



Coronary Artery Disease: What a Cardiologist Needs to Know in Daily Practice

CT Coronary Angiogram

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Computed Tomography

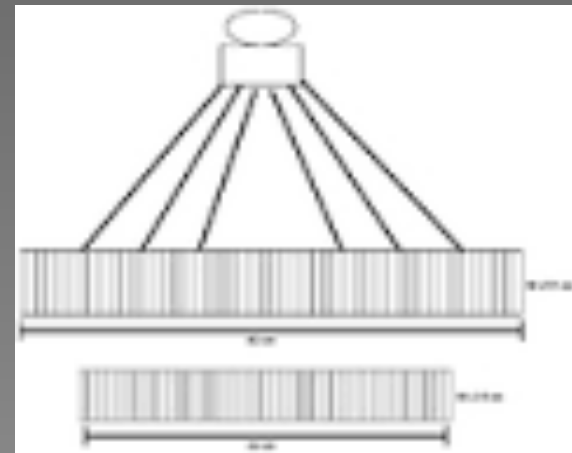
Development of Multi-detector Technology

- faster, volumetric data acquisition
- capability for ECG-gating
- reconstruction software

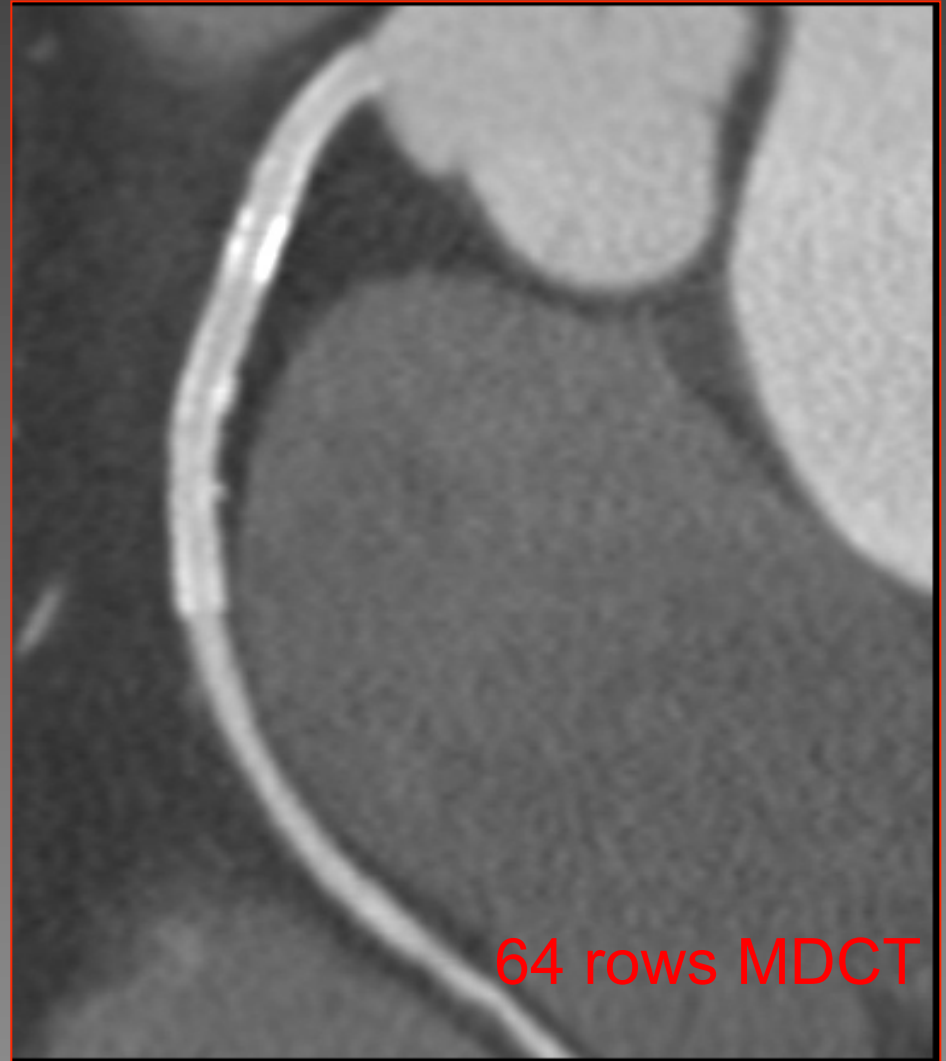


CT Machines

- Develop by 16/64-row detector CT
- Wide-detector CT scanner
 - 320 x 0.5mm detector array
 - 12-14cm CC coverage / rotation
- Dual-source CT scanner
 - $\frac{1}{2}$ temporal resolution (75ms)
- Dual-energy CT scanner
 - help depict ischaemic / normal myocardium



Effect of Number of Detector Rows



Parameters for Good Image Quality

- Challenges for visualization of coronary arteries
 - constantly moving cardiac motion
 - small caliber of coronary arteries (<5mm)
 - respiratory motion
 - calcified plaques: suboptimal X-ray beam penetration to vessel lumen

