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Title: Regional V-Q Distribution is More Uniform at Apex and in the Prone Position Measured by MDCT

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RATIONALE: Regional ventilation (V) and perfusion (Q) of the lungs can be measured via washin of the stable Xe gas and injection of iodinated contrast by use of multidetector-row CT (MDCT). Previous studies reported heterogeneity of V/Q distribution of the whole lung.. In this study, we investigate the heterogeneity of V/Q distribution at apex and base in supine and prone positions.

METHODS: 5 anesthetized, supine and prone sheep were scanned via MDCT (MX8000). acquiring 4 2.5 mm contiguous sections in 500msec. One V and one Q image set were acquired at apex and base, prone and supine for each sheep. Q was imaged during apnea (0cm$H_2$0 Pawy).

Imaging was ECG gated during RV injection of 0.75cc/kg Iohexol over 2 secs. V is assessed by a washin method: using 55% Xe. The lung is imaged at each end-expiration point during Xe iwash-in. By dividing V image by Q image in a voxel-by-voxel manner, we are able to now evaluate regional pulmonary V/Q. A logarithmic (log) transformation of V/Q ratios was used to assess linear vertical gradients in the V/Q distribution. The heterogeneity of V/Q was assessed calculating Q-and V-weighted V/Q distributions.

RESULTS: Supine, vertical gradients of log V/Q between apex and base were significantly different ($p<0.05$), but not iProne ($p>0.05$). When heterogeneity of V and Q distributions were compared with references to log (V/Q) ratios, the prone position and apex were associated with a lower log SD_V ($p<0.05$) and log SD_Q ($p<0.05$). When measured by log $SD_{V/Q}$, the heterogeneity of V/Q distribution was also lower at apex and in the prone position ($p<0.05$).

CONCLUSION: MDCT provides a means of assessing V/Q ratios. At base, the homogeneity of the V/Q distribution increased significantly in the prone position, but not at apex. Limitations to date are that the whole lung is not sampled. MDCT z-axis coverage will increase.

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Signature of Presenting Author:

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