

Mechanical Complications of Ischemic Heart Disease

**경북대학교병원
김근직**



Contents

- ✓ Postinfarction ventricular septal defect
- ✓ Ischemic mitral regurgitation
- ✓ LV free wall rupture
- ✓ LV aneurysm



Post infarction Ventricular septal defect



Incidence

- 1 ~ 2% of AMI (5% early deaths)

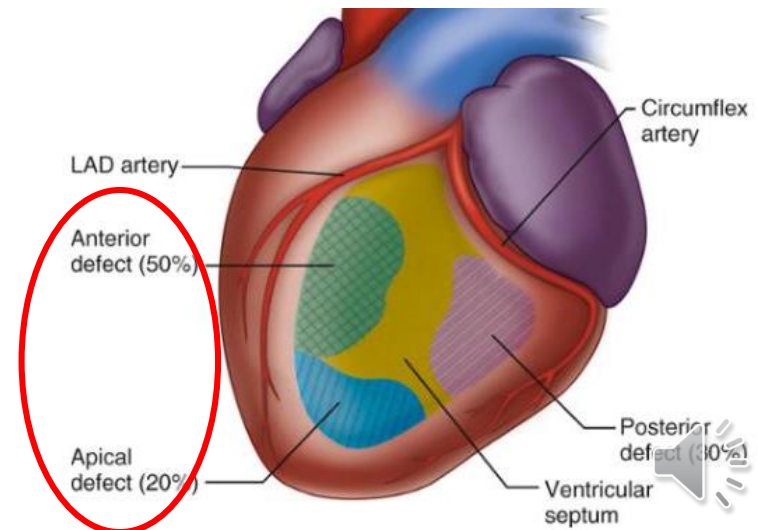
SHOCK trial registry (cardiogenic shock)

VSD : 3.9%

Mortality: 87.3%

Without surgical repair : 90% die within 2 months

- AMI \longrightarrow rupture : 2 ~ 4day
- **CAG** : complete **occlusion** of a coronary artery

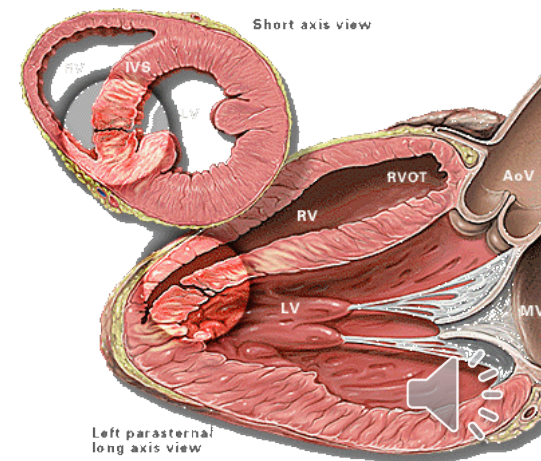


Pathophysiology

Determinant of early outcome

Heart failure

- Size of Ventricular infarction
- L – R shunt



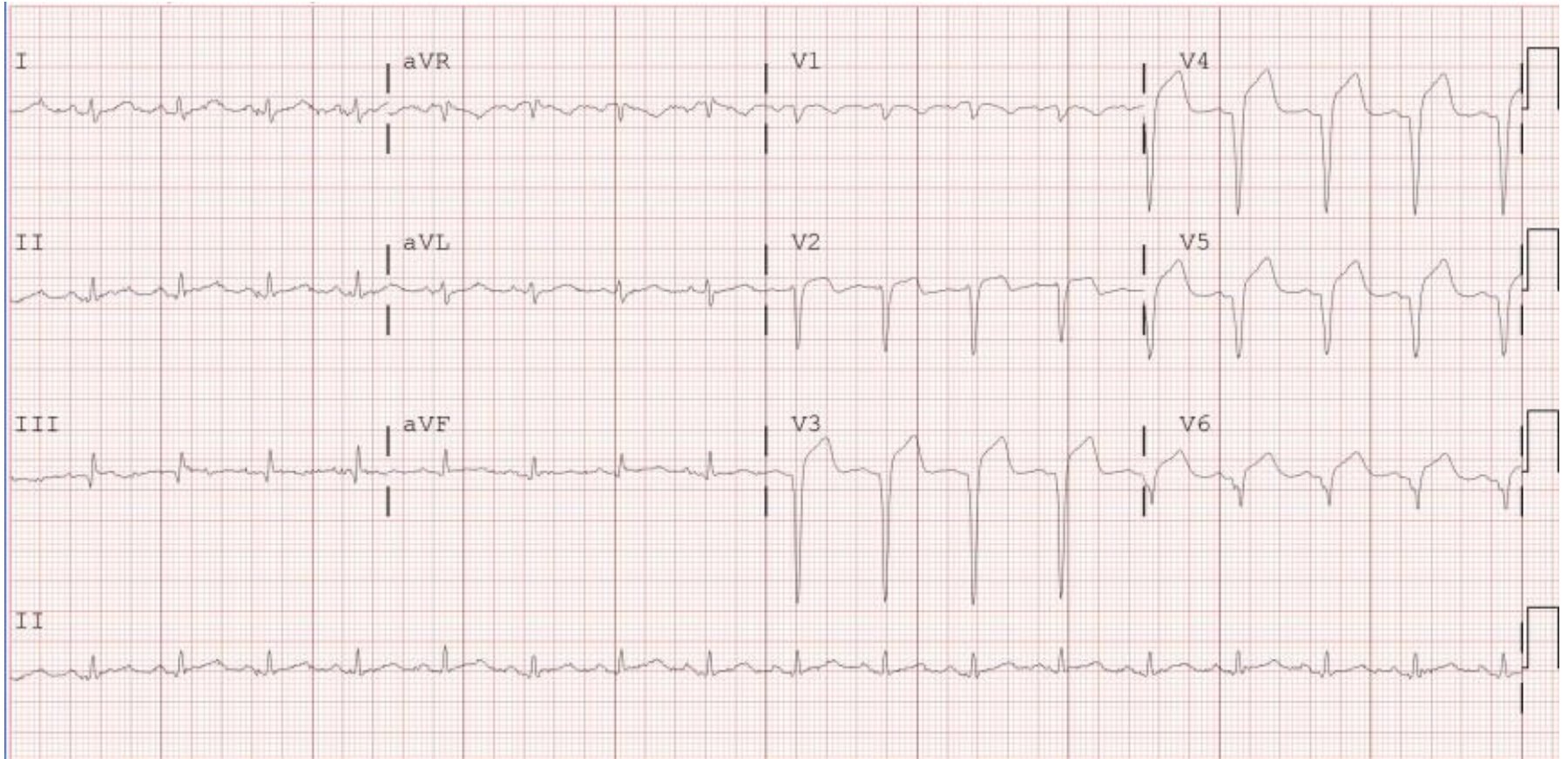
CASE

M/60

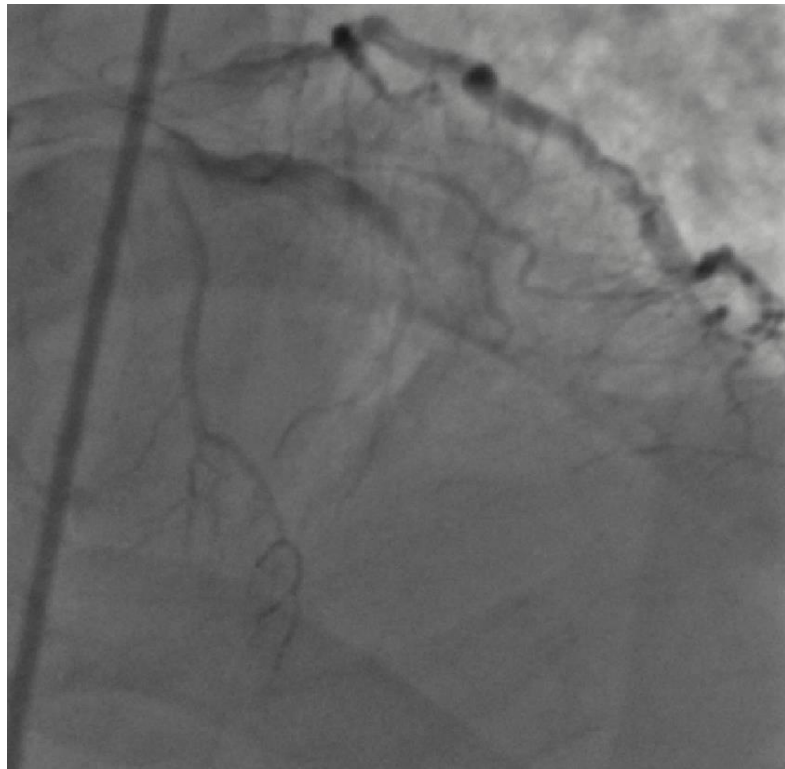
- **C/C** Sudden onset **ant. Chest pain, back pain**
- **P/I**
 - 1 wk PTA Ant. Chest pain, Nausea, Cold sweating
 - 1 day PTA Aggravated chest pain, BP 70/40
- **P/E**
 - BP 80/60 HR 110
- **Lab**
 - Tnl 21.97
 - NT-proBNP 21059



