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Allegheny General Hospital  
Adjunct Clinical Professor of Emergency Medicine

# GREAT SAVES

STRIVE TO REVIVE  
HILTON GARDEN INN, SOUTHPOINTE  
FRIDAY, OCTOBER 12, 2018



## Case #1


- 31 year old healthy male
  - Just finished a workout at the gym
  - Severe mid-sternal chest pain
  - EMS called
- 

# AGH ED Arrival

- HR 100
- BP 156/97
- RR 16
- 100% on RA
- “**Writhing**” on the stretcher



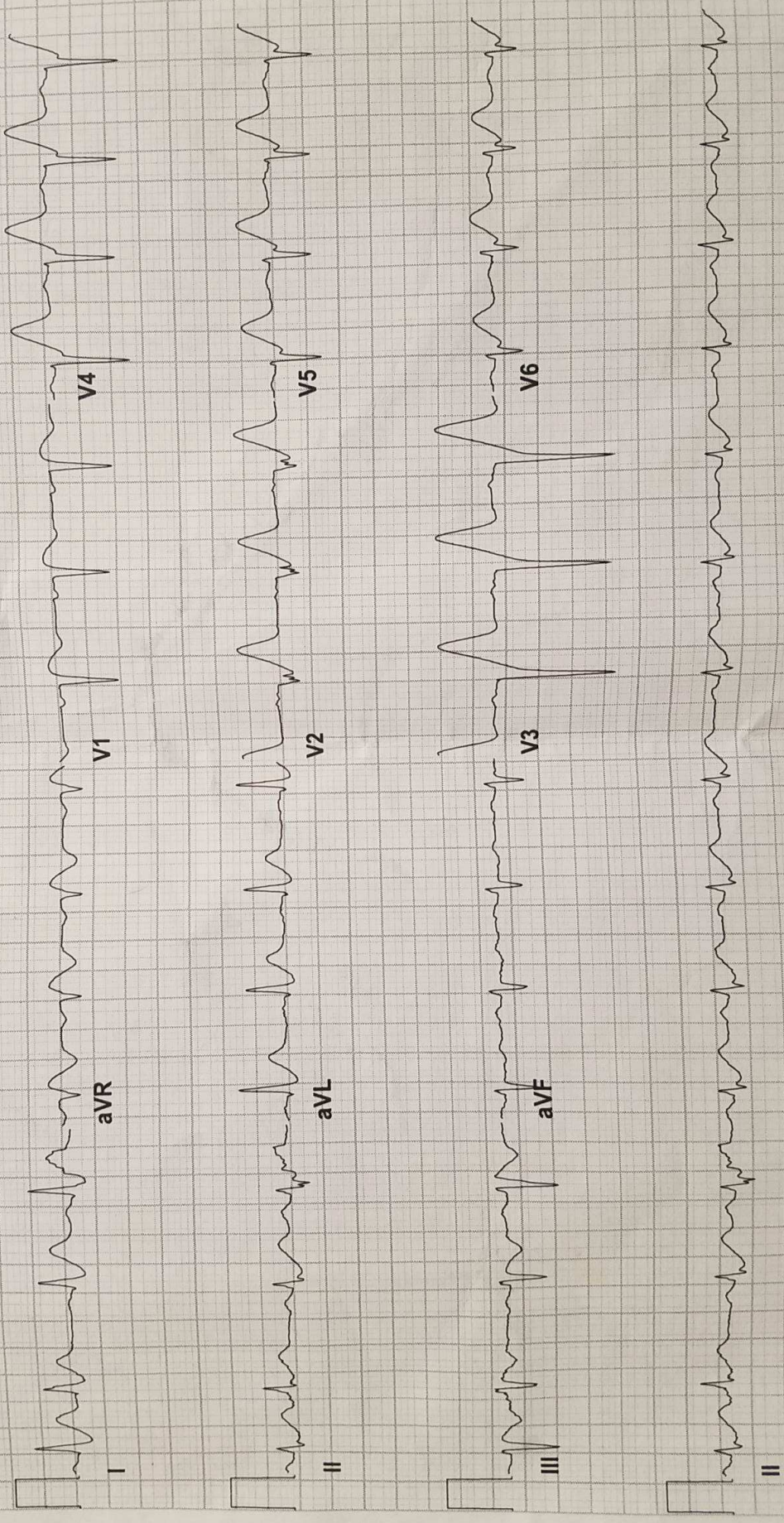
## AGH ED

- SOB
  - Diaphoretic
  - CP
  - PHX **None**
  - Family History **None**
- 

Requested by

AGH NAME:

