

## Poster Presentations

### DIFFERENTIATION OF HYDROSTATIC VERSUS HIGH PERMEABILITY EXPERIMENTAL PULMONARY EDEMA USING SERIAL CT-SCANS WITH CONTRAST MATERIAL

Roman Ullrich, MD\*, Claudia Weidekamm, MD\*\*, Mathias Prokop, MD\*\*, Christian Herold, MD\*\*, Peter Germann, MD\*, M. Zimpfer, MD, MBA\*

\*Department of Anesthesia and General Intensive Care Medicine and

\*\*Department of Radiology, Vienna General Hospital, University of Vienna, Austria

**Purpose:** Increased pulmonary vascular permeability (PVP) resulting in a proteinaceous interstitial and alveolar edema is a pathological hallmark of ARDS (1). Measurements of PVP are helpful to differentiate between ARDS and impairment of gas exchange from other causes. However, current techniques all use radioactively labelled substances and thus are not easily available. We hypothesized that the increased PVP following oleic-acid induced high permeability edema results in a different washout curve of contrast material (CM) obtained from serial CT scans as compared to hydrostatic pulmonary edema with intact PVP.

**Materials and Methods:** Piglets of both sexes (30-35kg) were anesthetized, instrumented and mechanically ventilated. High permeability edema was induced by i.v. oleic acid (0.15 ml/kg, n=7). Hydrostatic edema was achieved by inflating a balloon in the left atrium up to 36mmHg (n=5). Before and 90 min after induction of pulmonary edema serial CT-scans were performed during inspiration (synchronized to mechanical ventilation) at a representative level that included ground-glass opacification (GGO) and consolidation. After start of scanning 40 ml of contrast media was rapidly injected. A total of 34 scans was obtained over 238s. For image analysis regions of interest were placed in areas with normal ventilation and ground glass areas. Lung densities in the ROI were normalized to density before CM application and plotted as function over time. From these plots normalized slope value can be calculated where the steepness of the slope indicates degree of accumulation of CM (2).

**Results:** We observed an initial peak of enhancement during the first pass of CM in both groups. After 80 s, no significant changes in lung density of GGO areas were seen with hydrostatic edema, whereas lung density increased continuously following administration of oleic acid (normalized slope  $6 \pm 7 \cdot 10^{-5}$  vs  $84 \pm 28 \cdot 10^{-5}$ ,  $P < 0.01$ ). Pulmonary fluid accumulation did not differ between groups (W/D-ratio  $8,9 \pm 0,7$  vs  $8,8 \pm 1,4$  )

**Conclusions:** Assessment of lung density over time obtained from serial CT after CM application allows to differentiate hydrostatic from vascular permeability experimental pulmonary edema.

**References:** 1) Schuster DP. Chest 1995;107:1721  
2) Roselli RJ, J Appl Physiol 1989;67:2343