Current aspects of assessment and treatment of dysphagia
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An introduction to swallowing and swallowing disorders
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Eating and drinking are one of the basic necessities of mankind. Generally, a healthy adult swallows between 800 and 2400 times a day. Although swallowing seems easy, in reality it requires an extremely complicated interaction between various muscles. Timing, coordination, feeling and muscular strength all play a significant role. When one or more of these conditions for swallowing are disturbed, this is called dysphagia. Dysphagia can have severe impact on patients' Quality of Life. The swallowing process can be divided into the following four phases:

Oral phase
In this first phase the mouth is opened and a piece of solid food or liquid is taken in. The mouth closes, and in case of the intake of a hard consistency, chewing follows. The cheek muscles are tightened to prevent remnants of food remaining in the cheek pouches. Chewing mixes the food with saliva and prepares it for swallowing. When the chewing process is completed, the food (or bolus) is collected in the centre of the tongue and the person is ready to swallow. This first phase of the swallowing process is entirely voluntary.

Transport phase
The second phase in the swallowing process is the transport phase. When the bolus has been collected in the centre of the tongue, the tip of the tongue is placed behind the teeth creating a groove in the tongue. This allows the bolus to slide into the pharynx (the throat). The sliding into the pharynx is not an entirely automatic process. The tongue makes a wave-like movement, thus propelling food bolus into the back of the mouth. When the bolus reaches certain receptors in the pharynx, the swallowing reflex is triggered. From this point on swallowing is an entirely reflexive action.

Pharyngeal phase
The third phase in the swallowing process is the pharyngeal phase. When the swallowing reflex is triggered, the pharyngeal phase starts. This phase is the most complex phase of swallowing, because it involves many events which occur in a rapid sequence.
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The soft palate closes the nasopharynx to ensure that the food does not enter the nasal cavity. The vocal folds close and the larynx moves upwards, which results in tilting of the epiglottis and closure of the larynx. This ensures that the food cannot enter the trachea during swallowing. The three pharyngeal constrictor muscles (m. constrictor pharyngis superior, m. constrictor pharyngis medius, m. constrictor pharyngis inferior) contract from top to bottom and transport the bolus into the oesophagus.

Oesophageal phase
In this last phase of the swallowing process, the bolus enters the oesophagus and is transported further down towards the stomach by peristaltic contractions. In this final phase, the muscles in the neck relax, the larynx is lowered and the vocal folds open, allowing the subject to take a breath.

Swallowing problems (dysphagia)
Based on the symptoms of dysphagia, two major groups can be defined:

- solid food or fluids gets stuck during eating or drinking;
- solid food or fluids (including saliva) enters the larynx.

Food or fluids get stuck during eating and drinking
When a problem occurs in the coordination between the various muscles involved in swallowing or when some muscles involved in swallowing are weakened, the bolus cannot be transported properly from the oral cavity into the oesophagus. The bolus gets stuck either in the oral cavity or in the pharynx after swallowing. When part(s) of the bolus remain in the oral cavity or pharynx after swallowing, this is called residue.

Patients with residue after swallowing will complain of a sensation that food is stuck in the back of the throat. In addition, they can also complain that they are not able to eat specific types of food (mostly solid foods) anymore. In order to clear the residue, patients often have to swallow multiple times to clear a single bite of food out of the mouth. This results in the fact that the process of eating and drinking will take much longer. In some cases patients will need over one hour (or more) to finish a normal meal.
Problems in the bolus transport can have great impact on the Quality of Life, but it is also a potential harm for the patients’ health. A majority of patients will start to eat and drink less due to these transport problems. Therefore, involuntary weight loss (and even dehydration and malnutrition) is common in patients with dysphagia. Another threat to the patients’ health is choking: pharyngeal residue can block the upper airway and can in some cases lead to death by asphyxiation.