CRITICAL:



25mm/s 10mm/mV 40Hz 8.0 SP2 12SL 241 HD CID: 24 EID:695 EDT: 13:20 28-MAY-2018 ORDER: 70714043 ACCOUNT: 8907896 Page 1 of

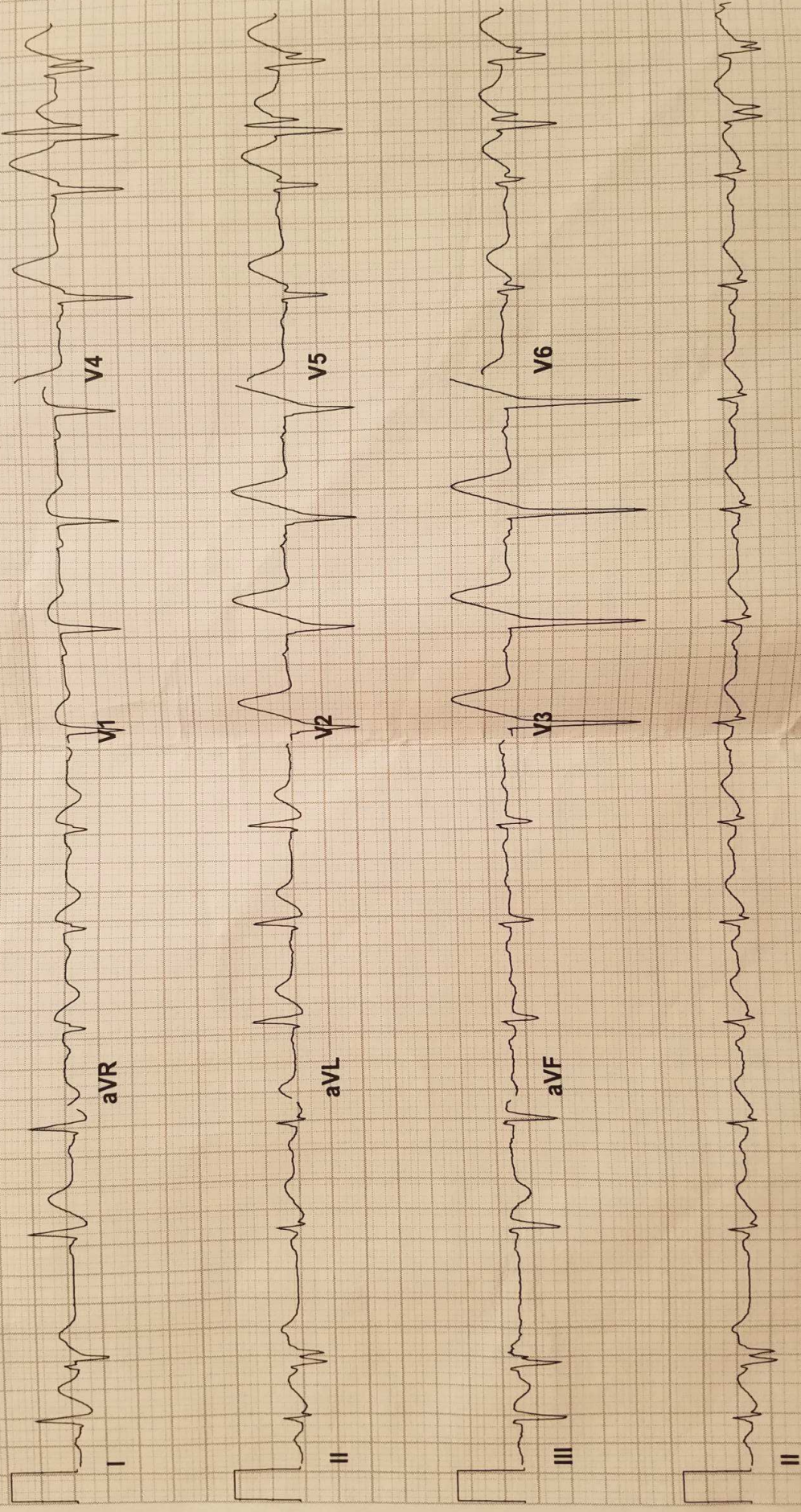
## What is next?

