

Respiratory and Nutritional Complications in Oropharyngeal Dysphagia

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ABSTRACT

INTRODUCTION: The probability of occurrence of aspiration pneumonia in the acute stroke phase is around 7% and two-third of all stroke patients develop aspiration pneumonia or malnutrition in long term. Studies have shown that neurogenic oropharyngeal dysphagia (NOD) is the most important risk factor for stroke-associated pneumonia.

METHODS: Our prospective study in dysphagic stroke patients ($n=85$) over a period of 3 months included the evaluation of the Swallowing-specific Quality of Life (SWAL-QoL) in a patient population of stroke patients in a stroke unit centre. Within a dysphagia management concept (DMC) an initial swallowing screening (MSA) and clinical swallowing examination (CSE) as well as endoscopic and radiological supported diagnostic instruments (FEES=flexible endoscopic examination of swallowing; VFSS=Videofluoroscopic swallowing study) were used to grade the severity of dysphagia.

RESULTS: The analysis of type and composition of solid and liquid food indicate that more adaptations in food/liquid consistencies are done in the first week of inpatient care setting. In the outpatient setting after 3 months when patients are back home, the implementation of therapeutic interventions regarding different food/liquid consistencies seems more problematic. The analyses of the subscales of SWAL-QoL in stroke patients show, that the „fear of choking“ only marginally affected the QoL. On the other hand, it was observed, that eating habits, communication and fatigue were more likely to create problems and have a negative effect on the

patients quality of life (QoL).

DISCUSSION: Importantly patients and their relatives should be informed intensively about the possibilities of adapting different food/liquid consistencies, thus a dysphagia-specific nutrition can be guaranteed also in an outpatient setting. Another important step could be a continuous medical education regarding neurogenic oropharyngeal dysphagia in outpatient setting by using brochures and training methods to enhance further treatment beyond clinical rehabilitative settings. It seems that the greatest limitation of quality of life is the eating duration, whereas interestingly the least restriction is caused by „fear of choking“ in stroke patients with oropharyngeal dysphagia (OD).

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Key words: Oropharyngeal dysphagia; Stroke; Aspiration pneumonia; Malnutrition; Quality of life

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INTRODUCTION

After urinary tract infections, pneumonia is the second most common hospital-acquired infection. 13 to 48 % of infections in nursing homes are caused by pneumonia^[1,2]. It is well established, that half of all healthy people aspirate while sleeping, but efficient bronchopulmonary defence mechanisms prevent further infections. The presence of potential pathogens, for example gramnegative bacteria, as well as low immunity enhance infections^[3]. The severity of an infection depends on the quantity of the aspirate (critical level: 0,4ml/kg body weight) and/or the acidity (significant pH<2.5). There is a difference between aspiration-pneumonitis and aspiration-pneumonia^[3]. The aspiration of gastric juice causes pneumonitis resulting in the development of the so-called “Mendelson Syndrom” with the additional occurrence of atelectasis, broncho-pneumonia and ARDS^[4]. The use of swallowing endoscopy and bronchoscopy has not only the ability to evaluate the swallowing but also reduce the pathological modified secret and enable a fast and secure

microbial identification by means of lavage. Most common is a polymicrobial aetiology with detection of aerobe and anaerobe pathogens. In community-acquired pneumonia gram-positive pathogens are very likely too, whereas the spectrum of pathogens in multimorbid patients probably consists of gram-negative pathogens or polymicrobial infections. Multimorbid patients are more frequently hospitalised and therefore had more antimicrobial therapies^[5]. Patients with severe neurological diseases are often in a bedridden state and due to unconsciousness and/or neurogenic dysphagia, have a higher risk for aspiration pneumonia^[6,7]. Studies have shown, that patients with fatigue, lethargy or under sedatives are more likely to aspirate^[8]. Polypharmacy also may have a negative effect regarding to side effects and thus different medications can cause xerostomia, immunosuppression, hypersalivation, myopathy, blockade of the neuromuscular junction and defects of mucous membrane and thereby increase the risk of aspiration^[9,10].