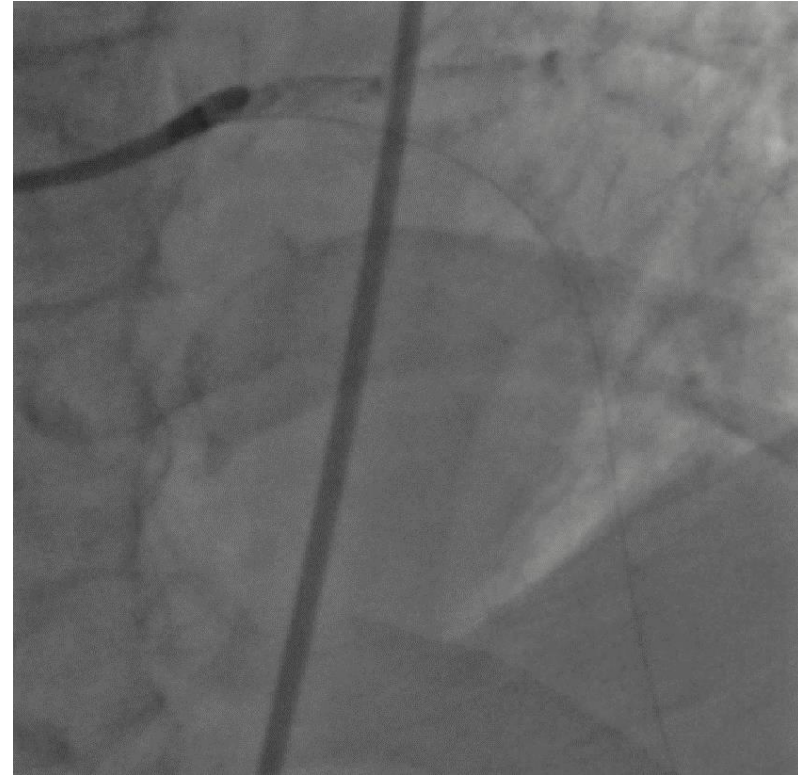

ECG



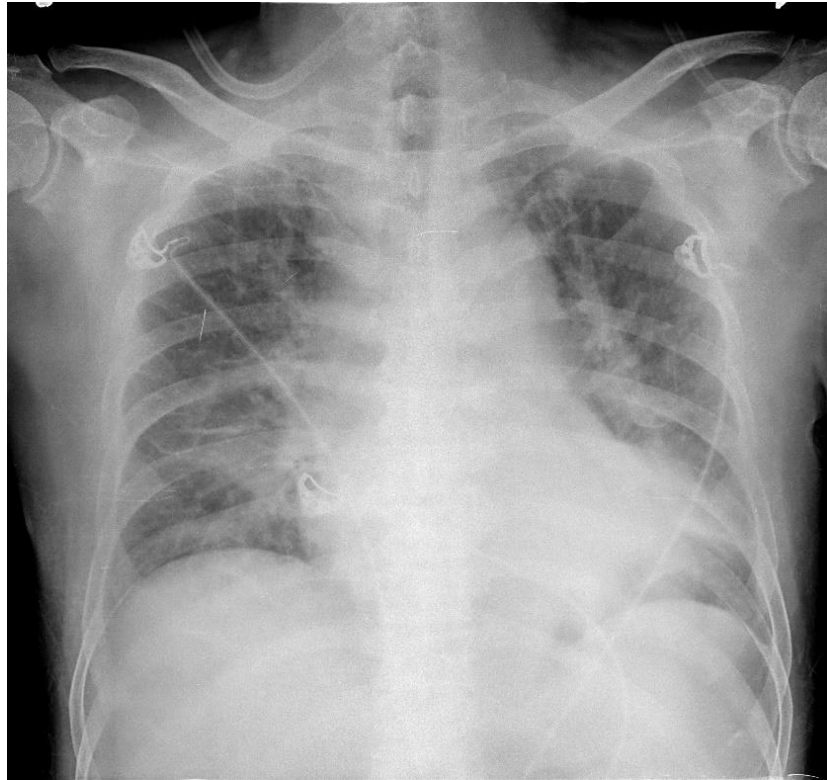
CAG



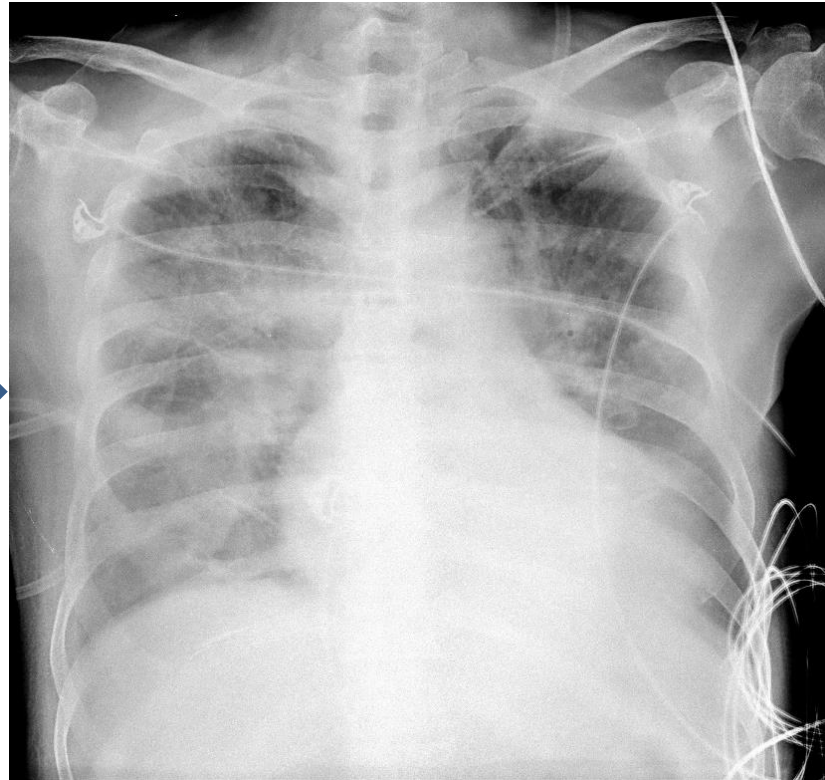
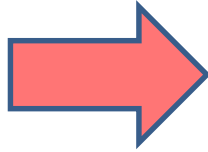
PCI



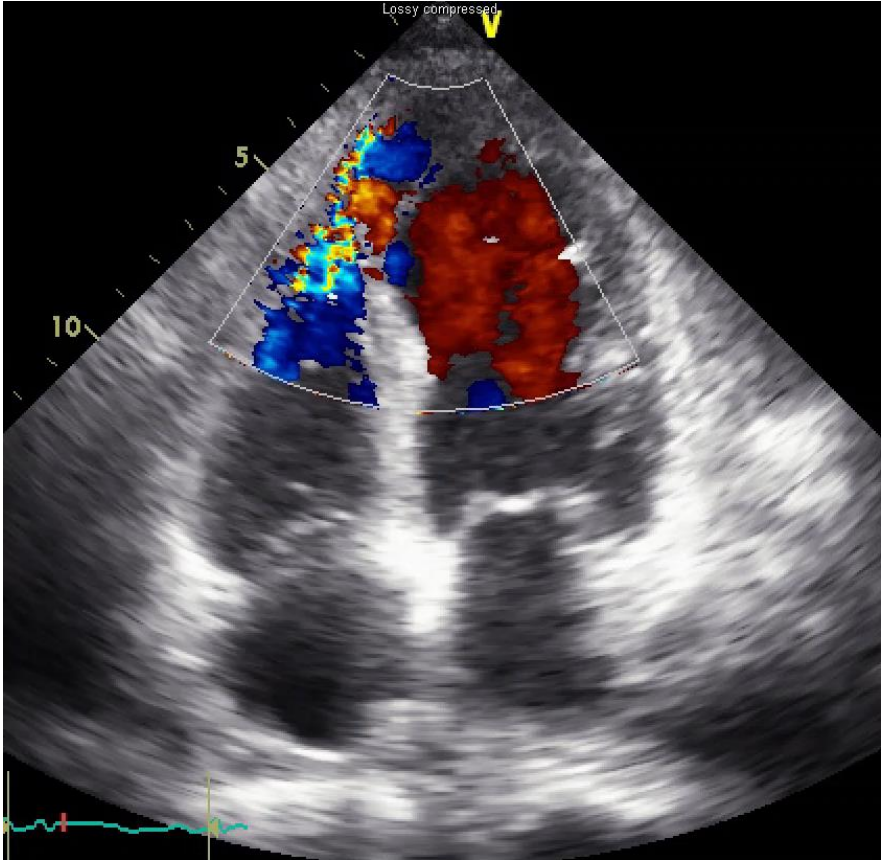
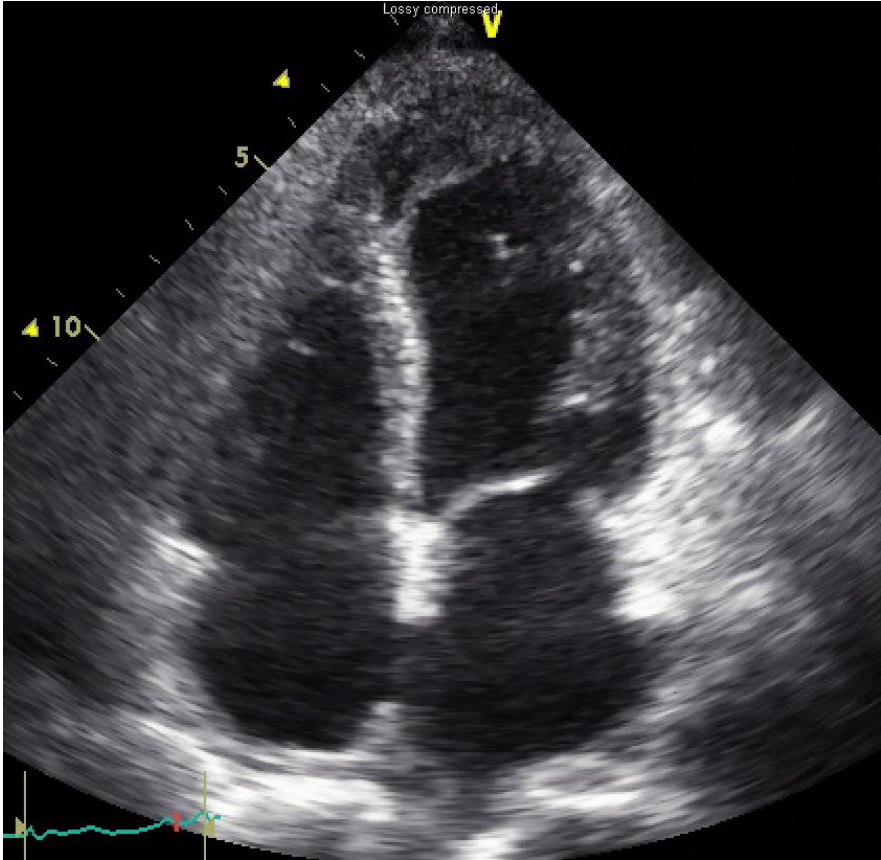
CXR



