

## Review questions

### Week 1 Nuclear medicine: Introduction

#### 1. For what purpose are radiopharmaceuticals administered?

Used to diagnose, treat and assess pathologies by using a gamma camera to detect gamma ray signals from the patient.

#### 2. What is a kit?

Vials containing pharmaceuticals which when combined with radioisotopes become radiopharmaceuticals.

#### 3. Which nuclear medicine imaging procedure is used to assess perfusion to the heart?

Myocardial perfusion

#### 4. What does the term 'hot' mean with respect to radioactivity?

A high concentration of radioactivity or 'radioactive'

#### 5. List the challenges associated with nuclear medicine as an imaging modality.

- Radiation safety – containing spills, minimising exposure to patient, staff and public, handling and transporting radioactivity
- Patient compliance – claustrophobic patients, inability to remain still, refusing to test because of radiation
- Cost
- Not widely available or known amongst clinicians
- Location of pharmaceutical suppliers

#### 6. Who developed the first gamma camera in 1957?

Hal Anger

#### 7. What is the name for the imaging unit that combines a nuclear medicine gamma camera with CT?

SPECT CT

#### 8. Name the different types of imaging devices used in nuclear medicine.

- Dedicated scanners – image specific organs
- Portable gamma cameras – used for emergency cases or unstable patients
- Intraoperative gamma cameras – operated by surgeons or NMT's during surgery
- SPECT – standalone gamma cameras – single photon emission CT
- PET/CT – Positron emission tomography
- SPECT/CT – SPECT with CT scanner
- PET/MRI – newest modality
- BMD – Bone mineral densitometry

## **9. List the different acquisition types that can be acquired on nuclear medicine gamma camera.**

- Dynamic imaging: series of continuous images acquired for set time period which commence immediately after administration of pharmaceutical– flow images (assess blood flow, gastric emptying rates and renal excretion)
- Static imaging: dedicated images of area over a set period of time.
- Whole body imaging: scan acquired of whole body; bed moves at continuous rate. Used when exact pathology of disease process unknown.
- Gated cardiac acquisitions: Form dynamic imaging. Gating process breaks each cardiac cycle into series of bits to allow for analysis of left ventricle wall motion and calculating ejection fractions and observing ECG related changes.
- SPECT: detectors rotate 360 degrees around the area of interest and a series of 2D images are acquired from various angles or projections. 2D data set put through a computer algorithm to create 3D data set (coronal, sagittal and axial slices)
- SPECT CT: combine SPECT with CT where SPECT performed first followed by CT which allows greater accuracy in anatomical localisation and improves specificity and sensitivity of the modality. CT contrast can also be used.

## **10. What does the term SPECT stand for? And provide a brief explanation of this image acquisition method.**

Single photon emission computed tomography. It is a functional modality that uses a gamma camera and the injection, inhalation or consumption of radiopharmaceuticals. The radiopharmaceuticals are chosen based on organ or function being assessed and emit gamma rays from inside the patient which are measured by the gamma camera. Based on the intensity of the signal, function of organs can be assessed. Provides 3D views of anatomy as gamma detector rotate around patient and reconstructed into slices.

## **11. What are the benefits of performing SPECT/CT procedures?**

SPECT is a functional modality whereas CT is anatomical modality. Combining them produces precise information about how different parts of the body are working and more clearly identify problems. Allows for greater accuracy in anatomical localisation and improves specificity and sensitivity of the modality

## **12. True or false, all nuclear medicine procedures involve imaging?**

False

## **13. What are dynamic images?**

A series of continuous images acquired for a set time period – also called flow images. Used to assess blood flow, gastric emptying rates and renal excretion.

## **14. What is the newest modality to be utilised in nuclear medicine?**

PET/MRI

## **15. What does PET stand for?**

Positron emission tomography

**16. Following a diagnostic nuclear medicine procedure can a patient go onto to have additional medical imaging procedures? Why or why not?**

Yes as it does not affect the outcome of other examinations.

**17. Nuclear medicine is considered a \_\_\_\_\_ imaging modality.**

Functional

**18. How has nuclear medicine improved its ability to display anatomical detail?**

By combining it with anatomical modalities such as CT