

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

The Clinical Value of SPECT in Evaluating Coronary Artery Disease

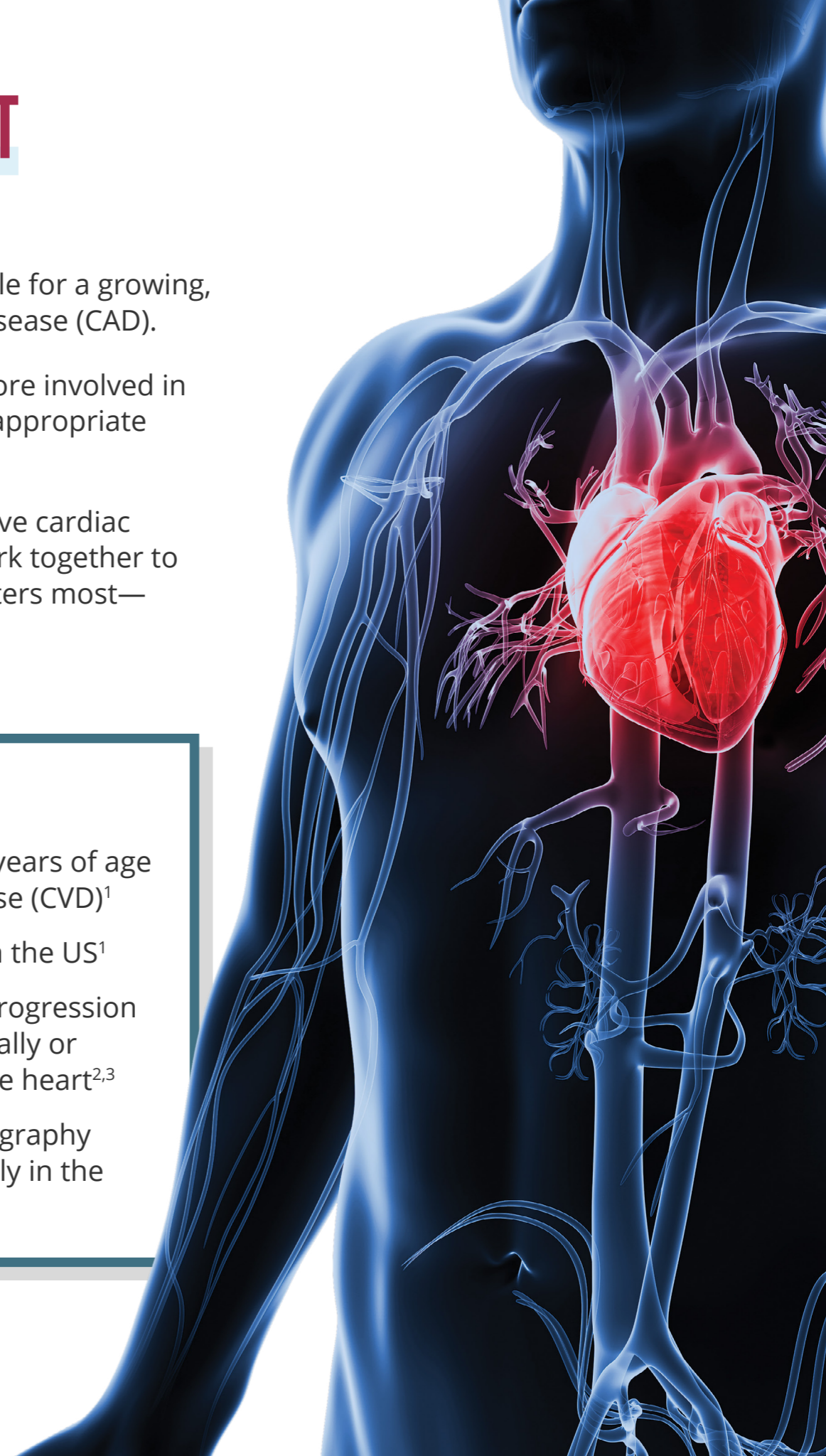
Frontline providers are increasingly responsible for a growing, aging population at risk for coronary artery disease (CAD).

Those who see at-risk patients first may be more involved in disease evaluation and care coordination for appropriate cardiac testing.

The more we understand about the noninvasive cardiac testing options available, the more we can work together to help improve the quality of care for what matters most—the patient.

Putting It Into PerSPECTive

- An estimated 126 million US adults ≥ 20 years of age have some form of cardiovascular disease (CVD)¹
- CAD is the leading cause of CVD death in the US¹
- Risk of CAD increases over time as the progression of atherosclerosis (plaque buildup) partially or totally blocks myocardial perfusion to the heart^{2,3}
- Single-photon emission computed tomography (SPECT) can detect perfusion defects early in the disease progression⁴



Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

Why SPECT?

