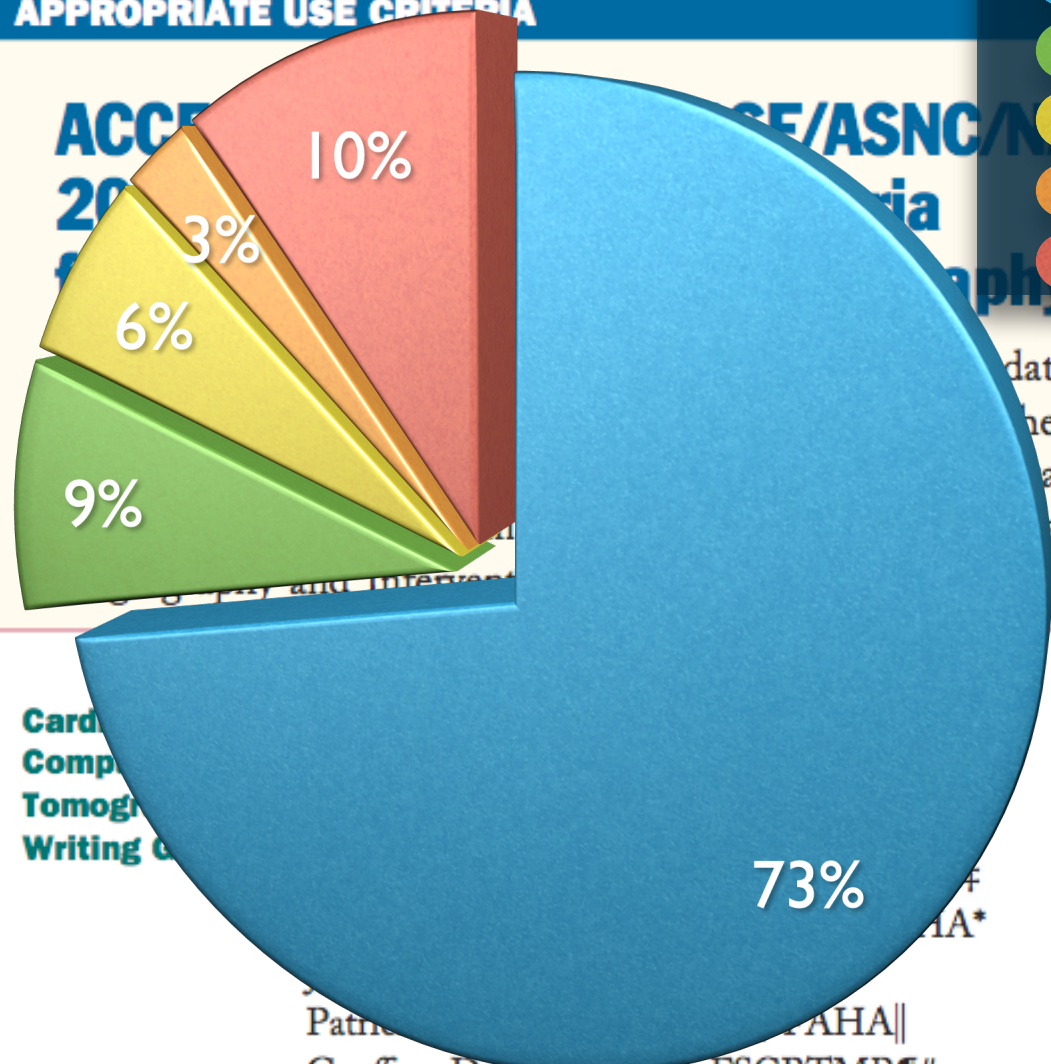


Non-Coronary Applications for CT of the Heart

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University of Arizona

APPROPRIATE USE CRITERIA



- CAD Detection
- Post CAD Revascularization
- Myocardial Function
- Congenital Heart Disease
- Everything Else

Foundation Appropriate Use Criteria Task Force, the American College of Radiology, the American Society of Nuclear Cardiology, the American Society of Nuclear Cardiology, the Society for Cardiovascular Magnetic Resonance

*Official American College of Cardiology Foundation Representative;
†Official American Society of Nuclear Cardiology Representative;
‡Official Society for Cardiovascular Angiography and Interventions Representative;
§Official Society of Cardiovascular Computed Tomography Representative;
||Official American Heart Association Representative;
¶Official American College of Radiology Representative;
#Official North American Society for Cardiovascular Imaging Representative

Geoffrey D. Rubin, MD, FSCBTMR¶
Patrick O. Gels, MD, EVCC, EVHA||
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Daniel M. M. MD, MPH, EVCC, EVHA||

Revascularization
#Official North American Society for Cardiovascular Imaging Representative;
¶Official American College of Radiology Representative;
||Official American Heart Association Representative;

Why not MR?

- Pacemakers & defibrillators
- Calcium detection
- Improved spatial resolution
- Faster exam time

Why CT the Heart?

- Quantitation of myocardial function
- Myocardial viability
- Congenital heart disease
- Pericardium
- Myocardial masses
- Cardiomyopathy
- Left atrial characterization
- Cardiac valves & perivalvular regions

Technique

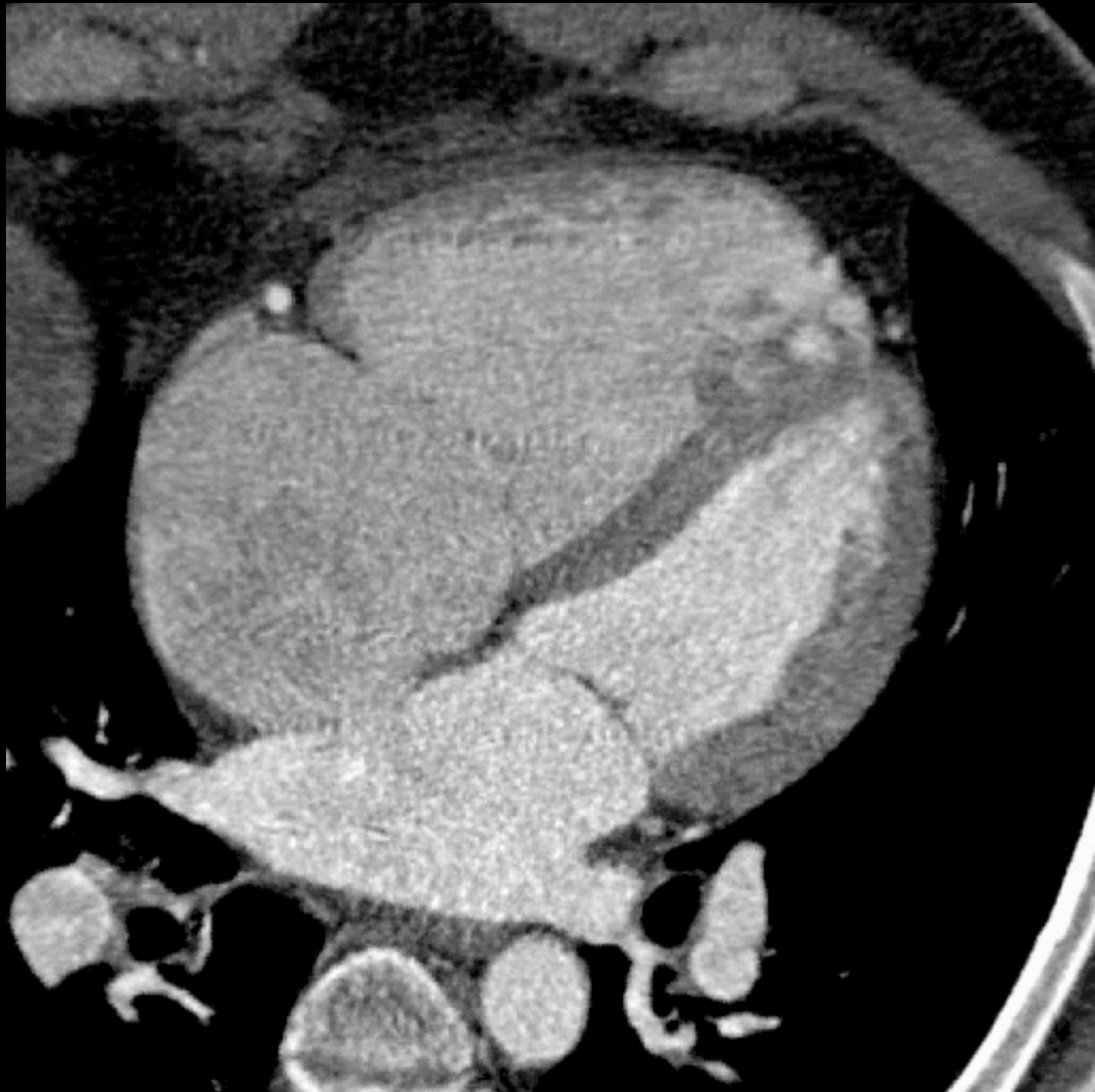
- ≥ 16 row MDCT
- Retrospective ECG gated acquisition, consider ECG pulsing
- Dual chamber injector
- Reconstruction of 10 cardiac phases
- 4D capable workstation
- Software modules for quantitation of myocardial function

Myocardial Function

- Little rationale to perform independent of coronary CTA

Evaluation of Ventricular Morphology and Systolic Function		
48.	<ul style="list-style-type: none">• Initial evaluation of left ventricular function• Following acute MI or in HF patients	I (2)
49.	<ul style="list-style-type: none">• Evaluation of left ventricular function• Following acute MI or in HF patients• Inadequate images from other noninvasive methods	A (7)
50.	<ul style="list-style-type: none">• Quantitative evaluation of right ventricular function	A (7)

- Can underestimate end systolic volume
~ *papillary muscle exclusion using thresholding*
- Automated software tools are available but need validation
- Important to review adequacy of segmentation

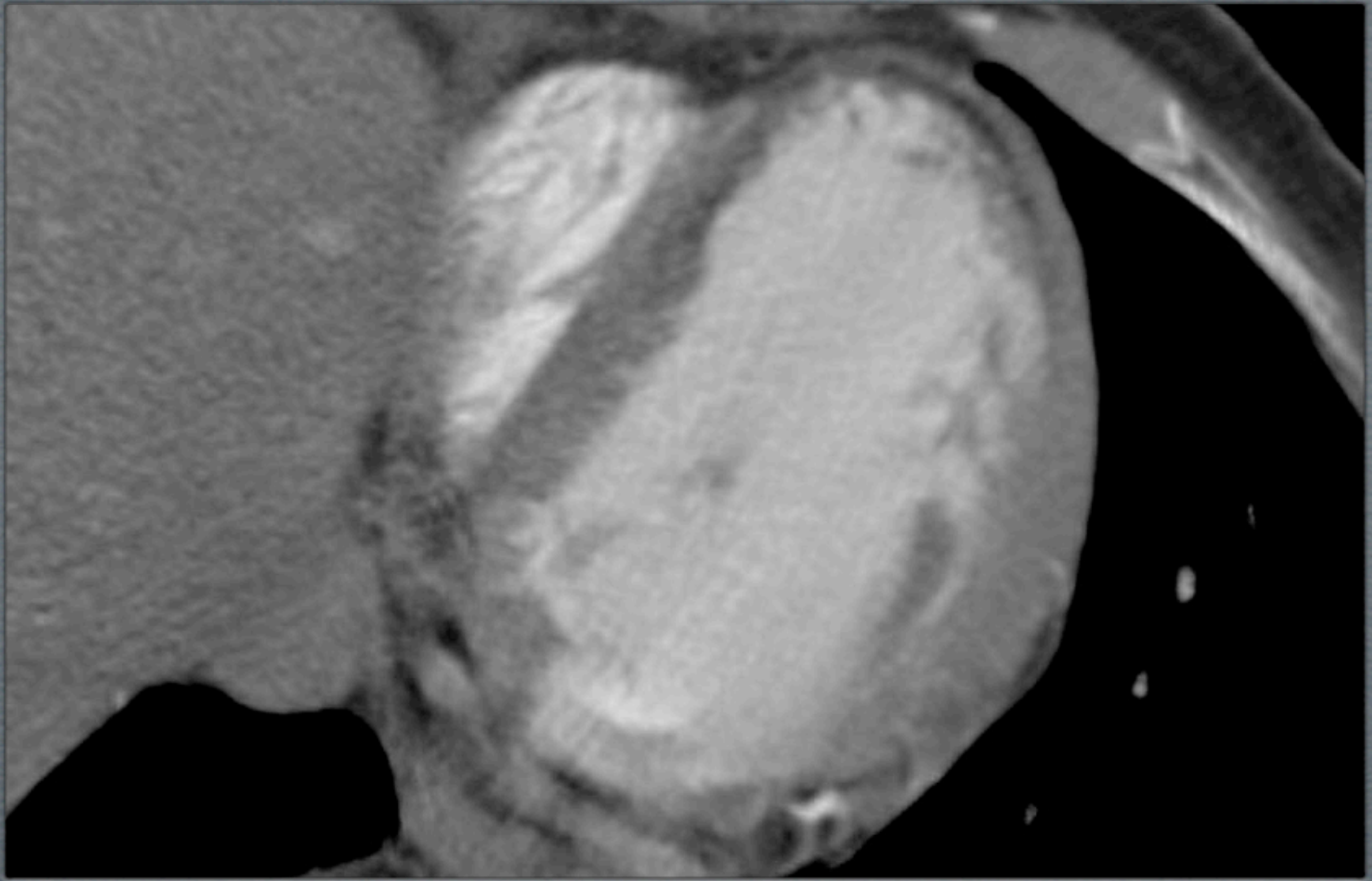


Myocardial Infarction

- Acute
 - Hypo-enhancement
 - Impaired function
- Chronic
 - Myocardial thinning
 - Calcification or fatty metaplasia
 - Hypo or akinesis
 - Delayed enhancement



