MEDICAL POLICY – 6.01.502
Single Photon Emission Computed Tomography (SPECT) for Non-cardiac Indications

Effective Date: Oct. 1, 2019
Last Revised: Sept. 5, 2019
Replaces: N/A

RELATED MEDICAL POLICIES:
6.01.54 Dopamine Transporter Imaging with Single-photon Emission Computed Tomography

Select a hyperlink below to be directed to that section.

POLICY CRITERIA | DOCUMENTATION REQUIREMENTS | CODING
RELATED INFORMATION | EVIDENCE REVIEW | REFERENCES | HISTORY

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Introduction

SPECT is a type of nuclear imaging test that uses a radioactive dye, also called a tracer, and a special camera to create a three-dimensional (3-D) image of the organs in the body. The images created by tracking the dye in the blood stream can show areas of increased/decreased blood flow and progressive changes in the body. SPECT is proposed to help diagnose or monitor certain tumors, bone disorders, and heart problems.

SPECT imaging of the brain for mental health disorders is used as a research tool in clinical trials. Research has not shown the utility of SPECT brain imaging for differential diagnosis or for assessing or predicting an individual’s risk of getting a mental health disorder.

Dopamine transporter imaging with single-photon emission computed tomography (DAT-SPECT) is addressed in another policy (see Related Medical Policies).

Note: The Introduction section is for your general knowledge and is not to be taken as policy coverage criteria. The rest of the policy uses specific words and concepts familiar to medical professionals. It is intended for providers. A provider can be a person, such as a doctor, nurse, psychologist, or dentist. A provider also can be a place where medical care is given, like a hospital, clinic, or lab. This policy informs them about when a service may be covered.
**Policy Coverage Criteria**

### Procedure | Medical Necessity
--- | ---
**SPECT scan** | **SPECT scans may be considered medically necessary for any of the following non-cardiac conditions or symptoms:**
- Brain tumor recurrence versus radiation necrosis
- Liver hemangioma versus tumor identification
- Localization of abscess, suspected or known localized infection vs. inflammation
- Assessment of osteomyelitis (bone vs. soft tissue infection)
- Lymphoma evaluation (tumor vs. necrosis)
- Neuroendocrine tumors (carcinoid, pheochromocytoma, thyroid carcinoma, adrenal gland tumors) [OctreoScan™ or MIBG]
- Parathyroid disease
- Renal function and renal scarring evaluation (Dimercaptosuccinic acid [DMSA] scan)
- Seizure foci localization for patients with intractable epilepsy (in place of positron emission tomography [PET])
- Vertebral abnormalities evaluation (such as spondylosis, spondylolisthesis, or stress fractures not visible on x-ray)

**SPECT scan** | **SPECT scans are considered not medically necessary for any of the following conditions or symptoms:**
- Cerebrovascular accident (also called CVA, stroke, or brain attack)
- Subarachnoid hemorrhage
- Transient ischemic attack (TIA)

### Procedure | Investigational
--- | ---
**SPECT scan** | **SPECT scans are considered investigational for all other non-cardiac conditions, including any of the following:**
- Attention deficit hyperactivity disorder (ADHD)
- Autism spectrum disorders
- Colorectal cancer (eg, with CEA-Scan, IMMU-4)
- Head trauma – evaluation of brain morphology
### Procedure

<table>
<thead>
<tr>
<th>Investigational</th>
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<tbody>
<tr>
<td>• Mental health disorders (diagnosis, prediction, response to medication)</td>
<td></td>
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<tr>
<td>• Movement disorder evaluation</td>
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<td>• Prostate cancer (eg, with ProstaScint®)</td>
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<tr>
<td>• Unclassified dementia evaluation (eg, Alzheimer disease)</td>
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### Documentation Requirements

The medical records submitted for review should document that medical necessity criteria are met. Include history and physical supporting that patient has ANY of the following symptoms or conditions:

- Brain tumors, to differentiate between recurrent tumor versus radiation changes, infection
- Liver hemangioma, to further define the mass
- Localization of abscess, infection, or inflammation
- Lymphoma evaluation
- Neuroendocrine tumors
- Parathyroid disease
- Renal function and renal scarring evaluation (dimercaptosuccinic acid [DMSA] scan)
- Patients with intractable epilepsy, when seizure focus cannot be localized
- Evaluation of vertebral abnormalities (such as spondylothesis, spondylolysis, spondylolisthesis, degenerative joint disease/arthritis of the facet joints, stress fractures)

### Coding

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>A9507</td>
<td>Indium in-111 capromab pendetide, diagnostic, per study dose, up to 10 millicuries</td>
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### Related Information
Definition of Terms

Abscess: A mass filled with pus (made up of dead white blood cells and dead tissue, bacteria, and blood serum) that collects anywhere in the body as a result of the body's response to an infection.

Adenoma: A noncancerous (benign) epithelial tumor that may affect various organs in the body. The adenoma often comes from or resembles glandular tissue, though some grow in nonglandular areas.

Autism spectrum disorders: Refers to a group of disorders defined as delays in the development of socialization and communication skills often accompanied by cognitive and language delays.

Carcinoid tumors: Carcinoid tumors are slow growing and usually start in the gastrointestinal tract (anywhere between the stomach and the rectum) or the lung. These tumors make and release (secrete) large amounts of hormones, including cortisol, histamine, insulin and serotonin. Carcinoid tumors are a type of neuroendocrine tumor.

Liver hemangioma: A noncancerous tumor (mass) that forms in or on the liver. It is made up of small blood vessels. Liver hemangiomas are more common in women than men.

Lymphoma: A cancer of the white blood cells (lymphocytes) of the body’s immune system. It develops in the lymph nodes and lymphatic system.

Movement disorders: A group of diseases that includes abnormally slow movement (bradykinesia), rigidity, tremor at rest, and postural instability.

Neuroendocrine tumors: A diverse group of tumors that form from cells of the hormone and nervous systems. They may be found in the intestine and also occur in the thyroid, lung and other parts of the body.

Transient ischemic attack (TIA): A temporary lack of adequate blood and oxygen (ischemia) to the brain. The neurological signs and symptoms are similar to a brain attack (stroke), but go away within a short period of time. This may also be referred to as a mini-stroke.
Background

SPECT is an imaging modality that provides information about the functional level of a particular body part. It requires the injection of a low-level radioactive isotope (chemical tracer) into the bloodstream. Images then reflect how the tracer is processed by the body. This is in contrast to structural information provided by CT, MRI or ultrasound. Scans are made with a device that detects radioactivity in the body. A SPECT tomograph generates detailed information as the radiotracers used with a SPECT attach to elements appropriate for obtaining specific information. An example of this is how antibodies attach to specific types of tumors. A radiotracer can be attached to an antibody that will then bind to a tumor, which is then identified and located by a SPECT scan.

SPECT provides information about the cellular or level of chemical activity within an organ or system, including structural information about that system. This process can show areas of increased activity, such as inflammation seen in an abscess. Patterns of distribution can then be correlated with particular diseases. The selection of a radiotracer and imaging protocol is specific to the disease process being investigated. SPECT cameras can image large areas of the body as the emitted radiation from the radiotracers travel through the body.

Information obtained by SPECT complements or confirms data obtained by other forms of testing and may provide additional information in some situations. For many conditions, SPECT has been found to be as useful as PET, even though PET images tend to be of higher quality than those of SPECT, SPECT tends to be more available. Both PET and SPECT can diagnose disease prior to the onset of clinical symptoms or structural manifestations of disease as they provide information regarding the functional level of a body system.

