

Pericarditis

For the primary care Physician

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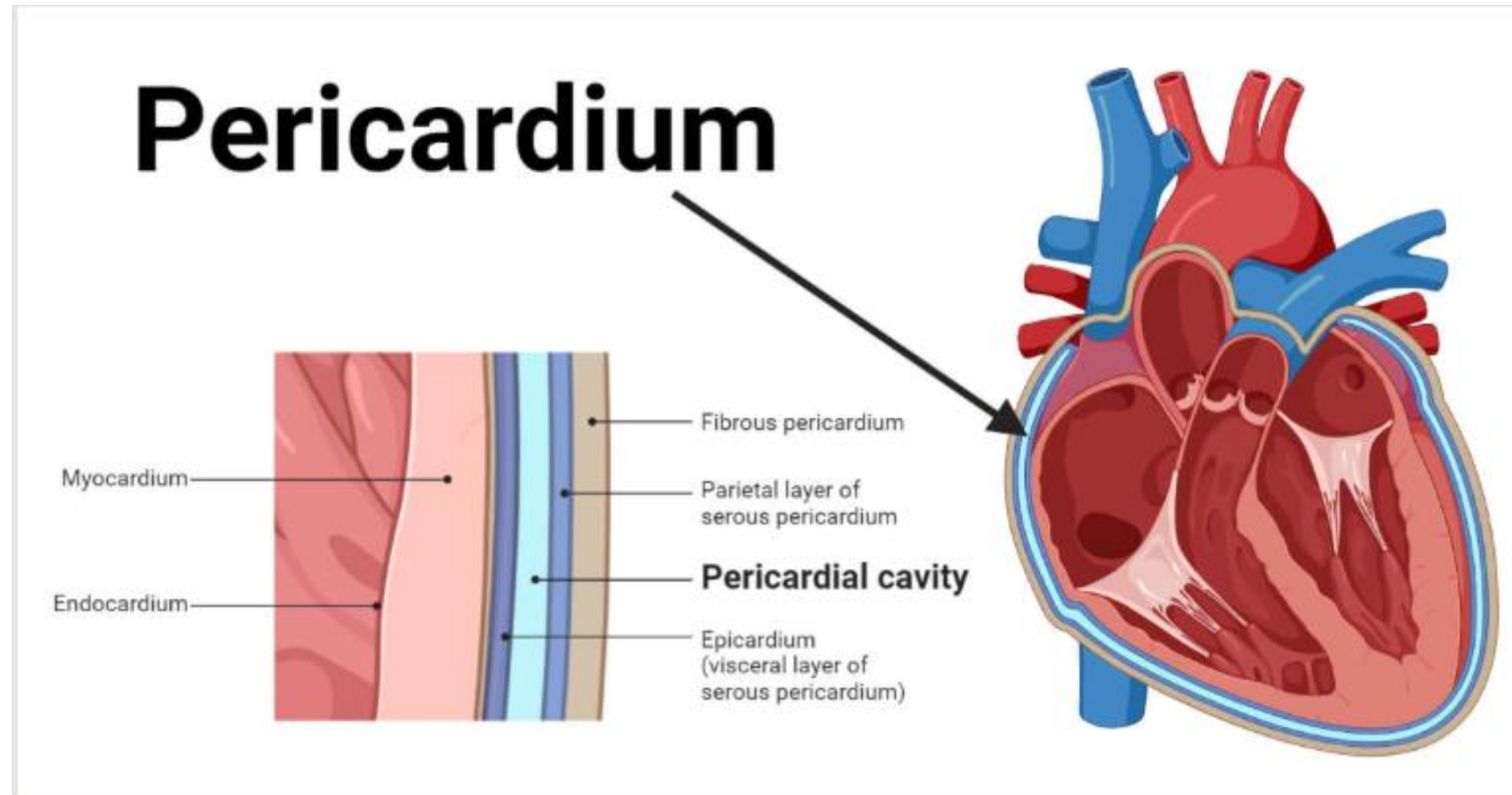
Disclosure

- No disclosures

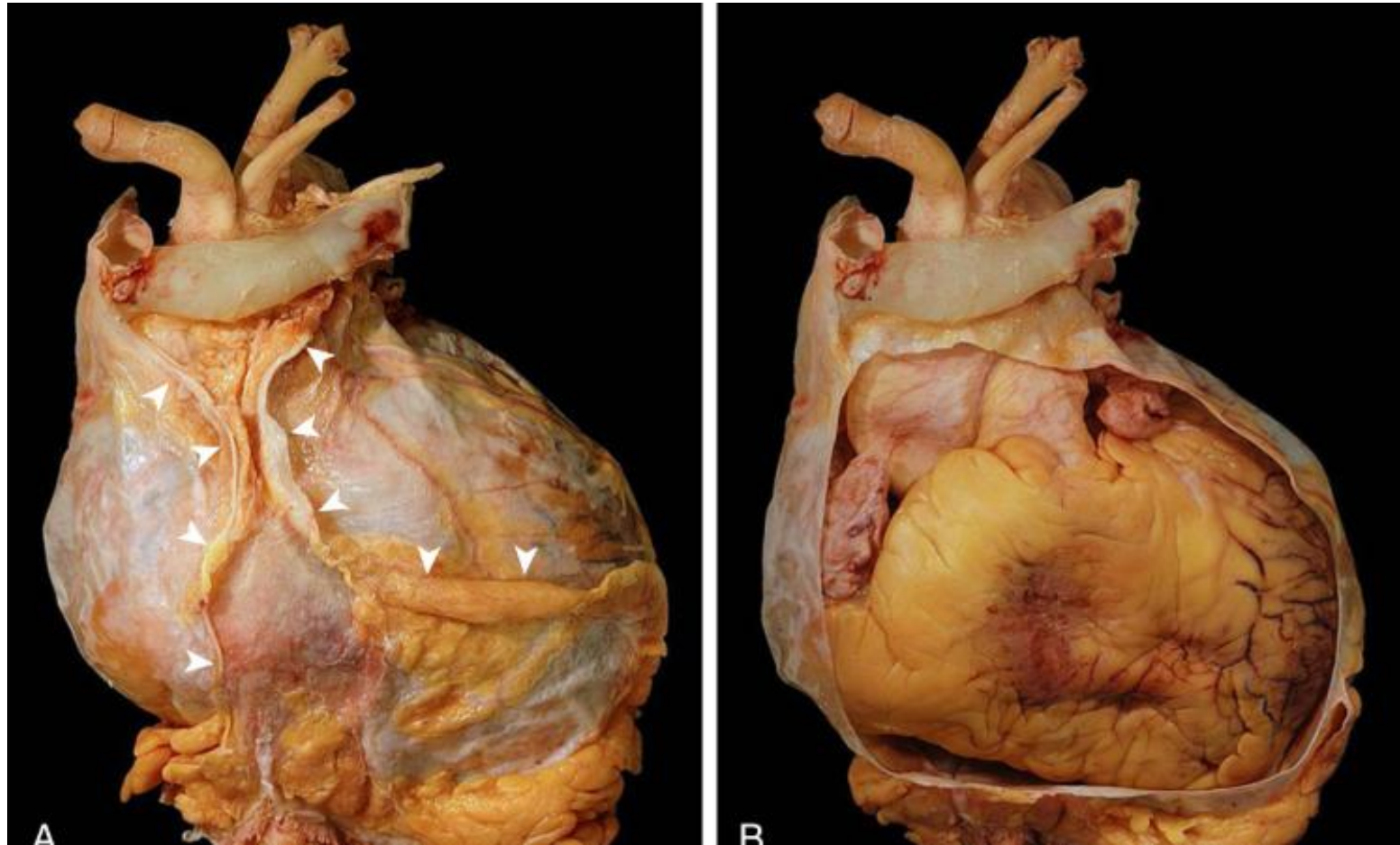
Objectives

- Pericardial anatomy
- Pathophysiology and definition of pericarditis
- Diagnosis of pericarditis
- Treatment of acute and recurrent pericarditis

