Faktoren und Umwelt noch weitreichenden Forschungsbedarf. Dieser Artikel fasst die pathophysiologischen Grundlagen sowie die derzeitige Evidenz für Diagnostik und Therapie neurogeriatrischer Dysphagien zusammen und kommt zu dem Ergebnis, dass Schluckstörungen aufgrund ihrer klinischen Relevanz den geriatrischen „I's“ als „impaired swallowing“ hinzugefügt werden sollten.

Schlüsselwörter

Schluckstörung · Malnutrition · Presbyphagie · Schlaganfall · Demenz

dysphagia as a basis for further diagnostics, meal adjustment and treatment planning. The survey begins with an examination of oropharyngeal structures and ends with swallowing experiments in which different consistencies, usually in the order semisolid, liquid, and solid, are tested. For the documentation of dysphagia severity several scores are available, e.g. the Bogenhausen dysphagia score (BODS) [2], which has not yet been validated for neurogeriatric patients.

IV: Instrumental procedures. The fiberoptic endoscopic examination of swallowing (FEES) is currently the most widely used method and is recommended in several guidelines of various professional societies [8]. A flexible nasopharyngeal laryngoscope is inserted transnasally into the pharynx to directly visualize the swallow. The standard FEES protocol consists of (i) an anatomical physiological examination, (ii) swallowing examination, and (iii) assessment

Table 1 Patterns of dysphagia in neurogeriatric patients

Dysphagia	Frequent findings
Chronic post-stroke	Significant premature spillage, delayed oral transfer, delayed pharyngeal swallowing, reduced hyolaryngeal elevation, impaired upper esophageal sphincter opening (Wallenberg syndrome)
Alzheimer's disease	Oral residue, delayed oral transfer, oral apraxia, delayed pharyngeal swallow, pharyngeal residue, reduced hyolaryngeal elevation
Parkinson's disease	Repetitive pumping movements of the tongue, oral residue, premature spillage, piecemeal deglutition, residue in valleculae and pyriform sinuses, somatosensory deficits, esophageal hypomotility, esophageal spasms
Drug-induced: tardive dyskinesia	Reduced base of tongue retraction, disorganized tongue movements, pharyngeal residue, irregular and insufficient pharyngeal contractions

of the effectiveness of therapeutic measures. In addition to this standard protocol, specific investigational protocols have been validated for several neurological disorders (FEES-tensilon test and fatigable swallowing test for myasthenic dysphagia; FEES-L-dopa test for the detection of L-dopa-sensitive dysphagia in Parkinson's disease; fiberoptic endoscopic dysphagia severity scale (FEDSS) for grading and management of stroke-related dysphagia) [27]. The video fluoroscopic evaluation of swallowing (VFSS) is a contrast-enhanced radiographic examination that allows a cinematic recording of the entire swallowing process [2, 12]. The VFSS is usually carried out according to the so-called Logemann standard [12] with increasing swallowing volumes. The image sequences are evaluated both qualitatively and quantitatively [26]. Finally, with the modern high-resolution manometry (HRM) endoluminal pressures in the pharynx and esophagus can be measured during swallowing. This method is particularly suitable for detecting relaxation disorders of the upper esophageal sphincter and motility disorders of the esophagus (achalasia, diffuse esophageal spasm). Further electromyography (surface or needle electrodes) as well as sonography and dynamic magnetic resonance imaging are predominantly experimental procedures for the evaluation of the swallowing act, which have not yet found their way into clinical routine. By using instrumental tools specific disturbance patterns of dysphagia can be found in different

neurological disorders that are highly prevalent in older people (■ Table 1).

Based on the merits and disadvantages of each of the diagnostic modalities presented above, as well as their varying site to site availability, a proposed diagnostic algorithm for geriatrics dysphagia diagnostics is shown in ■ Fig. 2.

Treatment

The primary goal of therapy is an adequate diet without any risk of aspiration. For this purpose, speech and language therapists specialized in swallowing treatment can resort to a variety of different methods depending on the clinical aspects of dysphagia. Furthermore, multidisciplinary collaboration between neurologists, geriatricians, speech and language therapists, nutrition specialists, nurses, physiotherapists, occupational therapists and social services is essential for optimal treatment of neurogenic dysphagia [22]. In geriatric patients the factors (i) dysphagia/reduced cough reflex, (ii) frailty/malnutrition/impaired immunity and (iii) poor oral health/colonization with pathogenic germs significantly contribute to the etiology of aspiration pneumonia [19]. A useful intervention has to cover all these factors. For this purpose the minimally massive intervention (MMI) was developed to reduce nutritional and respiratory complications in older hospitalized patients with dysphagia [15]. The MMI consist of the following steps: first, with the help of the VVST the appropriate diet for the individual patient and, if necessary, the required degree of thickening of liquids