For more than 40 years, noninvasive myocardial perfusion imaging (MPI) has been used to detect and manage CAD.⁵

SPECT is the most widely used nuclear imaging modality and plays an essential role in the risk assessment and evaluation of CAD.⁶

Whether you are a frontline provider^a or a cardiology specialist, the more you know about the most commonly used imaging procedure in nuclear cardiology, the better you'll understand which patients are appropriate candidates for the test.^{5,6}

inSPECTing the Name

You may have heard SPECT MPI referred to as one of the following terms:

- Radionuclide imaging (RNI)
- Nuclear stress test
- Noninvasive cardiac imaging
- Cardiac nuclear scan



^aFrontline providers are the first to see patients at risk for CAD and may include primary care physicians (PCPs), obstetricians/gynecologists (OB/GYNs), internists, hospitalists, nurse practitioners (NPs), physician assistants (PAs), or other referring or ordering providers.

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

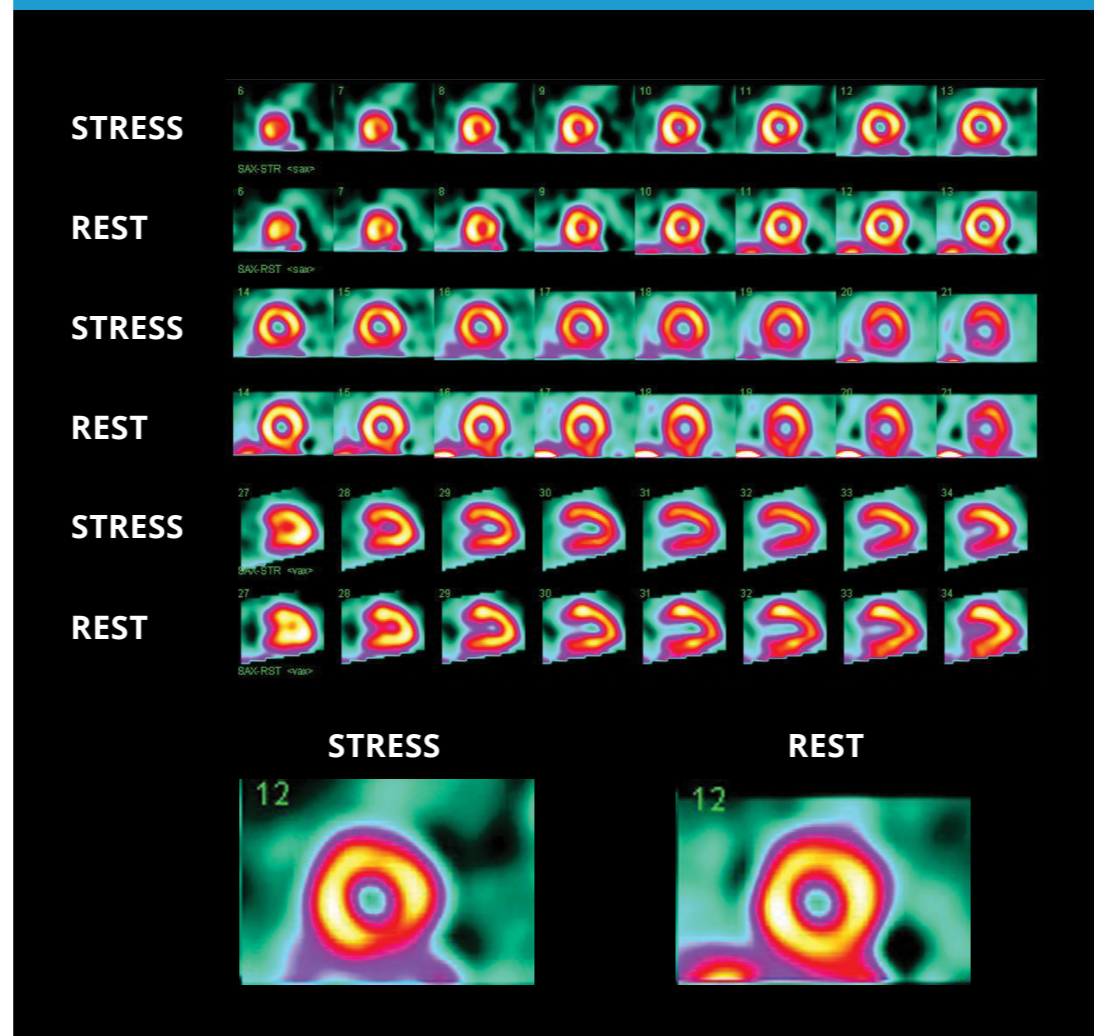
Resources

References

SPECT Imaging

SPECT scans are taken using a gamma camera, which captures images of photons emitted by radiotracers as they are taken up by viable myocytes proportional to the amount of blood flow to the heart. The radiotracers used in SPECT imaging are technetium-99m (Tc-99m) and thallium-201 (Tl-201). A series of images is taken to show different sections of the heart. Scans may be performed at stress and rest (Figure 1).^{5,7,8}

Figure 1. SPECT MPI Scans



The color indicates areas of perfusion where the radiotracer has entered the myocardium. Areas that appear lighter in color at rest and darker during stress indicate stress-induced ischemia, where blood flow is blocked.⁷

SPECT MPI is widely available and accessible for patients who have known or suspected heart disease.⁶

Images courtesy of Kim Allan Williams, MD.