- Cardiology called to bedside
- **Requested --- CTA chest to r/o dissection**
- A second EKG is done

Received by: [unclear]

AGH NAME:

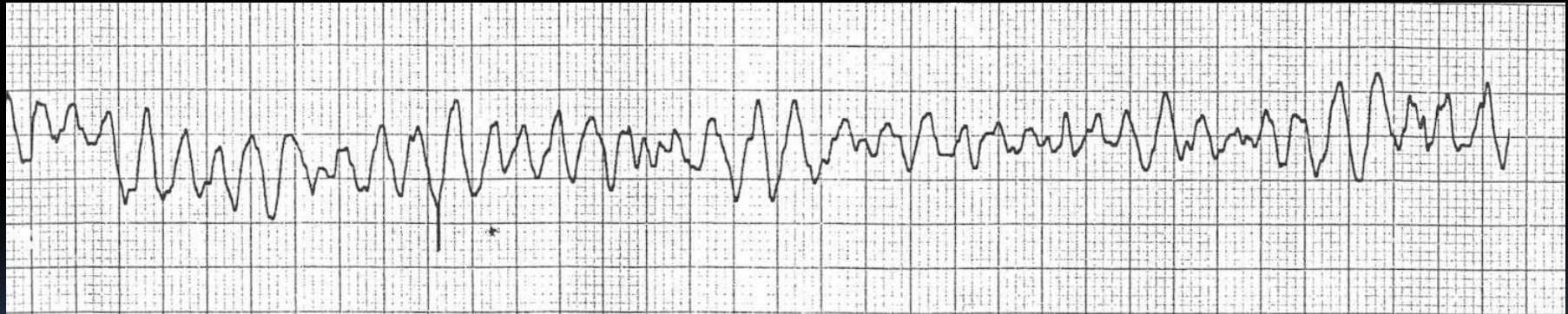
CRITICAL:



17SI 741 HD/CID: 16

FIN-605 ENT-13-20 28-MAY-2018 ORDER: 134657244 ACCOUNT: 8907


# CT Scanner








## What next?

- Compressions
  - Countershock x 2
  - Magnesium, Calcium and Lidocaine
  - **ROSC**
- 




## ED TREATMENT

- Intubated
  - **VF**
  - **Torsades**
  - **VT**
  - Intermittent compressions
  - 11 Countershocks
  - Lidocaine and Amiodarone drip
- 



# Perfusing Rhythm!

- CT surgery called
  - **ECMO**
  - Total downtime around 20 min
- 



# ECMO cart /E- CPR cart



- ECMO CART
- Arterial Cannula 10mg Box
    - 18 F x 2
  - Venous Cannula
    - 24 F x 3
  - Arterial Wire x 2
  - Venous Wire x 2
  - ECMO Tray
  - Sterile Drape Packs x 2 (full packs and half sheets)
  - Blue Towels x 2
  - Lap Pads x 2
  - Prep Sticks x 6
  - 4x4 Boat x 4
  - Basin (sterile blue bowl) x 2
  - Sterile Water x 2
  - Bulb Syringe x 2
  - Gowns – 3 Large, 3 XL
  - Sterile Gloves
    - 3 of each size (6 1/2, 7, 7 1/2, 8)
  - Hats
  - Masks
  - Suture - #0 silk x 8
  - Foley Catheter Holders
  - Scalpels (2 each #10 and #11)
  - Skin Stapler x 2