STROKE-ASSOCIATED PNEUMONIA IN PATIENTS WITH OROPHARYNGEAL DYSPHAGIA

After stroke 12-31% of all patients develop respiratory tract infections, resulting in the death of approximately one quarter of all patients within the first month^[11]. Neurogenic oropharyngeal dysphagia (NOD) is the most important risk factor for stroke-associated pneumonia (SAP) and during the acute stroke phase about 50% of all stroke patients suffer from swallowing problems^[12]. The results of a survey carried out in Germany have shown that currently no uniform concept exists regarding standardized diagnosis and treatment of dysphagia after acute stroke in German stroke units. Differences in strategies and the quality of care are obvious^[13]. Recently, with the development of dysphagia management concepts there are guideline, which enables a standardized diagnosis and treatment of NOD^[14,15,16]. By using a uniform management at the beginning of the hospitalization the risk of pneumonia and the use of antibiotics have been significantly reduced^[17]. Therefore screening should be performed in an acute care clinic by using a standardized swallowing assessment. In case of suspected dysphagia the patient should initially get nothing per os (NPO) and further diagnostics are necessary. With the help of stroke nurse courses a uniform assessment of dysphagia can be taught effectively and necessary skills are provided. Especially brainstem infarction leads to severe dysphagia and a study showed that 65,2% of all examined stroke patients aspirated^[18] (Figure 1).

In case of dysphagia, the clinical swallowing examination (CSE) by swallowing therapists and the flexible transnasal endoscopy (FEES) by doctors allow the graduation of dysphagia severity^[19]. Relating to the grade of dysphagia different food consistencies should be provided^[20]. According to therapy studies there is a need for an early and intensive swallowing therapy. In addition Hamdy *et al* showed that the reorganization of brain lesions happen within weeks after an acute stroke and can be accelerated by therapeutic interventions, e.g. electrical stimulation. Therefore, the early initiation of adaptive and functional therapy is beneficial for faster improvement of swallowing function^[21,22].

MALNUTRITION IN OROPHARYNGEAL DYSPHAGIA

Malnutrition is also accompanied with debilitation of the immune

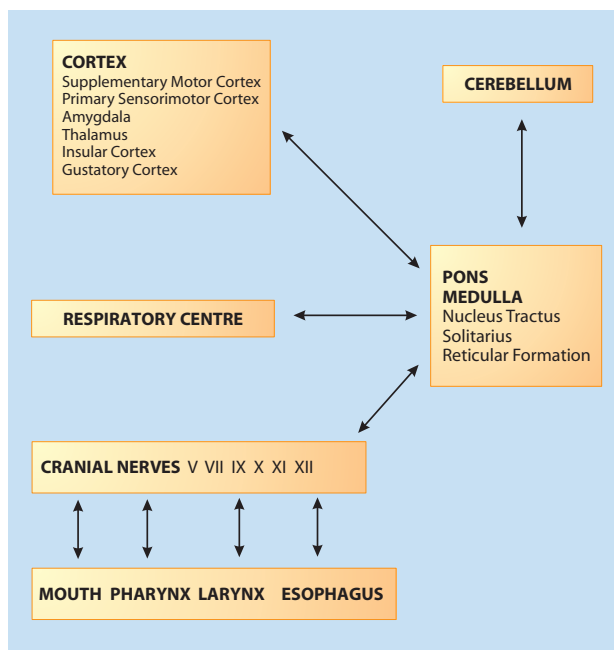


Figure 1 Neuroanatomy of swallowing.