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

Attributes of SPECT

This advanced diagnostic cardiac imaging procedure provides valuable risk assessment information that is incremental to electrocardiogram (ECG) data.^{4,5} SPECT MPI helps guide clinical management decisions regarding medical management or revascularization.

When a patient's pretest probability for CAD is intermediate to high based on risk assessment, SPECT MPI may be an appropriate modality.⁴



Why Use SPECT?

- It can be performed with exercise or pharmacologic stress⁴
- SPECT can help show perfusion defects in the early stages of the ischemic cascade⁴

Clinical benefits should be weighed against potential risks, which may include radiation exposure, injury, and interpretation error.⁹ The amount of radiation used in cardiac testing with SPECT varies by protocol.⁸ [Guideline-based appropriate use criteria](#) (AUC) may help define appropriate SPECT tests for certain clinical scenarios.⁹

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

What SPECT Reveals

What SPECT Reveals

SPECT Scan Analysis

Ischemic Cascade

SPECT Perfusion Defects

What SPECT Reveals

As a functional imaging test, SPECT can help detect perfusion defects and risk stratify patients.^{4,5}



What SPECT Can Do

- Uncover transient ischemic dilation, which may be associated with extensive ischemia and severe CAD^{4,5}
- Identify reversible perfusion defects indicating ischemia and irreversible perfusion defects indicating prior infarction⁵
- Provide estimates of left ventricular ejection fraction, adding incremental prognostic information⁵
- Help identify severe multivessel disease⁵
- Assess perfusion status after cardiac procedures⁵



Risk Stratification

The extent and severity of stress-induced perfusion abnormalities are directly correlated with the degree of risk for ischemic events, namely cardiovascular death and myocardial infarction (MI).⁴

- Normal test results are associated with a very low annual risk for cardiovascular death or MI (<1%)
- Moderate to severe abnormalities are associated with an annual risk for cardiovascular death or MI of $\geq 5\%$

Imaging results can help determine the need for further evaluation or procedures (eg, coronary angiogram, stent, bypass surgery, medical therapy).^{5,10} Gathering ECG information and data on exercise capacity is also important for diagnosis and prognosis.⁴

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

What SPECT Reveals

What SPECT Reveals

SPECT Scan Analysis

Ischemic Cascade

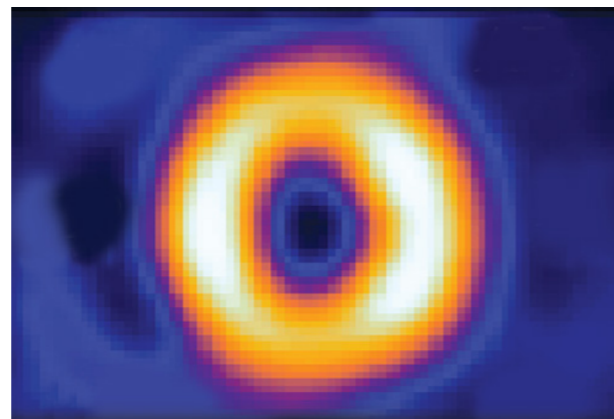
SPECT Perfusion Defects

SPECT Scan Analysis

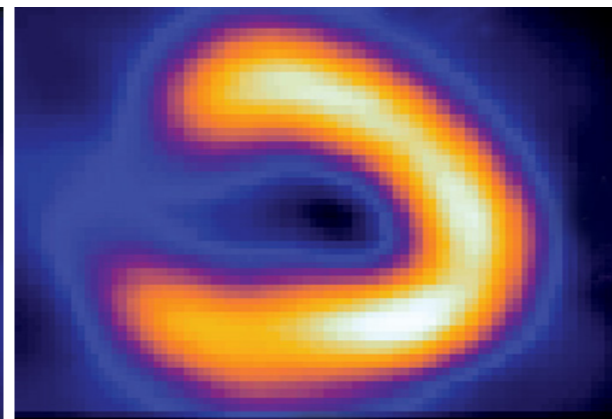
Figure 2 shows how sections of the myocardium are imaged in 3 axes to view perfusion defects at different angles.⁵

Figure 2. SPECT Scan Analysis

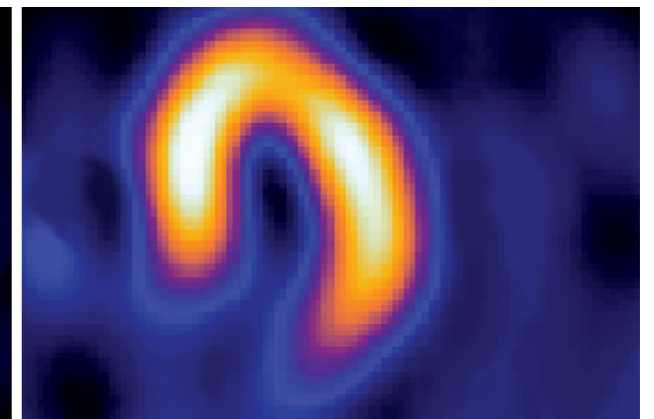
SHORT AXIS



VERTICAL LONG AXIS



HORIZONTAL LONG AXIS



Images courtesy of Kim Allan Williams, MD.