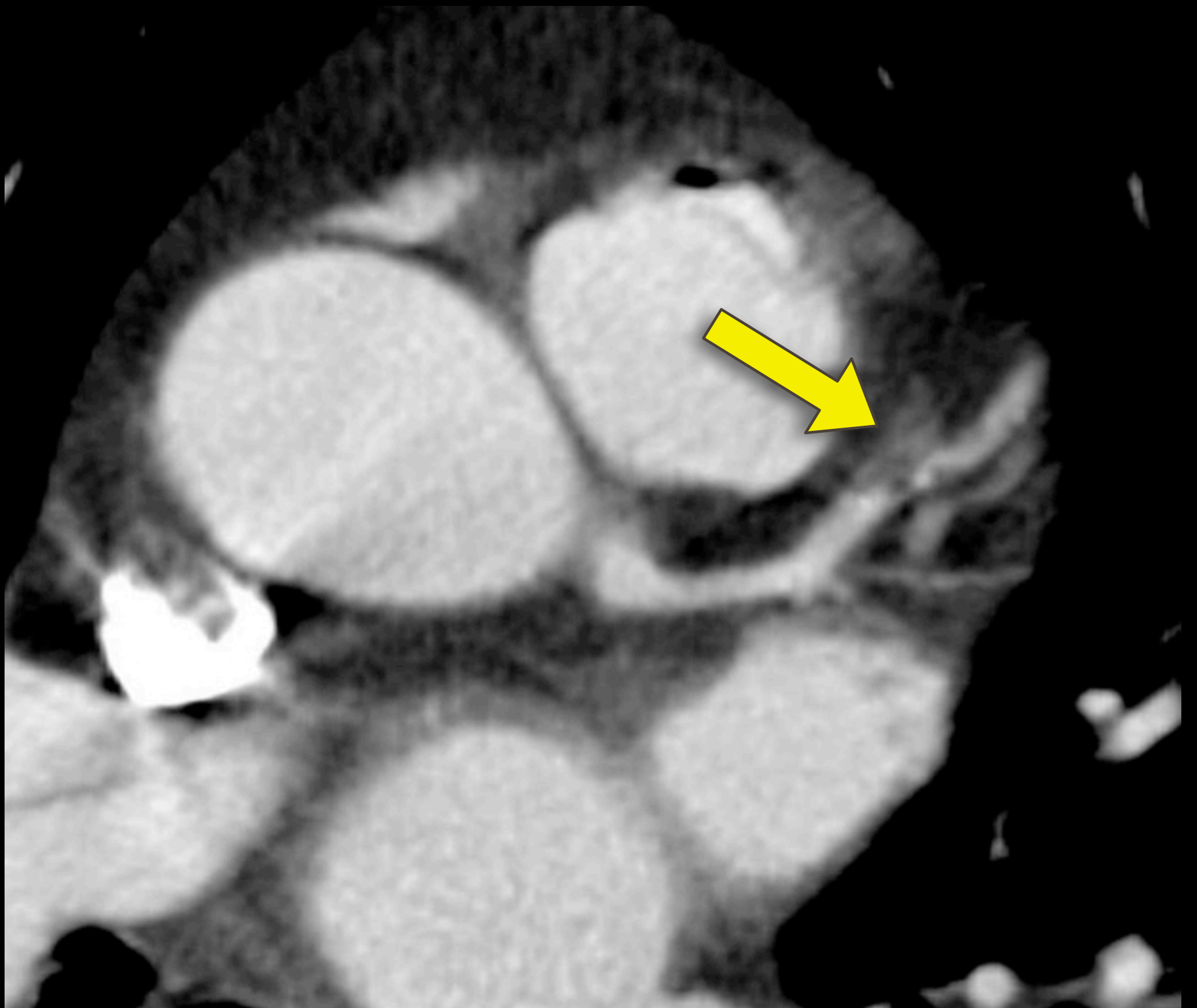
ISCHEMIC CARDIOMYOPATHY
CHRONIC MI



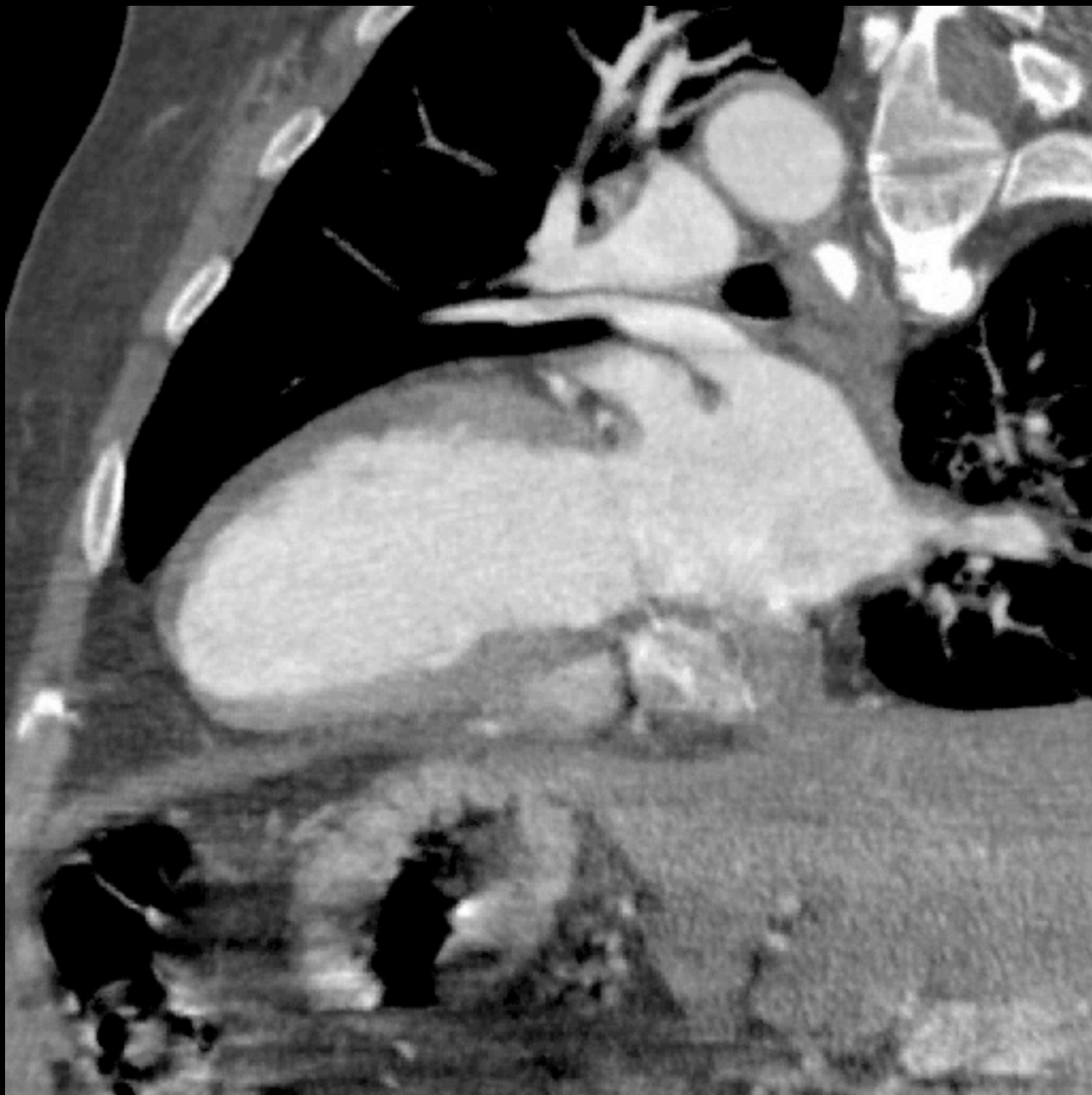
FATTY METAPLASIA

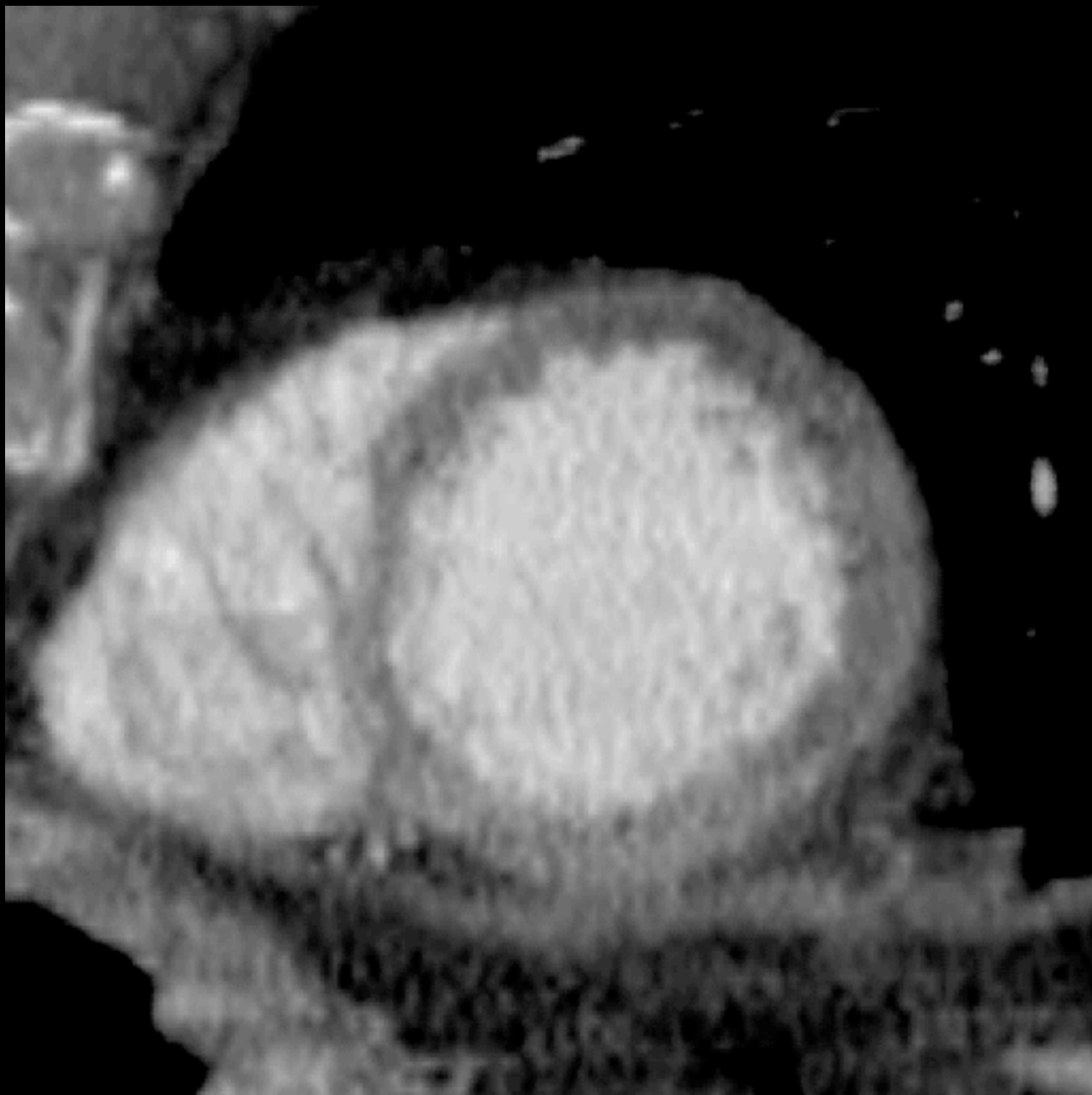












Post Ascending Ao Repair

Acute Type A Dissection



Post Asc Ao Repair

Acute Type A Dissection

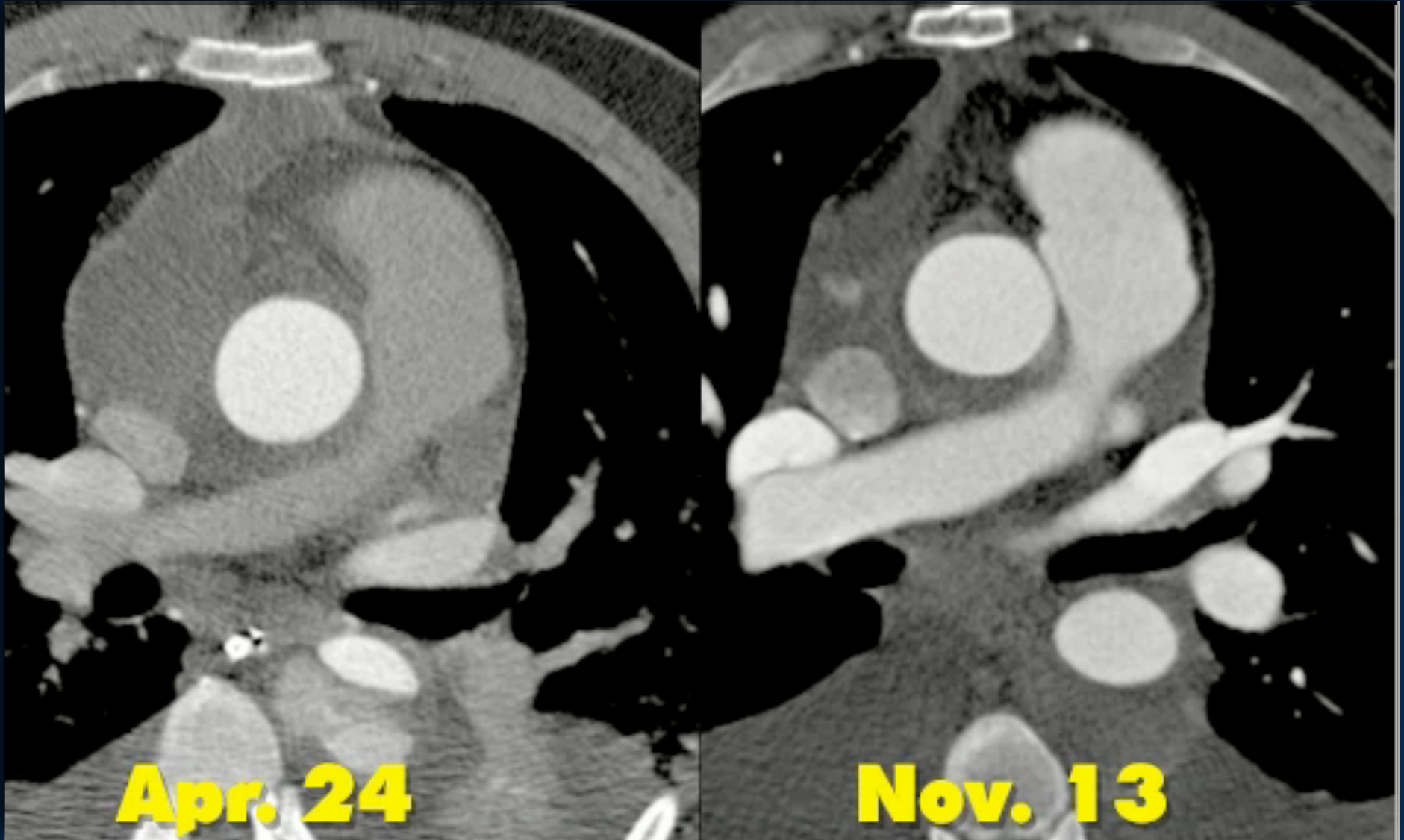


Clip on Circumflex Coronary Artery

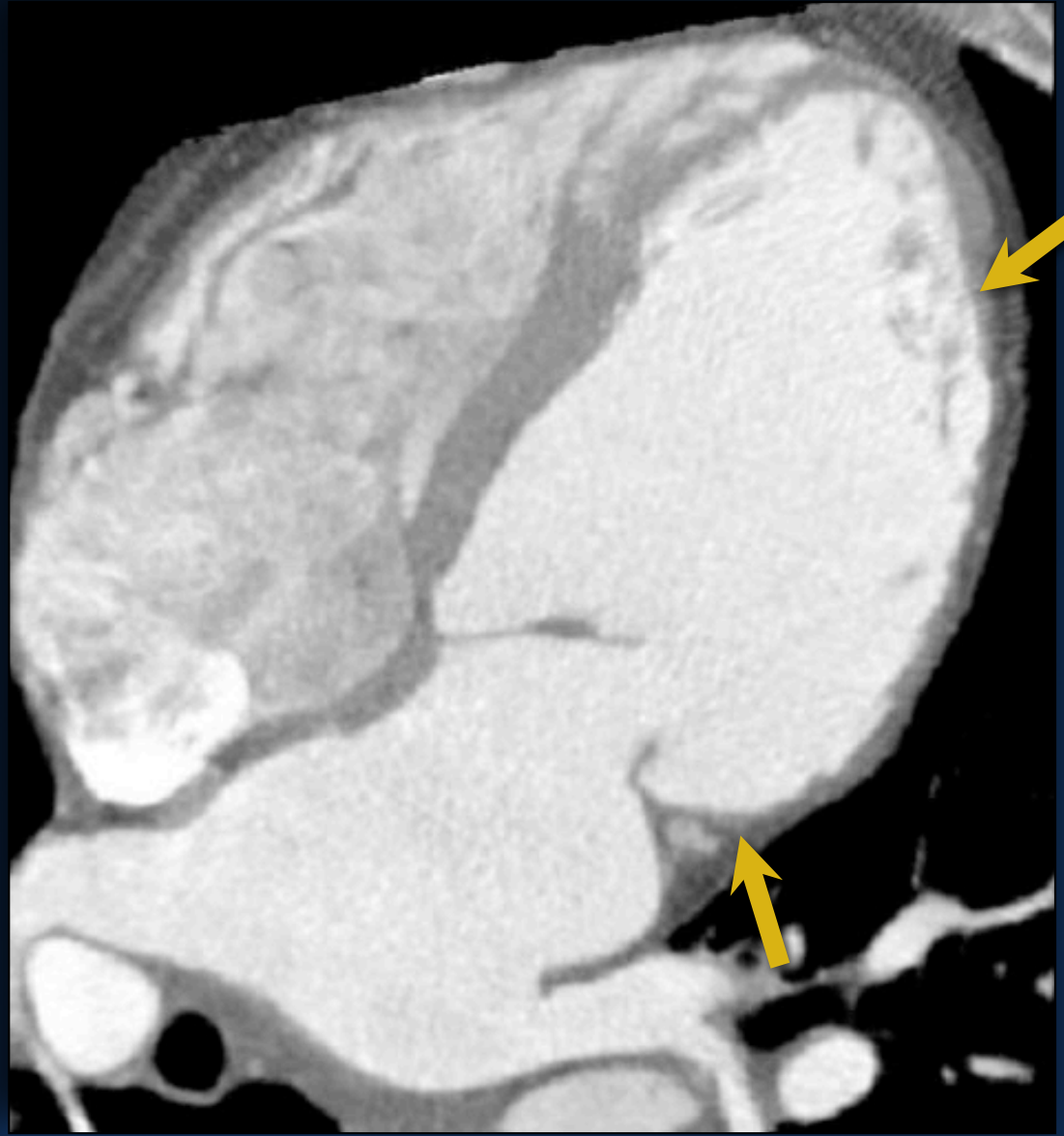
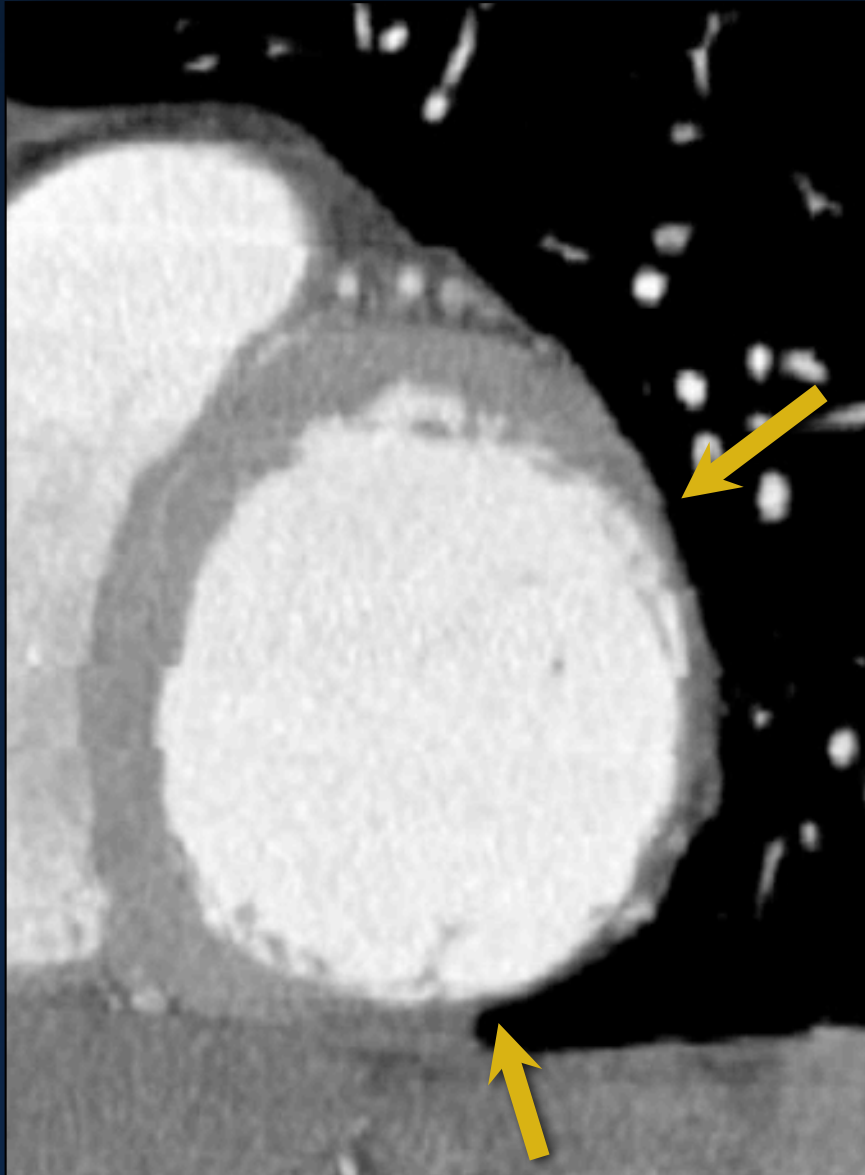