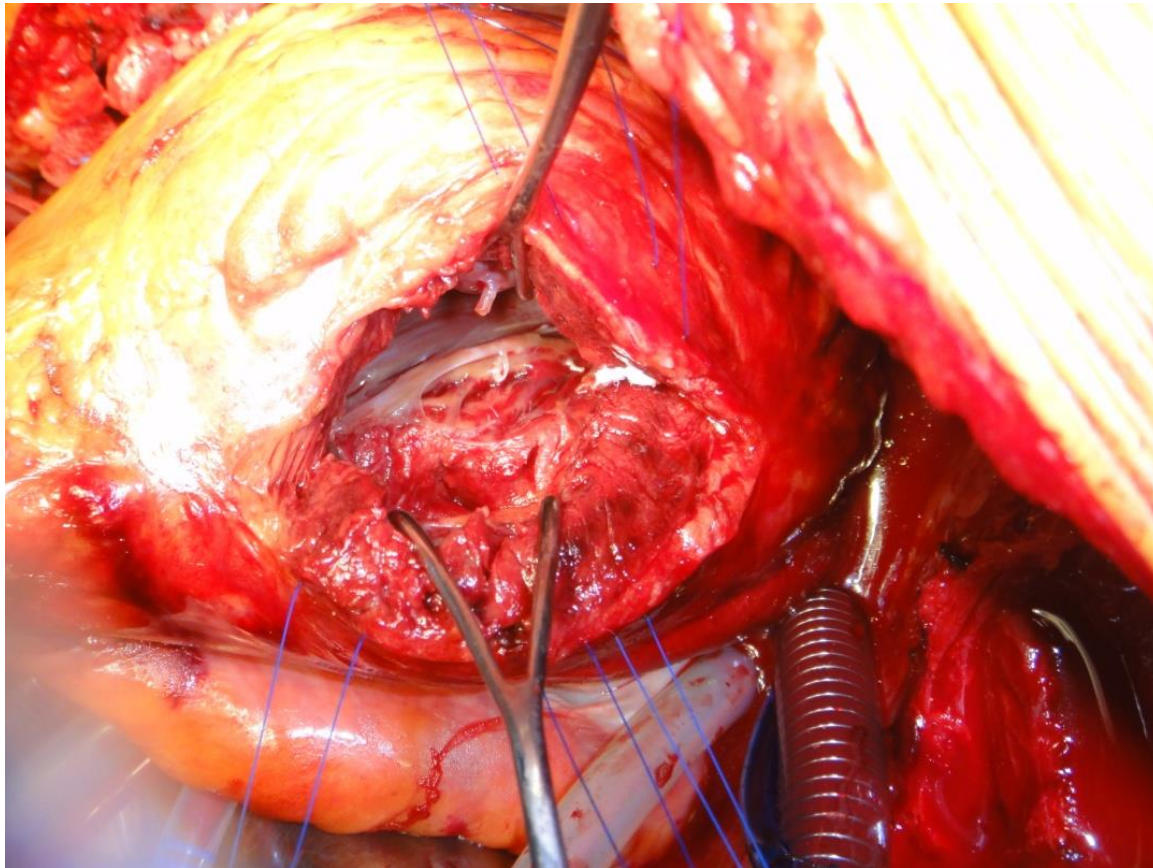
3 Day later



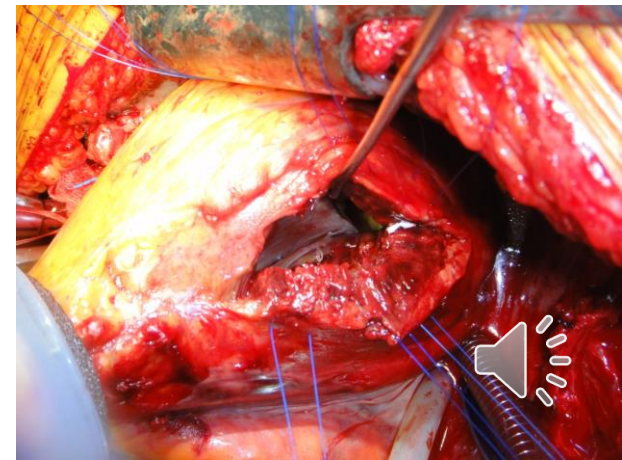
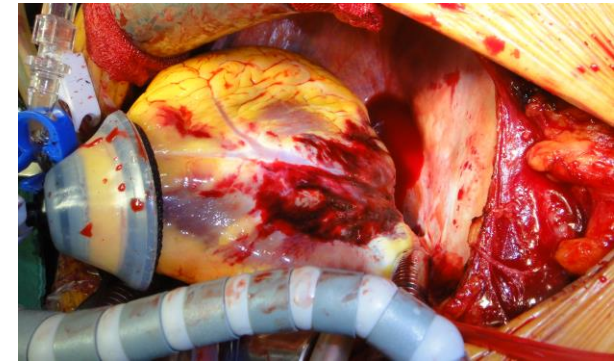
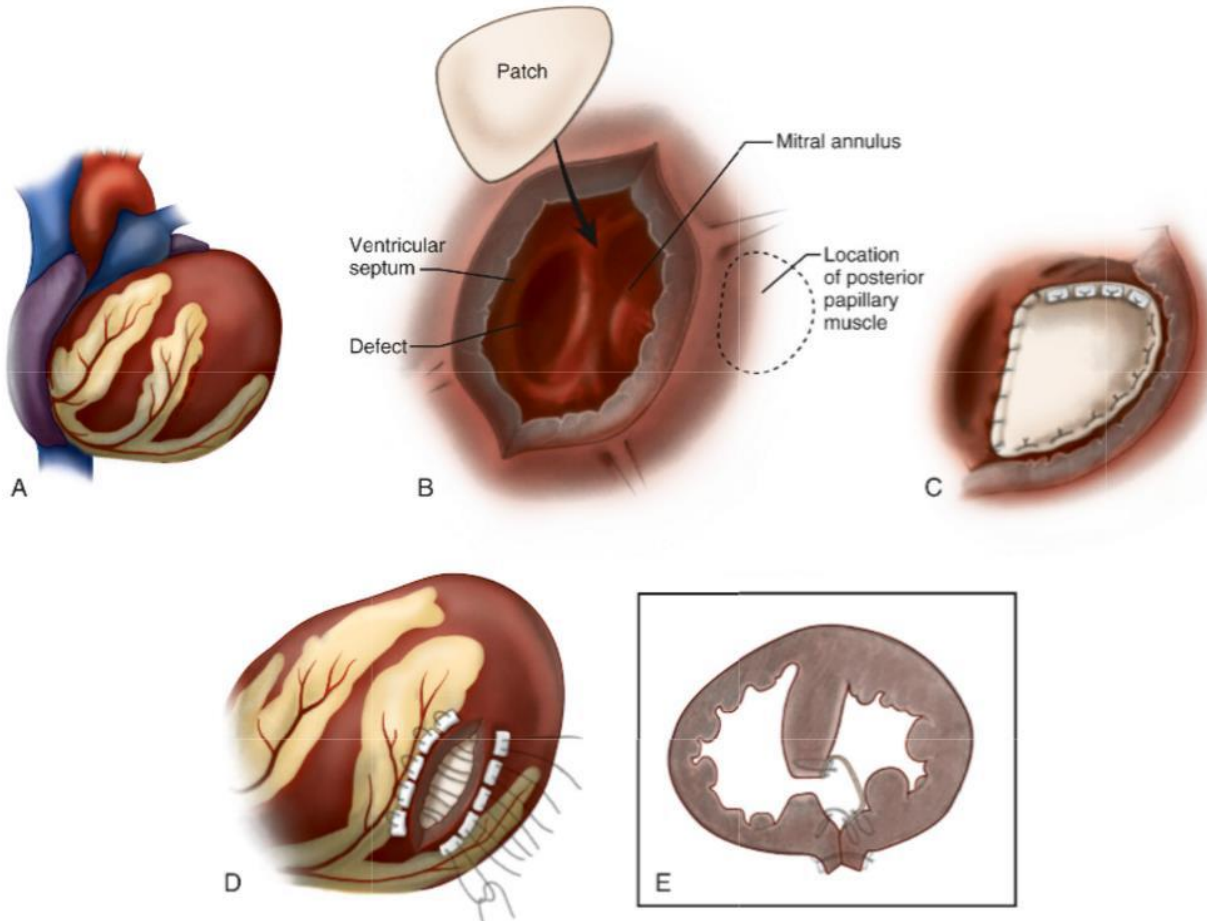
TTE



- Imp : **Postinfarction VSD, apical wall**
- Tx : **Bovine pericardial patch closure of VSD**



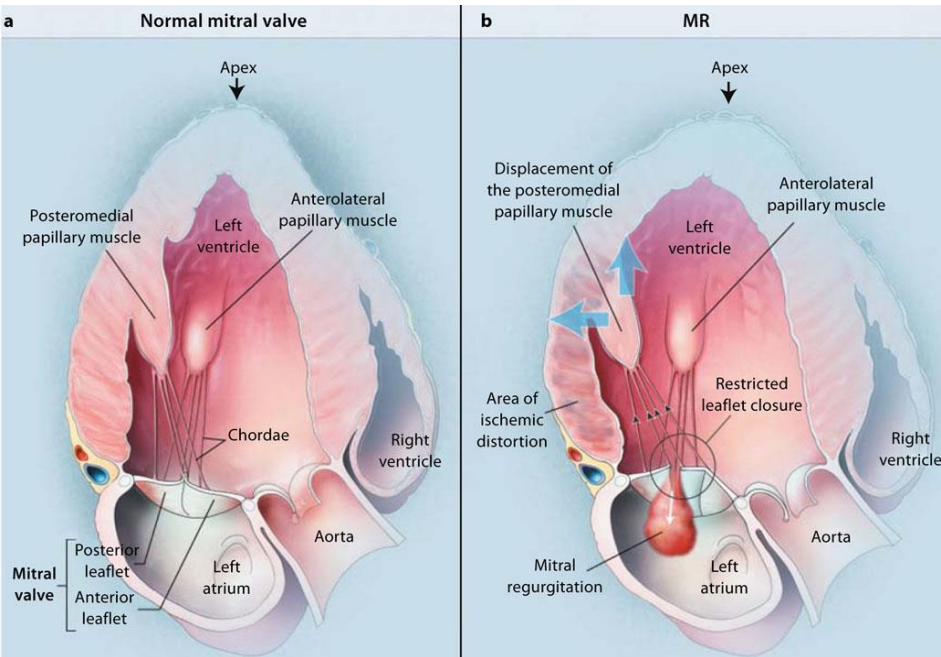
Repair of post. postinfarct VSD



Ischemic mitral regurgitation(IMR)

