



## Neuromuscular Electrical Stimulation in Dysphagia: Alone or Combine?

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Swallowing is a complicated, multilevel and neuromuscular physiological function on which research is still continuing. Yet, nutrition is important for both our health and socialization (1,2). For this reason, dysphagia is a significant health problem due to its dramatic outcomes such as malnutrition, increased morbidity and mortality, advanced disability, impaired quality of life, social problems, and increased healthcare expenditures (3-5). Although research has been made on the treatment of dysphagia, it is difficult to say that we are successful in effective treatment of every patient due to its complex physiopathology. The conventional treatment of dysphagia today involves collective administration of diet modifications, thermal tactile stimulation, positional approaches, special techniques, airway protection maneuvers and oral-motor exercises (4-6). Swallowing compensation and feeding techniques have been recommended to over one half of the patients, but their effectiveness remains uncertain. The limited number of data we have on the issue makes it difficult for us to decide which treatment is more effective (3). The different and sometimes insufficient outcomes of conventional treatments have induced researchers to look for new alternatives and after the FDA approval in 2002, the neuromuscular electrical stimulation (NMES), which is based on strengthening of the weak oropharyngeal muscles, started to be used for the treatment of dysphagia (7). The mechanism of action and efficacy of NMES are still not clear although we are already familiar with its use in improving motor movement in the upper and lower extremities and in the rehabilitation of urinary bladder and respiration (1,3,4,8,9). Based on strengthening of the weak and disused pharyngeal muscles, NMES is thought to be effective in muscle size increase, muscular power improvement, muscular aerobic capacity increase, muscular circulation and enduran-

ce increase, and sensory and motor recovery (3,5,6,8,10,11). During an electrical stimulation, the goal is to strengthen the pharyngeal muscles while performing an oral motor treatment or feeding (4). NMES does not cause muscular contractions, but it selectively targets the healthy innervated muscle fibrils and facilitates muscle contraction during functional activities (3,6). It is said to be effective in increasing pharyngeal and laryngeal muscular activity, recovery in hyoid bone range of motion, laryngeal elevation and upper sphincter opening (10,11). Its really interesting and exciting effect is the hypothesis that the pharyngeal electrical stimulation causes corticobulbar excitability change and cortical reorganization, resulting in an increase in neural plasticity (2,3,8,12). However, the available data is insufficient to be able to say that surface electrical stimulation is effective on neural plasticity (1,4,11).

Looking at the effects of NMES on the treatment of disease-specific dysphagia, its efficacy in primary dysphagia is not known (4). As there are not many studies on children, it becomes impossible to make a comment on its efficacy (4). Although the effect is said to be more distinct in radiation damage, head-neck cancer and Parkinson's disease and the evidences in stroke are controversial, there are study results stating the opposite (1,3,8).

Addition of NMES to the conventional treatment in patients with stroke who have been studied relatively more (compared to other diseases) seems to have yielded more successful results in the treatment of dysphagia. In patients with stroke, loss of control of the central nerve system over swallowing and muscle contractions do not occur. Since NMES cannot reeducate the functional muscle contraction pattern, it is argued that its administration in combination with the conventional treatment may

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increase the benefit (1,3,8,11). Although it seems more effective than the conventional treatment according to the general results, there is not sufficient evidence showing that it alone is superior to the conventional swallowing therapy. It is said to be effective in both the acute/sub-acute and chronic phases of dysphagia (3). Looking at the follow-up periods of patients, we see that there are follow-up data for a maximum period of 3 months, making it impossible to say that this therapy is effective in the short-run based on the data available (3,10).

There are data showing that patients with cancer-related dysphagia benefit less from it than patients with stroke (8). Maybe cancer and anatomic and mucosal changes associated with cancer treatment affect the efficacy of treatment negatively. However, since all patients with dysphagia, whether cancer-specific or not, have been included in the studies with cancer patients, study results do not provide so much of guidance for us (5,10). Since there is neurological loss of control over swallowing rather than muscle weakness or peripheral sensory dysfunction in patients with Parkinson's, no obvious benefit could be obtained from the NMES therapy (6). Due to the positive effects of NMES on muscles, its possible prevention effect is said to be born in mind (5). Various studies defend different results and reveal the deficiencies of each other (3,8). It seems that even in the stroke group that has been studied most, it is difficult for us to have a final judgment on the efficacy of NMES therapy. Interpretation becomes even more difficult because of the reasons such as the differences between the duration of dysphagia and the clinical conditions of patients (stroke or cancer-type, duration), non-randomized studies, lack of control groups, studies with randomized number of patients being insufficient and different treatment patterns. Although there are researchers who state that it is effective in mild or moderate oropharyngeal dysphagia but ineffective in severe dysphagia, there are still no data to support this interpretation. No side-effects or complications have been reported in the studies. I believe that it is necessary to discuss the placebo effect of NMES as well and studies should also focus on this issue.

When applying NMES, mylohyoid, thyrohyoid, suprahyoid, infrahyoid, and geniohyoid muscle contractions are tried to be activated through the electrodes placed on the submental and laryngeal regions in the anterior neck (1,2,13). However, it does not generally seem possible to mention a specific application regarding these muscles. Different stimulation protocols and some specific devices are usually used in studies (7). In the NMES method, various administration methods are seen in studies such as treatment time being between 20 and 60 minutes applied 3 to 5 days a week or consecutive administration for 3-4 weeks with 10-20 sessions of treatment each (3). The NMES intensity is described in studies to be in the 4.5-25 mA interval, an average of 7 (frequently)- 13 mA, 30-80 Hz, 700  $\mu$ s. For the dose to be administered to a patient, there are definitions such as until tingling / grabbing / disturbance is felt, until motor response is obtained or until muscle contraction is observed (3).

Due to the methodological quality of the available studies and some mysteries in the physiopathology of swallowing, evidences still remain inadequate although some effects of NMES

have been shown. The question of whether NMES should be applied alone or should be part of a combined treatment has not been answered with the data available to us (3).

There is a need for randomized, controlled studies with a well-prepared methodology and a large number of patients. Nevertheless, since NMES is a cheap and easily applied treatment free from side-effects, I believe that it would be beneficial for patients if we adopt it in our clinical practice.

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