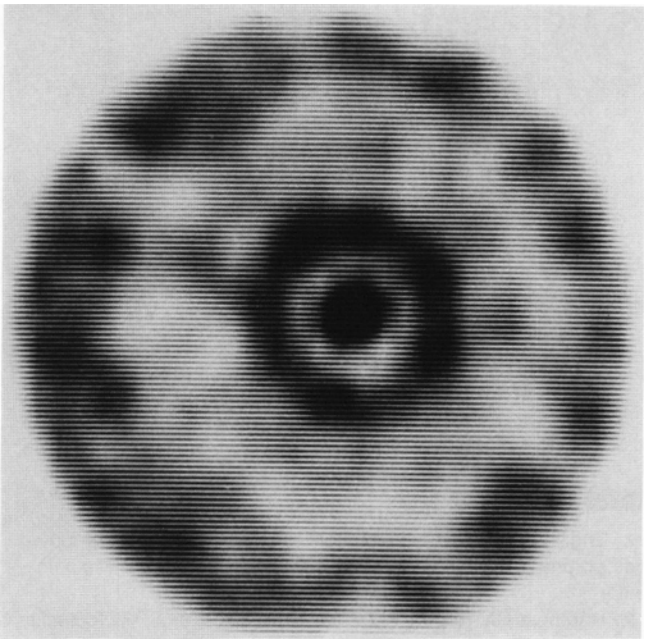
# SELF-ASSESSMENT QUIZ: SPECT

*The Continuing Education Committee presents this quiz for self-evaluation on single-photon emission computed tomography (SPECT). Answers can be found on page 158. References are listed at the end of the quiz to assist you in your review of this topic. Please select the best answer for each question below.*

1. *The most apparent advantage of SPECT is simply:*
   a. High spatial resolution
   b. Increased sensitivity
   c. Removal of overlying or underlying structural imposition
   d. Rapid multiple dynamic acquisitions Ref 1, pp 2–3

2. *Quality control standards used in planar imaging are unacceptable for SPECT, because:*
   a. Collected data are distorted by the analog to digital converter
   b. Tomographic reconstruction algorithms greatly amplify the effects of camera irregularities
   c. The high resolution of SPECT yields greater nonuniformities
   d. Collimators for SPECT systems generate substantial energy correction artifacts Ref 2, p 55

3. *In the image shown below, the ring's "bull's eye" pattern is a classic artifact resulting from:*



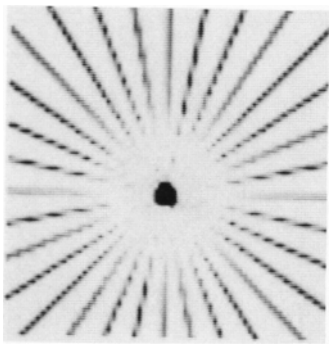
   a. Multi-formatter misalignment
   b. Improper center of rotation correction
   c. Detector saturation
   d. Uncorrected gamma camera nonuniformities Ref 2, p 55

4. *Center of rotation algorithms apply error corrections that:*
   a. Correct for detector nonuniformities
   b. Improve intrinsic FWHM and FWTM
   c. Correct for table/detector misalignment
   d. Determine a common reference point between detector and computer matrix Ref 3, p 79

5. *The maximum error that should be tolerated with a 64 × 64 matrix in a center of rotation procedure is:*
   a. ½ the FWHM
   b. ½ pixel
   c. 4 pixels
   d. ½ the radius of rotation Ref 3, p 80

6. *The total minimum number of counts required to obtain a ±1% statistical accuracy in a 64 × 64 uniformity correction matrix is:*
   a. 30 million
   b. 12 million
   c. 15 million
   d. 100 million Ref 2, p 56

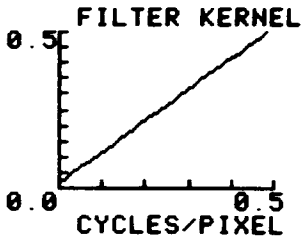
7. *The most common cause of a "streak" or "spoke" artifact, as demonstrated in the reconstructed point source below, is:*



   a. Improper center of rotation correction
   b. Table/detector misalignment
   c. Insufficient uniformity correction statistics
   d. Insufficient number of views in 360° collection Ref 4, p 24

8. *The single greatest deterrent to improved resolution for SPECT is:*
   a. Thin crystal
   b. Improper source to camera distance
   c. Insufficient collection time
   d. Insufficient uniformity statistics Ref 1, p 53

9. *Filtered back-projection sometimes employs a _____ filter (pictured below in frequency domain) in the initial reconstruction process.*

