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ZURICH HEART HOUSE

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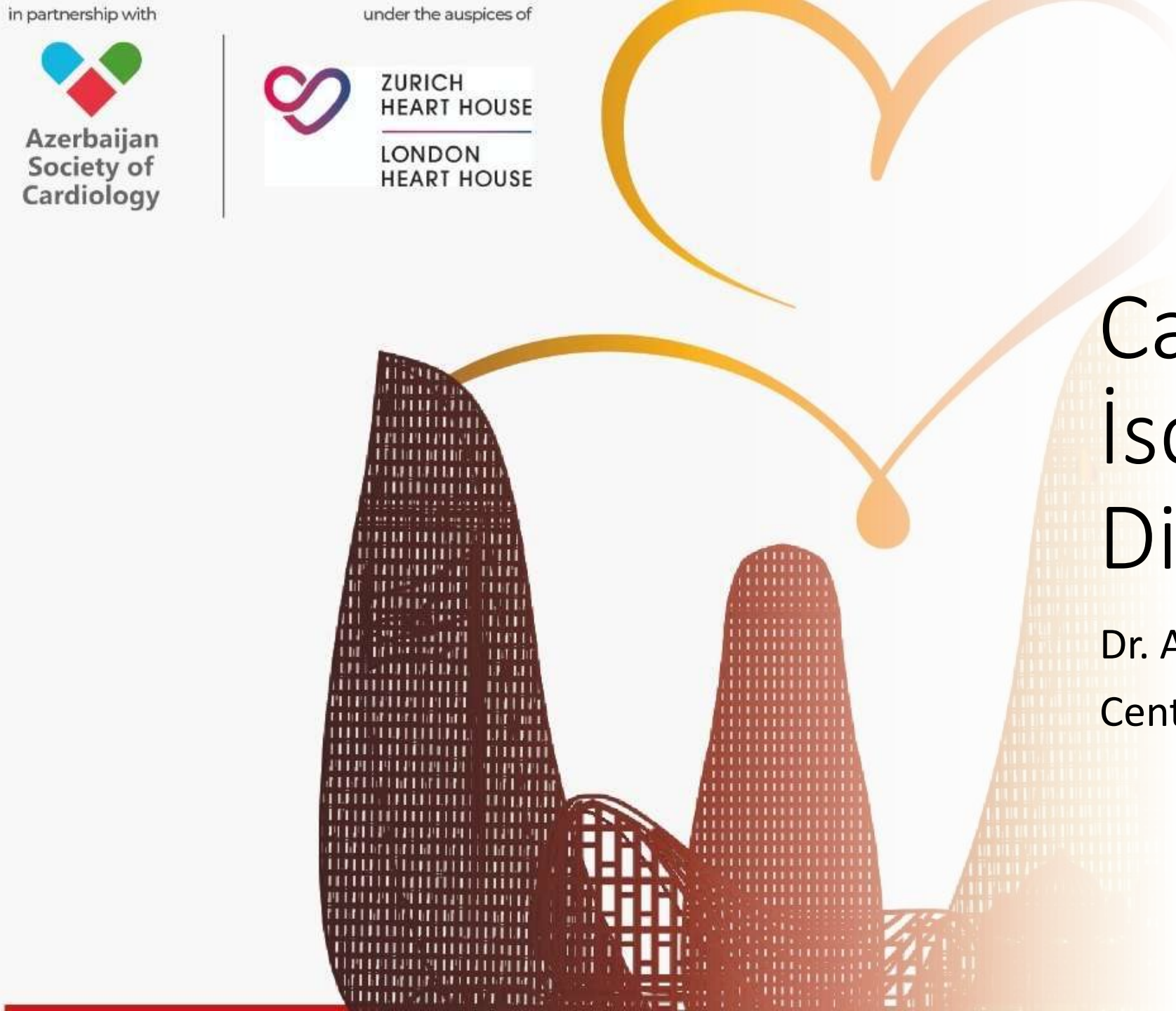
Master Course in Heart failure 25 BAKU

Baku Marriott Hotel Boulevard

30st of May - 1st of June



Cardiac MRI in İschemic Heart Disease

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Central Clinic Hospital

Why We Need CMR in Ischemic Heart Disease

Ischemic heart disease is the leading cause of heart failure worldwide.

Up to 50% of patients with EF <35% do not recover function post-revascularization.

Standard tools like echocardiography and angiography often fail to distinguish viable from non-viable myocardium.

Seeing Beyond the Ejection Fraction

Echo is a map – it shows us motion.

- **Echo Provides**
- EF and wall motion
- LV volumes
- Valve function

CMR is a microscope – it reveals tissue composition.

CMR Adds

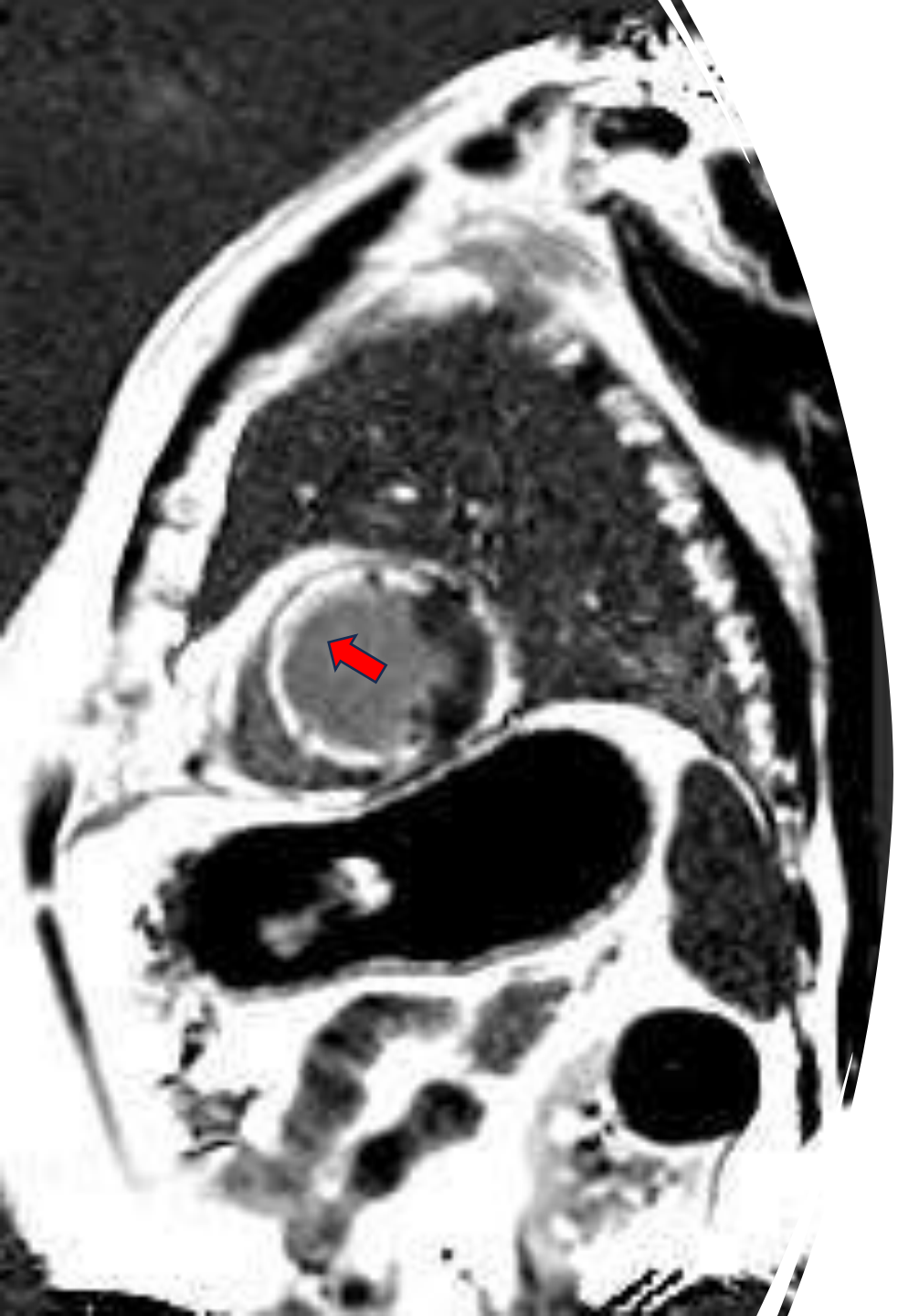
- Tissue characterization (scar, edema, fibrosis)
- Microvascular obstruction (MO)
- Myocardial salvage index (MSI)
- Viability assessment
- Prognostic information

CMR Tells Us:

- What is alive
- What is dead
- What can recover

CMR Sequences in Ischemic Heart Disease

Sequence	Measures	Clinical Interpretation
Cine SSFP	Wall motion, volumes, EF	Systolic dysfunction
T2-weighted (STIR)	Edema	Acute injury, area-at-risk
EGE (Early Gadolinium)	Hyperemia, inflammation	Acute ischemia
LGE (Late Gadolinium)	Fibrosis, necrosis	Viability, transmurality
T1 Mapping / ECV	Interstitial fibrosis	Chronic remodeling
Stress perfusion	Blood flow reserve	Ischemia detection
Feature Tracking (Strain)	Deformation analysis	Subclinical dysfunction



