Isfahan Cardiovascular Research Institute

THE NAMES OF
GOD

WHO Collaborating Center

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Paraclinic tests in AMI

Myocardial imaging's

Nuclear Imaging:

- Radionuclide angiography, perfusion imaging, infarct-avid scintigraphy, and PET have been used to evaluate patients with MI.

- Nuclear cardiac-imaging techniques may be useful for detecting MI; assessing infarct size, collateral flow, and jeopardized myocardium; determining the effects of the infarct on ventricular function; and establishing the prognosis of patients with MI.

- However, the necessity of moving a critically ill patient from the CCU to the nuclear medicine department limits practical application of this study unless a portable gamma camera is available.

- For the diagnosis of MI, cardiac radionuclide imaging should be restricted to special, limited situations in which the triad of the patient's clinical history, ECG findings, and serum marker measurements is unavailable or unreliable.

Nuclear Imaging:

- Radionuclides, such as thallium, sestamibi, and tetrofosmin, are used along with mechanical (treadmill or bicycle) or pharmacologic (dobutamine or adenosine) stress testing. Images are obtained at rest and during stress and are compared to look for inducible ischemia (decreased counts with stress).

- When thallium is used, images must be obtained within a few minutes of infusion. Images obtained at rest sometimes do not show adequate redistribution, and reinjection and imaging performed at 24 hours reveals viability that was missed during immediate imaging.

Thallium myocardial scan

- Indications for stress thallium
  - Prognostic stratification after acute MI and unstable angina
  - Identification of extent and severity of ischemia
  - Determination of myocardial viability
  - Identifying lesions causing ischemia if not otherwise known by ecg

Imaging of Myocardial Infarction

In patients with previous myocardial infarction (MI), blood flow to the infarcted region is diminished, often severely, and few viable myocytes are present within the scarred territory.

Thus severely reduced uptake of a radionuclide perfusion tracer in a rest study is a good marker of presence, location, and extent of MI (Fig. 16.20).