Abscess/Infection

Labeled white blood cells are infused prior to SPECT imaging of the suspected clinical site of infection. This infusion helps with localization of tissue inflammation.¹

Autism Spectrum Disorders

Autism spectrum disorders can be difficult to diagnose due to the variety and severity of the presentation of symptoms. The American Academy of Neurology Practice Guideline states the following: “There is no evidence to support a role for functional neuroimaging studies in the clinical diagnosis of autism at the present time.”²⁵
Surgical Repair

SPECT can be useful in distinguishing between tumor regrowth and radiation necrosis in patients with cerebral metastases.²

Cerebrovascular Disease (CVA, stroke, brain attack, TIA)

The use of SPECT has become outdated for the evaluation and management of cerebrovascular disease, including cerebrovascular accidents (CVA or stroke), subarachnoid hemorrhages, and transient ischemic attacks (TIA). Newer imaging techniques are more common such as computed tomography angiography (CTA) and magnetic resonance angiography (MRA).³-⁵

Epilepsy Seizure Foci

Ictal SPECT may be applicable for patients being considered for surgery to treat intractable epilepsy, when seizure focus cannot be localized by EEG, video-EEG, or MRI. Effective surgical treatment of patients with intractable epilepsy is dependent on accurate localization of the epileptic focus and precise delineation of the epileptogenic region. Ictal SPECT uses the physiologic increase in regional cerebral blood flow during seizures to localize the epileptogenic region. This testing aids in identifying the source or sources of the seizures as well as assess brain function. SPECT may offer a safe and accurate alternative to quantitative MRI or PET for the pre-surgical ictal detection of seizure focus. It should be performed in a hospital setting.⁶,⁷

Kidney (renal)

Using Technetium-99m labeled dimercaptosuccinic acid (DSMA) for diagnostic imaging may be useful to evaluate kidney function and identify scarring that may be the result of frequent infections.⁸,⁹ The National Institute for Health and Clinical Excellence 2007 guideline recommends DMSA scanning when the diagnosis cannot be confirmed by Doppler ultrasound.¹⁰ The American Urological Association 2010 Clinical Practice Guideline recommends DMSA scan when a renal ultrasound is abnormal in children with vesicoureteral reflux to detect the presence of any renal scaring.¹¹
**Liver Hemangioma versus Primary Hepatoma or Metastases**

Technetium-labeled red blood cells are infused prior to SPECT imaging of the liver. There is risk of hemorrhage in a percutaneous biopsy of liver hemangiomas, so non-invasive methods of testing are useful for differentiating between the blood pool of an hepatic hemangioma from other solid hepatic masses. Review articles and published studies support SPECT as an appropriate diagnostic tool to differentiate between hepatic lesions versus hemangiomas.¹²

**Lymphoma**

SPECT scans may be useful to distinguish tumor from radiation necrosis in the chest and abdomen. An initial study can be compared with a follow-up study after the completion of treatment. SPECT is not appropriate for initial staging of lymphoma.¹³

**Mental Health Disorders**

SPECT imaging of the brain for mental health disorders is used as a research tool in clinical trials. The National Institute of Mental Health (NIMH) made the following statement in their brochure titled “Neuroimaging and Mental Illness: A window into the brain”:

> No scientific studies to date have shown that a brain scan by itself can be used for diagnosing a mental illness or to learn about a person’s risk for disease. Brain scans alone cannot be used to diagnose a mental disorder, such as autism, anxiety, depression, schizophrenia, or bipolar disorder. Other types of tests are needed for a mental illness to be properly diagnosed.¹⁴,¹⁵

**Mild Cognitive Impairment (MCI) Conversion to Alzheimer’s Disease (AD)**

The utility of SPECT to predict conversion from mild cognitive impairment (MCI) to Alzheimer’s disease (AD) is limited.¹⁶,¹⁷ A technology assessment of SPECT for dementia and AD by the Institute for Clinical Effectiveness and Health Policy concluded: “SPECT has not clearly demonstrated its usefulness in assessing patients with dementia, and it has no precise indications for diagnosis, evaluation of prognosis or monitoring response to treatment.”¹⁸

Controlled studies of SPECT in AD show the sensitivity of this testing varies from 50 to 95%. The
American Academy of Neurology does not recommend SPECT for routine use in the differential diagnosis of dementia.\textsuperscript{19}