Saliva, food or fluids enters the airway
Saliva, food or fluids entering the trachea is called aspiration. Aspiration can lead to (fatal) infections of the lungs (aspiration pneumonia). Due to certain neurogenic disorders, the coughing reflex is sometimes no longer active and patients aspirate without being aware of it. This phenomenon is called ‘silent aspiration’.

When dysphagia prevents patients from eating certain types of food, many of these patients will try to avoid these in their daily diet. This can result in serious malnutrition. For this reason, if a patient has swallowing problems it is important that not only the speech pathologist is involved in determining the nature of the problem, but also a dietician is consulted to establish a well balanced oral intake.

Dysphagia in different patient groups
In general, patients with either acute or chronic dysphagia can be divided into three groups:
- neurogenic dysphagia;
- head-and-neck cancer related dysphagia;
- dysphagia due to aging (presbyphagia).

Neurogenic dysphagia
The neurological condition of a patient might lead to sensory problems in the oral cavity or pharynx which may lead to dysphagia. Some neurological disorders can induce weaknesses of specific muscles and muscle groups, causing food to get stuck in the pharynx. Other neurogenic disorders can induce diminished laryngeal closure resulting in (silent)
aspiration. In addition, coordination of the swallowing process can be affected by certain neurological conditions negatively influencing the motor planning of swallowing.

Neurogenic dysphagia can be caused by a range of neurological disorders, like:
- Alzheimer’s disease
- Stroke
- Parkinson’s disease
- Multiple sclerosis
- Amyotrophic lateral sclerosis (ALS)
- Huntington’s disease
- Head injury
- Guillain-Barré syndrome
- Chronic meningitis
- Poliomyelitis
- etcetera.

Sensory problems are frequently found in stroke patients, but also occur frequently in other neurological conditions. Due to decreased pharyngeal sensitivity, the coordination between swallowing and closure of the larynx is disrupted. As a result, the bolus enters the pharynx before the pharyngeal phase of swallowing has been triggered. In general, these patients will aspirate thin liquids.

Other neurogenic disorders might cause motor problems (i.e. on the level of the pharyngeal and laryngeal muscles). Due to general muscle weakness, chewing can be difficult and the pharyngeal muscles might no longer be able to propel the bolus into the oesophagus. Food gets stuck in the pharynx and patients are at risk of choking. These patients often have less problems with the drinking of thin liquids. In some patients, lip closure is insufficient due to facial paralysis, or the bolus cannot be collected in the centre of the tongue due to paralysis of the tongue musculature. This results in food residue in the oral cavity.
Swallowing requires motor planning and coordination. It is known that some neurological conditions, e.g. stroke and dementia, can influence the motor planning of swallowing. In these cases an apraxia of swallowing can occur: a patient puts food in his mouth but seems to have forgotten what to do with it.

Problems in the coordination of swallowing can result in a situation where certain structures (like pharyngeal constrictor or the upper oesophageal sphincter) might have a good motor response to swallowing, but this response is out of sequence. In some neurological patients for instance, the lower pharyngeal constrictors might contract before the middle pharyngeal constrictors contract resulting in a propulsion force which directs the bolus into the direction of the oral cavity instead of the oesophagus.

*Dysphagia in patients with head-and-neck cancer*

Dysphagia can also occur after head-neck surgery, for example because muscles or nerves have been partially or completely resected during surgery, like a hemi-glossectomy or hemi-laryngectomy, causing loss of sensitivity in the oral cavity or pharynx or loss of motor function. The severity of dysphagia depends on the location of the tumour and the extent of surgery. Dysphagia will be negatively influenced by postoperative (chemo-) radiation due to fibrotic changes. Apart from these problems, exposure of the pharynx to radiation might lead to a decreased sensitivity, which can lead to residue in the pharynx and a possible concomitant aspiration or choking. Swallowing rehabilitation in this patient group is mainly targeted on teaching compensation techniques.