Post Asc Ao Repair

Acute Type A Dissection



Posterolateral Wall Infarction

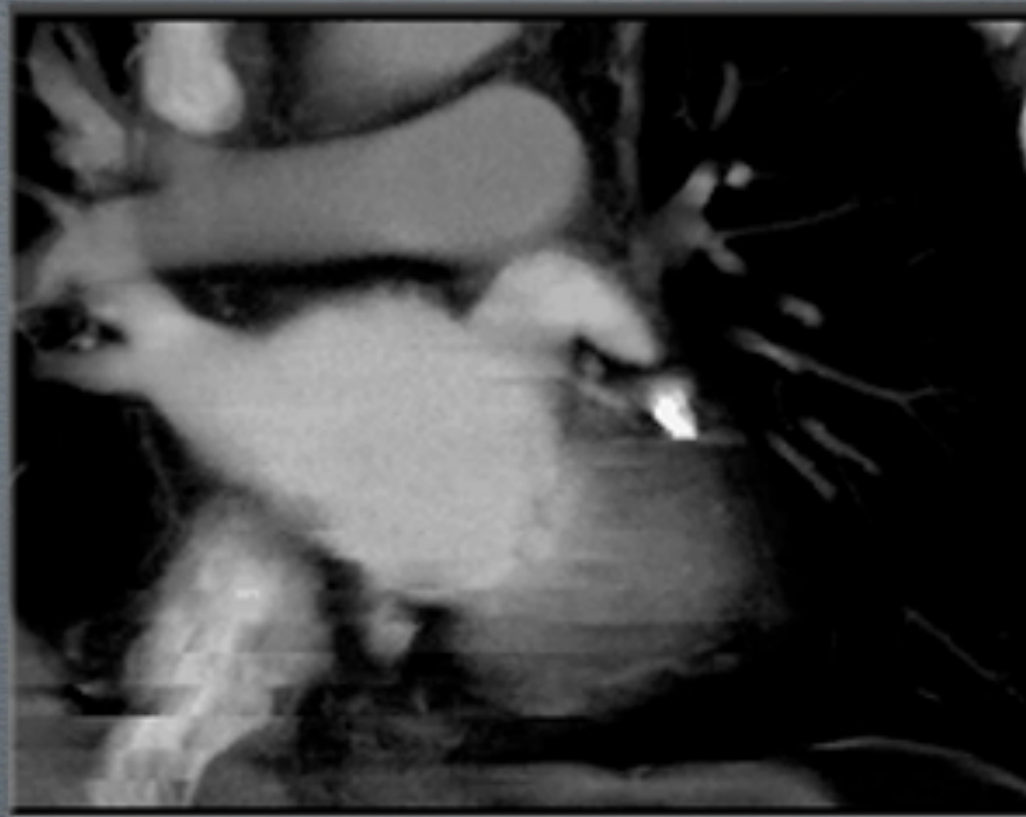


Other Cardiac Structures

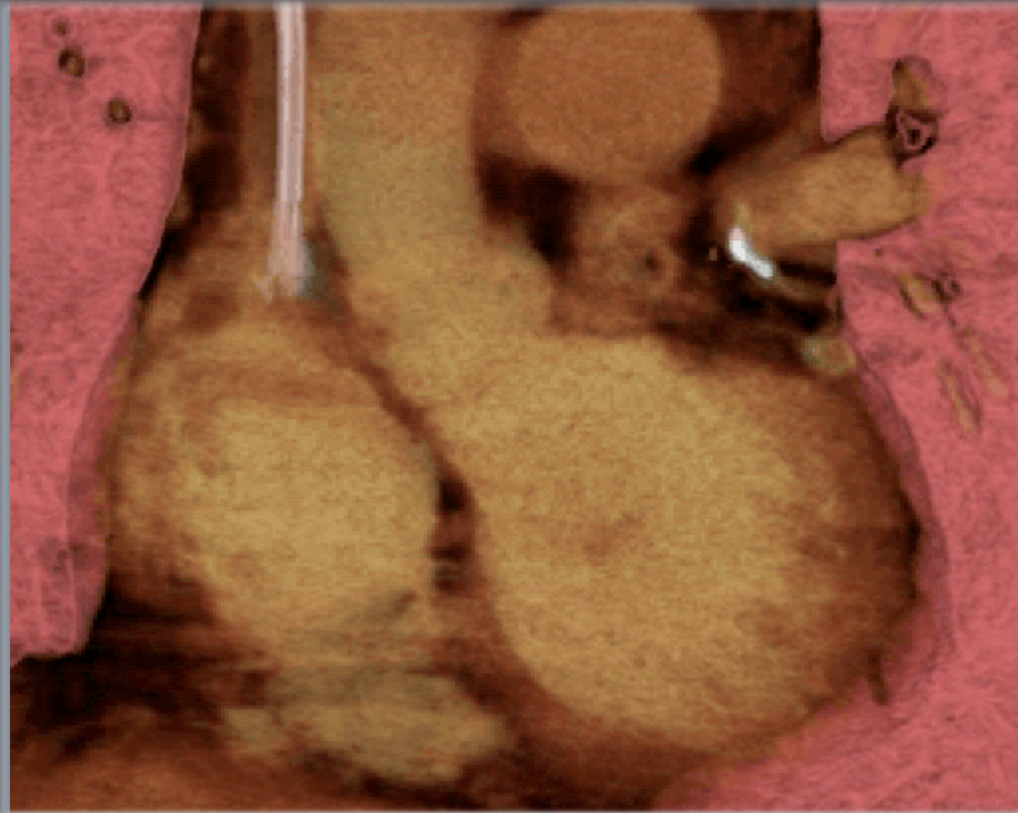
Evaluation of Intra- and Extracardiac Structures		
53.	<ul style="list-style-type: none"> • Characterization of native cardiac valves • Suspected clinically significant valvular dysfunction • Inadequate images from other noninvasive methods 	A (8)
54.	<ul style="list-style-type: none"> • Characterization of prosthetic cardiac valves • Suspected clinically significant valvular dysfunction • Inadequate images from other noninvasive methods 	A (8)
55.	<ul style="list-style-type: none"> • Initial evaluation of cardiac mass (suspected tumor or thrombus) 	I (3)
56.	<ul style="list-style-type: none"> • Evaluation of cardiac mass (suspected tumor or thrombus) • Inadequate images from other noninvasive methods 	A (8)
57.	<ul style="list-style-type: none"> • Evaluation of pericardial anatomy 	A (8)
58.	<ul style="list-style-type: none"> • Evaluation of pulmonary vein anatomy • Prior to radiofrequency ablation for atrial fibrillation 	A (8)
59.	<ul style="list-style-type: none"> • Noninvasive coronary vein mapping • Prior to placement of biventricular pacemaker 	A (8)
60.	<ul style="list-style-type: none"> • Localization of coronary bypass grafts and other retrosternal anatomy • Prior to reoperative chest or cardiac surgery 	A (8)

Pericardium

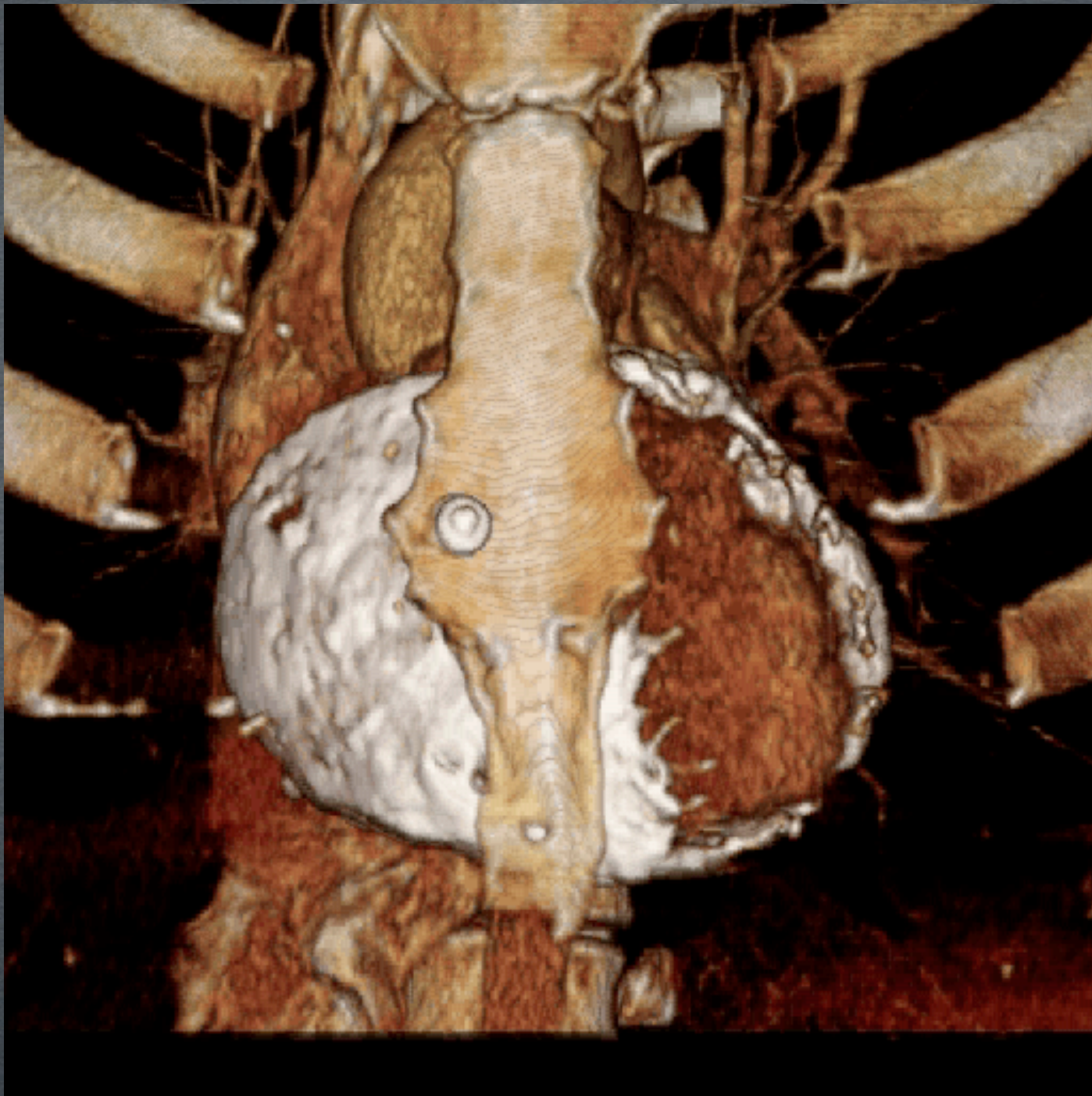
- Normal thickness is ≤ 2 mm
- Up to 50 ml fluid is normal
- Calcium associated with constriction
- Primary malignancy is rare
- Benign masses include hematoma, cyst, proteinaceous debris



