Transcutaneous neuromuscular electrical stimulation can improve swallowing function in patients with dysphagia caused by non-stroke diseases: a meta-analysis
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CRD summary
The authors concluded that neuromuscular electrical stimulation was more effective than traditional therapy for treating dysphagia (swallowing difficulties) not caused by a stroke. Limitations in the evidence base suggest that the conclusion may be overstated.

Authors' objectives
To compare the efficacy of transcutaneous neuromuscular electrical stimulation with that of traditional therapy for the management of dysphagia.

Searching
The authors searched PubMed, Cochrane Central Register of Controlled Trials (CENTRAL) and EMBASE to December 2011. Search terms were reported. Reference lists of relevant articles were screened. Only articles published in English were included.

Study selection
Randomised and quasi-experimental trials that compared neuromuscular electrical stimulation (using electrodes placed on the anterior neck) with traditional therapy in adults with dysphagia of any cause were eligible for inclusion. Traditional therapy was defined as a combination of diet modification, position adjustment, effortful swallowing and training to use gestures that enhanced airway protection during swallowing.

More than half the included studies involved patients with dysphagia following stroke; other causes of dysphagia were Parkinson's disease, head and neck cancer and radiation damage. Duration of dysphagia, where reported, ranged from 20 days to more than a year. Neuromuscular electrical stimulation was typically given for one hour/day for 10 to 20 sessions (where reported). Various outcome measures were used.

Two reviewers independently selected studies for inclusion. Disagreements were resolved by discussion or by consulting a third reviewer.

Assessment of study quality
Study quality was assessed by two reviewers independently using the Cochrane risk of bias tool. Disagreements were resolved by consulting a third reviewer.

Data extraction
Mean differences in reported outcomes were extracted or calculated. Where a study reported the median and interquartile range, the mean and standard deviation were imputed using a method described in the paper. Similarly, where no standard error for the final value of an outcome was reported, the standard error of the mean difference across groups was calculated.

Two reviewers independently extracted data for the review.

Methods of synthesis
Studies were pooled by meta-analysis. A random-effects model was used where significant heterogeneity was present; otherwise a fixed-effect model was used. Heterogeneity was assessed using $I^2$ and $\chi^2$. Pooled outcomes were expressed as the standardised mean difference (SMD) of the change from baseline between groups, with associated 95% confidence interval (CI).

Sensitivity analyses were performed by excluding one study with a particularly good outcome and one with obvious methodological flaws. A subgroup analysis was performed by cause of dysphagia (stroke or other).
Results of the review
Seven studies were included: three randomised trials (74 participants) and four non-randomised studies (217 participants). All the randomised trials reported adequate allocation concealment but only one was at low risk of bias for blinding.

Across all studies neuromuscular electrical stimulation was associated with a statistically significantly better improvement in swallowing score compared with traditional therapy (SMD 0.77, 95% CI 0.13 to 1.41; I²=83%). The difference remained statistically significant in sensitivity analyses. In subgroup analyses the benefit of neuromuscular electrical stimulation was significant for dysphagia not caused by stroke (SMD 0.63, 95% CI 0.24 to 1.02; I²=0%) but not for stroke-associated dysphagia (SMD 0.78, 95% CI -0.22 to 1.78; I²=88%).

Authors' conclusions
Neuromuscular electrical stimulation was more effective for adult dysphagia patients of variable aetiologies than traditional therapy. In patients with dysphagia following a stroke the effectiveness of the two treatments was comparable.

CRD commentary
The review question and inclusion criteria were clear. The search covered a range of relevant databases. Restriction to published studies in English meant that some relevant studies may have been missed. Appropriate methods were used to minimise reviewer errors or bias during the review process. Study quality was assessed and the results were used in the synthesis. Studies were pooled by meta-analysis and sources of heterogeneity were investigated by standard methods.

As acknowledged by the authors, the main limitation of the review was the quality of the included studies. Most were small and non-randomised so at high risk of bias. Use of standardised mean difference as an effect measure meant that the clinical significance of the effect was difficult to assess. The group of studies involving patients with dysphagia not due to stroke was inherently heterogeneous, which limited the generalisability of the findings to particular patient groups. The authors' conclusions reflect the evidence presented but these limitations suggest that the conclusions may be overstated.

Implications of the review for practice and research
Practice: The authors stated that neuromuscular electrical stimulation was useful for treatment of dysphagia and can be used in conjunction with other interventions.

Research: The authors stated that high-quality studies of neuromuscular electrical stimulation with larger sample sizes were required.

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