What SPECT Reveals

What SPECT Reveals

SPECT Scan Analysis

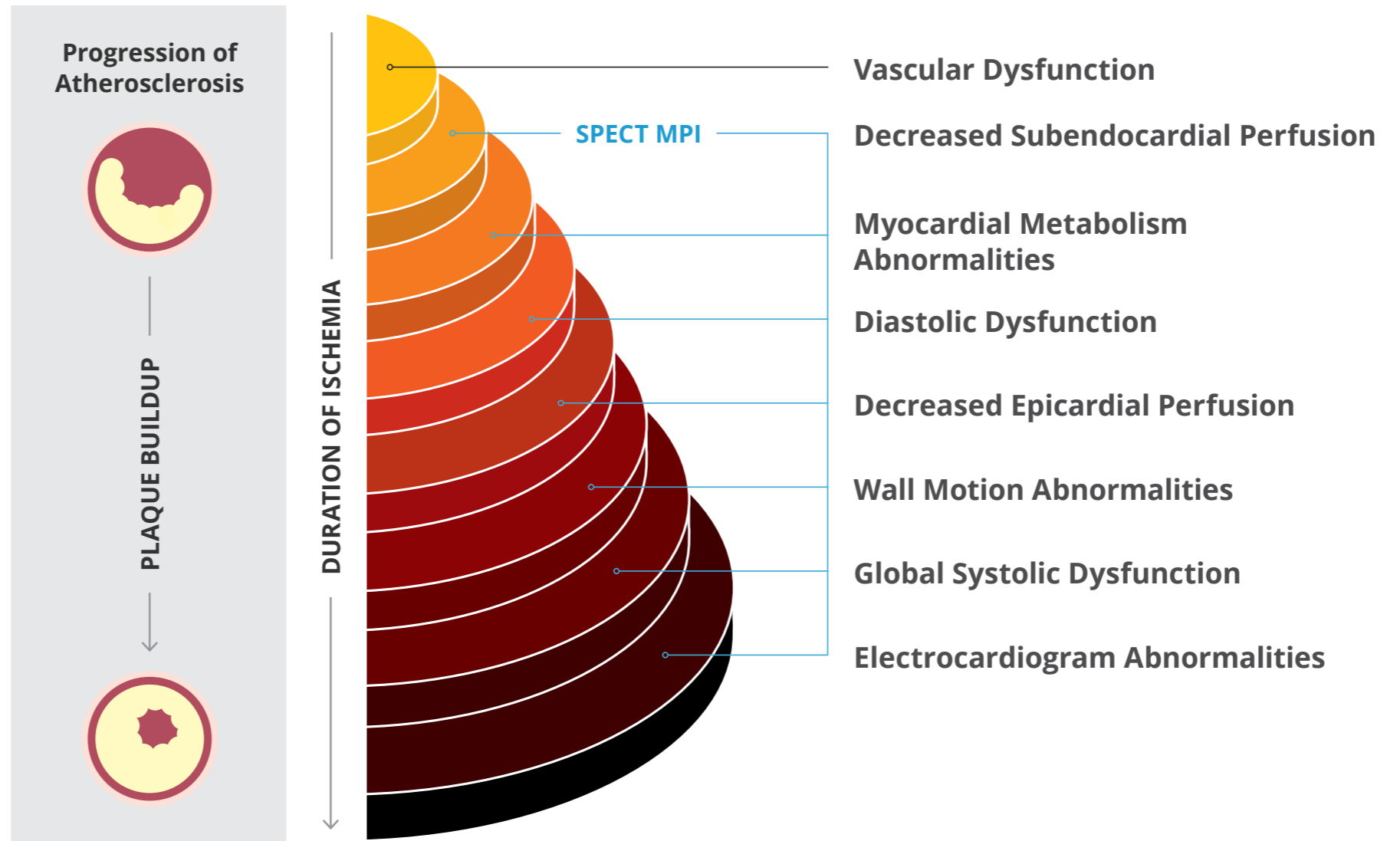
Ischemic Cascade

SPECT Perfusion Defects

Ischemic Cascade

Figure 3 shows where a SPECT scan can detect perfusion defects in the ischemic cascade.⁴