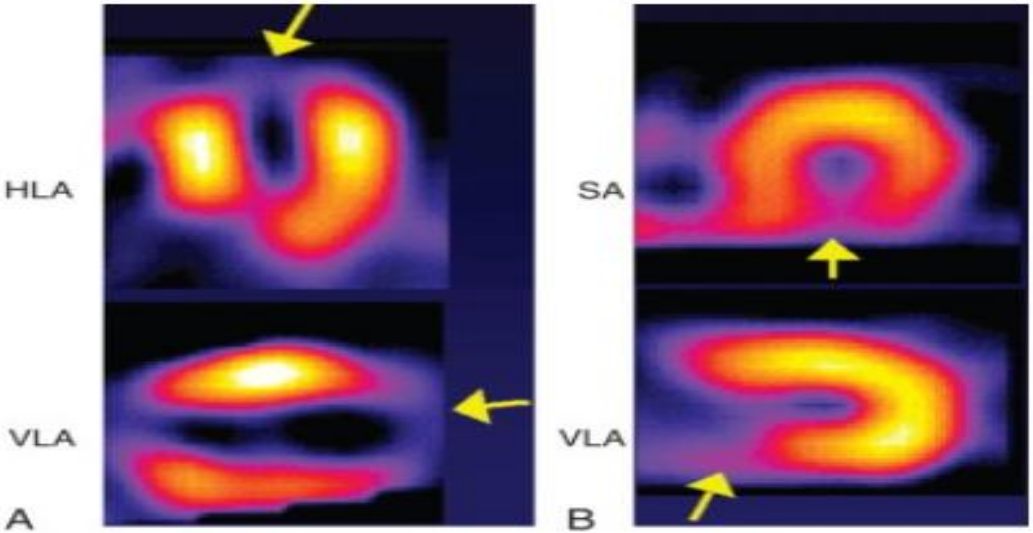
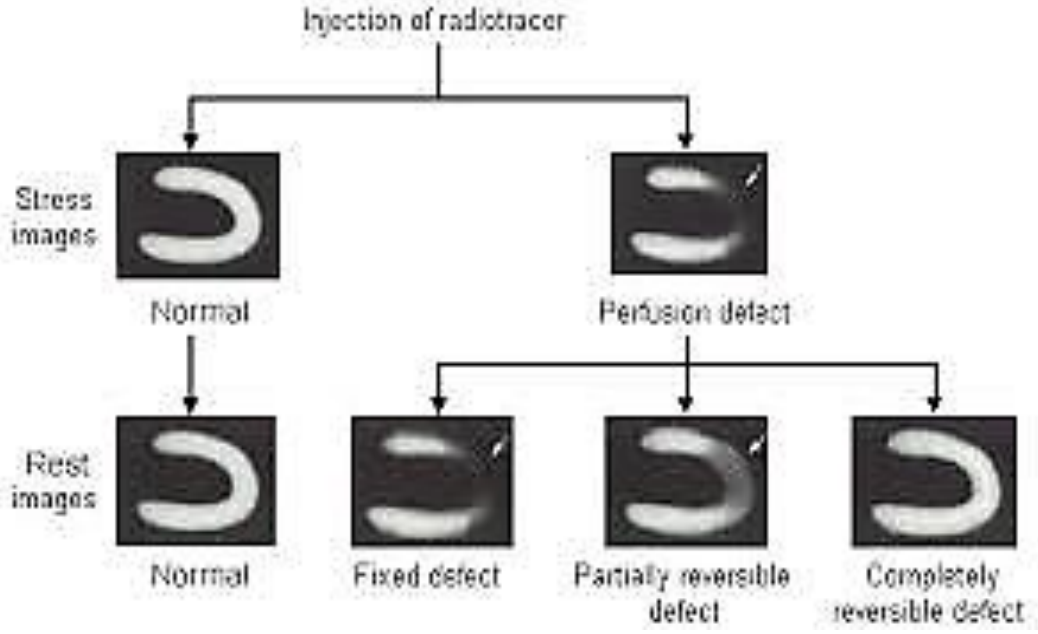
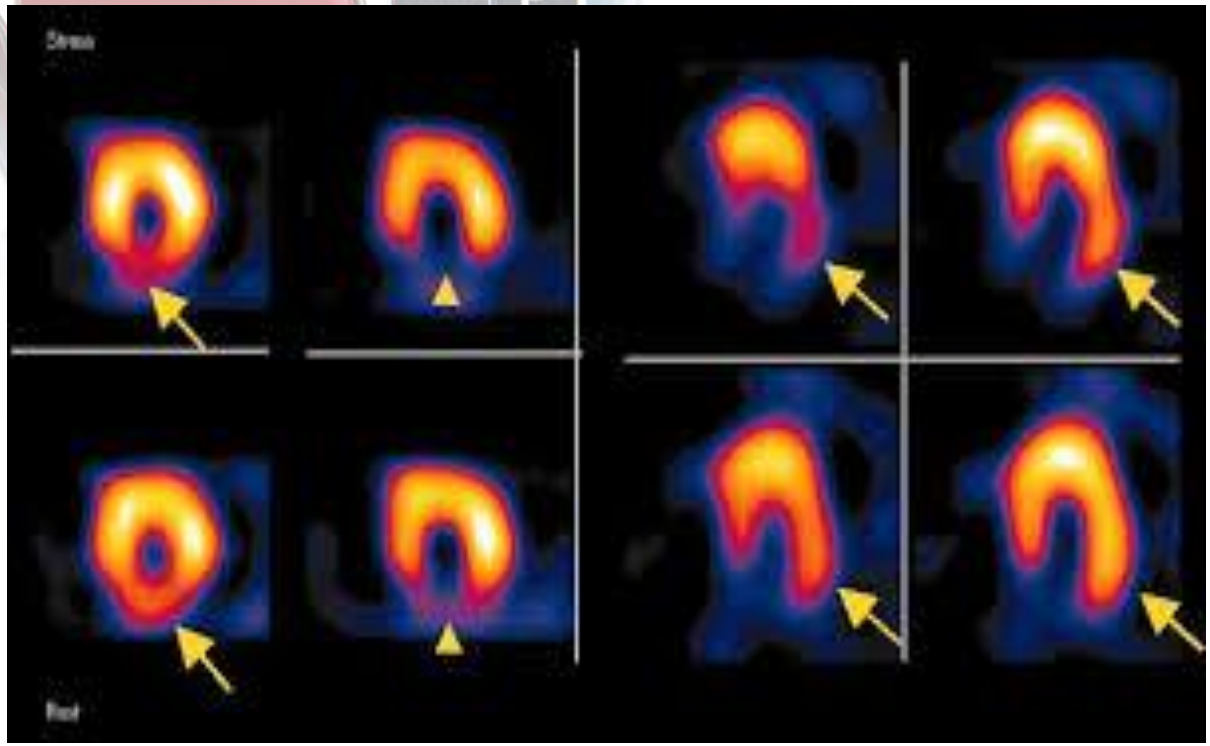