## VA ECMO

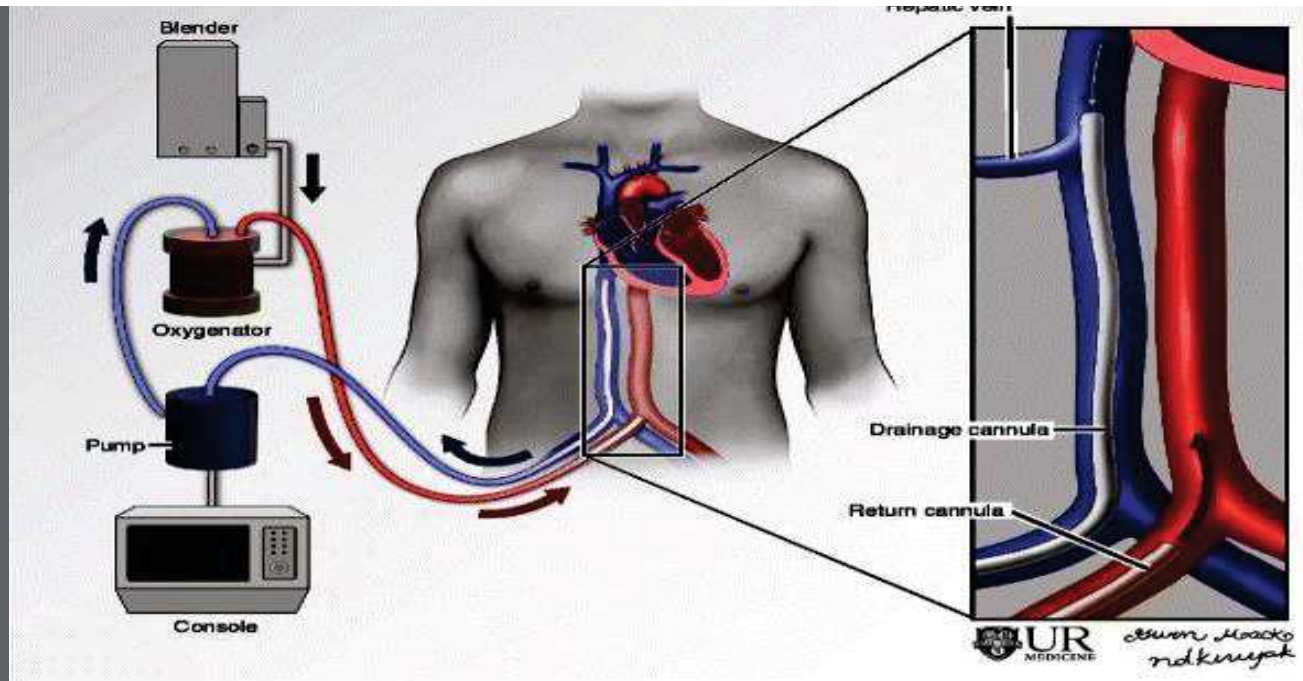
Venous Blood ( RA )