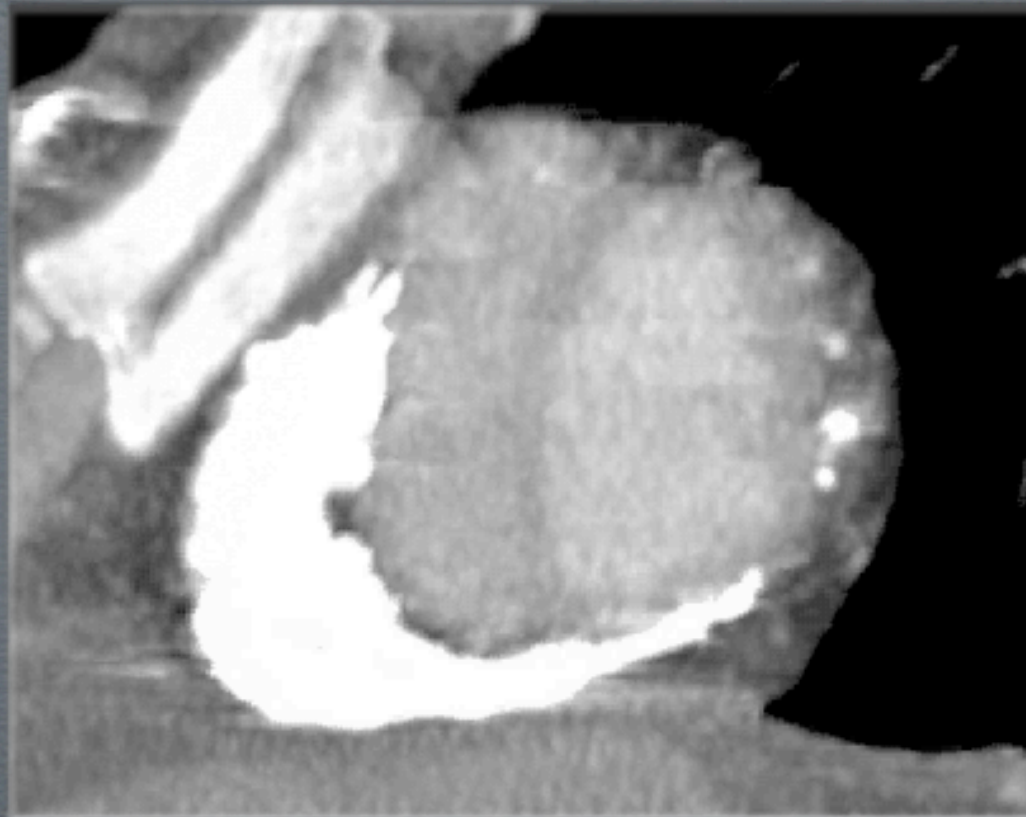
MOBILE PERICARDIAL CALCIFICATION



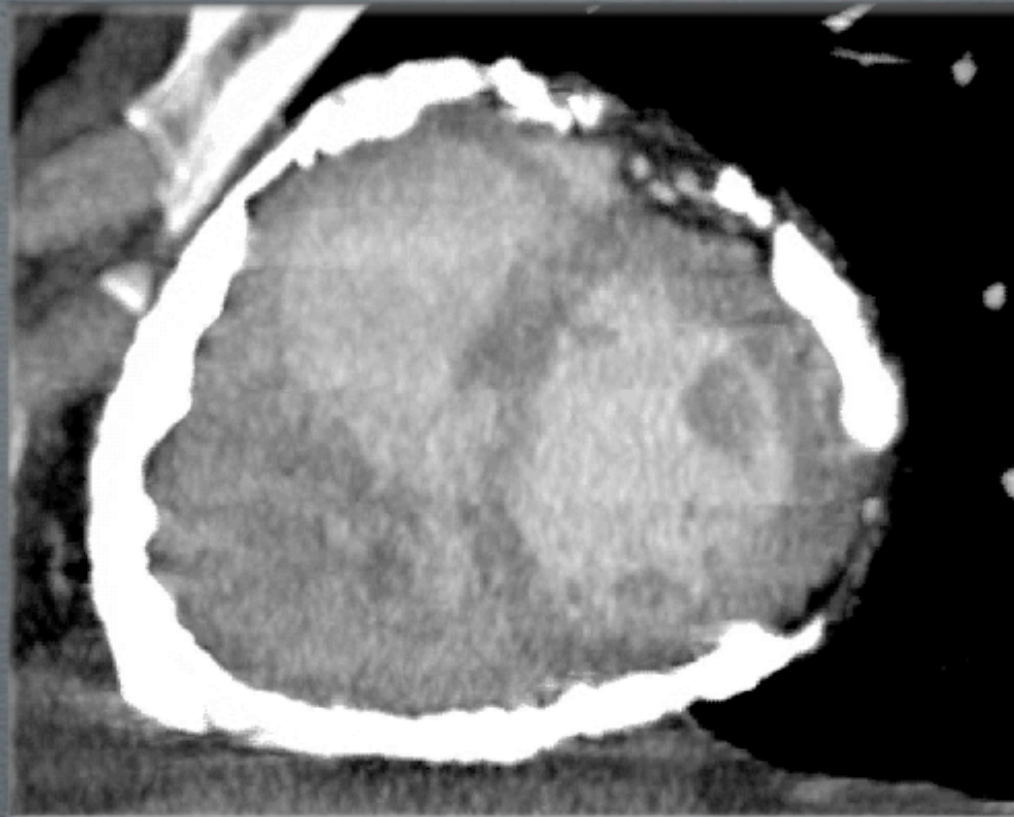
MOBILE PERICARDIAL CALCIFICATION



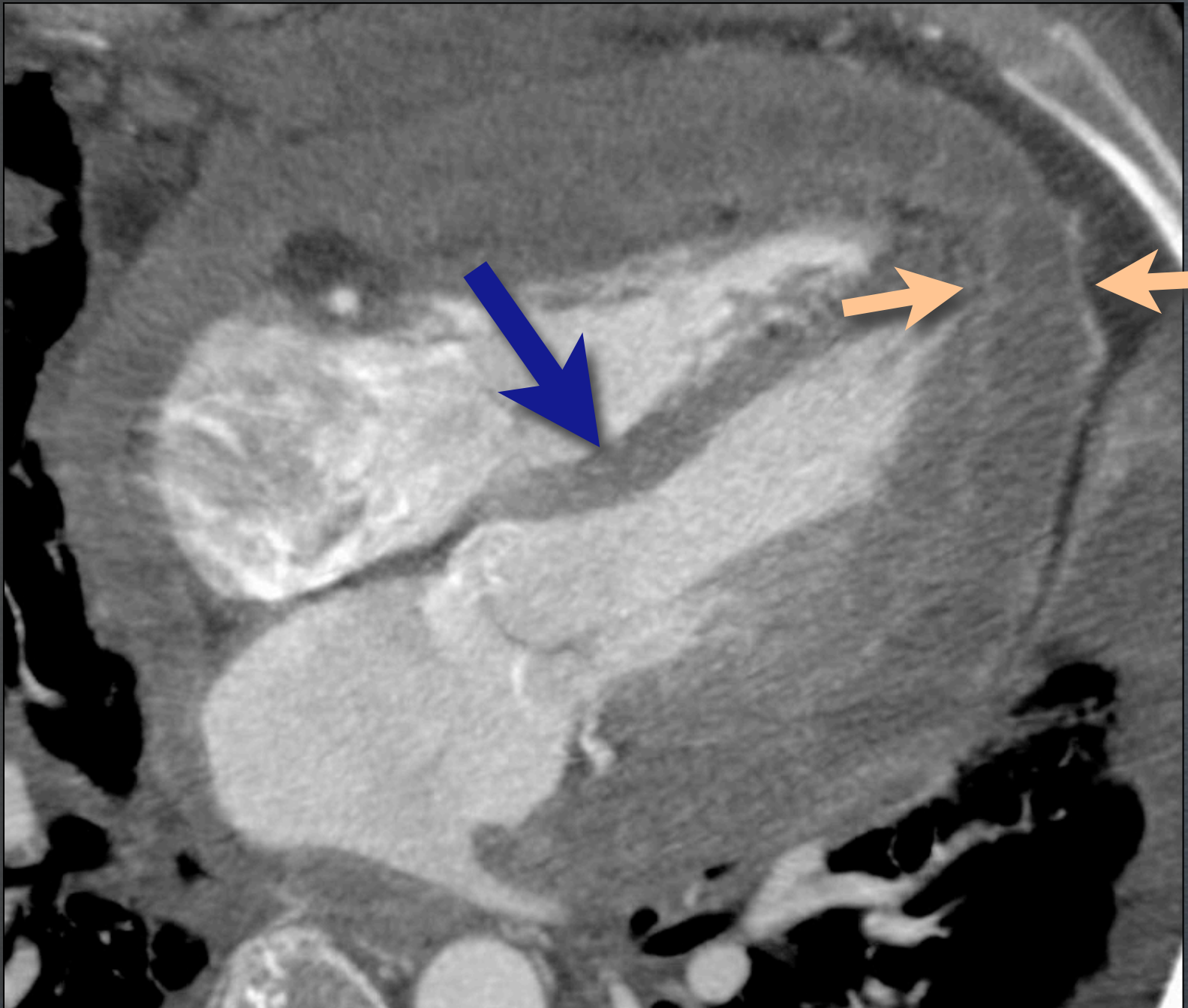
CALCIFIC PERICARDITIS



CALCIFIC PERICARDITIS



CALCIFIC PERICARDITIS



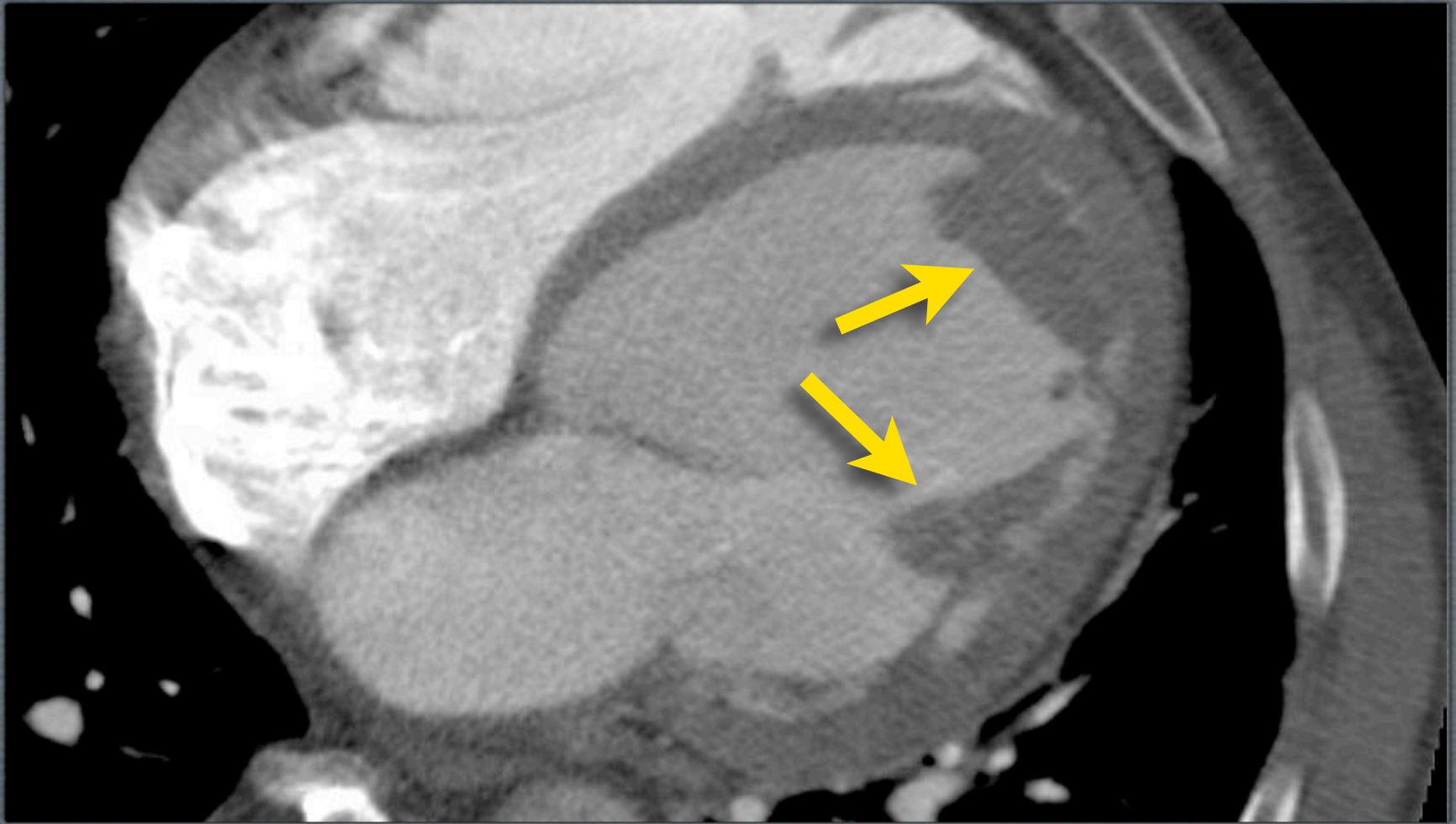
PERICARDIAL METASTASES



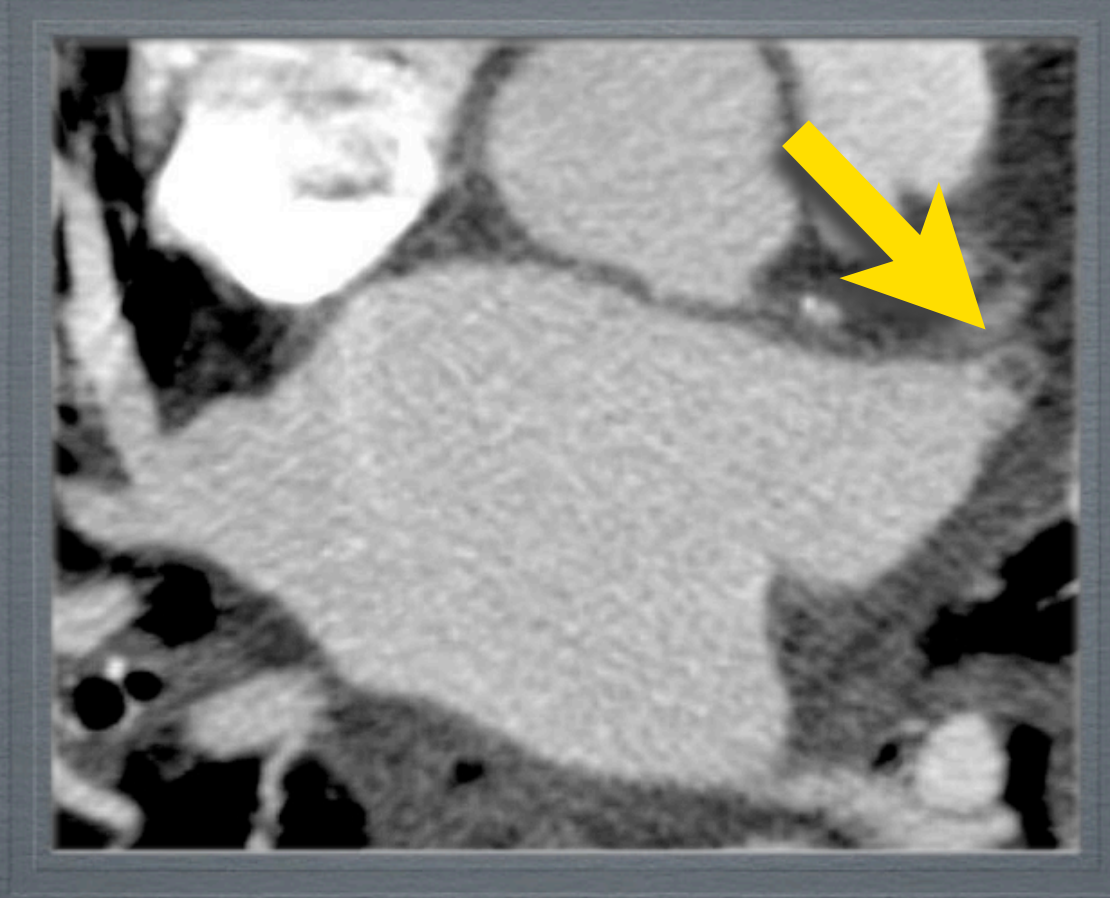
**DELAYED VIEW
PERICARDIAL METASTASES**

Myocardial Masses

- Thrombus most common mass, often associated with infarct or aneurysm
- Metastases are 20-40x more prevalent than primary malignancy
- CT is excellent for delineating calcium and fat in masses