FIGURE 16.20

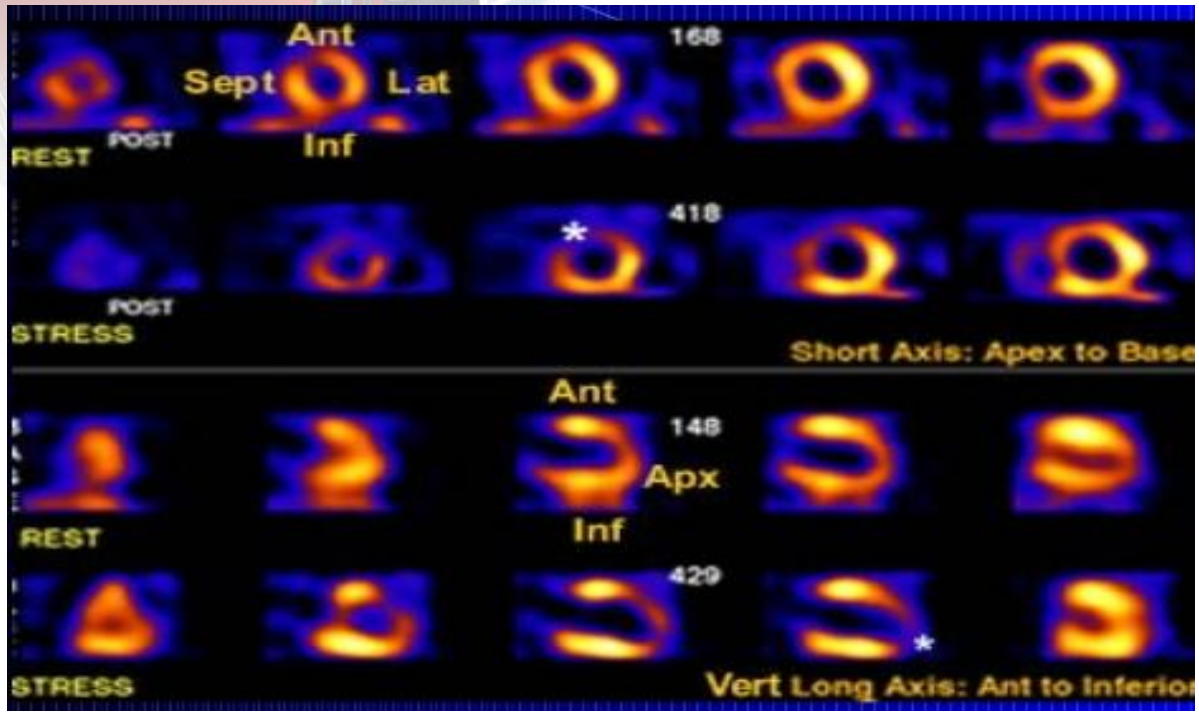
When is a thallium ETT needed?