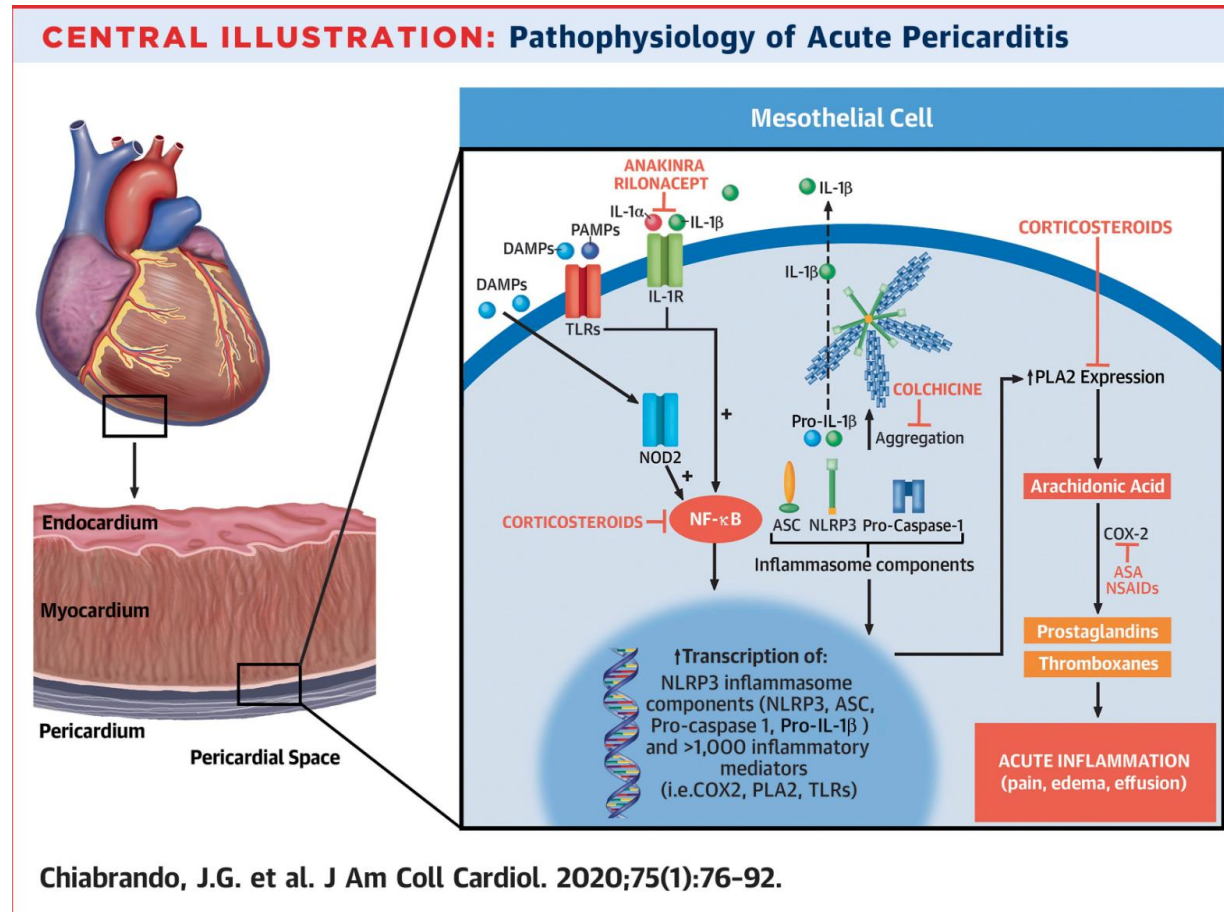
The pericardium



The pericardium

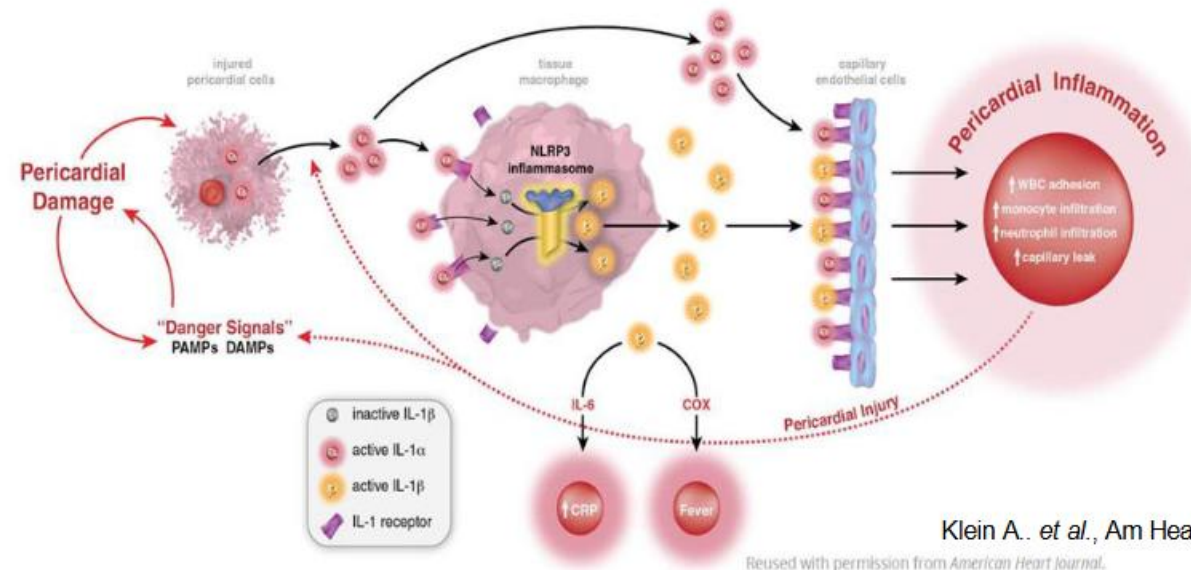


What is pericarditis?



PATHOPHYSIOLOGY OF RECURRENT PERICARDITIS^{1,2}

IL-1 is the primary driver of symptomatology in patients with recurrent pericarditis³⁻⁵



Klein A. et al., Am Heart J. 2020

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Etiology

Infectious
Autoimmune (common)
Metabolic (common)
Traumatic/Iatrogenic (common)
Neoplastic
Drug Related (rare)

Etiology

Infectious	Viral (common) – enterovirus, herpesvirus, adenovirus, parvovirus B19 Bacterial (mycobacterium tuberculosis is most common) Fungal/Parasitic (very rare)
Autoimmune (common)	Systemic autoimmune/inflammatory diseases – SLE, Sjogren, RA, scleroderma Systemic vasculitis Autoinflammatory diseases (FMF) Sarcoidosis IBD
Metabolic (common)	Uremia Myxedema Anorexia nervosa
Traumatic/Iatrogenic (common)	Early Onset (rare): from direct or indirect thoracic injury, or radiation Delayed Onset (common): post-MI, post-pericardiectomy, post-trauma (including iatrogenic trauma like PCI, pacemaker insertion, ablation)
Neoplastic	Primary tumor (rare): pericardial mesothelioma Secondary mets (common): lung, breast, lymphoma
Drug Related (rare)	Lupus-like syndrome (procainamide, hydralazine) Hypersensitivity with eosinophilia (penicillin)

Table 1.

Most common etiology of acute pericarditis

A. Infectious (80–85%)	B. Non-infectious (15–20%)
<u>Viral (most common):</u>	<u>Autoimmune (up to 10%):</u>
• Coxsackievirus echovirus • Herpes viruses • Influenza • Adenovirus • HCV • HIV • Parvovirus B19 • SARS-CoV-2, etc	• Post-cardiac injury syndromes • Systemic autoimmune and autoinflammatory diseases
	<u>Neoplastic pericarditis (5–7%):</u>
	• Rarely primary and most often secondary tumors
	<u>Metabolic:</u>
	• Uremia
	Myxedema
<u>Non-viral:</u>	<u>Drug related:</u>
• Bacterial (Tuberculous 4–5%, <i>Coxiella burnetii</i>) • Rarely fungal and parasitic	• Antineoplastic drugs • Drugs inducing lupus-like syndrome • Vaccines (including vaccines against COVID-19)

Prevalence

- Incidence of acute pericarditis in the general population is estimated at approximately 27.7 cases per 100,000 subjects per year, whereas the standardized incidence rate of hospital admissions for pericarditis is 3.32 cases per 100,000 person-years