Gas exchanger

Remove CO<sub>2</sub>  
Add oxygen

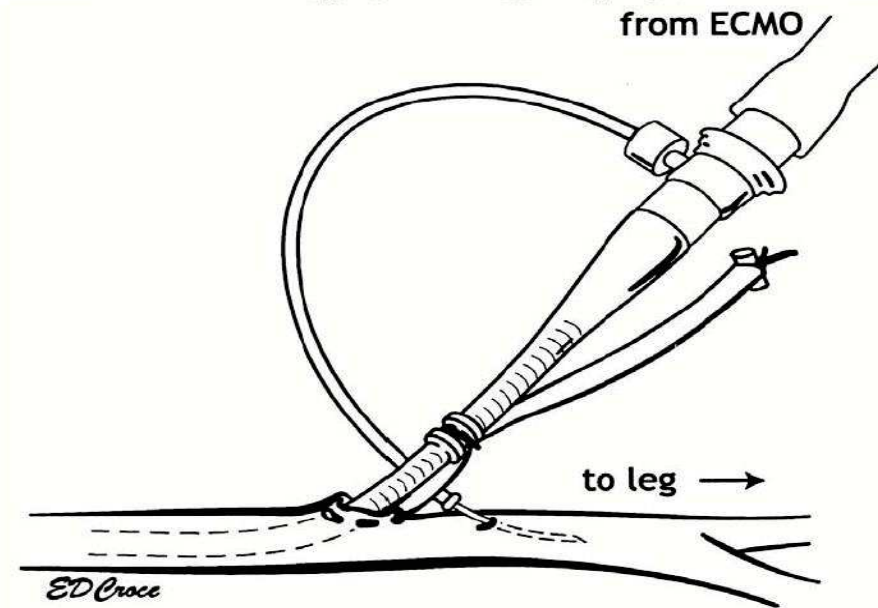
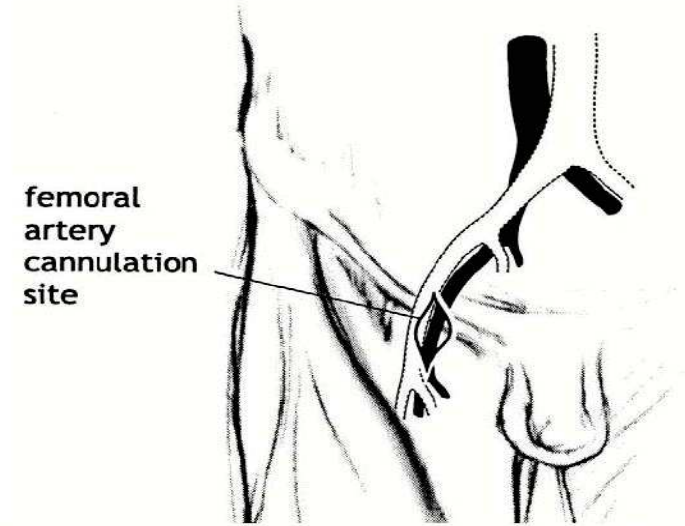
Blood returns ( FA )

Retrograde

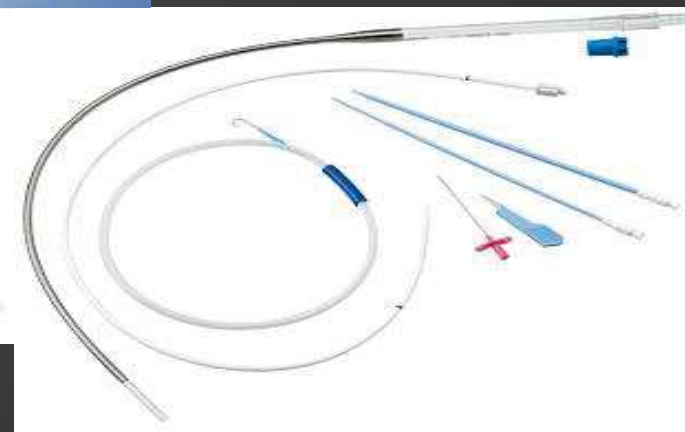
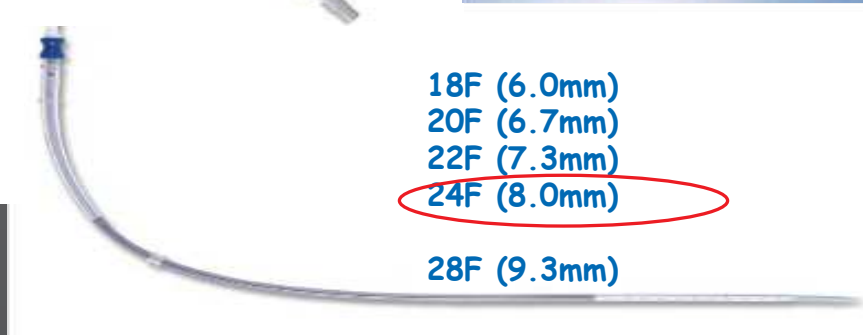
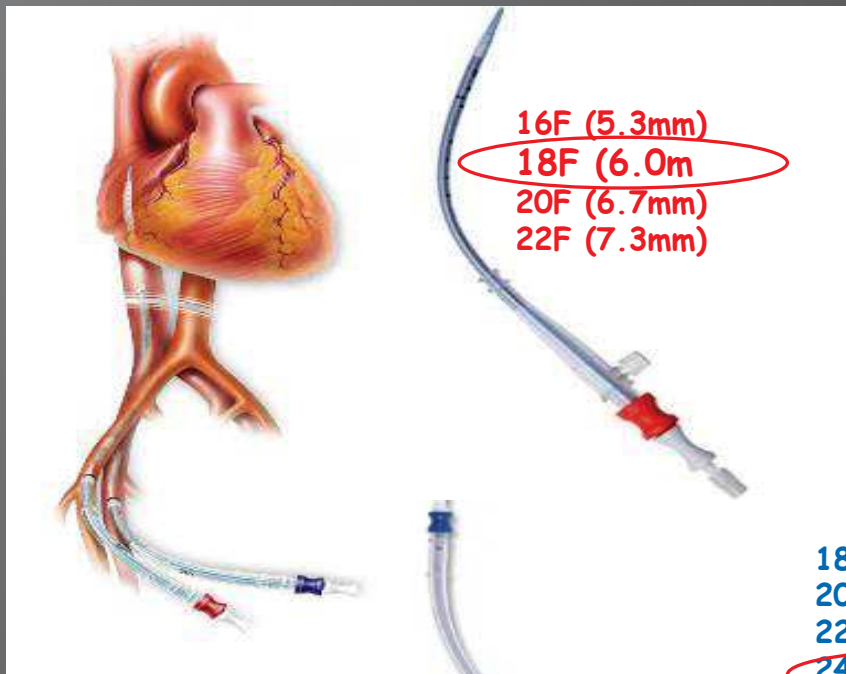