Role of CMR in Viability Assessment

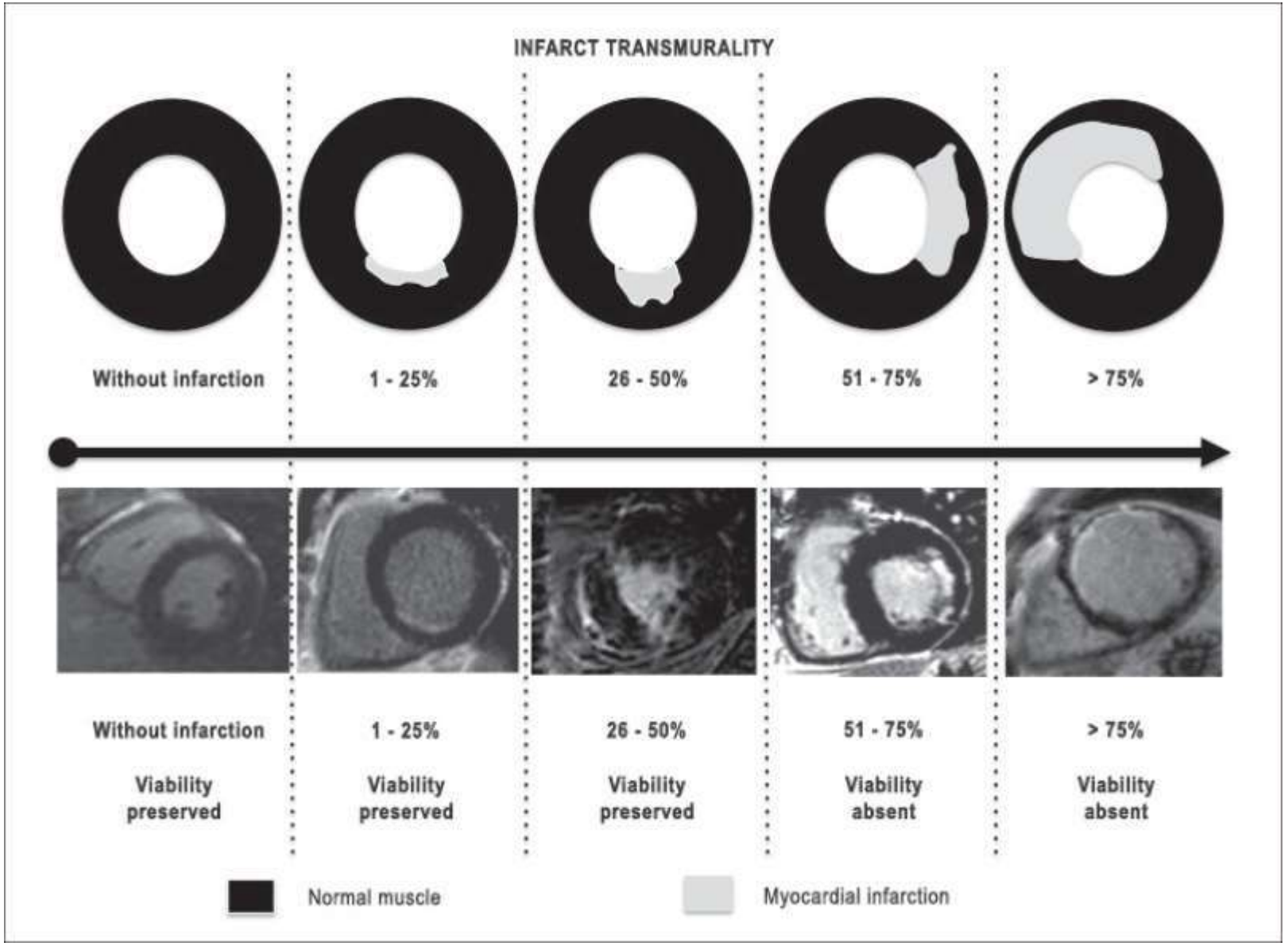
- **What is Viability Assessment?**

  Selecting patients who will benefit from revascularization over optimal medical therapy

  Markers of viability = presence of living myocytes

Bright is Dead

Viability in Chronic ischemia

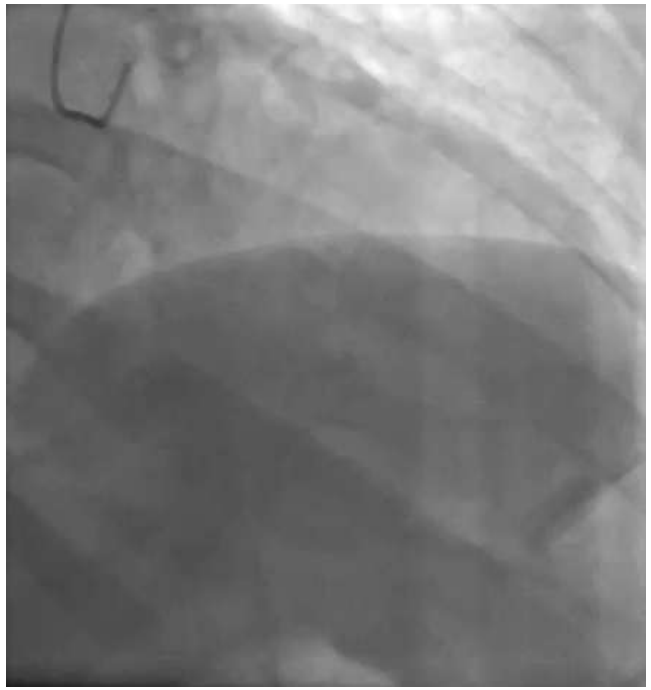


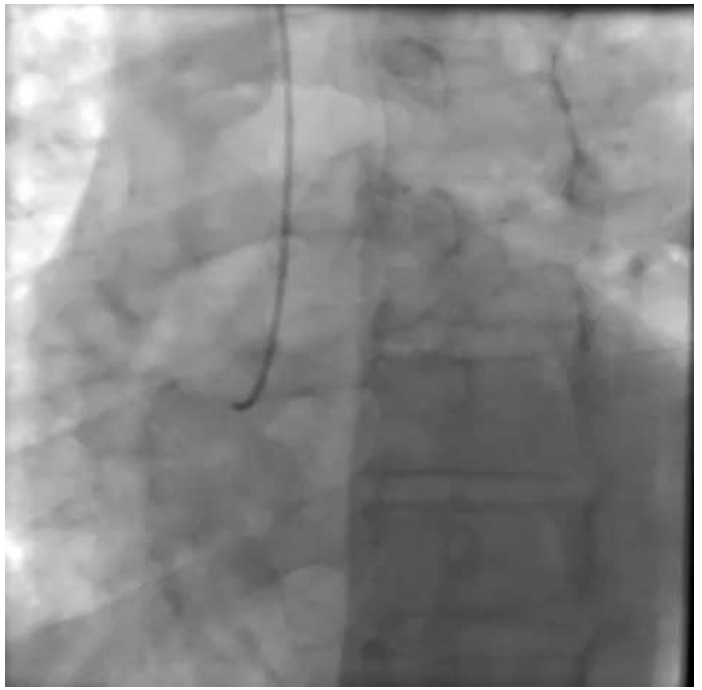
ABC kardiol, *Ana Luiza Mansur* **DOI:** 10.5935/abc.20170056

Clinical presentation 1

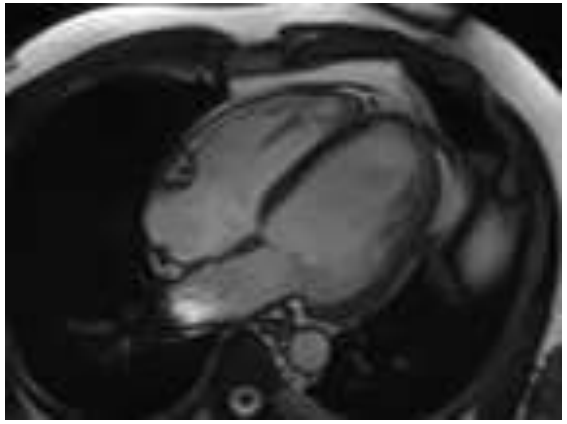
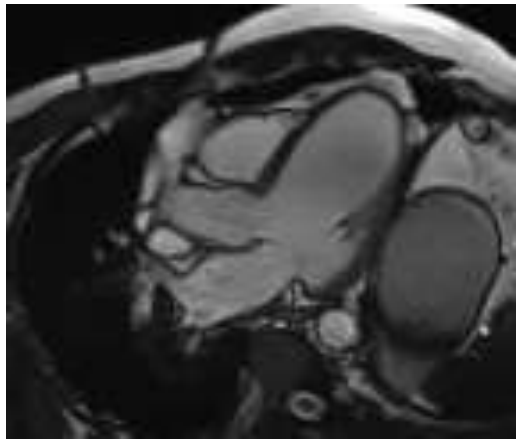
- 58-year-old male
- Prior STEMI and multivessel CAD
- EF 30%

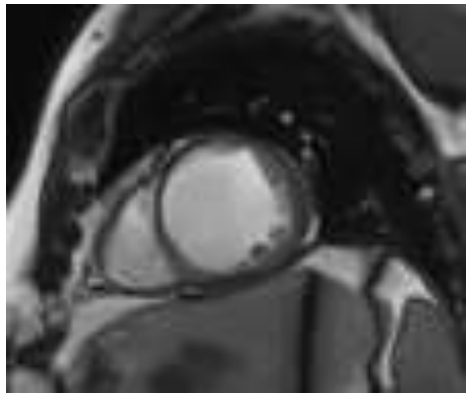
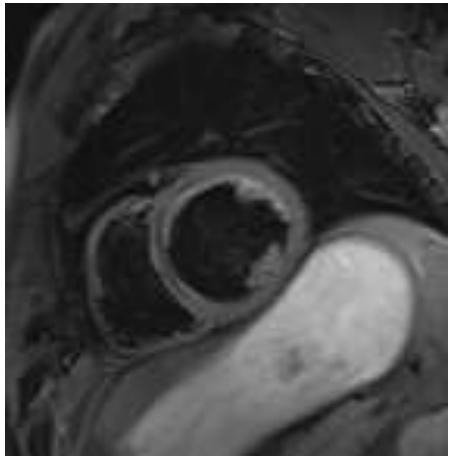
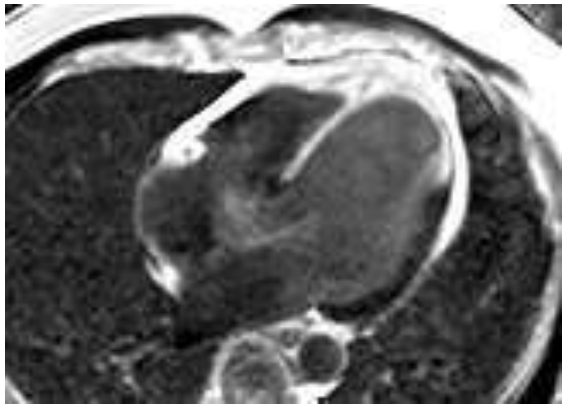
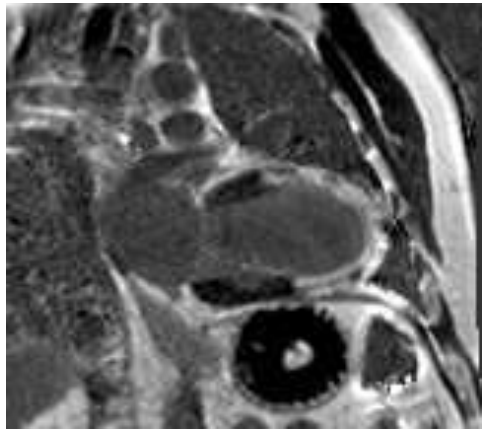
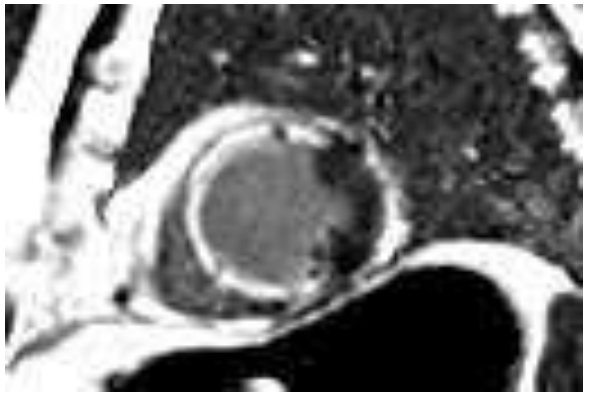
Revascularization?