Diagnosing and defining pericarditis

Diagnosis of Pericarditis



1. **Pleuritic chest pain or equivalent** suggestive clinical presentation (must be present)
2. Plus at least 1 more finding (0 = unlikely, 1 = possible, 2+ = definite diagnosis)
 - a) **Pericardial friction rub**
 - b) **ECG changes:** diffuse ST-elevation and/or PR-segment depression
 - c) **Inflammatory biomarkers elevation** (C-reactive protein, sedimentation rate)
 - d) **Cardiac imaging evidence of new or worsening pericardial effusion**
(especially echocardiography, other imaging modalities as alternative)
 - e) **Cardiac imaging evidence of pericardial inflammation** (cardiac magnetic resonance pericardial late gadolinium enhancement and/or edema, computed tomography with contrast as alternative)

Duration of Pericarditis Classification



1. **Acute:** Event lasting <4-6 weeks
2. **Incessant:** Event lasting >4 to 6 weeks without remission
3. **Recurrent:** New episode with signs and symptoms of pericardial inflammation after a symptom-free interval of 4 to 6 weeks
4. **Chronic:** Event lasting >3 months

History

- Pleuritic chest pain
- History of GI or URI sx
- Recent fevers/illness
- History of autoimmune disorder
- Prior pericardial effusion or prior pericarditis

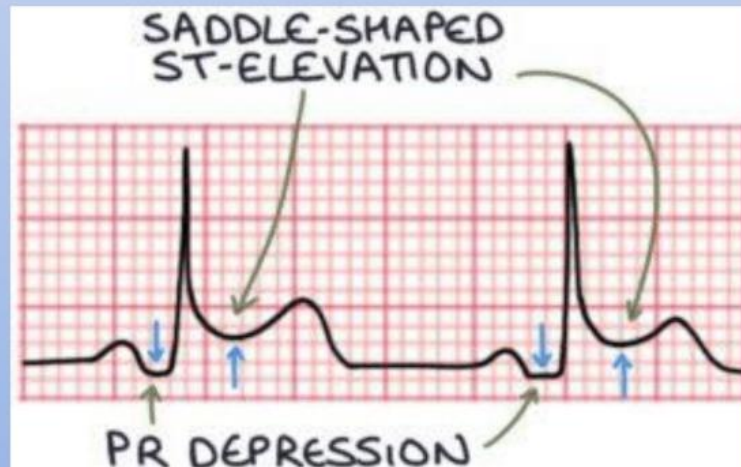
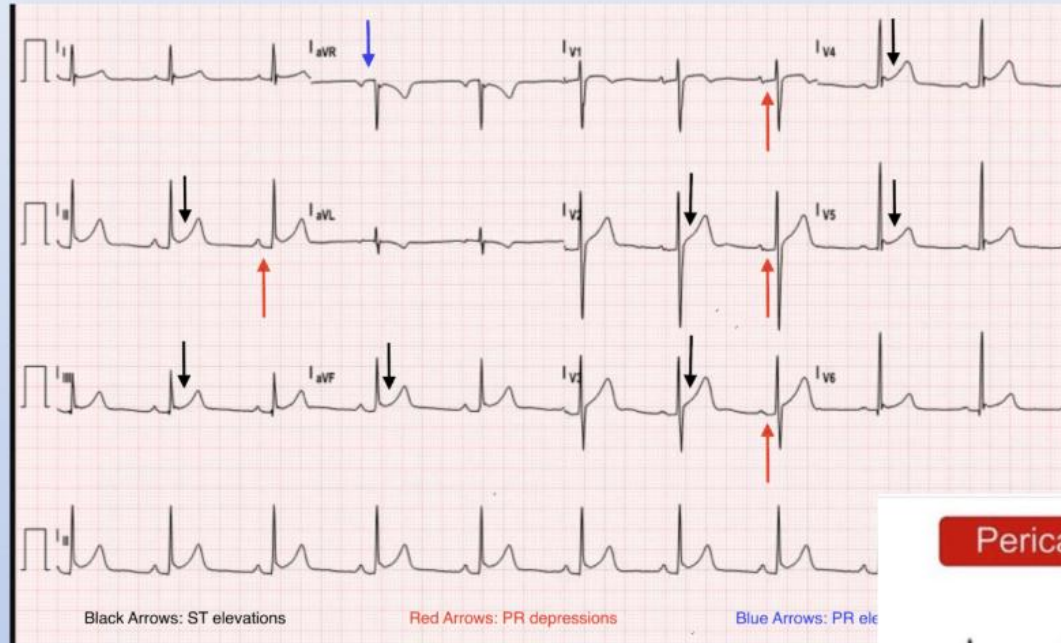
Physical exam

- Pericardial friction rub

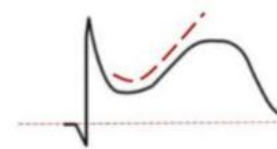
Labs

- ESR/CRP
- Troponin
- NT proBNP
- Consider autoimmune markers on a case by case basis

ECG



Pericarditis vs. STEMI on ECG



Pericarditis



STEMI

ST Concave Elevation
Global leads (except AvR)

PR Global Depression (except AvR)
Most common in Lead II

X Absence of T or Q wave changes

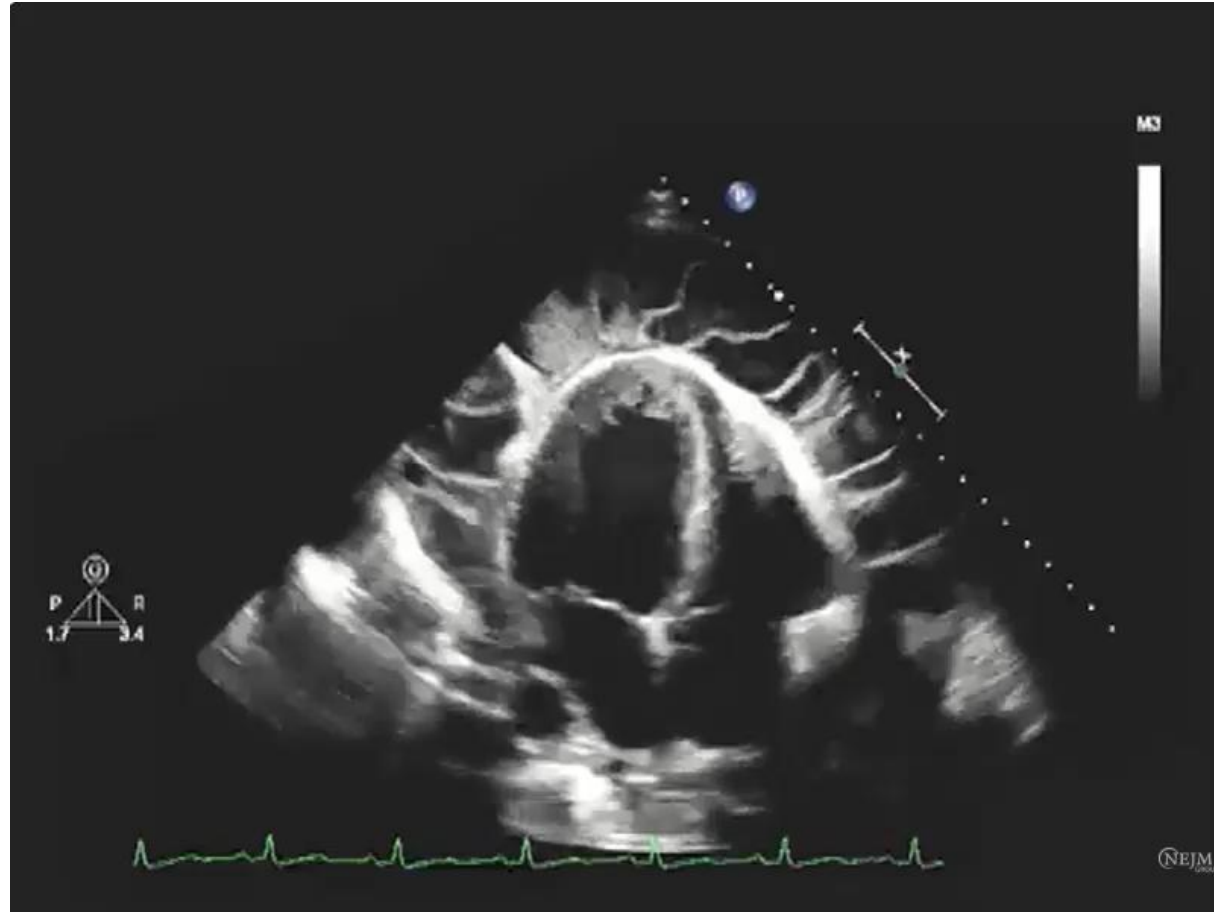
ST Convex Elevation ("tombstone")
≥2 Contiguous leads (artery region)