ECG Gating

- **Retrospective Gating**

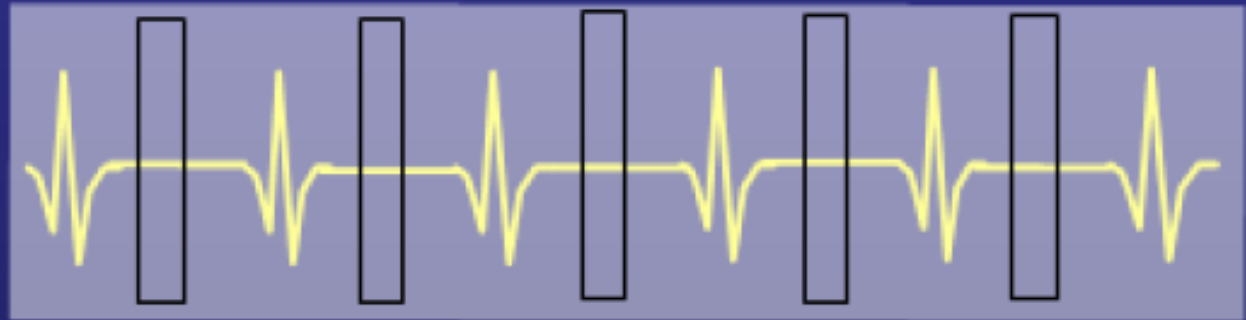


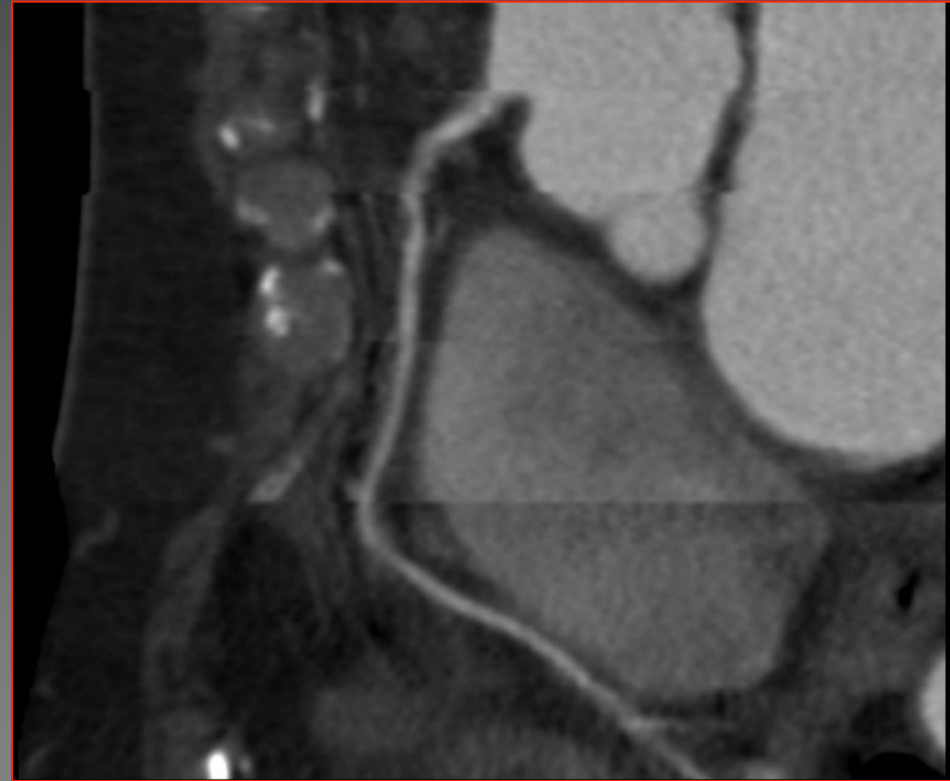
Table motion



Effect of HR on Gating



Low HR



High HR

Multiplanar Reformat (MPR)

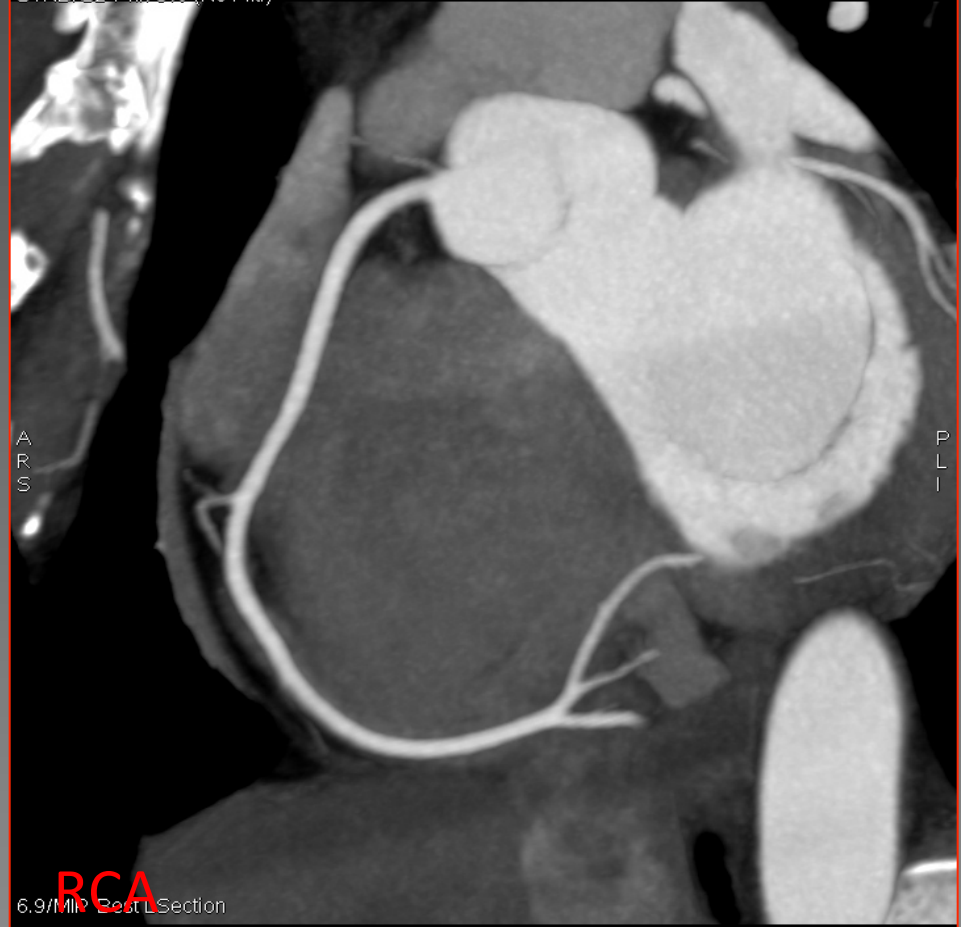
Lt main LP: 9.4

DFOV 12.0cm
STND/C2 Ph:75% (No Filt.)



