



# Cardio-Obstetrics On Call

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- No disclosures

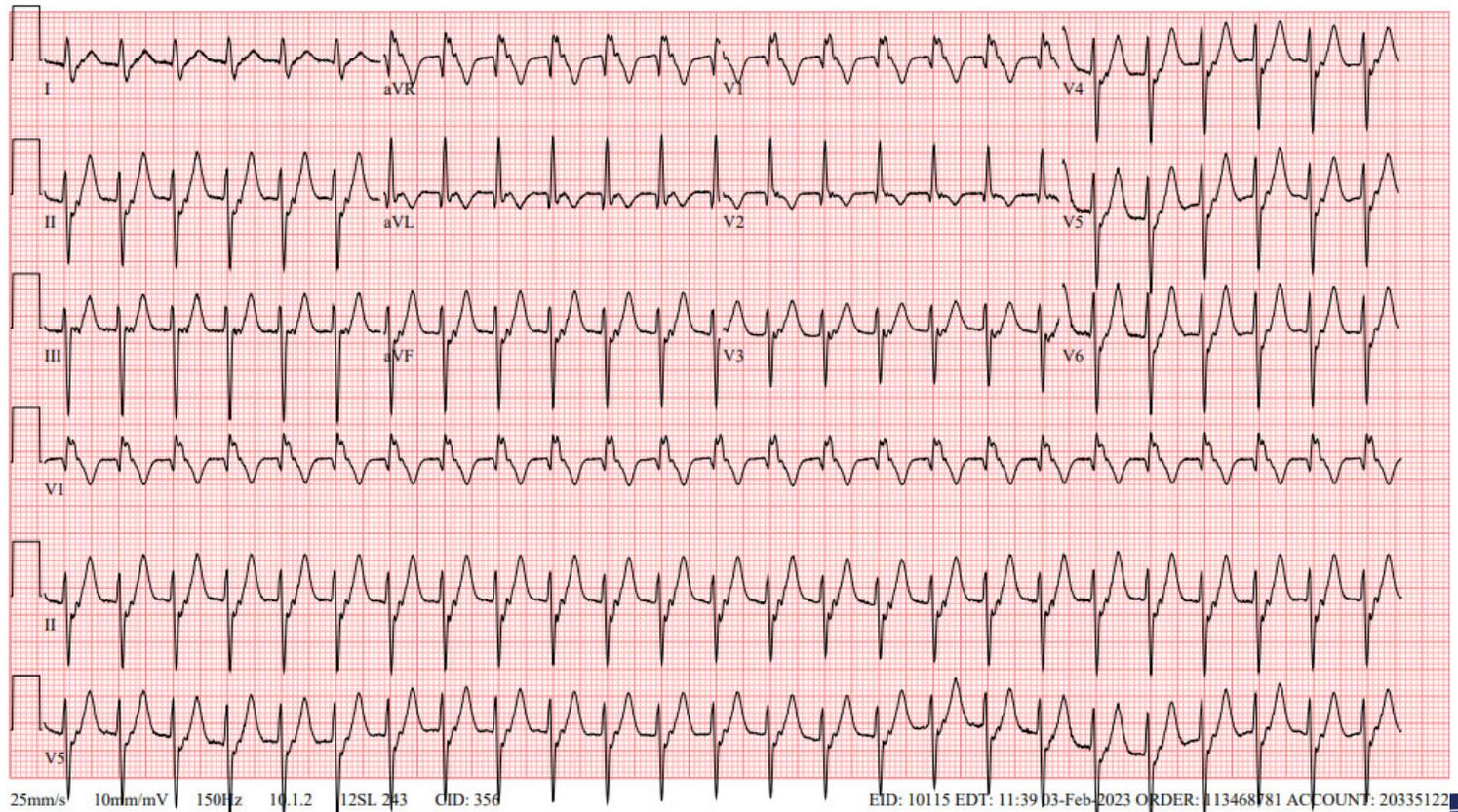


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# Case 1

- 32 y.o. female presented to OB triage with **palpitations and tachycardia**
- G2P1 currently 24 weeks 6 days uncomplicated pregnancy thus far
- Vitals: T 98.4F    HR 163bpm    BP 108/63    SpO2 100% RA

# 12 Lead EKG at time of presentation



# Case 1 Continued

- Palpitations that began around 1 hour prior to presentation, associated shortness of breath
- Has a history of similar palpitations that occur 2-3 times a month and resolve spontaneously after a few minutes, told due to anxiety

