Another Simple Pericarditis?

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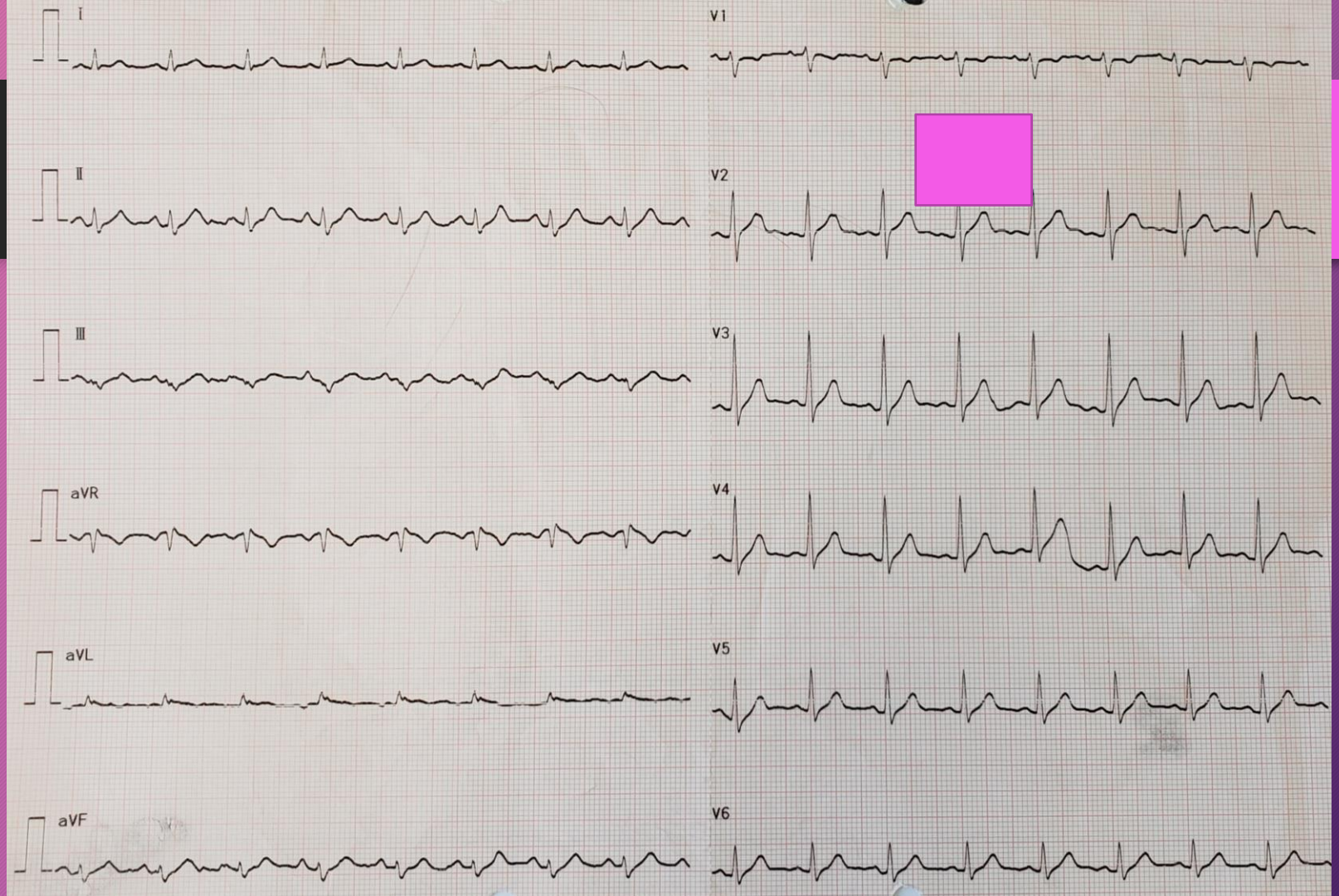
Case

- Mr. X, 19 years old gentleman

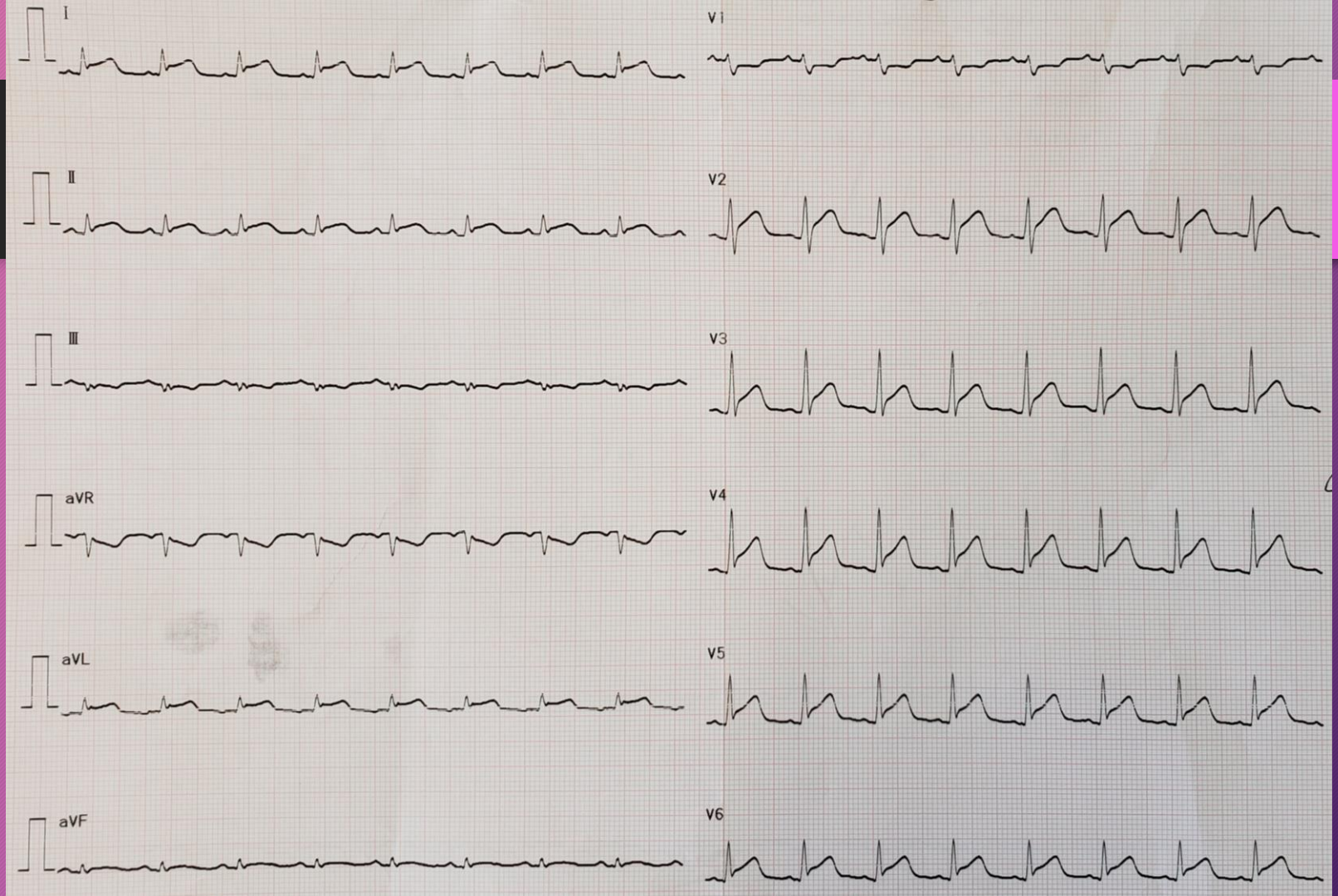
- PMHx
  - Aseptic meningitis upon birth
  - Epilepsy on epilim with good control

- Came back from study in the UK in late April
- P/W fever, sore throat, myalgia, pleuritic chest pain
- No pleural/pericardial rub on auscultation


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6

Case

- Put on empirical Augmentin x fever & ↑ WCC 15.9
- Persistent fever & rising WCC -> Stepped up to IV ROC/Doxy
- Increasing pleuritic chest pain / SOB / abdominal pain
- CT whole body
  - Fat stranding and small amount of fluids at mediastinum and epicardial fat, with thickened pericardium, suspicious of pericarditis
  - Bilat. trace pleural effusions