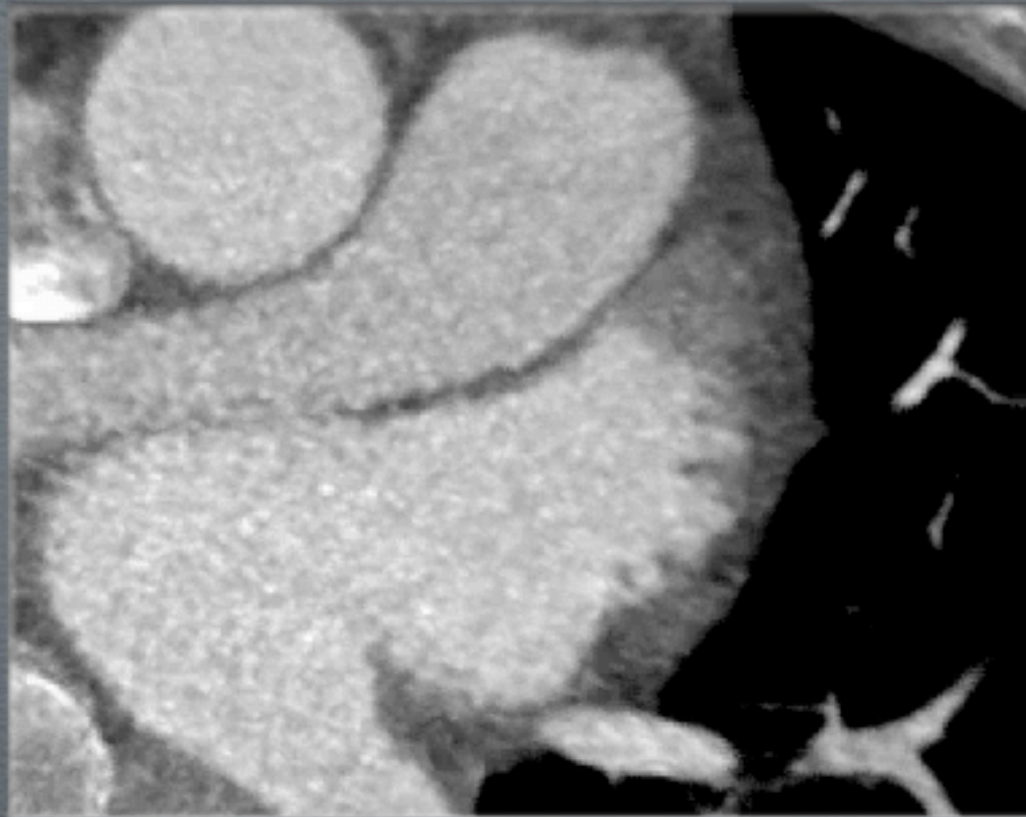
LEFT VENTRICULAR
THROMBUS



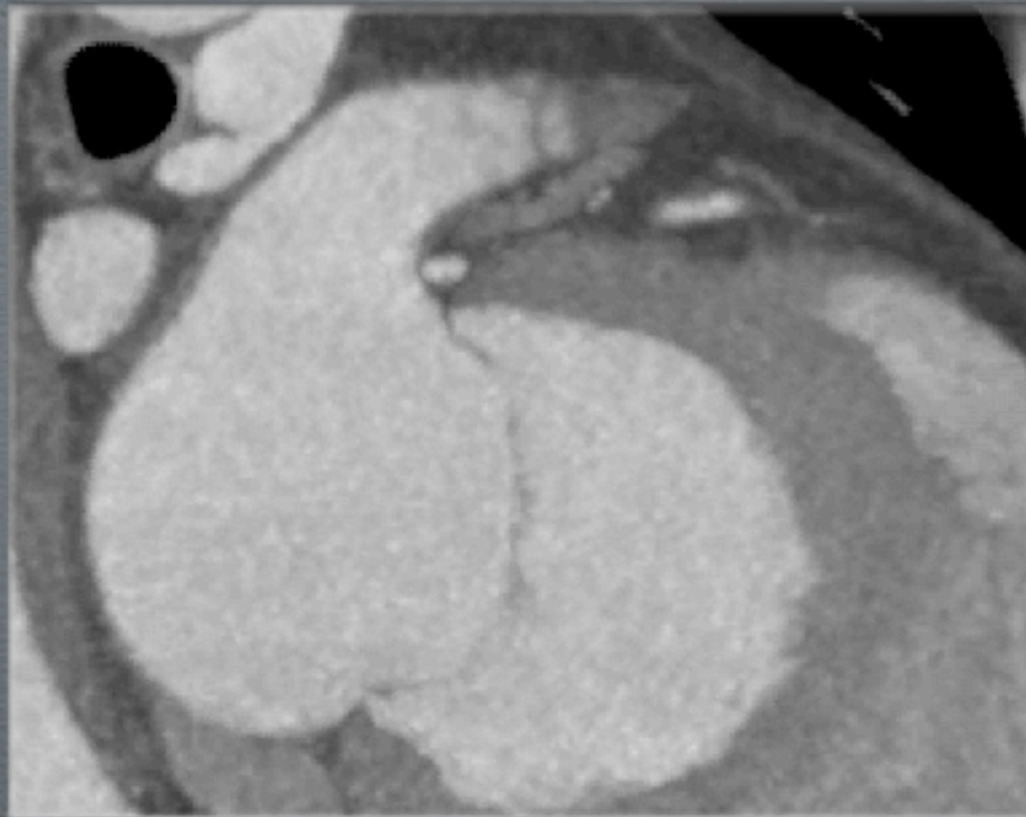
THROMBUS IN LEFT
ATRIAL APPENDAGE



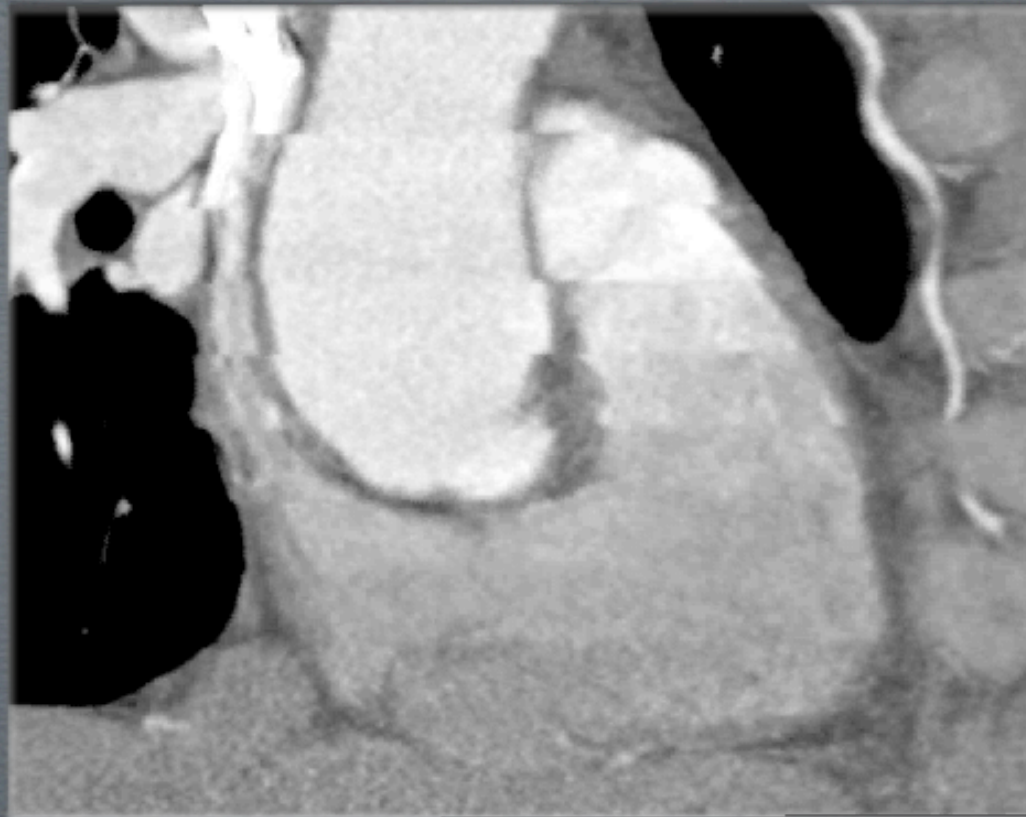
EMBOLUS TO RIGHT
RENAL ARTERY



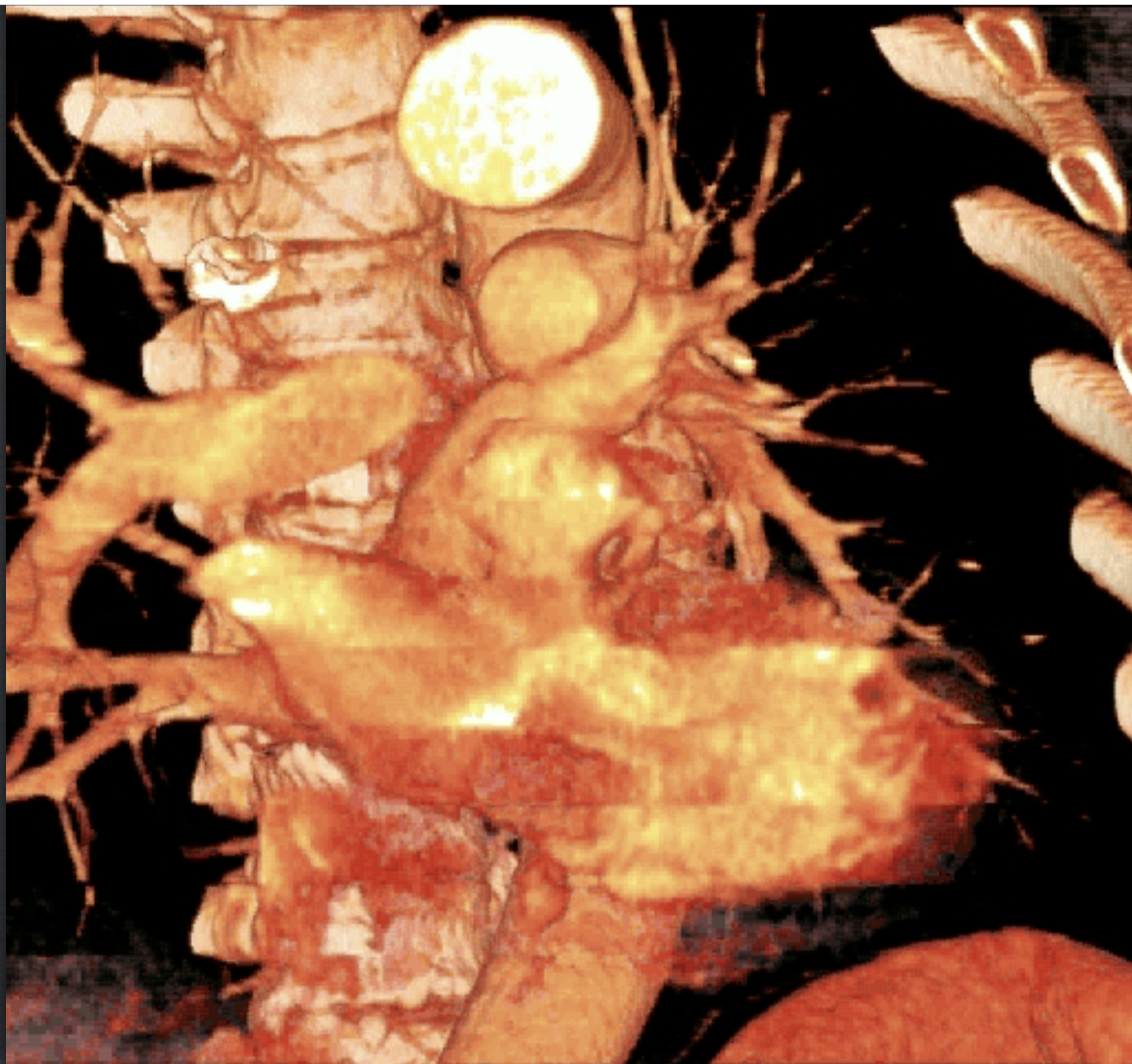
THROMBUS IN LEFT
ATRIAL APPENDAGE ?

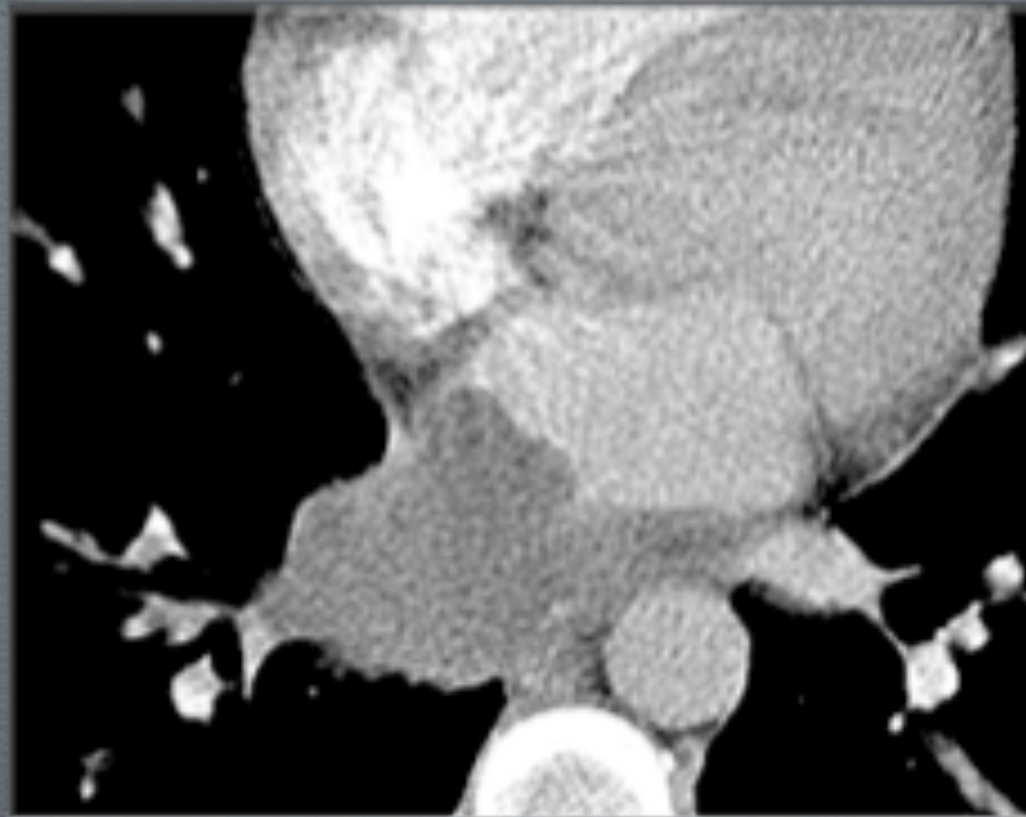


THROMBUS IN LEFT
ATRIAL APPENDAGE ?



RIGHT VENTRICULAR CARCINOID





RHABDOMYOSARCOMA

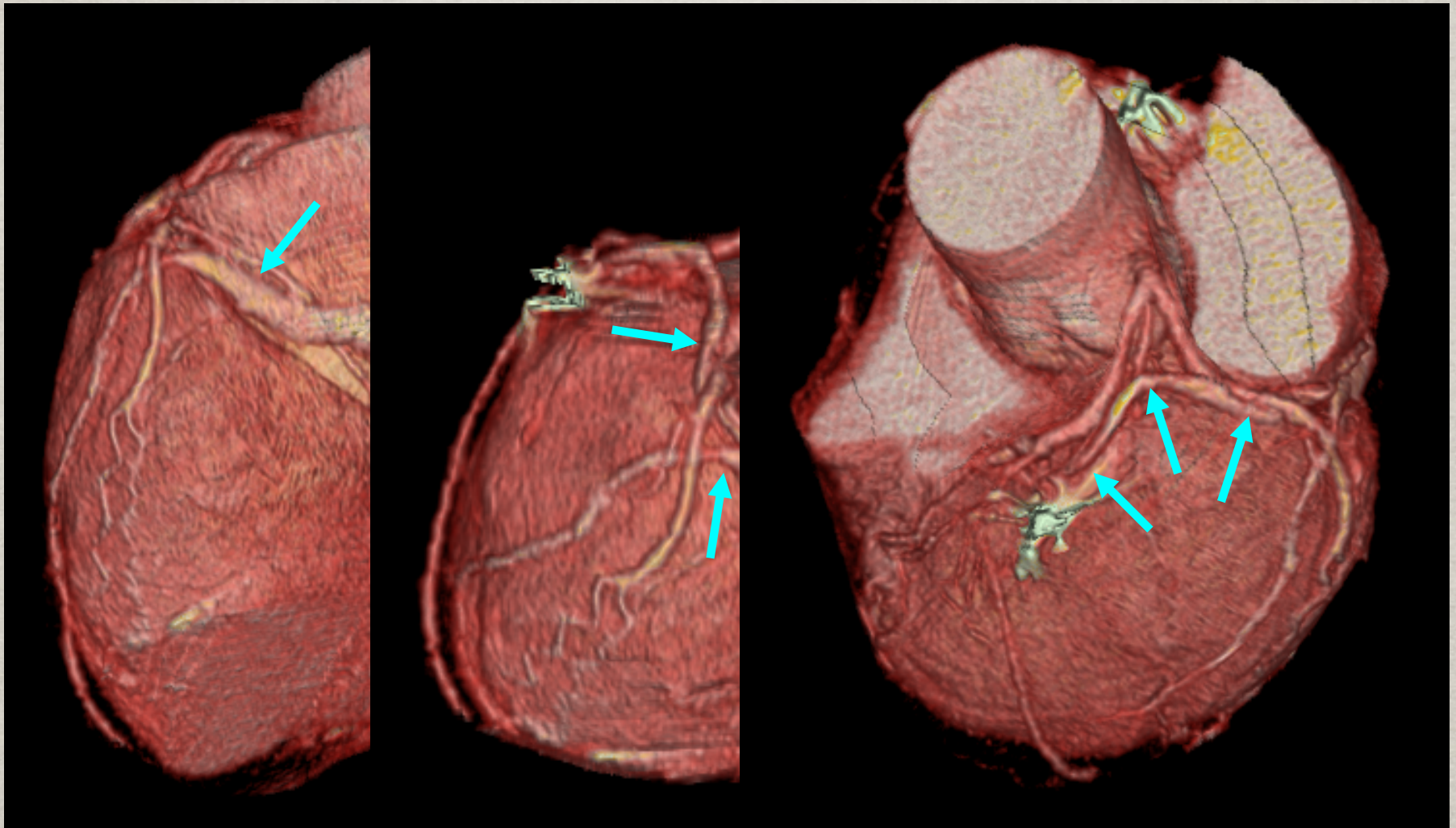
Anatomical Mapping

- Left atrium and pulmonary veins
 - Planning ablation for atrial fibrillation
- Coronary sinus
 - Bi-ventricular pacing for improved contractile synchrony in severe CHF