## **Obstetric History:**

First pregnancy uncomplicated

## **Family History:**

Denies family history of heart disease, SCD

## **Exam:**

General: Anxious appearing, NAD

Neck: no JVD

Lungs: Clear with good bilateral air entry

Heart: tachycardic, regular, no murmur

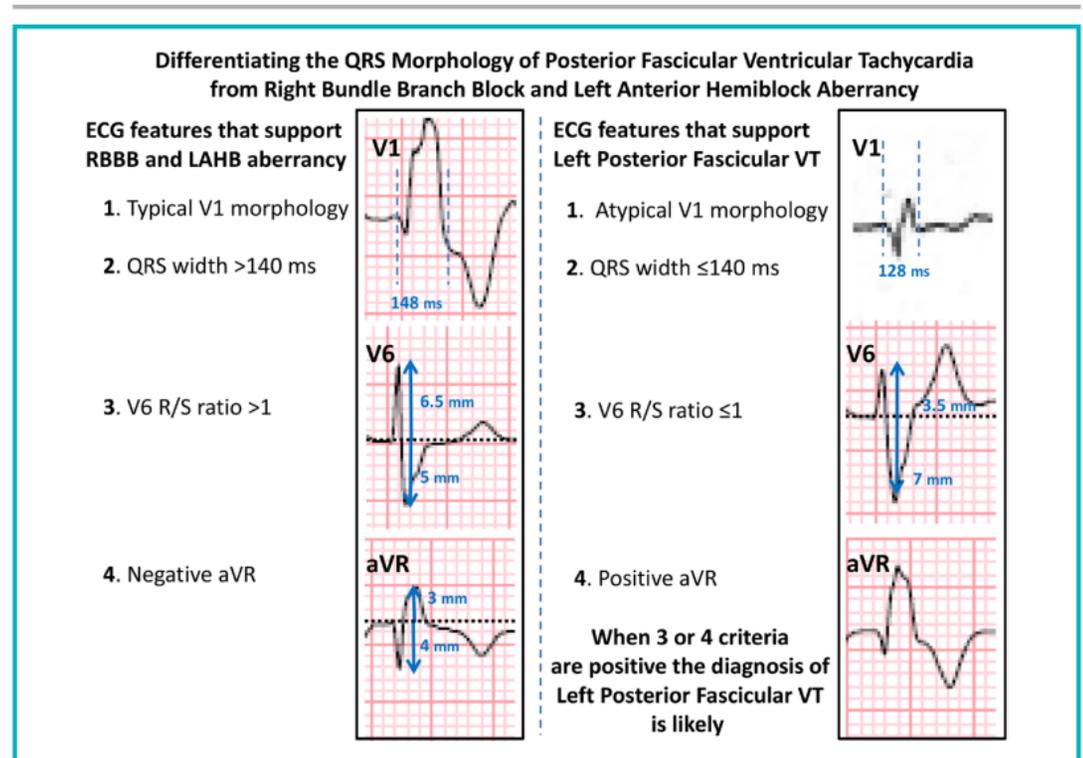
Abdomen: Gravid

Lower extremities: no edema

Neuro: Aox3, no focal deficits

# Differential Diagnosis

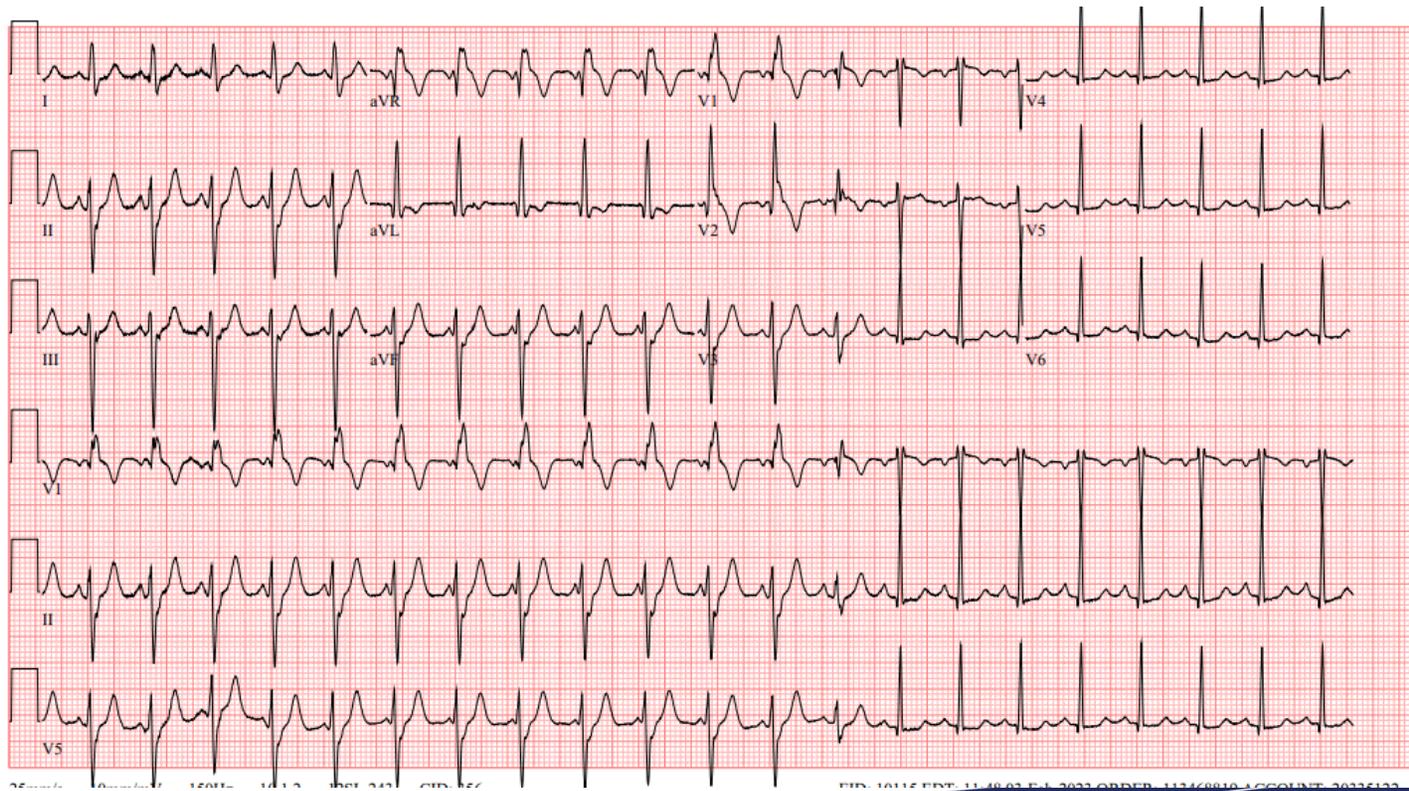