I
II
III
aVR
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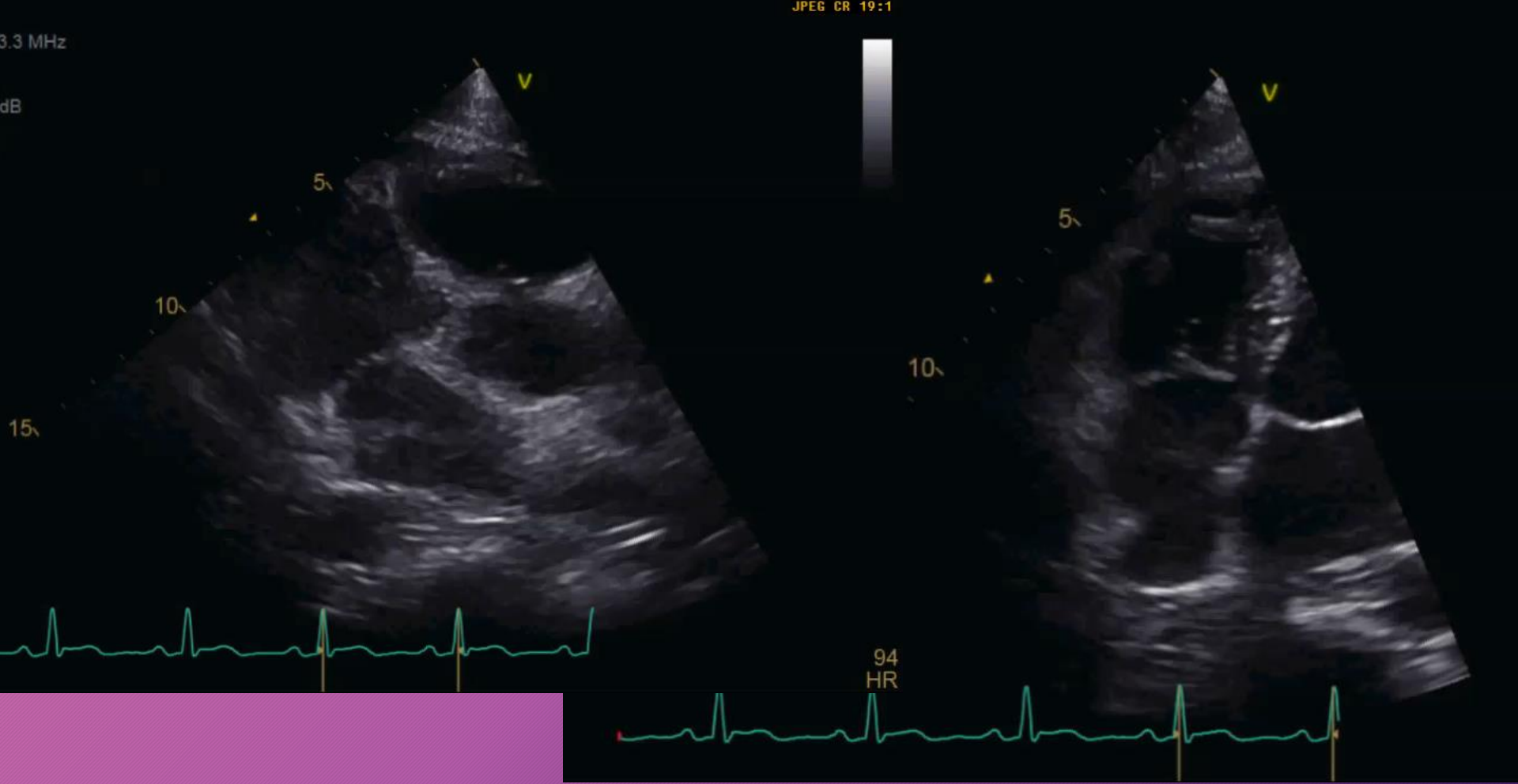
V1
V2
V3
V4
V5
V6