Clinical presentation 1

- **LGE:**
  - Transmural (>75%) LGE in septal, anterior, inferior walls
- **No microvascular obstruction**
- **T2-weighted imaging: No edema (chronic infarct pattern)**

Would you consider revascularizing in this patient?

Hibernation vs Stunning – Myocardial Viability Phenotypes

hybernation

=

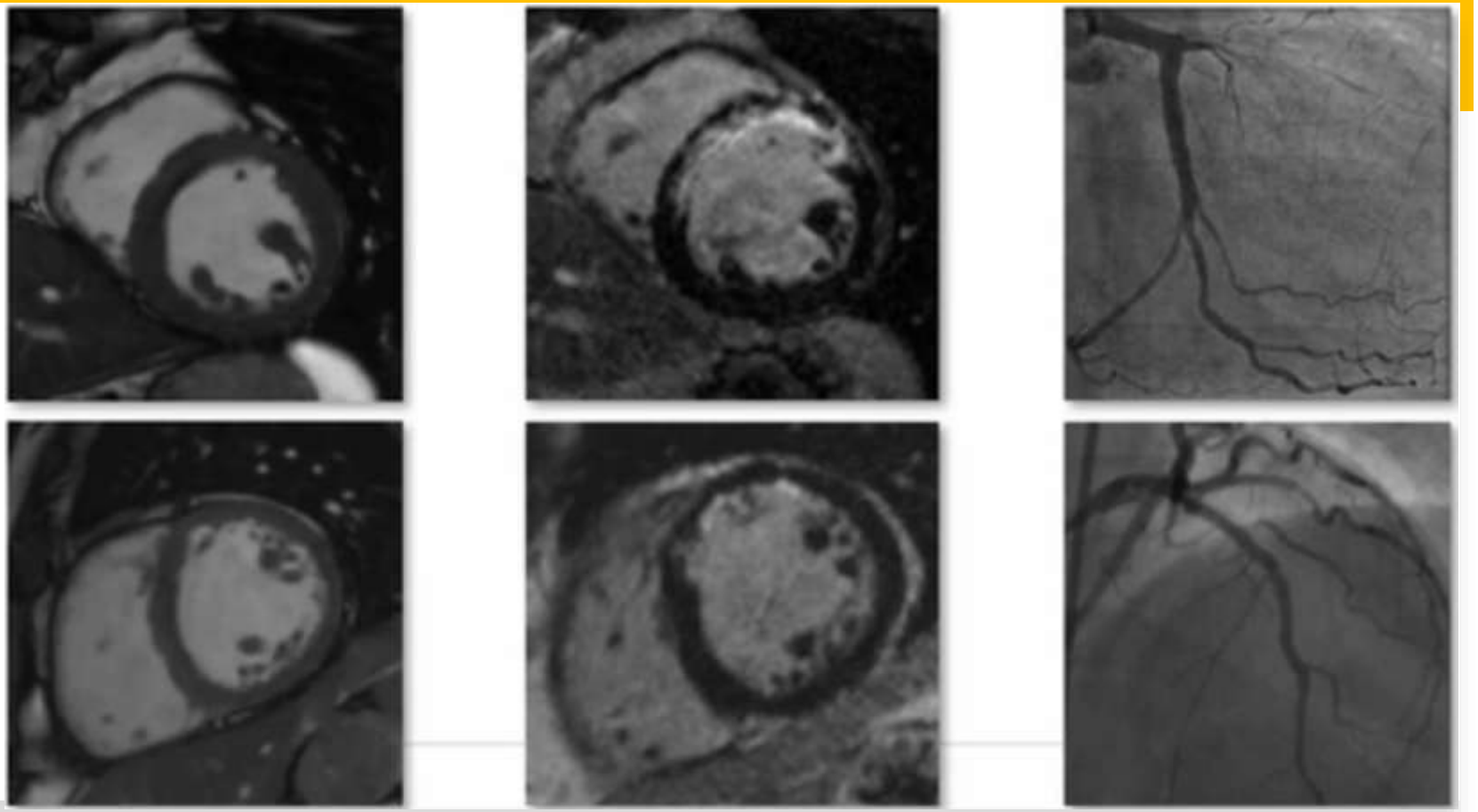
viability

stunning

=

recovery

after ischemia

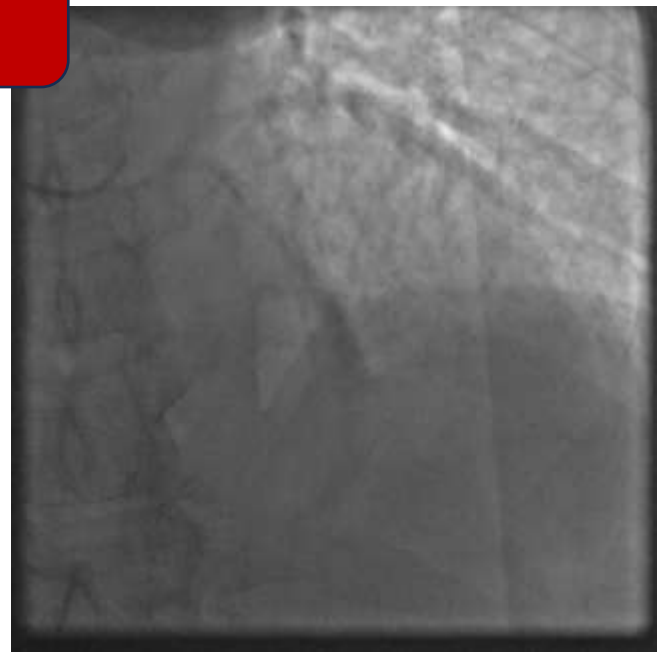


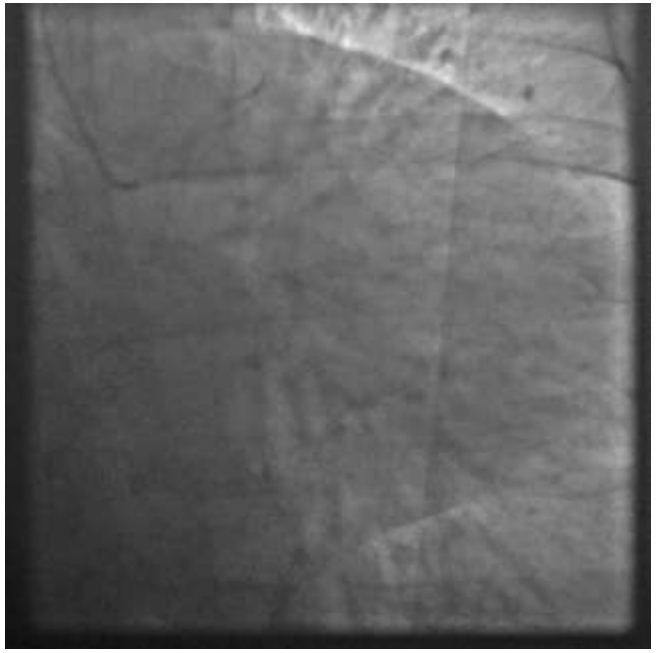
Clinical presentation 2

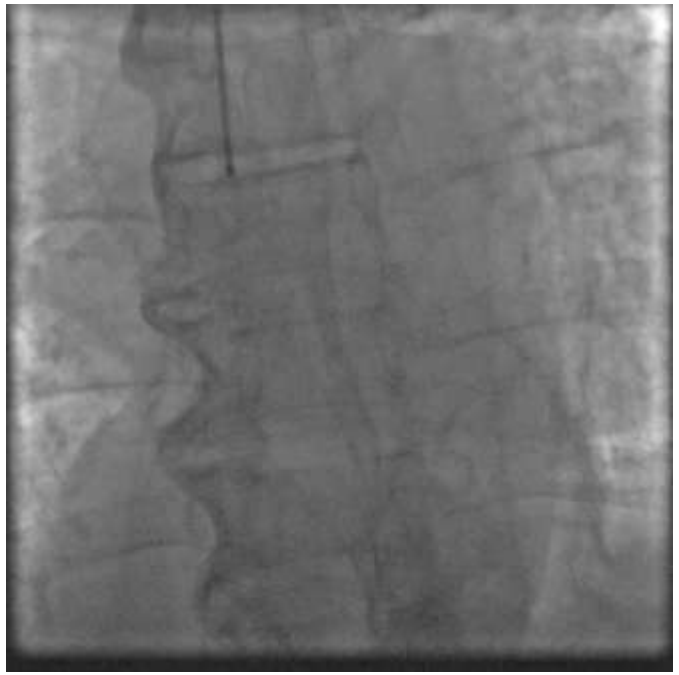
- 66-year-old male with prior NSTEMI and multivessel CAD:

LAD-100%, CX-95%, RCA-99%

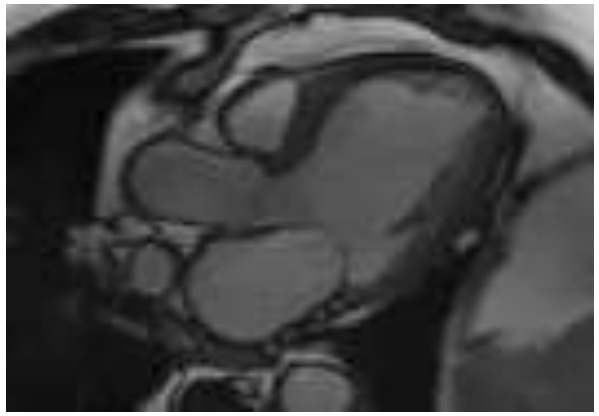
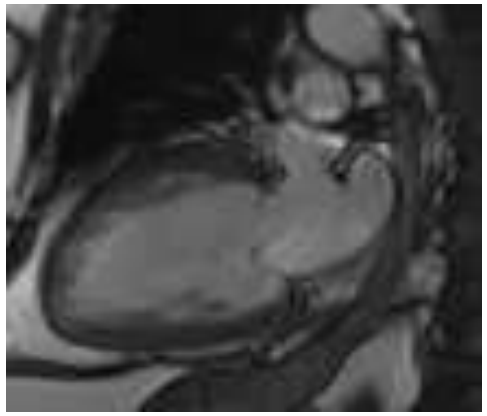
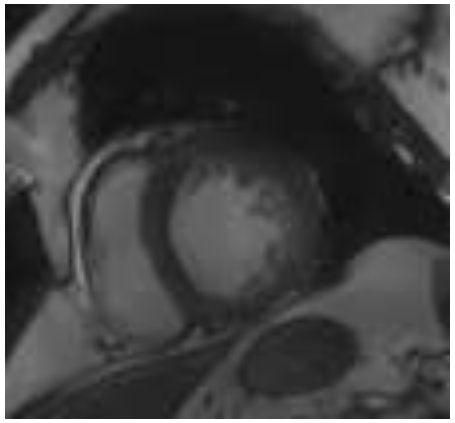
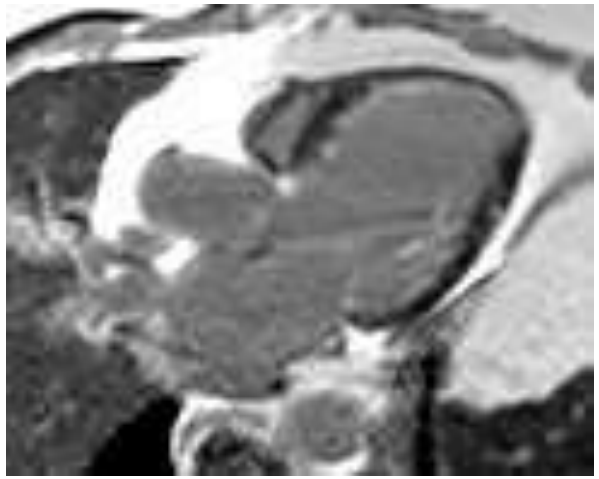
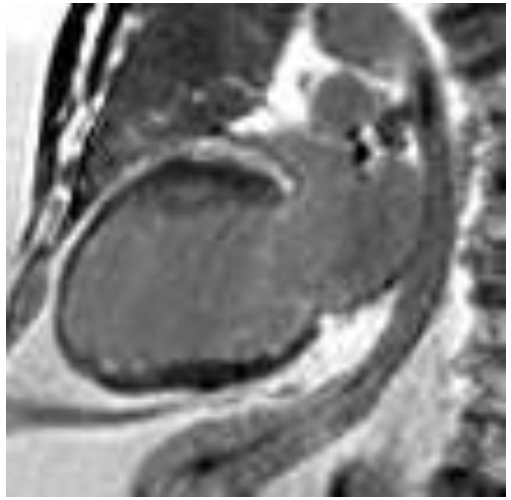
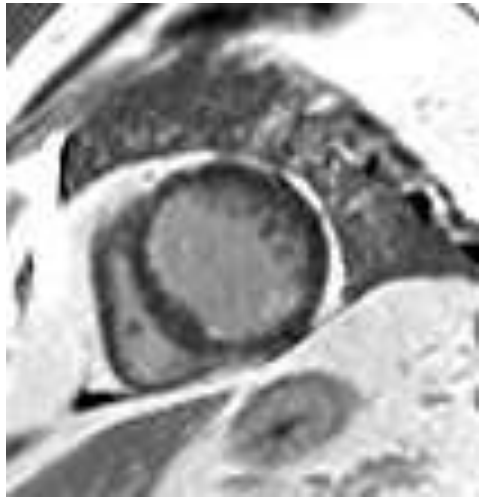
- EF: 35%
- Being evaluated for revascularization vs device therapy







Clinical presentation 2

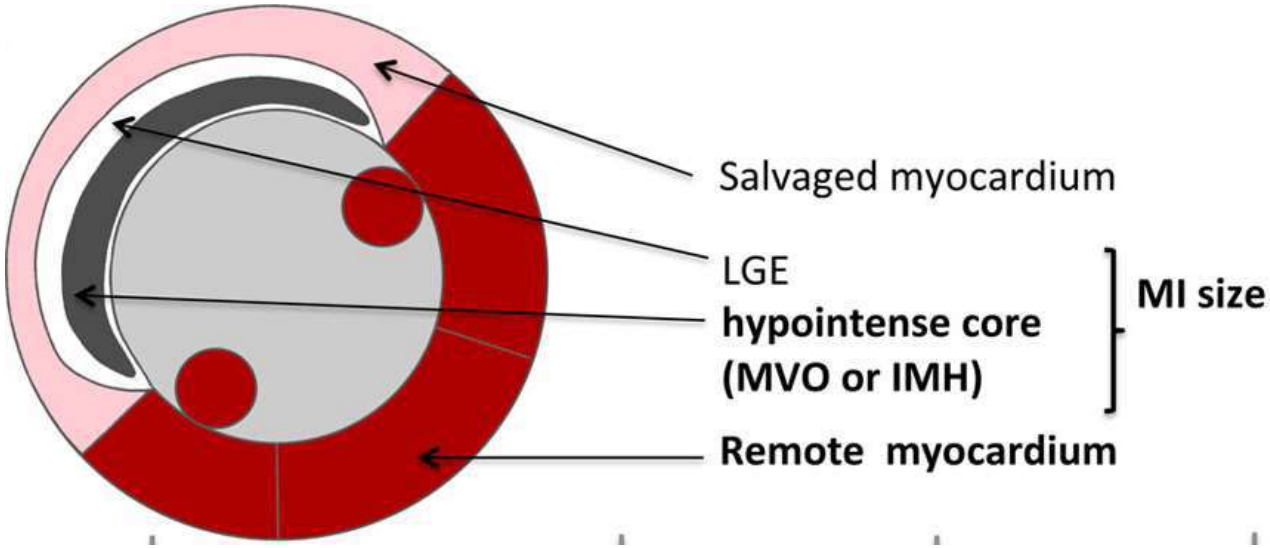







- **LGE:** Subendocardial LGE <50% in septal, anterior and inferior segments
- **No microvascular obstruction, no acute edema**

Would you recommend revascularization in this case?

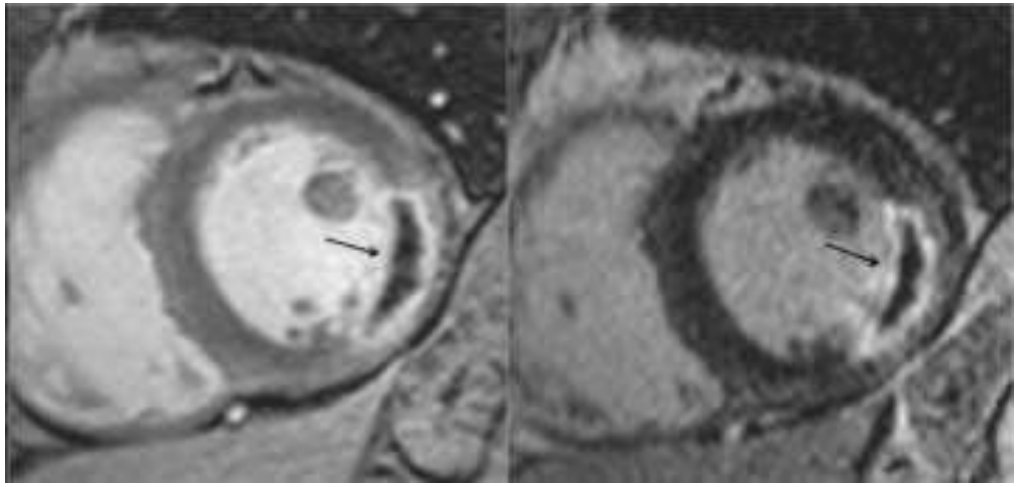
CMR in Acute Myocardial Infarction

MVO strongly associated with worse outcomes, including adverse remodeling and increased risk of arrhythmia



$$\mathbf{MSI} = \frac{\text{Area at Risk (AAR)} - \text{Infarct Size}}{\text{Area at Risk (AAR)}} \times 100\%$$

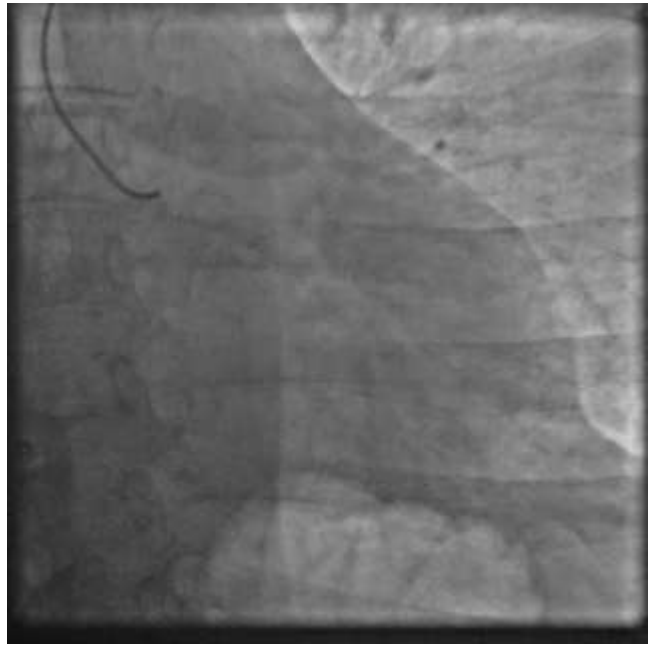
MSI above 40% is typically associated with better long-term recovery.

