NSW Speech Pathology
Evidence Based Practice Interest Group

Critically Appraised Paper (CAP)

CLINICAL BOTTOM LINE:
Stroke patients with dysphagia are able to improve lingual strength with an 8 week program of isometric exercises for the tongue. These stroke patients used greater lingual strength during swallowing naturally. Also observed was reduced oropharyngeal residue and decreased airway invasion due to faster oral transit times and longer pharyngeal response durations for liquid swallows. This leads to better hydration and QOL.

Clinical Question [patient/problem, intervention, (comparison), outcome]:
Do tongue strengthening exercises affect the impaired oropharyngeal swallow?

Citation:
Robbins, J., Kays, S.A., Gangnan, R., Hewitt, A. & Hind, J. The effects of lingual exercise in stroke patients. Archives of Physical Medicine. (2007).

Design/Method: Prospective cohort intervention study, with 4 and 8 week follow-ups

Participants:
Participants: 10 ischemic stroke patients between 51-90 years (mean 69.7yrs). Considered eligible if 45 years or older, have a history of stroke, reduced lingual pressures with anterior or posterior tongue, referred by MO for MBS that confirmed the presence of aspiration, penetration or oropharyngeal residue.

Experimental Group:
8 week lingual exercise program consisting of compressing an air-filled bulb (IOPI) between the tongue and hard palate. Anterior and posterior sections of the tongue were exercised 10 reps, 3 times a day, on 3 days a week.
Data were collected at pre-intervention, week 4 and week 8 (post-intervention)

- Maximum isometric pressure was measured using the IOPI bulb
- Swallowing pressure was measured during natural swallows during VFSS using 3 air filled bulbs
- Bolus flow parameters measured during VFSS, under various swallowing conditions. These were oropharyngeal residue, penetration aspiration scale and durational aspects of the swallow
- Magnetic Resonance imaging to measure lingual volume
- QOL and dietary questionnaires measured specific foods that were eliminated or added to each subjects diet

Control Group: None.

Results:

Lingual strength:

- Maximum isometric pressure: significant increase as measured by IOPI both anterior and posterior sites. Greater % of change in first 4 weeks.
- Swallowing pressures: maximum swallowing pressures increased significantly on at least 1 of 3 trials for 10ml, 3ml and semisolid bolus'.

Bolus flow parameters:

- Oropharyngeal residue measures: significant reduction in overall residue for 3 ml effortful swallow, 10ml, and 3ml bolus conditions most significantly in pharyngeal residue. There was a trend towards reduction in average residue in the oral cavity and cricopharyngeus at week 8. No significantly changes in average residue in the pyriform sinuses or valleculae after 8 weeks.

Penetration-Aspiration Scale:

- Scores were significantly reduced showing increased swallow safety for 3ml thin liquid after only 4 weeks of exercise and the 10ml liquid bolus after the 8 week exercise program. A trend towards reduced airway invasion was observed for the effortful swallowing condition at week 8, which was statically significant after 4 weeks of exercise. At the end of the 8 weeks a greater number of subjects (9 post, only 4 pre) were able to complete the entire VFSS.

Durational measures:

- Significant decrease in oral transit duration for the 3ml liquid bolus and an increase in the pharyngeal response duration for both the 3ml liquid and 10ml liquid were observed on 1 of 3 trials in those subjects capable of performing these swallows at baseline.

Magnetic resonance:

- 2/3 subjects who underwent MRI showed increased lingual volume after 8 weeks of exercise, the 3rd subject showed a decline.

QOL and dietary outcomes:

- Average SWAL-QOL scores increased for all subscales with statistically significant changes in the areas of fatigue, communication, and mental health. Substantial gains were also made in burden and social subscales. SWAL-QOL revealed reports of decreased coughing on liquids, dietary upgrades, and an improved ability to use supplemental compensatory strategies by chronic and acute stroke subjects.
- Dietary intake questionnaires indicated 6 subjects reported the addition of difficult to swallow foods (nuts, popcorn, salad, raw vegetables) to their diet as they progressed through the exercises.

Comments – Strengths/weaknesses of paper

No control group.
Small number of participants.
Large number of different measures including muscular, neurological, physiological, and QOL.
Wide age range.
Not all subjects could complete all aspects of the data collection.

Level of Evidence (NH&MRC): III. 3. Evidence obtained from comparative studies with historical control without a parallel control group

Appraised By: NSW Adult Swallowing EBP Group

Date: February 2010