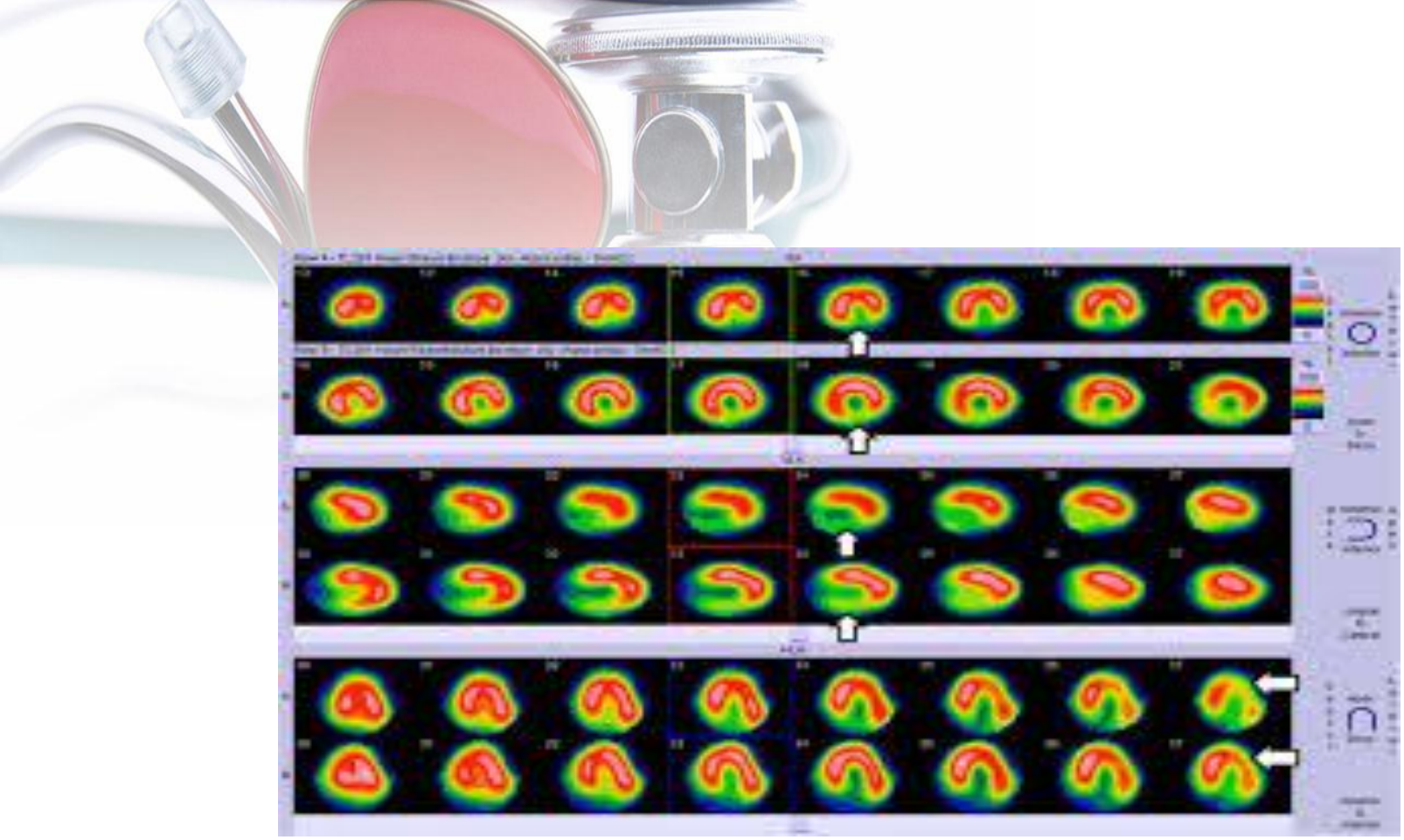
- BBB (especially LBBB)
- WPW
- Marked ST wave changes at rest (or with hyperventilation)
- Q wave infarctions (with baseline ST changes)
- Unable to stop medications (such as digoxin, quinidine, or procainamide)

