

Obstructive sleep apnea therapy: enoral-cutaneous versus cutaneous submental electromyostimulation

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The electromyostimulation (EMS) of the geniohyoid muscle for obstructive sleep apnea becomes of increasing importance next to surgical invasive treatment procedures. Combined intraoral electrodes and cutaneous or only cutaneously electrodes are used. Therefore it was of interest, whether a varied placement of the electrodes had any influence on the effectivity of muscle stimulation.

In 20 healthy probands (mean age 42 years) the EMS was applied by using the BMR PolyStim 262 apparatus (Bio-Medical Research Company). The training parameters in all probands have previously been determined: frequency = 50 burst/s, contraction-time/rest = 10/20s., pulse width 250 μ s, increase/decrease 1.5/1.5 s, stimulation 2 x daily 20 minutes over a time period of 4 weeks. The positions of the electrodes were varied. In 10 probands, a cutaneous application of 2 adhesive electrodes was done in the submandibular and submental area only. In the remaining 10 cases, an electrode was applied intraorally the other was applied cutaneously in the submental area. To evaluate the effectiveness of stimulation, the force of the tongue muscles was measured by the polysensographical system SensOral (SensoMedical Company), whereas the thickness and the volume of the geniohyoid muscle were measured by 3D-ultrasound (ViewPoint Company).

In the group with only cutaneous stimulation, no significant increase in tongue force nor an increase of thickness or volumetric changes of the M. geniohyoideus have been found. On the other hand, in the group of intraoral-cutaneous EMS an increase of lingual force with a median of 31 % and simultaneous increase of thickness and increase of the initial volume of 8 % could be diagnosed. In all probands the M. geniohyoideus was sonographically found to be sharply differentiated from the other muscles. Moreover, in cutaneous submental stimulation, undesired stimulations of the N. facialis sometimes occurred.

The combined intraoral-cutaneous EMS as opposed to the submental cutaneous EMS technique showed a good training effect on the tongue muscles. Relative to the use of EMS in obstructive sleep apnea syndrome, the combined intraoral-cutaneous EMS should be preferred to only cutaneous EMS.

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