Right Coronary Artery LP: 14.4

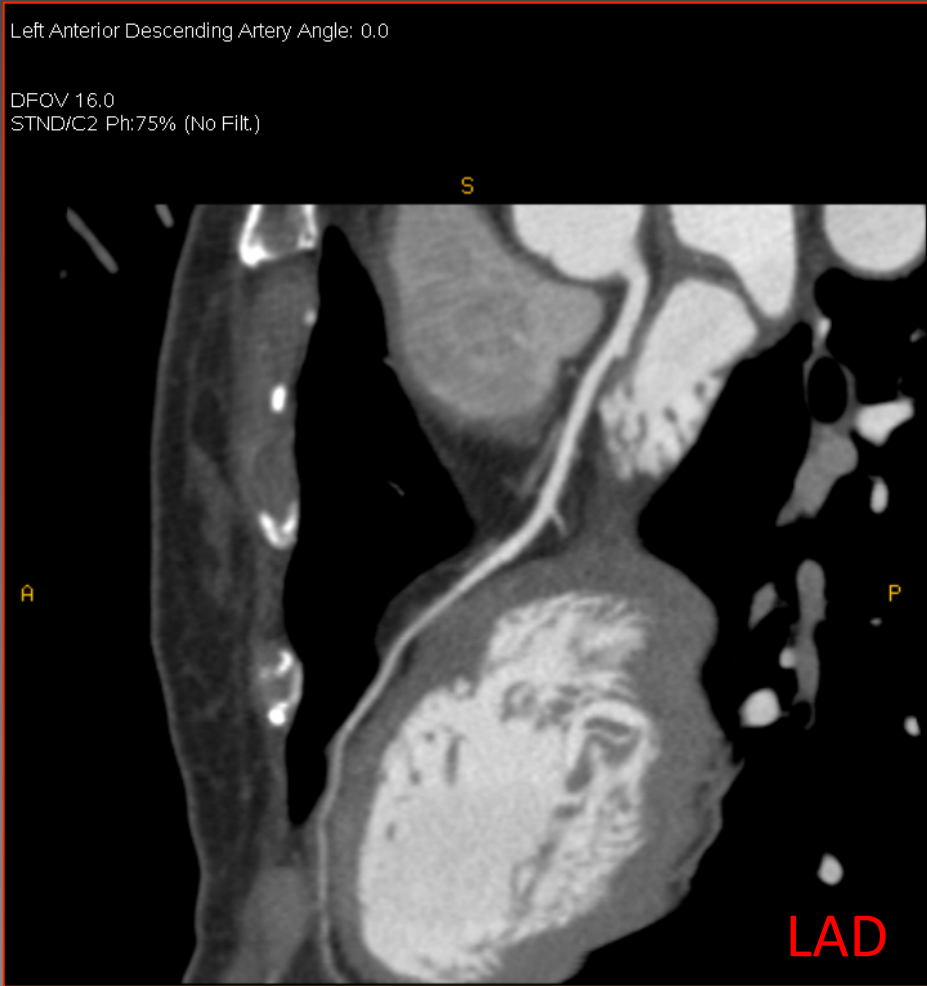
DFOV 12.0cm
STND/C2 Ph:75% (No Filt.)



MPR Coronary Arteries

Left Anterior Descending Artery Angle: 0.0

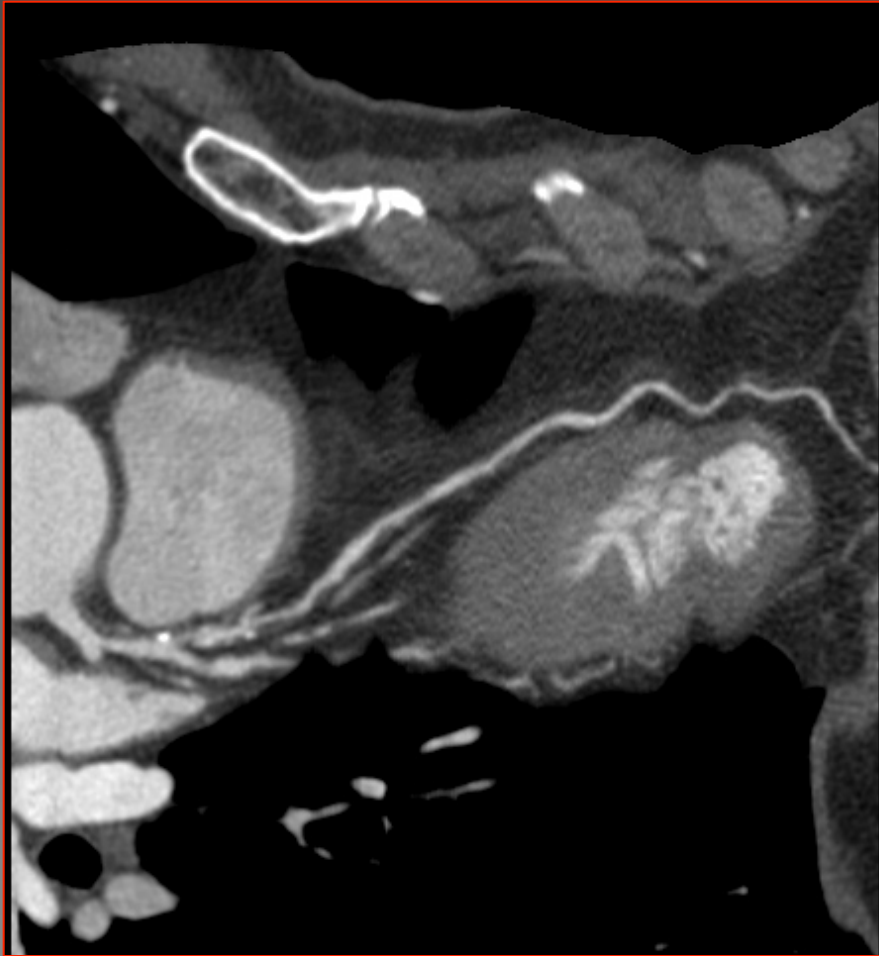
DFOV 16.0
STND/C2 Ph:75% (No Filt.)