Figure 3. SPECT Scan Analysis



What SPECT Reveals

What SPECT Reveals

SPECT Scan Analysis

Ischemic Cascade

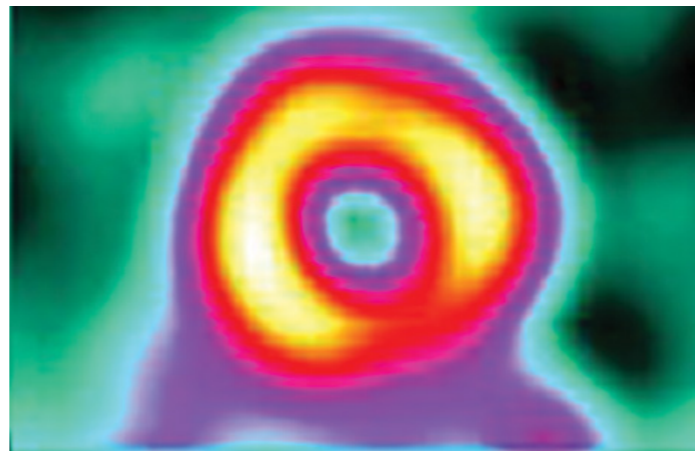
SPECT Perfusion Defects

SPECT Perfusion Defects

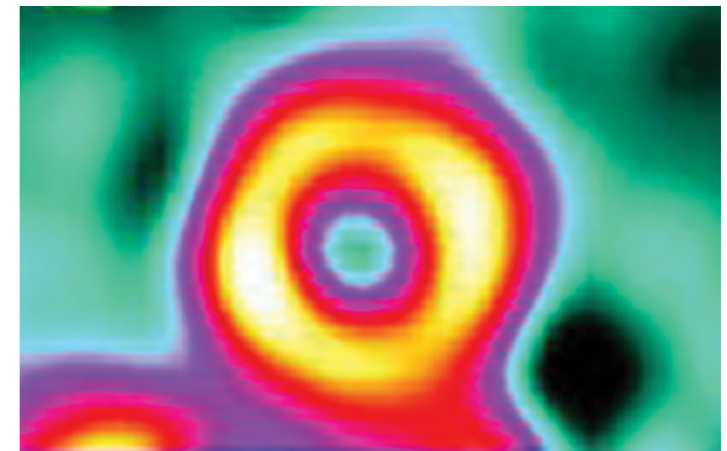
Figure 4 shows how perfusion defects may be reversible, with perfusion abnormalities at stress and normal perfusion at rest, or fixed, with perfusion defects visible on both stress and rest images, indicating greater risk for MI.⁵

Figure 4. SPECT Perfusion Defects

REVERSIBLE

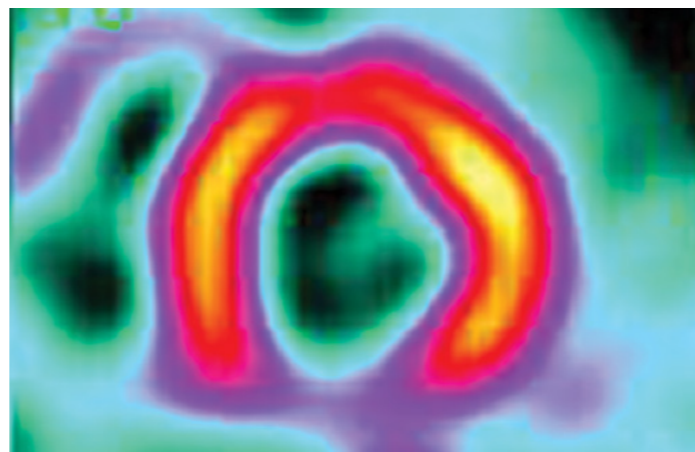


STRESS

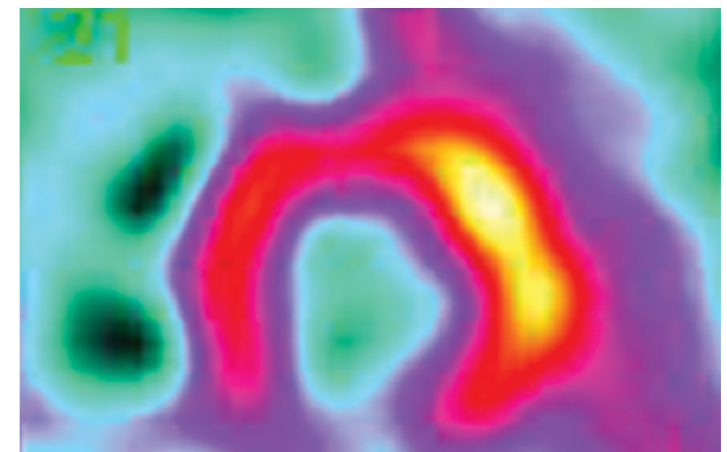


REST

FIXED



STRESS



REST

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

Advances in SPECT Scanners and Software

SPECT continues to be a valuable tool in the evaluation and risk assessment for CAD.^{5,6}

Recently, several enhancements have been made to SPECT camera hardware and software.⁵

- New cameras acquire images in a fraction of the time and improve image quality^{5,6}
- Rapid protocols reduce the amount of radiotracer needed, cutting radiation exposure by half⁵
- Novel reconstruction algorithms lead to better spatial resolution and improved accuracy⁵
- New techniques and multiposition imaging help minimize motion artifacts and improve patient comfort and tolerability⁵
- New cameras allow for simultaneous imaging and quantification of myocardial blood flow, which is used to detect microvascular disease⁵

Recent advances greatly expand the clinical applications for SPECT.⁵



Appropriate Patients for SPECT

Appropriate Patients for SPECT

Determining Who Is Appropriate for a SPECT Test

Appropriate Patients for SPECT

SPECT is a noninvasive imaging test that can help evaluate patients at risk for CAD. **But how do you know whether a SPECT test is right for your patient?**



The [ACCF Multimodality AUC^a](#) provide recommendations for performing the right test on the right patient at the right time.