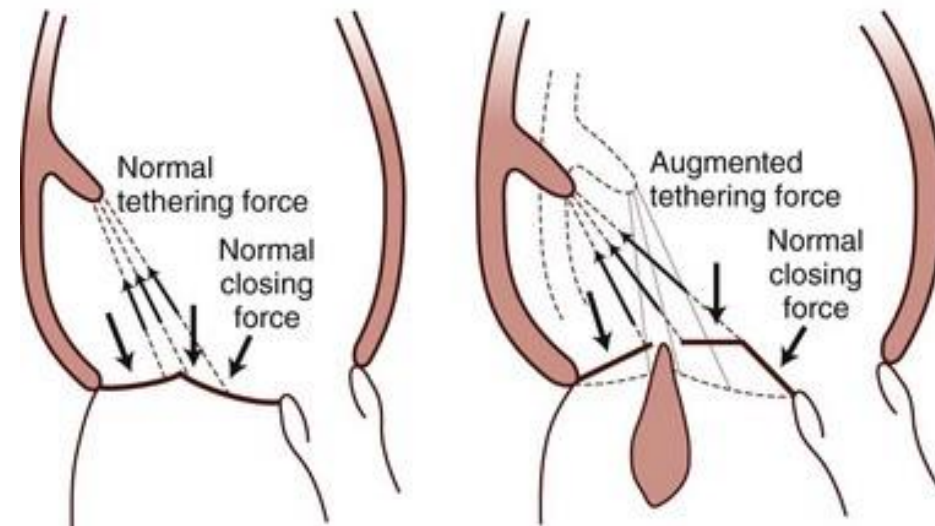


Pathophysiology



Normal

LV dilation



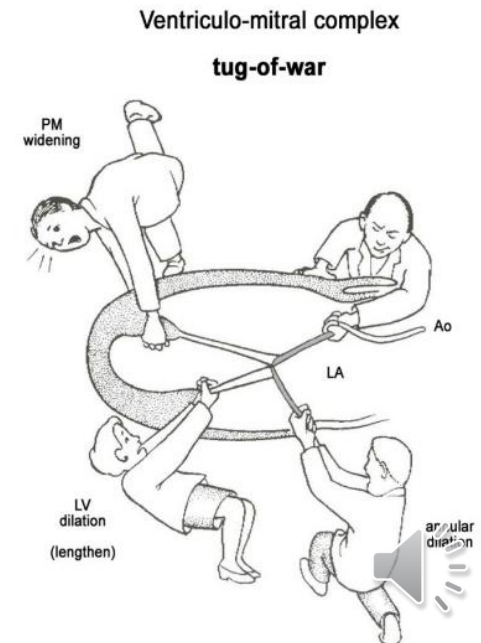
- Tethering of the valve leaflets
- Valve dysfunction
: Restriction of leaflet motion
(Carpentier's type IIIB dysfunction)



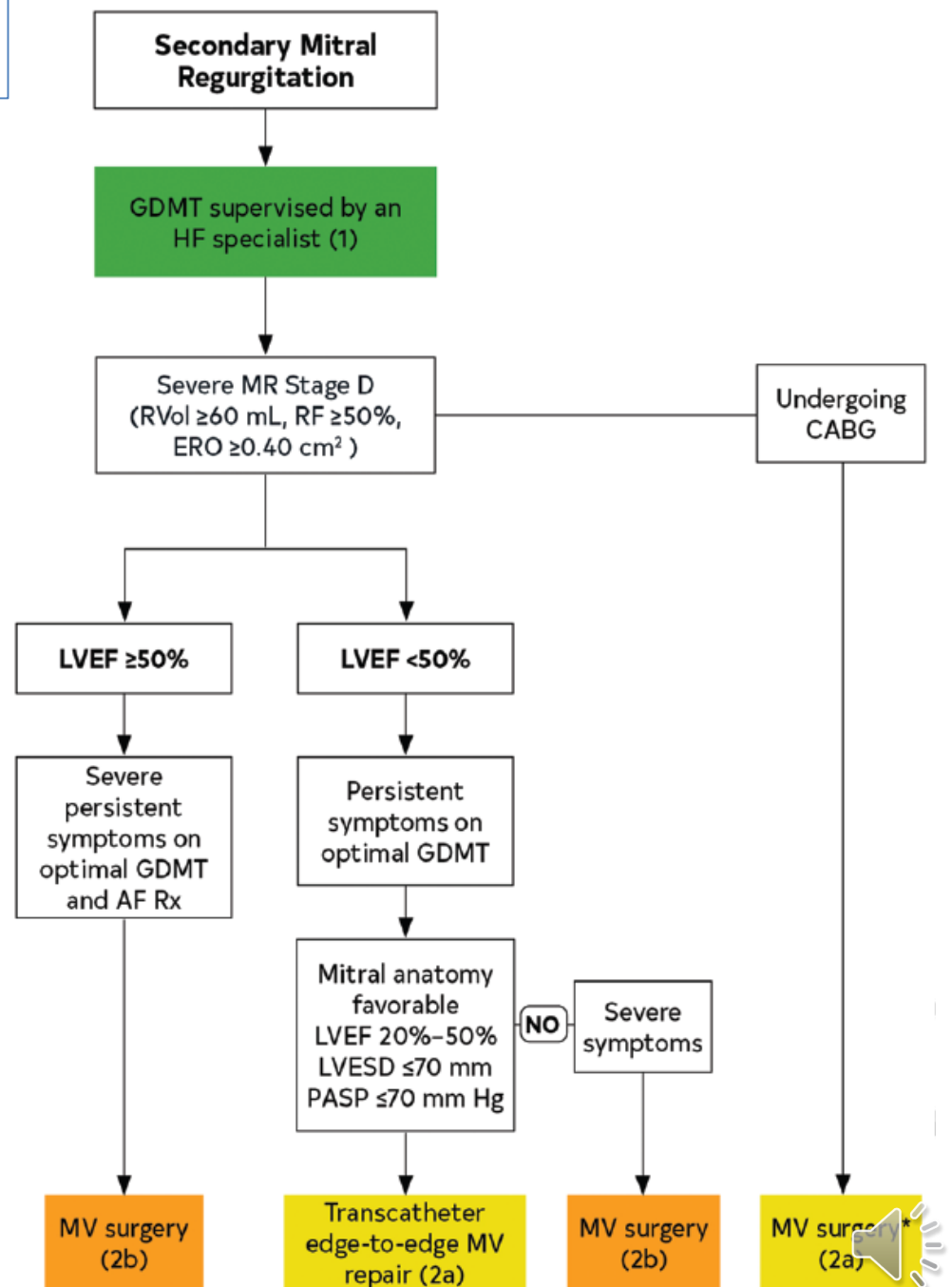
Pathophysiology

Adverse LV remodeling
(distortion of the ventricle & mitral annulus)
Apical & lateral migration of the papillary muscles


- Mechanism of ischemic MR
: complex!!!



2020 ACC/AHA Guideline for the Management of Valvular Heart Disease

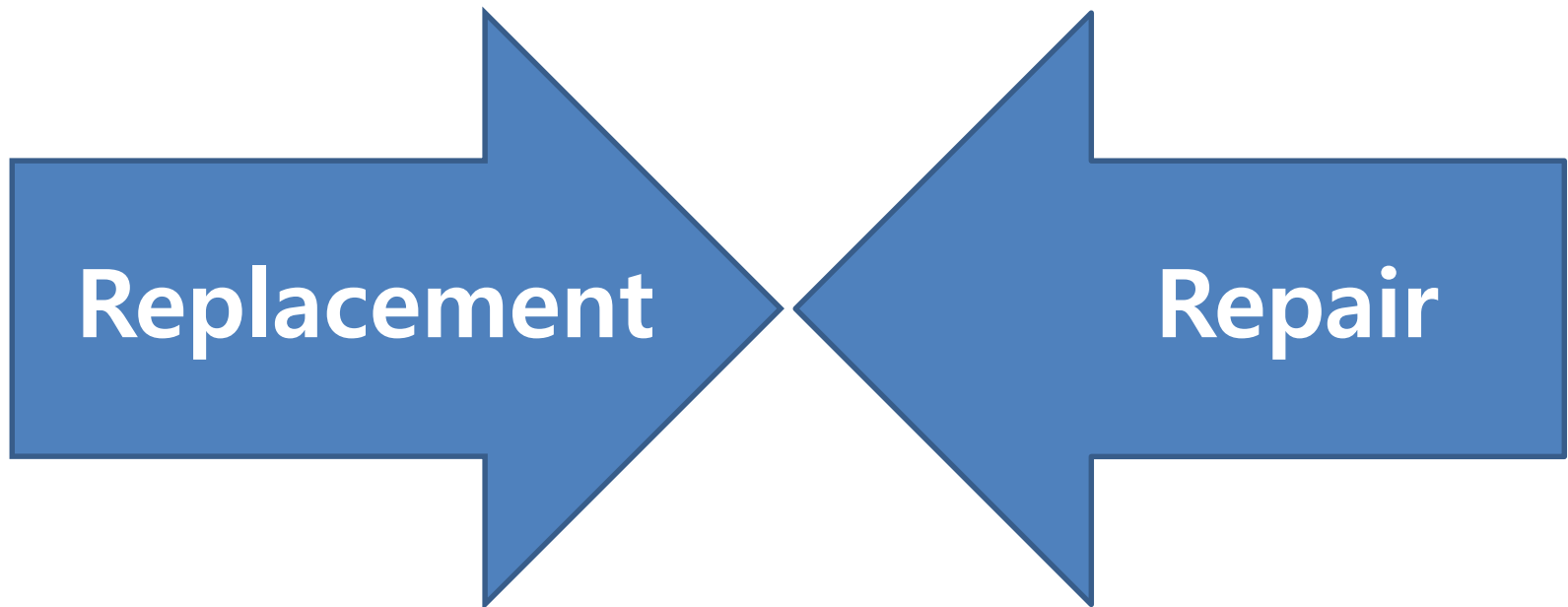


2017 ESC/EACTS Guideline for the Management of Valvular Heart Disease

<p>When revascularization is not indicated, surgery may be considered in patients with severe secondary mitral regurgitation and LVEF >30% who remain symptomatic despite optimal medical management (including CRT if indicated) and have a low surgical risk.</p>	<p>IIb</p>	<p>C</p>
<p>When revascularization is not indicated and surgical risk is not low, a percutaneous edge-to-edge procedure may be considered in patients with severe secondary mitral regurgitation and LVEF >30% who remain symptomatic despite optimal medical management (including CRT if indicated) and who have a suitable valve morphology by echocardiography, avoiding futility.</p>	<p>IIb</p>	<p>C</p>
<p>In patients with severe secondary mitral regurgitation and LVEF <30% who remain symptomatic despite optimal medical management (including CRT if indicated) and who have no option for revascularization, the Heart Team may consider a percutaneous edge-to-edge procedure or valve surgery after careful evaluation for a ventricular assist device or heart transplant according to individual patient characteristics.</p>	<p>IIb</p>	<p>C</p> 