system, whereby the risk of infections rises. Stroke patients are often older and thus have an increased risk of malnutrition, which was revealed by a study conducted by the health insurance companies in Germany 2003. According to this study 1.6 million German people suffer from malnutrition. 50% of all nursing home residents and 70% of elderly hospitalized patients show clinical signs of malnutrition^[23]. The most commonly used parameter of nutritional status is the Body-Mass-Index (BMI). Other advices are either accidental weight loss >5% within three months^[24] or 10% within six months and serum albumin <35g/L^[25,26]. A study showed that stroke patients with low serum albumin more frequently suffer from infections and had an increased mortality^[27]. Factors like senile anorexia (reduced food demand in elderly) and sarcopenia (atrophy of skeletal muscles) are decisive for changes in the nutritional status of the elderly^[28]. Furthermore there is a reduced sense of thirst in elderly people^[29,30] and overall the development of malnutrition is of multifactorial pathogenesis: Reduction in sensory perceptions (smell, taste, vision), increased activity of gastrointestinal appetite suppressing hormones and changes in different neurotransmitters, cytokines etc^[31,32]. Psychological problems, physical and mental impairments and moreover socioeconomic factors like loneliness and poverty are other possibilities of changes in nutrition status. Malnutrition can be caused by or result in dysphagia. It leads as a result of a protein- and energy-deficiency to an atrophy of the skeletal muscles, also in the area of swallowing muscles^[24] and changes in mouth-, maxillofacial- and dental status. Summarized, there is a circulus vitiosus with weakened immune system and reduced swallowing function^[33,34]. It can be concluded that malnourished stroke patients have a significant prolonged recovery and an increased mortality in contrary to patients with normal nutritional status^[35]. Perry and McLaren highlighted the connection between malnutrition and quality of life. This analysis shows, that quality of life was highly correlated with mood and nutritional status^[36].

Since many patients and caregivers have little knowledge about aspiration and aspiration pneumonia, there is a great demand to

enlighten the possible complications of OD. Therefore dysphagia should be an important clinical factor, which has to be addressed in clinical practice in case of suspected swallowing dysfunction. In a dysphagia management concept (DMC) an initial swallowing screening (MSA) and clinical swallowing examination (CSE) as well as endoscopic and radiological supported diagnostic instruments (FEES=flexible endoscopic examination of swallowing; VFSS=Videofluoroscopic swallowing study) should be used to grade the severity of dysphagia^[16,17,37]. A screening for malnutrition should be added, to identify patients, who could profit from nutritional medical interventions. As the method of choice the nutrition risk screening (NRS) is recommended^[38]. Therefore it seems to be useful to integrate the nutrition risk screening into the dysphagia management to allow individual dietary adaptations at the very beginning of dysphagia treatment (e.g. suitable preparations with high calories). It is important to provide continuous swallowing therapy within the clinical treatment period. This, in turns means, that at least two swallowing therapist should be provided at the department/stroke unit to guarantee continuous dysphagia diagnosis and treatment algorithms.

Our results from a prospective observational study in dysphagic stroke patients over a period of 3 months included the nutritional concept (Figure 2) as well as the evaluation the Swallowing-specific Quality of Life (SWAL-QoL) of stroke patients in a stroke unit centre. SWAL-QoL was developed to observe the swallowing difficulties in stroke victims. The questionnaire shows a good validity and reliability^[39,40], including 10 parts with 44 items (Figure 3).

The analyses of the subscales of SWAL-QoL in stroke patients show, that the „fear of choking“ only marginally affected the QL. On the other hand, it was observed, that eating habits, communication and fatigue were more likely to create problems and have a negative affect on the patients quality of life. It seems that the greatest limitation of quality of life is the eating duration, whereas interestingly the least restriction is caused by „fear of choking“ in stroke patients. However in a clinical study with mechanical dysphagia in oropharyngeal tumours showed an increased “fear of choking”^[41]. One explanation for this discrepancy could be, that in neurogenic dysphagia the loss of pharyngeal sensitivity leads to less attention to swallowing problems and put these patients in danger of „silent aspiration“. Furthermore post-stroke dysphagia is only one out of several symptoms like hemiplegia, aphasia, apraxia and neglect for

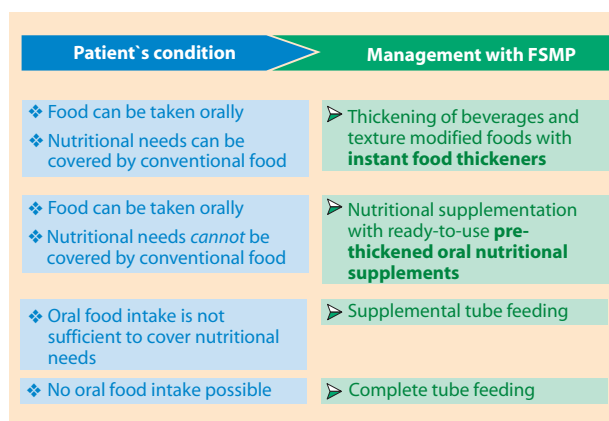


Figure 2 Foods for special medical purposes (FSMP) to manage nutrition of dysphagic patients.

example. On the other hand patients with oropharyngeal tumours and mechanical dysphagia decide consciously for a certain surgery option with all possible complications and thus they are often well informed about the most probable complications (e.g. dysphagia) in advance^[42]. In those patients speech and swallowing problems have often priority.

