PET imaging in neurodegenerative disease

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**Neuroimaging Modalities**

- **PET (Positron Emission Tomography)**
  - Injection of radioactive drug
  - Gives information about a specific target within brain
    (Different scans for Amyloid, Tau, etc)

- **MRI (Magnetic Resonance Imaging)**
  - Magnetic field and radio waves
  - Gives information about brain structure or brain function

- **Hybrid PET-MRI scanners allow simultaneous collection of these brain scans**

**PET can measure multiple AD targets**

- **Amyloid PET**
  - Amyloid plaques
  - Used for research since 2004
  - Three FDA approved PET scans (2012)

- **Tau PET**
  - Neurofibrillary tangles
  - Multiple research PET scans being investigated
  - First promising research scan 2013

- **Fludeoxyglucose (FDG) PET**
  - Glucose (sugar) uptake
  - Measure of neuron health
  - In use for decades

**Amyloid PET scans**

- Tangles (Tau Protein)
- Plaques (Amyloid Beta Protein)
Amyloid PET in AD clinical trials

1. Participant Selection
2. Examine drug engagement of anti-amyloid therapies

Bapineuzumab Phase 3 Trial

Without PET measurement, many enrollees are Amyloid-negative

APOE e4 carriers
302 Study N=123
Non-carriers
301 Study N=61

Salloway 2014 NEJM

PRIME Study: Anti-Amyloid therapy

Reductions in Amyloid PET measured over time

Sevigny 2016 Nature

PRIME Study: Example Subjects

Sevigny 2016 Nature
Combine Amyloid PET with Structural MRI scan

Amyloid-positive with hippocampus atrophy

Amyloid-negative with hippocampus atrophy

Amyloid PET scans

Tau pattern aligns with clinical symptoms

Ossenkoppele 2016 Brain

Dopamine imaging in Parkinson’s Disease

Need for alpha-synuclein PET scans
Summary

- PET imaging allows visualization of specific brain targets relevant for neurodegenerative disease
- Amyloid PET is widely used in clinical trials
- Combining PET and MRI can help understand underlying disease
- Tau PET is a new promising research tool
- Other PET targets are important and under development (alpha-synuclein, synaptic density, neuroinflammation)

Thank you!

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