論 文 要 旨

Primary Site Identification in children With Obstructive Sleep Apnea by Computational Fluid Dynamics Analysis of the Upper Airway

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Study Objectives: Obstructive sleep apnea (OSA) is a respiratory disorder caused by the obstruction of the upper airway during sleep. The identification of the primary site of OSA is essential to determine treatment strategy. This study aimed to establish computational fluid dynamics (CFD) analysis for determining the clinical severity of OSA and the primary site of OSA.

Methods: Twenty children (mean age, 6 years) were divided into OSA and control groups according to their apnea hypopnea index. Three-dimensional airways were constructed from computed tomography data. The pharyngeal airway morphology and the pressure and velocity of the upper airway were evaluated using CFD analysis.

Results: The maximum velocity and pressure of the upper airway in the OSA group were significantly correlated with the severity of OSA ($rs = 0.741$, $P < 0.001$; $rs = 0.653$, $P = 0.002$). A velocity higher than 12 m/s indicated the primary site of OSA. In addition, we found that the primary site of OSA is not necessarily the same as the collapsible conduit site.

Conclusions: CFD analysis allows both the evaluation of the disease severity of OSA and the identification of the primary site of OSA in children. The primary site of OSA is not necessarily the same as the collapsible conduit site; therefore, CFD analysis can be used to identify the appropriate intervention for treating OSA.