Tongue Pressure as a Clinical Tool for Predicting Tongue Base Collapse in Patients with Obstructive Sleep Apnea Syndrome

Ying-Chieh Hsu[1,2,3*], Yen-Tze Liu[4-6]

1. Department of Biomedical Engineering, National Taiwan University, Taipei 106038, Taiwan
2. Department of Otolaryngology-Head & Neck Surgery, Taipei Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, New Taipei City, Taiwan
3. School of Medicine, Tzu Chi University, Hualien, Taiwan
4. Department of Post-Baccalaureate Medicine, College of Medicine, National Chung Hsing University, Taichung 402, Taiwan
5. Big Data Center, Changhua Christian Hospital, Changhua 500, Taiwan
6. Department of Family Medicine, Changhua Christian Hospital, Changhua 500, Taiwan

Objective: This study aimed to investigate the correlation between tongue strength, as measured by the Iowa Oral Performance Instrument (IOPI), and the anatomical site of upper airway collapse observed during drug-induced sleep endoscopy (DISE) in patients with obstructive sleep apnea syndrome (OSAS).

Methods: The study included 28 patients who underwent standard polysomnography, DISE, and IOPI measurement of maximum tongue strength. Tongue strength was measured using IOPI, and DISE findings were recorded as video and scored via VOTE classification and the interpretation was conducted by two different surgeons who were blinded to the clinical data. The study used descriptive statistics, t-test, Mann-Whitney U test, chi-square test, and ordinal logistic regression model to analyze the data. Firth's penalized likelihood approach was used to address small sample size issues and reduce bias.

Results: The study found that mean IOPI tongue pressure was 50.4 ± 15.3 kPa, with no significant gender difference. Using an ordinal logistic regression model with Firth's penalized likelihood approach, tongue base and epiglottic collapse were found to be significantly associated with IOPI groupings. The odds ratio (OR) for tongue base obstruction in the IOPI < 40 kPa group was 12.79 (95% CI 1.30, 126.91) compared to the IOPI ≥ 40 kPa. For epiglottis obstruction, the OR was 54.05 (95% CI 1.66, 1760.25) with a p-value of 0.025.

Conclusion: The study found a correlation between IOPI tongue pressure and anatomical collapse levels during DISE in OSAS patients, suggesting the potential clinical utility of IOPI in predicting tongue obstruction in OSAS patients.