Exercise-Based Approaches to Dysphagia Rehabilitation

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It is only in the last 15 years that the dysphagia literature explores the possibility that some forms of dysphagia intervention might have rehabilitative potential, i.e. the possibility of achieving permanent changes in swallowing physiology. Rehabilitative techniques for dysphagia typically employ repeated exercise modeled on methods used in sports medicine. Three techniques, in particular, show promise for improving muscle strength and function related to swallowing: the Shaker exercise, expiratory muscle strength training (EMST) and tongue-pressure resistance training. All three techniques invoke principles of task specificity, muscular load, resistance, and intensity, and aim to achieve functional changes in swallowing through changes in muscle physiology derived from strength or endurance training [1]. Repeated practice over a 6- to 8-week time frame appears to lead to changes in swallowing physiology, just as such regimens lead to changes in muscle strength in the limbs.

For example, the Shaker exercise is a head-lifting technique performed in the supine position, and intended to specifically exercise the suprahyoid muscles. Gravity provides a source of fixed resistance, and the exercise is performed in both an isometric (sustained) and isokinetic (short repetitions) manner [2]. Indicated for patients who display impaired opening of the upper esophageal sphincter, the technique exploits biomechanical linkages via the suprahyoid muscles to facilitate greater UES opening and reduced UES pressures. Outcomes from a recent trial suggest that penetration-aspiration (entry of foreign material into the airway) improves with practice of this exercise.

EMST is a second exercise-based approach to dysphagia rehabilitation, originally developed for patients with respiratory difficulties and voice disorders [3]. Patients exhale forcefully through a device that provides graded resistance to expiratory airflow. This exercise appears to engage the suprahyoid muscles. Individuals with Parkinson's disease have shown improvements in penetration-aspiration and in hyoid excursion measures following 4 weeks of EMST [3].
Perhaps the most studied form of exercise training for dysphagia is resistance training for the tongue based on evidence that maximum tongue-palate pressure capacity declines in healthy aging [4]. Robbins et al. [4] have successfully shown that an 8-week program of repetitive tongue-pressure resistance exercise leads to improvements in tongue strength, both in healthy seniors and stroke survivors with dysphagia. As with the Shaker and EMST exercises, penetration-aspiration scale scores are also reported to improve with tongue-pressure resistance training.

Recent work in the area of tongue-pressure resistance training has explored the idea that liquid bolus control in swallowing requires the ability to modulate tongue-palate pressures with precision, rather than requiring increased strength. A modification to the Robbins protocol has been developed by Yeates et al. [5], in which the target zone for practice involves variable pressure targets, falling between 20 and 90% of the patient’s maximum values. Patients with dysphagia of differing chronicity have all demonstrated improvements in tongue strength measures with this technique, although more chronic tongue weakness requires a longer course of treatment, as illustrated for one patient who required 90 sessions of practice to reach normative values (fig.1). This approach demonstrates similar swallowing outcomes to the Robbins protocol [4], namely improvements in penetration-aspiration scale scores with thin liquid.

**Fig. 1.** Anterior tongue strength.
stimuli. Improvements in post-swallow pharyngeal residues have not yet been consistently demonstrated.

The persistence of pharyngeal residues following all three of the different approaches to exercise-based dysphagia intervention (Shaker exercise; EMST; tongue-pressure resistance training) suggests that the field has not yet found treatment tasks that have adequate specificity for the process of pharyngeal bolus clearance. In conclusion, exercise-based interventions require careful design, with attention to task selection and specificity, load, intensity and treatment duration. To date, there is preliminary evidence that penetration-aspiration can be reduced through exercise-based interventions in neurogenic dysphagia.

References