ST Elevation of ≥1 mm (except V2, V3)
Reciprocal ST depression

+/- T-wave inversion
Pathological Q wave
(>1mm wide, >25% depth of QRS)

Echo

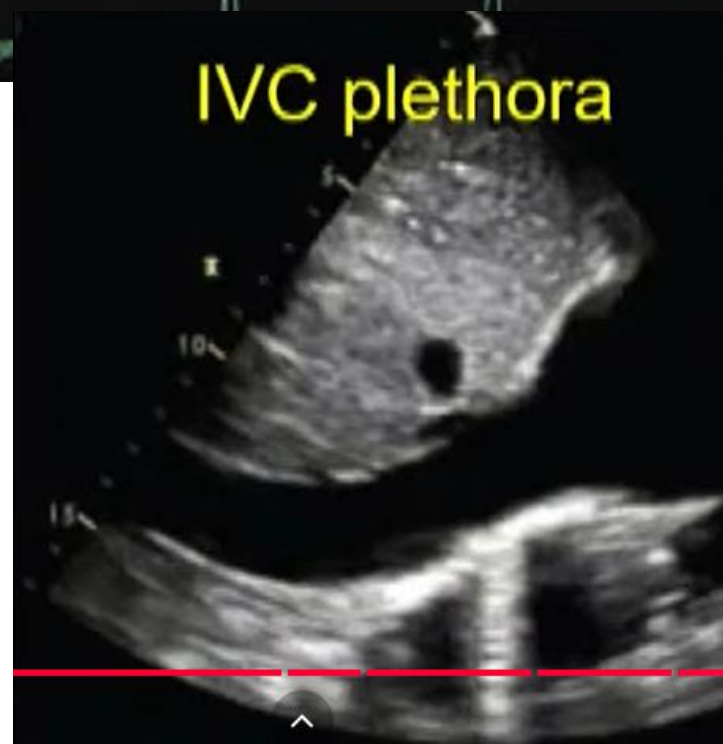
- Effusion
- Pericardial thickness
- Annular motion - annulus reversus
- Septal motion – septal bounce