Case

- Echo
  - Good LV & RV contraction
  - Normal chambers size
  - No obvious vegetation
  - Trace amount of pericardial effusion, no tamponade
- Started NSAID & colchicine on top of antibiotics
- Still progressive deterioration in chest pain
- Rising inflammatory markers: WCC 39.4; CRP >294; PCT 3.97
- Persistent high swinging fever despite further escalation to TZC then MER+VAN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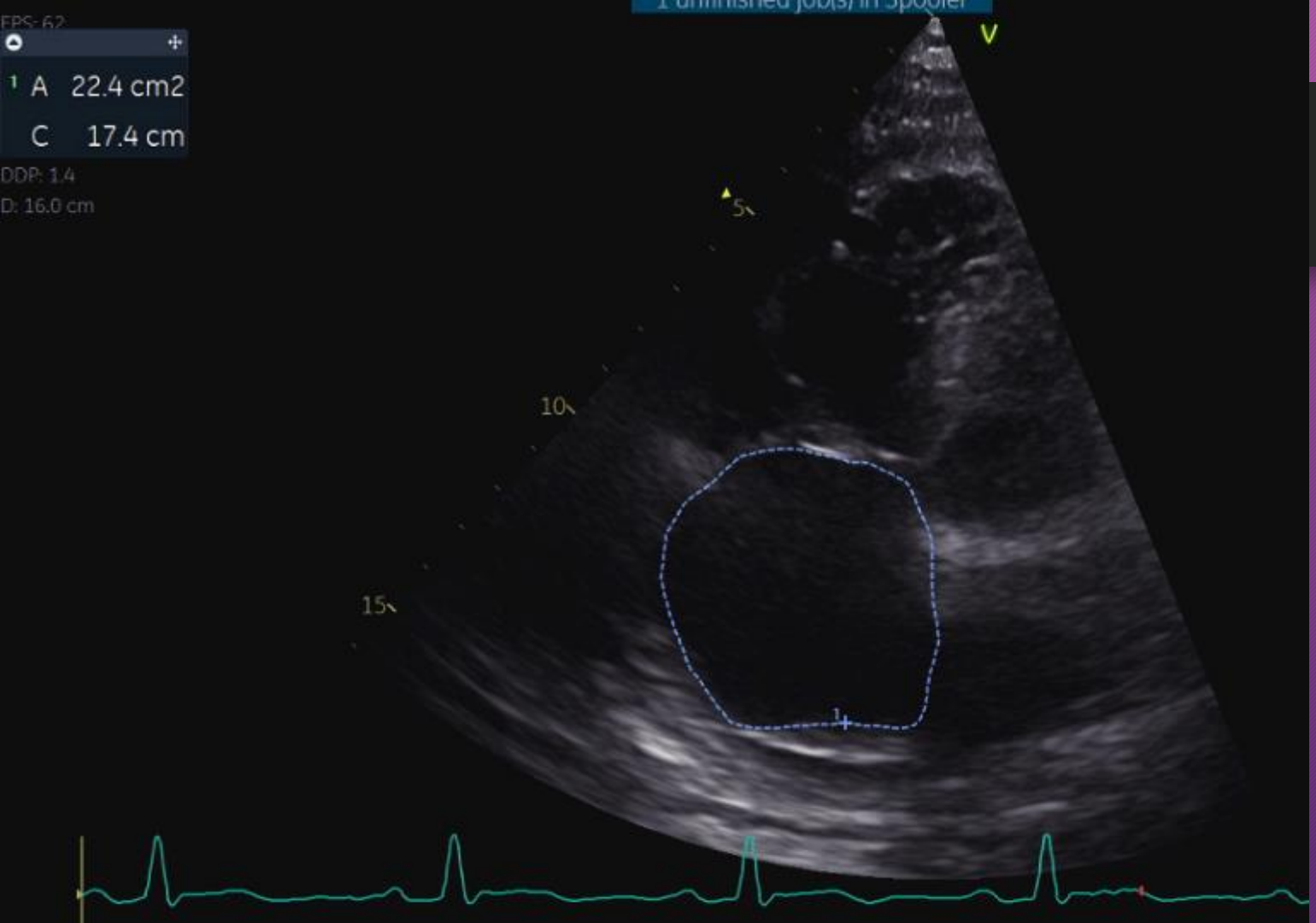
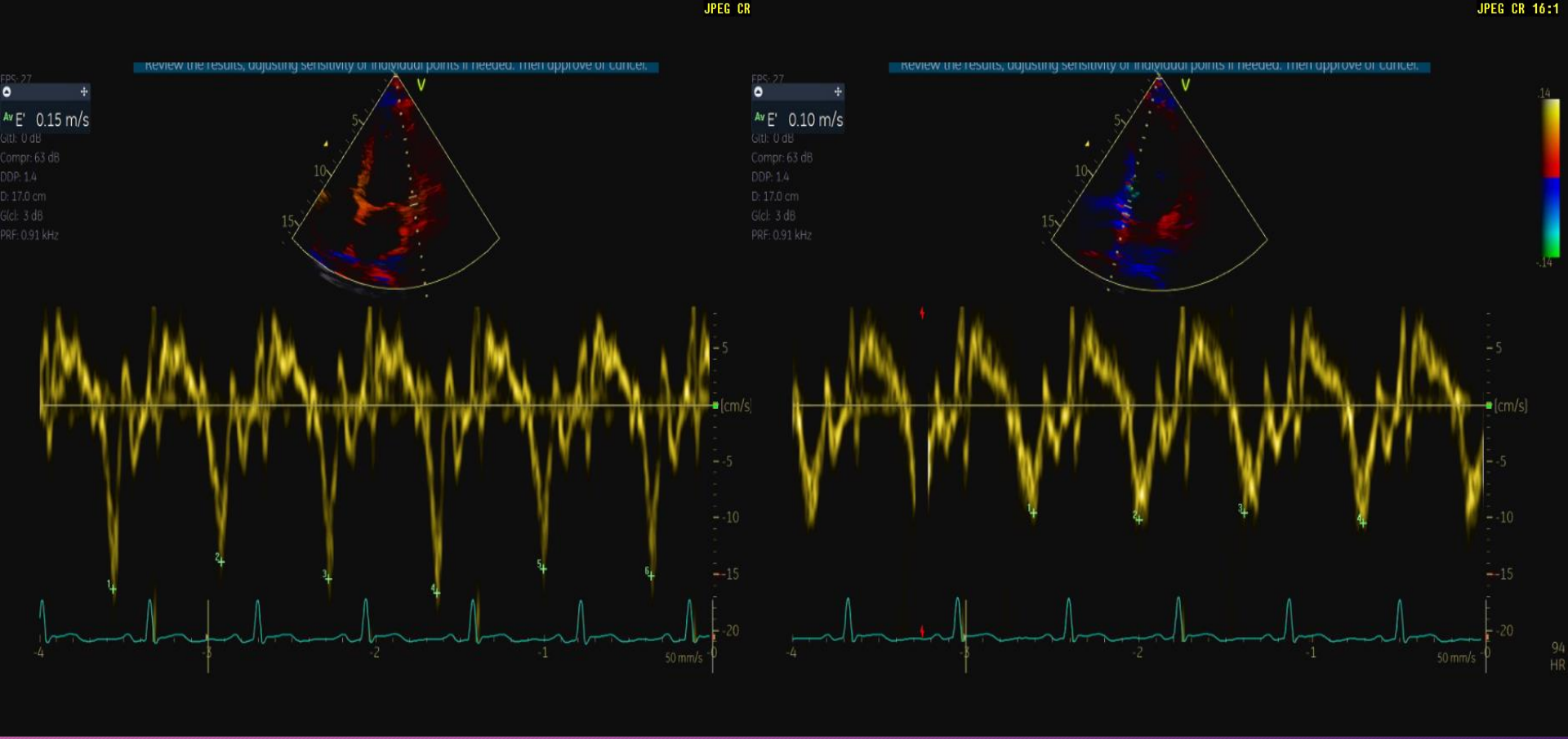
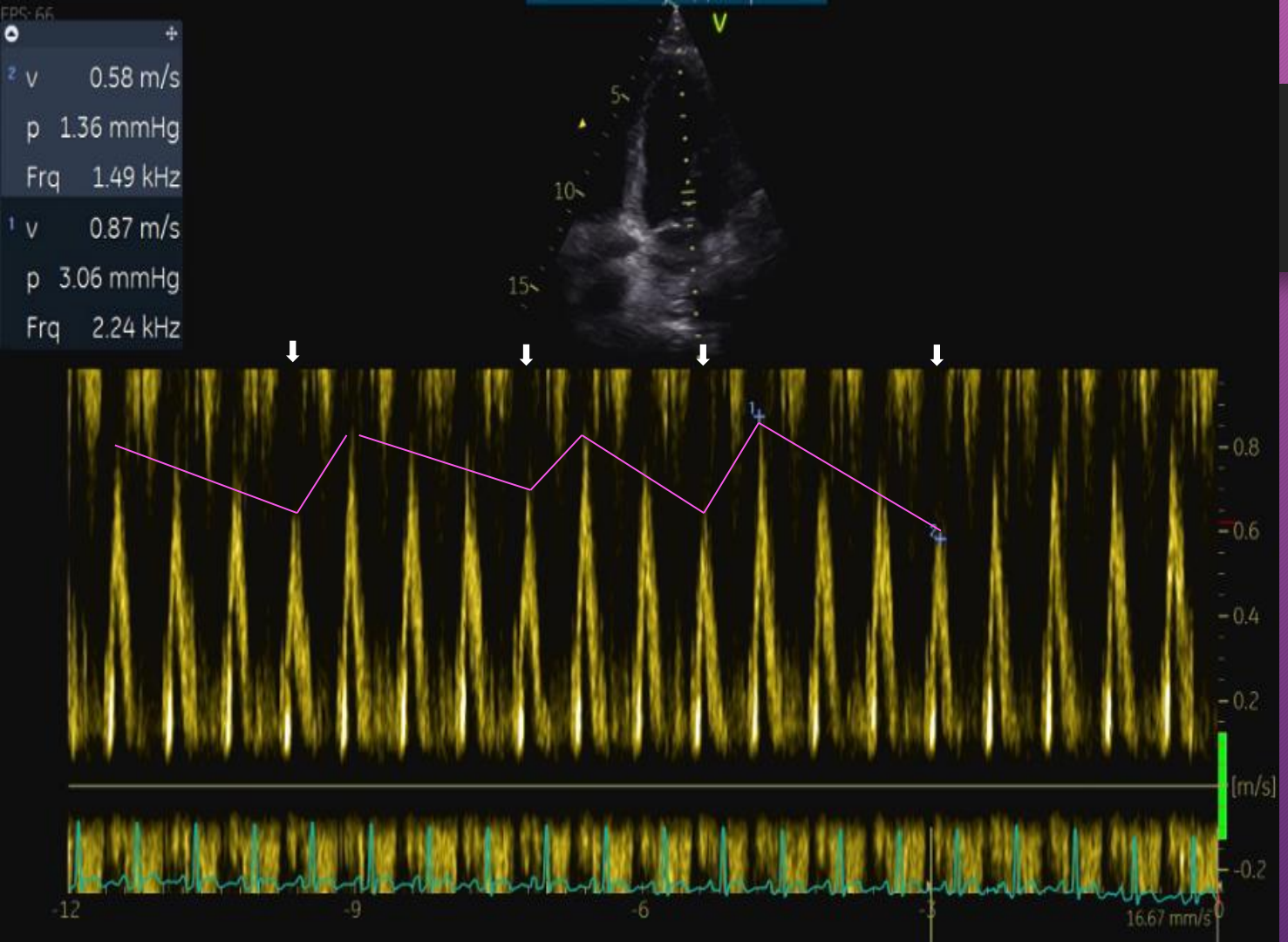

1 unfinished job(s) in Spooler
FPS: 62
1 A 22.4 cm2
C 17.4 cm
DDP: 1.4
D: 16.0 cm
5
10
15

