Detection-based Spectral CT: Workflow

Lakshmi Ananthakrishnan, MD
Assistant Professor, Division of Abdominal Radiology
Director of Abdominal CT
UT Southwestern Medical Center
Dallas, TX
Disclosures

- Institutional research agreement with Philips Healthcare and Siemens Healthcare
Detection- based Spectral CT: Basics

- Single x-ray beam source
- Double layer detector
- Spectral separation performed at detector level

Image courtesy Philips Healthcare
Source-based versus Detection-based Approaches

Source-based

- Dual-Source
- kV Switching

Detection-based

- Dual Layer Detector

Image courtesy Philips Healthcare
Spectral Dual Layer “Sandwich” Detector

Low Energy Spectrum
Top layer absorbs only low energy photons. High energy photons pass through to second layer.

High Energy Spectrum
Second layer absorbs >99% of high energy photons.
Available spectral results

- Conventional [HU]
- MonoE [HU]
- MonoE [HU] (Equiv. to conventional CT)
- VNC [HUA]
- Iodine no Water [mg/mlA]
- Z Effective

More Spectral results

- Iodine Density [mg/ml]
- Contrast-Enh. Structures [HU]
- Iodine Removed [HU]
- Uric Acid [HU]
- Uric Acid Removed [HU]
Workflow

- RETROSPECTIVE: Spectral data on all cases performed at 120 or 140 kVp

- No change in technologist workflow after initial protocol build
  - Spectral based images (SBI) series automatically generated and sent to PACS
  - Approximately 5 minutes

- Available on independent workstation, on thin client, or in PACS
  - Spectral analysis may be created “on the fly” in PACS
“On the Fly” Analysis (Magic Glass™)

- Integrated into PACS
- Provides spectral data for selected region of interest
- Customize which reconstructions are displayed
Potential Applications

- **VNC**
  - Renal stone detection on post-contrast CT
  - Incidental renal or adrenal lesion characterization

- Low monoenergetic images
  - Oncology: increased lesion conspicuity
  - Vasculature: increased iodine conspicuity on CTA

- High monoenergetic images
  - Metal artifact reduction

- Iodine quantification
  - Incidental renal lesion characterization