



## TURBULENT FLOW PATTERN IN UPPER AIRWAY WITH OBSTRUCTED SLEEP APNEA

M.Z. LU<sup>1</sup>, Y. LIU<sup>1,c</sup>, J.Y. YE<sup>2</sup>

<sup>1</sup>Department of Mechanical Engineering, The Hong Kong Polytechnic University, Hong Kong

<sup>2</sup>Tongren Hospital, Capital Medical University, Beijing, China

<sup>c</sup>Corresponding author: Tel.: +85227667814; Fax: +85223654703; Email: mmyliu@polyu.edu.hk

### KEYWORDS:

**Main subjects:** flow visualization

**Fluid:** turbulent flow

**Visualization method(s):** CFD

**Other keywords:** OSA, upper airway, turbulence

**ABSTRACT:** Computational fluid dynamics (CFD) techniques were used to model the turbulent flow of airway geometry in the upper airway of one subject with obstructive sleep apnea (OSA). Model geometry was reconstructed by computerized tomography (CT) obtained during quiet tidal breathing. The Large Eddy Simulation (LES), a more accurate approach in this technique, was selected to solve the unsteady flow. Only the inspiratory process was conducted with six periods (about 15 second) and the mesh with the unstructured grid were generated from nostrils to trachea for both pre- and post-surgery models. The axial velocity contour shows clearly there exists a reversed flow due to the larynx jet effect. The upper airway surgery has improved the flow separation. The results suggest the CFD techniques may help to show the turbulent flow pattern in the upper airway with obstructive sleep apnea to evaluate the effect of the surgery.

**KEYWORDS:** OSA, upper airway, CFD, turbulence.

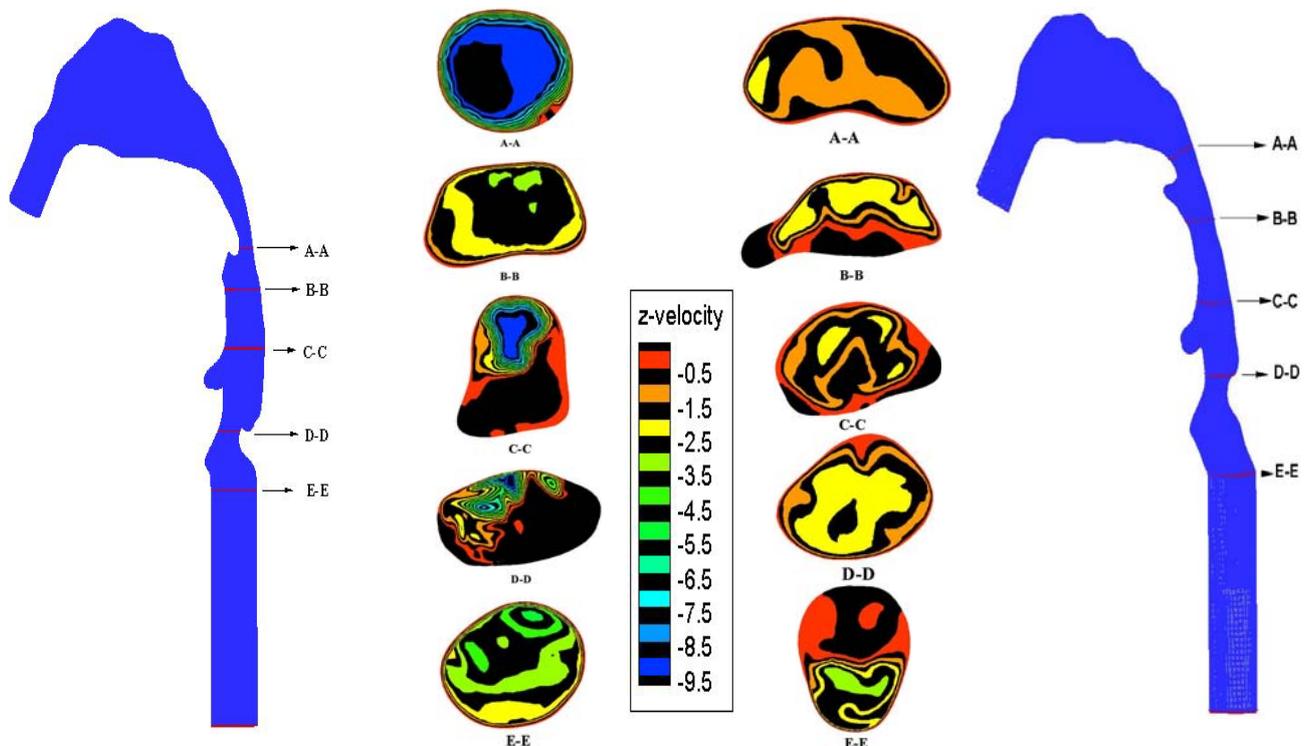


Fig. 1 Flow visualization in upper airway of OSA patient pre-surgery (left) and post-surgery (right).