

QIBA COPD/Asthma Phantom Design Subcommittee

February 04, 2010

2 PM CST

Call Summary

In attendance

Philip Judy, PhD (co-chair)

Andrew Buckler, MS

Zachary Levine, PhD

Daniel Sullivan, MD

RSNA Staff

Susan Anderson, MLS

Joe Koudelik

Review imaging of foam at UPenn

- Review material Dr Judy forwarded ("Making Lemonade" presentation)
- Future plans for paper submission to AAPM or RSNA

Status of evaluation of NIST and COPDGene foams (Drs Judy and Levine)

- Dr Torigian (Duke) to scan foam samples within and outside acrylic box for artifact comparison, then send DVD with foam data and scan parameters to Dr Levine for analysis of micro- and mini-CT acquisitions
- Difference between thin and thick slices pursued by examining 17 ROI averages
 - Moving average of mini-CT done using a 5x5x5 box filter
 - CT numbers found identical for 1x1x1 (original image) and 5x5x5 (moving average) contrary to Stoel's hypothesis
 - Very small difference seen between averaged CT numbers of thick and thin foam slices
 - Large changes in attenuation seen
 - Repeating the Stoel experiment proposed
- Scanning each foam sample individually along the long axis proposed
- Circular container with regions of foam, air and 'water-equivalent' density needed
- Beam-hardening trends need attention
- Instrumental artifacts, e.g. registration
 - Rotating object 180° in 1 or 2 directions may isolate potential scanners generated artifacts/issues
- Foam/Tissue Interaction
 - Vendor protocols may reconstruct thin-to-thick sections
 - CT number issues may reflect scanning foam+tissue combination; foam may not be an issue
 - Computer computation, not simple physics, may be affecting CT numbers; Kemerink work remains solid
- Whether thin slice scanners perform better with air trachea structures still not clear

Status of modification of COPDGene Phantom

- Mr Levy (Phantom Laboratory) fabricating the COPDGene phantom annulus
- Dr Judy to study air trachea behavior when annulus is received
- Phantom air trachea CT numbers discussed; substantial variations reported; Dr Judy reviewing literature

- Truncation an issue; digital numbers bottom out below -1024 HU (all readings default to -1024 when at, or below, this value; means not possible); current phantoms seldom reach -1000 HU for air trachea estimates even with thin segmentation
- Uniform phantoms and schemes to calculate medians needed as well

Conclusions

- CT issues may arise when integrating non-foam material with foam, i.e. foam+tissue
- Variation in phantoms seen; need to standardize or certify phantoms to their ability to deal with their various issues
- Propagating artifacts, e.g. beam-hardening, need further examination

Next Steps:

- Dr Torigian to send scan data on DVD to Dr Levine
- Proposed abstract development for AAPM Annual Meeting, July, Philadelphia; March deadline for abstract submission
 - Acknowledge QIBA methodology
 - System analysis and sources of variability
 - Working on sources of variability
- Dr Levine to provide feedback and propose material to organize and present
- Next call scheduled for February 18th, 2010 at 2 pm CST (3 PM EST)