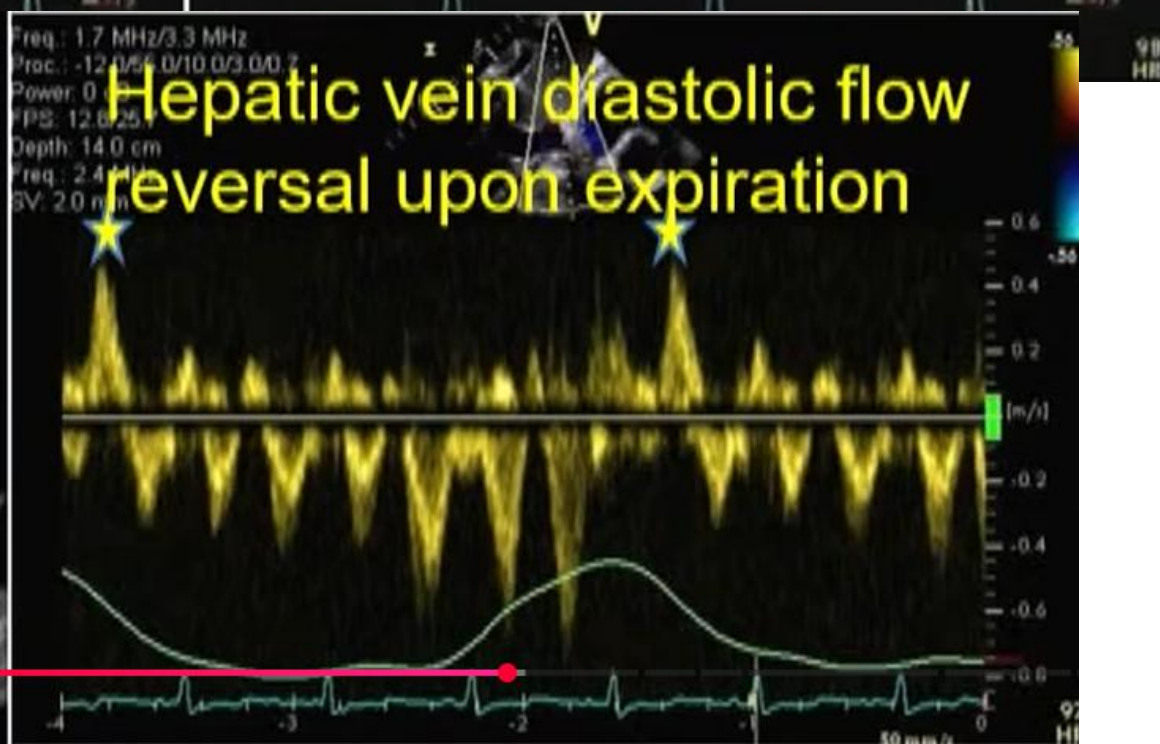
Annulus Reversus & Annulus Paradoxus

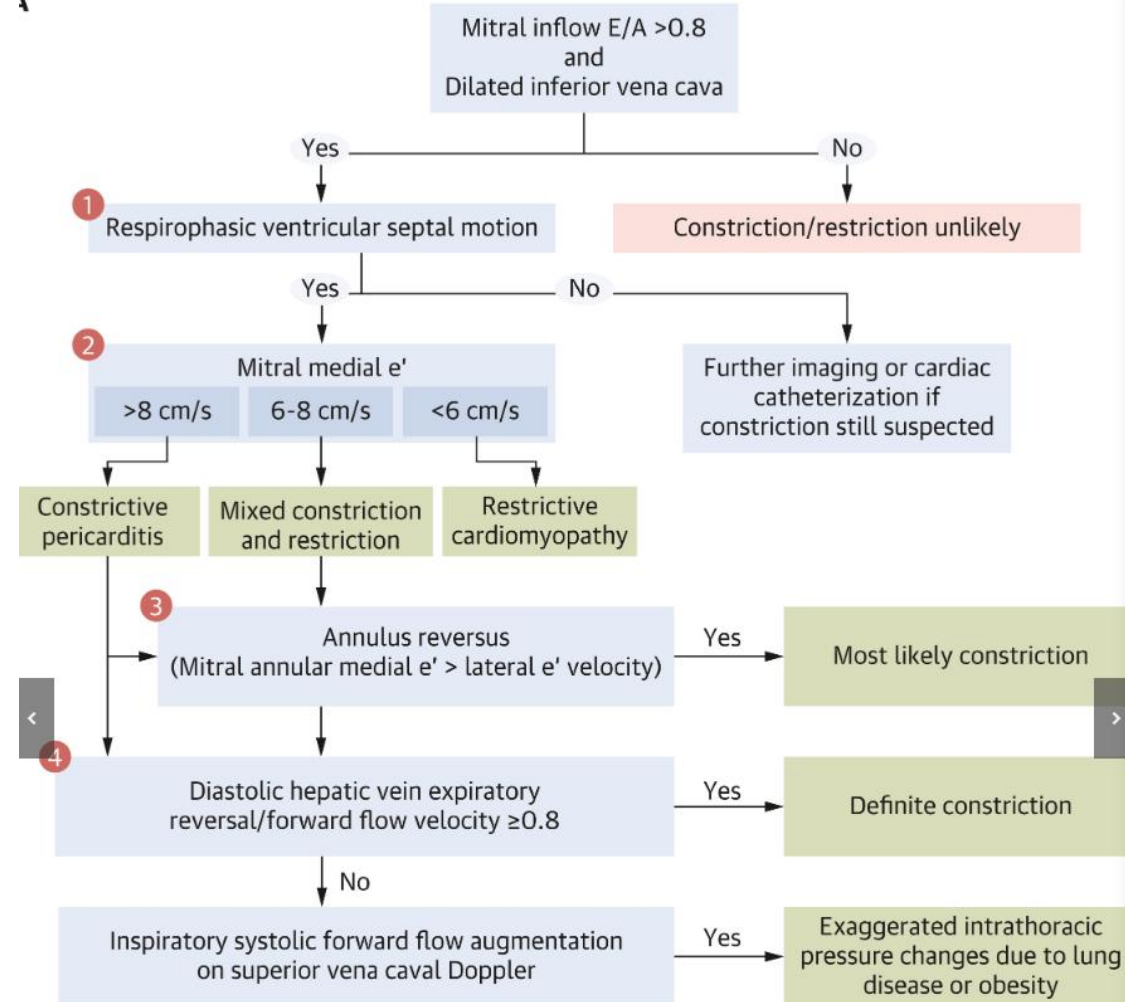


IVC plethora



Hepatic vein diastolic flow reversal upon expiration



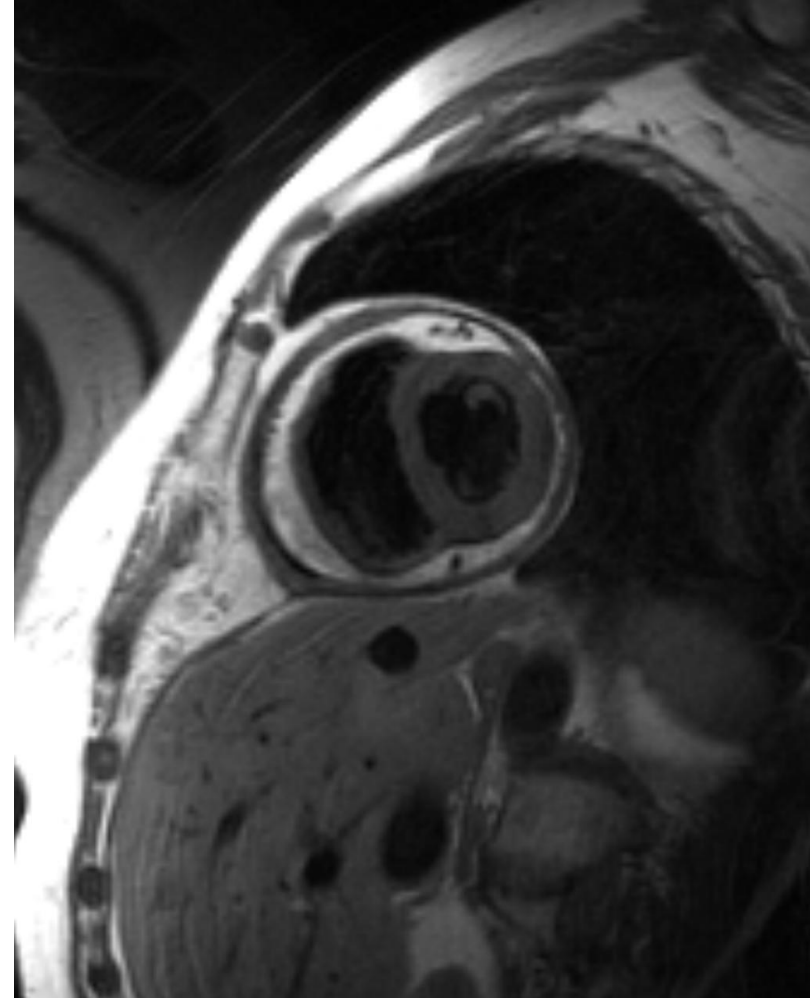
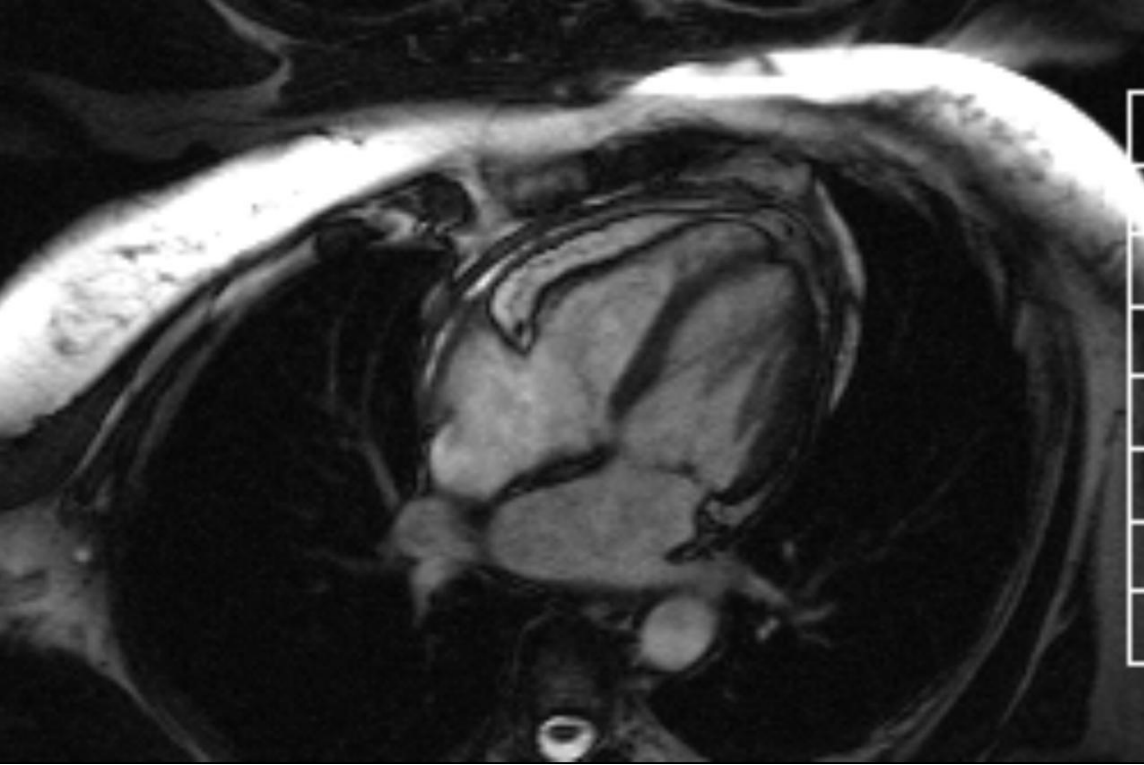


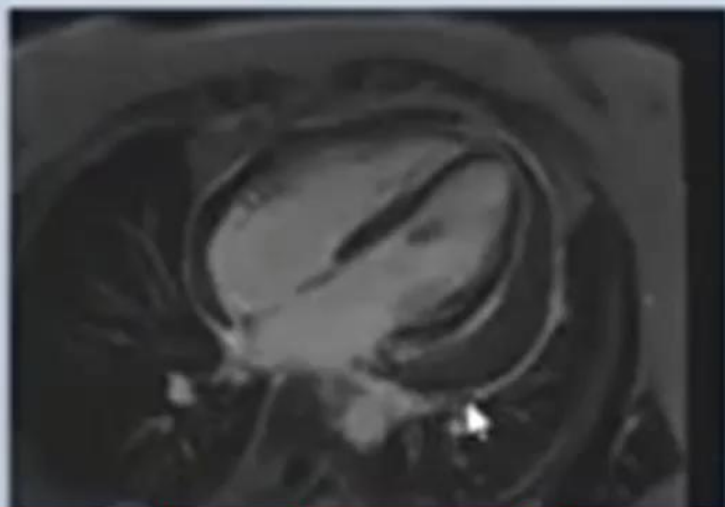
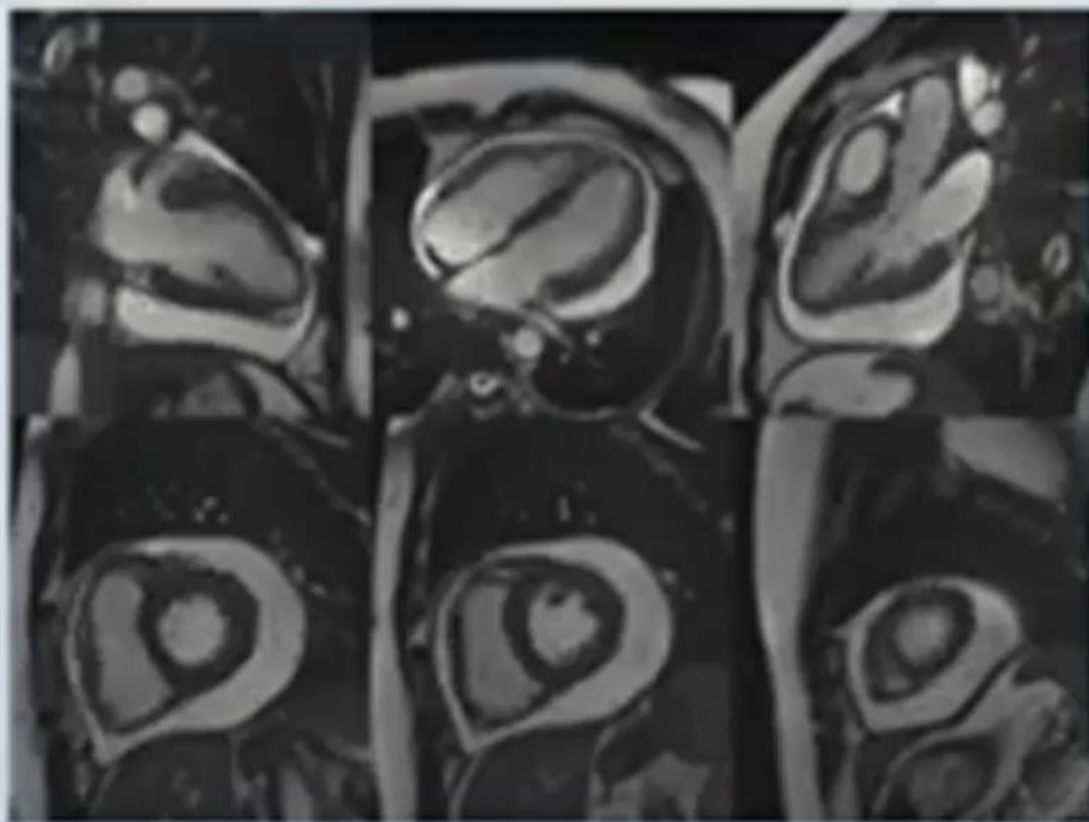
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	Sensitivity	Specificity	PPV	NPV
1	94%	73%	93%	77%
2	81%	91%	97%	58%
3	71%	79%	93%	45%
4	73%	66%	86%	42%
1 and 2	80%	96%	99%	58%
1 with both 2 and 4	67%	99%	100%	50%

