IN VIVO IMAGING OF REGIONAL VENTILATION BEFORE AND AFTER HISTAMINE PROVOCATION USING SYNCHROTRON RADIATION CT

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We have introduced a novel CT imaging technique where synchrotron radiation is used to image stable xenon gas within the airways and peripheral air spaces, with a spatial resolution of 0.35mm x 0.35mm [1, 2].

In bronchial asthma the constriction in the airways causes dramatic changes in the regional distribution of ventilation. Distributions were studied before and after histamine provocation in healthy rabbits. Ventilation was measured using a wash-in imaging sequence, and distributions at three different lung levels were followed up to 60 minutes after the histamine inhalation. Imaging was performed under anaesthesia and mechanical ventilation. Experiments were repeated using histamine in concentrations of 20, 50, and 125 mg/ml.

We found out that immediately after the histamine provocation, the ventilation decreased in several areas, became non-uniform and the distribution had bimodal shape. The response to the histamine correlated with the histamine dose. After 60 min, the ventilation had recovered to nearly normal.

We conclude that synchrotron radiation CT using stable xenon gas is a sensitive and quantitative method to study the changes in the ventilation distribution and effective ventilated lung areas during histamine challenge of lungs.