The ultimate objective is to improve patient care and health outcomes in a cost-effective manner.⁹

^aBy clicking on this link, you will connect to a website neither owned nor controlled by Astellas. Astellas is not responsible for the content or services on this site.

ACCF = American College of Cardiology Foundation.

Appropriate Patients for SPECT

Appropriate Patients for SPECT

Determining Who Is Appropriate for a SPECT Test

Determining Who Is Appropriate for a SPECT Test

< Page 1 of 2 >

According to the ACCF Multimodality AUC, SPECT can be considered an appropriate test for the following indications.⁹



Patients with symptoms and

- An uninterpretable ECG,
- An intermediate to high risk for CAD, or
- An inability to exercise adequately



Patients with or without symptoms and

- Other cardiovascular conditions (such as newly diagnosed heart failure or syncope and intermediate to high CAD risk), or
- In postrevascularization for evaluation of ischemic equivalent symptoms or where additional revascularization is feasible



Patients with poor or unknown functional capacity and

- Prior to kidney or liver transplant, or
- Prior to vascular surgery with ≥ 1 clinical risk factors



Patients with new or worsening symptoms and

- Normal or abnormal exercise ECG results,
- Nonobstructive CAD on angiography or normal prior stress imaging study results,
- Obstructive CAD on coronary computed tomography angiography (CCTA) or invasive coronary angiography, or
- Abnormal calcium score (Agatston score >100)

Appropriate Patients for SPECT

Appropriate Patients for SPECT

Determining Who Is Appropriate for a SPECT Test

Determining Who Is Appropriate for a SPECT Test

< Page 2 of 2 >

According to the ACCF Multimodality AUC, SPECT can be considered an appropriate test for the following indications.⁹



Patients with abnormal prior results (≤90 days) and

- Abnormal rest ECG, or
- Abnormal prior exercise ECG test, or
- Obstructive CAD on prior CCTA or prior invasive coronary angiography, or
- Abnormal prior CCT calcium (Agatston Score >100)



Patients with uncertain prior results (≤90 days) and

- Prior exercise ECG test, or
- Prior CCTA, or
- Prior angiography showing coronary stenosis or anatomic abnormality of unclear significance

Appropriate SPECT testing has important implications for clinical decision-making. Perfusion data provide prognostic information about risk for a cardiac event, which may affect patient management choices.⁵

Preparing Patients for SPECT Imaging

Once SPECT has been deemed appropriate, it is important to prepare patients for the test by helping them understand what is expected (Figure 5).

Figure 5. What Patients Can Expect During a SPECT Test



Stress Test

Patient ECG, heart rate, and blood pressure are monitored during stress.⁷

While exercise is the preferred stress method, patients who are unable to achieve adequate exercise should be given a pharmacologic stress agent. Pharmacologic stress simulates exercise effects by increasing blood flow to the heart.^{4,7}



Radiotracer Injection

A small amount of radioactive tracer is injected into the patient's arm.⁷ The radiotracer is distributed throughout the myocardial tissue proportional to blood flow.⁵



Radionuclide Imaging

A gamma camera captures images of myocardial perfusion after stress and at rest for comparison, if needed.^{5,7}

To help your patients prepare for a stress test, download educational resources from the [Resources](#) section.

