Scientific Posters

CODE: 2428CH-p

SESSION: Chest (Quantitation of Thoracic Images)

CT Measured Regional Specific Compliance Reflects Regional Ventilation in Supine Sheep

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★ - Author stated no financial disclosure

▲ - Disclosure information unavailable

SUBSPECIALTY CONTENT

CH Chest Radiology

DATE: Thursday, December 02 2004
START TIME: 12:55 PM
END TIME: 01:05 PM
LOCATION: Hall D1, Lakeside Center

PURPOSE

In order to fully characterize pulmonary function in health and disease, we have developed multidetector-row CT (MDCT) imaging techniques for the non-invasive measurement of regional lung function. Regional specific compliance, measured from the change in regional lung density over a tidal breath, should correlate with regional ventilation and involves considerably lower radiation exposure than Xenon CT-based ventilation measures which require scanning over multiple breaths.

METHOD AND MATERIALS

Anesthetized, intubated, supine mechanically ventilated sheep (N=5) were studied. Axial imaging was performed gated to two points in a respiratory cycle (tidal volume: 12 ml/kg). By using a step-and-gate method, incrementing the table by half the z axis coverage of a multislice acquisition, we obtain inspiratory and expiratory scans at each slice level except for half the slices in the first and last acquisition. MDCT was via a 4 slice scanner (120kV, 100mAs, pitch 1.5, slice thickness 1.3). Xenon CT used axial scanning with gating at end-expiration over 60 breaths to fully capture wash-in and wash-out. Regional lung specific compliance (sC) may be measured from the changes in tissue density (H) of lung regions with changes in inflation pressure (P) using the relationship sC= (1000*(H2-H1))/(H1*(1000+H2)*P). Distinct anatomical markings were used to define corresponding lung regions of interest (ROI) between inspiratory, expiratory, and Xe-CT images, with an average ROI size of 1.6±0.7 ml. Changes in ROI density with tidal breathing were measured with the public domain program Image J and used to calculate sC. Corresponding regional Xe-CT specific ventilation (sV) was measured with TSIA software from the Univ of Iowa reported previously.

RESULTS

A linear relationship between sC and sV was demonstrated over a wide range of regional sV found in the normal supine lung (R2=0.73)

CONCLUSION

Regional sC, which involves significantly reduced exposure to radiation and Xe gas compared to the Xe-CT method, represents a safe and efficient surrogate for measuring regional ventilation in experimental studies and patients.

Supported by NIH HL64368 and DOD DAMD17-02-1-0732

DISCLOSURE

E.A.H.: Share holder in VIDA Diagnostics