Evaluating Atypical Dementia Syndromes using Positron Emission Tomography with Carbon 11-labeled Pittsburgh Compound B

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Overview

• Context
• Atypical dementia
• Objective
• Design, Setting, and Participants
• Main outcome measures
• Results
• Discussion
Context

• Alzheimer Disease (AD)
  • Development of multiple cognitive deficiencies
  • 2 mechanisms
    • Development of β amyloid plaques (β A)
    • Degenerative neuron

• 15% of AD with focal syndroms → atypical AD
  • Younger
  • More extended disease evolution
  • 5 types of which primary progressive aphasia and posterior cortical atrophy
Atypical dementia

Primary Progressive Aphasia (PPA)

- Language dysfunction
  But comprehension and visuo-spatial process intact

- MRI: Frontal and left perisylvian temporal cortical atrophy and hypometabolism on 18F-FDG PET

Posterior Cortical Atrophy (PCA)

- Progressive visuo-spatial difficulties – Balint Syndrom

- MRI: Severe posterior parietal cortical atrophy and hypometabolism on 18F-FDG PET
Objective

- Positron Emission Tomography (PET) imaging Carbon 11-Labeled Pittsburg Compound B (11C- PIB) → assessment of β Amyloid plaques

→ To explore **presence** and **topography** of β **Amyloid** in **atypical dementia**

→ To **compare** them with
  - Healthy controls
  - Patients with typical Alzheimer disease
Design, Setting, and participants

- At a tertiary referral center for memory disorders
- 15 healthy controls
- 12 patients with dementia
  - 10 with Alzheimer disease
  - 1 with Primary Progressive Aphasia
  - 1 with Posterior Cortical Atrophy
- All subjects are right-hand dominant
Main outcome measures

- **Topography** of cortical **11C-PIB** binding in **atypical vs typical** Alzheimer disease

  - P<0.001  AD vs control
  - P<0.1  Atypical dementia vs typical AD

  - T2 to rule out stroke
  - 11C-PIB intravenous injection -> 90min dynamic PET acquisition
  - Standardized uptake values and uptake values ratio images
  - Removed intersubject anatomical variability
Results (1)

- Typical AD vs Control subjects

- Both patients with atypical dementia vs Control subjects
Results (2)

- Patient with PPA vs typical AD

→ PET asymmetric focal 11C-PIB retention of left frontotemporal cortex
Results (3)

- Patient with PCA vs typical AD

→ PET visual cortical 11C-PIB retention
Discussion

• This study → concept of atypical AD in some cases of focal dementia

• No established relationship between β amyloid deposition and this 2 atypical dementia

• But concordance between 11C-PIB retention, clinical signs and 18 F-FDG hypometabolism → β amyloid -> role in pathogenesis?

• Longitudinal studies with serial amyloid PET imaging and clinical evaluation → role of β amyloid in atypical dementia
Take home message

• **Presence** of distinctive focal $\beta$ amyloid retention in patients with **atypical dementia**

• Identification of 11C-PIB:
  
  • Differential diagnosis of dementia

  • **Specific therapeutic strategies**: anti $\beta$ amyloid
Bibliography

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