Furthermore we analysed of type and composition of solid and liquid food (Table 1) over time indicating that more adaptations in food/liquid consistencies are done in the first week of inpatient care setting. In the outpatient setting after 3 months when patients are back home, the implementation of therapeutic interventions regarding different food/liquid consistencies seems more problematic (Figure 4).

Type / composition of solid food	day 3-5 (n=85)	day 90 (n=85)
normal	55.3%	81.2%
soft food	23.5	9.4%
pureed food	11.8%	2.4%
mainly nasogastric tube	3.5%	2.4%
exclusively nasogastric tube	5.9%	2.4%
prefer not to say	0%	2.4%
Type/composition of liquids		
water, tea	68.2%	87.1%
similar to tomato-or apricot juice	16.5%	3.5%
similar to bananamilk or honey	4.7%	0%
similar to pudding	1.2%	1.2%
nothing	9.4%	4.7%
prefer not to say	0%	3.5%

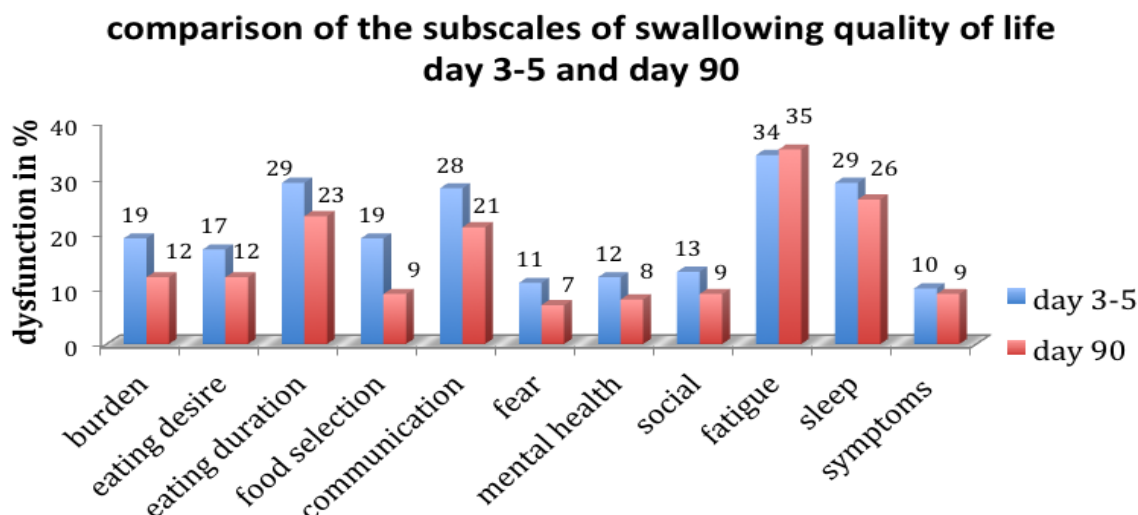


Figure 3 Comparison of subscales of swallowing specific quality of life in patients with dysphagic stroke.

Key feature of pre-thickened ONS	Target of nutritional management
❖ Nectar, honey and pudding-like stable consistency	➤ to adapt to the kind and degree of swallowing impairment
❖ Milky or fruity in a variety of flavors	➤ to consider the patients' taste and preference
❖ Mostly high energy (>1.2 kcal/g or mL) and high protein (≥20 en%)	➤ to fill the nutritional gap with lowest possible volume and improve patients' compliance to nutrient intake

Figure 4 Key features of pre-thickened oral nutrition and their benefits for dysphagic patients.