should be determined. Second, patients at risk for malnutrition or a state of malnutrition should be identified using the mini-nutritional assessment (MNA) and receive a high-calorie, high-protein diet. Third, patients and caregivers should receive hands-on guidance to optimize oral hygiene. Preliminary results suggest that the MMI might become a simple and cost-effective strategy to reduce dysphagia complications in the geriatric population with an acute disease admitted to a general hospital. In addition, special drug or surgical treatment options are available for specific forms of neurogenic dysphagia. Neurostimulation methods (e.g. transcranial magnetic stimulation, transcranial direct current stimulation and pharyngeal electrical stimulation) are promising new options that are currently being investigated in several clinical studies [27]. Specific treatment options for stroke-related dysphagia with preliminary proof of benefits are thermal tactile stimulation, electromyographic biofeedback, Mendelsohn maneuver, Shaker exercise, expiratory muscle strength training (EMST), and the abovementioned neurostimulation methods; however, all these methods have to be validated in further randomized and multicenter studies. For dysphagia in patients with Alzheimer's disease there is some evidence that thickening of liquids may reduce the aspiration risk [27]. For patients with Parkinson's disease-related dysphagia it is recommended to test if dysphagia improves after adjustment of dopaminergic treatment. In Parkinson's disease the thickening of liquids may be more effective than the Chin-tuck maneuver in avoiding aspiration; however, on an individual level one might consider performing the Chin-tuck maneuver when thickening of liquids is refused by the patients, which frequently occurs in the long term. In any case, the effectiveness of the chosen method should be evaluated by FEES or VFSS. Effortful swallowing can be used to reduce pharyngeal residues and FEES can serve as a biofeedback method during the swallowing therapy. Expiratory muscle strength training (EMST) for 4 weeks can result in decreased severity