- SVT with aberrancy vs fascicular VT



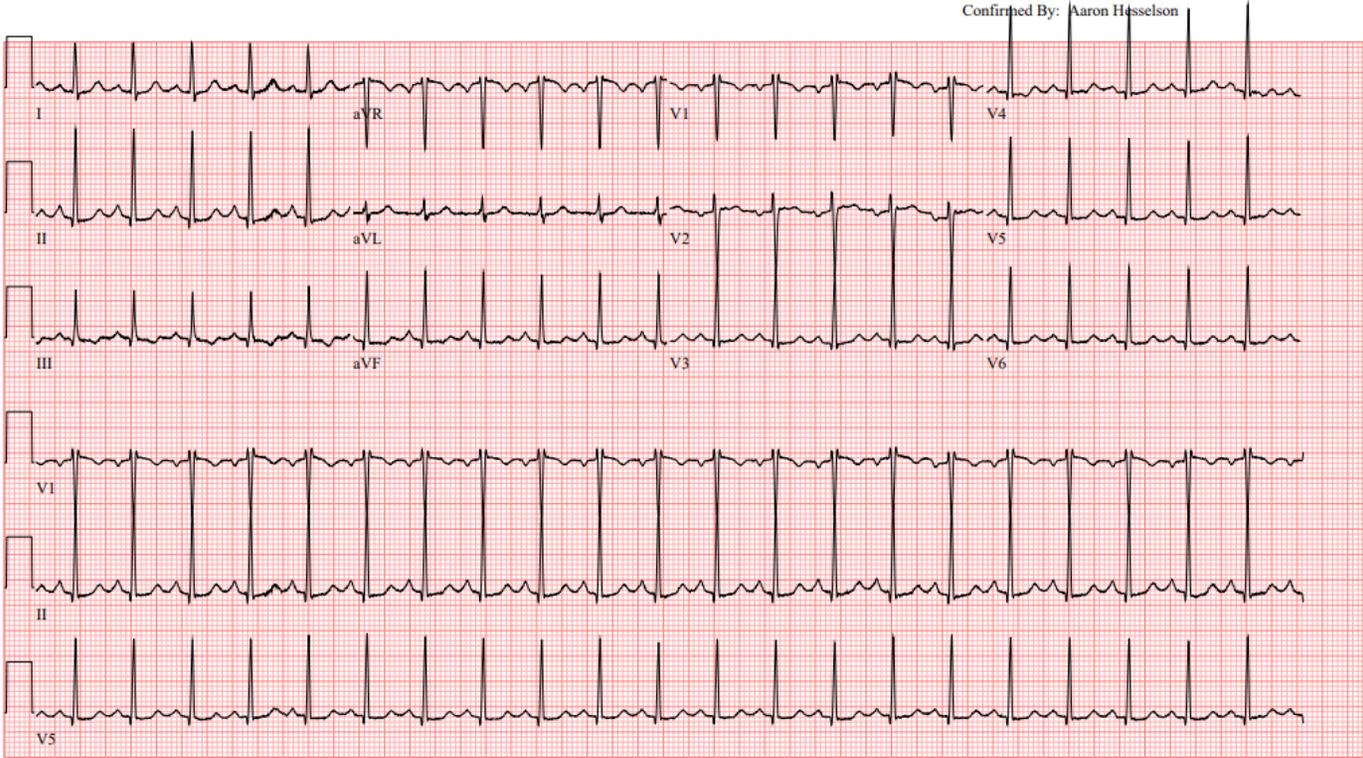
Michowitz et al; LPF-VT vs RBBB and LAHB Aberrancy  
 Circ Arrhythm Electrophysiol. 2017;10:e005074. DOI: 10.1161/CIRCEP.117.005074

- Called the electricians
- Likely posterior fascicular ventricular tachycardia (RBBB + LAFB)
- Decision made to give IV Verapamil 5mg

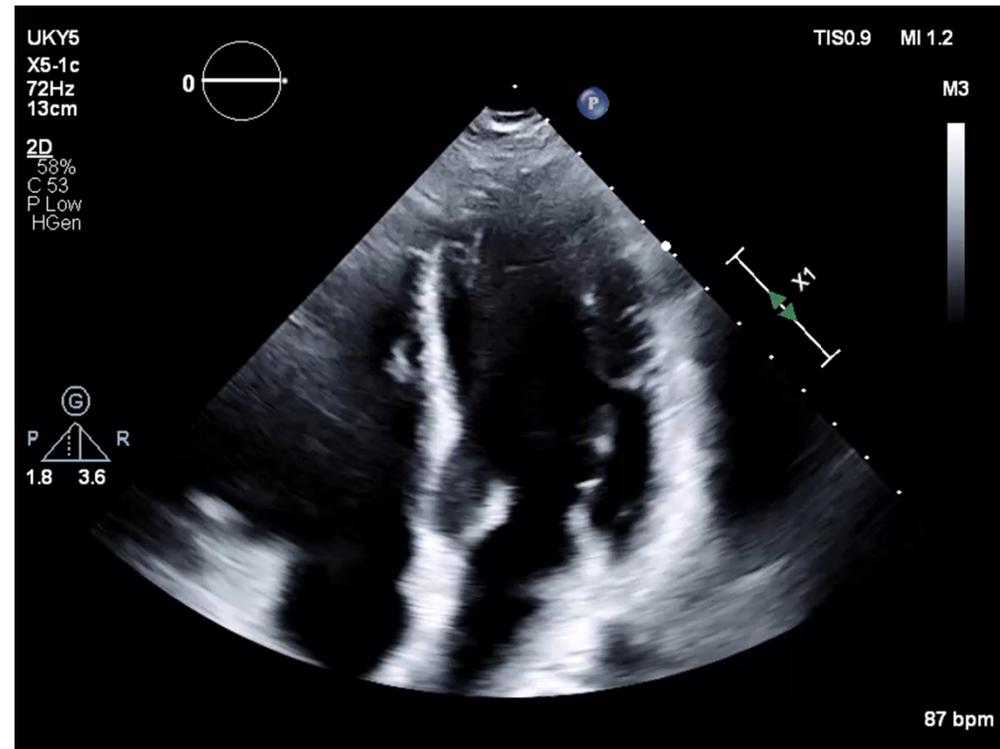
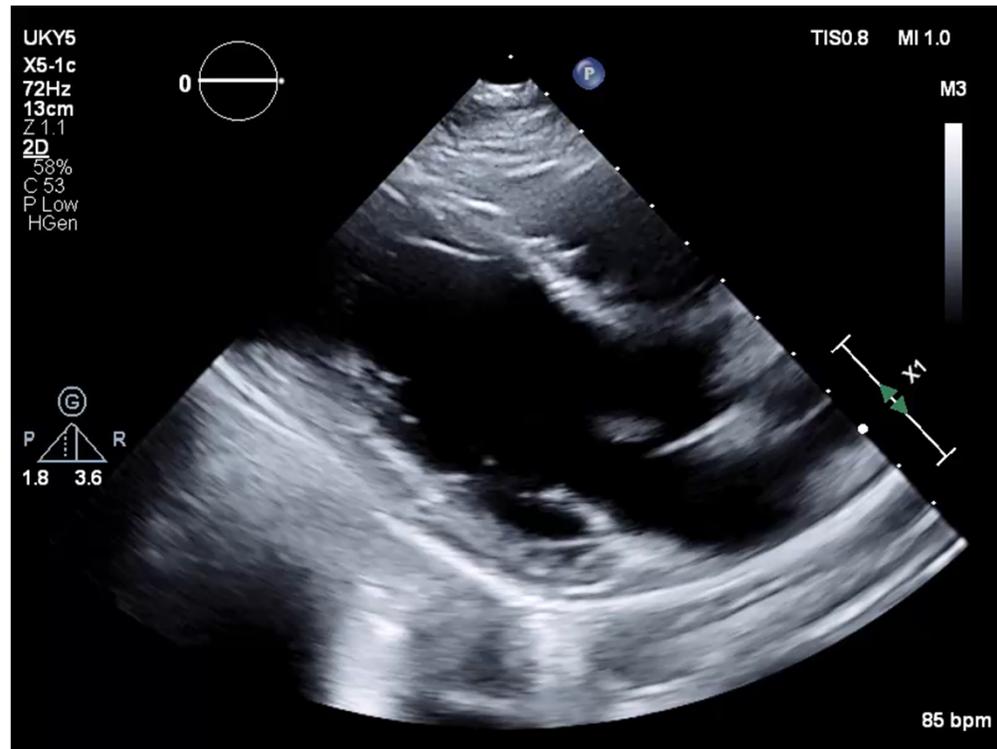
# EKG during Verapamil Infusion



