Is PET/CT really helpful in diagnosing Alzheimer’s Disease?

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Conflict of Interest
PET/CT in the diagnosis of Alzheimer’s Disease

Is a technically possible exam also clinically feasible?
Spoiler alert
Dr. Jekyll and Mr Hyde
Thirty years ago… (Dr. Jekyll)
At that time.....
PET/CT-MRI co-registration
Fifteen years ago...... (Mr Hyde)
Diagnosing Alzheimer’s Disease

A clinician’s point of view
Dementia

• Prevalence 5-7% in people over 60 years of age (250-300,000 patients in Greece)
• Mild Cognitive Impairment
• Subjective memory impairment – pseudodementia

• Disease duration: 6-10 years
• Preclinical stage (MCI): 6-8 years

• Seen by
  • Neurologists, psychiatrists, internal medicine, general practitioners
  • To be replaced by nuclear medicine?
Dementia – clinical issues

- Is it dementia?
- Is it a reversible type of dementia?
- “Curative treatment”
- Symptomatic treatment
- Palliative care
- Caring for caregivers
Is it dementia?

- **Clinical definition of dementia**
  - Progressive loss of acquired higher cortical functions

- **Diagnostic criteria**
  - ICD-10
  - DSM-V
  - NINDS-ARDRA

- **Histopathological findings**

![Histopathological images of brain cells](image)

Alois Alzheimer & Auguste Deter
Clinical examination

- Medical History

- Neurological examination
  - Focal neurological signs
  - Extrapyramidal signs
  - Myoclonus

- Neuropsychological testing
  - MMSE
  - Clock test
  - Specialized test batteries

- Psychiatric examination
  - Pseudodementia of depression
Is it a reversible type of dementia?

- Chronic intoxications
- Infections (HIV, syphilis)
- Metabolic diseases
- Endocrine diseases (hypothyroidism)
- Malnutrition, hypovitaminosis
- Endocranial neoplasms, paraneoplastic syndromes
- Chronic subdural haematoma
- “Normal-pressure” hydrocephalus

- Biochemical and serological exams - neuroimaging
Degenerative and non-reversible dementias

- **Degenerative dementias**
  - Alzheimer’s disease, frontotemporal dementia, dementia with Levy bodies, Dementia in Parkinson’s disease,

- **Γενετικές βιοχημικές ανωμαλίες**
  - Wilson’s disease, Huntington’s disease, metachromatic leucodystrophy, mitochondrial encephalopathies, CADASIL

- **Vascular dementia**
  - Multi-infarct dementia, progressive subcortical leucoencephalopathy (Binswanger’s disease), multiple lacunar infarcts, amyloid angiopathy

- **Biochemical and serological exams - neuroimaging**
PET/CT and diagnosis of AD

AD diagnosis is based on
- Clinical data
- Neuropsychological examination
- Diagnostic criteria
- Differential diagnosis workup (exclusion of other forms of dementia)

PET/CT
- Not needed in the vast majority of patients
Relevant issues after the diagnosis of AD

• Initiation of treatment – monitoring for efficacy and side effects
  • “Curative treatment”
    • Inhibitors of cerebral cholinesterases - memantine
  • Symptomatic treatment
    • Behavioral disturbances – sleep disturbance – aggression – depression
    • “TLC”
    • Caring for caregivers

• Necessary for many years
• “not sexy” from a “scientific” point of view
• Humanitarian task
• No need for high-tech examinations
PET/CT and Alzheimer’s Disease

What is the evidence?
18F-FDG PET for the early diagnosis of Alzheimer's disease dementia and other dementias in people with mild cognitive impairment (MCI).

- Given the considerable variability of specificity values and lack of defined thresholds for determination of test positivity in the included studies, the current evidence does not support the routine use of 18F-FDG PET scans in clinical practice in people with MCI.

- The 18F-FDG PET scan is a high-cost investigation, and it is therefore important to clearly demonstrate its accuracy and to standardise the process of 18F-FDG PET diagnostic modality prior to its being widely used.

11C-PIB-PET for the early diagnosis of Alzheimer's disease dementia and other dementias in people with mild cognitive impairment (MCI).

- Although the good sensitivity achieved in some included studies is promising for the value of 11C-PIB-PET, given the heterogeneity in the conduct and interpretation of the test and the lack of defined thresholds for determination of test positivity, we cannot recommend its routine use in clinical practice.

- 11C-PIB-PET biomarker is a high cost investigation, therefore it is important to clearly demonstrate its accuracy and standardize the process of the 11C-PIB diagnostic modality prior to it being widely used.

Functional and molecular imaging for diagnosis of AD in 2017?

• Fascinating technique that permits
  – In vivo studies of pathophysiology of AD
  – Molecular imaging in AD

• For the majority of AD patients
  • Diagnosis is based on clinical and neuropsychological data
  • Differential diagnosis is based on biochemical and serological examinations, as well as neuroimaging
  • Therapy monitoring, symptomatic treatment and palliative care do not need “high-tech” examinations

• A long way for PET/CT until its use in clinical routine
A place for PET/CT in diagnosing AD in 2017?

In clinical studies aiming at
- Insights in AD pathophysiology
- Studying surrogate parameters in AD therapy studies
- But: No immediate benefit for individual patients

Highly selected cases of
- persistent or otherwise unexplained MCI
- AD as a possible but still uncertain diagnosis after expert evaluation
- atypically early-age-onset progressive dementia

Maybe we’re not so different...

THE GOOD
THE BAD AND THE UGLY
A SPAGHETTI WESTERN WITH MILD SAUCE AND NO MEATBALLS

STARRING CLINT EASTWOOD AS BLONDIE
STARRING CLINT EASTWOOD AS ANGEL EYES
STARRING CLINT EASTWOOD AS TUCO

DIRECTED BY SERGIO LEONE
The secret of being a bore is to tell everything.

Voltaire, Discours en Vers sur l'Homme