MRI

- Thickness
- Effusion
- Annular motion
- Septal bounce
- Respiratory variation
- T2 times (elevated with elevated water content – sign of edema)
- Late gadolinium enhancement – sign of fibrosis/scarring

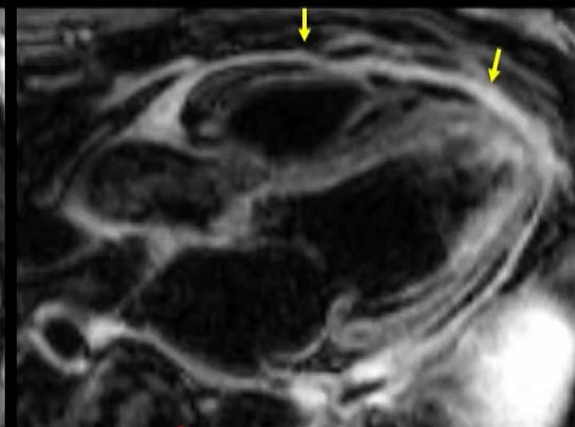
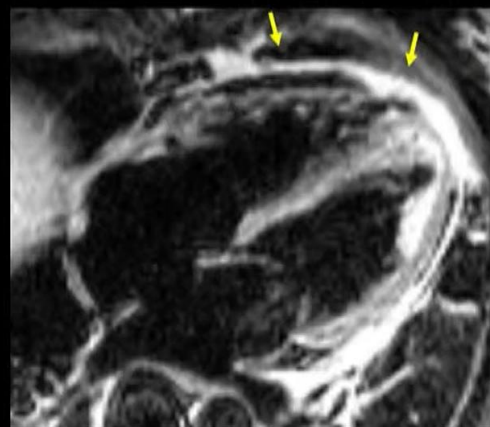




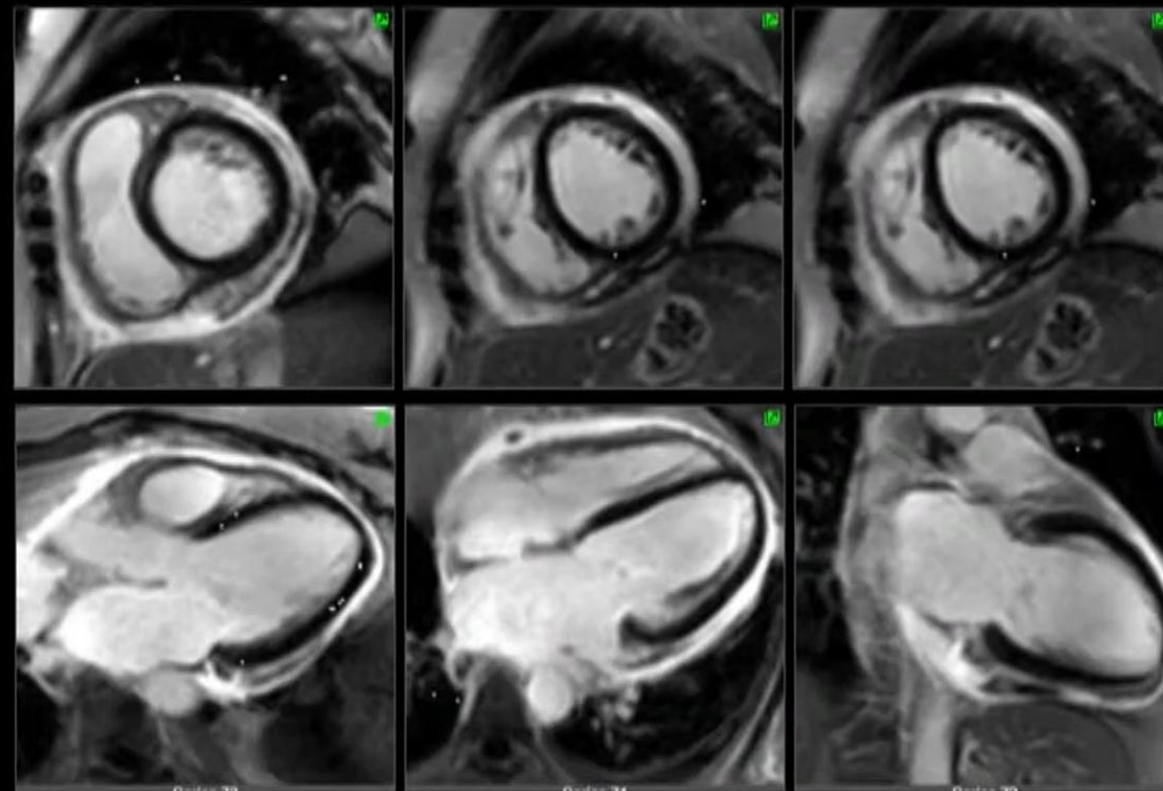
T1
(thickness)