Recommendations	Class ^b	Level ^c
<p>Surgery is indicated in patients with severe secondary mitral regurgitation undergoing CABG and LVEF >30%.</p>	<p>I</p>	<p>C</p>
<p>Surgery should be considered in symptomatic patients with severe secondary mitral regurgitation, LVEF <30% but with an option for revascularization and evidence of myocardial viability.</p>	<p>IIa</p>	<p>C</p>

Surgical Treatment



Acute Papillary Muscle Rupture

- 5% of STEMI ↓↓↓

- **Posteromedial PM**

>>> Anterolateral PM

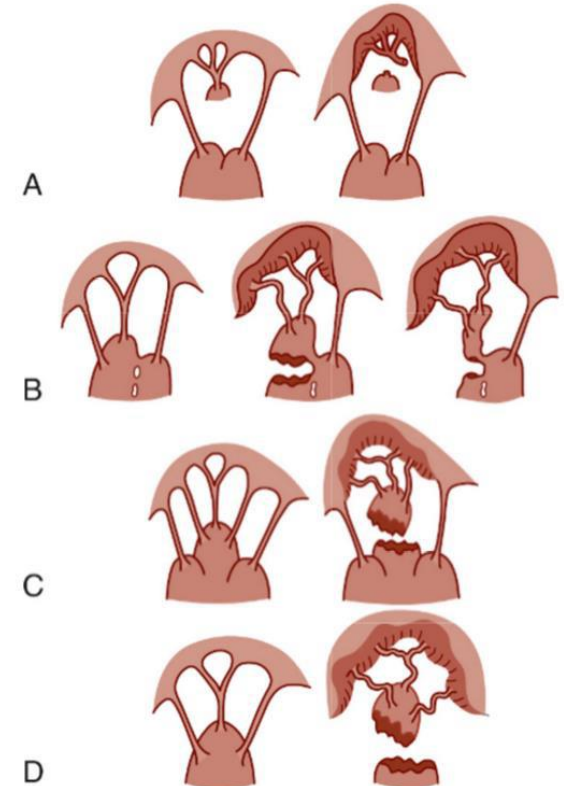
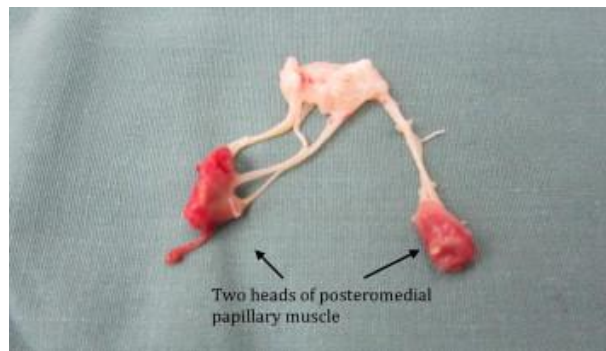


- About 1 week after AMI
- Sx: new systolic murmur, hemodynamic collapse, shock
- DDx: infarct VSD, LV free-wall rupture, global LV dysfunction



Acute Papillary Muscle Rupture

- Emergent Surgery!!!
- **MV Replacement**(mc)
- MVP with reimplantation of PM
- Hospital mortality: 20%



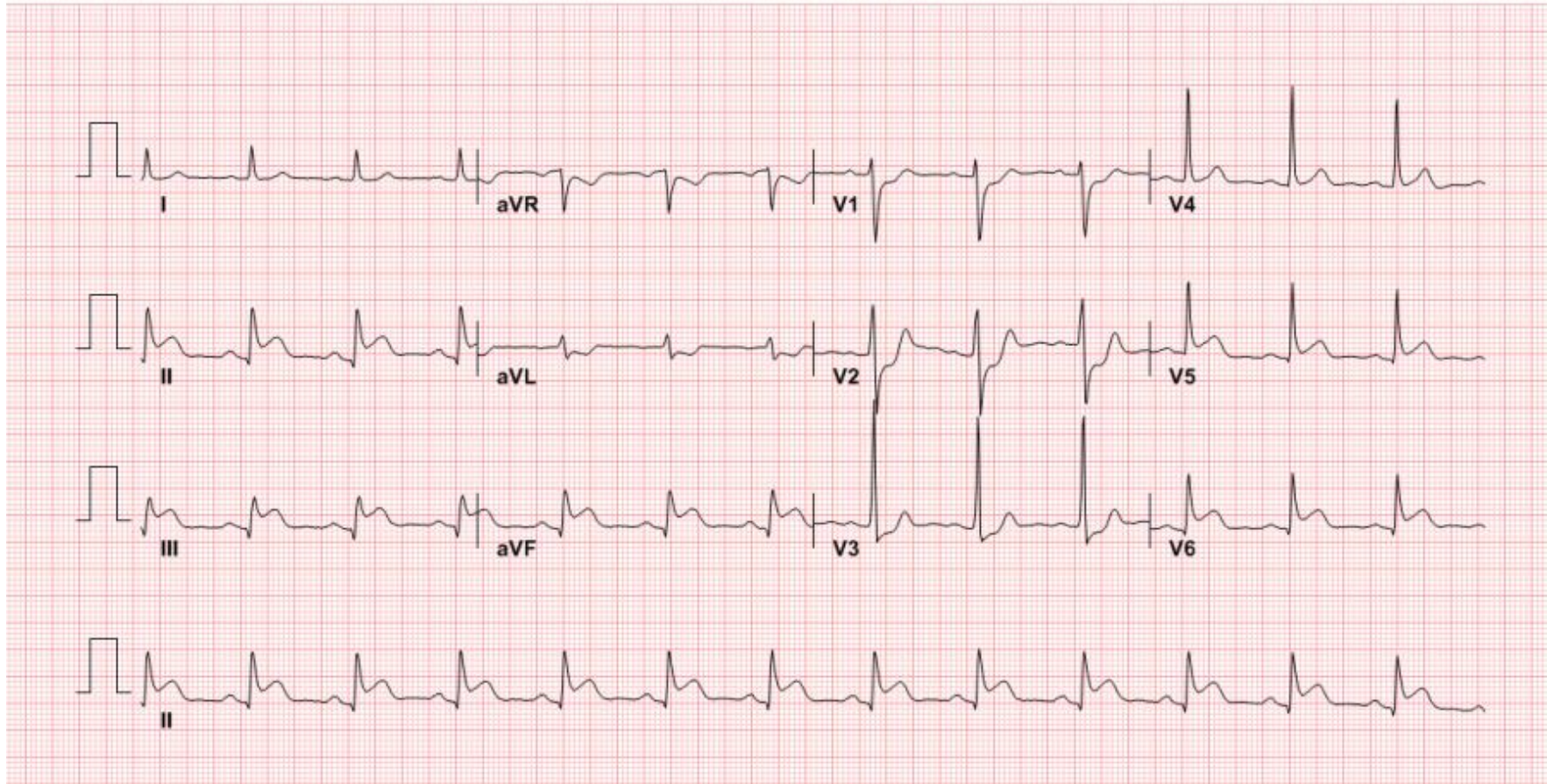
CASE

M/70

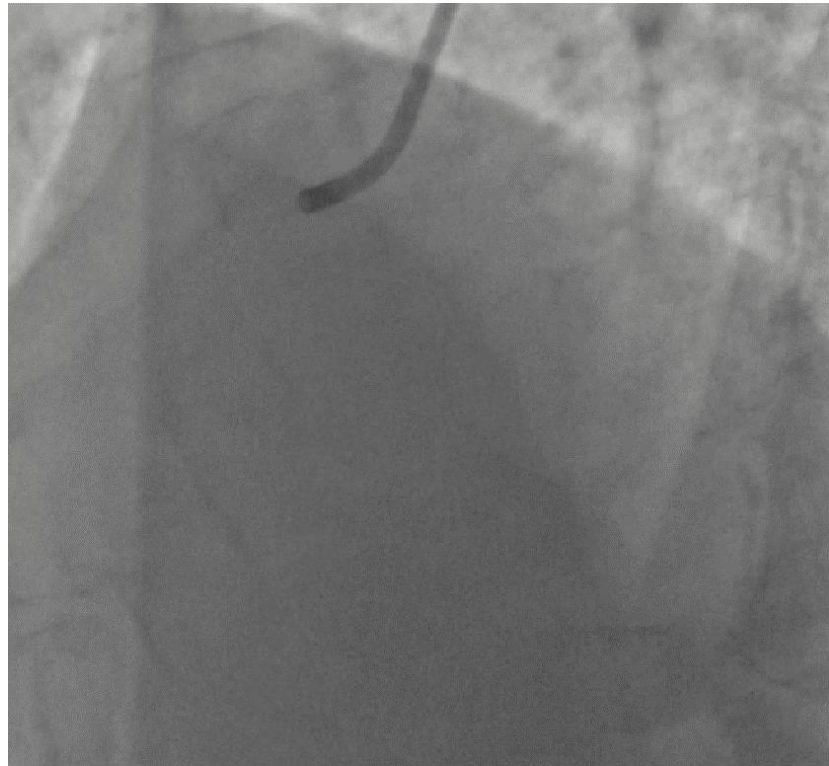
- **C/C** ant. Chest pain for 2 days
- **P/I**
 - 2 day PTA effort related chest pain
 - 1 hr PTA aggravated **chest pain, cold sweating**
- **P/Hx**
 - HTN/DM(+/+)
- **P/E**
 - BP 119/78 HR 94
- **Lab**
 - Tnl 394