# EKG post chemical cardioversion



# Echocardiogram



# Case 1 Continued

- Started on Verapamil 240mg daily
- Labwork including TSH, CBC, BMP unremarkable
- Observed overnight on telemetry with no recurrence
- Discharged the following day

## Case 1 Continued

- Patient followed up in Womens Cardiology Clinic with recurrence of palpitations, patch holter ordered, referred to EP
- Seen by EP with holter results demonstrating VT lasting 23 mins 59 seconds, started on Flecainide 50mg BID
- Remained stable on this dose without recurrence
- SVD at term, recommended telemetry throughout delivery and 24 hours post partum, delivery complicated by ~20 mins fascicular VT treated with Metoprolol
- Following with EP and planning for ablation once 6 months post partum



# Arrhythmias in Pregnancy

- Arrhythmias more common in pregnancy, recurrence rate high
- Incidence of arrhythmias affecting pregnancy growing, primarily caused by increased incidences of atrial fibrillation and ventricular tachycardia
- Hospitalization during pregnancy for arrhythmias associated with increased risk of maternal and fetal complications, including maternal mortality
- Most common are sinus arrhythmias (60%), atrial or ventricular ectopic beats (19%) and paroxysmal supraventricular tachycardia (14%)

Tamirisa K, Elkayam U, Briller J, et al. Arrhythmias in Pregnancy. J Am Coll Cardiol EP. 2022 Jan, 8 (1) 120–135.  
<https://doi.org/10.1016/j.jacep.2021.10.004>



# Mechanism

- Combination of hemodynamic, hormonal, and autonomic change
- **Autonomic:** Decreased parasympathetic and increased sympathetic activity at rest
  - May contribute to abnormal automaticity, reentry, or triggered activity
- **Hemodynamic:** Increase in blood volume by 30-50% (beg at 8 weeks and peaking at 34 wks), CO increases by 45% (peaks in 2<sup>nd</sup> trimester), HR increases by 15%
- **Hormonal:** E and P proarrhythmic in animal studies, Relaxin + chronotropic activity, estrogen has been shown to increase the number of adrenergic receptors in the myocardium, and adrenergic responsiveness seems to be increased in pregnancy

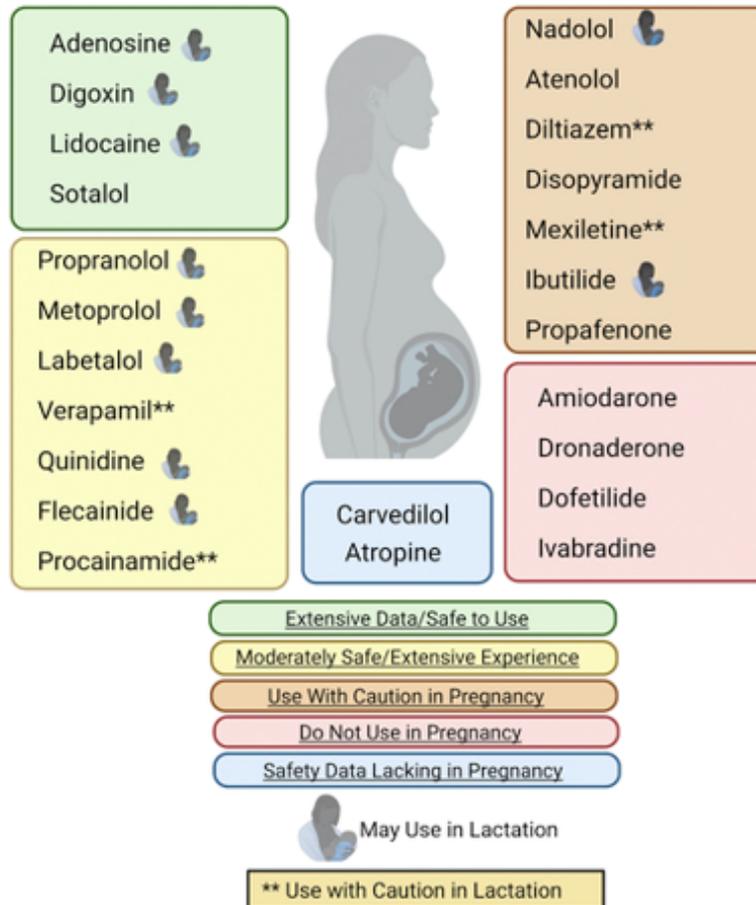
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# Ventricular Tachycardia in Pregnancy

- Rare during pregnancy with a prevalence of 2 per 100,000 hospital admissions
- **VT in structural heart disease**
  - Highest risk in CHD, VT recurrence rate ~27%
  - Ischemic heart disease related to SCAD
  - Underlying NICM
- **VT in nonstructural heart disease**
  - Typically hemodynamically stable and associated with a good prognosis
  - Often catecholamine sensitive, and treatment with  $\beta$ -blockers is usually effective
  - Sotalol, flecainide may be considered
  - Verapamil can be used for acute termination and prevention of fascicular VT

Tamirisa K, Elkayam U, Briller J, et al. Arrhythmias in Pregnancy. J Am Coll Cardiol EP. 2022 Jan, 8 (1) 120–135.  
<https://doi.org/10.1016/j.jacep.2021.10.004>



Tamirisa, K.P. et al. J Am Coll Cardiol EP. 2022;8(1):120-135.