(17-27F) femoral vein- ( advance 40-50 cm)  
(15-19F) femoral artery( to the hub)

# ECMO: Cannulas



## VA ECMO Cannulation





---

**CARDIOHELP**  
**Connections and components**

---

**MAQUET**  
GETINGE GROUP

**Front View**



**Rear View**




# CATH LAB

- **LAD 100% proximal occlusion**
  - LAD stent placed
- EF ~20%

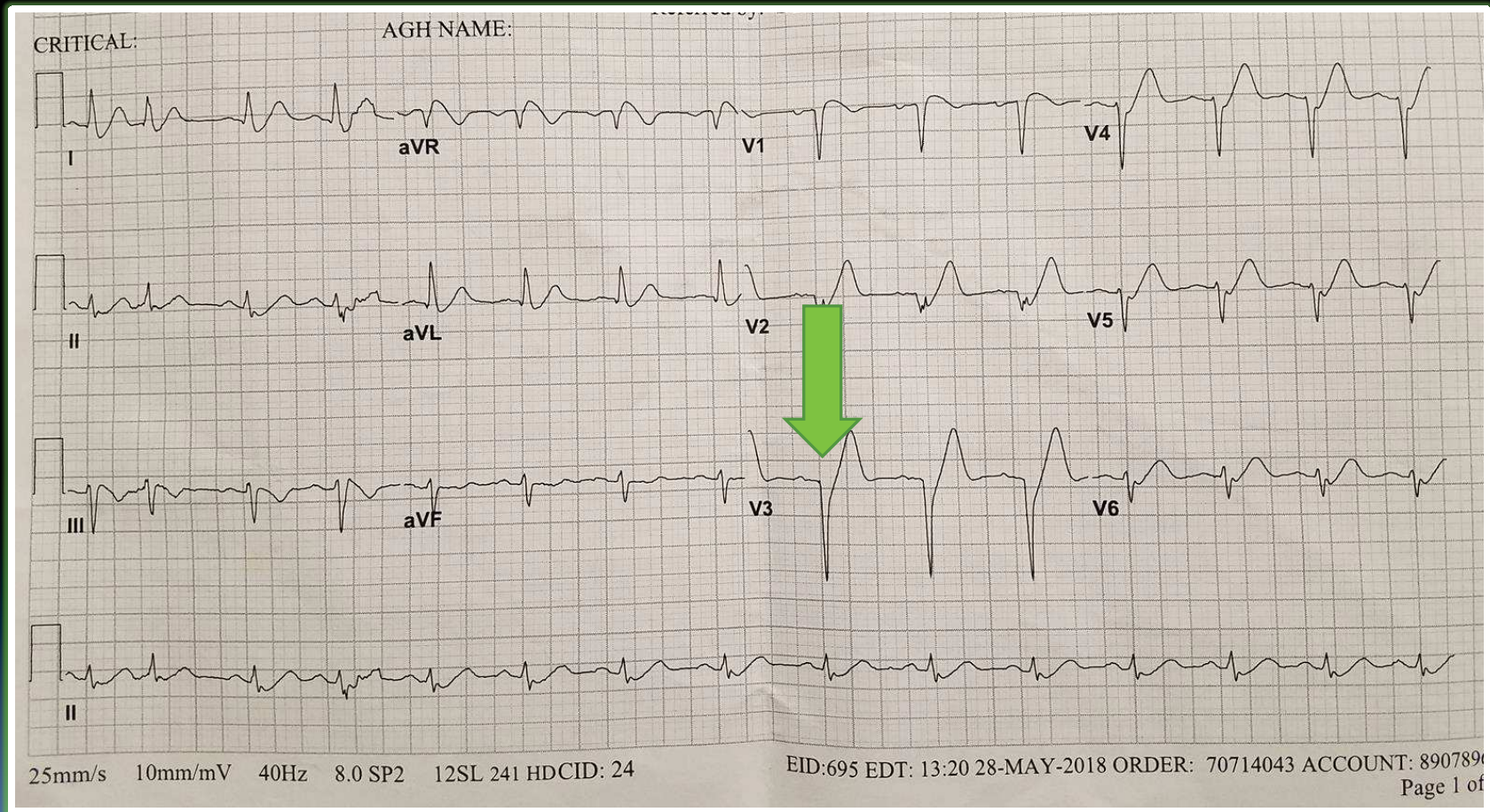


# Hospital Stay

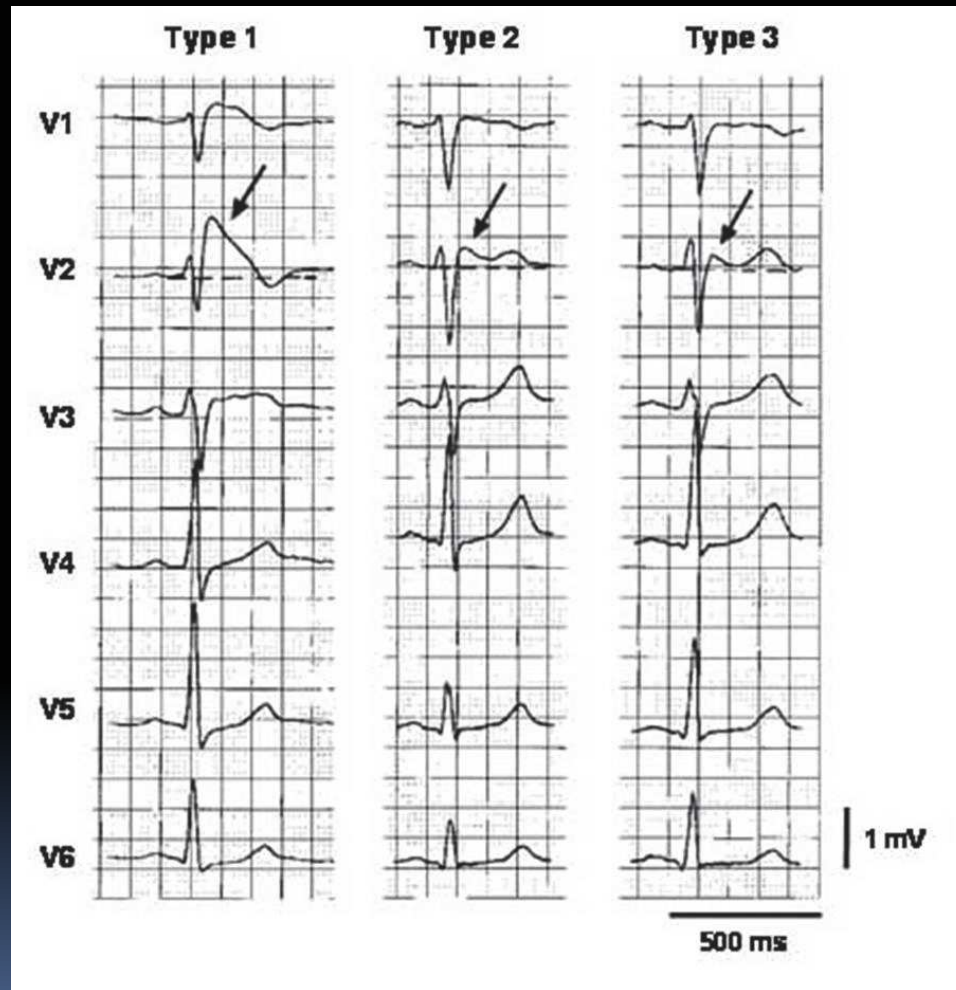
- **Weaned off pressors over the next couple days**
  - Decannulated
  - Extubated
  - Discharged
    - **Neurologically intact**
    - **Seen by one of our nurses walking around and doing well with his baby!**
- 

