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Vortical Structures in CT-based Breathing Lung Models JIWOONG CHOI, CHANGHYUN LEE, Seoul Natl Univ, ERIC HOFFMAN, CHING-LONG LIN, University of Iowa — The 1D-3D coupled computational fluid dynamics (CFD) lung model is applied to study vortical structures in the human airways during normal breathing cycles. During inhalation, small vortical structures form around the turbulent laryngeal jet and Taylor-Gőrtler-like vortices form near the curved walls in the supraglottal region and at airway bifurcations. On exhalation elongated vortical tubes are formed in the left main bronchus, whereas a relatively slower stream is observed in the right main bronchus. These structures result in helical motions in the trachea, producing long lasting high wall shear stress on the wall. The current study elucidates that the correct employment of image-based airway deformation and lung deflation information is crucial for capturing the physiologically consistent regional airflow structures. The pathophysiological implications of these structures in destruction of tracheal wall will be discussed.

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