Continuing Medical Education Article

Imaging of Inflammation by PET, Conventional Scintigraphy, and Other Imaging Techniques

JNM, December 2010, Volume 51, Number 12

Authors
Martin Gotthardt¹,², Chantal P. Bleeker-Rovers²,³, Otto C. Boerman¹,², and Wim J.G. Oyen¹,²

¹Department of Nuclear Medicine, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands; ²Nijmegen Institute for Infection, Inflammation and Immunity, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands; and ³Department of Internal Medicine, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

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 residents and physicians in the fields of nuclear medicine, radiology, internal medicine, infectious diseases, and rheumatology.

Objectives
On successful completion of this activity, participants should be able to describe:
1. The role of nuclear medicine imaging techniques in the detection of inflammatory diseases.
2. The mechanisms of uptake of radiotracers into inflamed tissue.
3. The respective advantages and disadvantages of different imaging modalities in the detection of inflammatory diseases, including PET, SPECT, ultrasonography, MRI, and CT.

Questions
1. Which imaging modality is the least sensitive for the detection of bone erosion of the small joints of the hand in rheumatoid arthritis?
   A. CT.
   B. MRI.
   C. Multipinhole $^{99m}$Tc-hydroxymethylene diphosphonate SPECT.
   D. Planar radiography.

2. Which order of imaging procedures would be most suitable in patients with FUO?
   A. MRI, PET, bone SPECT.
   B. CT, bone SPECT, PET.
   C. Ultrasonography, MRI.
   D. Ultrasonography, PET.

3. Which imaging modality has the lowest reported sensitivity in the detection of sites of inflammation in IBD?
   A. MRI.
   B. WBC scintigraphy.
   C. CT.
   D. $^{18}$F-FDG PET.

4. Increased uptake in shoulders and hips in combination with hot spots in the processi spinosi on an $^{18}$F-FDG PET scan may indicate:
   A. Rheumatoid arthritis.
   B. GCA.
   C. PMR.
   D. Sarcoidosis.
5. Which examination in patients with IBD is associated with an increased risk of complication if severe inflammation is present?
A. $^{18}$F-FDG PET.
B. Hydro MRI.
C. Ileocolonoscopy.
D. WBC scanning.

6. Which statement is not correct?
A. $^{18}$F-FDG PET uptake is correlated to formation of aneurisms in vasculitis and may therefore be a prognostic marker.
B. MRI and MRA are well suited for the diagnosis and follow-up of Takayasu arteritis because of the ability to detect formation of aneurisms.
C. Changes in superficial cranial arteries in vasculitis can be detected by MRI or MRA with high sensitivity.
D. Ultrasonography does not play a role in the detection of Takayasu arteritis because the thoracic artery cannot be adequately examined.

7. Increased uptake of $^{18}$F-FDG in the temporal artery can often be found on PET scans of patients with giant cell arteritis. This statement is:
A. True.
B. False.

8. In rheumatoid arthritis, PET is well suited for early detection of synovitis. This statement is:
A. True.
B. False.

9. In patients with sarcoidosis, $^{67}$Ga scintigraphy has a higher sensitivity than $^{18}$F-FDG PET. This statement is:
A. True.
B. False.

10. Which is the most sensitive and specific imaging technique in a patient with fever, chills, severe backache for 3 d, and blood cultures growing *Staphylococcus aureus*?
A. Bone scanning.
B. $^{18}$F-FDG PET.
C. Labeled leukocyte scintigraphy.
D. MRI.

11. Which imaging technique has the highest radiation exposure?
A. Bone scintigraphy.
B. $^{18}$F-FDG PET.
C. $^{67}$Ga scintigraphy.
D. Leukocyte scintigraphy.

12. What should be the next diagnostic step in a patient with FUO with stable weight, normal CRP and ESR, normal chest radiography findings, and normal abdominal ultrasonography findings, without guiding symptoms or signs?
A. $^{18}$F-FDG PET.
B. Leukocyte scintigraphy.
C. Wait and see.
D. Whole-body MRI.