

## Feature Characterization of PSG Signals of OSA for Surgical Treatment

### Response Analysis: A Pilot Study

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### ABSTRACT

**Importance:** Obstructive sleep apnea (OSA) is a common sleep disorder with a prevalence varied across different populations and regions. An accurate diagnosis with phenotyping is crucial for delivering the appropriate treatment to the OSA patients.

**Objective:** To characterize the PSG signals for OSA phenotyping is an essential stage in treatment planning. In this study, the nasal pressure as well as SpO<sub>2</sub> were processed to extract the related features such as sample entropy, pseudo-gain factor, age, AHI, ODI, BMI, etc. The correlation between these clinical parameters and response rate of sleep surgery were further investigated.

**Materials and Methods:** This study was approved by IRB of NCKUH with informed consent. Seventy-three patients with OSA were recruited in this study. The PSG signals for one night in sleep center were acquired. Firstly, nasal pressure signals were integrated for simulating the ventilation. Afterwards, the event-recovery time, event-REM/NREM ratio, sample entropy and pseudo-gain factor were obtained for later analysis. These four feature variables as well as neck circumference, arousal index, BMI, age, AHI, ODI parameters were considered as the important features for predicting surgical response of OSA subjects. The percentage difference of AHI before and after surgery was used as the reference for evaluating responder. Therefore, the correlation between each feature variable was correlated with the above reference. Pearson correlation analysis was used to determine the rank order of these variables in terms of AHI improvements.

**Results:** The data showed that event-recovery time, pseudo-gain factor, event-REM/NREM ratio, sample entropy were demonstrated to be first four important features among all 11 variables analysis for predicting responder of sleep surgery based on AHI improvements. Event-recovery time was a novel variable for the first important factor in this study.

**Conclusion:** By analyzing parameters of nasal pressure collected during PSG, four novel derived features such as the event-recovery time, pseudo-gain factor, event-REM ratio and sample entropy, all are sampled in a non-invasive manner, are demonstrated to be important in predicting responder of sleep surgery for OSA.

**Keywords:** Obstructive sleep apnea, surgical treatment, sample entropy.

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