*Presbyphagia*

The third patient group consists of patients with ‘presbyphagia’; dysphagia as a result of normal ageing. Elderly people often have more problems with thin fluids (due to the slowing down of the swallowing process) and hard consistencies (less strength for chewing). Ekberg et al. (2002) describe that one in three of elderly people in European nursing homes experience dysphagia. In 70% of these cases, there is no professional treatment provided for these symptoms. Half of these patients say they eat less and 44% say they have involuntarily lost weight over the previous twelve months. This study also focuses on the psychosocial aspects of dysphagia; 41% of these patients are afraid of choking at mealtimes, and a large group of patients (36%) avoids eating in a group due to their frequent choking.
In 1997, Steele et al. also found that a large group of nursing home residents experienced dysphagia. In this study, however, it is concluded that dysphagia does not occur in isolation. Not only (patho-)physiological problems influence the severity of dysphagia, problems with correct posture and behavioural problems also appear to play a role.

Staff shortages, resulting in decreased patient care, can also contribute to eating and feeding problems. This often leads to an overly cautious approach. An American study revealed that 91% of nursing home residents have a diet that is too restrictive, which must have a significant effect on the Quality of Life of these patients.

Assessment of dysphagia

After thorough ENT work-up, patients with dysphagia are commonly referred to a speech-pathologist for further assessment and treatment. The clinical assessment of dysphagia by a speech pathologist will consist of an examination of motor function of the tongue (like lateral movements on command, raising the tip of the tongue, etcetera) and laryngeal excursion during swallowing. During this examination the sensitivity of the oral cavity is also tested in order to determine unilateral loss of sensation. After examination of motor function and sensitivity, several observations and trials with different types of food are conducted to establish swallowing safety.

As the standard speech pathology assessment in patients with dysphagia is mainly based on observation and thus a subjective measurement, the outcome of the assessment is highly dependable on the skills of the assessor. Although the validity assessment of dysphagia by speech-pathologists has been evaluated and determined for several patient groups, in many cases it will be necessary to perform an objective (instrumental) examination to evaluate the underlying problems and to determine swallowing safety. The most frequently performed objective examinations are radiographic (i.e. videofluoroscopy) or the use of flexible nasendoscopy. Although these examinations are more strenuous for a patient, the outcome is considered to be superior to a standard speech pathology assessment.

Dysphagia rehabilitation: treatment for swallowing problems

Apart from surgical interventions for restoring swallowing function, swallowing function might be restored through functional rehabilitation (dysphagia therapy). Functional swallowing rehabilitation can be divided into three different approaches:
swallowing rehabilitation through exercise restoring swallowing function through the use of compensatory strategies, and, finally, the use of dietary adjustments.

Swallowing rehabilitation
Swallowing rehabilitation consists of exercises targeted to train specific muscles or muscle groups. This can be, for example, exercises which improve the function of the tongue muscles, so that the patient is able to make a better, more homogeneous bolus in the mouth prior to swallowing. There are also exercises to improve laryngeal excursion and pharyngeal contraction.

Compensatory strategies
Compensatory strategies allow patients to swallow safely even though their underlying physiology is impaired. The patient learns how he can avoid problems during eating and drinking (such as choking, coughing). Compensatory strategies are mainly aimed at changing the position of the head during swallowing or using special swallowing techniques. An example of a compensatory strategy is swallowing with a ‘supraglottic swallow’. The patient learns to hold his breathing prior to swallowing and is taught to close both true and false vocal folds when swallowing. After swallowing the patient deliberately coughs to clear any possible residue. Aspiration cannot occur as the larynx is fully closed and possible residue is cleared.

Dietary adjustments
A third therapy option is changing specific parameters in the patient’s diet. A speech pathology examination, flexible endoscopy or videofluoroscopy is used to determine which consistencies and which quantities the patient is able to swallow without problems. In stroke patients there is a significant chance that aspiration will occur with thin liquids. When a videofluoroscopy shows that thicker liquids are not aspirated, the thin liquids in the patient’s diet can be thickened with commercially available thickening powders. These products are manufactured by many different commercial companies. These companies also provide ready-made ‘thickened’ drinks for dysphagic patients. Apart from changing the consistency of the food, the temperature can also be adjusted. It is well-known that receptors in the oral cavity and pharynx that trigger the swallowing reflex
are more sensitive to colder stimuli. Therefore it is often advised to start oral feeding with cold food, such as ice water, cold custard, etcetera.  