**Neuroendocrine Tumors**

SPECT for the diagnosis and staging of neuroendocrine tumors may be done using a monoclonal antibody (OctreoScan™) or I-131 meta-iodobenzyl-guanidine (MIBG) because carcinoids and other neuroendocrine tumors have somatostatin receptors and can be imaged with somatostatin analogs tagged with an appropriate radioisotope.\textsuperscript{20, 21}

**Parathyroid Disease**

Guidelines on parathyroid scintigraphy from the Society of Nuclear Medicine\textsuperscript{22} state that there is a developing consensus that SPECT and SPECT/CT are most useful for improving the precision of anatomic localization. The Parathyroid Task Group of the EANM\textsuperscript{21} state that the use of SPECT/CT has a major role for obtaining anatomical details on ectopic foci. However, its use as a routine procedure before target surgery is still investigational. Preliminary data suggest that SPECT/CT has lower sensitivity in the neck area compared to pinhole imaging.\textsuperscript{22-24}

**Prostate Cancer**

ProstaScint, a monoclonal antibody combined with radioactive indium-111, is used to detect prostate cancer. It is injected into the body and then a gamma camera is used to locate prostate cancer cells. There is little evidence demonstrating improvements in health outcomes following ProstaScint scans. One study showed 60% progression-free survival (PFS) of 60% for those study participants with a negative scan and 74% for those with a positive scan. The researchers of the study concluded that the individuals with positive scans did not have a statistically significant difference in PFS than those with a negative scan result.\textsuperscript{26} Pucar concluded that “ProstaScint has not added benefit over other imaging modalities in evaluating post-radical prostatectomy recurrence, due to its low sensitivity for detecting local recurrences and bone metastases.”\textsuperscript{27}

The American College of Radiology (ACR) states: “The reliability and usefulness of indium-111 radiolabeled capromab pendetide (a first-generation monoclonal antibody against prostate-specific membrane antigen [PSMA]) scan as a method to stage prostate cancer remains
unproven." They also note that the optimal use of the scan remains to be determined as the scans are difficult to interpret and are costly to perform.

**Spondylolysis and Stress Fractures**

SPECT scans may be useful in evaluating chronic back or neck pain that is atypical, that may be caused by spondylolysis or stress fractures that are undiagnosed by conventional imaging. Bone SPECT may provide diagnostic information in cases of low back pain that is not available with routine imaging. One study of 34 patients with chronic low back pain compared findings from radiography, computed tomography (CT) and bone scintigraphy with SPECT. The majority of lesions (89%) seen on SPECT corresponded to identifiable disease on CT. SPECT was also found to be more sensitive than planar bone scintigraphy in identifying patients with painful defects in the pars interarticularis compared to radiographic evidence of spondolysis and/or spondylolisthesis in 19 adult patients studied. Bencardino et al (2016) in the Expert Panel on Musculoskeletal Imaging. American College of Radiology Appropriateness Criteria states: "planar scintigraphy combined with SPECT is more accurate in diagnosing stress injuries than planar scintigraphy alone."

**Vertebral Abnormalities**

SPECT scans may be useful in evaluating chronic back or neck pain that is atypical, that may be caused by spondylolysis or stress fractures that are undiagnosed by conventional imaging studies.

**References**


### History

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<th>Date</th>
<th>Comments</th>
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<td>09/01/16</td>
<td>New policy, approved August 9, 2016. Add to Medicine section. SPECT may be considered medically necessary when criteria are met for select non-cardiac indications. SPECT is not medically necessary for cerebrovascular indications. SPECT is investigational when criteria are not met.</td>
</tr>
<tr>
<td>06/01/17</td>
<td>Annual review, approved May 23, 2017. Policy reorganized for clarity; no change in policy statements.</td>
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<tr>
<td>07/01/18</td>
<td>Annual Review, approved June 12, 2018. Policy updated with literature search through April 2018, References 10, 11,18, 19, 26-29 added. Added assessment of osteomyelitis to medical necessity criteria. Deleted degenerative joint disease/arthritis of the facet joints from the vertebral abnormalities medical necessity criteria.</td>
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U.S. Department of Health and Human Services
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Washington, D.C. 20201, 1-800-368-1019, 800-537-7697 (TDD)

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