Dilated RA

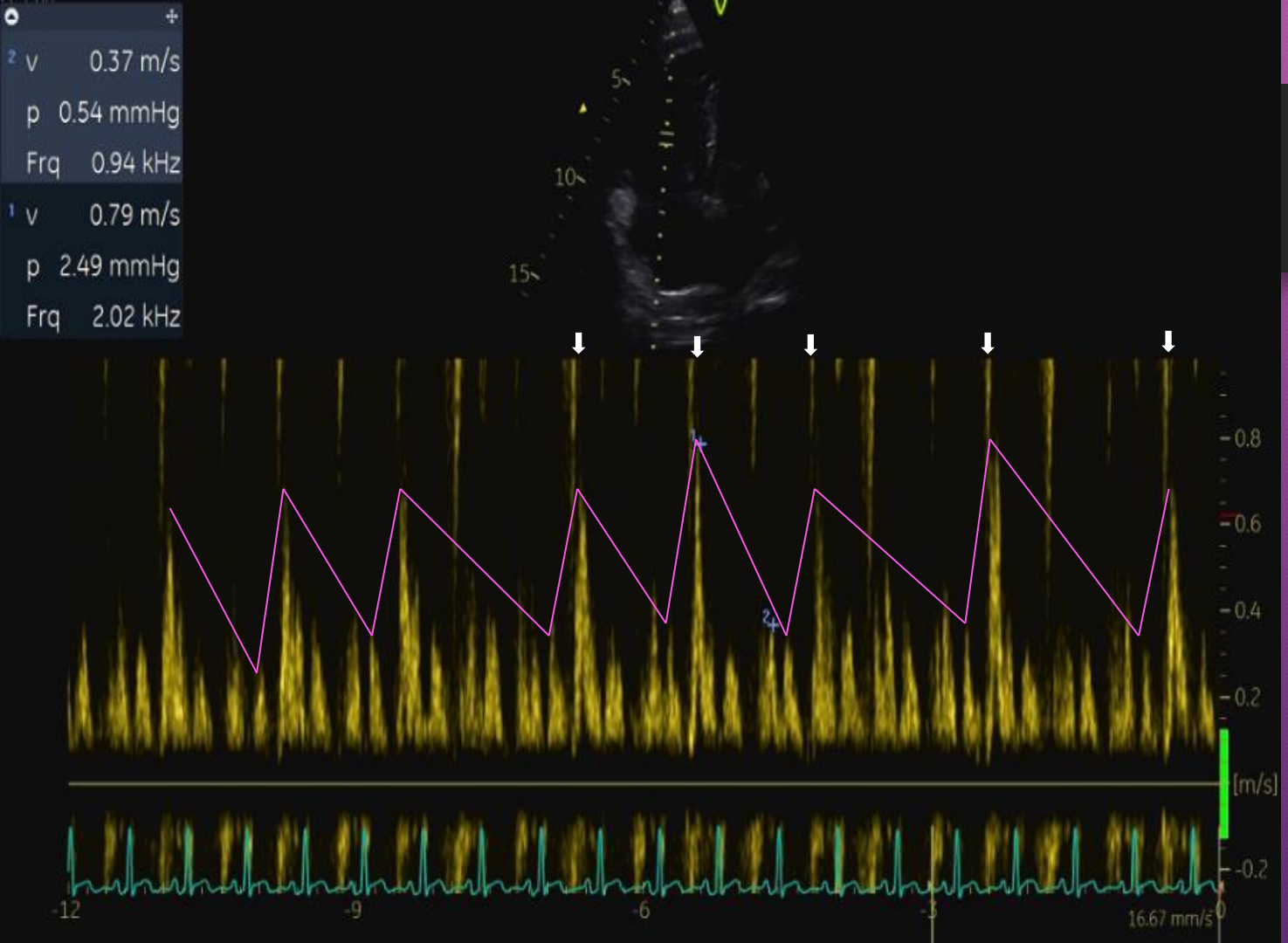


Lateral E’: 15cm/s

Medial E’: 10 cm/s



- Periodic change in mitral inflow velocities
- 33% drop in mitral inflow velocity upon inspiration
- Peak E wave, small A wave, ratio 1.9



- Similar periodic variation in tricuspid inflow velocities
- 53% drop in peak velocity in expiration

Ventricular Coupling

- Increased variation of mitral & tricuspid inflow velocities with respiration
- → Interventricular interdependence/ventricular coupling

- Commonly seen in both cardiac tamponade & constrictive pericarditis (different mechanisms but same result)

Shared common features

	Tamponade	Constrictive Pericarditis
Ventricle interdependence (ventricular coupling)	✓	✓
IVC plethora	✓	✓
Raised JVP	✓	✓
Low cardiac output/hypotension	✓	✓

Is it really constriction?

- Classically constrictive pericarditis is a long term sequalae of previous pericardial insult causing formation of a fibrocalcific “shell”
- Common risk factors
  - Post-cardiac surgery/intervention
  - Previous tuberculosis infection
  - Irradiation to the chest
  - Previous episodes(s) of pericarditis
- Middle-aged, if not elderly

Key question: Tamponade vs CP

- HOW TO DIFFERENTIATE???????

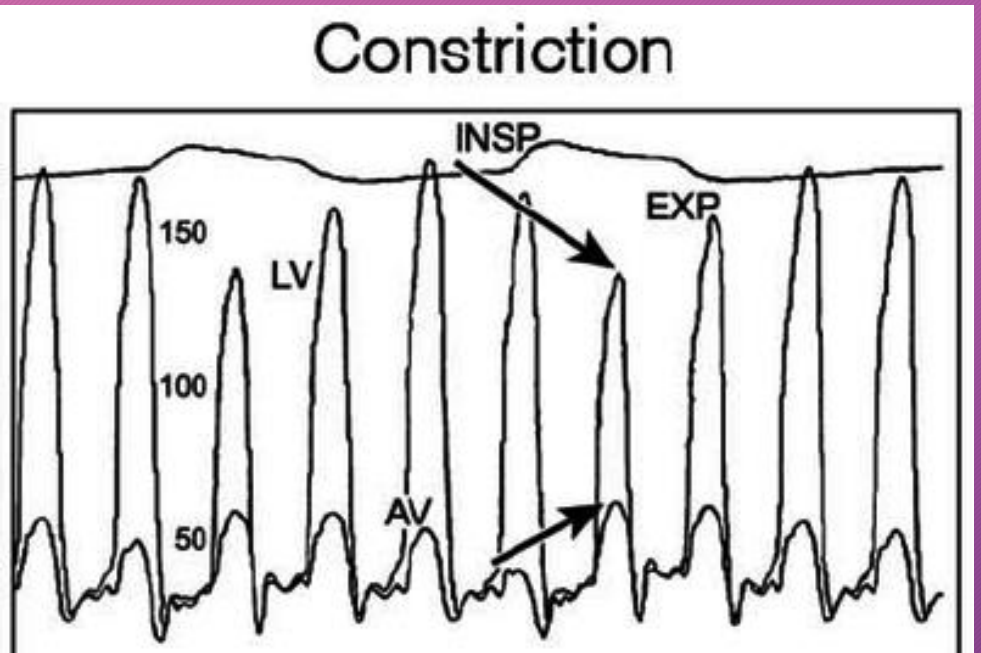
Basic difference

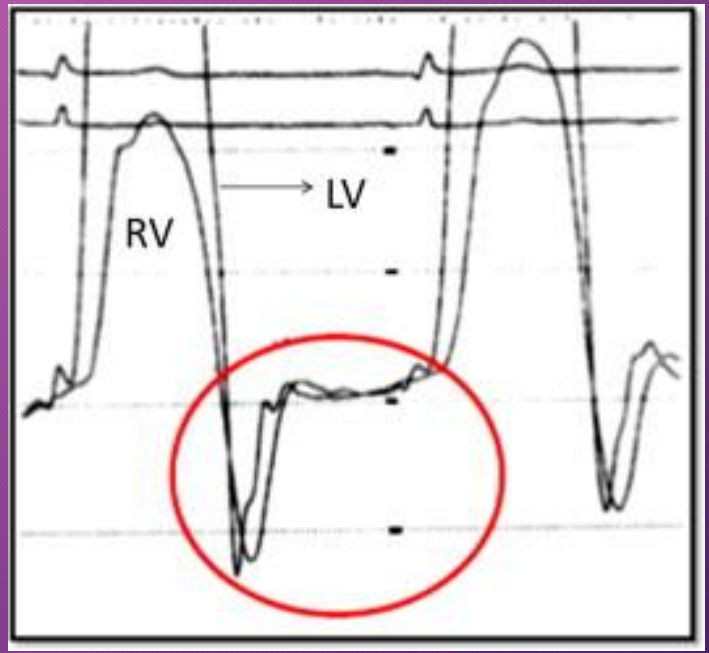
- Tamponade
- Restricts ventricular diastolic filling at all time → PAN-DIASTOLIC restriction of RV & LV

- Constrictive pericarditis
- Initial 1/3 of diastolic filling normal; later 2/3 restricted due to encasement by the fibrocalcific shell

Gold standard

- Invasive hemodynamics monitoring/ L&R heart catheterization



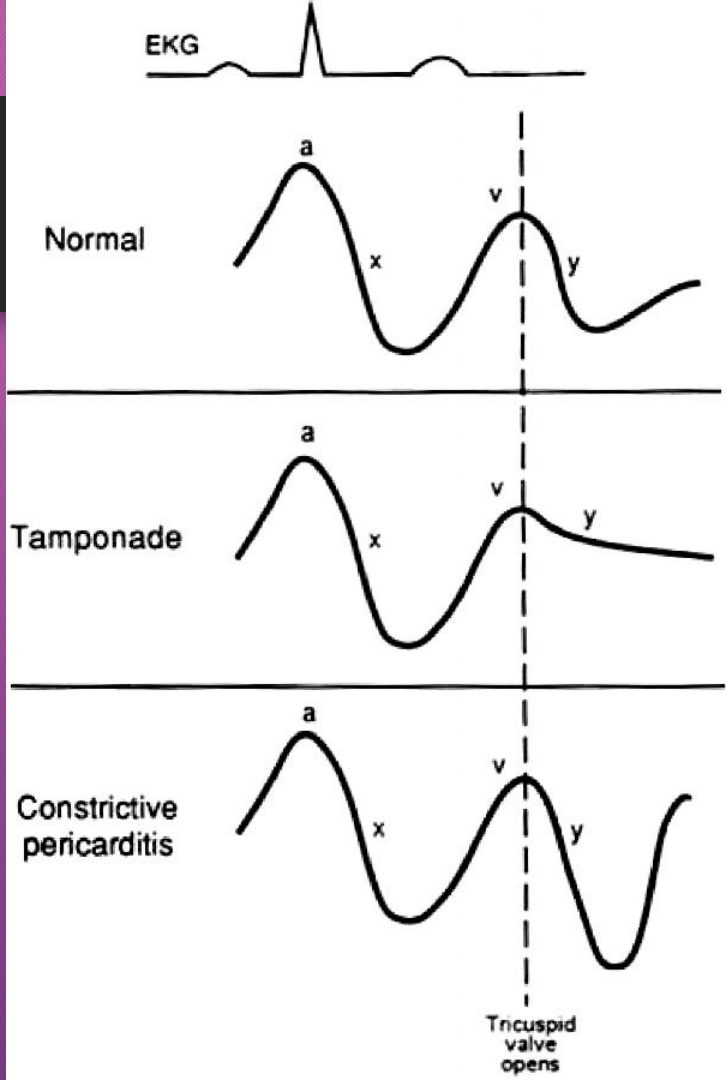


Physical examination?