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## Case 2

- 33 yo female G5P2 currently 36 weeks 2 days of gestation with past medical history significant for congenital pulmonic stenosis s/p surgical PVR with homograft who presented to OB floor as a transfer with **chest pain and elevated troponin**
- Vitals: T 98.7F HR 85bpm BP 134/89 SpO2 99% on RA
- On a heparin gtt, currently chest pain free

# Case 2 Continued

- Chest pain yesterday morning at 0700 , aching pain between her shoulder blades that radiated to her left chest, severity 7/10 and no associated symptoms, she took a Tums without improvement
- Presented to outside ED with non ischemic EKG, normal CBC, BMP, TSH and BNP. Troponins elevated 166>1641>1807>2698
- V/Q scan negative
- Started on heparin and transferred
- Currently chest pain free without recurrence since arrival

## **Pertinent PMH:**

Congenital pulmonic stenosis s/p surgical PVR with 25 mm homograft 12/2006

## **Obstetric History:**

Current pregnancy uncomplicated

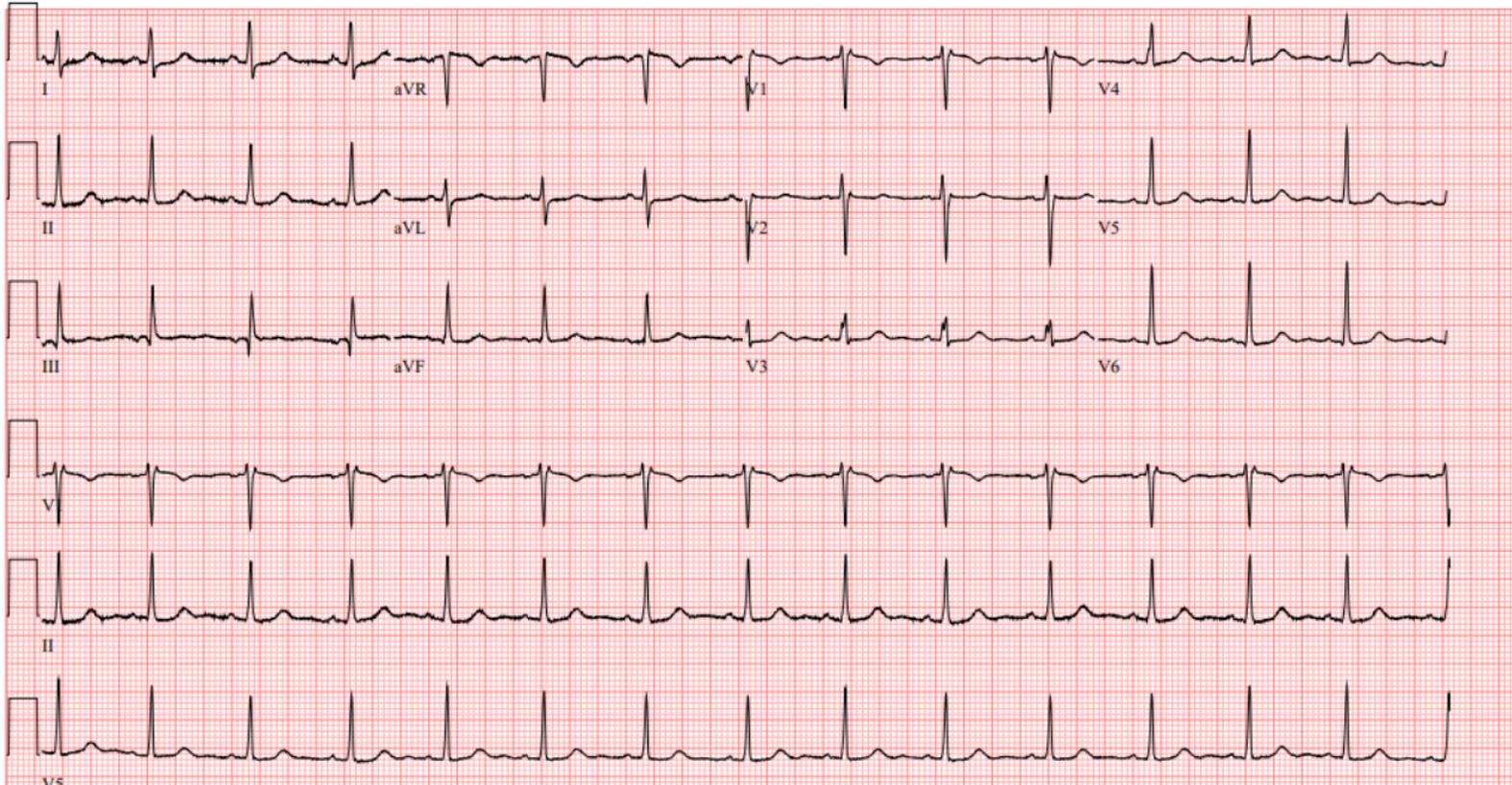
G1- 10w SAB- D&C

G2- 38w SVD- uncomplicated

G3- 5w SAB

G4- 37w3d- SVD-uncomplicated

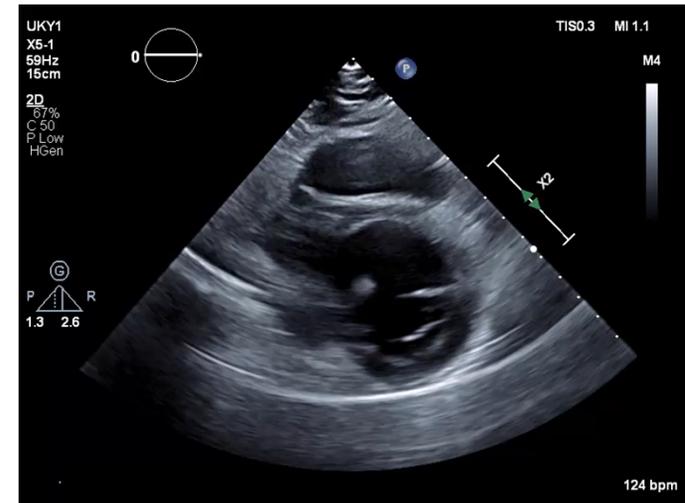