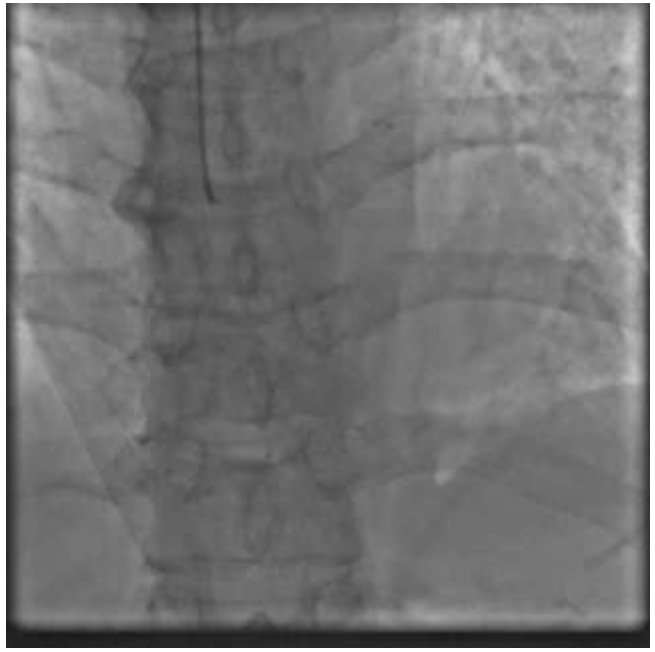


EGE LGE

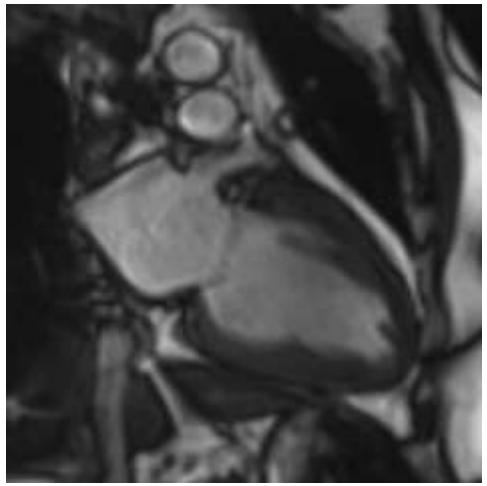
Clinical presentation 3

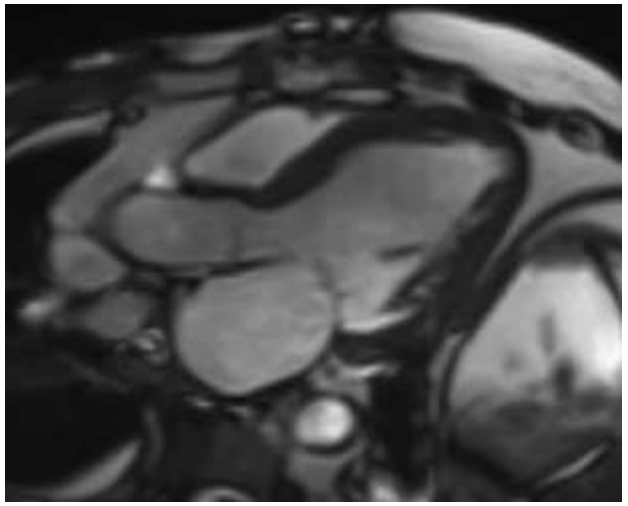
- 58-year-old male with **inferior STEMI**, LAD – 95%, CX-100%
- Primary PCI performed within 2 hours of symptom onset
- EF: 40% post-PCI
- Undergoing early CMR on day 4

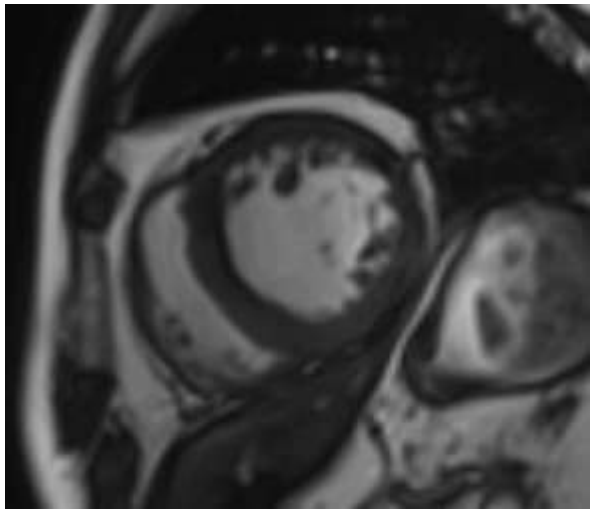


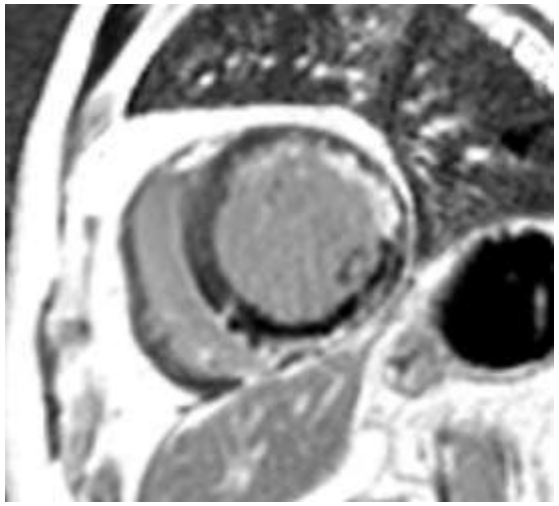


Clinical presentation 3



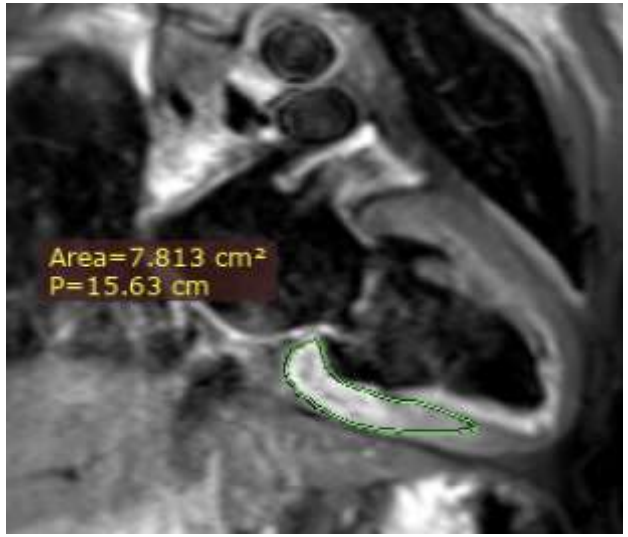


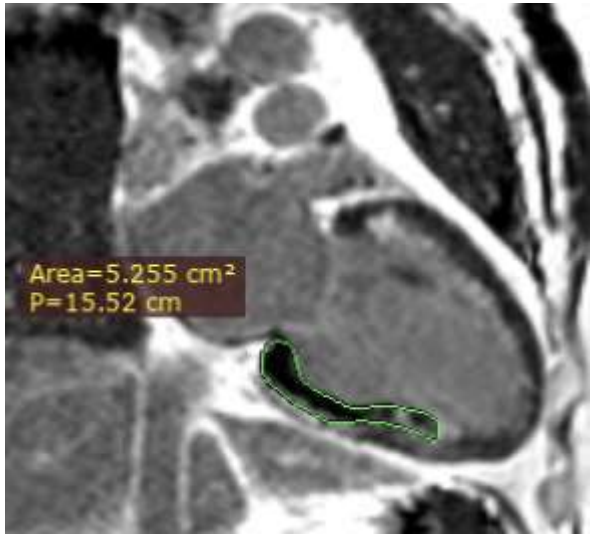


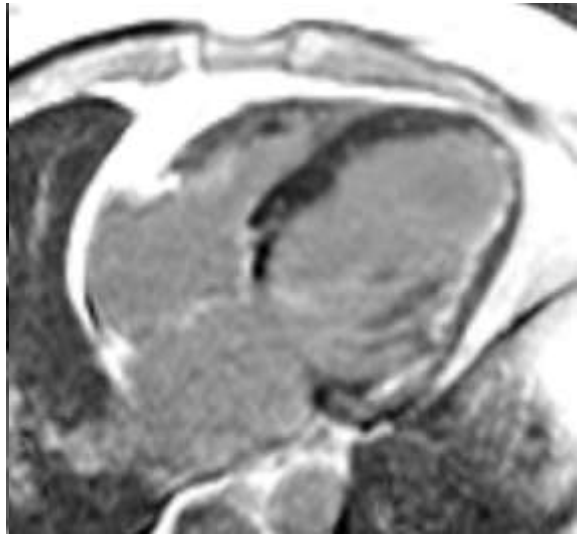


MSI = (AAR - infarct size) / AAR

MSİ = (7.8-5.2)/7.8 = **33%**







T2w

LGE

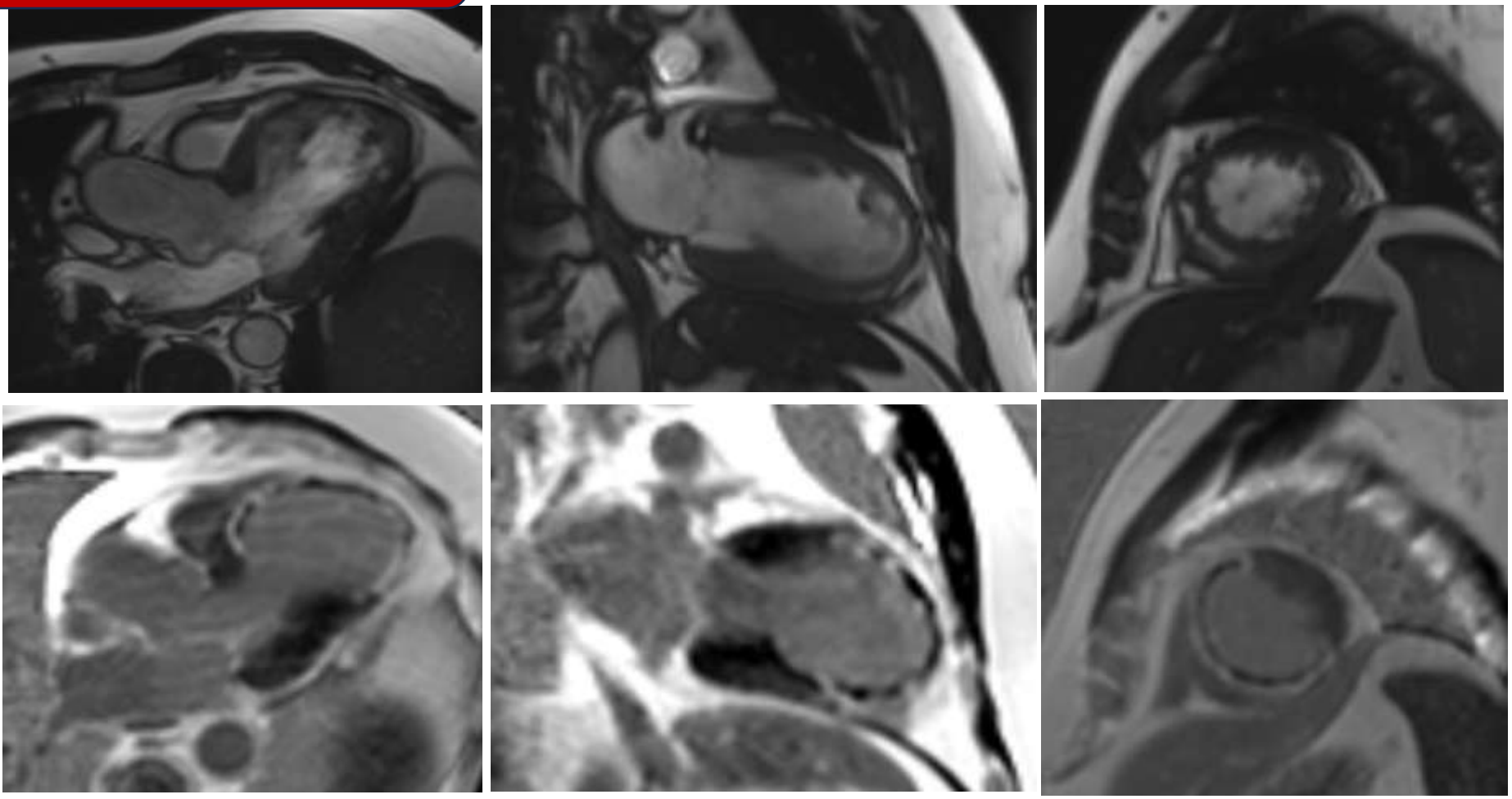
Microvascular damage

Higher risk of worse outcomes despite reperfusion

What does the presence of MO and MSI tell you in this case?