- JVP can tell!

- Tamponade
- Blunted or absent y descent due to pandiastolic filling restriction
- Passive RA emptying impaired

- CP
- Preserved y descent as initial ventricular diastolic filling is unrestricted & rapid



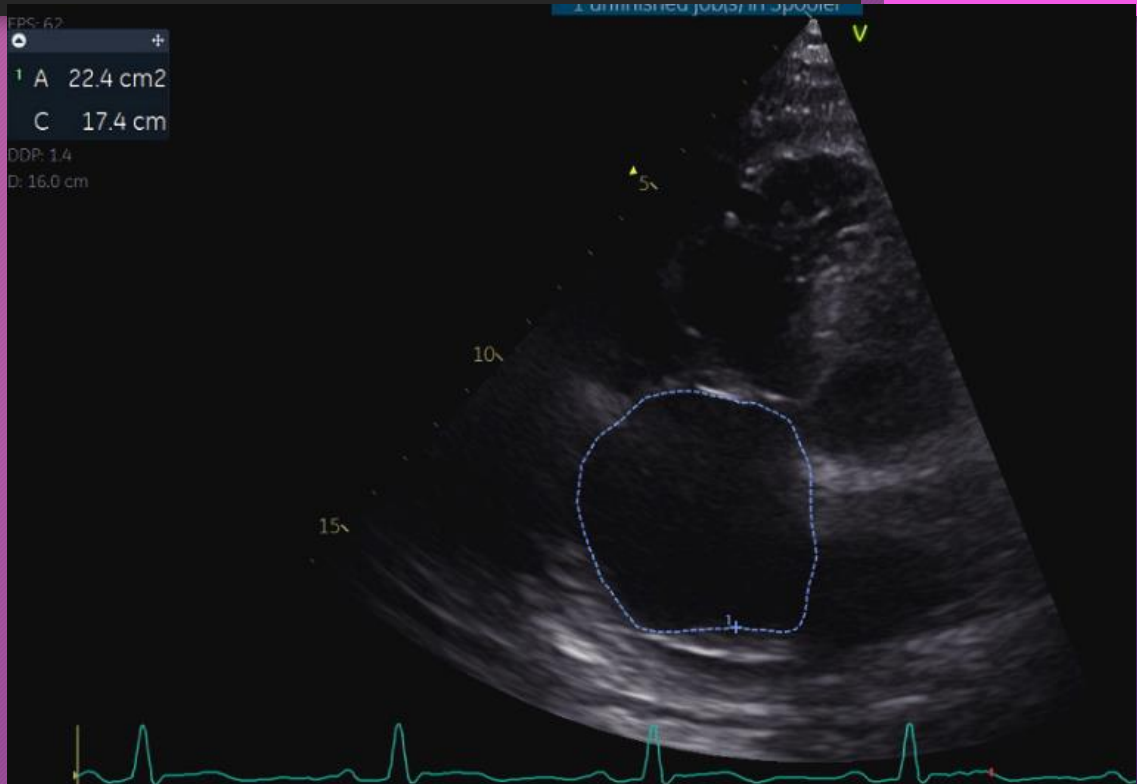
Physical examination?

- Kussmaul's sign (inspiratory increase in JVP)
- Only in constrictive pericarditis but not in cardiac tamponade
- RA encased within the fibrotic/thickened pericardium & cannot accommodate increase in venous return during inspiration
- This amount of blood competes with SVC & cause backflow into jugular veins

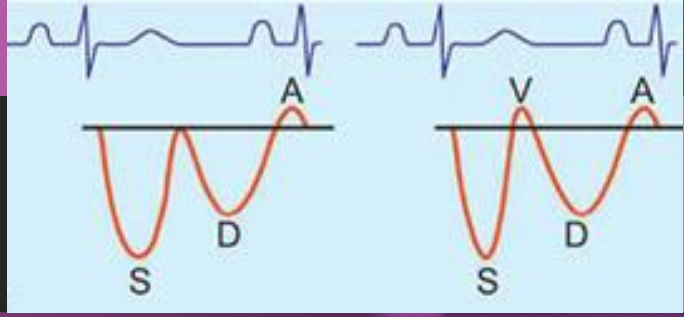
Echocardiography-wise?

A. Cardiac chambers size

- Tamponade
  - Rt sided chambers diastolic collapse – indentation during respective diastole period
- CP
  - Distended atriums due to ventricular incompliance

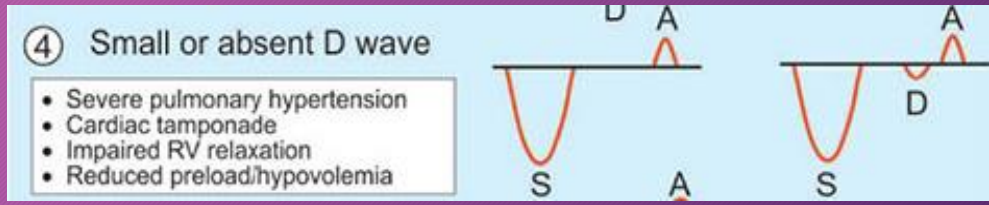


Echocardiography-wise?