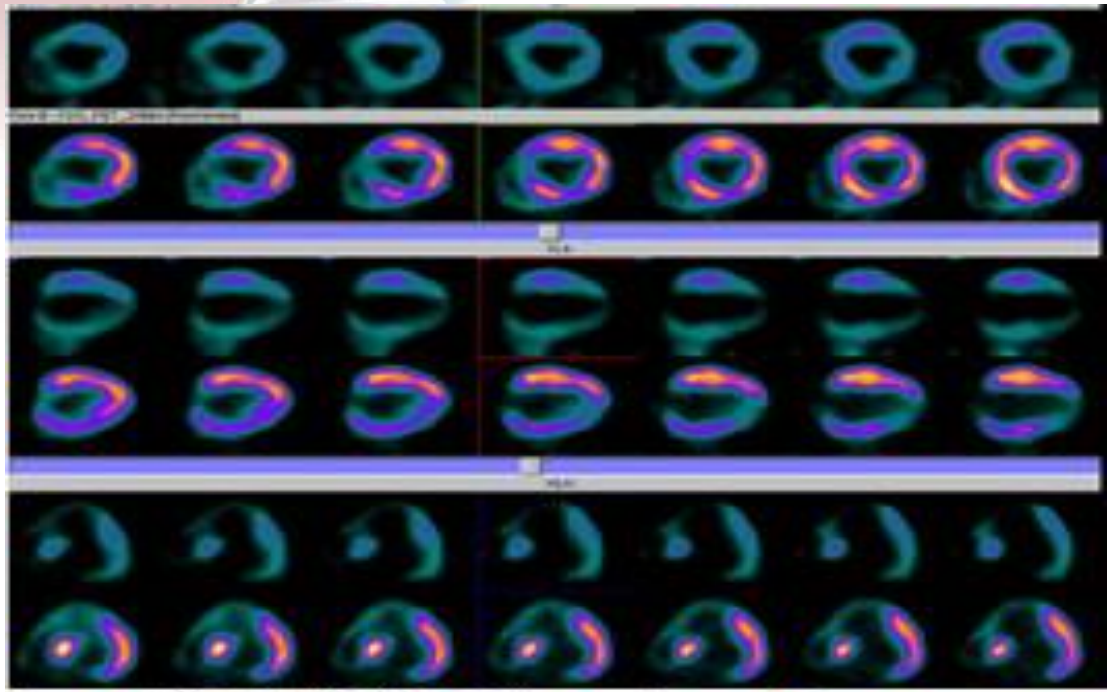

Injection of radiotracer
Stress images
Normal
Perfusion defect
Rest images
Normal
Fixed defect
Partially reversible defect
Completely reversible defect



