Continuing Medical Education Article

Modern Nuclear Imaging for Paragangliomas: Beyond SPECT

*JNM*, February 2012, Volume 53, Number 2

**Authors**

David Taïeb*1, Hartmut Neumann*2, Domenico Rubello3, Adil Al-Nahhas4, Benjamin Guillet1, and Elif Hindié5

1Department of Nuclear Medicine, La Timone University Hospital, Aix-Marseille University, Marseille, France; 2Preventive Medicine Unit, Department of Medicine, University Medical Center, Albert-Ludwigs-University, Freiburg, Germany; 3Department of Nuclear Medicine, PET/CT Centre, Radiology, Medical Physics, “Santa Maria della Misericordia” Hospital, Rovigo, Italy; 4Department of Nuclear Medicine, Hammersmith Hospital, London, United Kingdom; and 5Department of Nuclear Medicine, Haut-Lévêque Hospital, University of Bordeaux-2, Bordeaux, France

*Contributed equally to this work.

**Disclosure**

In accordance with ACCME Revised Standards for Commercial Support and SNM Conflict-of-Interest Policy, the authors have indicated no relevant relationships that could be perceived as a real or apparent conflict of interest. Disclosure of a relationship is not intended to suggest or to condone bias but is made to provide participants with information that might be of potential importance to their evaluation of the activity.

**Target Audience**

This article contains information of value to nuclear medicine physicians, endocrinologists, internists, surgeons, and medical geneticists.

**Objectives**

On successful completion of this activity, participants should be able to describe…

1. The best nuclear imaging procedures to detect pheochromocytomas/paragangliomas according to the clinical situation (e.g., sporadic vs. hereditary; primary vs. metastatic; sympathetic vs. parasympathetic).

2. The differences in the phenotypic information obtained by various PET tracers.

**Questions**
1. What is true about adrenal paragangliomas (pheochromocytomas)?
   A. They are common neuroendocrine tumors.
   B. They are hereditary in up to 25% of cases.
   C. They are characterized by nuclear imaging only.
   D. They are always benign.

2. What statement is true about the sensitivity of $^{123}$I-MIBG scintigraphy?
   A. It is lower for adrenal than extraadrenal paraganglioma.
   B. It is lower for primary than metastatic paragangliomas.
   C. It is lower than $^{111}$In-DTPA-pentetreotide for head and neck paragangliomas.
   D. It is lower than $^{131}$I-MIBG in general.

3. Which of the following is associated with paragangliomas with mutations in the succinate dehydrogenase SDHB gene?
   A. A low risk of metastatic disease.
   B. High avidity for $^{18}$F-FDG.
   C. A high rate of head and neck paragangliomas.
   D. 100% sensitivity on $^{18}$F-FDOPA imaging.

4. Which of the following features characterizes pheochromocytoma?
   A. High $^{18}$F-FDG uptake.
   B. Solid homogeneous appearance
   C. Inferior vena cava involvement.
   D. Absence of calcifications.

5. What is true of $^{18}$F-FDOPA?
   A. May NOT detect metastases from medullary thyroid carcinoma in MEN2.
   B. Is more sensitive than MIBG in the staging of paragangliomas.
   C. Is taken up through a mechanism similar to that of MIBG.
   D. Has low sensitivity in head and neck paragangliomas.

6. What is the MOST prevalent somatostatin receptor expressed by paraganglioma?
   A. SST1.
B. SST2.
C. SST3 and 4.
D. SST5.

7. Which radiopharmaceutical does NOT accumulate in normal adrenal glands?
A. MIBG
B. $^{18}$F-FDOPA
C. $^{18}$F-DOTATATE
D. $^{18}$F-DOTATOC

8. For apparently sporadic pheochromocytoma, what radiopharmaceutical is MOST recommended?
A. $^{123}$I-MIBG
B. $^{131}$I-MIBG
C. $^{18}$F-FDOPA
D. $^{18}$F-DOTATATE

9. What is an indication for $^{68}$Ga-DOTA-SSTR?
A. First-line radionuclide imaging for detection of pheochromocytoma.
B. Evaluation of the cell receptor status prior to peptide radionuclide therapy.
C. Staging an apparently sporadic pheochromocytoma.
D. Differentiating adrenal adenoma from adrenal carcinoma.

10. $^{18}$F-fluorodopamine ($^{18}$F-FDA) is taken up by which mechanism?
A. Amine precursor uptake and decarboxylation system.
B. Norepinephrine transporter.
C. Somatostatin receptor expression.
D. Glucose transporter.