Incidence of dysphagia and outcome of swallowing therapy
As dysphagia is not a single disease, but a symptom of an underlying medical problem, it is difficult to estimate how many patients are suffering from dysphagia. Any estimation of the incidence of dysphagia is highly influenced by the definition of dysphagia. As there is no standardized definition for dysphagia, an estimation of the incidence will vary from publication to publication. It is probable, however, that dysphagia is under diagnosed in many patients.

Incidence and outcome of dysphagia in stroke patients
Stroke is considered to be one of the major causes of dysphagia. In 2002 the World Health Organisation calculated that about 15 million people worldwide suffer from a stroke every year. Swallowing problems occur in about half of these patients. In many patients, the swallowing function will recover within two months. In a small group recovery of swallowing function may take many months to several years. In a large group of stroke patients this recovery does not occur. It is not known exactly how many patients receive long term tube feeding after stroke. It is estimated that in England 1.7% of all stroke patients are long term tube dependent. Generally, stroke patients are discharged from swallowing rehabilitation six to twelve months after a stroke, because no further recovery is to be expected. When there are still swallowing problems at the end of the treatment period, the patient often requires (partial) tube feeding for an extended period of time. In one Canadian study, it is suggested that 1.25% of all stroke patients still require tube feeding after one year.

Incidence and outcome of dysphagia in patients with other neurological disorders
A prospective study into recovery of dysphagia in patients with other neurological conditions shows that the average duration of swallowing rehabilitation for patients who are (partially) dependent on tube feeding prior to therapy is two months. Of this patient group, only 55% returns to an oral diet.
In many degenerative neurogenic disorders, swallowing problems occur in different degrees of severity. It is difficult to say, however, which problems occur specifically with these conditions. There appears to be a large variability in the time between diagnosis and the occurrence of dysphagia. In certain degenerative conditions, dysphagia will manifest itself immediately (e.g., bulbar forms of amyotrophic lateral sclerosis), while in other disorders, dysphagia will not manifest itself until the disorder is at an advanced stage. The incidence of dysphagia in patients with neurodegenerative diseases is estimated to be 40%\(^1\).

The treatment of swallowing problems in degenerative conditions consists predominantly of advice on posture while eating and drinking and learning compensatory strategies. Exercises to strengthen particular muscles or muscle groups is usually contraindicated for these patient groups\(^1\).

**Incidence and outcome of dysphagia in patients with head-and-neck cancer**

Head-and-neck cancer patients with dysphagia constitute a heterogeneous population strongly related to the extent of surgery and use of (chemo) radiation either in postoperative or primary setting\(^2\,\,^\text{20}\). The cause of dysphagia for patients undergoing surgical resection is evident. Tissue loss because of surgical excision, transection of muscles and nerves, and resulting scar and loss of sensation result in marked alteration in the functioning of tissues vital for normal swallowing. Although the use of swallowing rehabilitation is generally believed to be efficacious, there are only few prospective randomized studies in head-and-neck cancer patients\(^2\). Some studies suggest that postural techniques clearly result in decrease aspiration by 50% to 75% and that swallowing exercises may improve swallowing efficacy\(^5\).

**Incidence and outcome of presbyphagia**

It has been recognized that 40%–60% of the institutionalized elderly have identifiable signs and symptoms of oropharyngeal dysphagia\(^10\). For these patients, widely accepted interventions such as meal texture modification, compensatory postures, food-administration techniques, and direct therapeutic procedures are used\(^9\). No outcome figures are available on interventions in this population.
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References


