Nuclear Medicine Brain Imaging – Non-Dementia

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TECHNIQUES:

- SPECT
- SPECT/CT
- PET
- Planar
RADIOPHARMACEUTICALS:

- Tc99m Bicisate (Neurolite©)
- Tc99m HMPAO (Ceretec©)
- I-123 Ioflupane (DaTscan©)
- F-18 FDG
- In-111 DTPA
- Tc-99m pertechnetate
- Tc-99m glucoheptonate
INDICATIONS:

- Dementia
- Interventional Studies
  - Pharmacologic – Diamox©
  - Occlusion
- Suspected Parkinsonian syndromes
  - DaTscan©
- Seizure Localization
- Brain Death
- CSF Studies
  - Flow analysis
  - Leak detection
  - Shunt evaluation
SPECT in Transient Ischemic Attacks…Diamox© challenge

- Acetazolamide (1gm IV) Diamox© produces vasodilatation with 30-50% increase in rCBF in normal brain at 30 minutes
- Areas with vascular compromise show little or no increase
- Comparison of baseline and post Diamox images can identify territories at risk
Cerebral Perfusion SPECT in Arterial Occlusion Assessment

- evaluation of patients with ICA aneurysms, tumors at base of brain
- study of perfusion, with injection during temporary balloon occlusion with imaging later
- baseline study (?)
- evaluate collateral blood flow
- location and severity of perfusion changes during occlusion
  - assess need for bypass prior to definitive surgery
R ICA Balloon Occlusion
R ICA Balloon Occlusion
I-123 ioflupane (DaTscan®)

- evaluation of patients with suspected Parkinsonian syndromes (PS)
- striatal dopamine transport system visualization
- SPECT, SPECT /CT
Suspected Parkinsonian syndromes (PS)

- Essential Tremor (ES) vs PS
  - idiopathic Parkinson’s disease
  - multiple system atrophy
  - progressive supranuclear palsy
Normal
Normal
Quantitative Analysis
Unilateral Decreased Dopamine Transporters
Bilateral Decreased Dopamine Transporters
Bilateral Decreased Dopamine Transporters
Seizure Focus Localization

- Surface EEG
  - poor spatial resolution
- Depth EEG
  - invasive
- SPECT/CT (Bicisate, HMPAO)
  - increased rCBF (ictal)
  - decreased or normal rCBF (inter-ictal)
- PET
SPECT in the Evaluation of Epilepsy

- primary goal of perfusion SPECT imaging is seizure focus localization
- inject activity to maximize diagnostic value:
  - ictal imaging
  - inter-ictal imaging
  - post-ictal imaging (?)
Ictal Imaging

- inject tracer at onset of seizure
  - Within 10 seconds of seizure onset
  - Requires special monitoring/surveillance
- images show hyperperfusion (increased activity) in epileptogenic focus extending to ipsilateral basal ganglia/thalamus
- may also extend to ipsilateral motor cortex/contralateral cerebellum
Ictal SPECT
Inter Ictal Imaging

- Least accurate of the three techniques
- Images may show hypoperfusion in the region of the seizure focus, but may be normal
Inter-Ictal
Inter-Ictal
Subtraction
PET Seizure
Cerebral Death

- Flow Study
- Static Images
- Tc99m Glucoheptonate
- HMPAO/ECD
Cerebral Death Evaluation
Blood Flow
Cerebral Death Evaluation
Planar Statics
RADIONUCLIDE CISTERNOGRAPHY

- Tc-99m or In-111 DTPA
- Normal Pressure Hydrocephalus (NPH)
- CSF Leaks
- Shunt Function/Patency
Normal Cisternography
4 Hour
Normal Cisternography
24 Hour
Normal Cisternography
48 Hour
NPH at 4 Hours
NPH at 24 Hours
NPH at 48 Hours

Anterior

Posterior

Lt Lateral

Rt Lateral
Alzheimer’s Disease PET
Alzheimer’s Disease PET