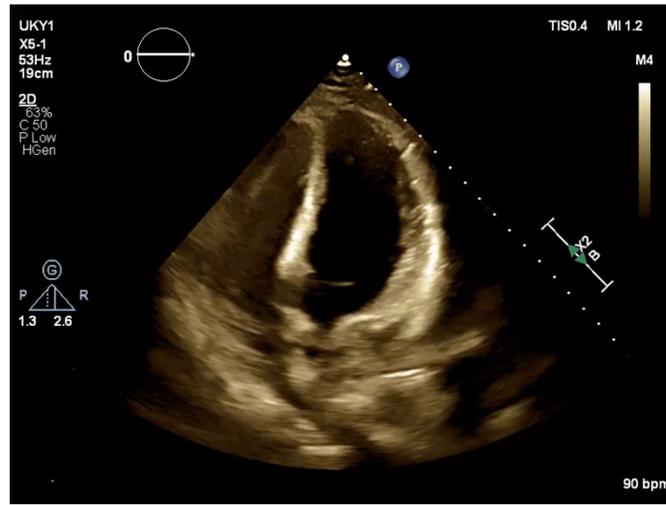
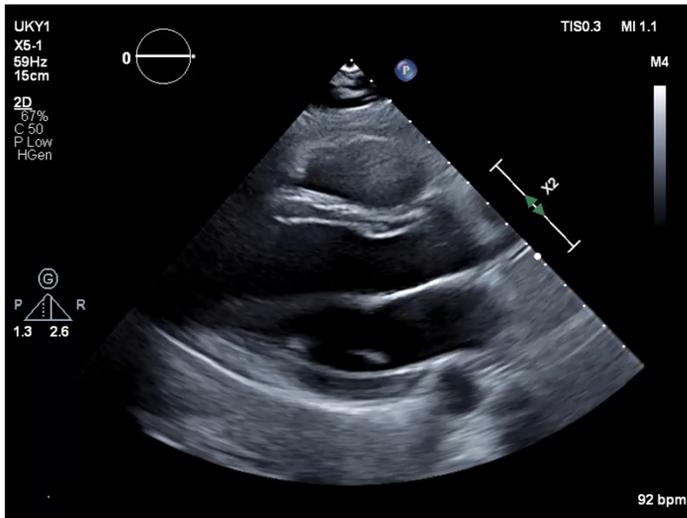
# EKG on Presentation



# Laboratory Data

- CMP and CBC unremarkable other than WBC 12K
- NT-Pro BNP 220 pg/mL (0-449)
- High sensitivity troponin 407- 531- 518 ng/L (<14 ng/L )

# Echocardiogram



# Differential Diagnosis

## Coronary

- SCAD
- Plaque rupture
- Coronary thromboembolism
- Vasospasm

## Non- Coronary

- Myocarditis
- Aortic Dissection
- Pre-eclampsia
- PE
- PPCM

# Differential Diagnosis

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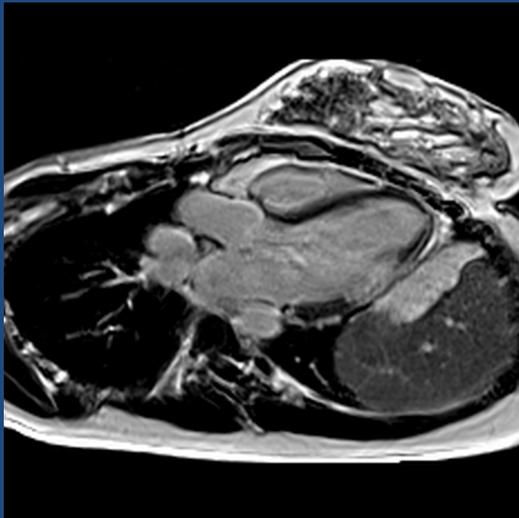
## Case 2 Continued

- Working diagnosis P-SCAD
- Multi-disciplinary meeting
- Risk of CTA or angiogram outweighed benefit as would not change management, could not obtain CMR as would need gadolinium
- Maintained on ASA 81mg daily (no P2Y12) and Metoprolol Tartrate 12.5mg BID
- Planned to defer IOL until at least 37 weeks with assisted 2<sup>nd</sup> stage

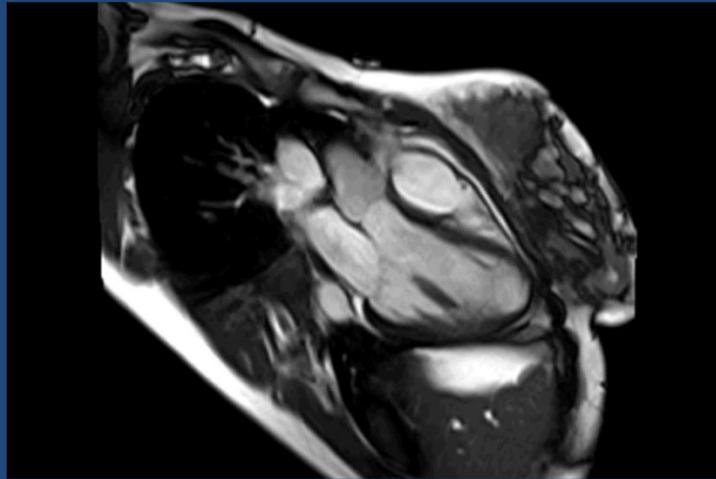
## Case 2 Continued

- At 36 weeks 6 days PTL, underwent FAVD with delivery of healthy baby, maintained on telemetry monitoring
- Uncomplicated without recurrence of chest pain
- 4 day post partum underwent CMR...

