QIBA PET Amyloid BC June 10, 2016 - Agenda

- Claim update and discussion
  - Specifically need feedback from PET Amyloid tracer vendors
    - Please make this call if possible!
- Image Analysis Workstation Conformance update
- Round 5 Project Updates (if time and PI's present and willing)

Amyloid-PET Profile Claims

- Claim 1: A measured change in SUVR of Δ % indicates that a true change has occurred if Δ > 5-8%, with 95% confidence, where the percent change in SUVR (Δ) is defined as [(SUVR at Time Point 2 minus SUVR at Time Point 1) / SUVR at Time Point 1] x 100.

  Note: we need to have a group consensus of which number to pick between 5-8%, unless we want to leave this as a range? I believe we wanted to go with the low end, so 5%.

- Claim 2: If Y1 and Y2 are the SUVR measurements at the two time point, then the 95 % confidence interval for the true change is (Y2-Y1) ± 1.96 × √([Y_1 ×0.043]^2+[Y_2 ×0.043]^2).

Claim Discussion

- Latest version of Claim
  - Radiopharmaceutical vendors in accordance with this version, specifically 5-8% RC?
  - Note, due to normal and abnormal groups having similar RCs per Rathan's analysis, we will NOT have separate claims for these groups
- Rathan: any update re test-retest studies, re discussions with Lilly?
- ADNI: any follow-up for using these data for test-retest analysis?

Image Analysis Conformance Update

- Dawn, Nancy, Eric, Rachid and Anne met this week
  - Metrology's (Nancy's) Framework
  - Problem statement from Dawn
  - Regarding the actors to show conformance:
    - "Conformance" is defined by the Profile
      - Image Analysis vendors must show conformance for their software
      - Readers/users must show conformance for their roles/protocols
  - For Image Analysis Software, two types of conformance
    - Reproducibility
      - Most relevant for Longitudinal claims (what our first version of Profile Claim is)
      - Can take a single patient dataset and transform in various ways
        - » Would test the registration to standard atlas space part of the analysis
      - Can take a single high statistic subject dataset and add various levels of noise
        - » Could choose standard patient datasets of HCs and varying levels of amyloid positivity
        - » SUVRs should be reproducible in each case until noise level is too high
      - *Dawn took action item to investigate using ADNI and Centiloid datasets (Centiloid paper)
    - Linearity
      - Most relevant for Longitudinal claims (what our first version of Profile Claim is)
      - Usually best to use a DRO or Phantom where true activity and amyloid positivity are known
      - Is Hoffman Brain phantom a reasonable choice for this?
      - *Anne took action item to see if Paul's DRO could possibly be ready in the time frame we have for version 1 of Profile
        - » Assume that John's mechanical phantom WILL NOT be ready
    - Fixed bias
      - Most relevant for Cross-sectional claims (will not address in Version 1.0 of Profile)
  - Will schedule another meeting next week with this group, to keep progress happening
    - Anyone with good ideas is welcome to join!

Profile – Next Steps

- Needs to finalize Profile for Public Review
  - CT BC: had a single day multi-hour review via WebEx
    - Agenda would be clear such that members could join at specific times
    - Thoughts on this?
  - Multiple separate sessions
  - DEFINITELY need a “Physics” session
    - Believe Eric has a list of open physics issues

Round 5 Project Update

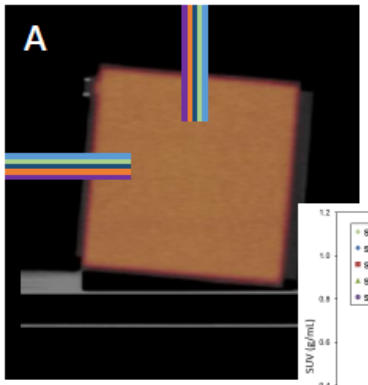
- Head motion project
  - Anne
    - 56 simulated head transformations between CT and PET scan completed for the 3 subjects: HC, aMCI, eAD
    - Maximum transformers were 10 mm translations in all directions, and 10 deg rotations about all axes
    - 171 DICOM image volumes transferred to Dawn for image analysis
  - Dawn
    - All images aligned to the originally positioned scan for all subjects
      - Comparing two SPM methods for registration
    - Alignment parameters calculated by SPM compared to original applied translational and rotational misalignment
    - A set of ROIs and Reference Regions have been transformed to the native space of each subject for measurement
    - ROI measurements are in progress

Round 5 Project Update

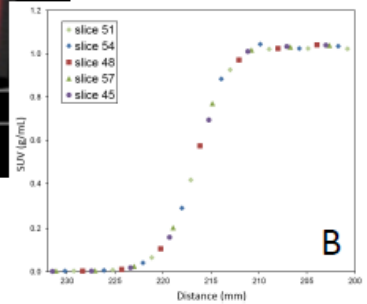
- Tilted cylinder resolution measurement – Martin