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

Resources About Cardiac Testing

Resources About Cardiac Testing

Patient Resources

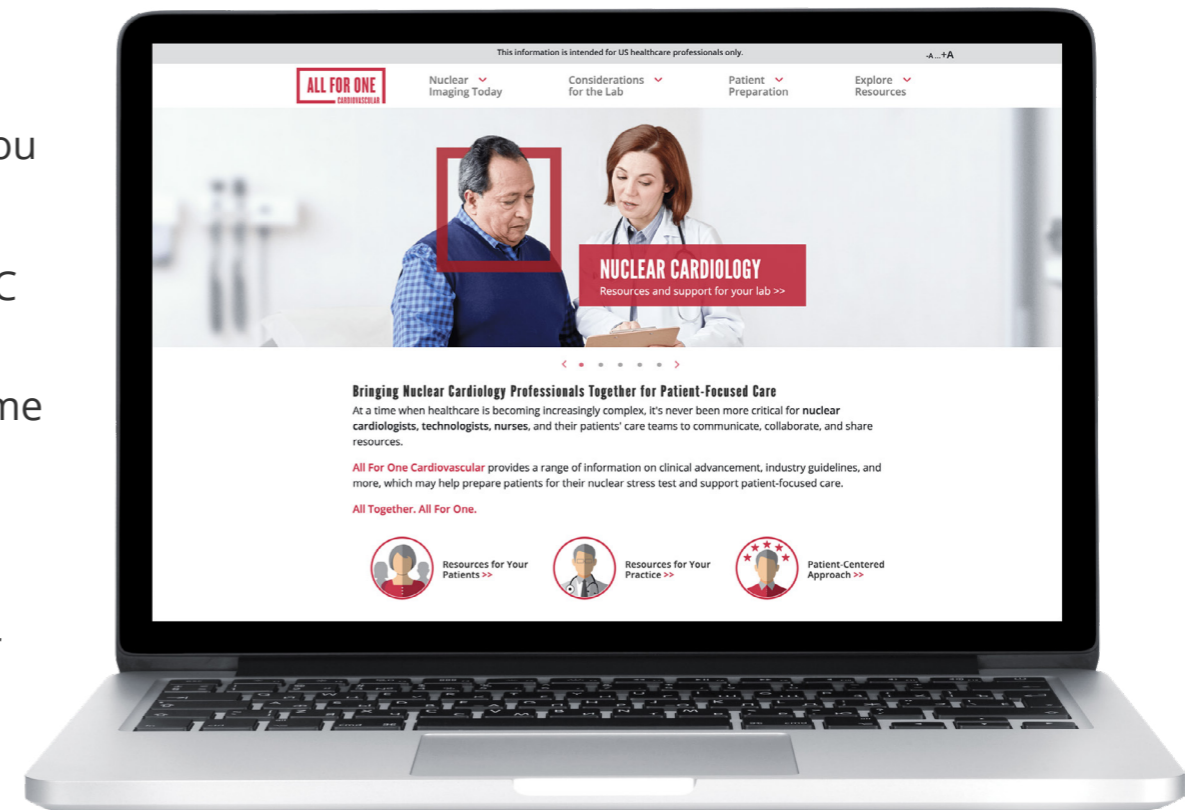
Practice Resources

Resources About Cardiac Testing

For more than 25 years, Astellas has offered practical resources to help providers make decisions focused on patient-centered care. The educational materials are designed to help increase understanding of cardiac testing and encourage communication between providers—all to help each patient get the right cardiac test at the right time.

For the latest information about cardiovascular care, go to AllForOneCardiovascular.com. There you can:

- Read about risk assessment and AUC
- Learn about potential nuclear lab challenges and ways to help overcome them
- Download and review hypothetical patient scenarios
- Download educational resources for your patients and practice



This image may not reflect the most current version of the website.

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

Resources About Cardiac Testing

Resources About Cardiac Testing


Patient Resources

Practice Resources

Patient Resources

Download these educational resources to help your patients prepare for a stress test, which can help avoid delays and improve the patient experience.

YOUR HEART IMAGING TEST: What You Should Know





We'll Be Testing Your Heart

You will be taking a heart imaging test, also known as a cardiac nuclear stress test—it's a very common test for coronary artery disease (CAD). Many people take this test every year. It helps doctors see if there's a problem with your heart without doing surgery.

*The technical name of this procedure is myocardial perfusion imaging (MPI).

The heart muscle has an important job. Like other muscles in your body, it needs oxygen and nutrients. The coronary (heart) arteries bring oxygen and nutrients to your heart so it can do its job of pumping blood to your whole body.

		<ul style="list-style-type: none"> • People with CAD may have 1 or more heart arteries that have become narrowed or blocked over time by fatty deposits called "plaques" • This can lead to your heart muscle getting less blood
---	---	--

Less blood flow to your heart can cause:

- Chest pain (called angina)
- Shortness of breath
- Possible heart attack

An injured part of the heart muscle may be permanently damaged if the coronary arteries stay blocked for too long. If there's a problem, it's very important to know about it as soon as possible.

[Patient Heart Imaging Test Guide](#)

WHAT YOU NEED TO KNOW ABOUT YOUR Heart Imaging Test






We'll be testing your heart

You will be undergoing a **cardiac nuclear stress test**—it's a very common test for coronary artery disease (CAD). It can help doctors see if there's a problem with the blood flow to your heart without doing any surgery.

*The technical name of this test is myocardial perfusion imaging (MPI).

What is this test exactly?

This test creates a picture of the blood flow through your heart muscle. A liquid called a tracer, which holds a small amount of radiation, is injected into your vein. The tracer makes its way through your veins and into your heart. Then a special camera creates computer-generated pictures of how the tracer flows into your heart.

				
---	---	---	---	---

Using this camera, your doctors will be able to see which areas of your heart are not getting enough blood. This tells them which coronary arteries may be clogged.

The clogged arteries may be identified by looking at 2 images of your heart side by side: one taken while you are at rest, and one taken after you have been exercising.

If you are not able to exercise, your doctor may prescribe a stress medicine in its place. This medicine will be injected in the same place as the tracer.

The images above show what the scans may look like.







Your doctors will explain to you what your heart images mean.

[Getting Ready Patient Handout](#)

GETTING READY FOR YOUR Heart Imaging Test

Soon you'll be taking a very common type of test called a heart imaging test, also known as a **cardiac stress test**. During your heart imaging test, the doctor will take pictures of your heart to check for coronary artery disease (CAD).

Here is a checklist to help you get ready **before** the day of your test:

- Ask your doctor if you should avoid certain foods or drinks before your test. 
- Ask your doctor if you should stop taking any of your usual medicines. 
- Do not eat, drink, or take anything with methylxanthines, ie, caffeine and theophylline, for at least 12 hours before the test. Certain ingredients in foods and medications may interfere with the test. **See the tables on the next page for a list of some things you should avoid.** 
- Wear comfortable clothing and shoes. 
- Tell your doctor if you have a history of wheezing, asthma, or lung disease that keeps coming back. 
- Tell your doctor if you've ever had a seizure. 

