

A Study of Predicted Optimal Positive Airway Pressure for OSA Patients with The Computed Arousal Thresholds

Hsiang-Ting Huang, UG¹, Ming-Feng Wu, Ph.D^{2*}, Yu-Hsuan Chen, Ph.D^{1*}

¹Department of Medical Laboratory Science and Biotechnology, Central Taiwan University of Science and Technology, Taiwan.

²Division of Chest Medicine, Department of Internal Medicine, Taichung Veterans General Hospital, Taiwan

Objective: Positive airway pressure (PAP) titration is a time-consuming process when done manually. The study aimed to propose the predicted optimal PAP pressure based on the different computed arousal thresholds.

Methods: This retrospective study reviewed the electronic medical records of obstructive sleep apnea (OSA) subjects who underwent Polysomnography (PSG) diagnosis and manual PAP titration at Taichung Veterans General Hospital, Taiwan, from January 2014 to January 2025. Low arousal thresholds (LArTH) of enrolled participants were computed for any two conditions among nadir pulse SpO₂ (SpO₂nadir) > 82.5%, apnea-hypopnea index (AHI) <30, or Fhypopnea > 58.3%. The rest were defined as high arousal threshold (HArTH). The optimal PAP pressures were randomly sampled for predictive training and the validation.

Results: A total of 1607 participants aged 49.5, with males of 1363 (84.8%) and females of 244 (15.2%), were enrolled in the study. The numbers of LArTH and HArTH were computed as 452 and 1155, respectively. The study showed that the failure rates of titration were 21 (4.6%) cases for the LArTH, and 103 (8.9%) for the HArTH. Besides, the study also showed that the waistline and AHI were the significant predicted variables for LArTH ($R^2 = 0.171$), while the body mass index (BMI), AHI, Fhypopnea, SpO₂nadir, and neck circumference were the significant predicted variables for HArTH ($R^2 = 0.374$). Finally, the predicted accuracy was 77.2% for LArTH and 71.9% for HArTH.

Conclusion: The study proposed higher accuracy predicted formulas of optimal PAP pressure for OSA with different arousal threshold populations. It may be a reliable reference pressure for auto-PAP and manual titration. In addition, the failure rate of HArTH was twice that of LArTH. It was suggested that the titration protocol may be tinier for the treatment compliance facing the subjects.