

## Anatomically-Based Oropharyngeal Rehabilitation for the Patients with Obstructive Sleep Apnea Using a Multilevel Approach

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**Abstract :** Obstructive sleep apnea (OSA) is characterized by a complete or partial obstruction of the upper airway during sleep. The vulnerable sites of upper airway collapses are consequences of sleep state-dependent reductions in tone in specific pharyngeal dilators. Clinical examinations reveal multilevel collapses of the upper airway among the patients with OSA. Therefore, an anatomically-based oropharyngeal rehabilitation should comprise a multilevel approach, including retropalatal, retroglossal, hypopharyngeal, temporomandibular, and facial levels, all of which involve different muscle groups and contribute to multifunctional interaction and coordination, such as swallowing, breathing, and phonation. The purpose of the study was to exam the effects of this rehabilitation program with a multilevel approach. In this study, fifteen subjects with newly diagnosed moderate or severe OSA (Apnea-Hypopnea-Index $\geq$ 15) were randomized into an intervention group and control group. The intervention group (N=8) underwent a 12-week-intervention of a hospital-based rehabilitation program, while the control group (N=7) was kept on the waiting list. The 12-week-intervention comprised an anatomically based multilevel approach. The primary outcome was Polysomnography (PSG) data, and the secondary outcome was oropharyngeal and respiratory muscle function. In the intervention group, Apnea-Hypopnea-Index significantly improved ( $46.96\pm 19.45$  versus  $32.78\pm 10.78$  events/h,  $p=0.017$ ) compared with control group ( $35.77\pm 17.49$  versus  $42.96\pm 17.32$  events/h,  $p=0.043$ ). While the control group remained no change, the intervention group demonstrated other PSG outcomes significantly improvement, including arousal index ( $46.04\pm 18.9$  versus  $32.98\pm 8.35$ /h,  $p=0.035$ ), mean SpO<sub>2</sub> ( $92.88\pm 2.1$  versus  $94.13\pm 1.46\%$ ,  $p=0.039$ ). Besides, the intervention group demonstrated significant improvement in oropharyngeal and respiratory muscle function compared to the control group. This anatomically-based oropharyngeal rehabilitation with a multilevel approach can be proven as a non-invasive therapy for patients with OSA.

**Keywords :** obstructive sleep apnea, upper airway, oropharyngeal rehabilitation, multilevel approach

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