- Amyloid Phantom (will do on a later call)
  - DRO - Paul
  - Mechanical – John

Martin's Update Slide



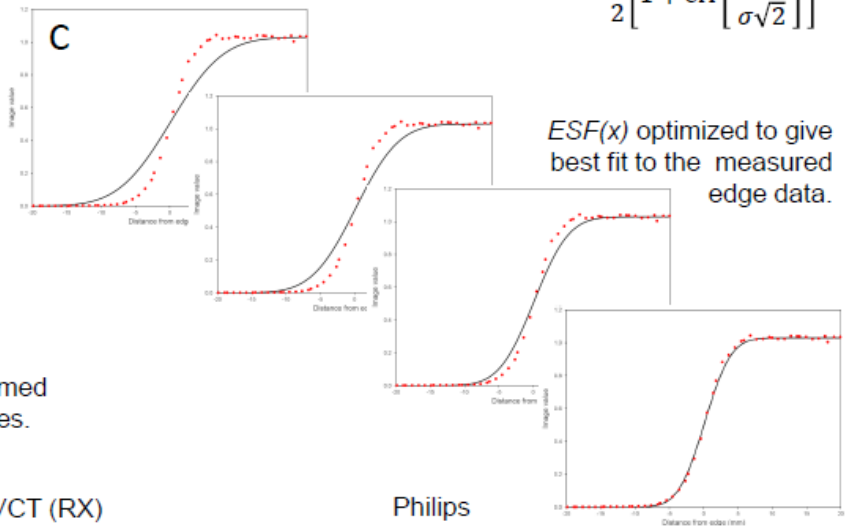
Sagittal view
Uniform 20 cm cylinder



Edge spread function can be described by the integral of a Gaussian point spread function.

$$ESF(x) = \int_{-\infty}^{x} PSF(x')dx' = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{x} e^{-(x'-\mu)^2/(2\sigma^2)}\, dx'$$

$$= \frac{1}{2}\left[1 + \mathrm{erf}\left[\frac{x-\mu}{\sigma\sqrt{2}}\right]\right]$$



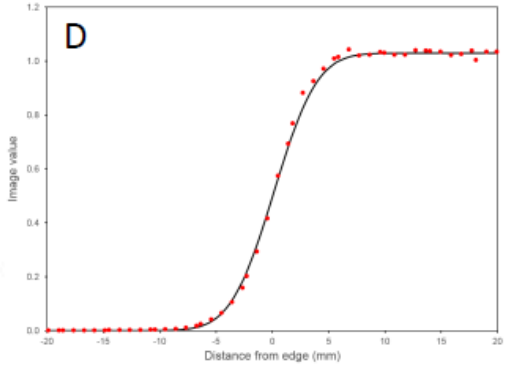
ESF(x) optimized to give best fit to the measured edge data.

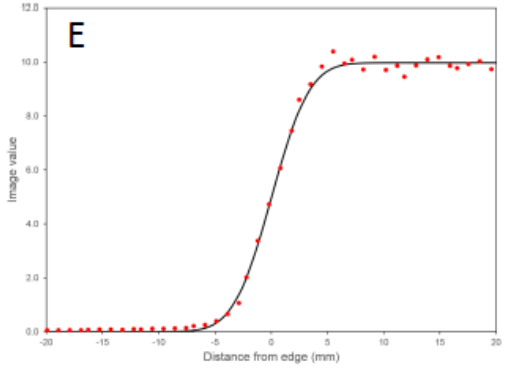
Finely sampled edge spread function formed by combining profiles from multiple slices.

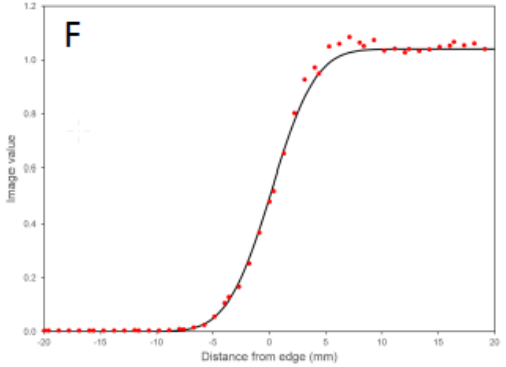
Siemens
Biograph mCT
OSEM + TOF, 2i, 21s,
5 mm Gaussian (3D)
→ Radial FWHM = 7.1 ± 0.1 mm

GE
Discovery VCT (RX)
OSEM, 2i, 21s, 3 mm Gaussian (2D),
z-filter *standard*
→ Radial FWHM = 6.2 ± 0.1 mm

Philips
Gemini TF
BLOB-OS-TF
→ Radial FWHM = 7.3 ± ? mm







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