One explanation could be a significant improvement in swallowing function within 3 months. On the other hand a lack of understanding the risks and complications of dysphagia could be another reason for these results. It seems to be important to inform and guide patients and their relatives intensively about the importance of the adaptation of different food/liquid consistencies, thus a dysphagia-specific nutrition can be guaranteed also in an outpatient setting.

Another important step could be a continuous medical education regarding neurogenic oropharyngeal dysphagia (NOD) in outpatient setting by using brochures and training methods to enhance further treatment beyond clinical rehabilitative settings. Also more dysphagia centres should be established, that consolidate the different departments (e.g. neurology, internal medicine, geriatrics, ENT, intensive care, radiology, surgery and paediatrics) that deal with oropharyngeal dysphagia. The boundary between prevention, acute care and rehabilitation are not yet permeable, which results in communication difficulties often due to anonymity of the involved actors.

DISCUSSION-ASPIRATION PNEUMONIA AS A REAL CHALLENGE FOR THE COOPERATION BETWEEN DIFFERENT DEPARTMENTS IN A HOSPITAL SETTING

Besides neurological diseases, further risk factors for aspiration pneumonia are a weakened immune status, dental hygiene, gastro-intestinal diseases (e.g. reflux), altered consciousness^[43] and malnutrition^[33]. Aspiration can be categorized into different grades of severity due to clinical, radiological and endoscopic classifications. Often a proper clinical diagnosis is difficult due to different constellations of symptoms, which can or cannot lead to the presumption of pneumonia. Following symptoms can be found in upper respiratory tract infection: general malaise, fever or hypothermia, cough, purulent sputum, dyspnoea or flu symptoms like myalgia, arthralgia, cephalgia. However following medical findings are more likely to be found in pneumonia: dyspnoea with high respiratory rate, tachycardia, hypotonia, reduced percussion sound, fine crackles and bronchial breathing^[44]. For a proper diagnosis of pneumonia there should be evidence of infiltrates on a chest x-ray but sensitivity, specificity and reliability as proven evidence of infiltrates on chest X-ray are limited^[45,46], especially in mild pneumonia where only slight infiltrations occur. According to Mann et al. more than 3 of the following parameters are required to diagnose pneumonia: fever

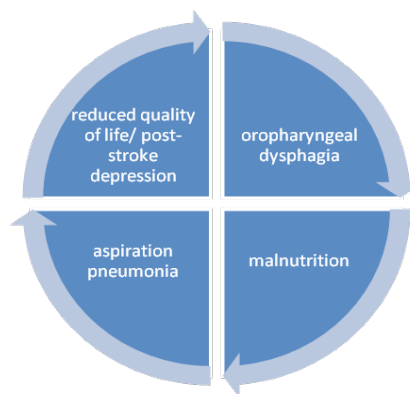


Figure 5 Circulus vitiosus of complications in oropharyngeal dysphagia.

over 38°C, purulent sputum, pathological respiration, pathological chest x-ray, hypoxemia, and proof of pathogens^[47]. Further diagnostics in pneumonia depend on the grade of severity. Thus in the case of mild community acquired pneumonia (CAP), detailed medical history, clinical examination, chest X-ray in two planes and laboratory tests are required. If there are additionally risk factors, it is recommended to extend the laboratory tests corresponding to risk constellation and eventually add microbiological diagnostics and thoracic computer tomography. Hence moderate CAP diagnostics should be extended by the examination of differential leukocyte count, C-reactive protein (CRP) and procalcitonin, analyses of the arterial and capillary blood gases and oxygen saturation. In those cases the clinical meaning of microbial investigations are uncertain. Whereas the microbial diagnostic of severe CAP has great importance and the following parameters are recommended to evaluate: blood cultures, sputum or tracheal secret, pleura puncture, L. pneumophila antigen in urine and bronchoscopy (lavage) in case of suspected unusual pathogens or bronchus stenosis^[44].