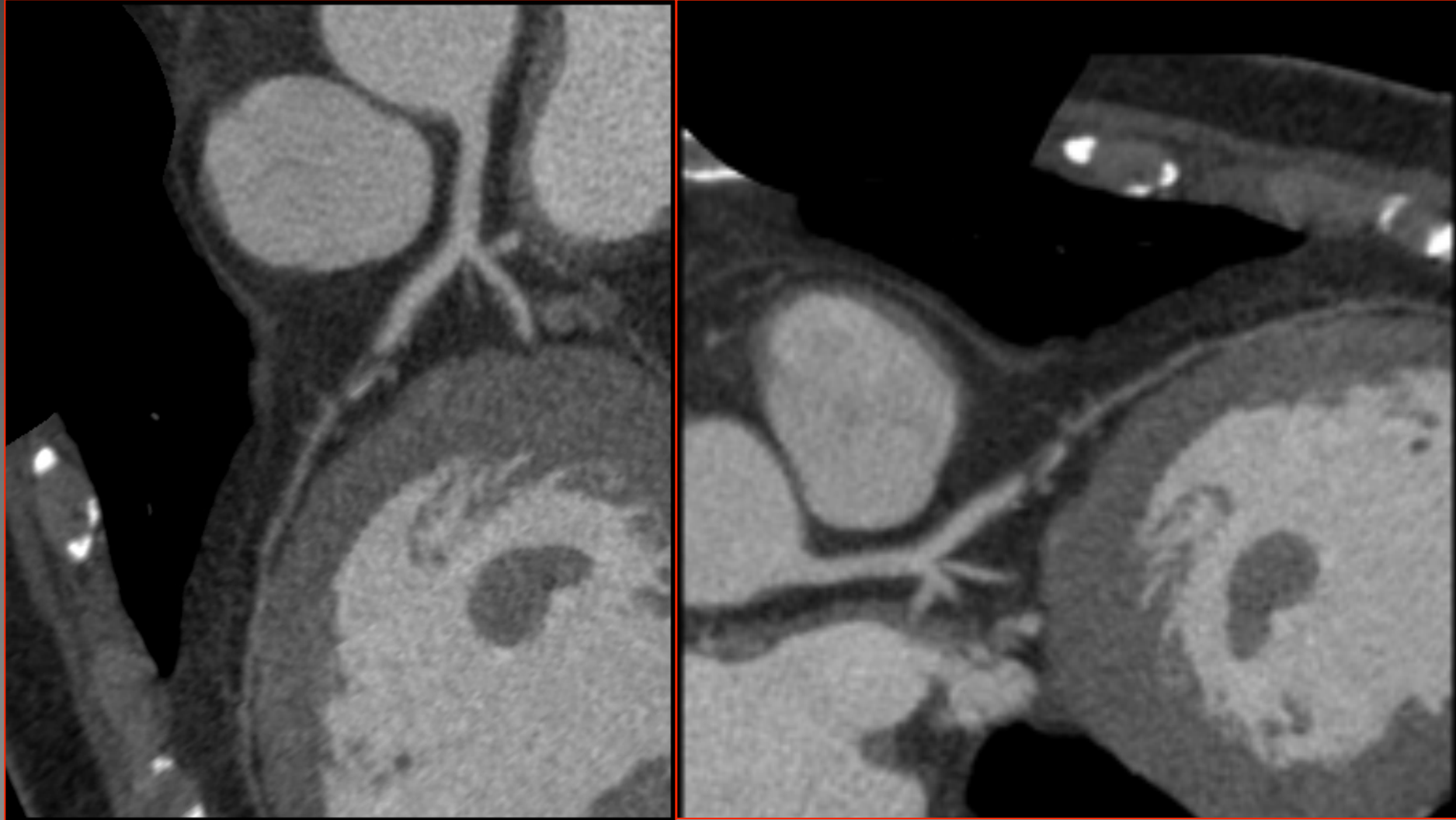
Use of Cardiac CT in IHD

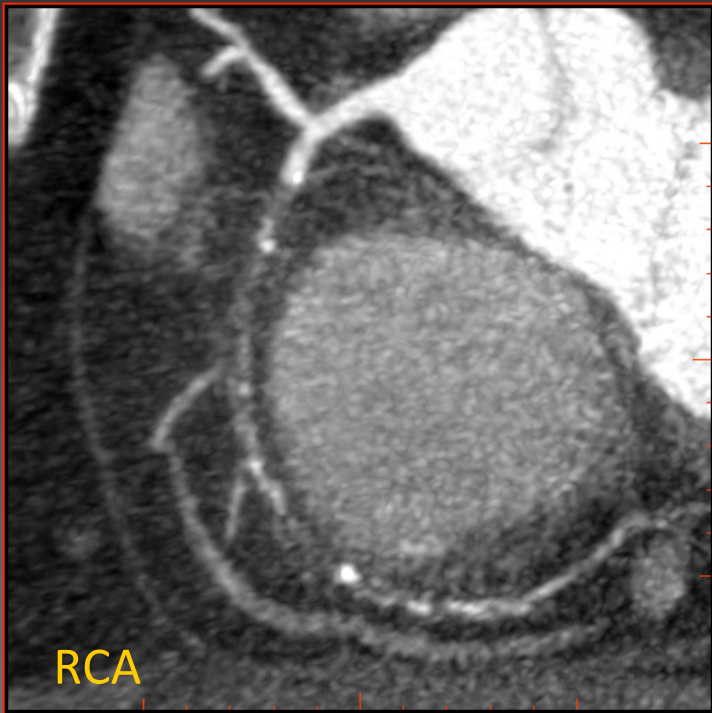
- Coronary artery stenosis
 - presence / absence
 - stenosis / occlusion
 - site
 - severity
 - length
- Plaque composition / characterization
- Functional assessment
- Stent / CABG assessment

LAD stenosis

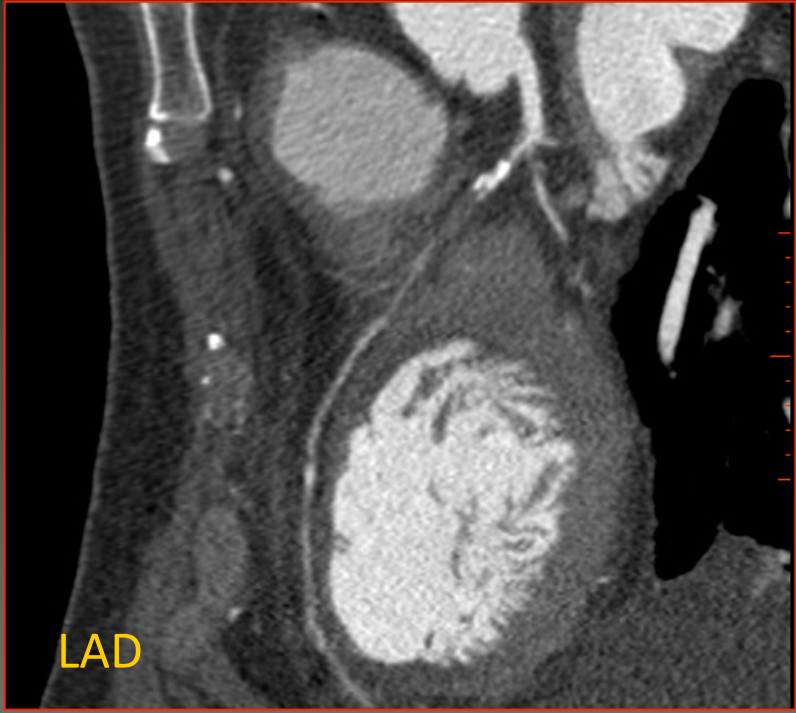


LAD Occlusion





RCA



LAD



LCx



LV Apex Infarct

Evaluation of Acute Chest Pain

Low to intermediate pre-test likelihood for ACS

- Safe
- Reduced time for diagnosis
- Reduced time to discharge
- Lower cost

Goldstein, et al. J Am Coll Cardiol 2007
Goldstein, et al. J Am Coll Cardiol 2011
Litt HI, et al. NEJM 2012
Hoffmann U, et al. NEJM 2012

