AbstractID: 5099 Title: Serial Flat Panel Computed Tomography Quantification of Bleomycin-Induced Murine Lung Damage In Vivo

Purpose:

To compare methods of quantifying lung damage based on non-invasive flat-panel CT images with the standard method based on histologic section analysis.

Method and Materials:

Lung damage was induced in mice with bleomycin and damage progression followed with fpCT on days 10, 14, and 21 and with postmortem histological examination on day 21. Ten mice, five control and five treated, were scanned under breath hold with flat-panel CT (fpCT). Prior to scanning, a tail vein catheter was inserted for administration of IV contrast. The percent lung damage calculated from fpCT (PLD_{fpCT}) image data sets was compared to that obtained from sequential histological sections (PLD_H).

Results:

IV contrast was helpful in separating vessels from regions of lung damage. PLD_{fpCT} calculations were on average 2 times greater than PLD_H calculations. Linear trendlines were fit between PLD_H and PLD_{fpCT} to all data (n=10) and then to only the treated mice (n=5); the resultant R^2 values were 0.87 and 0.89, respectively. The fpCT scans allowed for observation of the progression of damage over time versus the single snapshot sampled with histology. Less damage was observed at day 14 than at either day 10 or day 21, which could be due to a transition from an acute inflammatory reaction to inflammation with formation of collagen.

Conclusion:

The quantification of lung damage based on fpCT images was strongly correlated to the conventional histological section analysis. Although the overall change in damage is consistent between histology and fpCT the magnitude of measured damage differs which may be explained by an inflammatory response throughout the lung which is not detected with histology. A potential strength of these longitudinal studies is the ability to follow individual animals over time to investigate biological affects such as a transition from acute to chronic damage patterns.