

# An investigation into effects of neuro-muscular electrical stimulation on swallowing

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## Background

Decreased laryngeal elevation is common among patients with swallowing difficulties. It has been hypothesised that electrical stimulation can assist hyo-laryngeal elevation (Freed et al 2001; Leelamanit et al 2002). Stimulation of laryngeal elevation musculature via NMES in combination with traditional treatments is suggested to re-educate muscles when suffering from reduced laryngeal elevation.

A particular approach to NMES-Ampcare Effective Swallowing Programme (ESP) places electrodes sub-mentally only, as evidence suggests when stimulating neck and sub-mental muscles simultaneously, muscles that depress the larynx, override muscles, which promote elevation. Ampcare ESP aims to stimulate the suprahyoidal musculature to promote laryngeal elevation. The anterior digastric, mylohyoid, and geniohyoid are located in the submandibular region and act to protract and elevate the hyoid bone.

The rationale for the AMPCARE ESP technique and parameters follow the rules of electrophysiology for stimulating small muscle groups. Using NMES to treat decreased laryngeal elevation provides SLTs with another treatment option. However, NMES is not utilised routinely in the UK for patients with dysphagia.

## Method

Feasibility study using a case series design which included 5 patients with stable and persistent dysphagia who presented with decreased laryngeal elevation diagnosed by Videofluoroscopy (VF).

Participants received 4 weeks of daily intervention (5 days per week for 30 minutes) using the Ampcare ESP. Participant's swallowing was re-assessed by VF and clinical assessment post intervention. A follow-up assessment was completed two weeks after completion of the intervention.

Data was collected using Rosenbek Penetration/aspiration scale, Waxman dysphagia severity scale and Functional Oral Intake Scale. Participants also completed a questionnaire about acceptability of the intervention.

Data was analysed using descriptive statistics.



## Results

5 patients were recruited. Two with diagnosis of stroke, two head and neck cancer and one skull base osteomyelitis. Time of dysphagia ranged from 3 months to two years.

All participants completed 20 sessions, described the intervention as acceptable and would strongly recommend it to others.

All 5 participants showed improvements in their swallowing to varying degrees.

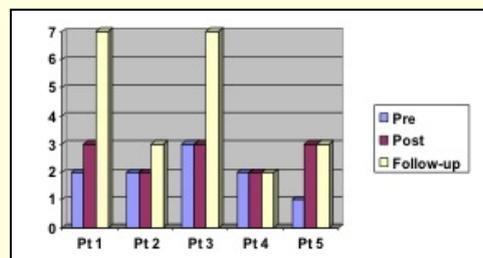
Two returned to full oral diet having been on non-oral feeding for 5 months and over 24 months respectively, although one continued to show aspiration with some intake. Both ceased nutritional intake via PEG reducing costs to the NHS.

Three patients introduced an increased amount and range of food consistencies to their oral intake, although they continue to receive their main nutrition via PEG.

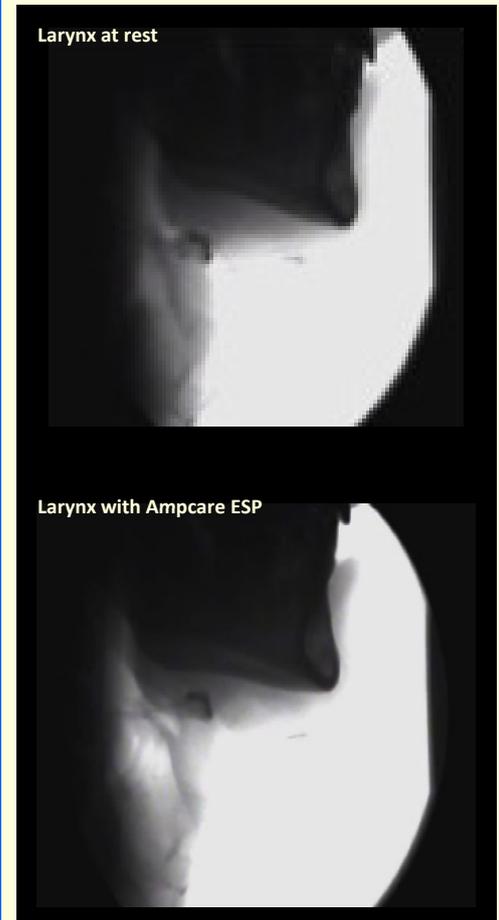
### Patient description of daily oral intake (all had PEG tubes for nutrition)

