Effects of Isometric Progressive Resistance Oropharyngeal (I-PRO) Therapy Using the Madison Oral Strengthening Therapeutic (MOST) Device

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Background
- Dysphagia is a common co-morbidity following stroke and can result in aspiration pneumonia, weight loss and/or malnutrition.
- Device-facilitated Isometric Progressive Resistance Oropharyngeal (I-PRO) therapy has been shown to improve swallowing function in patients post-stroke.

Hypothesis
- Strength training based on the "overload, progression (intensity), and frequency principles," fundamental principles of exercise, will result in greater lingual isometric and swallowing pressures.

Patient History
- 56 year old female nurse 27 months post "brainstem plus" stroke
- Discharged from acute hospitalization with gastrostomy-tube (G-tube)
- Expected to eat intake of a cup
- Due to reduced upper esophageal sphincter (UES) opening during swallowing, under-eating and US use citations
- Avoided all social situations which highlighted food and drink

Methods
- Intervention: I-PRO therapy performed (Figs. 1-2)
- 10 lingual press repitions, 3 times daily, 3 days per week for 8 weeks
- Targets re-calculated at 80% of new maximum at weeks 3, 5, and 7
- Detraining: No intervention performed.
- Maintenance: Modified intervention performed.
- 10 lingual press repetitions, 3 times daily, 1 day per week

Data Collected Pre- & Post-Intervention
- Dietary Intake: Progressed from 1-cube to a general diet
- Quality of Life: Improvement in all subscales (Fig. 3)
- Pressure: Significantly improved max isometric lingual pressures for the anterior and posterior tongue (p=0.003; Fig. 4)
- Decline observed during detraining, and anterior tongue pressures plateaued with maintenance (Fig. 5)
- Whole tongue pressures, irregular and unstable at baseline, became regular and less variable (Fig. 6 & 7)
- Significantly improved max pressure in pharyngeal region (p=0.0431) and in UES (p=0.0035; Figs. 7-8)
- Videofluoroscopy: fluid flow kinematics
  - Significantly improved timing between laryngeal vestibule closure and beginning of hyoid elevation (p=0.02)
  - Significantly reduced residue in the oral cavity (p=0.009)
  - Significantly increased oral clearance durations (p=0.02)
  - Trend of increased duration of UES opening (p=0.09)
- Imaging: Lingual volume increased by 8.37%

Conclusions
- 1. MOST-facilitated -PRO therapy was effective in reducing, and eliminating, profound dysphagia characteristics greater than 2 years post-stroke, well beyond the standard period of 3-4 months.
- 2. Maintenance is clearly warranted given the decline in swallowing function observed during detraining and improvement with modified intervention.
- 3. The upper limit of potential gain is not currently well-defined. Further research is needed relative to frequency, duration, and maintenance of intervention.

References

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