ACCF/AHA 2010 Appropriate Use Criteria for
Cardiac CT



Evaluation of Chronic / Stable Chest Pain

2012 ACCF/AHA Guideline

- CTA “reasonable to perform” in patients with suspected CHD at intermediate pre-test probability (Class IIa recommendation)

2014 ESC/EACTS Guideline

- CTA is indicated to rule out CAD in symptomatic patients with intermediate pre-test probability (Class IIa recommendation)

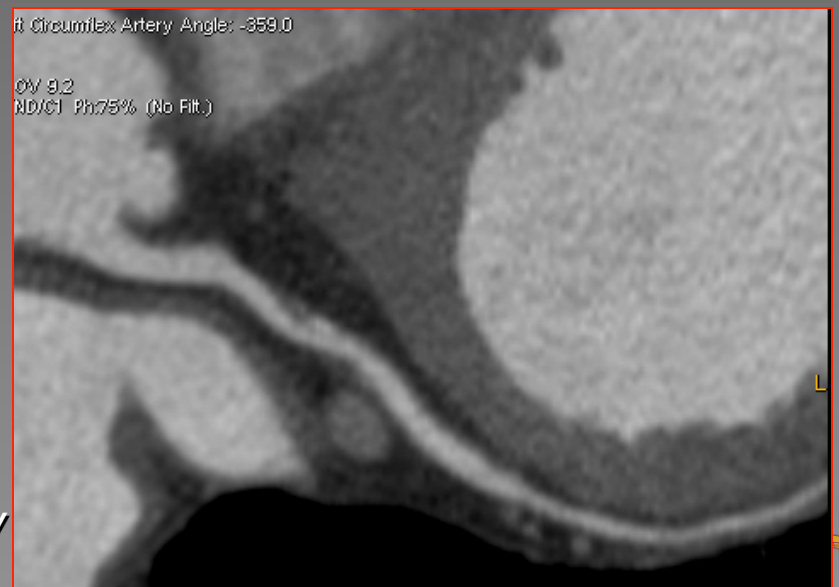
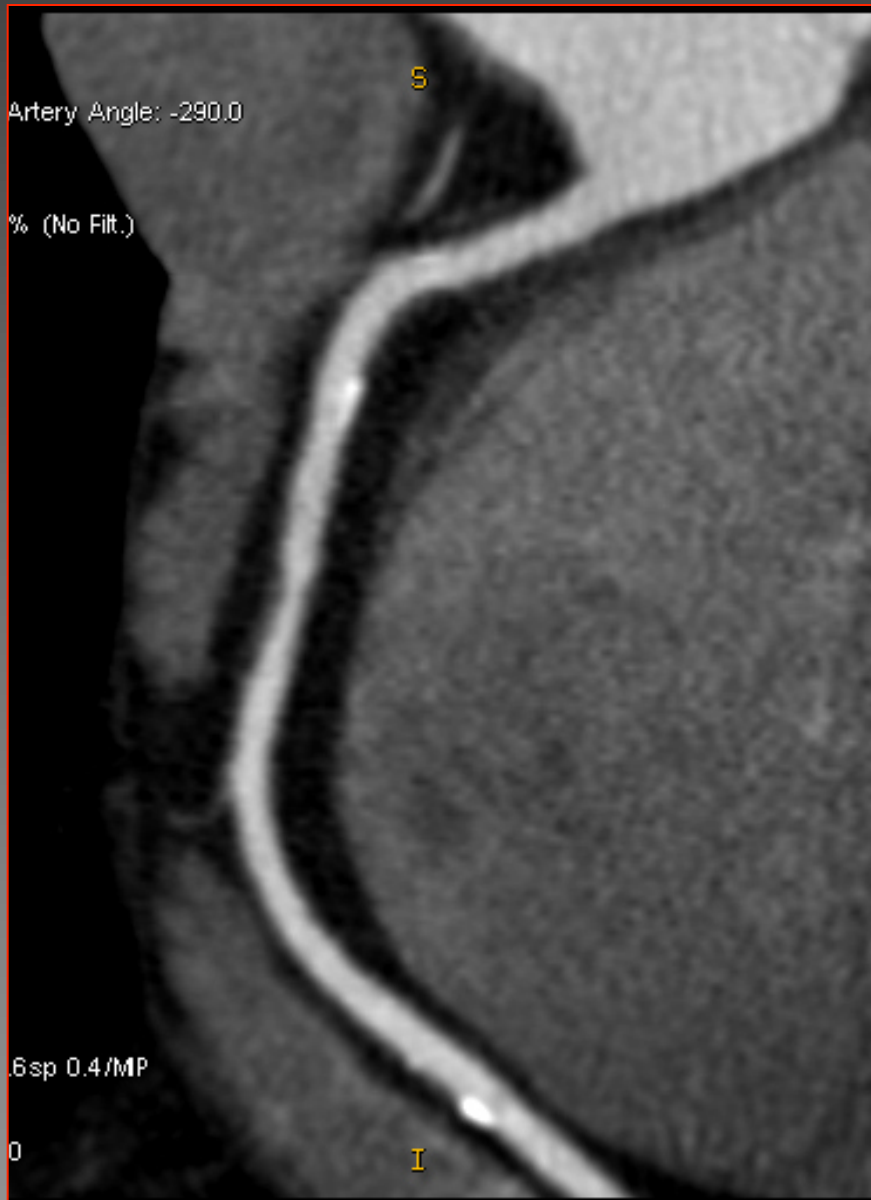
Evaluation of Chronic / Stable Chest Pain

