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Commentary

# Principle and Diagnosis of Diseases using Single-Photon Emission Computed Tomography

**James Anderson***

*Department of Biophysics, The Ohio State University, Columbus, USA*

## DESCRIPTION

Single Photon Emission Computed Tomography (SPECT) scan is an imaging examination that demonstrates how blood flows to tissues and organs. Seizures, strokes, stress fractures, infections, and spinal tumours can all be diagnosed with SPECT. A radioactive tracer and Computed Tomography (CT) are combined in a nuclear imaging scan called SPECT. The tracer makes it possible to observe how blood moves through tissues and organs. To visualize the blood flow through the coronary arteries and the heart itself, SPECT imaging is frequently combined with the three-dimensional images of the heart created by Myocardial Perfusion Imaging (MPI).

### Basic principle of SPECT

Gamma cameras move around the patient and provide spatial data on the radionuclide's distribution within tissues. The efficiency and spatial resolution of the detectors are improved by using numerous gamma cameras. Following the collection of projection data from the cameras, three-dimensional images are typically created in axial slices. Attenuation adjustment and higher resolution anatomical localization are possible with Single Photon Emission Computed Tomography-Computed Tomography (SPECT-CT).

SPECT is frequently used to diagnose or monitor brain abnormalities, bone disorders and heart problems. Finding out which areas of the brain are being affected can be made easier with the help of a SPECT test, which produces a detailed 3D map of the blood flow activity in the brain.

Moyamoya disease, a condition in which the arteries in the brain become clogged or restricted, is one example of a vascular brain problem that can be detected by SPECT scanning and helped to be diagnosed or evaluated. By pinpointing the region of the brain where seizures are occurring, a SPECT scan can help to diagnose and treat seizure disorders like epilepsy.

Parkinson's disease is a degenerative neurological condition that affects movement, and in rare instances, doctor may advise a particular SPECT scan called a dopamine transporter scan to help confirm a diagnosis of Parkinson's disease. If the arteries that supply the heart muscle are restricted or blocked, the portions of the heart muscle served by these arteries can become damaged or even die. SPECT can demonstrate how entirely heart chambers empty after contractions, which can indicate diminished pumping efficiency.

SPECT scans are increasingly being used to diagnose hidden bone fractures as they typically show areas of bone healing or cancer progression. Additionally, SPECT scans can be used to diagnose cancer that has spread to the bones, follow its progression, and identify sites for bone biopsy.

### Applications of SPECT

Since SPECT has so many applications which make this form of imaging convenient for the medical profession.

- Cardiac SPECT scans can be used to examine the blood flow through the heart areas. Heart with poor blood flow will appear dark, while those with good flow will appear light.
- It is also significantly less expensive than Positron Emission Tomography (PET), despite providing a lower resolution image with a resolution of only 1 cm.
- A blockage in one or more of the coronary arteries may also be visible on the scans as a region with little or no tracer uptake.
- Because areas of bone healing typically light on the scans, SPECT scans can be used to discover hidden fractures in bone, such as shin splints and stress fractures.
- SPECT scans are used to identify the regions of the brain that are affected by conditions including epilepsy, dementia and head injuries.

**Correspondence to**: James Anderson, Department of Biophysics, The Ohio State University, Columbus, USA, E-mail: anderson42@edu.com

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