Current aspects of assessment and treatment of dysphagia
Bogaardt, H.C.A.
Chapter 11

Summary
This thesis explores several different aspects of swallowing problems and the subsequent assessment and treatment of swallowing problems.

In the first part of this thesis, the focus of research was directed towards normal physiology of swallowing and assessment of swallowing disorders.

In Chapter 3 we attempted to investigate the correlations between viscosity and pharyngeal residue in healthy volunteers. We did not find evidence for a positive correlation between an increase of viscosity and an increase in pharyngeal residue. One should consider the fact that viscosity is described as the measure of the internal friction of a fluid. This friction becomes apparent when a layer of fluid is made to move in relation to another layer. The greater the friction, the greater the amount of force required to cause this movement, which is called shear. Shearing occurs whenever the fluid is physically moved or distributed, as in pouring, spreading, spraying, mixing etcetera. The force applied to induce shearing is called shear stress and the shearing a liquid experiences is called shear rate. Viscosity can therefore be defined mathematically in the following formula: $\text{viscosity} = \frac{\text{shear stress}}{\text{shear rate}}$.

In our study we used xanthan as thickener to thicken water into different consistencies. Xanthan is a polysaccharide commonly used in the food industry to thicken fluids. Another commercially frequently used thickener is starch, a polysaccharide carbohydrate consisting of a large number of glucose monosaccharide units. Both thickeners have different shear rates as they have a chemically different composition. This might suggest that products with the same viscosity, but with different shear rates might behave different under the same stress to which they are exposed.

Commercial thickeners are frequently used in the treatment of dysphagia; mostly to thicken thin liquids into ‘honey thick’ or ‘pudding thick’ to prevent the patient from aspirating. So far no research has been done whether these commercially available thickeners have influence on pharyngeal residue. Further research should be conducted to explore whether products with the same viscosity but a different shear rate induce the same percentage of pharyngeal residue. As the residual amount of food or beverages in the pharynx after swallowing (pharyngeal residue) is an important parameter in diagnostic procedures in the treatment of swallowing disorders (see Chapter 3 of this thesis), research
is needed whether the use of commercially available thickeners will lead to the same amount of residue.

In Chapter 4 the SWAL-QoL, an American Quality-of-Life questionnaire for patients with dysphagia, was validated for Dutch patients. Not all items on the original questionnaire can be used in the Netherlands to study the Quality-of-Life in patients with dysphagia: our study highlights that some differences in cultural differences seem to exist between dysphagia patients in the US and the Netherlands. In literature was already described that there are differences in health-related quality of life measures between different cultures. Flaherty et al. already described in 1988 that researchers should give particular attention to cross-cultural validity when using an instrument designed in one culture in a second culture. Our study supports the findings of Guillemin et al. that one should investigate translated questionnaires clinimetrically thorough, before one uses the questionnaire in another language. Nevertheless, the SWAL-QoL has been used in other languages, but to date no clinimetric evaluations have been made of these translations. This raises serious issues in interpreting data from different countries on Quality of Life in dysphagic patients when the SWAL-QoL was used. The international research community should strive to provide clinimetrically valid translations of SWAL-QoL in order to make valid comparisons between international studies.

Chapter 5 focussed on the validity of clinical dysphagia assessment in patients with severe multiple sclerosis. Our data suggests that swallowing problems in patients with multiple sclerosis can occur in any stage of the disease. We did not find a clear correlation between factors of a clinical speech-pathology assessment and the risk of aspiration in our population, which suggest that a sole clinical assessment of swallowing in patients with multiple sclerosis is not sufficient. One should bear in mind that a speech-pathology examination is primarily aimed to gather relevant neurological data on oral function of a patient for treatment purposes. As aspiration is a rather frequent finding in these patients, this would suggest that a thorough examination of swallowing function on a regular base is appropriate. Based on our data it would be recommended to perform an instrumental examination (FEES or videofluoroscopy) to determine swallowing safety.