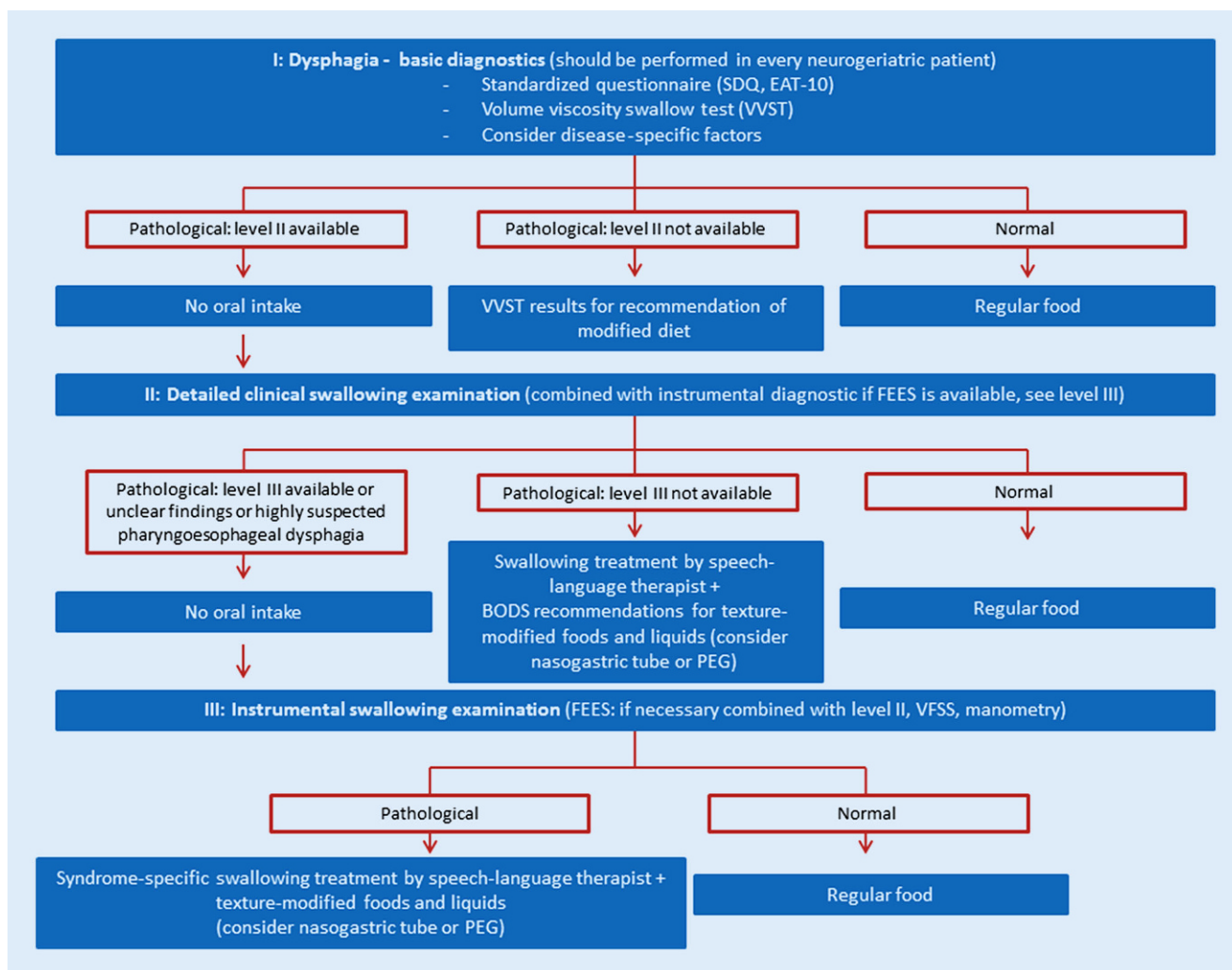


Fig. 2 ▲ Diagnostic algorithm for dysphagia in older patients. At the first level, this algorithm provides a history-based medical record structured by the use of validated questionnaires (SDQ swallowing disturbance questionnaire EAT-10 eating assessment tool) and the application of the volume viscosity swallow test (VVST). If there are no indications of the presence of dysphagia, the dysphagia-specific examination at this point can be terminated and no therapeutic interventions are required; however, if there are indications of the presence of dysphagia, at least one clinical swallowing examination should be carried out but ideally also an instrumental procedure (preferably fiberoptic endoscopic examination of swallowing, FEES). BODS Bogenhausen dysphagia score, PEG percutaneous endoscopic gastrostomy, VFSS video fluoroscopic evaluation of the swallowing act

of penetration and aspiration in mild to moderate Parkinson's disease-related dysphagia [27].

Conclusion

- The prevalence of dysphagia increases with age.
- Dysphagia is still underdiagnosed and frequently not spontaneously reported by the patients.
- Age-related changes of swallowing (primary presbyphagia) impair the compensation of disease-related

impairment of swallowing and can lead to secondary presbyphagia.

- A neurogeriatric diagnostic algorithm should cover (i) dysphagia-specific anamnesis, (ii) dysphagia screening, (iii) detailed clinical swallowing examination, and (iv) instrumental examination methods.
- There is an urgent need to study dysphagia in out-patient settings to explore barriers and facilitators of different diagnostic and therapeutic strategies in detail.

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Compliance with ethical guidelines

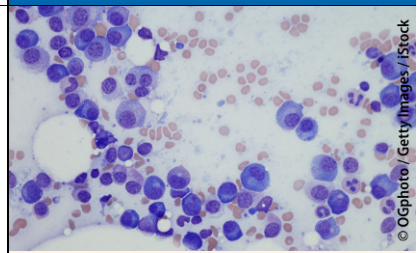
Conflict of interest T. Warnecke, R. Dziewas, R. Wirth, J.M. Bauer and T. Prell declare that they have no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All studies performed were in accordance with the ethical standards indicated in each case.

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Fachnachrichten



Herbert Czitober-Forschungspreis

Der Vorstand der Österreichischen Gesellschaft zur Erforschung des Knochens und Mineralstoffwechsels schreibt seit 1996 in Gedenken an den österreichischen Osteologen Prof. Dr. Herbert Czitober (1925-1990) einen Forschungspreis aus.

Der mit EUR 2.000,00 dotierte Preis gelangt 2019 für die beste wissenschaftliche Arbeit auf dem Gebiet des Knochen- und Mineralstoffwechsels zur Ausschreibung. Zur Einreichung sind alle WissenschaftlerInnen berechtigt, die entweder Österreichische StaatsbürgerInnen sind oder nachweislich ihre Arbeit überwiegend in Österreich durchgeführt haben. Die/der Bewerber/in muss im Titel der Arbeit als Erste/r angeführt und darf nicht älter als 45 Jahre sein.

Erwartet wird die Einreichung klinischer und experimenteller Originalarbeiten, die Themen auf dem Gebiet des Knochen- und Mineralstoffwechsels zum Inhalt haben. Die Arbeiten müssen entweder in den letzten zwei Jahren publiziert oder nachweislich zum Druck angenommen worden sein. Publikationen, die bereits an anderer Stelle eingereicht oder prämiert wurden, können nicht berücksichtigt werden.

Die Einreichung der Arbeit hat elektronisch zu erfolgen unter Angabe des Lebenslaufes und des Geburtsdatums der Bewerberin/des Bewerbers an das Sekretariat der ÖGKM zu erfolgen. Die Kontaktdaten lauten: Bettina Pugl, oegkm@medacad.org

Einreichfrist. 31. Oktober 2019

Die Einreichungen werden von einer Jury bewertet. Die Verleihung erfolgt im Rahmen des Osteoporoseforums 2020 in St. Wolfgang. Ein Vortrag des Preisträgers ist im Rahmen der Verleihung vorgesehen.