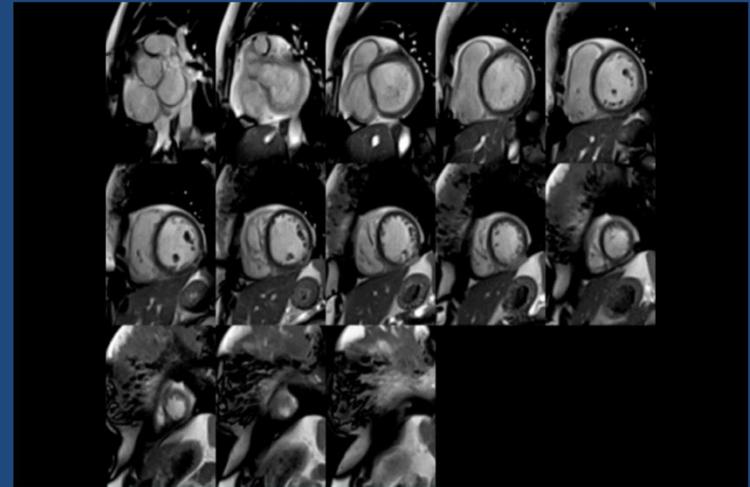
# CMR



A. 3Ch LGE



B. 3Ch Cine



C. SAX Cine

\*Credit: Dr. Leung

- 1. Inferolateral extending into inferior near transmural subendocardial late gadolinium enhancement **suggestive of left circumflex artery territory myocardial infarction, less likely myocarditis. Same region has elevated T1 and T2 relaxation time suggestive of recent process.** Mid inferolateral wall demonstrates subendocardial perfusion defect and akinesis also.
- 2. Mildly dilated left ventricle with mildly reduced global systolic function (EF 49%).
- 3. Normal sized right ventricle with mildly reduced global systolic function (EF 49%).
- 4. Normal functioning pulmonary bioprosthesis valve with no significant stenosis. Peak velocity 2.2 m/s. No regurgitation

## Case 2 continued

- Discharged with diagnosis of P-SCAD
- Medical therapy: ASA 81mg daily, Metoprolol Succinate 25mg daily
- Attended cardiac rehab
- FMD screening negative
- Counseled against future pregnancies due to risk of recurrence



# Pregnancy-Associated Myocardial Infarction

- Defined as myocardial infarction (MI) during pregnancy or the postpartum period
- Accounts for over 20% of maternal cardiac deaths
- PAMI occurs ~8/ 100,000 delivery, 4-fold higher than occurrence among nonpregnant counterparts
- Case fatality rate is estimated at 5% , higher than MI fatality rates among nonpregnant women of reproductive age
- Most commonly occurs in post partum period
  - 21% in antepartum, 24% during L and D, 53% occurred post partum
- Traditional risk factors important, along with pregnancy related factors (pre-eclampsia, multi-parity)
- Most common cause **SCAD** (43%), **CAD** (27%), **thrombosis** (13%)

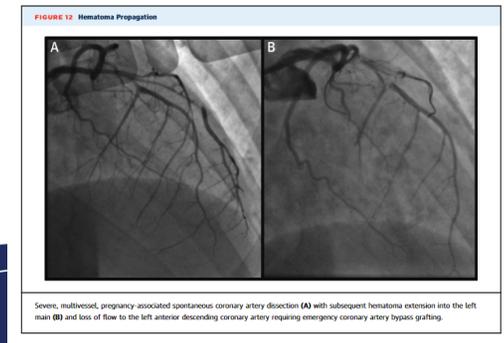
1. Smilowitz, et al. Acute Myocardial Infarction During Pregnancy and the Puerperium in the United States. Mayo Clin Proc. 2018 Oct;93(10):1404-1414. doi: 10.1016/j.mayocp.2018.04.019. Epub 2018 Jul 18. PMID: 30031555; PMCID: PMC6173614.  
2. Tweet, et. al. Pregnancy-Associated Myocardial Infarction: Prevalence, Causes, and Interventional Management. Circ Cardiovasc Interv. 2020 Aug 1;CIRCINTERVENTIONS120008687. doi: 10.1161/CIRCINTERVENTIONS.120.008687. Epub ahead of print. PMID: 32862672; PMCID: PMC7854968.



# Pregnancy-Associated SCAD

- *Most common cause of PAMI*
- Most commonly occurs (>70%) in post partum period, usually within 1 week
- P-SCAD usually more severe clinical presentations (STEMI, left main or MV involvement, impaired LV function, cardiogenic shock)
  - Outcomes: Mortality 4%, Shock 24%, Mechanical Support 28%
- Conservative management preferred due to high complication rates and most heal (~95%) within 30 days, PCI reserved for more severe cases
- Future pregnancy discouraged, however shared decision is paramount

Hayes S, Tweet M, Adlam D, et al. Spontaneous Coronary Artery Dissection. J Am Coll Cardiol. 2020 Aug, 76 (8) 961–984.  
<https://doi.org/10.1016/j.jacc.2020.05.084>





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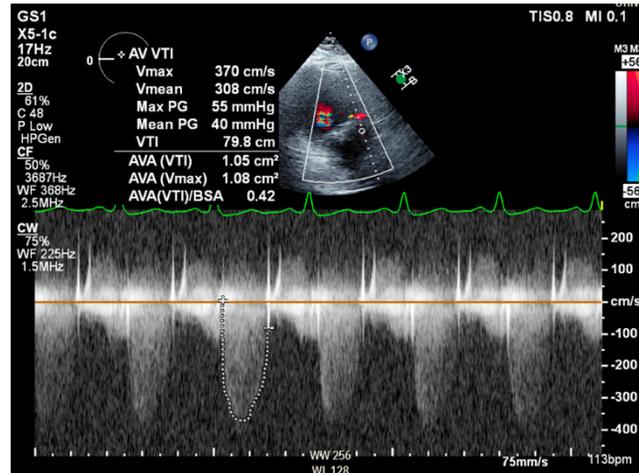
## Case 3

