Modeling the Flow Process inside the Lungs attached to a High Frequency Ventilator (HFV).

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Abstract

Lung injury remains an important cause of morbidity among newborns who require assisted ventilation and surfactant there are still some neonates who cannot be adequately ventilated with even sophisticated conventional ventilation. Therefore respiratory insufficiency remains one of the major causes of neonatal mortality. Intensification of conventional ventilation with higher rates and airway pressures leads to an increased incidence of barotrauma. High-frequency ventilation (HFV) as a ventilatory therapy has reached increasing clinical application over the past ten years and might resolve such desperate situations. The key difference from conventional mechanical ventilation (CMV) is the usage of unusually high rates and low tidal volumes. The cyclic changes in lung volume during large tidal ventilation are believed to be an important factor in causing lung injury. In general, conventional ventilation can have severe side effects for a patient and can sometimes fail to safely and adequately ventilate a patient. HFV is now seen as an alternative when conventional ventilation fails. This presentation will provide an introduction and comparison of CMV and HFV and give the results from various clinical studies. In addition computational results will be presented for a 3D bifurcation model of the 5^{th} to 7^{th} generation of the model lung described by Weibel, see Fig.1.

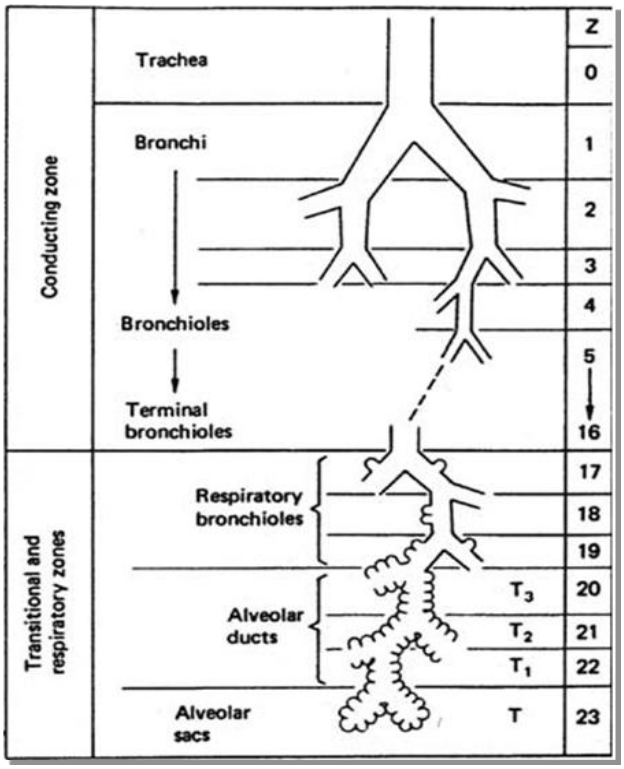

Fig. 1: Wiebel's Model