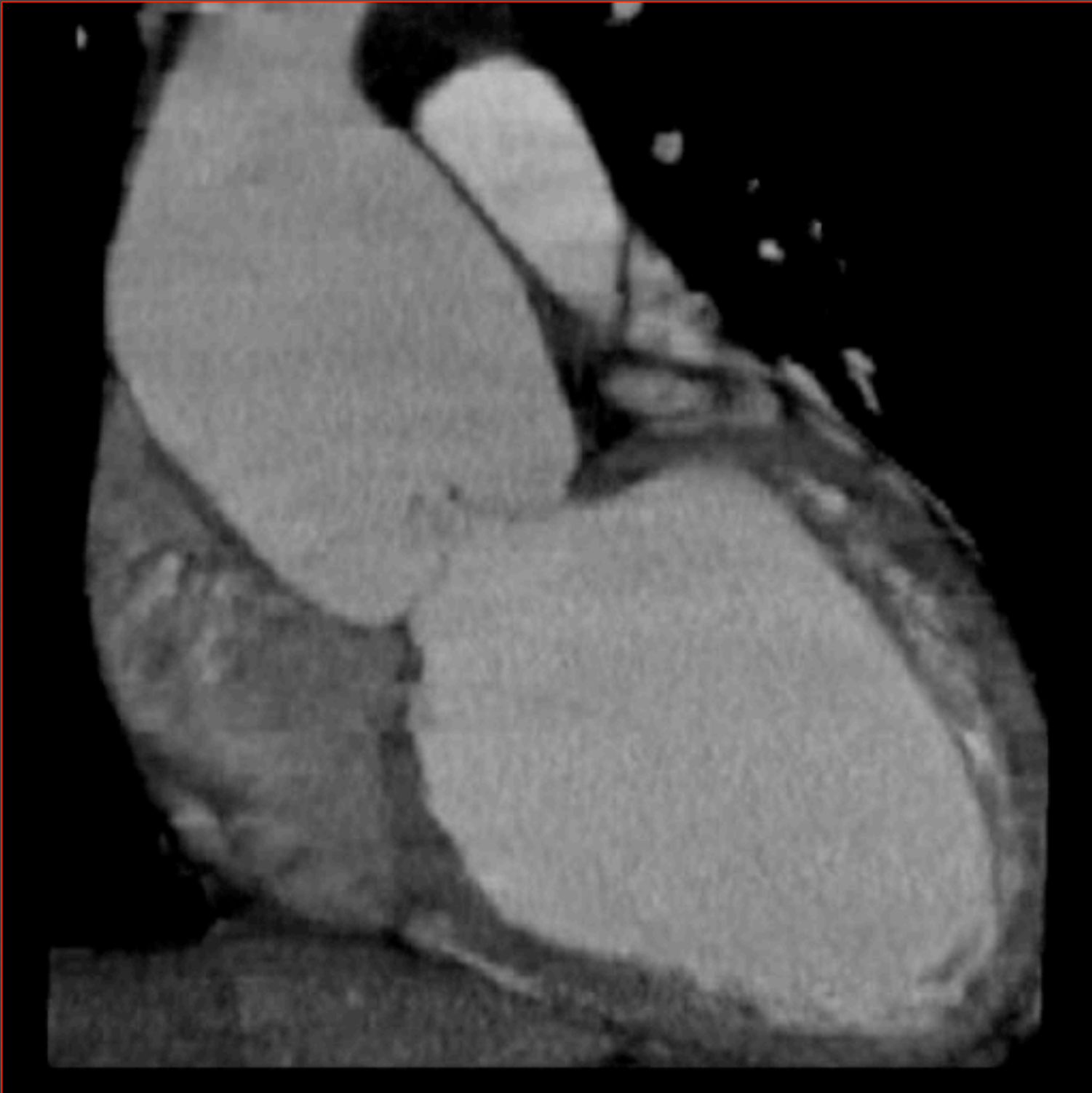
LEFT ATRIAL MAPPING

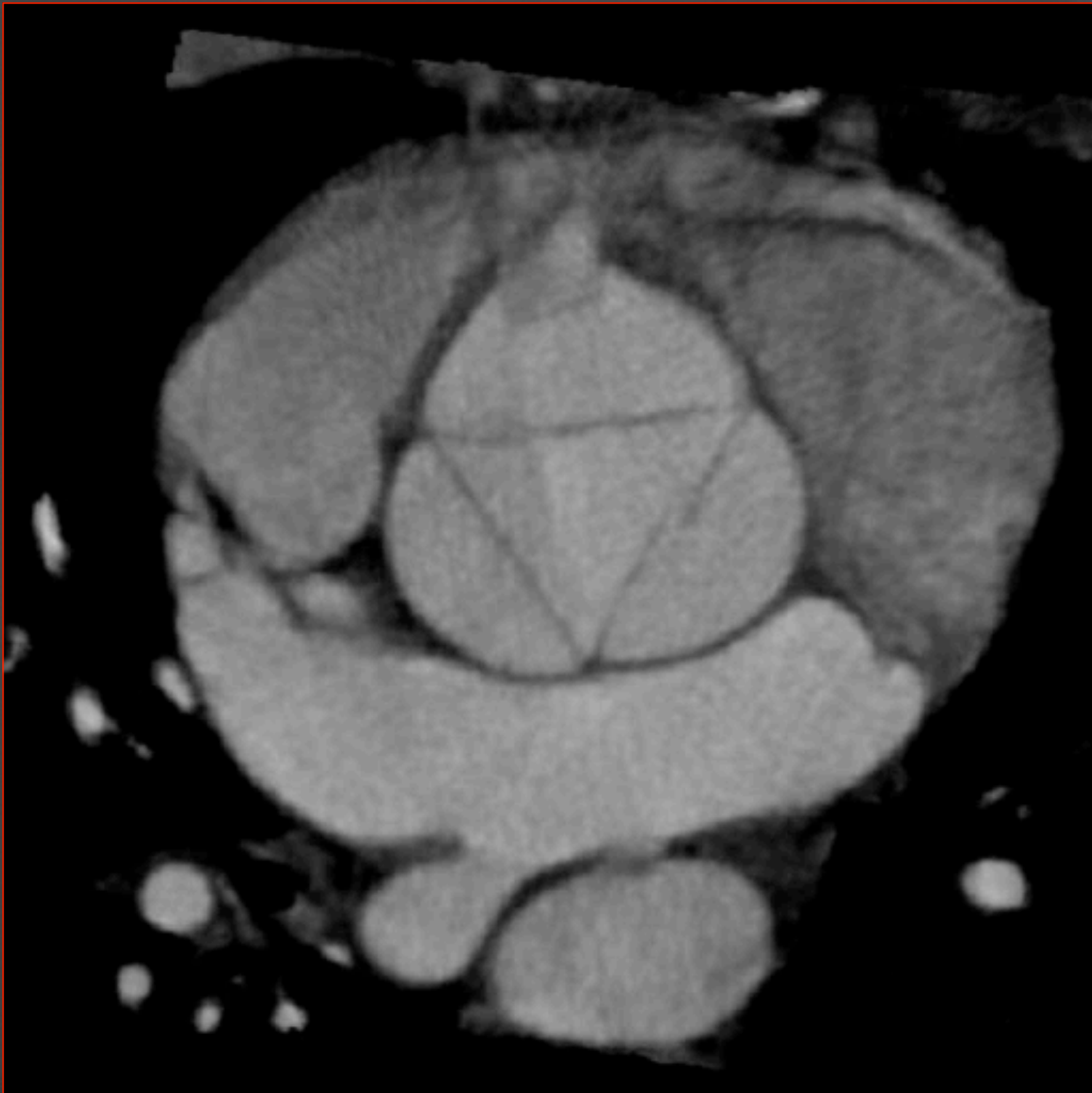
CORONARY VEIN MAPPING

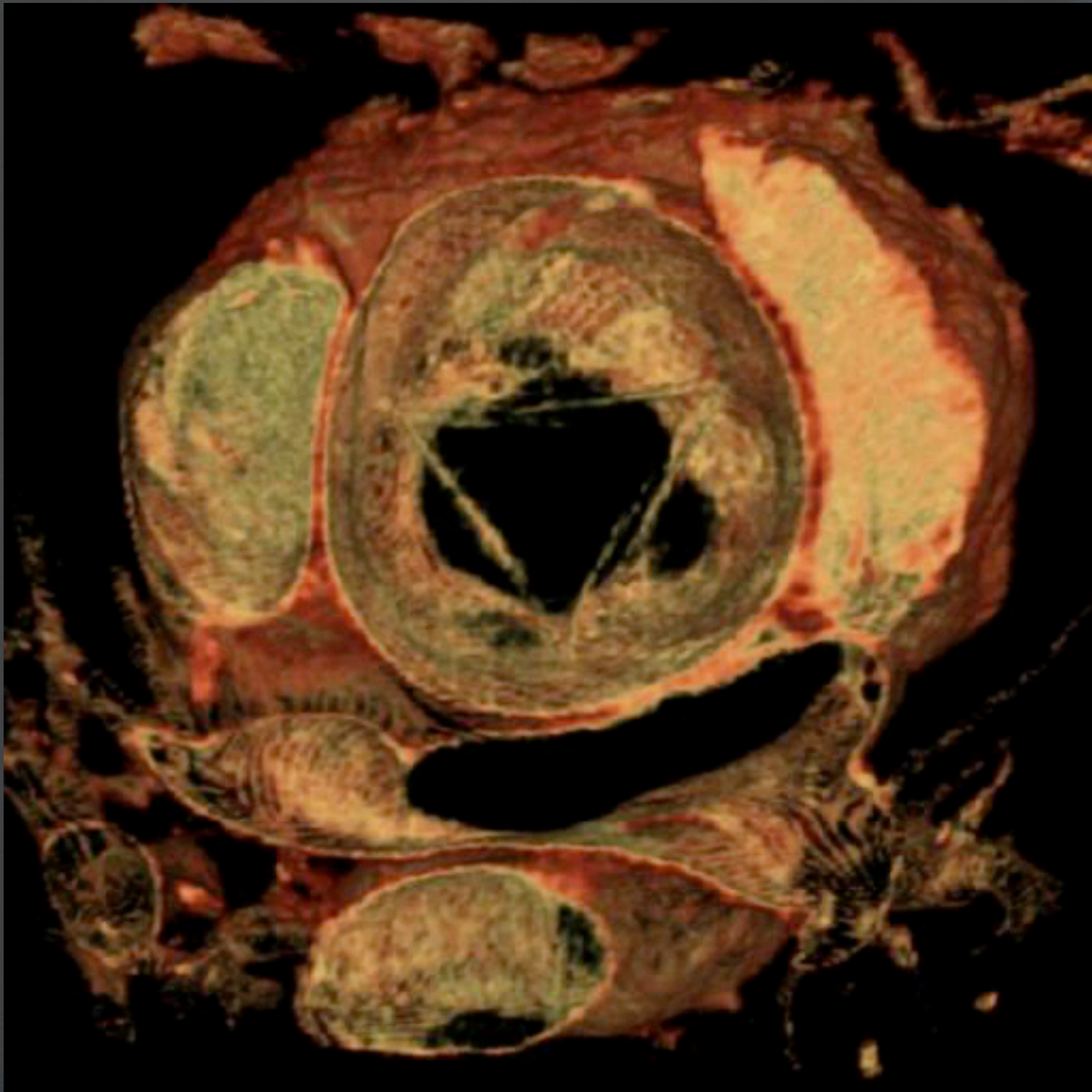


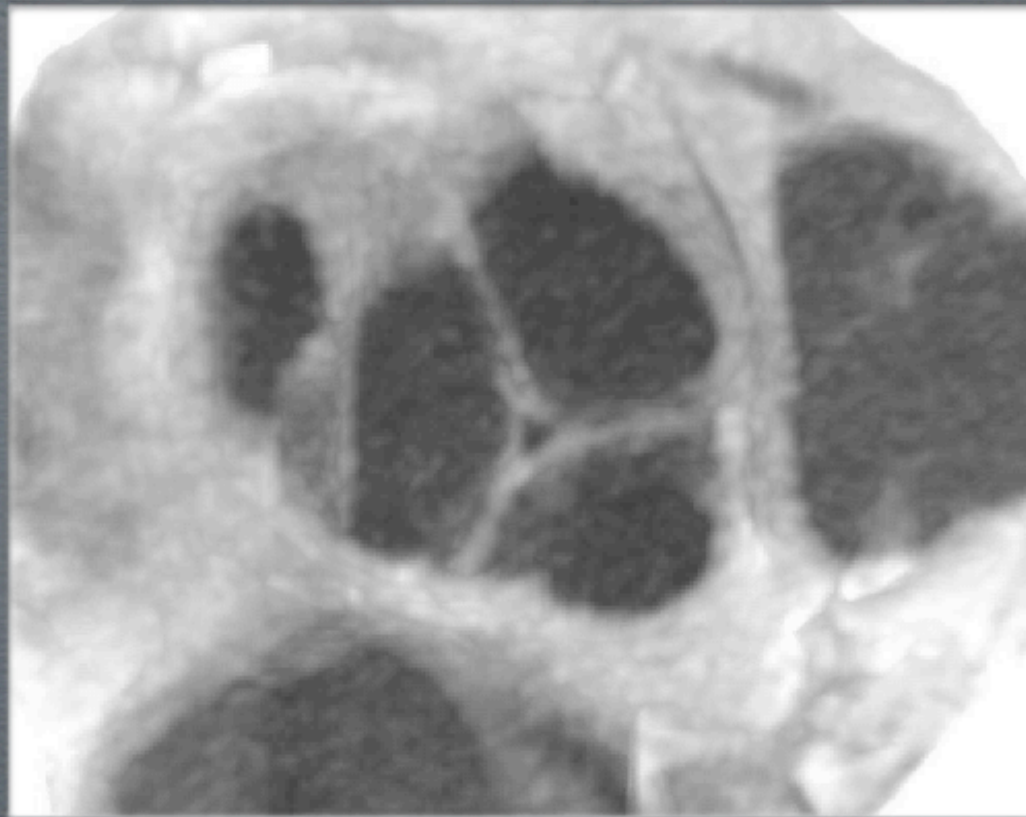
Valvular and Peri-Valvular Disease

- Aortoanuloectasia
- Aortic Valvular Stenosis
- Prosthetic valve assessment
- Acute Aortic Syndromes