Clinical presentation 4

- 59-year-old male with anterior STEMI 3 days ago
- Delayed PCI performed
- EF: 35% post-PCI
- Undergoing early CMR on day 4

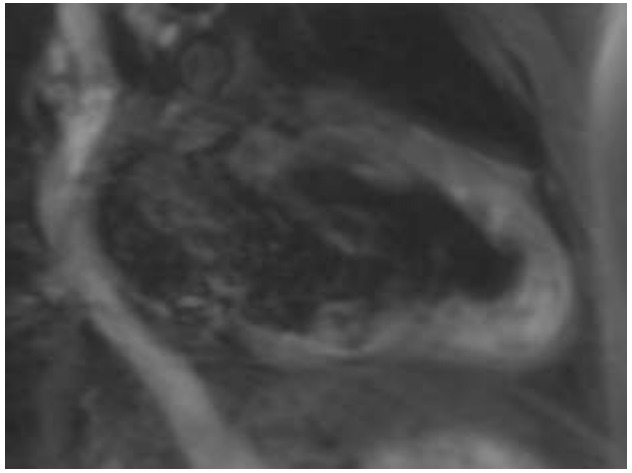


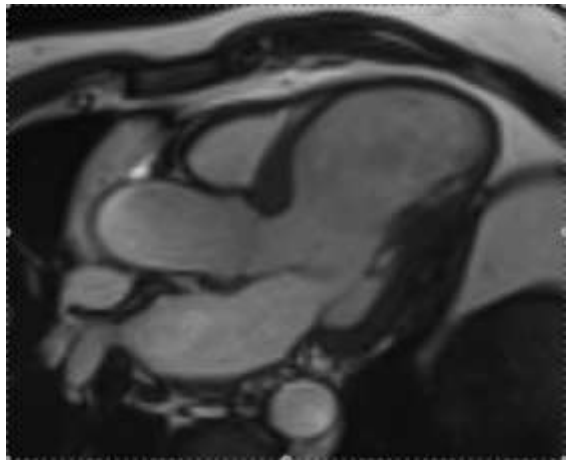
- Cine SSFP: Hypokinesis\akinesis in septum, anterior wall, apical s
- T2-weighted imaging: High signal intensity in anterior segments
- LGE: transmural enhancement in mid\apical septum, anterior wa
- Central hypoenhancement (MO) within LGE area

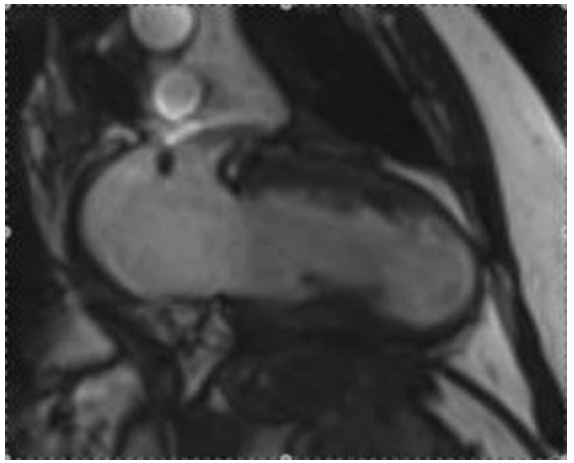
most of the myocardium at risk had already undergone irreversible injury prior to revascularization

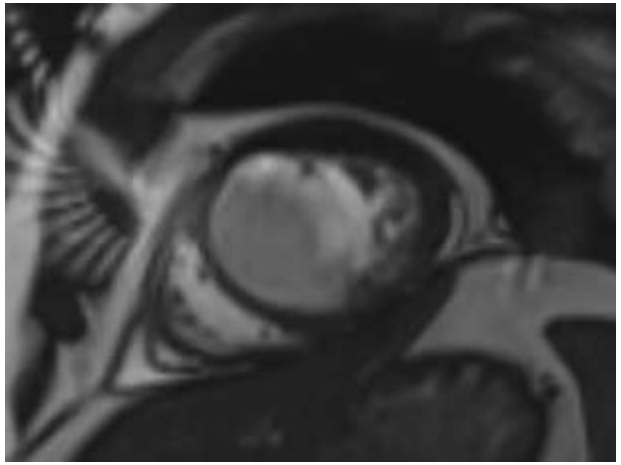
Clinical presentation 4

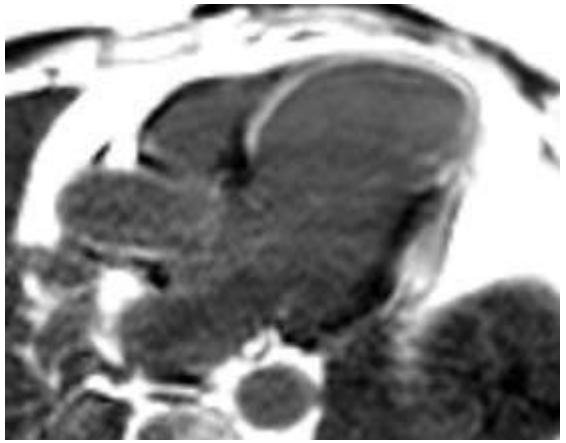
After 3 months

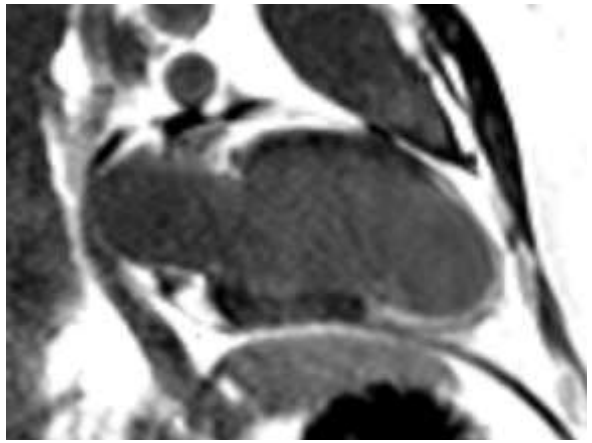


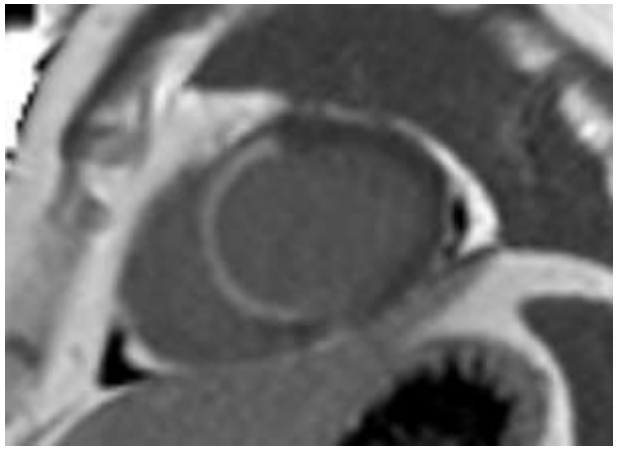








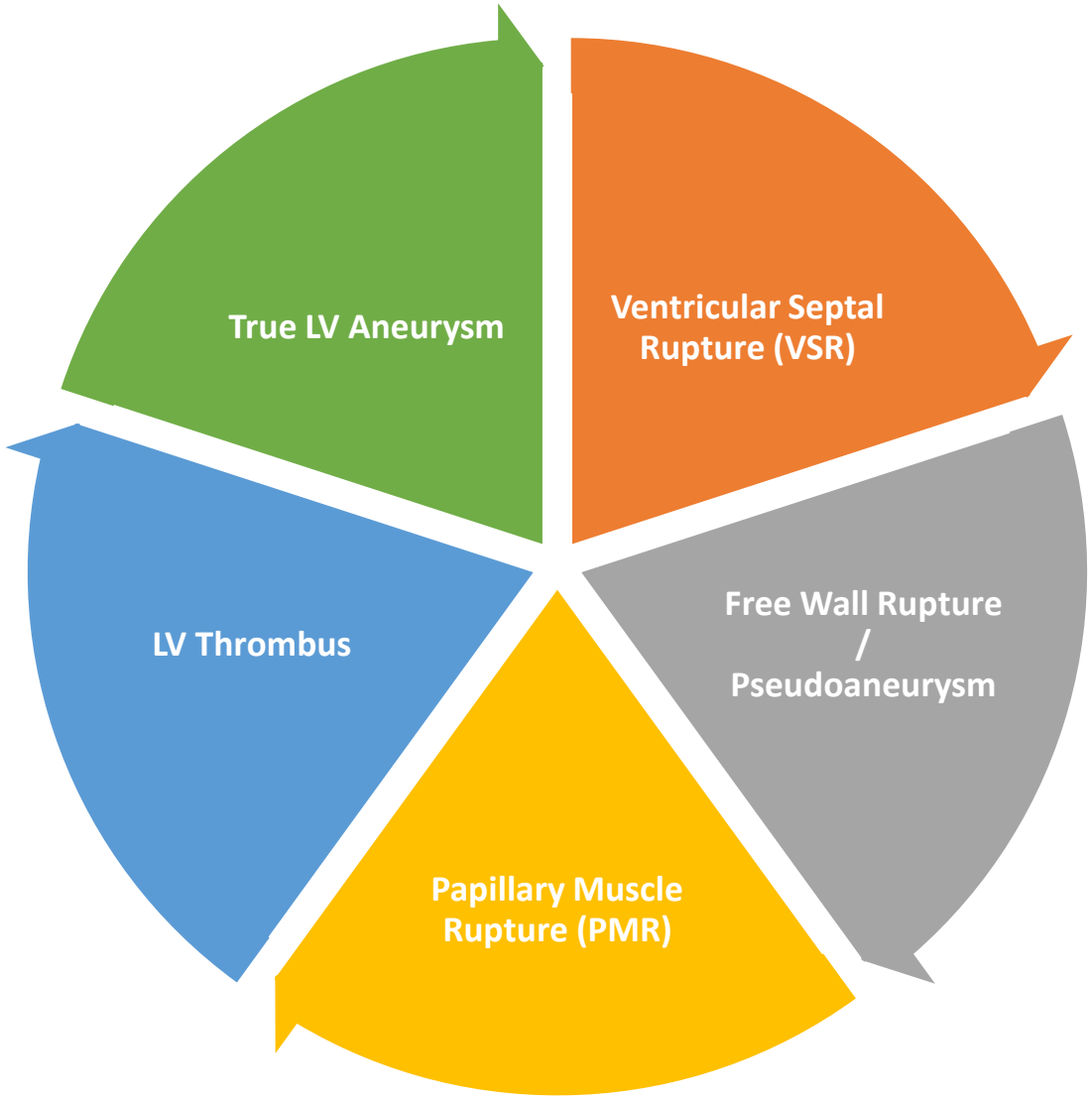




- Cine SSFP: Hypokinesis\akinesis in septum, anterior wall, apical segments and apex
- LGE: transmural enhancement in mid\apical septum, anterior wall, apical segments and apex