[Patient Prep Test Checklist](#)

These images may not reflect the most current versions of the educational resources.

Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

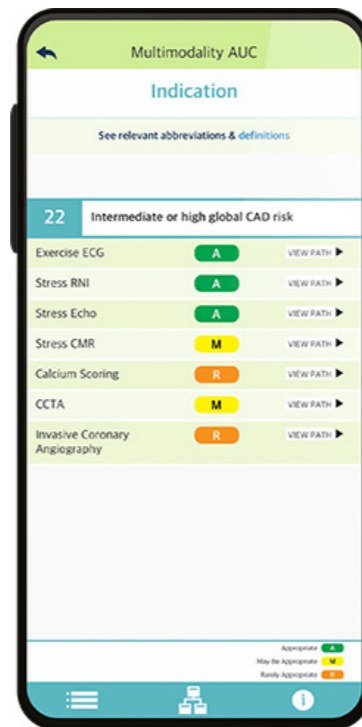
Resources About Cardiac Testing

Resources About Cardiac Testing

Patient Resources

Practice Resources

Practice Resources



Download the Multimodality AUC App. Based on the ACCF/AHA Multimodality AUC, this app allows providers to review the appropriateness of 7 cardiac testing modalities for the detection and risk assessment of stable ischemic heart disease.

AHA = American Heart Association.

The Multimodality AUC App is not intended to diagnose, treat, or prevent any disease or condition. It is also not a qualified Clinical Decision Support Mechanism (CDSM). Thus, the Multimodality AUC App must not be used to try and comply with the Centers for Medicare & Medicaid Services (CMS) AUC program requirements. The Multimodality AUC App is for informational purposes only.



Home

Why SPECT?

SPECT Imaging

Attributes of SPECT

What SPECT Reveals

Advances in SPECT

Appropriate Patients

Preparing Patients

Resources

References

References

1. Tsao CW, Aday AW, Almarzooq ZI, et al. Heart disease and stroke statistics-2022 update: a report from the American Heart Association. *Circulation* (Epub) 02-22-2022.
2. National Heart, Lung, and Blood Institute. What is coronary heart disease? (03-24-2022). <https://www.nhlbi.nih.gov/health/coronary-heart-disease>. Accessed 05-12-2022.
3. American Heart Association. Atherosclerosis (11-06-2020). <https://www.heart.org/en/health-topics/cholesterol/about-cholesterol/atherosclerosis>. Accessed 01-26-2022.
4. Fihn SD, Gardin JM, Abrams J, et al. 2012 ACCF/AHA/ACP/AATS/PCNA/SCAI/STS guideline for the diagnosis and management of patients with stable ischemic heart disease. *J Am Coll Cardiol* 2012;60(24):e44-164. Erratum in: *J Am Coll Cardiol* 2014;63(15):1588-90.
5. Dorbala S, Di Carli MF. Nuclear cardiology. In: Libby P, Bonow RO, Mann DL, Tomaselli GF, Bhatt DL, Solomon SD, eds. *Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine*. 12th ed. Philadelphia, PA: Elsevier Inc, 2022.
6. Abbott BG, Case JA, Dorbala S, et al. Contemporary cardiac SPECT imaging—innovations and best practices: an information statement from the American Society of Nuclear Cardiology. *J Nucl Cardiol* 2018;25(5):1847-60.
7. American Heart Association. Single photon emission computed tomography (SPECT) (07-31-2015). <https://www.heart.org/en/health-topics/heart-attack/diagnosing-a-heart-attack/single-photon-emission-computed-tomography-spect#.WXdxYl6QyS4>. Accessed 10/13/2022.
8. Henzlova MJ, Duvall WL, Einstein AJ, Travin MI, Verberne HJ. ASNC imaging guidelines for SPECT nuclear cardiology procedures: stress, protocols, and tracers. *J Nucl Cardiol* 2016;23(3):606-39. Erratum in: *J Nucl Cardiol* 2016;23(3):640-2.
9. Wolk MJ, Bailey SR, Doherty JU, et al. ACCF/AHA/ASE/ASNC/HFSA/HRS/SCAI/SCCT/SCMR/STS 2013 multimodality appropriate use criteria for the detection and risk assessment of stable ischemic heart disease. *J Am Coll Cardiol* 2014;63(4):380-406.
10. American Heart Association. Myocardial perfusion imaging (MPI) test (09-19-2016). <https://www.heart.org/en/health-topics/heart-attack/diagnosing-a-heart-attack/myocardial-perfusion-imaging-mpi-test>. Accessed 08-26-2022.



ASTELLAS IS PROUD
TO SUPPORT

THE PATIENT
ALL FOR ONE

The Apple logo is a registered trademark of Apple Inc. App Store® is a service mark of Apple Inc. Google Play is a trademark of Google LLC. Use of this trademark is subject to Google Permissions. Astellas® and the flying star logo are registered trademarks of Astellas Pharma Inc. All other trademarks or registered trademarks are the property of their respective owners. ©2022 Astellas Pharma US, Inc. All rights reserved. 014-0654-PM 12/22