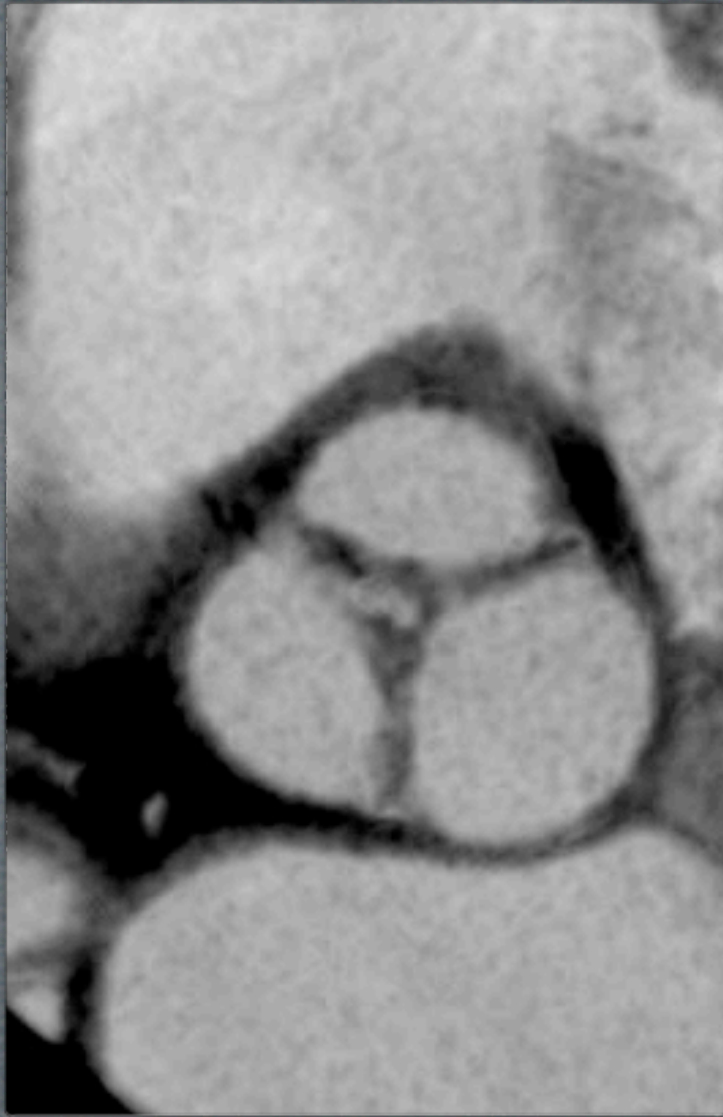




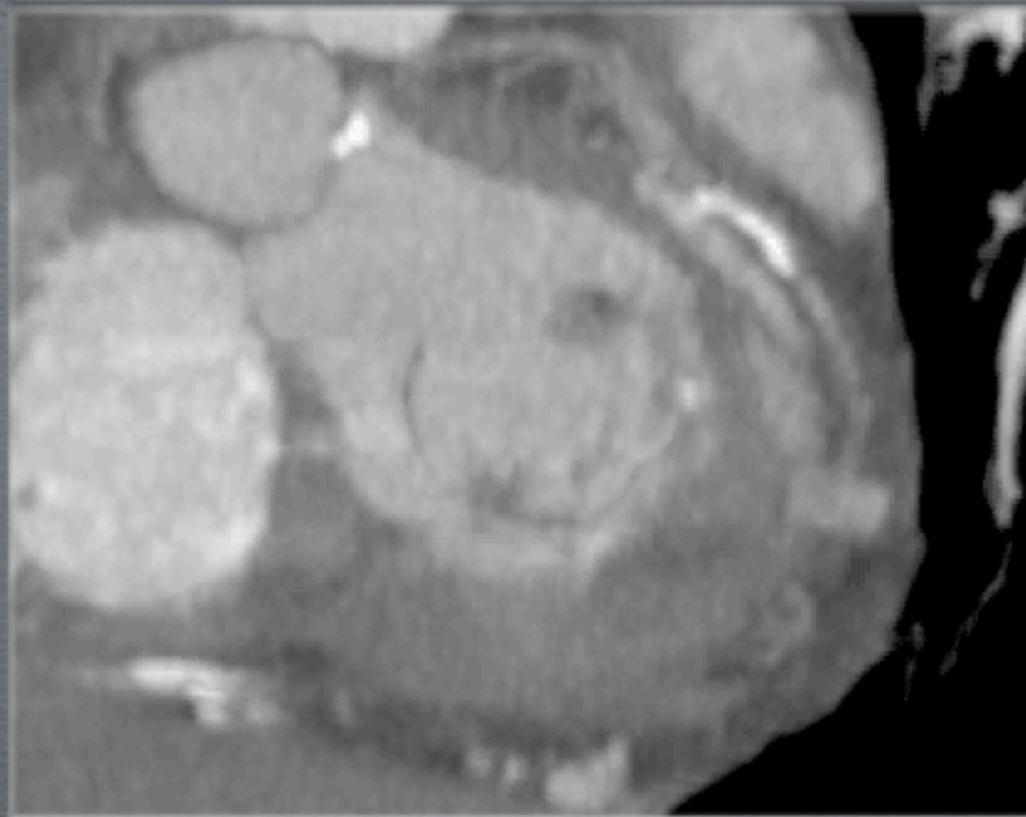
MINIMUM INTENSITY PROJECTION



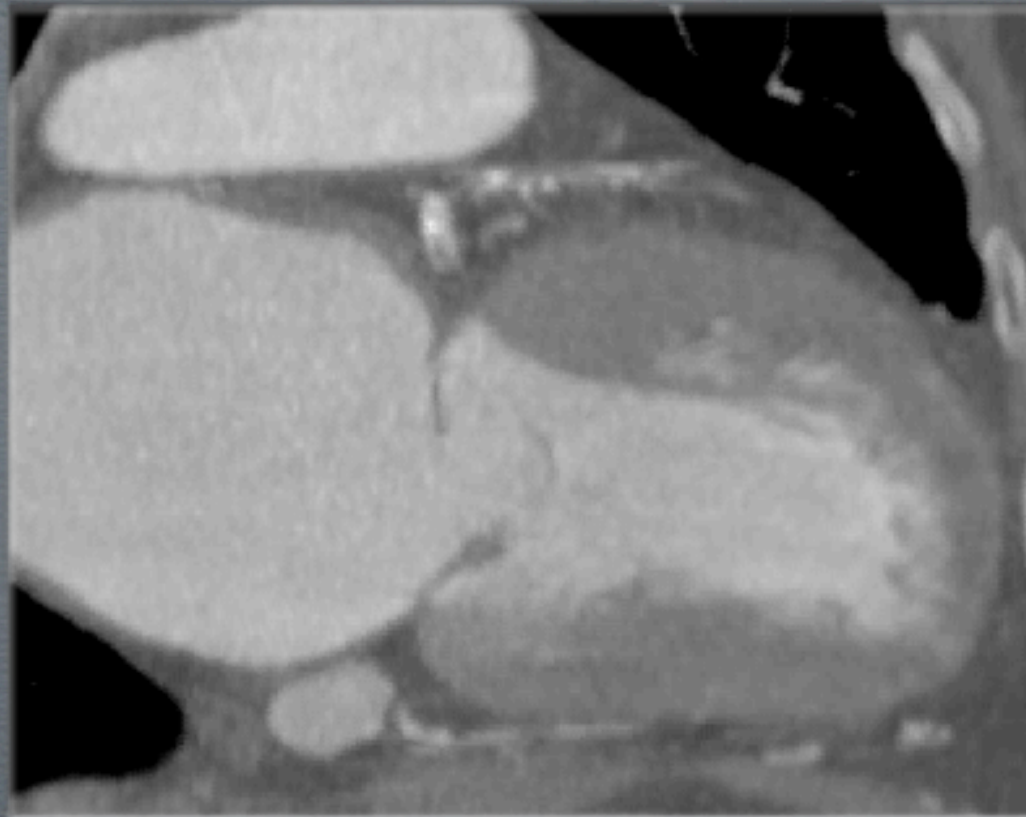




BICUSPID AO VALVE

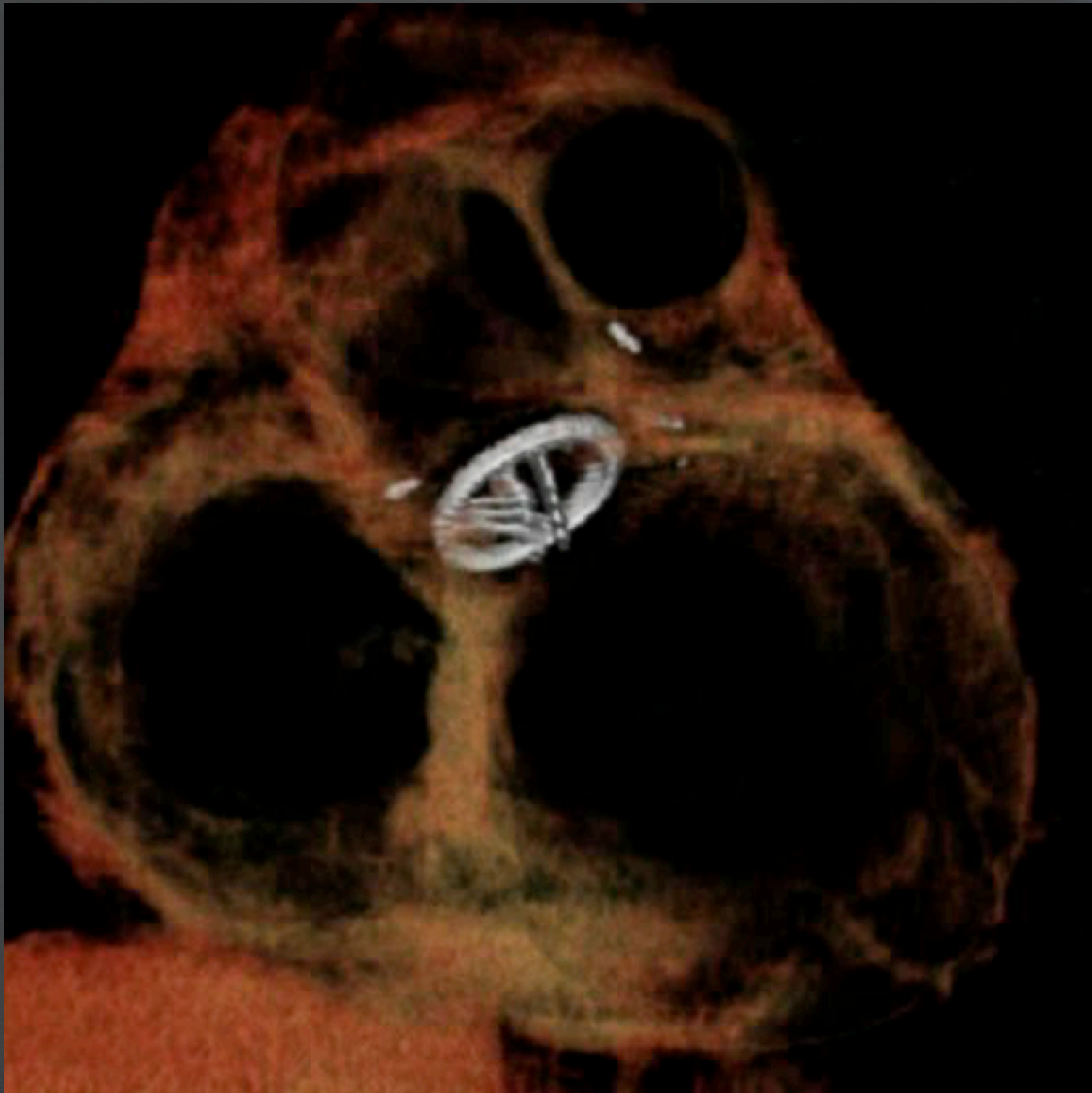


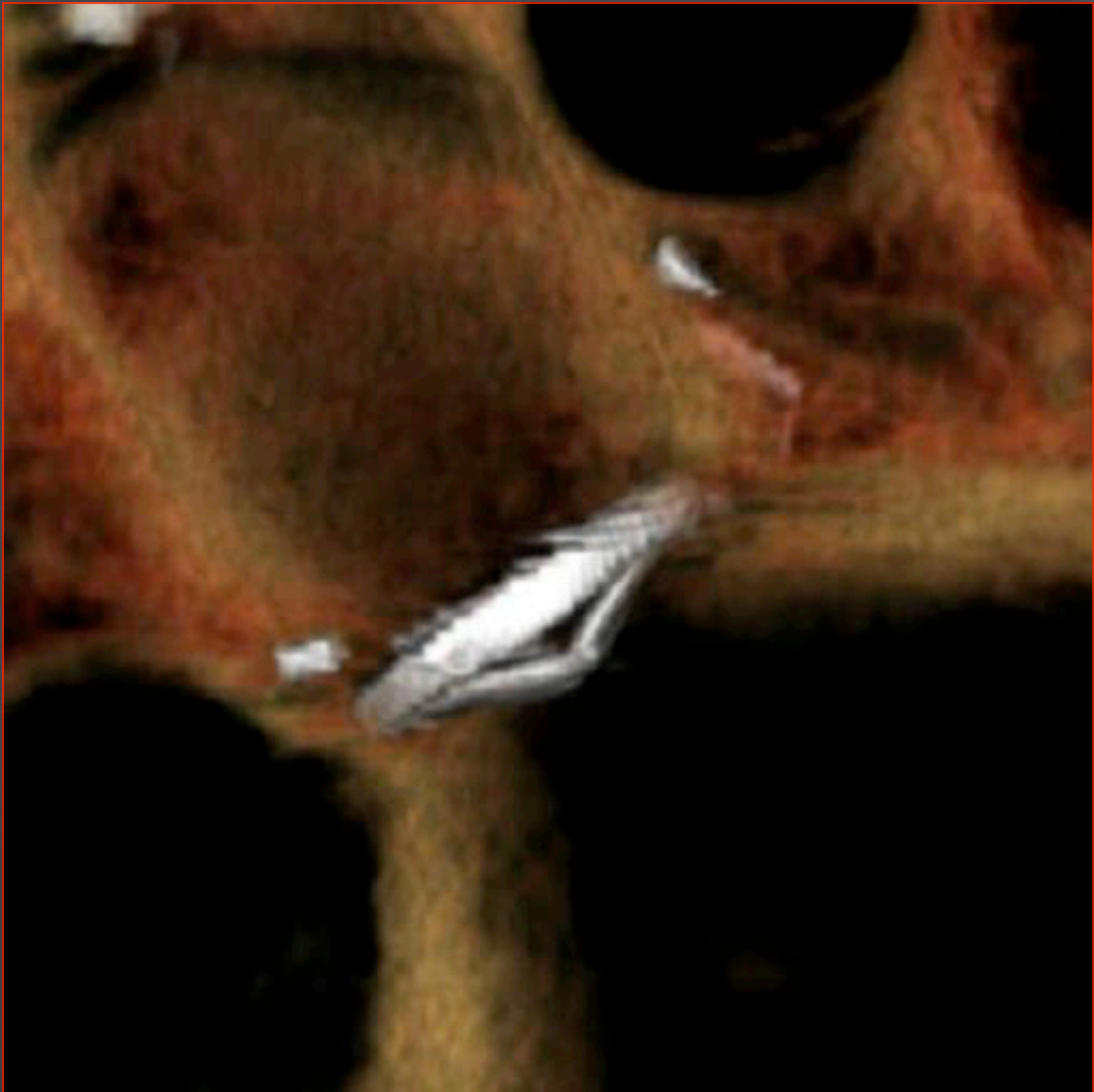
MITRAL VALVE

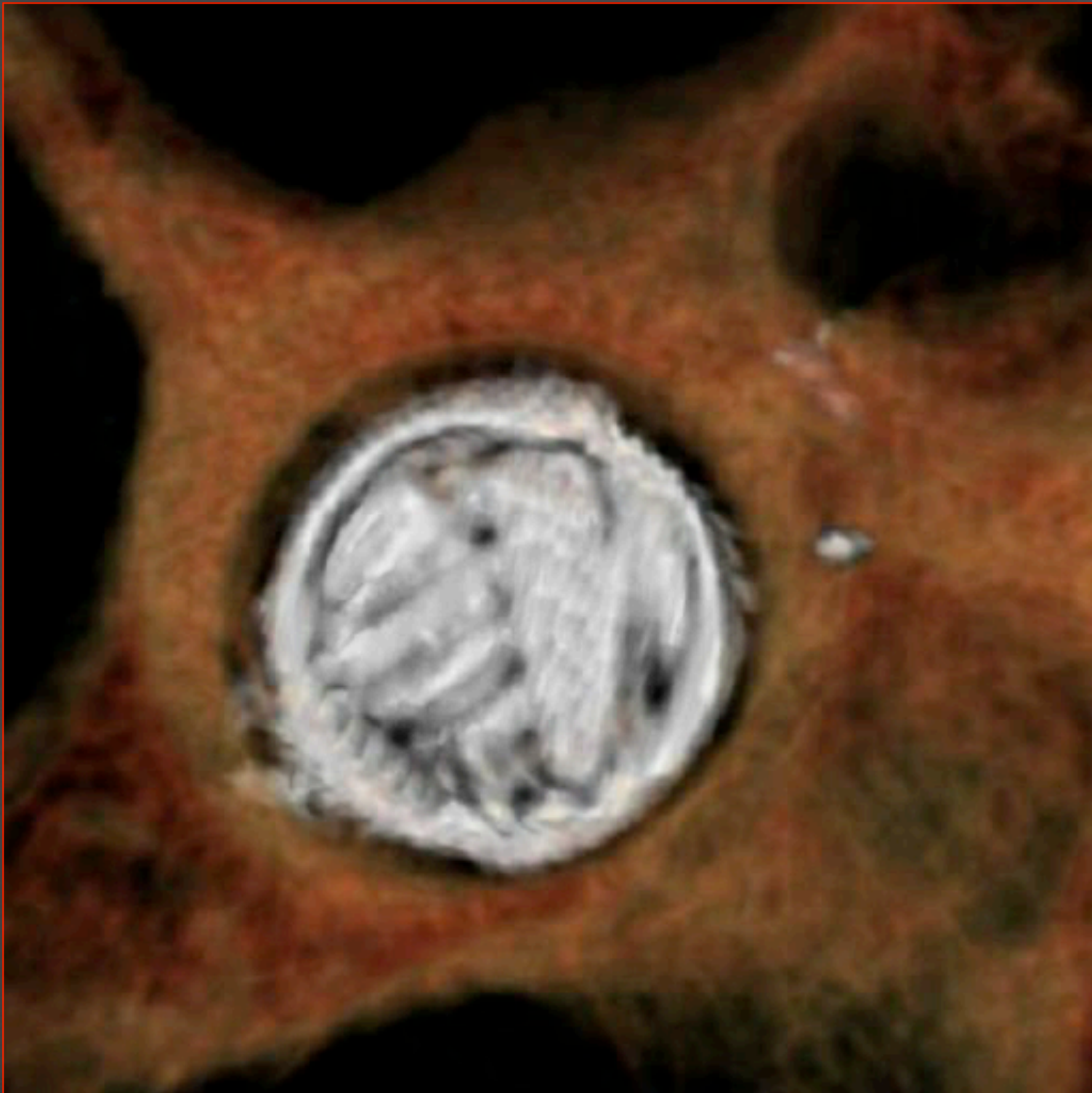


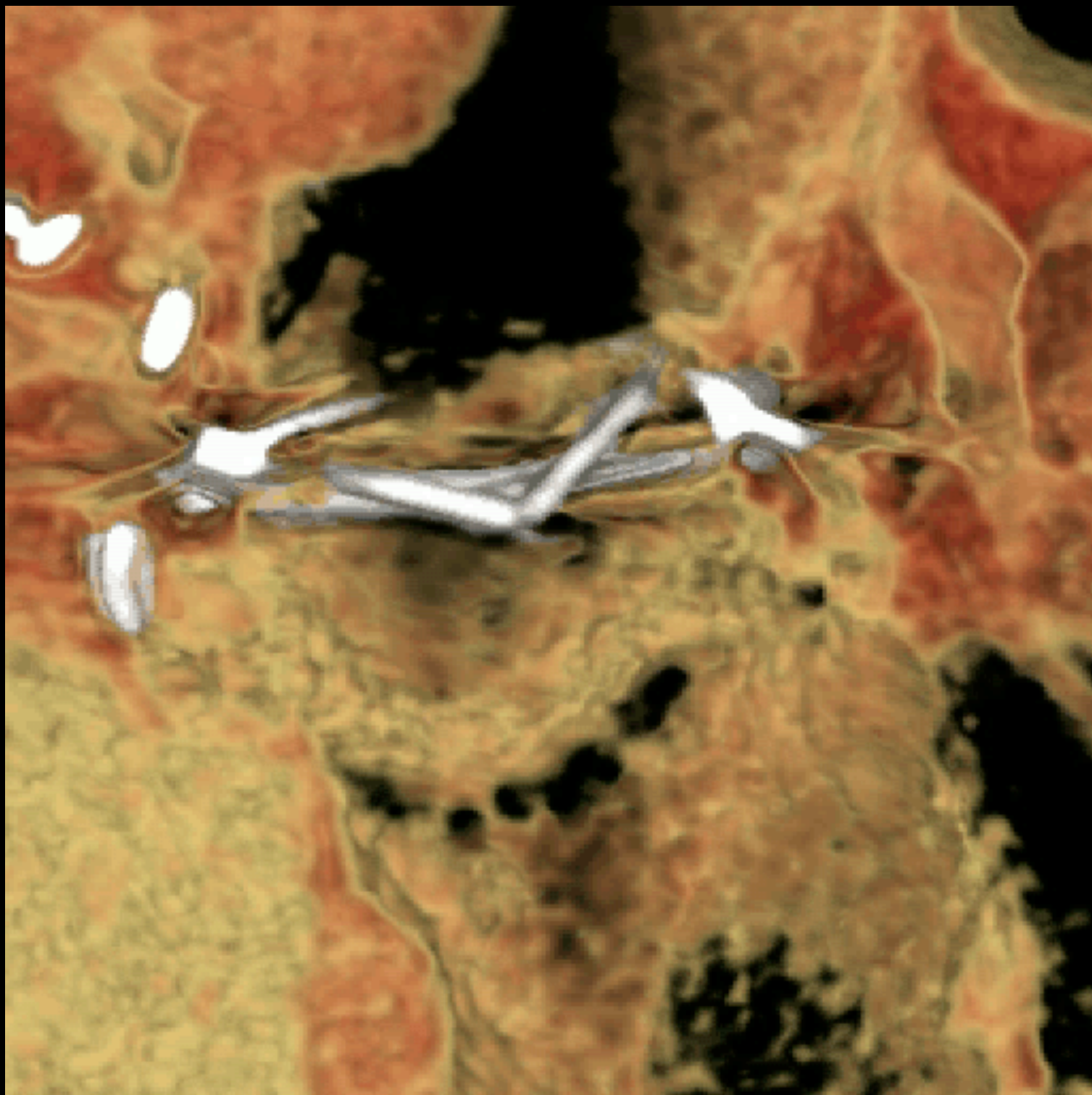