Myocardial ischemia







PET/CT Cardiac Scan

MSCT and CT angiography

When to Consider MSCT

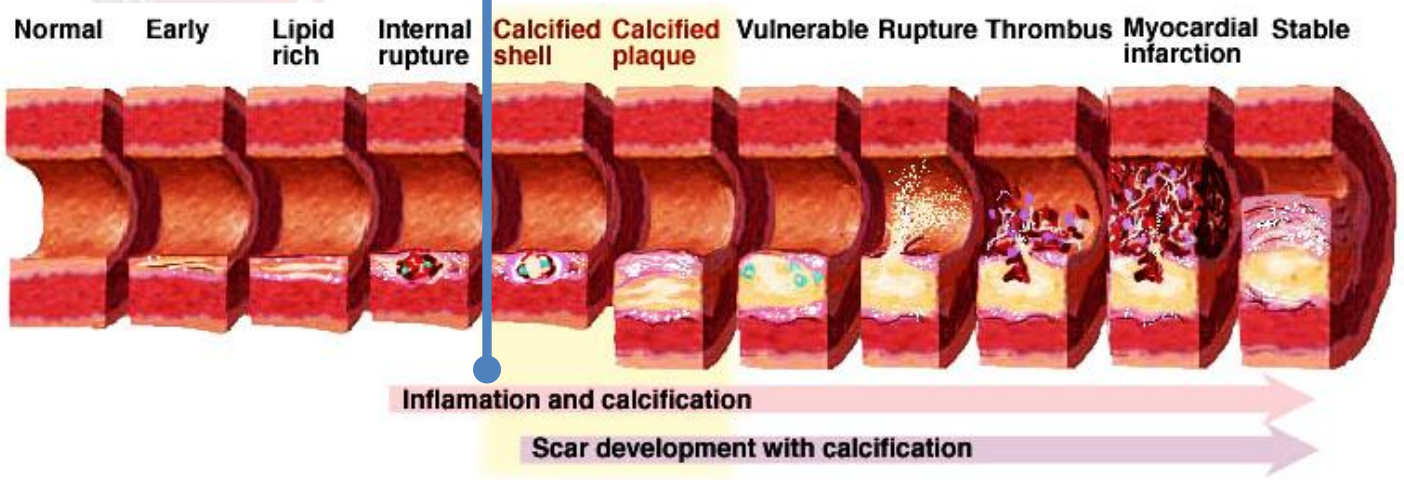
- Equivocal stress test or persistent symptoms despite negative stress test
- Prior to non-coronary cardiac surgery (valve or congenital repair)
- Patients with difficult access or on therapeutic warfarin
- Suspected coronary anomalies

When to Consider MSCT

- Idiopathic dilated cardiomyopathy
- Cardiac transplant evaluation
- Patients to undergo electrophysiologic intervention (AF ablation, BiV pacing)
- Selected patients pre- and post-bypass surgery (aortic pathology, graft patency