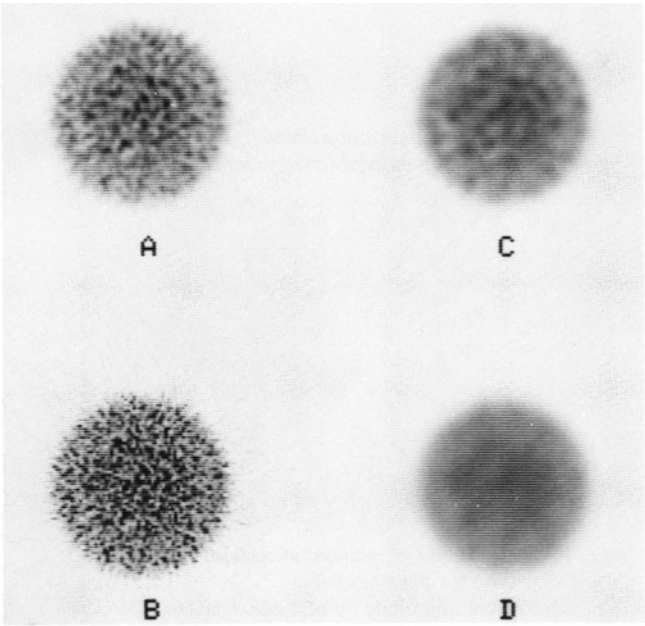



   a. Ramp
   b. 9 Point smooth
   c. Hanning
   d. Metz Ref 1, p 72

10. *Exclusive use of the Ramp filter with low statics will yield reconstructed images that are:*
    a. Over smoothed
    b. Too noisy
    c. Blurry
    d. Riddled with uniformity artifacts — Ref 1, p 74

11. *The higher frequency noise component of a reconstructed data set may be suppressed with a (an) ____ combined to the reconstruction filter.*
    a. Attenuation coefficient
    b. Center of rotation correction
    c. Ramp filter
    d. Window — Ref 1, pp 74–79

12. *Of the four reconstruction images shown below of a cylindrical phantom, the image demonstrating the highest frequency cutoff is:*



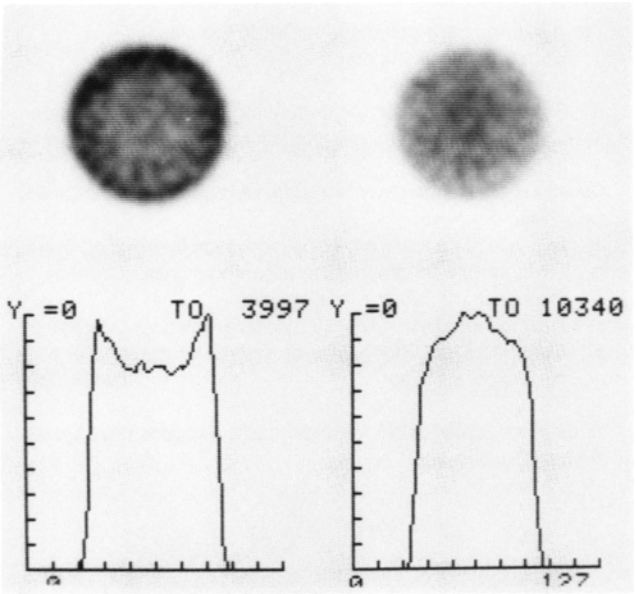

    a. Image A
    b. Image B
    c. Image C
    d. Image D — Ref 1, p 78

13. *Acquisition and reconstruction of 180⁰ data that might be employed in thallium SPECT prohibits the use of:*
    a. Attenuation correction
    b. Asymmetrical energy windows
    c. Center of rotation correction
    d. Butterworth windows — Ref 4, pp 28–29

14. *Reorientation of transaxial data into standard coronal and sagittal formats would* not *be applicable in which of the following SPECT studies:*
    a. Liver (sulfur colloid)
    b. Gallium (chest)
    c. Thallium (myocardium)
    d. Brain (glucoheptonate) — Ref 1, p 83

15. *Utilization of SPECT in pelvic bone studies is most often complicated by:*
    a. Excessive acquisition times
    b. Bladder filling
    c. Poor sensitivity
    d. Table misalignment — Ref 5, p 234

16. *A uniform filled, cylindrical source presents either transaxial slices with an inversed bow (left), or slices with an even distribution (right). This difference is due to:*




    a. Center of rotation
    b. Improper filter selection
    c. Insufficient counts
    d. Application of attenuation correction — Ref 1, p 21

17. *Ideally, the best SPECT acquisition might be done using the largest available matrix size and the largest available number of image projections encompassing a 360⁰ rotation. A serious drawback to these parameters is:*
    a. Increased uniformity statistics
    b. The need for large amounts of continuous disk space
    c. Increased processing time
    d. All of the above — Ref 1, pp 48–49

## References


1. English RJ, Brown SE. Single Photon Emission Computed Tomography: A Primer. New York: The Society of Nuclear Medicine, 1986.

2. Harkness BA, Rogers WL, Clinthorne NH, et al. SPECT: Quality control procedures and artifact identification. *J Nucl Med Technol* 1983;11:55–60.

3. Greer K, Jaszczak R, Harris C, et al. Quality control in SPECT. *J Nucl Med Technol* 1985;13:76–85.

4. Eisner RL. Principles of instrumentation in SPECT. *J Nucl Med Technol* 1985;13:23–31.

5. Collier BD, Dellis CJ, Peck DC, et al. Bone and liver SPECT. *J Nucl Med Technol* 1985;13:230–241.