

論 文 要 旨

Relationship between pharyngeal airway depth and
ventilation condition in mandibular setback surgery
: A computational fluid dynamics study

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Objectives : This study aimed to determine the anteroposterior depth (APD) of the pharyngeal airway (PA) where postoperative PA obstruction was predicted, using computer fluid dynamics (CFD), in order to prevent obstructive sleep apnea after mandibular setback surgery.

Methods : Nineteen skeletal Class III patients (8 men; mean age, 26.7 years) who required mandibular setback surgery had computed tomography images taken before and 6 months after surgery. The APD of each site of the four cross-sectional reference planes (retropalatal airway [RA]), second cervical vertebral airway, oropharyngeal airway, and third cervical vertebral airway) were measured. The maximum negative pressure (Pmax) of the PA was measured at inspiration using CFD, based on a three-dimensional PA model. Inter-site differences were determined using analysis of variance and the Friedman test with Bonferroni correction. The relationship between APD and Pmax was evaluated by Spearman correlation coefficients and non-linear regression analysis.

Results : The smallest PA site was the RA. Pmax was significantly correlated with the APD of the RA ($r_s = 0.628$, $P < 0.001$). The relationship between Pmax and the APD-RA was fitted to a curve, which showed an inversely proportional relationship of Pmax to the square of the APD-RA. Pmax substantially increased even with a slight reduction of the APD-RA. In particular, when the APD-RA was 7 mm or less, Pmax increased greatly, suggesting that PA obstruction was more likely to occur.

Conclusions : The results of this study suggest that APD-RA is a useful predictor of good PA ventilation after surgery.