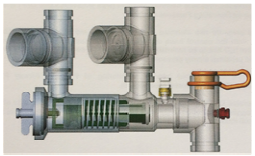

Gas distribution in a two-compartment model ventilated in high-frequency percussive and pressure-controlled modes.

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PURPOSE: To demonstrate in a two-compartment heterogeneous mechanical model of the lung how different loads applied to one compartment, while the other is kept constant, would modify gas distribution between the two pathways under high-frequency percussive ventilation (HFPV). Additionally, these results were compared with those generated in the same model by pressure-controlled ventilation (PCV).
METHODS: Analysis was based on a Siemens lung simulator, representing a fixed branch of the system with an elastance equal to 45 CmH_2O/L and a resistance of 20 $CmH_2O/L/s$, and a single-compartment lung simulator, representing a variable pathway of the model, presenting three elastic loads varying between 35 and 85 CmH_2O/L and three resistive loads varying between 5 and 50 $CmH_2O/L/s$. Each simulator represented one compartment of the model connected to a central airway that was ventilated with either a volumetric diffusive respirator (VDR-4; Percussionaire Corporation, Sandpoint, ID, USA) or a Siemens Servo 900c ventilator. Flow and pressures were measured in each branch of the model under nine conditions representing the combinations of three elastic and three resistive loads (variable branch) while the loads in the other pathway were kept constant.
RESULTS: HFPV was able to avoid hyperinflation and reduce tidal volume in a bicompartmental heterogeneous lung model. Under HFPV, gas distribution between the two compartments was not constrained by their time constants. PCV yielded gas distribution as determined by the time constant of each compartment.
CONCLUSIONS: HFPV accommodated volume distribution without overinflating compartments with low time constants, thus possibly presenting a potential protective behavior in mechanically heterogeneous lungs.PMID: 20689922 [PubMed - as supplied by publisher]

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