Continuing Medical Education Article

Workflow and Scan Protocol Considerations for Integrated Whole-Body PET/MRI in Oncology

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Disclosure
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Target Audience
This article contains information of value to physicians and technicians working in radiology and nuclear medicine and clinicians interested in hybrid molecular imaging.

Objectives
On successful completion of this activity, participants should be able to describe…
1. Special requirements for planning whole-body PET/MRI examinations.
2. General aspects of whole-body PET/MRI protocols in oncology.
3. Possible artifacts in PET/MRI.

Questions
1. Which MRI sequence is used for attenuation correction?
   A. T1-weighted VIBE Dixon sequence.
   B. T2-weighted sequences.
   C. Dynamic contrast-enhanced sequences.
   D. T1-weighted turbo spin echo sequences.
2. Which MRI sequence is most helpful for detection of local recurrence of prostate cancer?
   A. T2-weighted sequences.
   B. Dynamic contrast-enhanced sequences.
   C. T1-weighted VIBE Dixon sequences.
   D. T1-weighted turbo spin echo.

3. What procedure is most sensitive for detection of liver metastases?
   A. $^{18}$F-FDG PET.
   B. T2-weighted MRI.
   C. Diffusion-weighted MRI.
   D. Contrast-enhanced CT.

4. For true whole-body coverage in PET/MRI, which of the following statements is correct?
   A. For time-efficient scanning, the torso/head can be covered with bed positions of 4-min duration whereas for the legs only 2 min are sufficient.
   B. During the coverage of the trunk, coronal T1- or T2-weighted sequences are never sufficient.
   C. For detection of brain metastases, the $^{18}$F-FDG PET information is sufficient and more sensitive than the MRI information.
   D. Despite comprehensive selection of diagnostic MRI sequences and the advantage of using an integrated system, true whole-body coverage in PET/MRI can be performed in 15–30 min.

5. What is the radiation dose of a PET/MR examination as compared to PET/CT?
   A. Higher than that of a matching PET/CT examination.
   B. Identical to that of a matching PET/CT examination.
   C. Lower than that of a matching PET/CT examination.
   D. There is no ionizing radiation associated with a PET/MR examination.

6. How are attenuation maps acquired in integrated PET/MRI scanners?
   A. With a radionuclide source rotating around the patient.
   B. With a dedicated MR sequence.
C. With a T2-weighted MRI sequence.
D. With a transmission CT image.

7. Which statement is correct about metallic implants and PET/MRI?
A. Patients with metallic implants cannot be scanned in a PET/MRI device.
B. PET/MR images are not affected by metal.
C. Metal produces streaking artifacts in the PET image.
D. Metal might decrease the PET signal.

8. Which answer is correct about combined PET/MRI systems?
A. Combined PET/MRI systems are not commercially available.
B. Integrated and sequential PET/MRI systems are available for clinical use.
C. All vendors offer sequential and integrated PET/MRI systems.
D. The clinical benefit of combined PET/MRI over PET/CT has been demonstrated.

9. Which is an advantage of an integrated compared with a sequential PET/MRI system?
A. Accommodation of patients with metallic implants.
B. Smaller footprint.
C. Shorter MRI examination time.
D. More accurate diagnostic capability.

10. Which statement is correct about the clinical impact of PET/MRI?
A. PET/MRI will completely replace PET/CT.
B. PET/MRI is not useful for clinical applications.
C. PET/MRI has a higher diagnostic accuracy than PET/CT.
D. The impact on patient management of PET/MRI is still unclear.