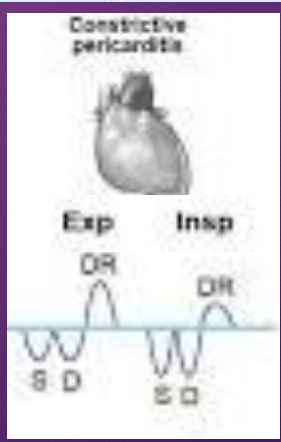


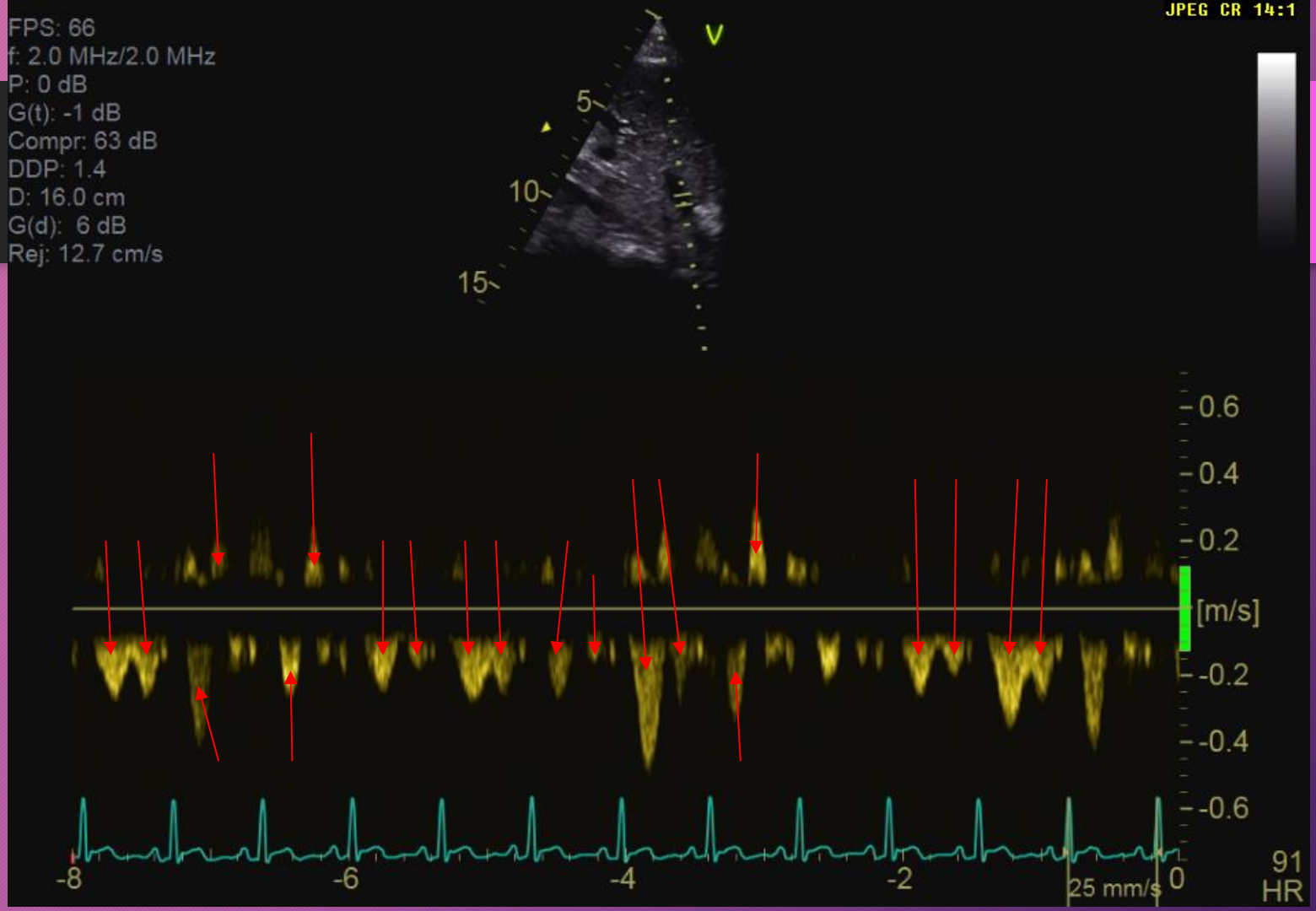
B. Hepatic vein Doppler ultrasonography

- Tamponade
  - Severely reduced D wave velocity
  - Unimodal venous return
    → Loss of D wave in expiration due to pan-diastolic compression



- CP
  - Remains bimodal venous return → Preserved D wave
  - Diastolic D wave reversal upon expiration




JPEG CR 14:1
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f: 2.0 MHz/2.0 MHz
P: 0 dB
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Compr: 63 dB
DDP: 1.4
D: 16.0 cm
G(d): 6 dB
Rej: 12.7 cm/s
V
5
10
15
0.6
0.4
0.2
[m/s]
-0.2
-0.4
-0.6
-8
-6
-4
-2
25 mm/s
0
91
HR

Small summary

	Tamponade	CP
Diastolic filling restriction	Pan-diastolic	Mid-to-late diastole
JVP	Sharp X descent; Blunted Y descent	Sharp X & Y descent
Kussmaul's Sign	No	Present
Cardiac chambers	Collapsed RA or/and RV	Engorged atria
Hepatic vein doppler	Unimodal/Absent D wave	Bimodal/D wave reversal
L & R heart cath		Square root sign
Inspiratory RA venous return augmentation	Intact	Loss

Case progress

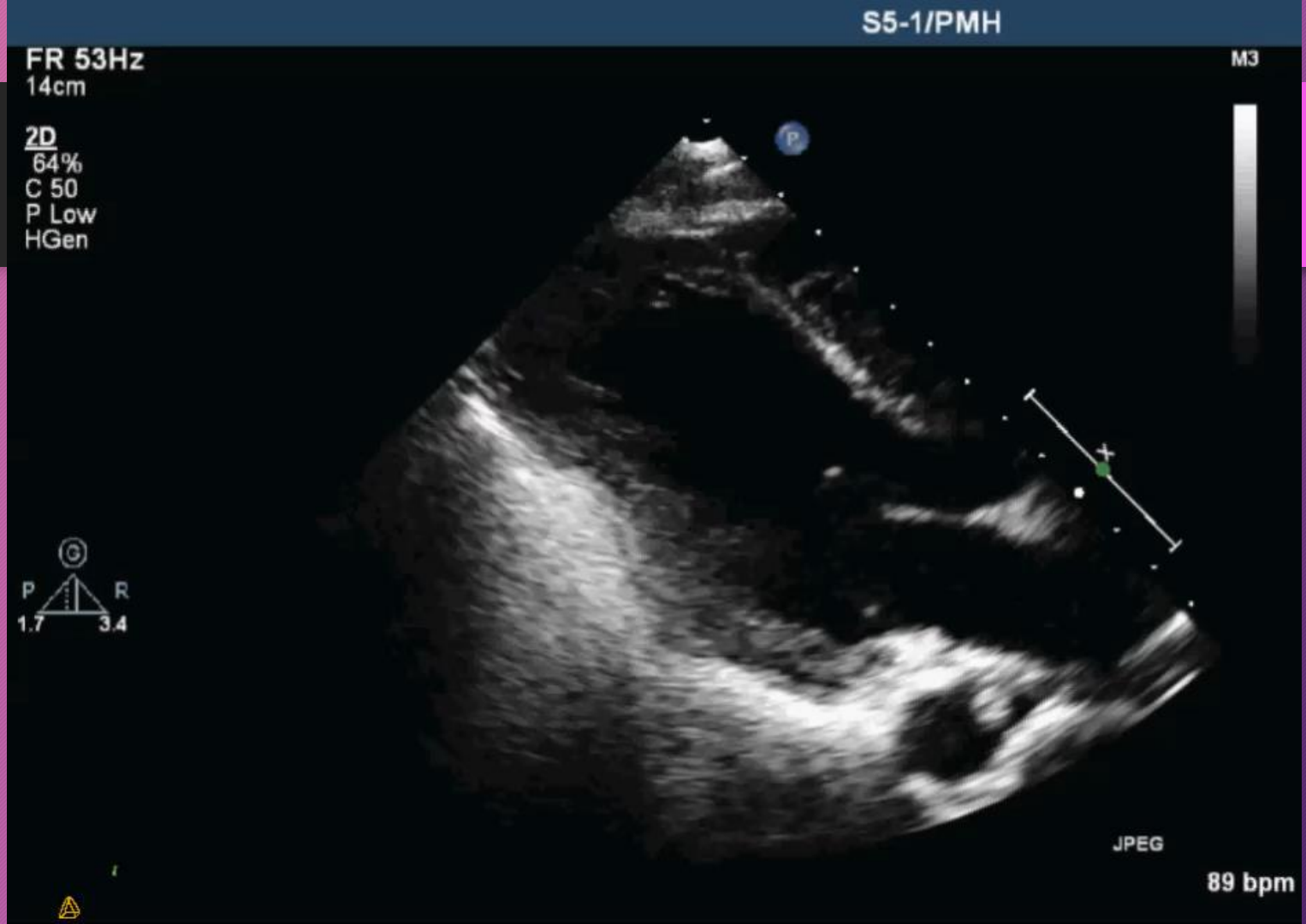
- Borderline BP + sinus tachycardia
- Repeated urgent CT thorax → Thickened & enhancing pericardial lining with increased rim-enhancing pericardial fluid collection up to ~3cm
- Transferred to QEH Cardio-Thoracic Surgery Unit
- EOT x Right VATS + pericardial window performed