X To screening in asymptomatic patients

X To r/o CAD in symptomatic patients with low pre-test probability for CAD

X To r/o CAD in symptomatic patients with high pre-test probability for CAD

Plaque Composition



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Stent Assessment



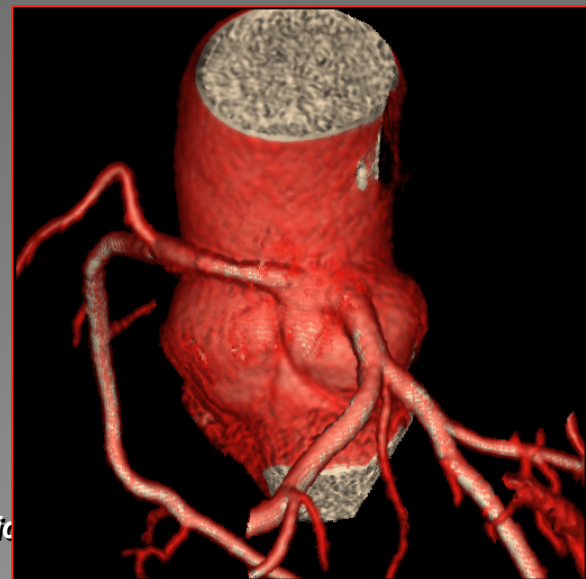
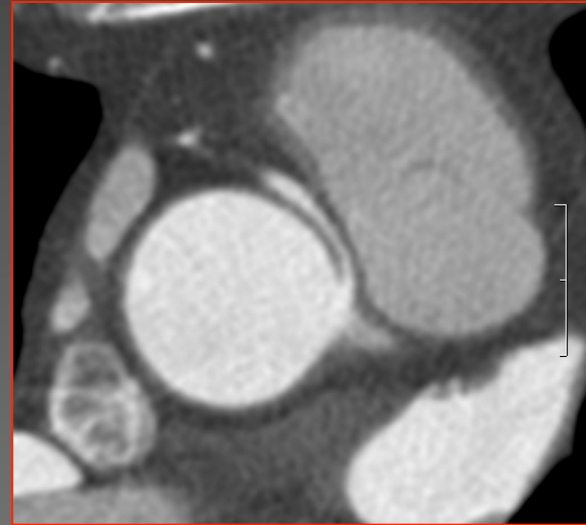
Post CABG Assessment



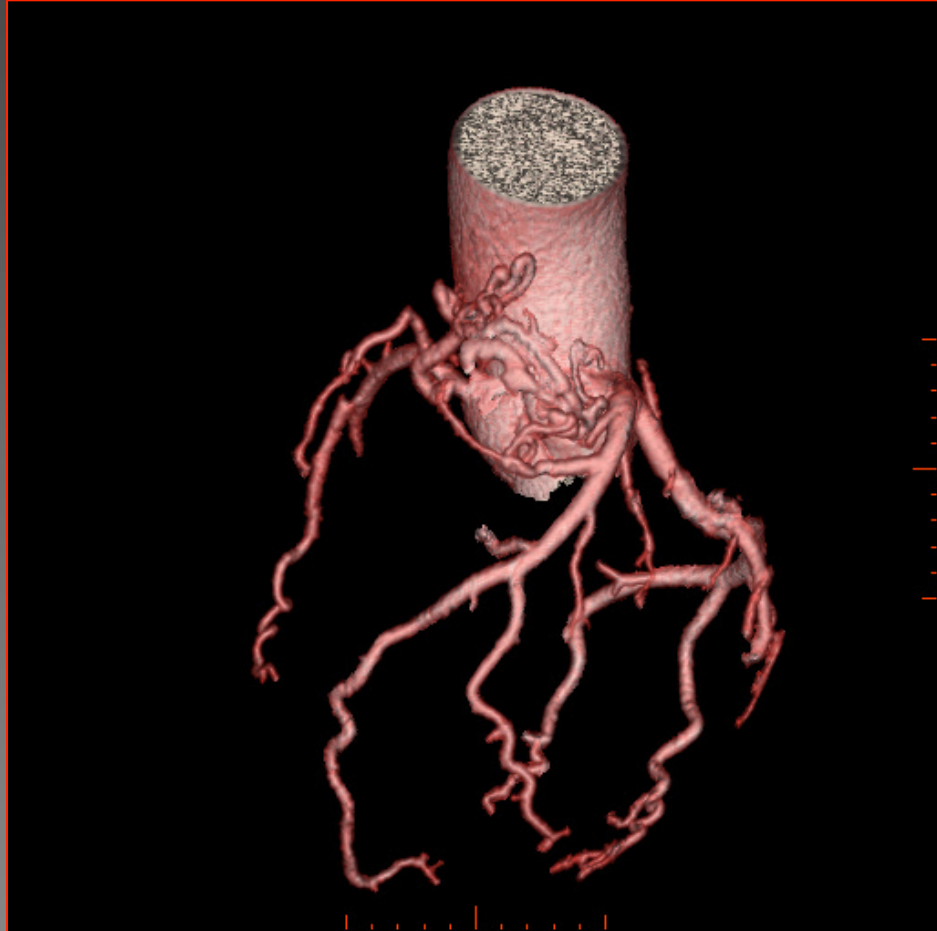
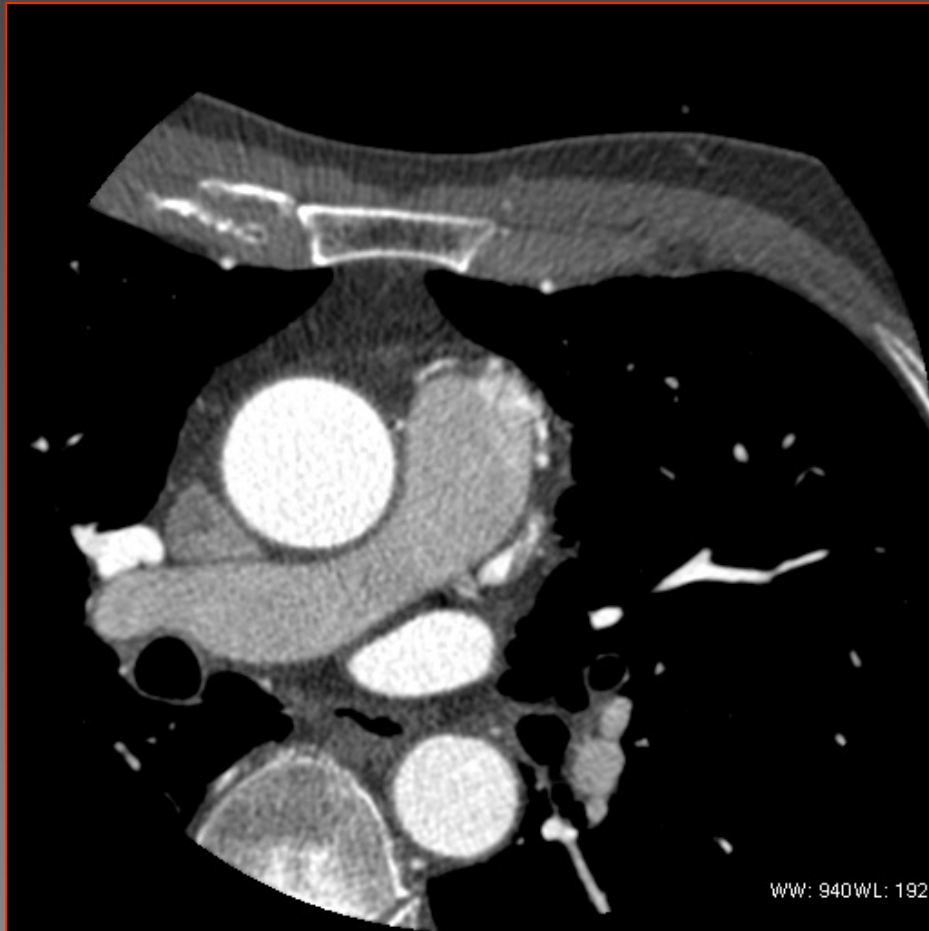
Don't Forget