MITRAL VALVE PROLAPSE

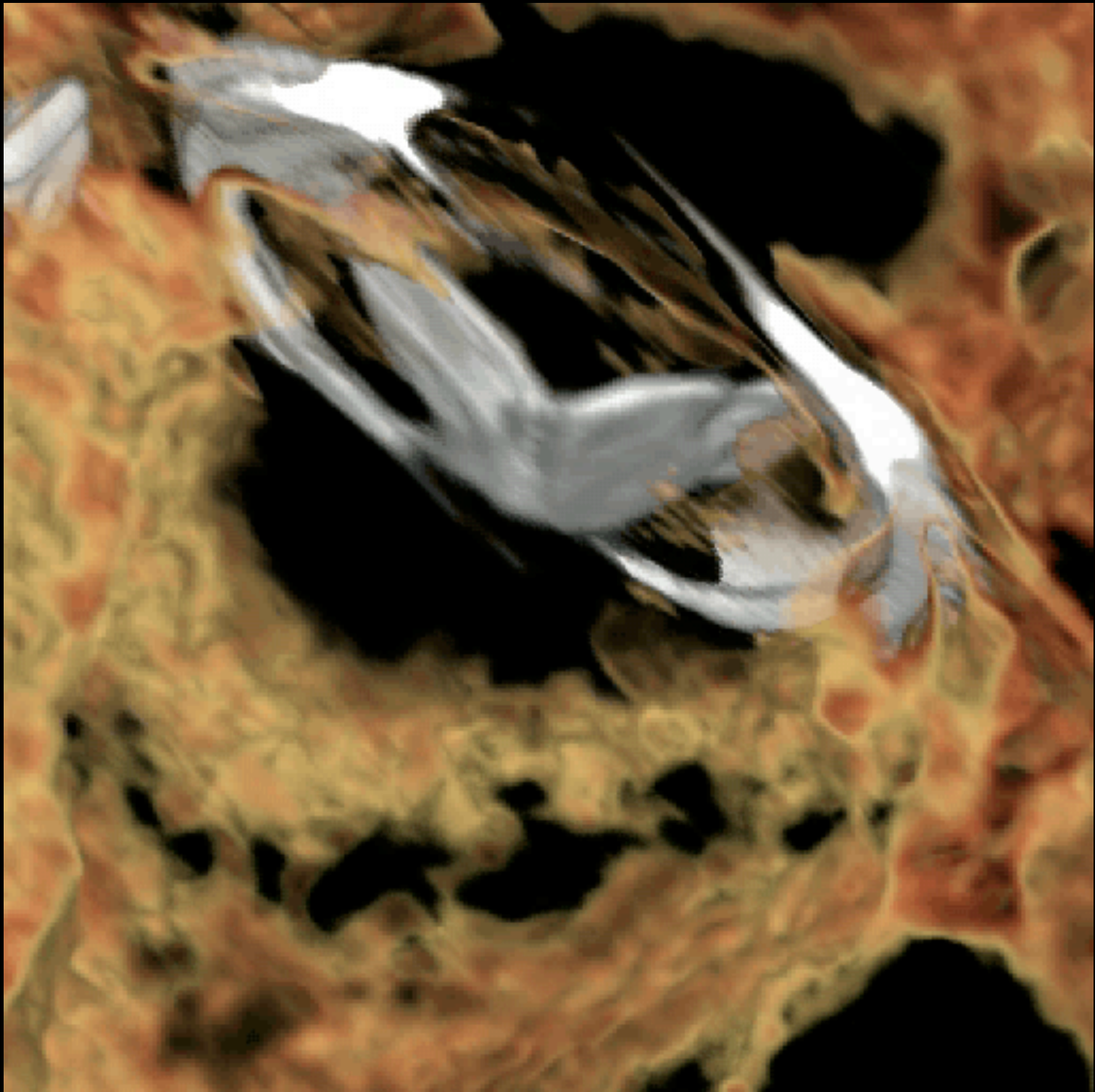


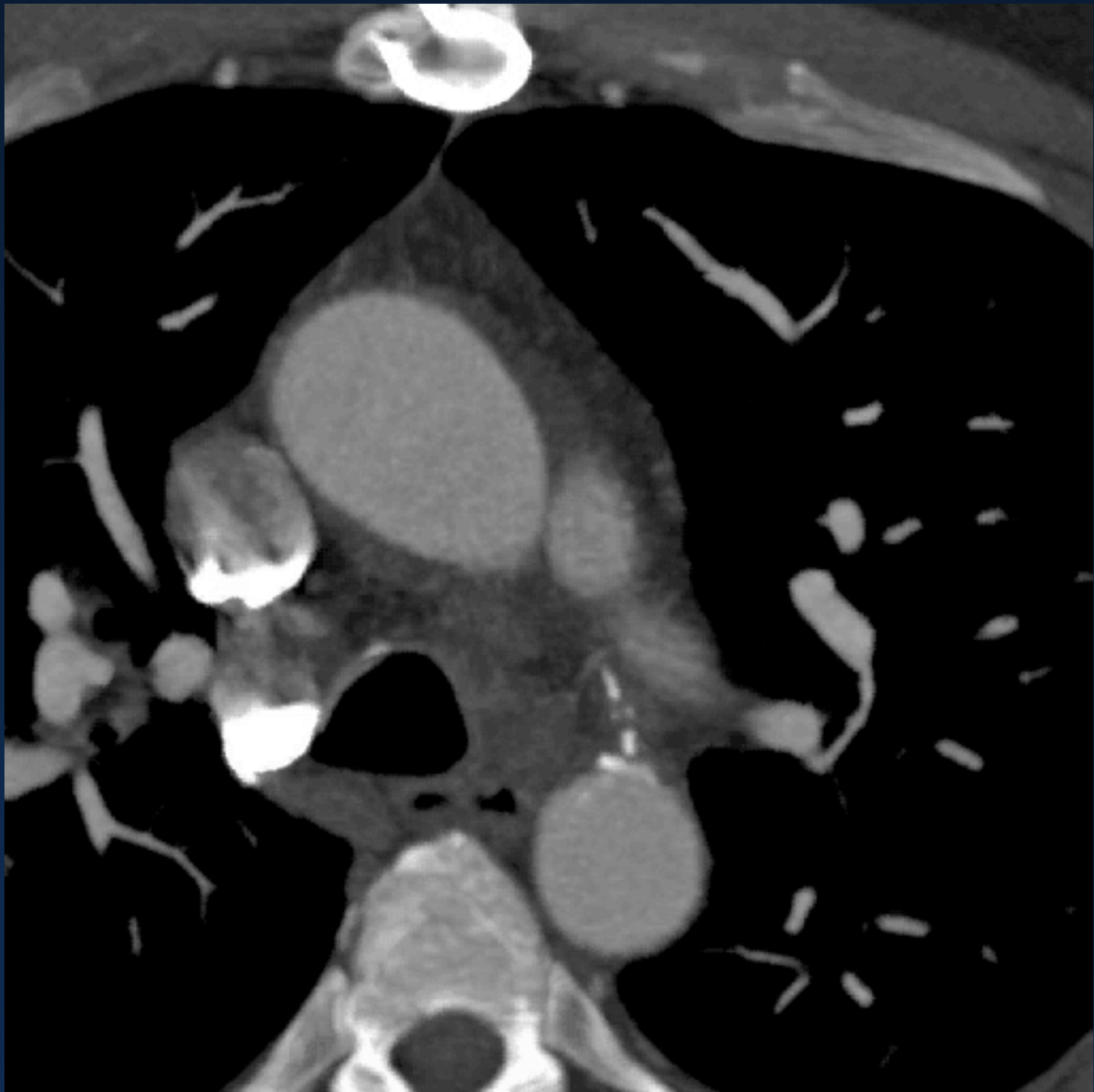


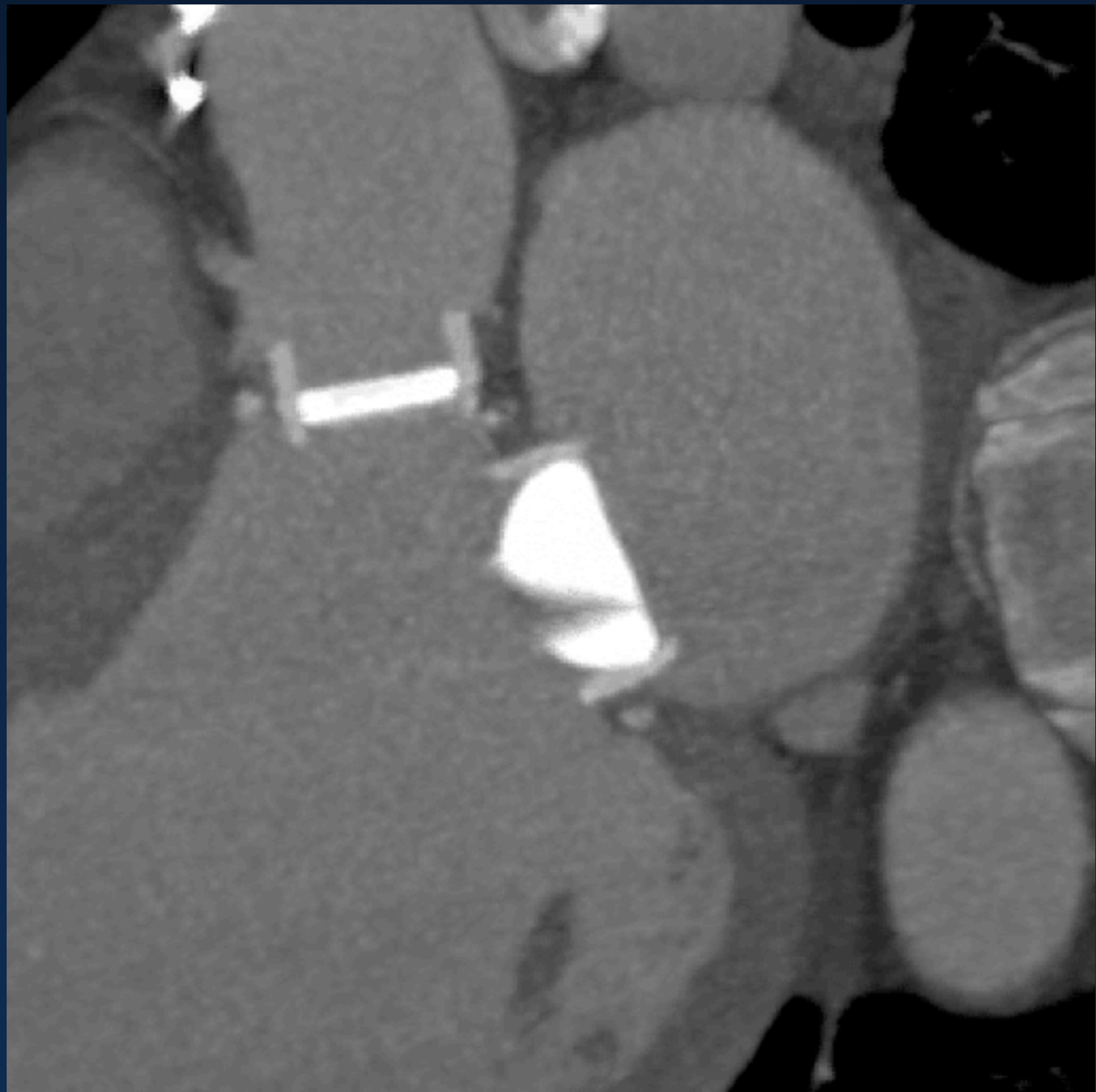


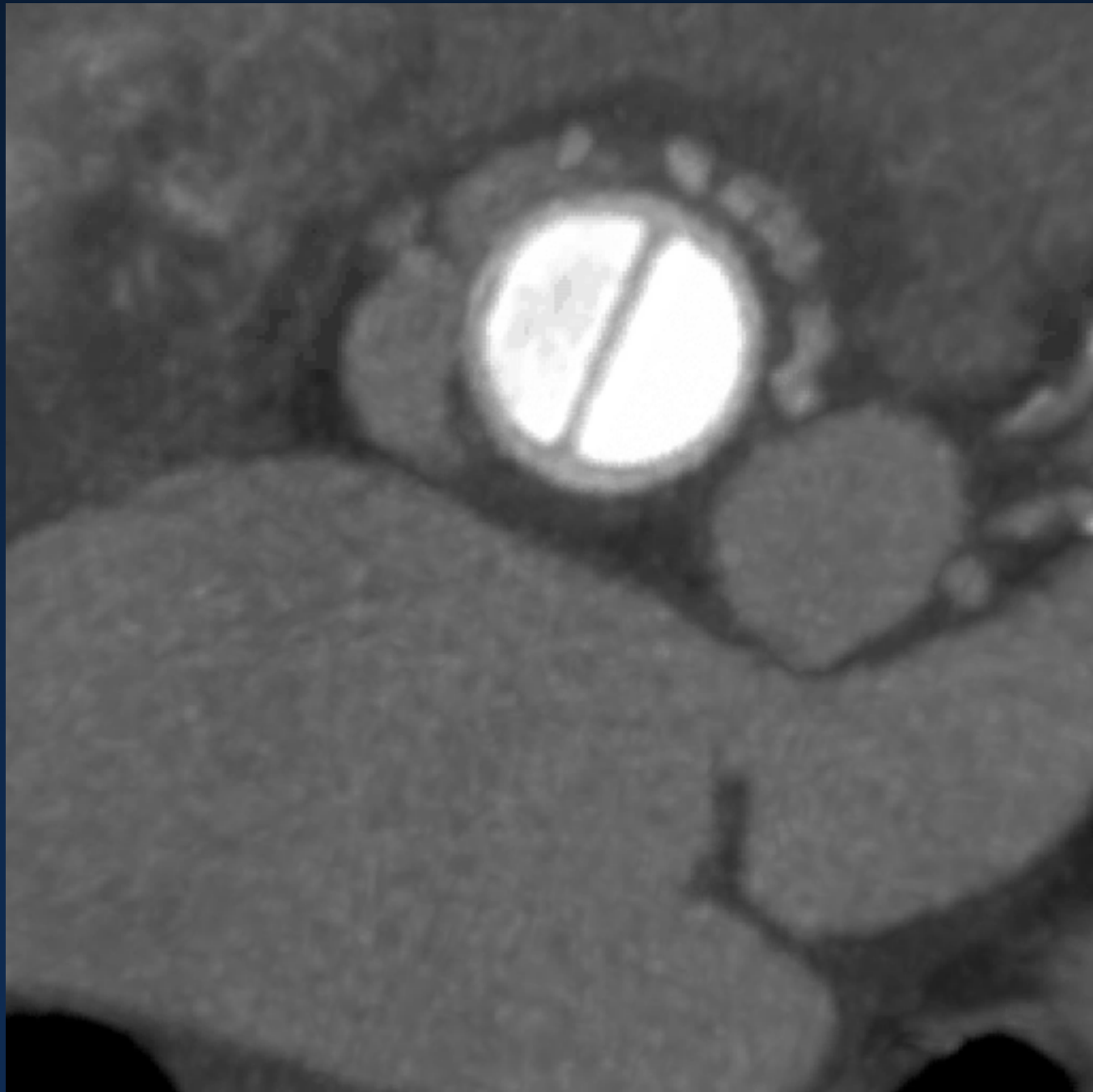














Summary

- MDCT allows rapid and detailed cardiac assessment
- Morphology and function
- Many applications beyond the coronary arteries