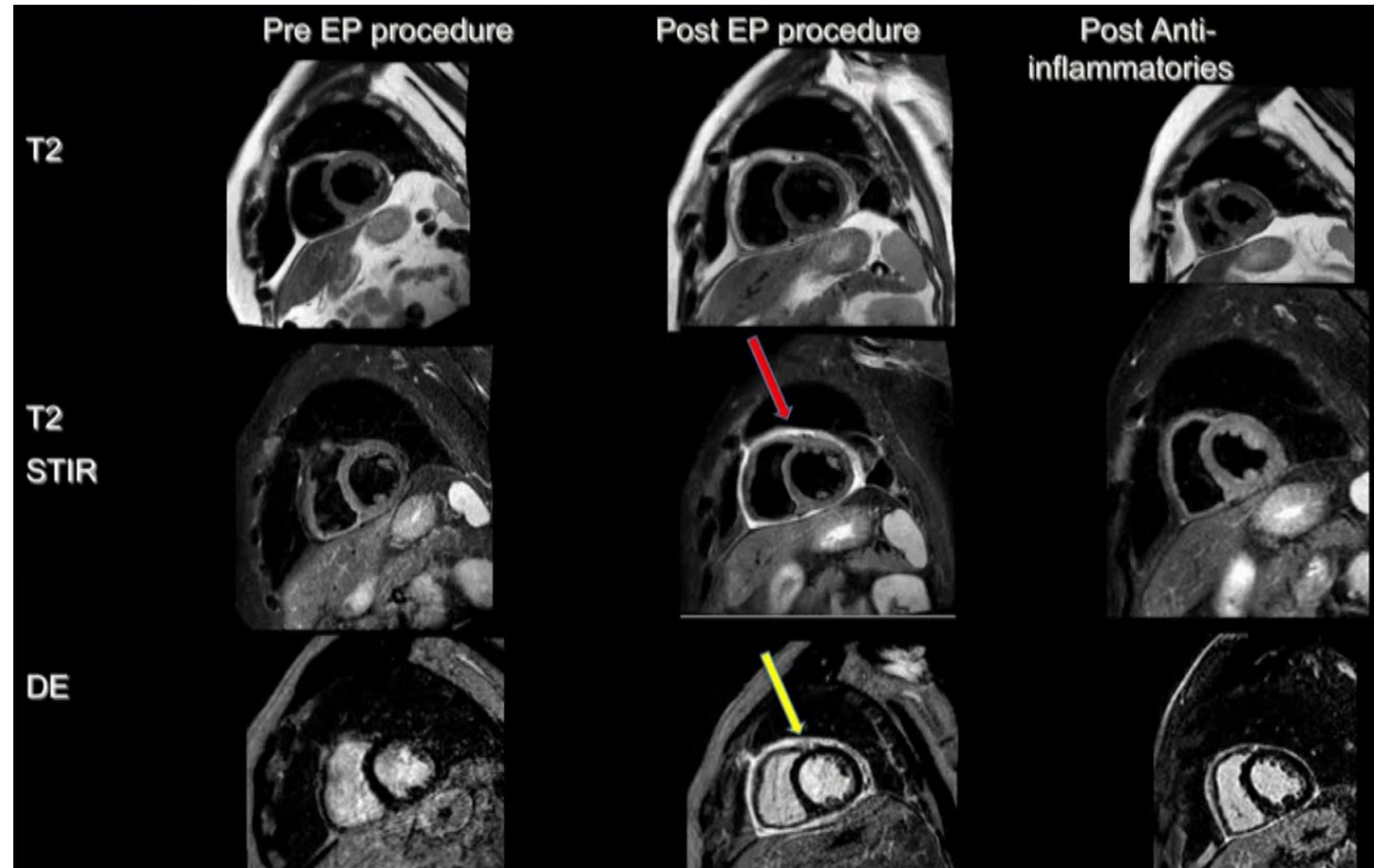


T2
(edema)

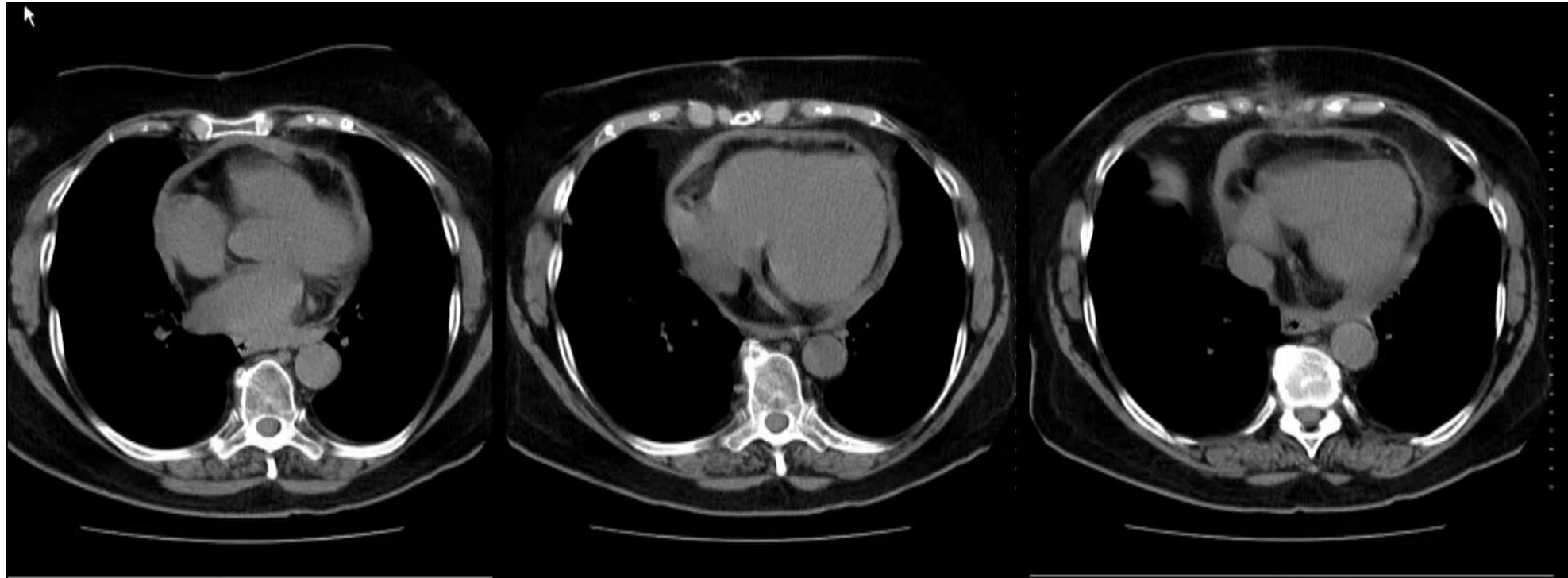


LGE





Noncontrast CT

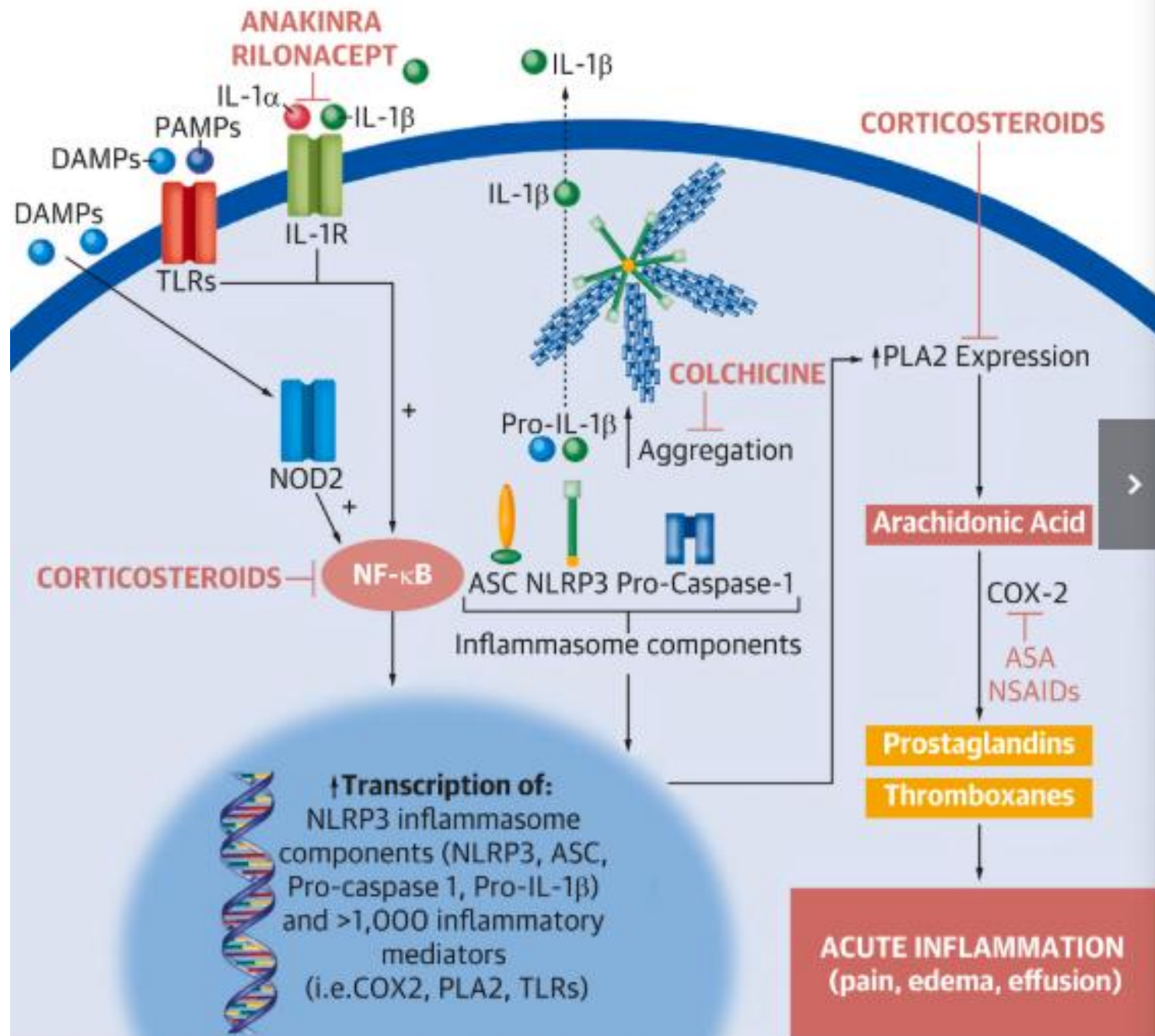


CT is a highly accurate method of evaluating pericardial thickness and best diagnostic technique to detect pericardial calcification

