Target-Specific PET Probes for Neurodegenerative Disorders Related to Dementia

Authors
Ahmadul Kadir\textsuperscript{1} and Agneta Nordberg\textsuperscript{1,2}

\textsuperscript{1}Division of Alzheimer Neurobiology, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet, Karolinska University Hospital Huddinge, Stockholm, Sweden; and \textsuperscript{2}Department of Geriatric Medicine, Karolinska University Hospital Huddinge, Stockholm, Sweden

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Target Audience
This article contains information of value to neurologists, geriatricians, psychiatrists, and nuclear medicine physicians.

Objectives
On successful completion of this activity, participants should be able to describe:
1. Different PET tracers for measuring functional activity, neurotransmitter systems, and pathologic markers in the brain of patients with dementia.
2. How to use different PET tracers to study the typical pattern of changes in different types of dementia.
3. How to discriminate between the different dementia disorders using PET in clinical practice.

Questions
1. Which of the following neurodegenerative diseases produce dementia?
A. Alzheimer disease.
B. Parkinson disease.
C. Frontotemporal lobar degeneration.
D. All of the above

2. PET imaging technique is used to measure the functional and pathologic processes in the living human brain.
A. True.
B. False.

3. Which tracers are used to measure cerebral blood flow by PET?
A. $^{11}$C-butanol.
B. $^{15}$O-H$_2$O.
C. Both A and B.
D. Neither A nor B.

4. In which of the following brain regions is glucose metabolism as measured by $^{18}$F-FDG PET not affected in AD?
A. Cerebellum.
B. Visual cortex.
C. Both A and B.
D. Neither A nor B.

5. Which brain regions are affected in DLB as assessed by $^{18}$F-FDG PET?
A. Temporal, parietal, occipital, and cerebellar.
B. Temporal, frontal, occipital, and cerebellar.
C. Temporal, frontal, and parietal.
D. Temporal and parietal.

6. Which tracers are used to measure acetylcholinesterase activity in the brain by PET?
A. $^{11}$C-$N$-methyl-4-piperidyl benzilate.
B. $^{11}$C-methyl-4-piperidinyl-$N$-butyrate.
C. Both A and B.
D. Neither A nor B.

7. $^{18}$F-altanserin measures the 5HT2A receptor.
   A. True
   B. False.

8. Which parts of the brain show reduction of $^{11}$C-β-CFT uptake in AD patients?
   A. Putamen.
   B. Caudate nucleus.
   C. Both A and B.
   D. Neither A nor B.

9. For differential diagnosis between AD and DLB, $^{125}$I-FP-CIT, reflecting dopamine uptake sites, might be preferable to $^{18}$F-FDG for discrimination.
   A. True.
   B. False.

10. Which tracers are used to measure Aβ plaques in the brain?
    A. $^{18}$F-BAY-94-9172.
    B. $^{18}$F-FDDNP.
    C. $^{11}$C-PIB.
    D. All of the above.

11. Which form of Aβ plaque is measured by $^{11}$C-PIB?
    A. Fibrillar plaque.
    B. Oligomer.
    C. Diffuse plaque.
    D. All of the above.

12. Which statement is true?
    A. Compared with AD patients, patients with FTD have high PIB binding.
    B. Compared with AD patients, patients with FTD have low PIB binding.
13. Which brain areas show low PIB retention in AD patients?
A. Frontal cortex.
B. Occipital cortex.
C. Both A and B.
D. Neither A nor B.

14. Which type of pathology marker is measured by $^{11}$C (R)-PK11195?
A. Activated astrocytes.
B. Activated microglia.
C. Neurofibrillary tangles.
D. Nicotinic receptors.

15. Decreased uptake of 6-$^{18}$F-fluoro-L-dopa in striatum is observed in…
A. AD.
B. PD.
C. FTD.
D. All of the above.