

Alveolar oxygen respiratory oscillations measured in arterial blood.

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The partial pressure of oxygen in arterial blood can increase during inspiration and decrease during expiration in the presence of a variable shunt fraction, such as with cyclical atelectasis, but it is generally presumed to remain constant within a respiratory cycle in the healthy lung. In our experiments, arterial oxygen partial pressure was measured continuously with a fast intravascular sensor in the carotid artery of anaesthetized, mechanically ventilated pigs, without lung injury. Here we demonstrate that the partial pressure of arterial oxygen shows respiratory oscillations in the uninjured pig lung, in the absence of cyclical atelectasis (determined with dynamic computed tomography), with oscillation amplitudes that exceeded 50 mmHg, depending on the mechanical ventilation conditions. These respiratory oscillations in the partial pressure of arterial oxygen can be modelled from a single alveolar compartment and a constant oxygen uptake, without the requirement for an increased shunt fraction during expiration. Our results are likely to contribute to the interpretation of arterial oxygen respiratory oscillations observed during mechanical ventilation in animal models of the acute respiratory distress syndrome.