So when we look at acute MI on MRI, we're not just asking **'how much damage was done?'** – we're also asking **'how much was saved?'**

CMR in Post-MI Mechanical Complications

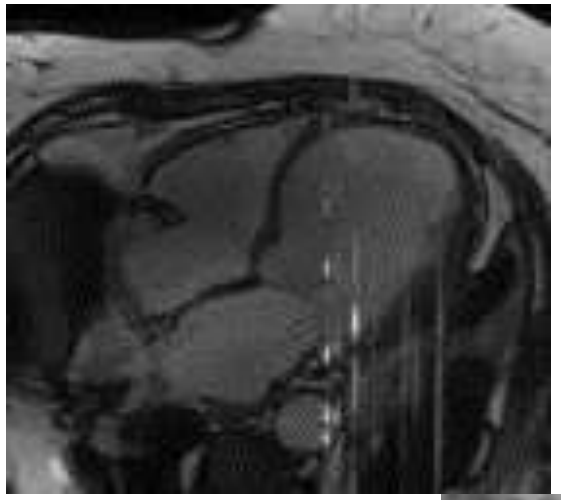


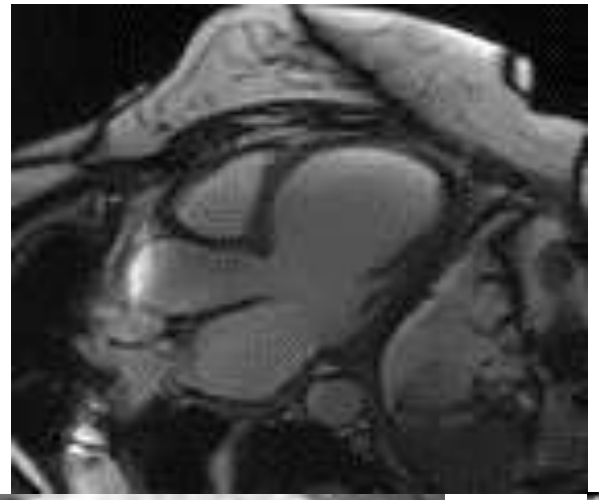
CMR-Based Summary Table of Mechanical Complications:

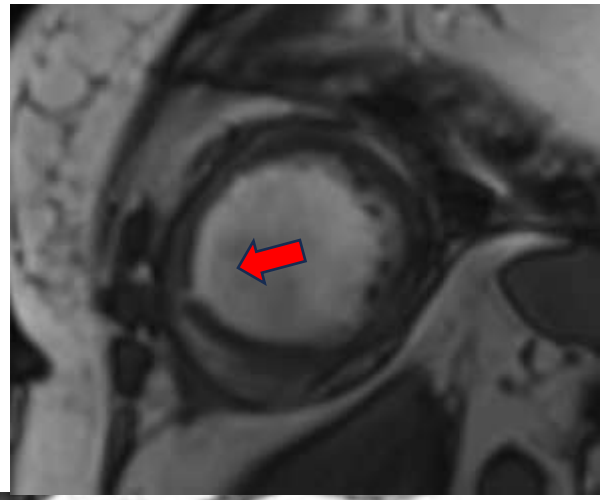
Complication	CMR Clues	Clinical Implications
Ventricular Septal Rupture (VSR)	Septal discontinuity, turbulent flow, transmural LGE	Hemodynamic collapse, urgent surgery
Free Wall Rupture / Pseudoaneurysm	Contained rupture, narrow neck, pericardial LGE/thrombus	Risk of tamponade, emergency repair
Papillary Muscle Rupture (PMR)	Hypermobile or absent papillary muscle, severe MR	Acute heart failure, surgical correction
LV Thrombus	Low signal, non-enhancing apical mass on EGE, LGE	Embolic stroke risk, anticoagulation
True LV Aneurysm	Wide neck, transmural LGE, dyskinetic motion	Surgical vs conservative decision