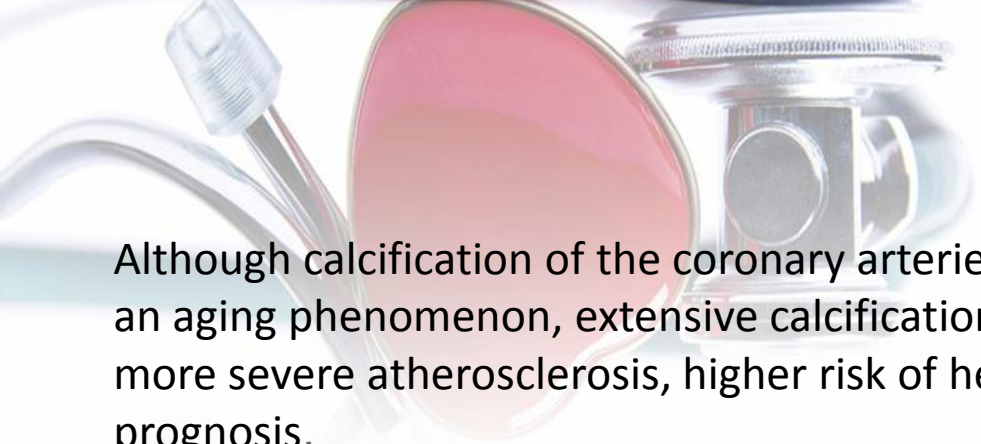
Coronary Disease Progression

Calcified Plaque Detected by CT



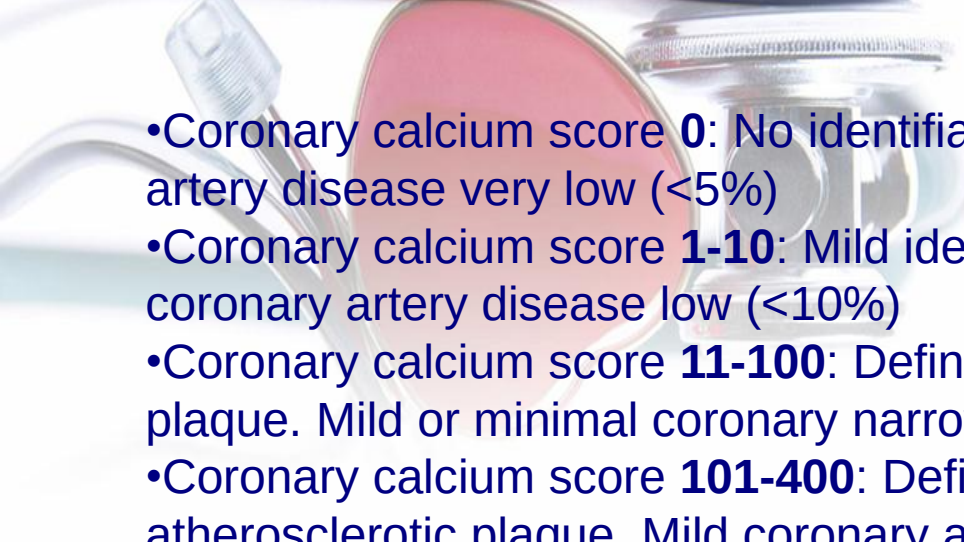
? Role for CTA

>60% stenosis (+) stress/imaging



Although calcification of the coronary arteries can be regarded as an aging phenomenon, extensive calcification appears to reflect more severe atherosclerosis, higher risk of heart attack, and worse prognosis.

For a long while, arterial calcification was thought to be the result of a degenerative process, but recent evidence suggests a that a more active process is involved, possibly arising from injury or inflammation of the vessel wall



- Coronary calcium score **0**: No identifiable plaque. Risk of coronary artery disease very low (<5%)
- Coronary calcium score **1-10**: Mild identifiable plaque. Risk of coronary artery disease low (<10%)
- Coronary calcium score **11-100**: Definite, at least mild atherosclerotic plaque. Mild or minimal coronary narrowings likely.
- Coronary calcium score **101-400**: Definite, at least moderate atherosclerotic plaque. Mild coronary artery disease highly likely. Significant narrowings possible
- Coronary calcium score **> 400**: Extensive atherosclerotic plaque. High likelihood of at least one significant coronary narrowing.


A
R


A
B
LAD
C

Magnetic Resonance Imaging

- MRI enables direct visualization of the myocardium with excellent delineation of the epicardial and endocardial interfaces. As a consequence, it may be used to accurately define segmental wall thinning indicative of previous MI. In some patients with a clinical history of transmural infarction, residual myocardium may be demonstrated at the site of the infarction.

- In other patients, MRI shows virtually complete replacement of muscle by scar.

- Direct visualization of the myocardium may be used to determine whether sufficient residual myocardium remains in the region jeopardized by a coronary arterial lesion to warrant bypass grafting.

- MRI scar maps may be generated through the use of delayed enhancement, it indicates early myocardial injury.