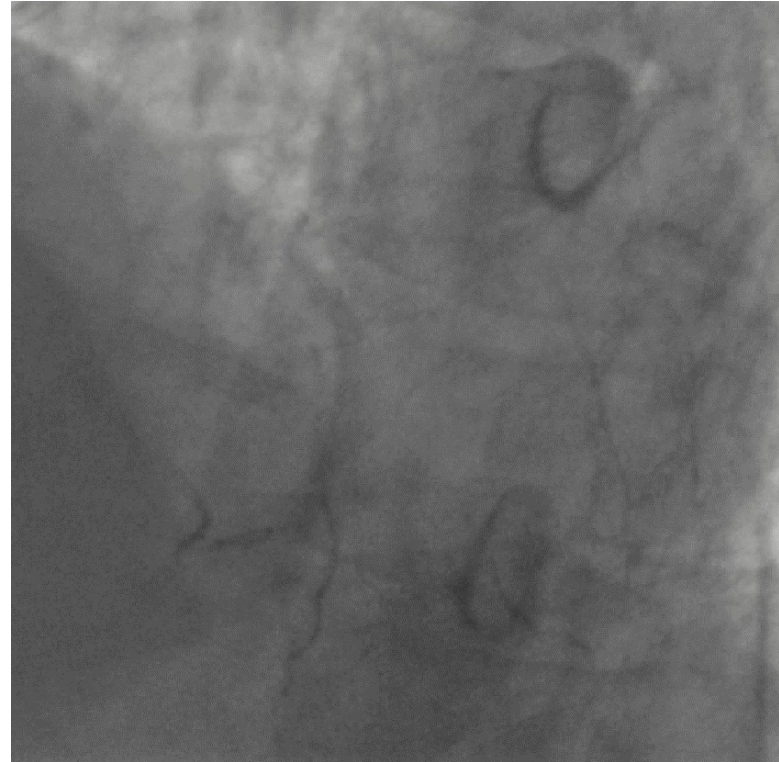

ECG



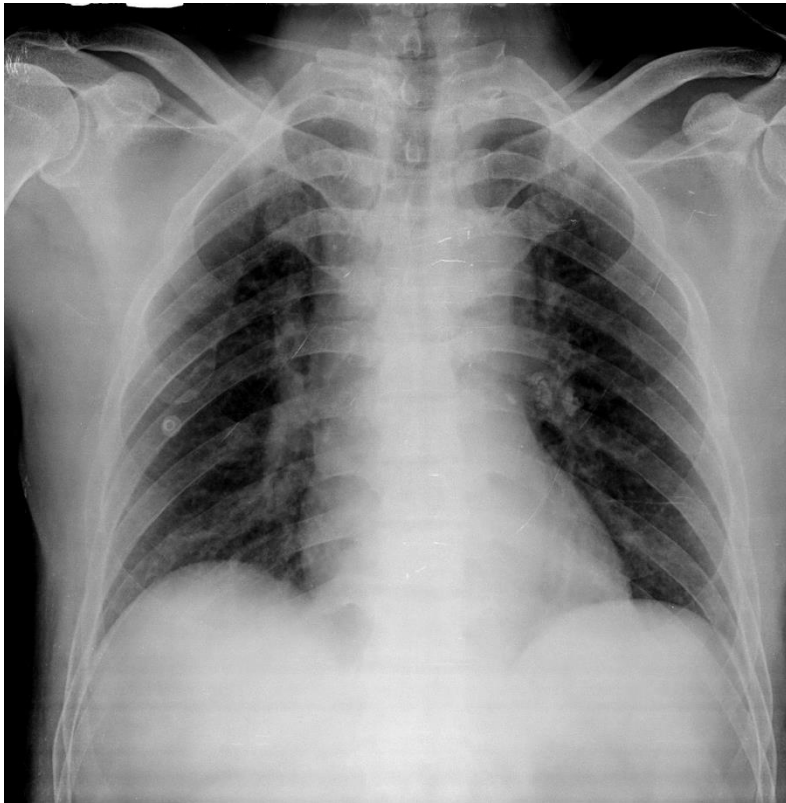
CAG



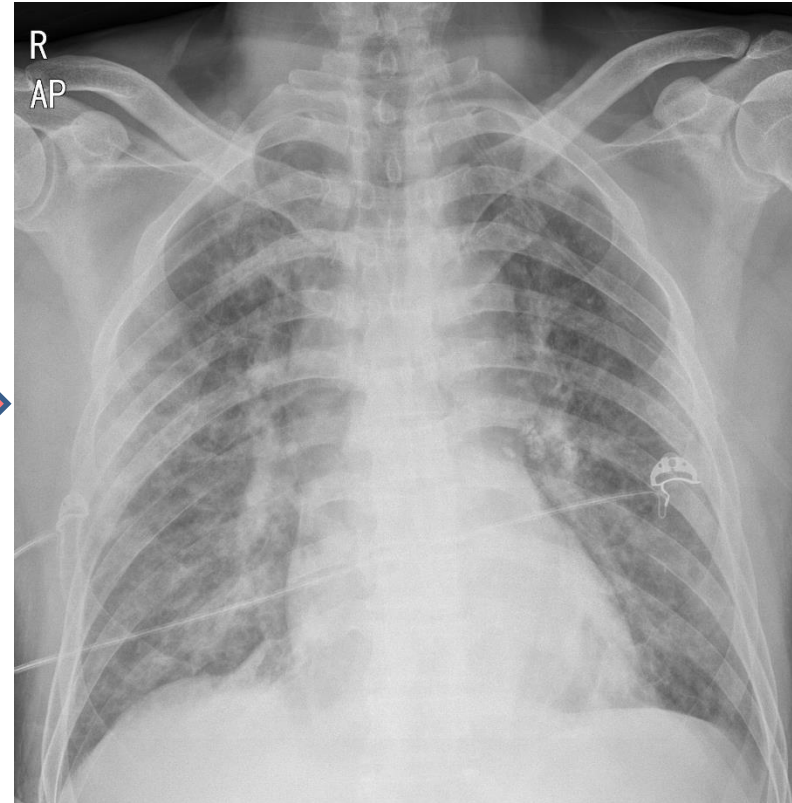
PCI



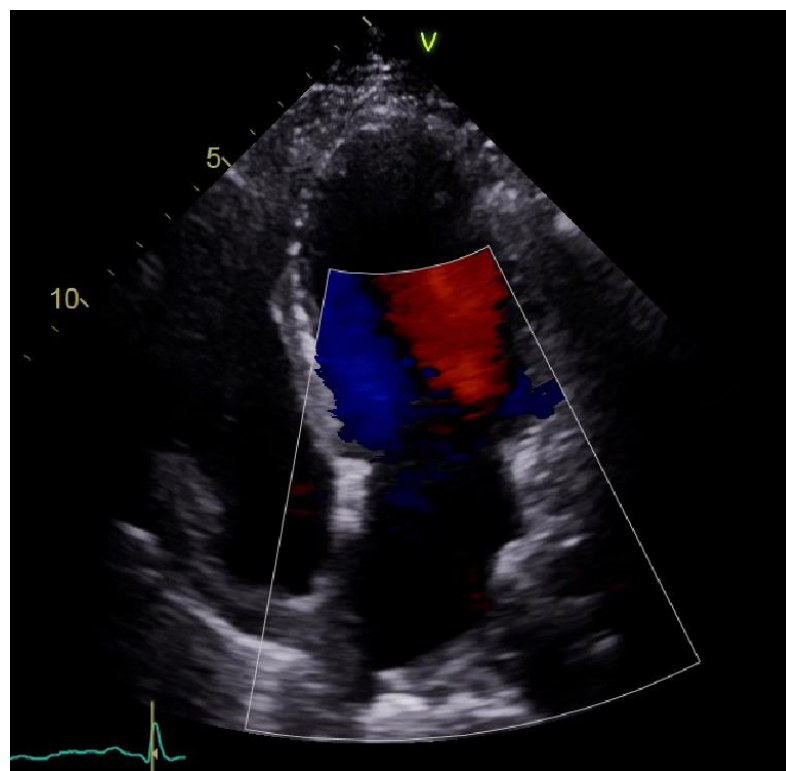
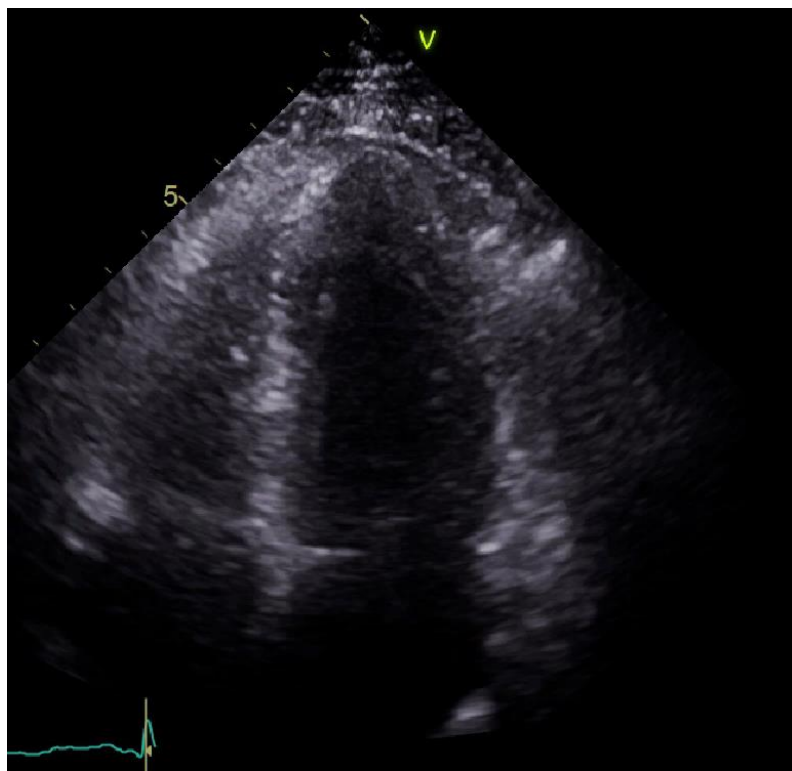
CXR



