

QIBA COPD/Asthma Committee Update

Tuesday, April 27, 2010

11:00 AM CDT

Call Summary

In attendance

Philip Judy, PhD (co-chair)
Andrew Buckler, MS
Harvey Coxson, PhD
James Crapo, MD
Zachary H. Levine, PhD
John Newell, Jr, MD

Jered Sieren
Daniel Sullivan, MD

RSNA staff

Susan Anderson, MLS
Joe Koudelik

NIST foam – next steps (Drs Levine and Judy)

- Four foam samples sent to UPenn for scanning on Siemens S64; Dr Torigian performed “5-factor study” (dose, FOV, kVp, recon kernel, inside/outside acrylic box) under 94 different conditions
- Statistical analysis done on each internal sample producing a 2 HU difference in mean value across samples
- Dose, kVp, recon kernel, position in/out of box showed minimal effect with shifting mean HU values
- Results demonstrate uniformity/consistency of foam samples; foam deemed usable as a reference standard phantom fill material
- Need to incorporate foam into current calibration reference standards (COPDGene, ACR phantom, etc) to mimic patient/real-life situations before Profile Claims can be made
- Dr Levine welcomes assistance with obtaining reference phantoms to work with and suggested Ft Detrick, Maryland as one potential site to perform multiple cross-platform/scanner comparisons
- Foam samples to be scanned in various containers (e.g. cylindrical cases, etc) to determine any shadow or beam hardening effects; need to qualify available containers
- This comprises the core series of experiments group is to build upon; need to formalize context and deliverables next
- Need to specify performance criteria in Profile based on Ideal/Target/Acceptable claimed performance

Status of measurements dose, ring and phantom position measurements of COPDGene Phantom 2 (Dr Hoffman and Mr Sieren)

- U Iowa scanning results distributed and discussed
- Thicker trachea ring within the modified COPDGene phantom affects CT numbers (RING B below)
- Additional material surrounding air hole shifts HU numbers lower (10 HU shift to the right on histogram) as seen with annulus in modified COPDGene phantom
- Median of trachea was found a function of Body Mass Index (BMI) on the Siemens Definition; showed systematic effects of larger ring on simulated trachea; additional data analysis needed
- Histograms affected by distance between annulus and edge of phantom, e.g. histograms attenuate (flatten-out) when moving from oval to round phantom shape (changing shape of phantom or patient); as similarly seen when changing dose (mAs)
 - Does a mechanism exist linking mAs and patient size?
 - BMI deemed possible to affect CT numbers from emphysema patients
- Shape (phantom or patient) has affect on histogram; corrections based on lung tissue may be difficult due to variability (real variation in CT numbers seen)

- Air value shift in trachea also dependant on inspiration/expiration; more discussion needed
- Mr Sieren to scan annulus insert itself using various doses while moving the phantom off-center to determine CT number shift for air trachea and lung
- Summary: Dose and patient size are critical to understand for accurate CT numbers

Trachea and lung median measurements informing reference standard design

- Air density in trachea and water density in heart only constants in -1000 HU range; useful references to help correct for lung; reason why correct air trachea CT numbers need to be pursued
- Need to correlate variability of air in trachea to that in lung

Next steps:

- Mr Sieren to scan annulus insert itself using various doses while moving the phantom off-center to determine CT number shift for air trachea and lung
- Consider different dose measurements (inspiration, expiration)
- Reminder: COPDGene Spring Investigators Meeting - May 15, 2010, New Orleans, LA
- Next call: May 11 at 11 am CDT

(Image kindly provided by Dr Eric Hoffman, U Iowa)

