Nuclear Medicine

Physiological Imaging

• Radioactive isotopes which emit gamma rays or other ionizing forms (half life for most is hours to days)
• Radionuclides are injected intravenously or inhaled where, depending on substance, they concentrate in organ of study
• The emitted gamma rays are then picked up by gamma camera and displayed
• **Special terms used on nuclear medicine reports**
  – Hot, Photon Rich, Cold, Photon Poor, Photopenic
Nuclear Medicine
Physiological Imaging

• Conventional Nuclear Medicine
  • Emitted gamma rays create image

• SPECT (Single Photon Emission Computed Tomography)
  • Tomographic images of emitted gamma rays
  • Rotating gamma camera creates 3-D data set
  • Data set is then manipulated to create volume images (sum of all images in stack), multiplanar thin section images and 3-D volume data sets

Gamma Camera
Bone Scan

Lung Scan

Ventilation  Perfusion
PET Scanning

- Oncology
- Function
- Metabolism
- Perfusion

Positron Emission Tomography

- PET (Positron Emission Tomography)
  - Tomographic images of emitted positrons
  - Can be used to study metabolic processes
  - 511 kEv gamma ray Photons emitted simultaneously at 180 degrees to each other
  - Evaluate location in space
  - Fusion imaging with CT scanning for precise localization
Nuclear Medicine
Physiological Imaging

- Positron Emission Tomography
  - Radionuclide emits positrons which interact with electrons to eject gamma rays at 180°
  - Use computer to localize in space

\[ B^+ + e^- \]

Positron Emission Tomography

- Lung Cancer
- Mediastinal Metastasis
Positron Emission Tomography

- Lung Cancer
- Metastases
- Obstructed right ureter

Normal Cardiac Perfusion
Anterior Wall Ischemia
13N-Ammonia and 18F-FDG PET-perfusion and viability