The treatment of aspiration pneumonia should start as soon as possible (a.s.a.p.). The antibiotic therapy need to take place before knowing the exact spectrum of pathogens. In order to select the correct antibiotic therapy thoughts about toxicity, pharmacokinetic/pharmacodynamic data and costs have to be made. According to the guidelines of the American Thoracic Society, the Paul-Ehrlich Institute and the German Society of Pneumology the severity of disease, the presence of risk factors, time of manifestation and the place of infection have to be considered as well. Regarding to the possible antibiotic agents there are a lot of recommendations^[4]. Additionally the treatment has to be complemented by all possibilities of intensive care medicine and targeted ventilation therapy. One of a greatly feared complication is the ARDS (Acute Respiratory Distress Syndrome), which consists of three stages: in the acute stage there are exudative changes with permeability disorders, in sub-acute or chronic proliferative stage persistent infiltrates are expected and in case of uncontrollable clinical course atelectasis, lung oedema and severe microcirculation disturbances are found. Severe pneumonia can also lead to sepsis or systemic inflammatory response syndrome (SIRS). Changes in treatment regimen (e.g. higher PEEP, definition of tidal-volume), positioning therapy, use of steroids, target normoglycaemia, immunomodulatory strategies and/or hemofiltration are further treatment options^[48]. Initially the antibiotic therapy should be related to the expected pathogens and later corresponding to germ identification and resistance testing should be adapted. Antibiotic resistance has increased regionally and world wide in the last ten years, especially in terms of the classical pathogens of the lower

airway as for example *S. pneumonia*, *H. influenza* and *M. catarrhalis*. Multiresistant pathogens include Methicillin-resistant *Staphylococcus aureus*, Vancomycin-resistant *Enterococcus*, extended β -Lactamases and *Klebsiella-pneumoniae* Carbapenemases. Further causes for the occurrence of multiresistant pathogens are inappropriate antibiotic therapy, poor hygiene in hospitals and adding of antibiotics containing glykopeptides to animal feed. However the development of aspiration pneumonia seems to be correlated with the loss of physical activity, which consequentially leads to impairment in daily life activities (ADL-functions). This applies especially to the independency in oral intake and oral hygiene^[49]. Patients, who are fed by caregivers are often in danger of forced feeding without full swallowing acts^[50]. Additional inadequate oral/dental hygiene can lead to the aspiration of food, liquid and contaminated saliva. A study showed that 88% of patients, who have been fed, suffered from dysphagia, 75% aspirated and 38% developed pneumonia^[2]. Furthermore an adequate body position and avoidance of sedative medications should be included in the monitoring regime of dysphagic patients^[17]. The nasogastric tube (NGT) or PEG-tube can be seen as an external sign for severe neurological impairment without the possibility of oral intake and thus vulnerability to secondary diseases with the reduction in quality of life (QoL) and increased risk of aspiration pneumonia^[37].

To summarize the previous explanations the interaction between oropharyngeal dysphagia, aspiration pneumonia, malnutrition and reduced quality of life/depression can be seen as a circulus vitiosus, whereby every factor is interlinked with each other. Therefore a good “team play” of different Departments in the hospital and “team play” in the different medical professions is needed to offer best possible care to this sensitive patient group.

CONCLUSION

An early detection of oropharyngeal dysphagia with reduction of aspiration pneumonia rate, improvement in quality of life and prevention of malnutrition should be performed by using standardized management programs^[13]. In a study Doggett *et al.* showed that aspiration pneumonia rate could be decreased from 8.2% to 1.3% (relative risk reduction 84%) within the first two weeks due to early dysphagia screening, respectively instrument-based diagnostics^[51]. Both reduced costs of antibiotics and economization of invasive diagnostics and treatment options to detect pneumonia can be achieved. Under certain circumstances this could also lead to a better quality of life, since reductions in diagnostic exposure, hospital stay and invasive procedures (pleural puncture, bronchoscopy) are attainable. In an observational study the rate of pneumonia could be significantly reduced over years by using a standardized dysphagia management concept (DMC) at the very beginning of a patient’s hospital stay^[17]. In addition early detection within a stroke complex treatment due to standardized measurement of temperature (e.g. every 4 hours) and monitoring of vital parameters is important to initiate an early treatment that later can be adapted to the expected spectrum of aspiration pneumonia in dysphagic patients.

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