Treatment

Table 6 Common Therapeutic Options for Acute Pericarditis and Recurrent Pericarditis

Therapy	Dosing	Duration*	Tapering	Monitoring [†]	LOE [‡]
Aspirin ^{S,}	500-1,000 mg 3 times daily	wks (acute) to mo (recurrent)	Weekly	Needed	A
Ibuprofen ^{S,}	600-800 mg 3 times daily	wks (acute) to mo (recurrent)	Weekly	Needed	A
Indomethacin	25-50 mg 3 times daily	wks (acute) to mo (recurrent)	Weekly	Needed	B
Colchicine ^{S,¶}	0.6 mg twice daily or 0.6 mg once daily (<70 kg, severe renal/hepatic impairment)	3 mo (acute), 6-12 mo (recurrent)	May be considered	Needed	A
Prednisone [#]	0.2-0.5 mg/kg/d	wks to mo	Several mo	Needed	B
Anti-IL-1 agents**					
Anakinra	1-2 mg/kg/d up to 100 mg/d in adults	>12 mo	Needed	Needed	A
Rilonacept	320 mg once followed by 160 mg weekly	>12 mo	Stopping vs tapering under investigation	Needed	A
Goflikicept (Not yet available in United States)	80 mg every 2 wks	>12 mo (under investigation)	Unknown	Needed	B
Azathioprine	Starting with 1 mg/kg per d then gradually increased to 2-3 mg/kg/d	Several mo	Several mo	Needed	C
IVIG	400 to 500 mg/kg IV daily for 5 d	5 d	Not required	Needed	C
Radical pericardiectomy	High-volume pericardial surgical centers	Not applicable	Not applicable	Needed	C



Acute (viral) pericarditis

Treatment: Symptomatic relief, prevention of complications

- **NSAIDs** are the main stay for pain relief but only 1 small RCT after surgery – can be PRN
 - Ibuprofen
 - Diclofenac as an IV alternative
 - High dose aspirin
- **Colchicine for treatment and 1st line for prevention of recurrences**
 - Class I → for recurrent episodes
 - Class IIa → for first episode
 - 1.2 mg load (can skip) then 0.6 mg every 12 h for 1 month (or every 24 h if <60Kg), then 0.6 mg daily for 2 months

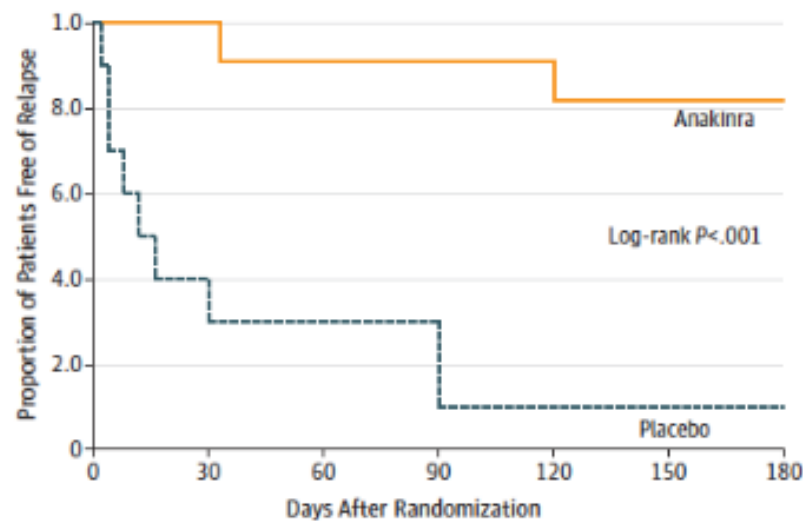
Additional Treatments:

- **Corticosteroids (prednisone)**
NOT routine recommended unless:
 - **REFRACTORY**
 - or for concomitant rheumatologic indication
- **IL-1 blockers: Rilonacept (Arcalyst) or Anakinra (Kineret)**
 - For refractory/recurrent cases
 - Can be as second line or third line after prednisone (steroid-sparing)
- **Additional immunosuppressive therapies for selective cases**
- **Pericardiectomy for very severe cases, especially if constriction**

IL-1 blockers to treat recurrent pericarditis and prevent recurrences

AIRTRIP trial

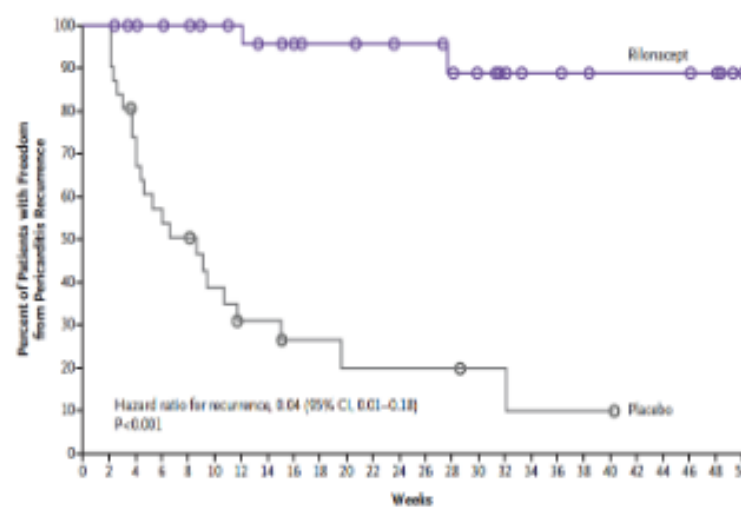
21 patients with recurrent pericarditis, resistant to colchicine and corticosteroid – dependent, treated with anakinra 100 mg daily and then when in remission randomized to continuation of anakinra or placebo



Brucato et al. *JAMA* 2016

RHAPSODY trial

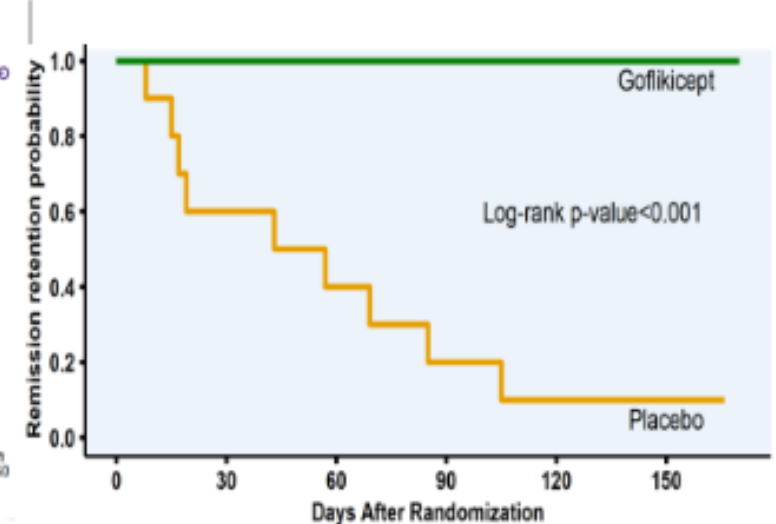
61 patients with recurrent pericarditis, treated with rilonacept 320 mg load and then 160 mg weekly and then when in remission randomized to continuation of rilonacept or placebo



Klein et al. *N Engl J Med* 2021

Goflikicept trial

20 patients with recurrent pericarditis, treated with goflikicept load and maintenance and then when in remission randomized to continuation of goflikicept or placebo



Myachikova et al. *J Am Coll Cardiol* 2023

Summary

- Pleuritic chest pain
- ECG and lab findings
- Echo and CMRI
- CT can be helpful (non-con)
- Colchicine
- NSAIDs
- IL-1 blockers

Thank you

- Please refer early!