As we examined a very specific patient group, which has severe disabilities it might be difficult to refer these patients regularly to a facility where either FEES of
videofluoroscopy are performed. This calls on the need for the introduction of these instruments in the settings where these patients live and the need for training their physicians and speech pathologists in performing instrumental examinations.

The second part of this thesis focuses on the instrumental treatment of dysphagia with either surface electromyography (sEMG) as biofeedback or with neuromuscular electrostimulation (NMES).

**Chapters 6 and 7** showed that surface-EMG biofeedback as an adjunct to swallowing therapy is a powerful method to treat chronic dysphagic stroke patients. In the Netherlands 30,000 people suffer from a stroke yearly and this number is increasing. A Canadian study\(^4\) suggests that the incidence of stroke patients that are tube fed over more than one year (thus no recovery is to be expected) is 1.25%. Similar, an English study\(^5\) found that 1.7% of stroke patients are tube fed in the home care setting. Exact numbers are not known for the Netherlands, but when percentages above are extrapolated to the Dutch healthcare system it leads to the estimation that yearly over 550 stroke patients will have tube feeding for more than one year. The inability to swallow, and thus the need for tube feeding, has not only severe consequences for the patients’ Quality of Life, but also leads to greater healthcare costs. The direct costs for a patient to be tube fed in the Netherlands is estimated to be around €10,000,- per year. This total includes special nutritional fluids, feeding pumps and costs to replace feeding tubes. In Chapters 6 and 7 we showed that the use of sEMG biofeedback can be successful in restoring oral feeding in two-third of these patients. The benefits of this treatment outweigh the costs to treat a chronic dysphagic stroke patient, as a session of speech therapy costs only around €28,- per session and the investment costs for equipment are relatively low (around €2500,-). Apart from the impact on the Quality of Life, these findings suggest that speech therapy in patients with dysphagia can be highly cost-effective.

In **Chapters 8 and 9** we studied the effect of neuromuscular electrostimulation (NMES) on patients with dysphagia. In our study presented in Chapter 8, we treated multiple sclerosis patients with dysphagia and found significant changes in swallowing function, like reduction of aspiration. Critical appraisal of current literature on NMES and dysphagia shows that this treatment is controversial, but does seem to have potential. As both sEMG
biofeedback and NMES use electronic equipment and electrodes, the question arises which of these two relatively new treatment procedures is best for patients with oropharyngeal dysphagia. And as both treatments use electronic equipment and electrodes, which will lead to investments and possible higher treatment costs, the issue of cost-effectiveness arises.

A future study should be directed to evaluate the efficiency of both treatments in patients. This study should be an open label randomized controlled trial to evaluate which treatment is most efficient in patients with chronic dysphagia after stroke. For the economic analysis from a societal perspective all direct and indirect health-care costs will be included. Direct costs within the healthcare system are considered medical costs for swallowing assessment, treatment costs for speech therapy, costs for enteral feeding (including placement of feeding tubes) and costs for obtaining sEMG-equipment, NMES equipment, electrodes and rental costs for treatment in home setting. Other direct costs are travel expenses for patients and time-reimbursement costs. Indirect costs are considered to be costs of production losses, based on friction cost method. As the studied population is relatively homogeneous, the indirect costs and costs outside the health care system are expected to have a relative small confidence interval. A wider confidence interval is expected for direct costs. A Monte-Carlo simulation will have to be performed to assess the cost-acceptability of one treatment over the other.

Finally the question arises, whether such a large randomized controlled trial is ever going to be realised, as new ideas on NMES and on sEMG arise in literature. Based on the first publication of Leelamanit et al. in 2002 a combination of both instrumental treatment procedures (e.g. sEMG triggered electrostimulation) seems to have also great beneficial effects on pharyngeal swallowing problems. Future research should address the question which type of treatment is most suitable for the specific needs of certain patients, rather than pursuing the invention of a “magic bullet”: a treatment that supposedly cures all patients.
References


