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Effect of Pressure Controlled Waveforms on Flow Transport and Gas mixing in a Patient Specific Lung Model during Invasive High Frequency Oscillatory Ventilation MOHAMMED ALZAHRANY, ARINDAM BANERJEE, Lehigh University, Bethlehem, PA — A computational fluid dynamic study is carried out to investigate gas transport in patient specific human lung models (based on CT scans) during high frequency oscillatory ventilation (HFOV). Different pressure-controlled waveforms and various ventilator frequencies are studied to understand the effect of flow transport and gas mixing during these processes. Three different pressure waveforms are created by solving the equation of motion subjected to constant lung wall compliance and flow resistance. Sinusoidal, exponential and constant waveforms shapes are considered with three different frequencies 6, 10 and 15 Hz and constant tidal volume 50 ml. The velocities are calculated from the obtained flow rate and imposed as inlet flow conditions to represent the mechanical ventilation waveforms. An endotracheal tube ETT is joined to the model to account for the effect of the invasive management device with the peak Reynolds number (Re) for all the cases ranging from 6960 to 24694. All simulations are performed using high order LES turbulent model. The gas transport near the flow reversal will be discussed at different cycle phases for all the cases and a comparison of the secondary flow structures between different cases will be presented.

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