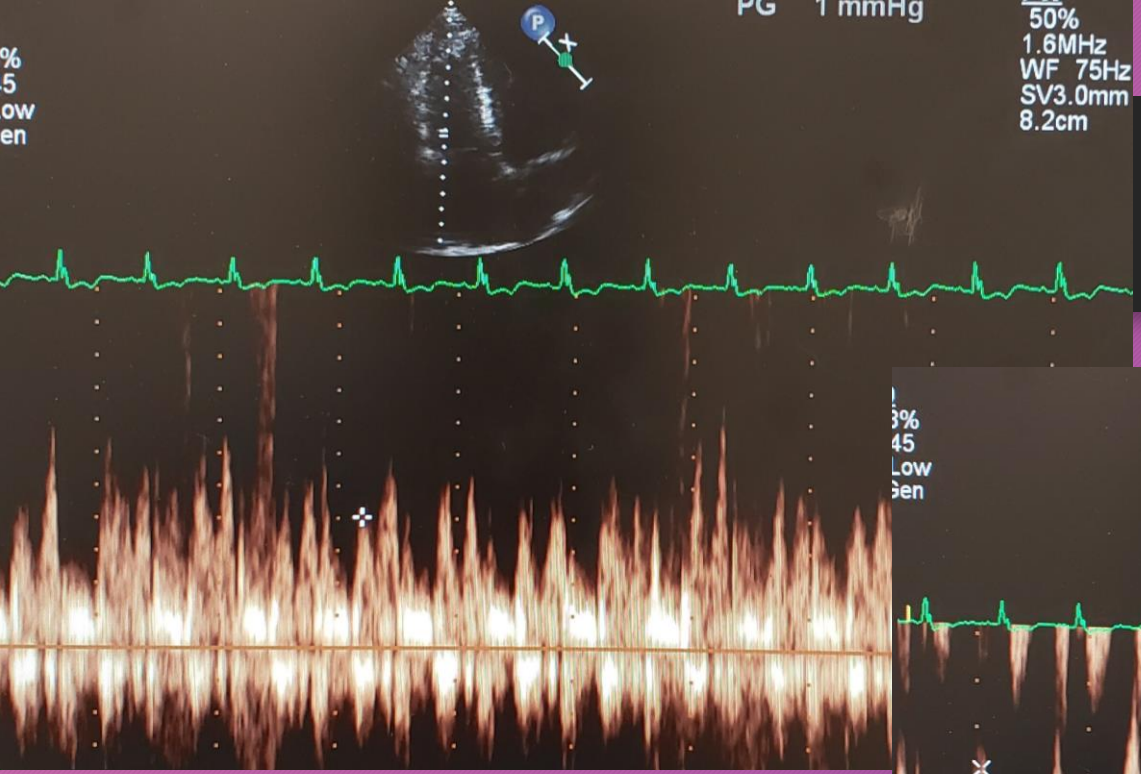
Case progress

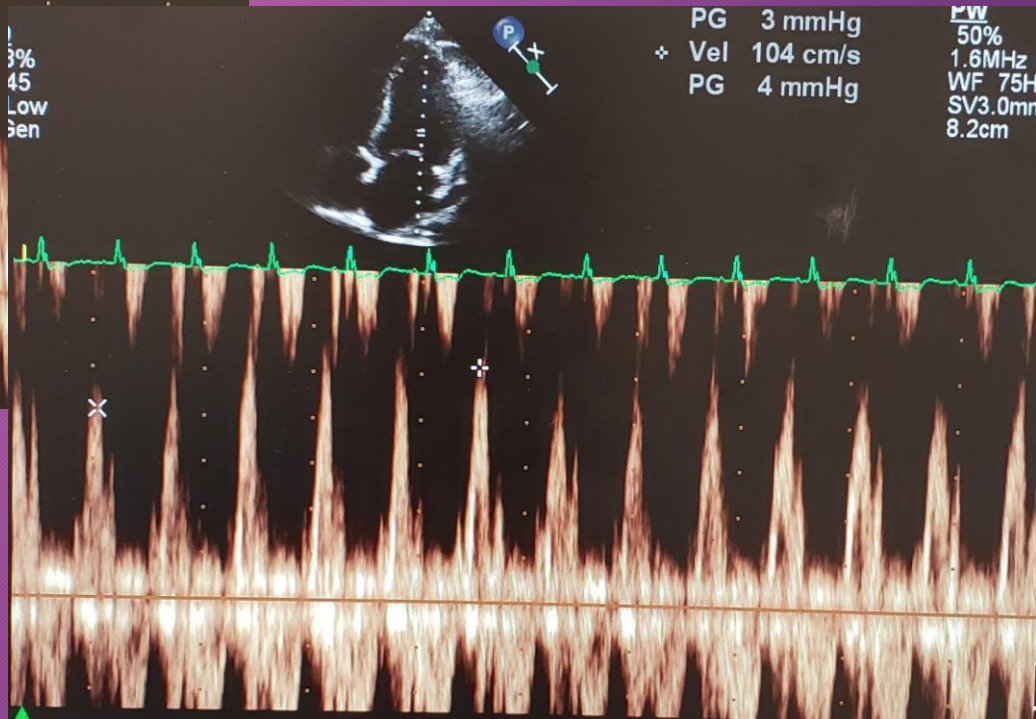
- EOT findings
  - Pericardial fluid
  - Diffuse dense fibrinous adhesion around RV & LV
- Adhesion released + Drained 300mL pericardial fluid + Lt chest drain insertion drained 600mL straw-coloured pleural fluid
- Pericardial fluid workup
- Exudative
  - WCC 8073; Polymorph 97%
  - Gram stain –ve; bacterial rDNA gene –ve; bacterial/AFB/fungal c/st no growth
- Pleural fluid
  - Exudative: WCC 1637; Polymorph 79.9%; Gram stain –ve; c/st no growth

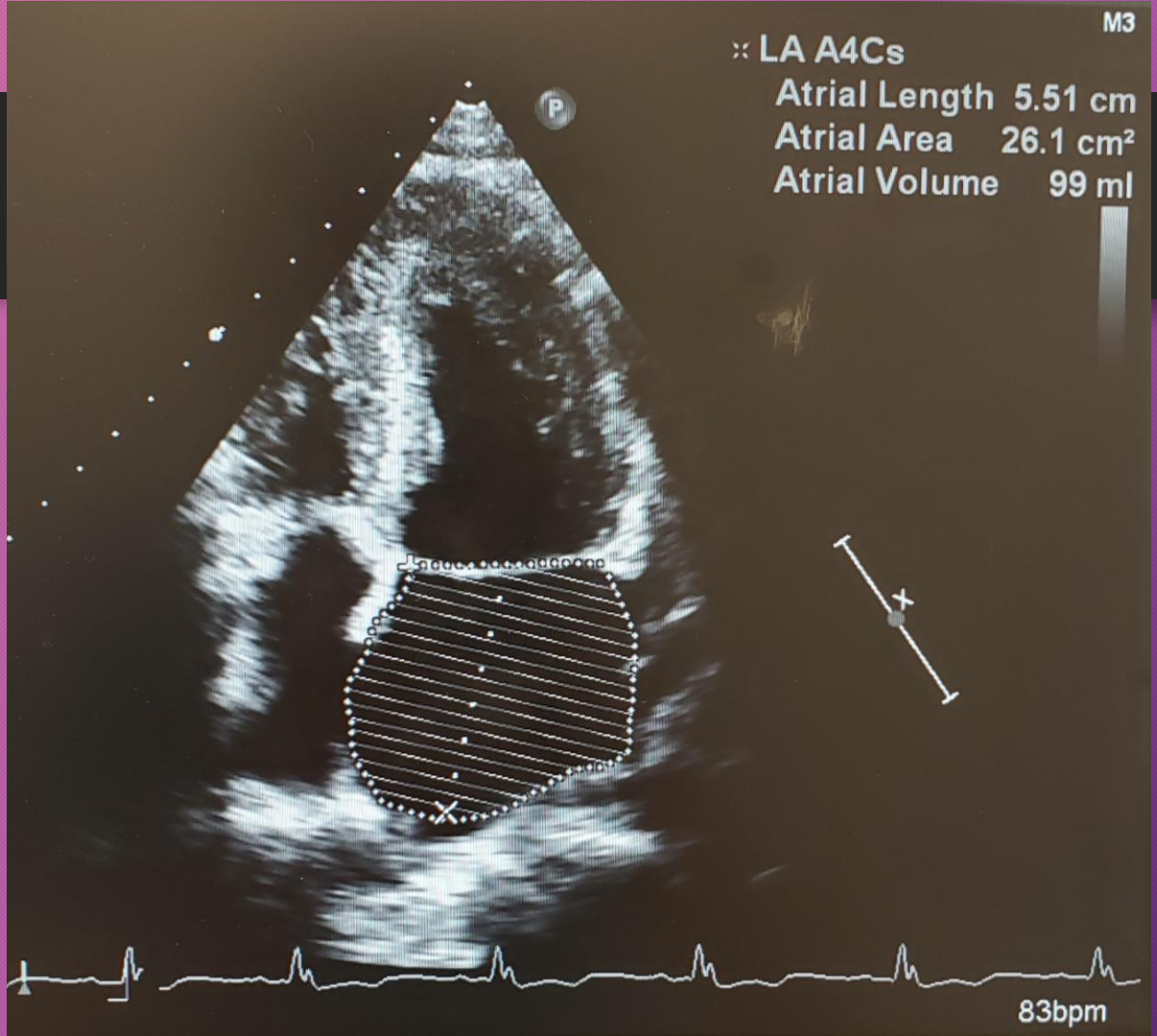
Case progress

- Resected pericardial tissue
  - Gram stain: Negative
  - Bacterial c/st: No growth
- Hemodynamics stabilized after EOT
- Repeated echo
  - Echogenic & thickened pericardium
  - No pericardial effusion
  - Mild residual constrictive physiology with dilated RA
  - Improved respirophasic variation in mitral & tricuspid inflow