- Anomalous coronary artery origins
- Vascular anomaly (eg AV fistula)
- Important incidental findings
 - pulmonary embolism
 - aortic dissection
 - extra-vascular lesions (liver/lung/breast)

Anomalous RCA origin

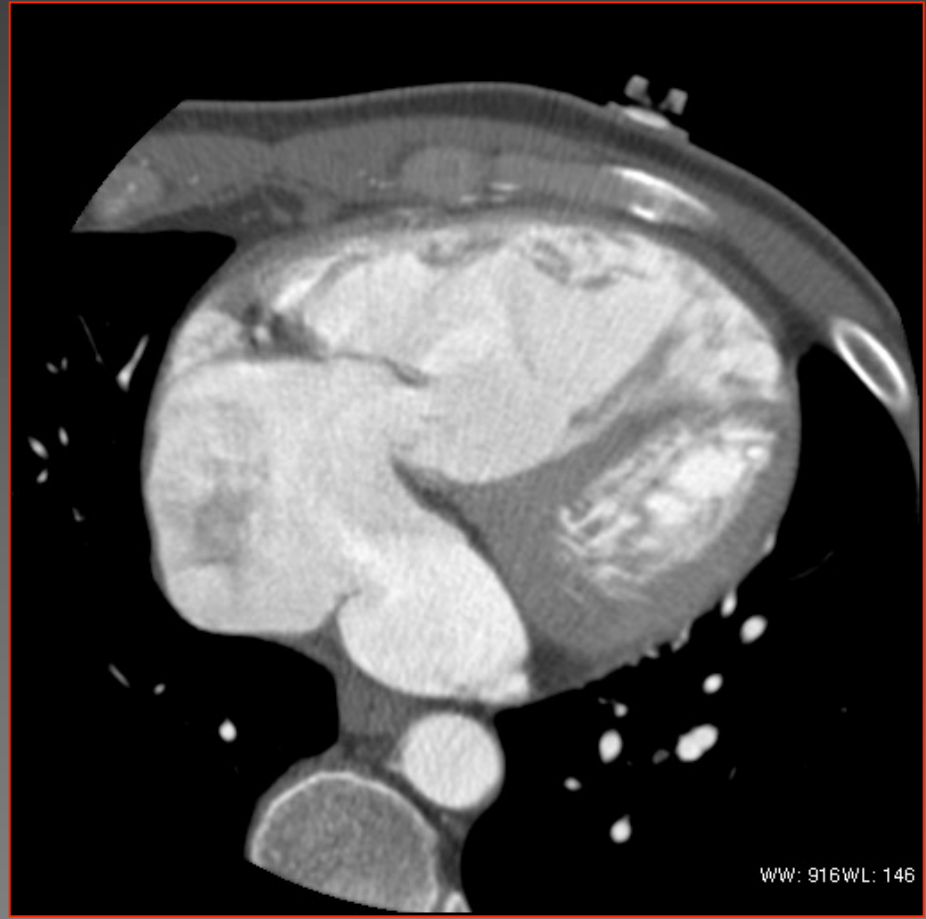


Coronary artery fistula





Pulmonary Embolism



ASD

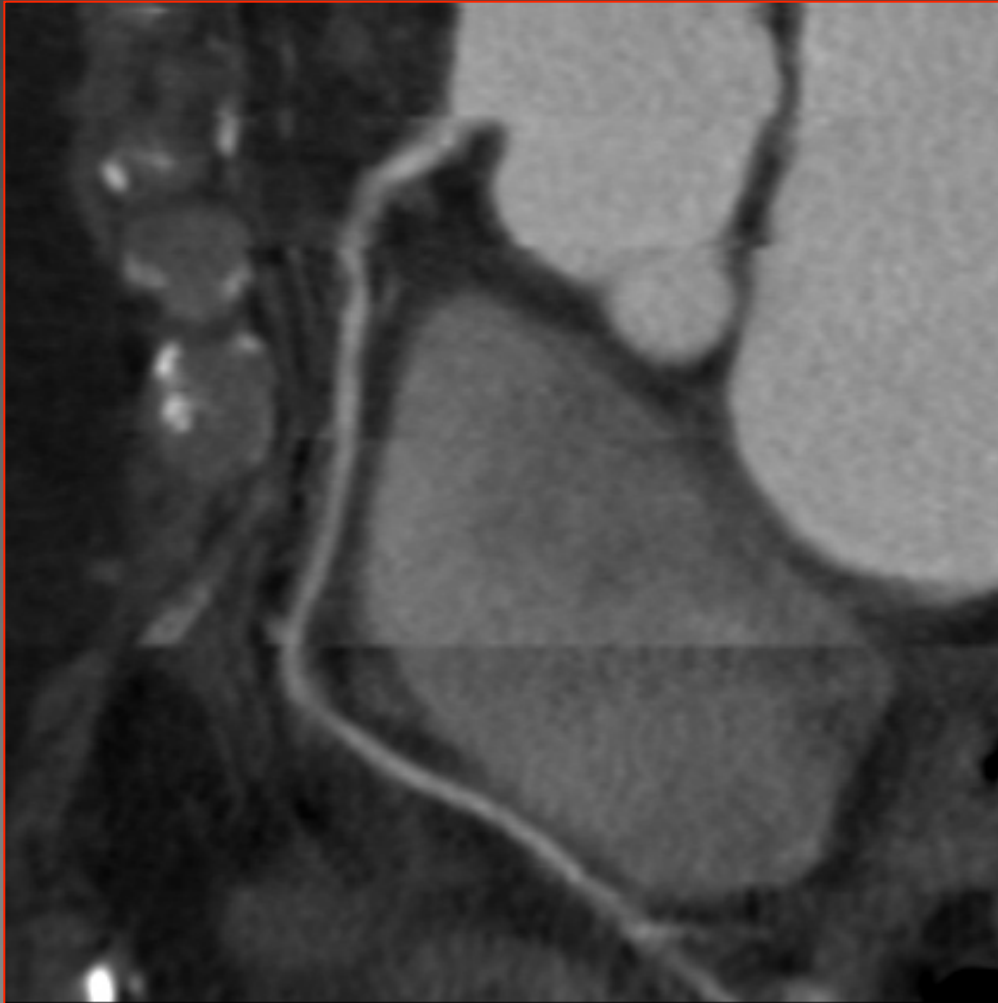


Breast Cancer



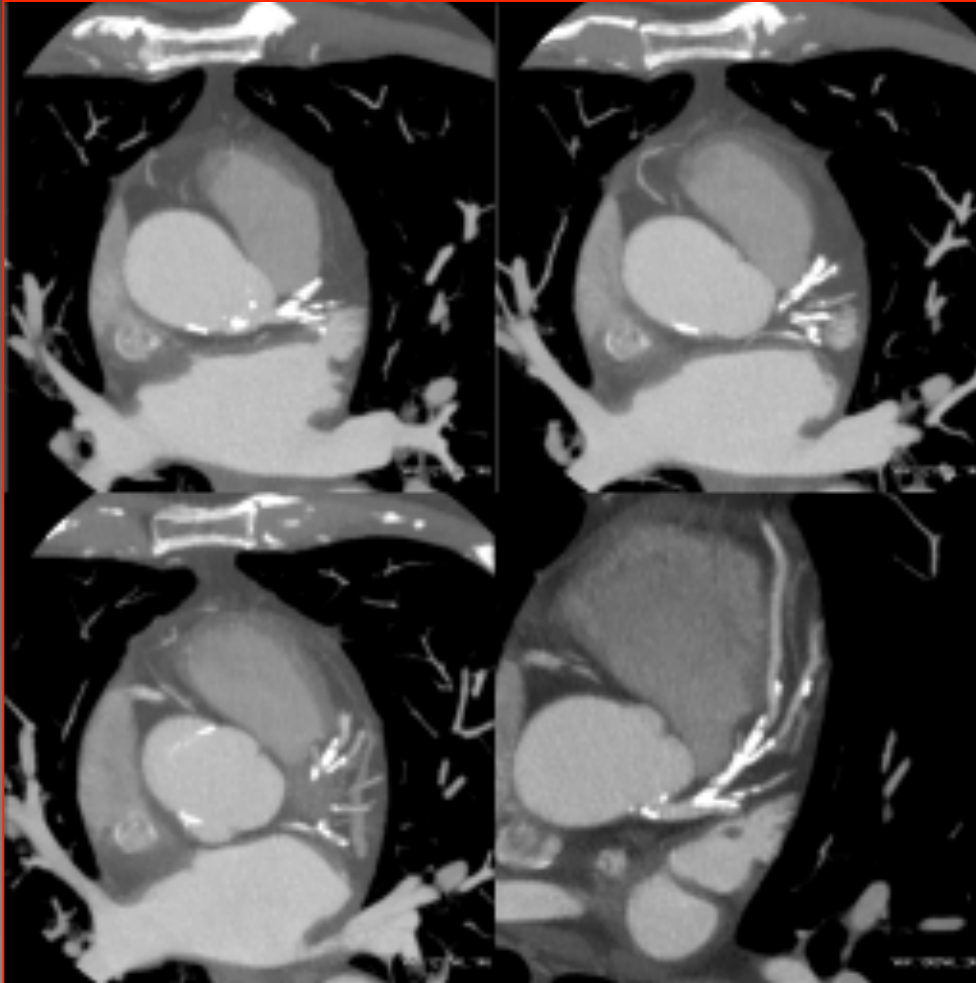
Carcinoma of Lung

Limitations



High / Irregular HR

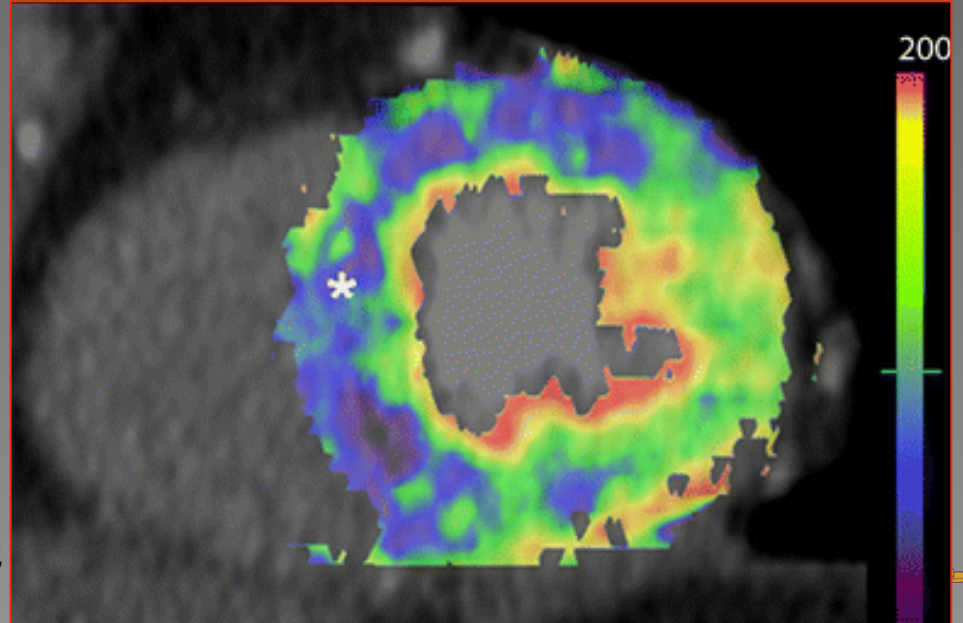
Limitations



Blooming Artefacts

Clinical Challenges

- Moderate stenosis ? Functional significance
- Densely calcified plaques, non-diagnostic CTA ? Functionally significant stenosis
- Small & dense metallic stent, non-diagnostic CTA ? Significant in-stent restenosis



Bring Home Messages

- CT coronary angiogram is useful in coronary artery disease
- Particularly useful for r/o CAD intermediate risk patients
- Accurately detect and mapping of stenosis
- Importance of good hardware, software, robust scanning technique, expert reader
- Limitations: HR, calcified plaques, dense stent
- Future development (eg CTP, CT FFR)



Thank you

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