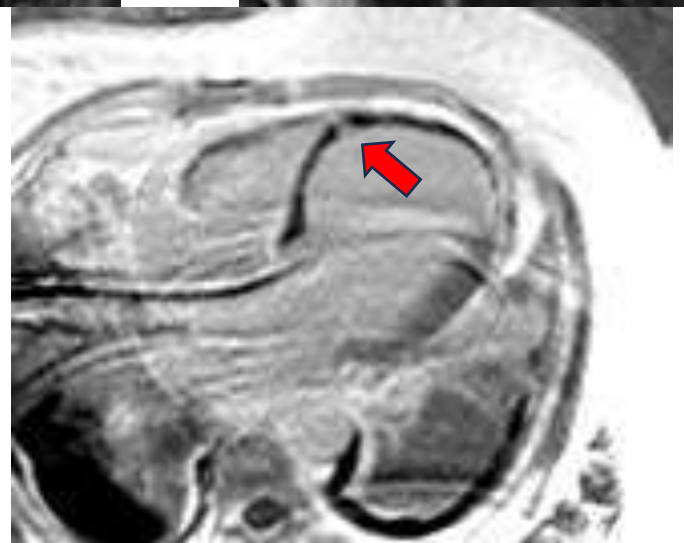
Ventricular septal rupture

- 69-year-old female with anterior STEMI 5-6 days ago
- EF 18%





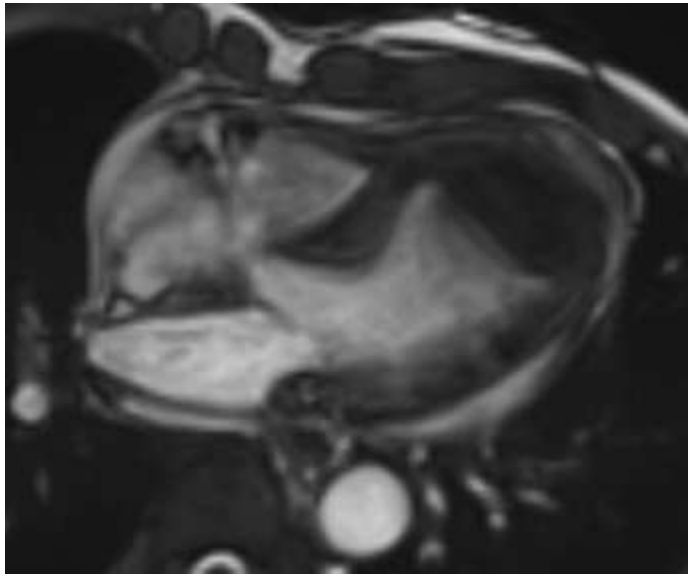


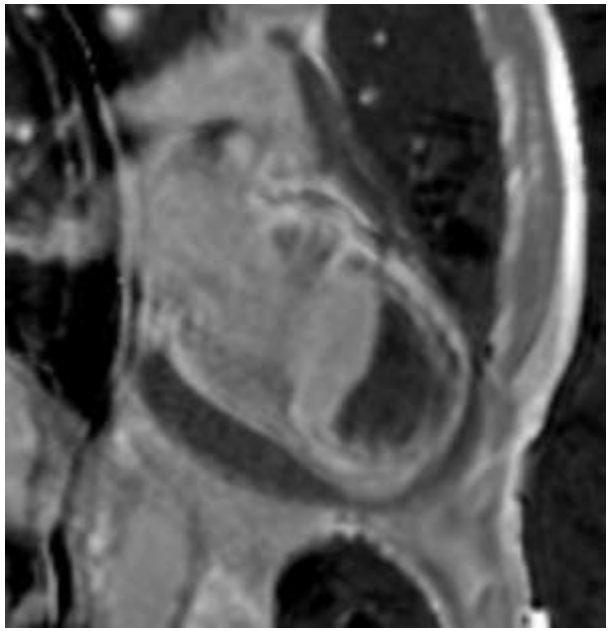


- **Septal discontinuity**
- **transmural LGE, MVO**

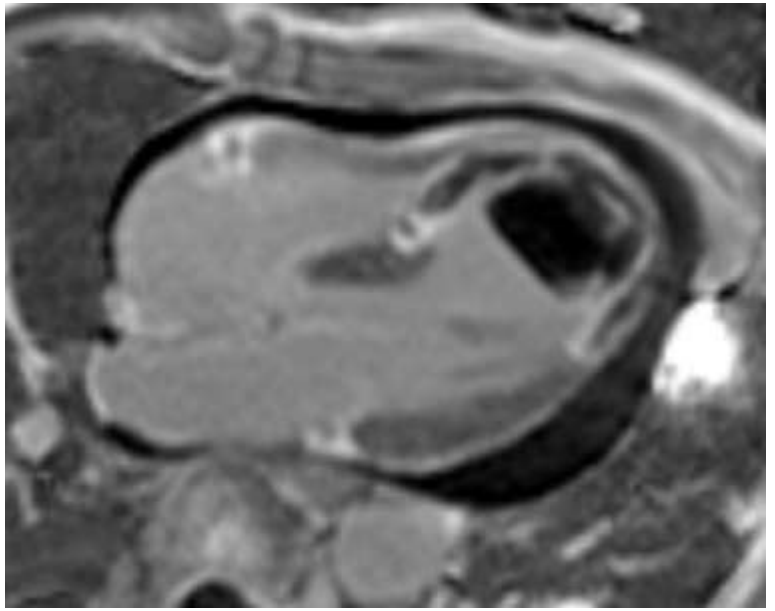
Thrombus

•63-year-old male, 1 month ago anterior STEMI
•LVEF 20%
•TTE giant mass in apex



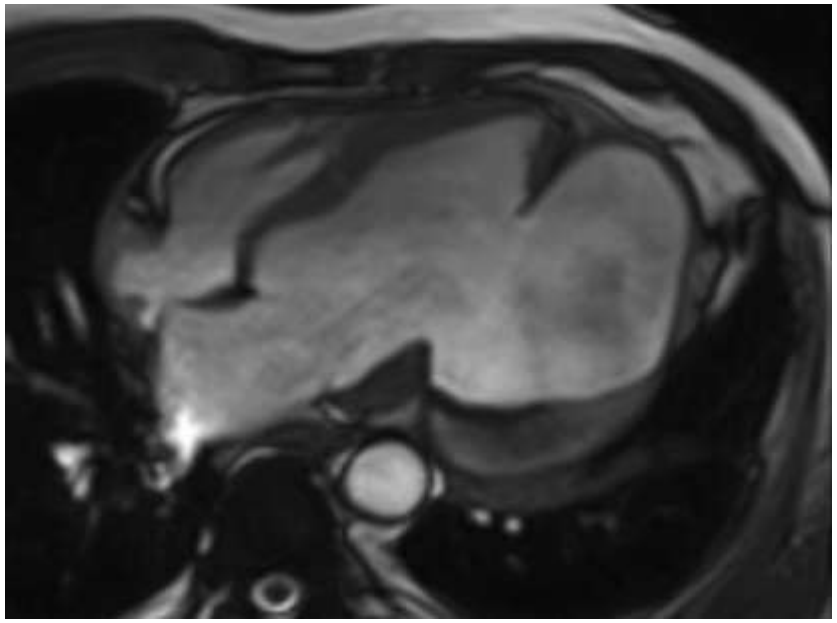


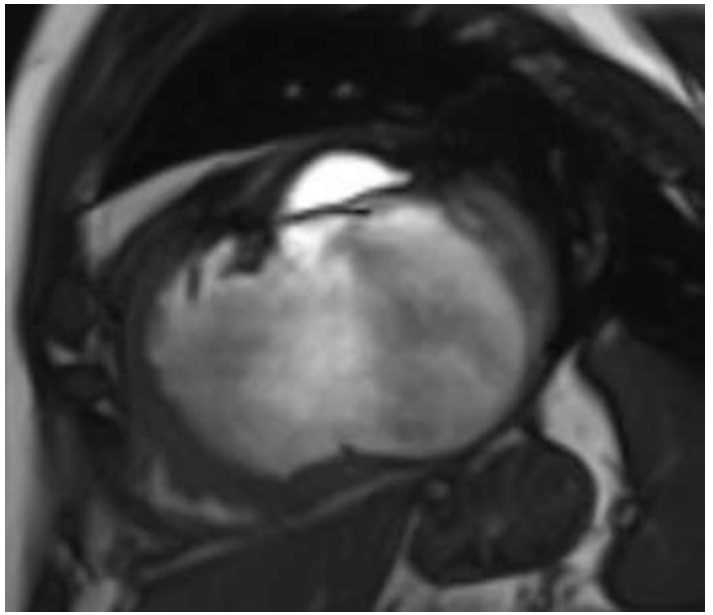
- **Low signal**
- **non-enhancing apical mass on LGE**

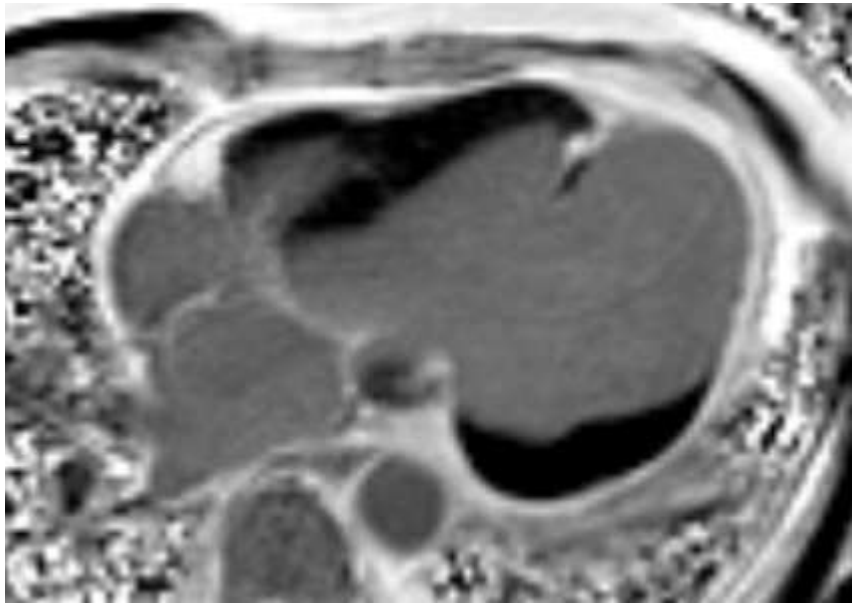


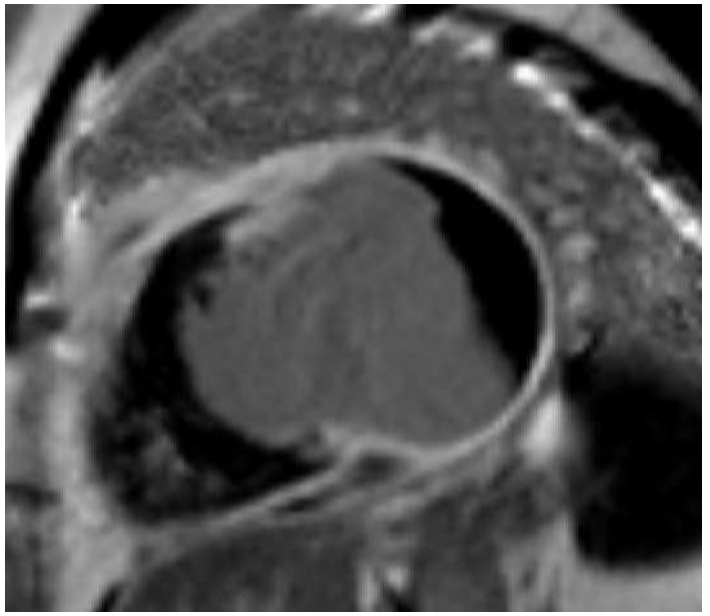
Pseudoaneurysm

- 54-year-old male, anterior STEMI 20 days ago
- Persistent chest discomfort, hypotension
- Echo: suspicious outpouching near lateral wall





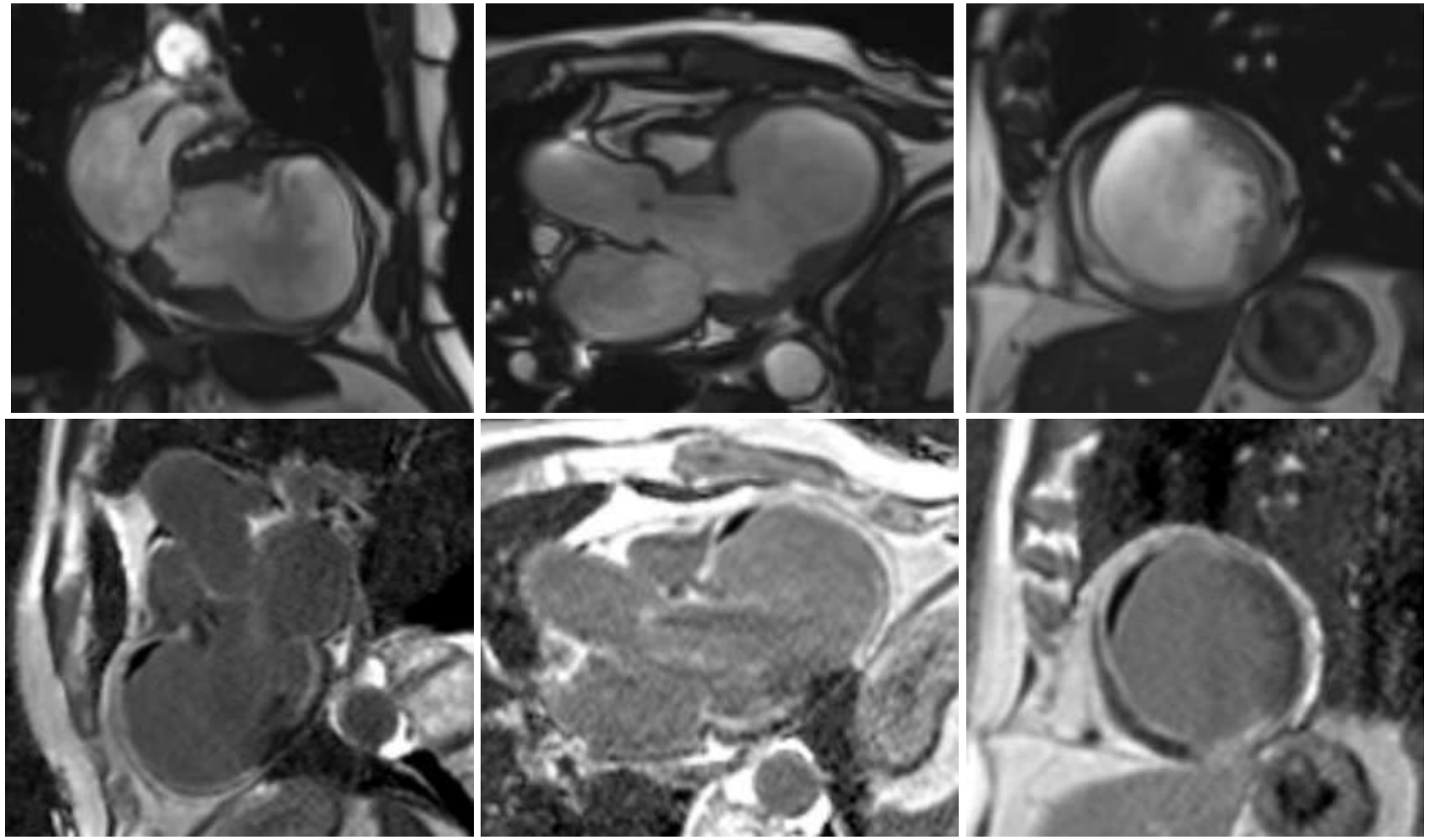




- **Cine:** Dyskinetic outpouching
- **LGE:** Transmural scar + pericardial enhancement + thrombus

Aneurysm

- 66-year-old female with prior anterior STEMI (4 months ago)
- Dyspnea on exertion, EF 30%
- Echo: akinetic bulge in anterior wall



- **Cine:** Dyskinetic motion, wide neck
- **LGE:** Transmural infarction, intact wall

“CMR doesn't just show the heart—it tells its story.”

Thank you for your attention!