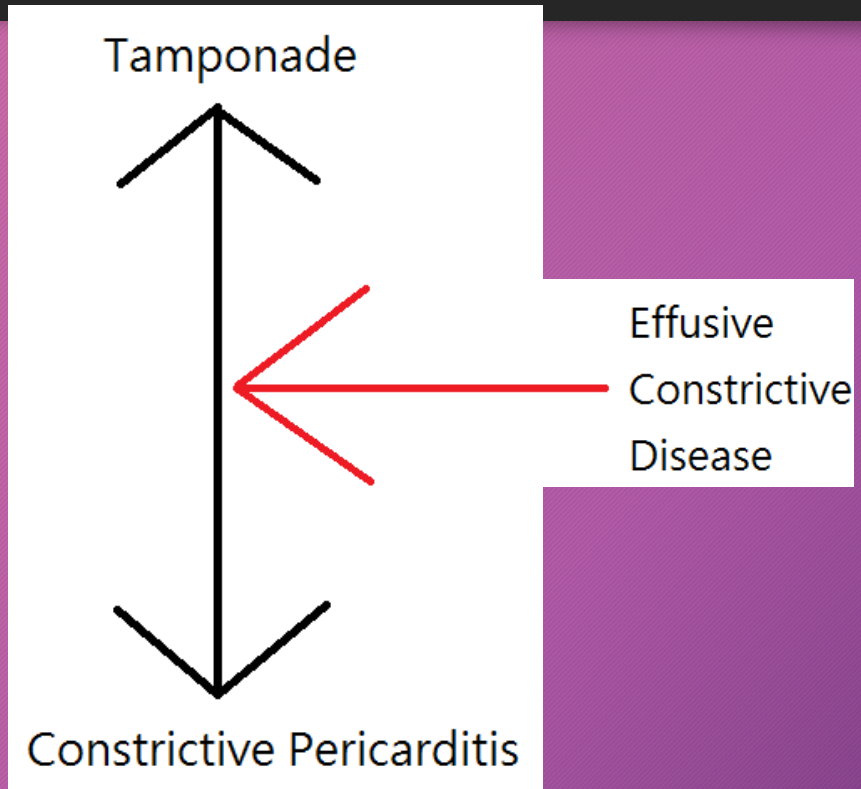

S5-1/PMH
FR 53Hz
14cm
2D
64%
C 50
P Low
HGen
M3
P
C
P
R
1.7
3.4
JPEG
89 bpm


PG 1 mmHg
50%
1.6MHz
WF 75Hz
SV3.0mm
8.2cm


PG 3 mmHg
Vel 104 cm/s
PG 4 mmHg
50%
1.6MHz
8.2cm


M3
LA A4Cs
Atrial Length 5.51 cm
Atrial Area 26.1 cm²
Atrial Volume 99 ml
P
83bpm

Pericarditis with pericardial effusion



- A spectrum of hemodynamics effect
- More happen in subacute settings
- Mixed clinical & hemodynamics findings between tamponade & CP
- Can be seen in post-inflammatory pericarditis, as well as hemopericardium
- Effusion contents vary from serous fluid to frank clot

What causes the pericarditis?

- Repeated bacterial, TB, virologic, rheumatological workup negative

- Only +ve findings
  - Mild ↑ ASOT titre to 400 (Normal <200 IU/mL) → ?GAS infection

What causes the pericarditis?

- Markedly elevated ferritin level: 182,245 pmol/L (67-899 pmol/L)
- Out of proportion to acute phase reaction

- Pancytopenia + dLFT + Coagulopathy+ Splenomegaly

- Put on IV steroid
  → Improvement in biochemical markers as well as temperature-wise
  → ?Autoimmune cause

Case progress

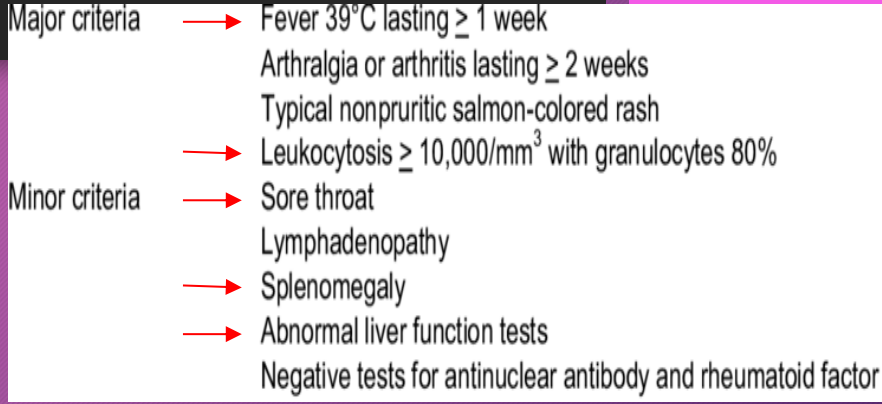
- Workup along line of high ferritin level
- DDx
  - Adult onset Still's Disease (AoSD)
  - Hemophagocytic Lymphohistiocytosis (HLH)
- Consulted Rheumatology team
  - AoSD is diagnosis of exclusion
- Bone marrow examination
  - Aspirate: Active marrow with haemophagocytosis, no infiltration
  - Trephine: Active marrow

Case Progress

- Consulted hematology team x suspected HLH
- Impression
  - Unlikely a case of HLH since clinical condition responds well to only moderate dose of steroid with resolution of cytopenias, coagulopathy and downtrend ferritin
  - HLH rarely responds to steroid alone, need other potent agents including etoposide etc
- Specific blood marker sCD25 x ?HLH
- Negative!

Case Progress

- Reconsulted rheumatology team
- Hemophagocytosis can be an association under AoSD, termed Macrophage-Activation-Syndrome



- Fulfills Yamaguchi diagnostic criteria

- Prescribed dexamethasone then taper to P30
- WCC & CRP & PCT completely normalized subsequently
- Ferritin downtrend to 3300

Adult Onset Still's Disease

- Rare autoimmune systemic inflammatory disease
- Incidence: 0.16-0.22 per 100,000 population
- Unknown pathogenesis, co-play of genetic & environmental & host factors
- Often triggered by infection
- Life-threatening complications including serositis, myocarditis (3%), reactive hemophagocytic syndrome, DIC, etc

Adult Onset Still's Disease – Cardiac Involvement

- Pericarditis 10-40%
  - of which ~20% complicated by pericardial effusion
- Literature review (English) till 2017
  - 18 cases of AoSD with pericardial effusion manifesting as cardiac tamponade
- Most cases had tamponade being the 1st manifestation

Adult Onset Still's Disease – Cardiac Involvement

- AoSD with constriction/constrictive pericarditis?
- VERY RARE!!!
- Only 2 cases indicating such correlation, 2010 & 2018 respectively, due to reversible pericardial thickening
- Both have constriction happening as 1st or early manifestation

A rare case of reversible constrictive pericarditis with severe pericardial thickening in a patient with adult onset Still's disease

Sebastian J. Buss [a,*], David Wolf [a], Derliz Mereles [a], Norbert Blank [b], Hugo A. Katus [a], Stefan E. Hardt [a]

Severe Adult-onset Still Disease with Constrictive Pericarditis and Pleuritis That Was Successfully Treated with Tocilizumab in Addition to Corticosteroids and Cyclosporin A

Hoshimi Kawaguchi, Hiroto Tsuboi, Mizuki Yagishita, Toshihiko Terasaki, Mayu Terasaki, Masaru Shimizu, Fumika Honda, Ayako Ohyama, Hiroyuki Takahashi, Haruka Miki, Masahiro Yokosawa, Hiromitsu Asashima, Shinya Hagiwara, Yuya Kondo, Isao Matsumoto and Takayuki Sumida

Take Home Message

1. Know how to differentiate between cardiac tamponade vs constrictive pericarditis

2. Constriction can happen in subacute settings, not necessarily a chronic sequalae

3. Don’t miss out autoimmune causes for any pericardial effusion

References

1. Buss SJ et al. A rare case of reversible constrictive pericarditis with severe pericardial thickening in a patient with adult onset Still's disease. Int J Cardiol 144: e23-e25, 2010

2. Kawaguchi et al. Severe adult-onset Still Diseease with constrictive pericarditis and pleuritic that was successfully treated with tocilizumab in addition to corticosteroids and cyclosporine A. Intern Med 57: 1033-1038, 2018

3. Yoo WH. Adult onset Still's disease flared with pericardial effusion. Rheumat Int 2008; 28(3):285-7

4. Parvez N, Carpenter JL. Cardiac tamponade in Still disease: a review of the literature. South Med J 2009; 102(8):823-7

5. Drouot MH, Hachulla E, Houvengal E, Hatron PY, Flipo RM, Goullard L, et al. Cardiac complications in adult onset Still's disease: from pericarditis to tamponade as manifestations. Rev Med Interne 1994; 15(11):740-3