- 29 yo female G6P1, currently 20 weeks 2 days of gestation with a past medical history significant for bicuspid aortic valve who presented to Women's Heart Clinic for evaluation in the setting of echo showing severe AS.
- Vitals: HR 107bpm BP 122/75 SpO2 96% on RA

# Case 3 continued

- Since start of pregnancy has started to have shortness of breath and tachycardia with walking on flat ground and climbing one flight of stairs
- Also complaining of palpitations that occur at rest
- No lower extremity edema
  
- **Pertinent PMH: DMT2, Chronic hypertension, morbid obesity with BMI 48, first diagnosed with BAV at age 16, did not have severe AS with previous pregnancy**
  
- **Obstetric History:**
  - G1- 6w SAB
  - G2- 6w SAB
  - G3- 5w SAB
  - G4- 7w SAB
  - G5 - 37w, C-section

# Echo



## Case 3 continued

- Patient initially planned for delivery at 37 weeks however began to develop worsening edema and delivery via C-section moved up to 34 weeks
- Started following with Cardiology weekly during her third trimester and was started on Lasix for uptrending NT-proBNP (324->370->463->557)
- Was recommended to be admitted for monitoring until delivery
- NT-proBNP continued to rise despite diuresis with Lasix and C-section moved to 33 weeks

# Possible Intervention

- Patient discussed with multidisciplinary valve team multiple times throughout course of pregnancy
- If patient were to decompensate with worsening HF symptoms despite medical treatment, would proceed with valvuloplasty
- Ideally, will plan for patient to safely deliver and then undergo evaluation for TAVR vs. SAVR

## Case 3 continued

- Patient discharged 3 days post-partum on Lasix 40mg daily and Labetalol 100mg TID
- Echo on day of discharge showing LVEF 45-50% with AV mean gradient 60mmHg, AVA 0.6cm<sup>2</sup>
- Has since followed up with ACHD as well as CTS, repeat echo 4 months post partum showing LVEF 45% with AV mean gradient 59mmHg
- Recently underwent SAVR with successful placement of mechanical AV



# Aortic Valve Disease in Pregnancy

Severe Aortic Stenosis in pregnancy is a high risk condition

- WHO Pregnancy Risk Classification IV
  - High risk of maternal mortality or severe morbidity
  - Pregnancy contraindicated and if occurs termination should be discussed
  - If proceeding with pregnancy, needs care with multidisciplinary team of cardiac and obstetric specialists throughout pregnancy, childbirth and in the postpartum period
  
- Bicuspid Aortic Valve also high risk when associated with the following:
  - Aortic dilation 45-50mm – WHO Pregnancy Risk Classification III
  - Aortic dilation >50mm – WHO Pregnancy Risk Classification IV
  
- All first degree relatives should receive screening for BAV along with fetal echocardiogram



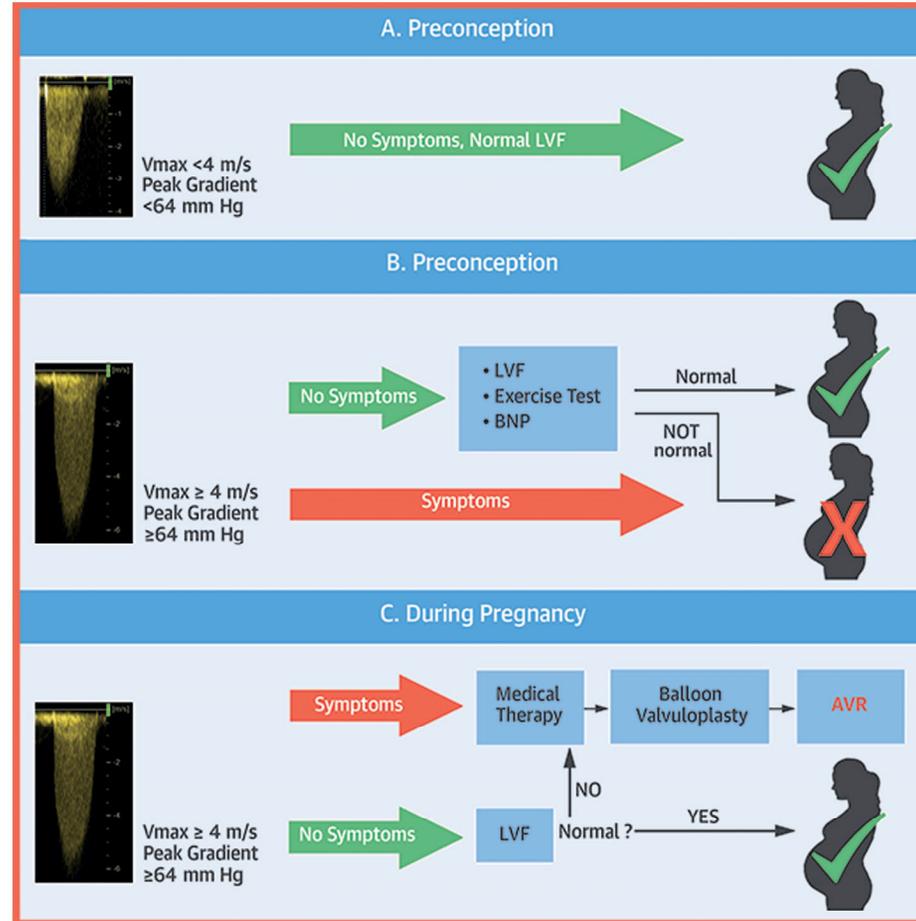
# Aortic Valve Disease in Pregnancy

As per The Registry on Pregnancy and Cardiac Disease (ROPAC) Data:

- Mortality in pregnant patients with severe AS was very low however morbidity especially in those with symptoms was high – 35.3%
  - Heart failure and associated hospital admission was the most common complication (26.3%)
- Increased risk for atrial arrhythmias
- Increased rate of adverse fetal outcomes including preterm birth and low birth weight



**CENTRAL ILLUSTRATION: Evaluation of Women With Moderate or Severe AS**



Orwat, S. et al. J Am Coll Cardiol. 2016;68(16):1727-37.