# IAEA/ESNM Webinar Series on basic NM

## Introduction to Nuclear Medicine in Neurology: bases for clinical use

**Self-assessment questions**

**Q1: Brain perfusion SPECT images provide information on the following aspects <u>except</u>:**
1. Regional cerebral function
2. Regional cerebral blood flow
3. Neuronal activity
4. Regional glucose metabolism

Answer: 4

**Q2: Which of the following radio ligands does not provide information about the presynaptic nigrostriatal dopaminergic system?**
1. $[^{123}I]\beta$-CIT
2. $[^{123}I]$IBZM
3. 18F-dopa
4. $[^{123}I]$FP-CIT

Answer: 2

**Q3: Brain SPECT perfusion or PET metabolism abnormalities in patients suffering from dementia with Lewy bodies particularly occur in:**
1. Frontal lobes
2. Thalamus
3. Temporal lobes
4. Temporoparietal lobes
5. Occipital lobes

Answer: 5

**Q4: Assessment of the presynaptic dopamine transporter with SPECT is helpful for the differential diagnosis between:**
1. Essential tremor and parkinsonian syndromes
2. Parkinson's disease and multiple system atrophy
3. DOPA-responsive dystonia and essential tremor
4. Familial Parkinson's disease and vascular Parkinsonism

Answer: 1

**Q5: Which of the following statements concerning PET studies of the brain is <u>correct</u>?**

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1. Ictal FDG PET is the method of choice to localise epileptogenic foci in patients with intractable epileptic seizures
2. Flumazenil PET is less accurate than FDG PET in localising foci in focal epilepsy
3. Fluorodopa PET is used to image dopamine D2 receptors
4. FDG PET is helpful in the differential diagnosis of dementia
5. **FDG PET sensitively detects astrocytomas I and II**

Answer: 4

**Q6: Which of the following statements is <u>correct</u>?**
1. [$^{123}$I]FP-CIT binds with high-affinity to dopamine D2 receptors
2. [$^{11}$C]raclopride is not a selective radiotracer for dopamine D2 receptors, but binds to all dopamine receptors
3. In PD, the DAT binding is commonly lower in the putamen than caudate nucleus
4. Vascular lesions cannot induce parkinsonian signs

Answer: 3

**Q7: A presynaptic dopaminergic deficit as assessed by DAT SPECT or Fluorodopa PET is characteristically found in:**
1. Psychogenic parkinsonian syndrome
2. Essential tremor
3. Alzheimer's disease
4. Drug-induced Parkinsonism
5. Parkinson's disease

Answer: 5

**Q8: Postsynaptic dopamine D2 receptor binding assessed with PET or SPECT ligands is relatively <u>preserved</u> in:**
1. Wilson's disease
2. Huntington's disease
3. Multiple system atrophy
4. Parkinson's disease
5. Progressive supranuclear palsy

Answer: 4

**Q9: Which of the following statements is <u>wrong</u>?**
1. During treatment with typical neuroleptics, schizophrenic patients present with reduced dopamine D2 receptor binding
2. In Parkinson's disease, D2 receptor binding is often asymmetric due to receptor upregulation (particularly in the striatum which exhibits the more pronounced presynaptic nigrostriatal deficit)
3. On the postsynaptic level differential diagnosis between Parkinson's disease and atypical parkinsonian syndromes (e.g., multiple system atrophy, progressive supranuclear palsy) is impossible

4. Treatment with dopaminergic drugs, e.g., dopamine agonists, may compromise dopamine D2 receptor binding
5. Cocaine abuse as well as pharmacological treatment with methylphenidate may compromise presynaptic dopamine transporter binding

Answer: 3

**Q10: Which of the following statements is <u>incorrect</u>?**
1. The pattern of perfusion and metabolic abnormalities in frontotemporal dementia cannot be distinguished from the respective pattern in Alzheimer's disease
2. In the assessment of dementias, readings based on pixel-wise comparisons are superior to visual assessment especially for non-expert readers.
3. Lewy body dementia is often associated with occipital hypoperfusion/hypometabolism
4. Hypometabolism/hypoperfusion in the medial temporal lobe, posterior cingulate and precuneus is indicative for early stage Alzheimer's disease
5. In the subcortical ischemic vascular dementia the hypometabolism might involve basal ganglia, thalami and frontal cortex

Answer: 1

**Q11: Which of the following statements regarding mild cognitive impairment (MCI) is correct?**
1. MCI ultimately always progresses to manifest Alzheimer's disease
2. MCI is not associated with changes in cortical perfusion or metabolism
3. Episodes of visual hallucinations combined with occipital hypoperfusion/hypometabolism are a characteristic finding in MCI
4. Specific changes in perfusion and metabolism as assessed by SPECT and PET have shown to reliably predict the conversion of MCI into Alzheimer's disease
5. MCI patients with normal PET and SPECT results respond best to treatment with acetylcholinesterase inhibitors

Answer: 4

**Q13: Which of the following SPECT and PET ligands is not used in the diagnosis of brain tumours?**
1. [$^{99m}$Tc]sestamibi and [$^{201}$Tl]
2. [$^{18}$F]FDG
3. [$^{11}$C]methionine / [$^{18}$F]fluoromethytyrosine / [$^{123}$I]alpha-methyltyrosine
4. [$^{18}$F]fluorodopa
5. [$^{11}$C]raclopride

Answer: 5

**Q14: PET and SPECT examinations in patients with brain tumors are <u>not</u> valuable for:**
1. Tumor grading and assessment of dedifferentiation in tumor recurrence
2. Differential diagnosis between tumor recurrence and radionecrosis
3. Estimation of tumor margins (combined with coregistered MRI scans)

4. More precise localization of biopsy sites (e.g. stereotactic biopsies)
5. Differentiation: between primary brain tumors and metastases

Answer: 5

**Q15: Which of the following statements regarding imaging brain tumors with amino acid tracer is <u>correct</u>?**
1. Amino acid tracers are clearly superior to FDG with respect to tumor grading
2. Amino acid tracers show lower tumor/background ratios than FDG
3. Amino acid tracers are superior to FDG in delineation of tumor boundaries
4. Amino acid tracer studies require modeling
5. Due to slow tracer kinetics acquisition cannot be started earlier than 60 min p.i.

Answer: 3