1 Day later



TTE



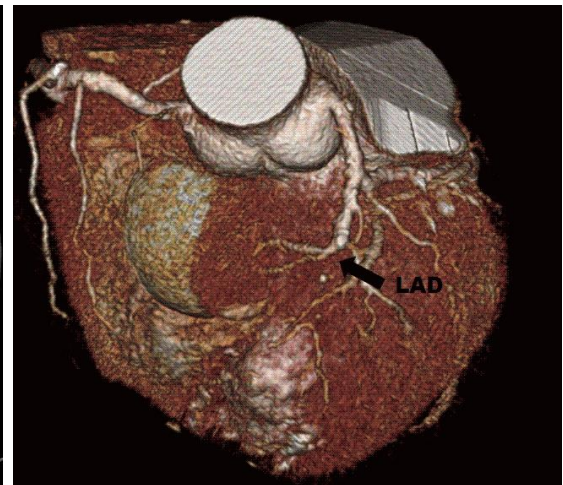
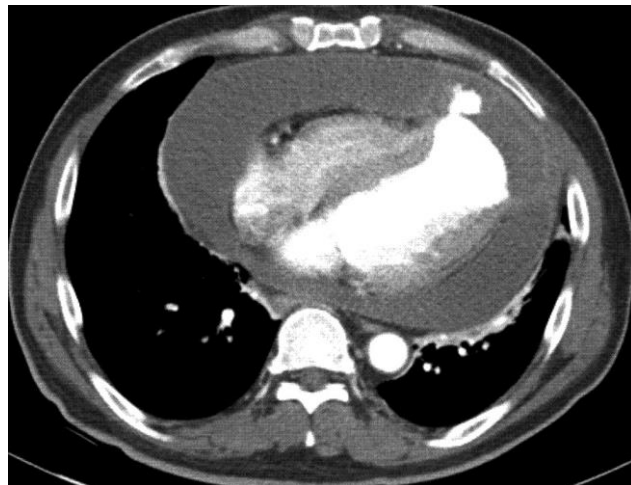
- Imp : **MR, severe**
d/t acute papillary muscle rupture
- Tx : **Mitral valve replacement**
with 31mm St. Jude mechanical valve



Left Ventricular Free wall Rupture



- Rare but catastrophic complication 2-4%
- 2nd cause of death after cardiogenic shock
: cardiac tamponade, irreversible electromechanical dissociation
- 30% subacute cardiac rupture – survive several hours
- Key to success
: **early diagnosis & prompt surgical intervention**



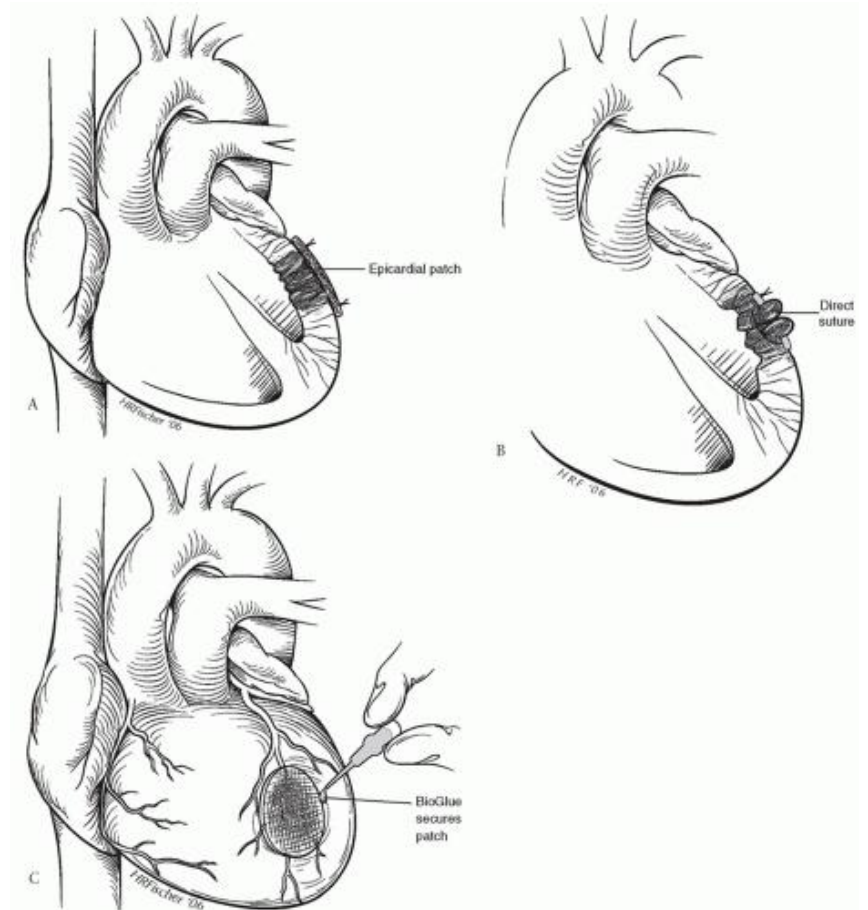
Clinical characteristics

- Age > 55 years
- 1st transmural acute myocardial infarct
- persistent ST segment elevation
- Prolonged pain during the acute phase
 - : sudden hypotension/electromechanical Dissociation
- Recurrence of chest pain, JVP↑
- TTE/TEE
 - : moderate to severe pericardial effusion