- **Patient 1**  
Pre: 5 teaspoons fluid or 5 teaspoons soft fork mashed diet.  
Follow-up: Eating full oral intake. PEG to be removed.
- **Patient 2**  
Pre: Half pint soup taken in small amounts throughout day.  
Follow-up: As above plus 4 x half cup coffee per day. Introducing small amount soft fork mashed foods.
- **Patient 3**  
Pre: Small amounts normal diet and fluids.  
Follow-up: Full oral intake. Flushing PEG only.
- **Patient 4**  
Pre: 2-4 cups tea per day.  
Follow-up: Intermittently eating minimal amounts soft fork mashed diet. First solid food in 3 years.
- **Patient 5**  
Pre: Water only sucked from mouth sponges.  
Follow-up: Sips water, plus small amount soft fork mashed diet.

### Functional Oral Intake Scale



- Level 1:** Nothing by mouth.
- Level 2:** Tube dependent with minimal attempts of food or liquid.
- Level 3:** Tube dependent with consistent oral intake of food or liquid.
- Level 4:** Total oral diet of a single consistency.
- Level 5:** Total oral diet with multiple consistencies, but requiring special preparation or compensations.
- Level 6:** Total oral diet with multiple consistencies without special preparation, but with specific food limitations.
- Level 7:** Total oral diet with no restrictions.



## Conclusions

Results suggest this technique may be an effective intervention for some patients presenting with persistent dysphagia.

A pilot study is now planned to investigate the technique using a randomised design.

## References

- Burnett TA, Mann EA, Cornell SA & Ludlow CL. *Laryngeal Elevation Achieved by Neuromuscular Stimulation at Rest. J Appl Physiol.*, 94:128-134, 2003.
- Freed ML, Freed L, Chatburn RL & Christian M. *Electrical stimulation for swallowing disorders caused by stroke. Respir Care* 46 (5):466-474, 2001.
- Leelamanit V, Limsakul C & Geater A. *Synchronized electrical stimulation in treating pharyngeal dysphagia. Laryngoscope* 112(12): 2204-2210, 2002.
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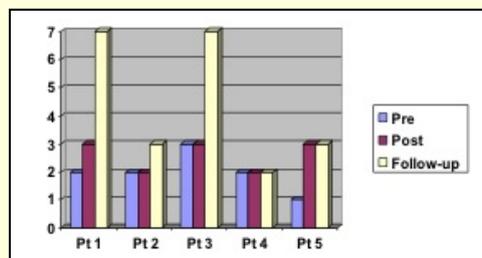
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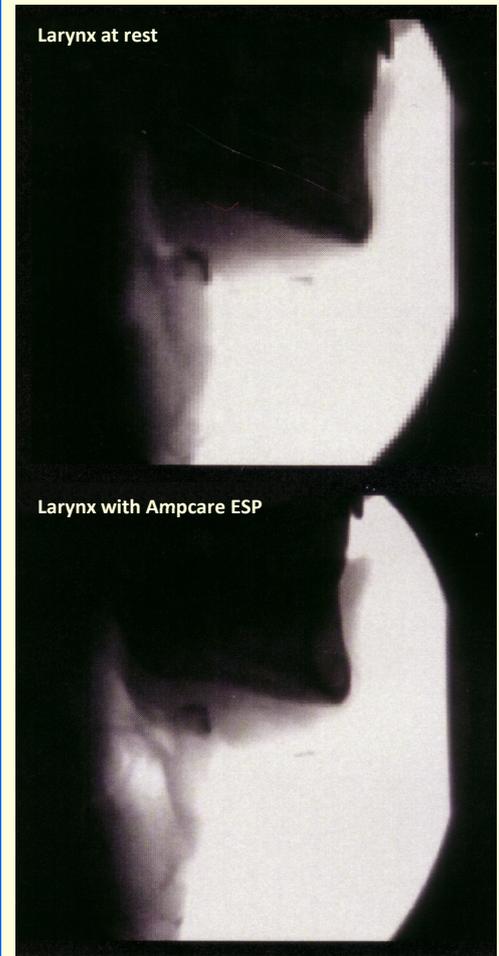
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