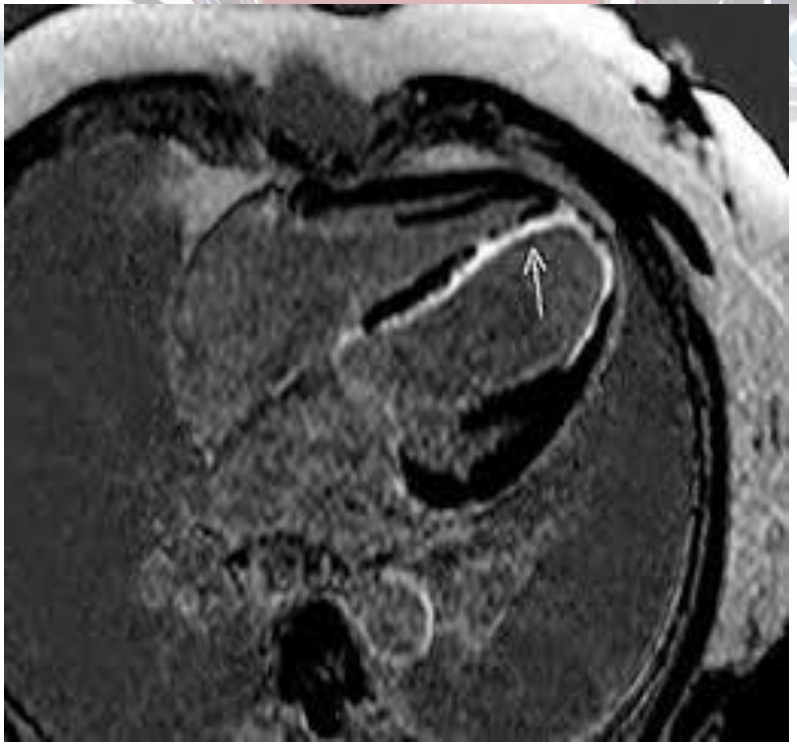
- Damaged cells and collagen in scar tissue retain the contrast material; this causes the scar to appear white, whereas normal wall appears dark.
- With scars measuring less than one third the thickness of the wall, there is good potential for improvement with revascularization, whereas with scars measuring more than one third the thickness of the wall, the potential for recovery with therapy is limited

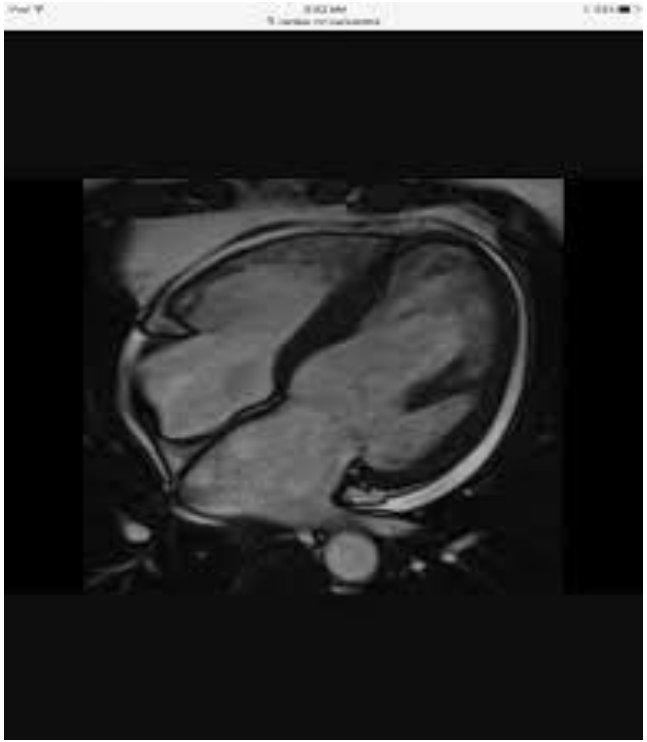
Imaging of Myocardial Infarction *CMR*

- It is now well established from contrast-echocardiography and contrast-enhanced CMR that microvascular obstruction identified at the tissue level represents a marker of subsequent poor outcome and adverse LV remodelling.

- Delayed-enhanced CMR has important clinical implications for detection of infarct size, which is the strongest determinant of prognosis in these patients, and for detection of myocardial viability. Infarct imaging by CMR is very sensitive and can depict subtle non-transmural infarcts or even infarctlets.

- The method has been validated against positron emission tomography (PET) for detection of viability and has been recognized as the standard of reference for viability detection by the European Society of Cardiology (ESC) Consensus Panel report.





3D SSFP coronary MRA