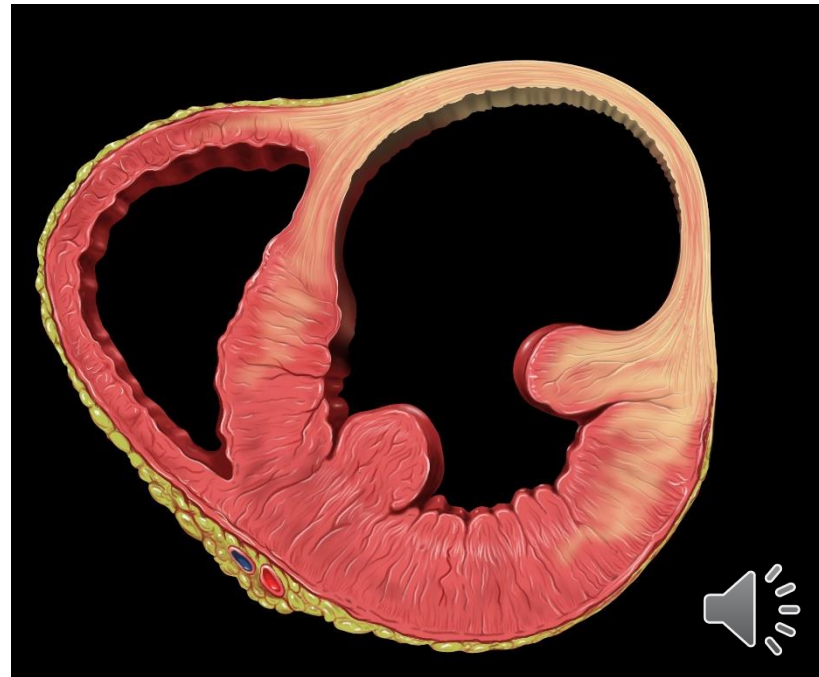


Surgical Treatment

1. Epicardial patch
2. Direct closure
3. Glue

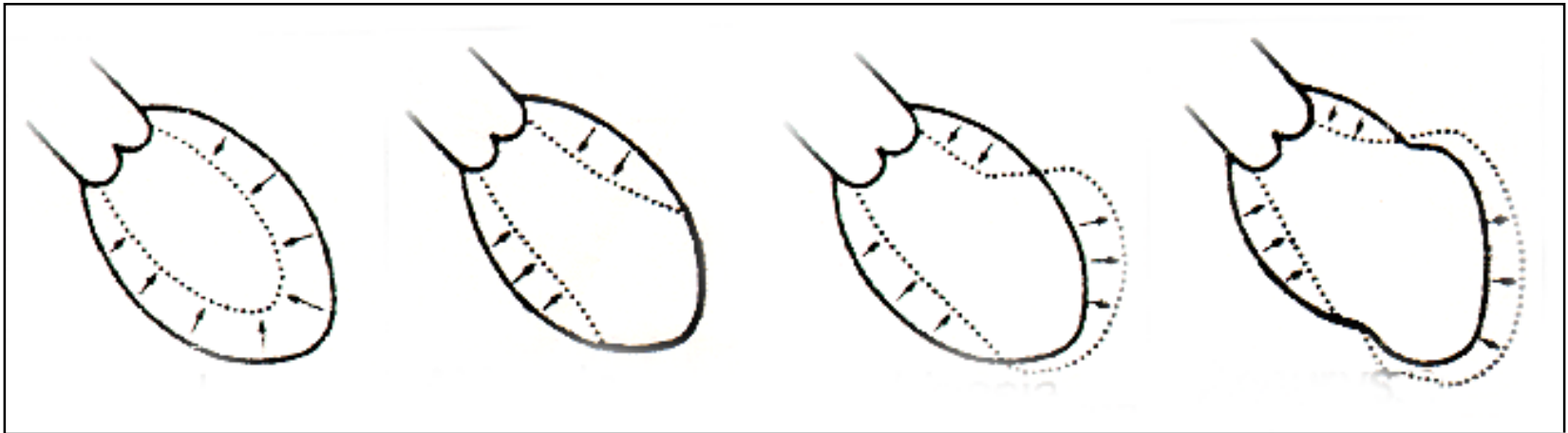


Left Ventricular Aneurysm

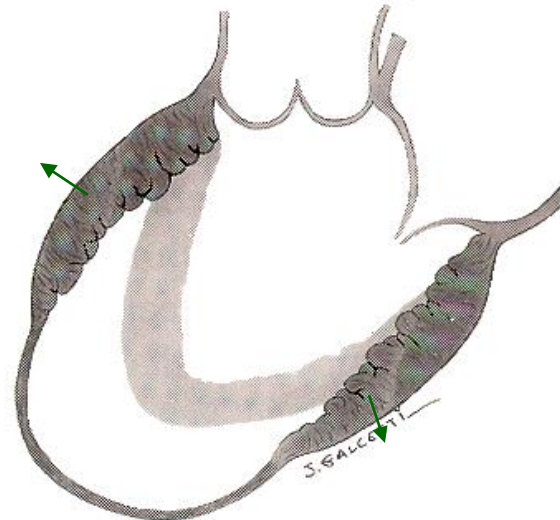
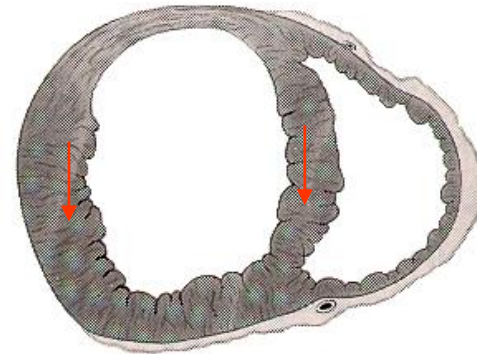
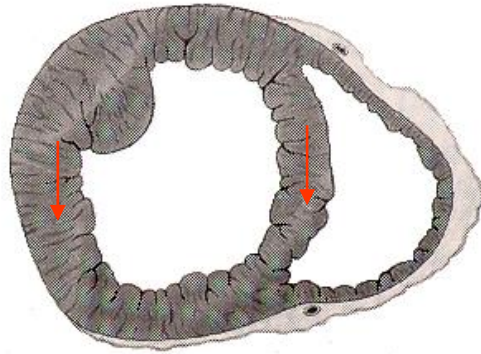


Left Ventricular Aneurysm

- Cause : CAD/MI(95%)
- True aneurysm
- False aneurysm

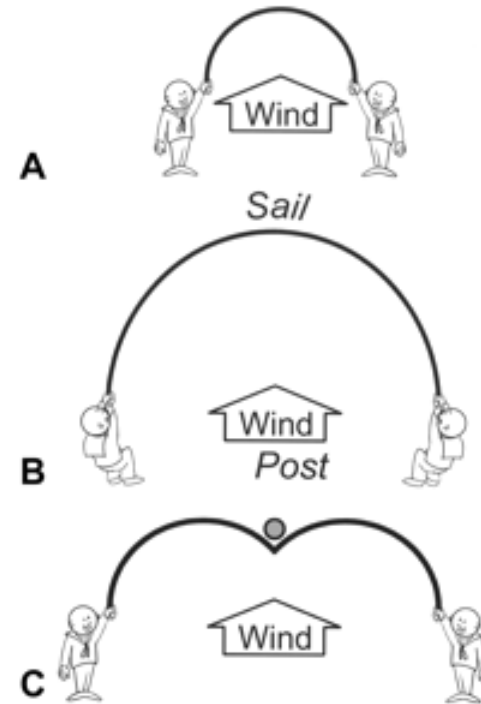


Change of LV Geometry

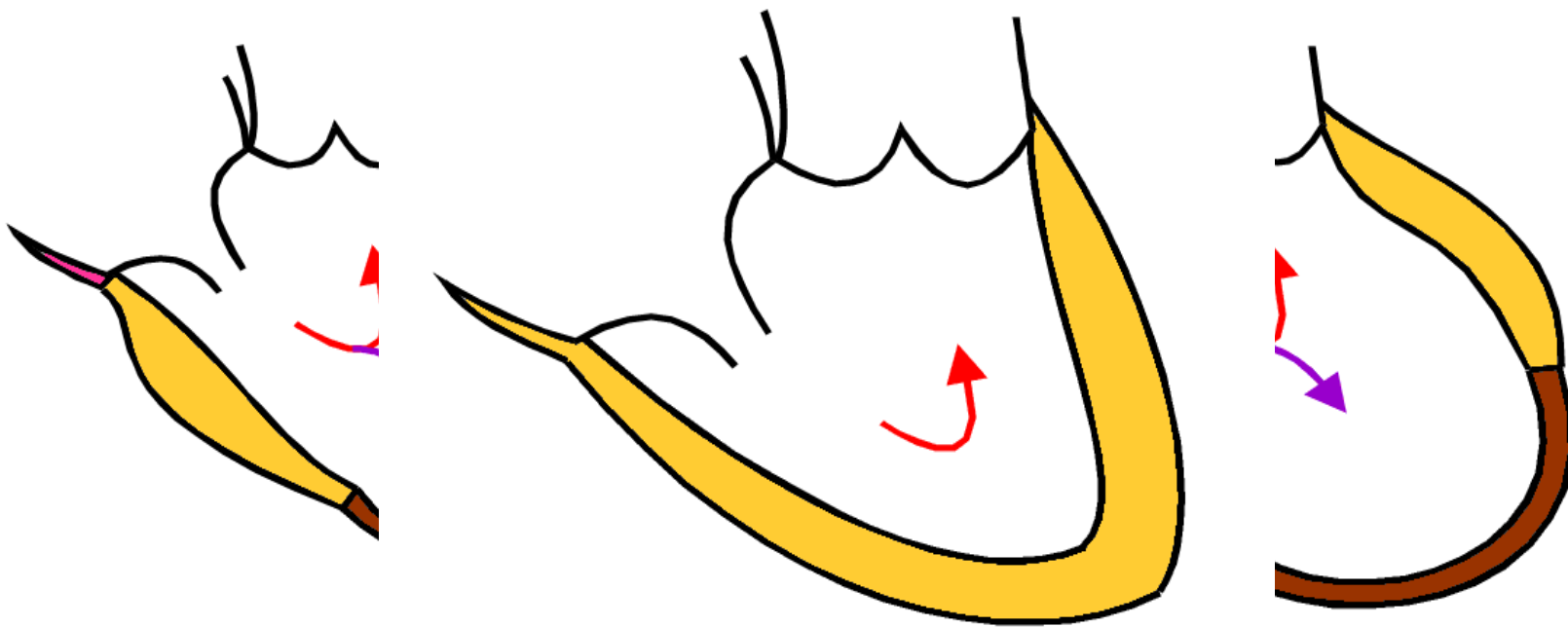


Laplace's law

$$T = \frac{P \times R}{2}$$



Dyskinesia vs Akinesia

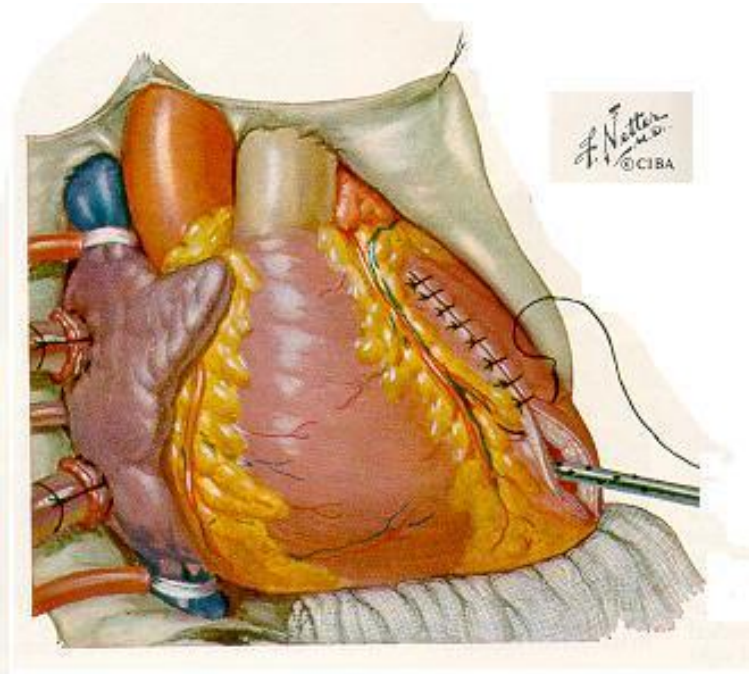
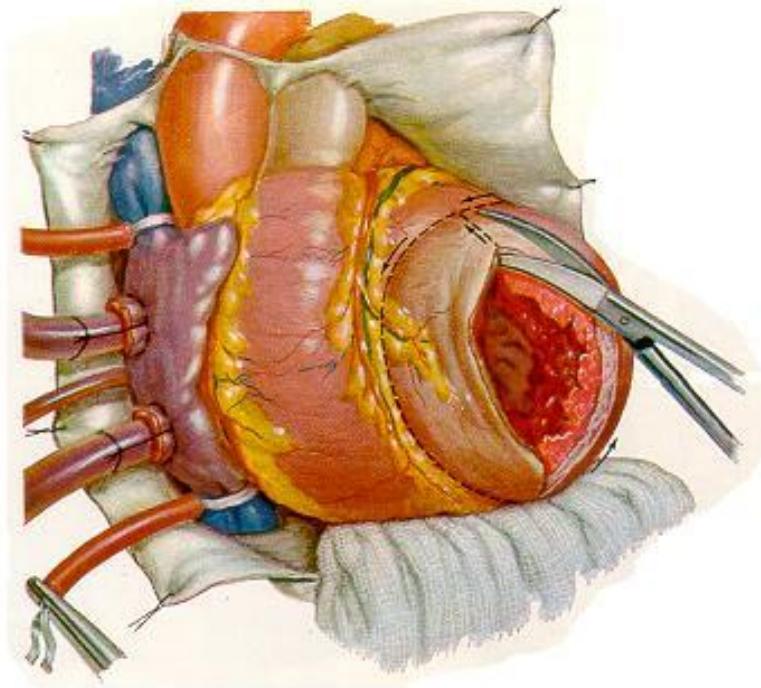


Surgical Treatment

1. Plication
2. Linear closure
3. Circular patch
4. Endoventricular patch



Linear Closure



Cooley DA, et al. JAMA 1958;167:557



Surgical Ventricular Reconstruction

