

Optimized intraoral electrodes for electromyostimulation therapy in obstructive sleep apnea

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Objectives: During the last years, innovative muscle stimulation techniques have become alternatives for therapy of OSAS breathing disorders. In this study, it therefore was of interest whether optimized intraoral electrodes had influence on efficiency of the EMS-therapy.

Material and methods: In group I an individually shaped mouth floor electrode (IME) and in group II an also individually adaptable multi point silicon electrode (MPE) have been used for electromyostimulation therapy in patients with obstructive sleep apnea (s. figure 1 and 2). The enoral-cutaneous EMS was carried out with the low frequency stimulation apparatus I-pulse over a period of eight weeks, two times daily for thirty minutes during daytime hours, only. The stimulation intensity in both groups could individually be influenced by the patient himself. For achievement of an efficient recruitment of the muscles, patients were instructed to choose treatment with maximum intensity. Before and after stimulation treatment 3D-volumetric sonographical measurement of the geniohyoid muscle has been carried out by B-scan sonography in combination with a 3D-workstation.

Results: All patients (n = 14, average age 52.1 years) totally applied the EMS-therapy. As well under IME as under MPE application after four weeks of EMS-therapy a volume increase in median of 19.6 % (minimum 9.5 %, maximum 27.6 %) was registered, the median after eight weeks IME was 27.6 % and in MPE 24 %). No significant difference (ANOVA type: $p > 0.05$) between both electrodes could be found. Through the visualization of the muscles in 3D-models the concentric volume increase could be proved which was mainly due to the contraction of the muscles. In both groups, a reduction of the muscles in length of 4.7 % was proved. **Conclusions:** In opposite to so far established stimulation techniques a threefold effectiveness enhancement could be verified by using both individually adaptable electrodes (IME as well as MPE). The proved contraction of the geniohyoid muscle which resulted from this treatment study also explains the reduction of the collaps of the posterior airway.