# De Winter's Waves

- Upsloping ST depression V<sub>1</sub>-V<sub>4</sub>
- Prominent T waves
- ST elevation in aVR
- Proximal LAD occlusion



# BRUGADA



1406272009479994 6/27/2014 9:01:01 PM  
28 yrs Male

PAGE: 01/01

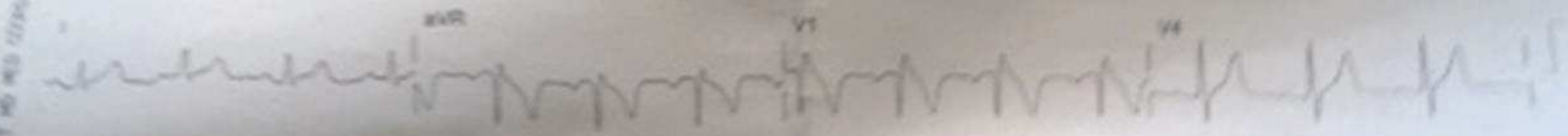
- Sinus rhythm
- Probable left axis enlargement
- Anterior infarct, acute (LAD)
- ST elevation, consider inferior injury
- Lateral leads are also involved

STAT MD MED (2849)  
Unconfirmed diagnosis

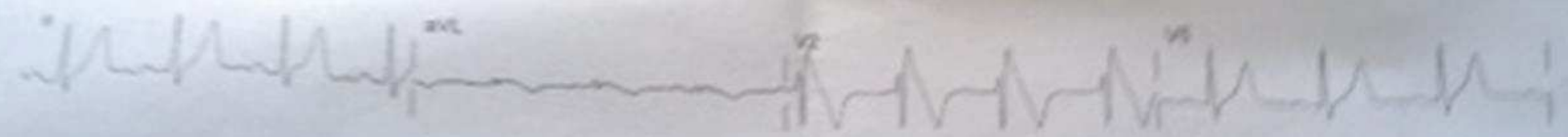
# BRUGADA

-ABNORMAL ECG-

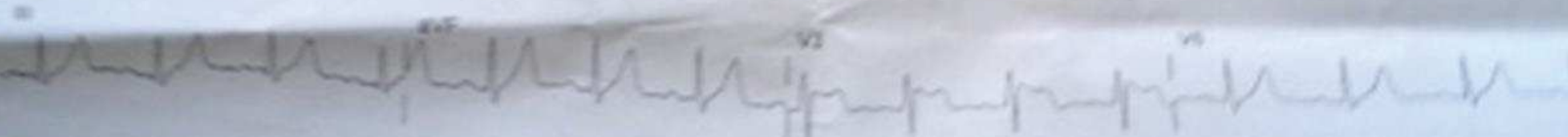
STAT MD MED (2849)



STAT MD MED (2849)



6/27/2014 21:05



1406272009479994

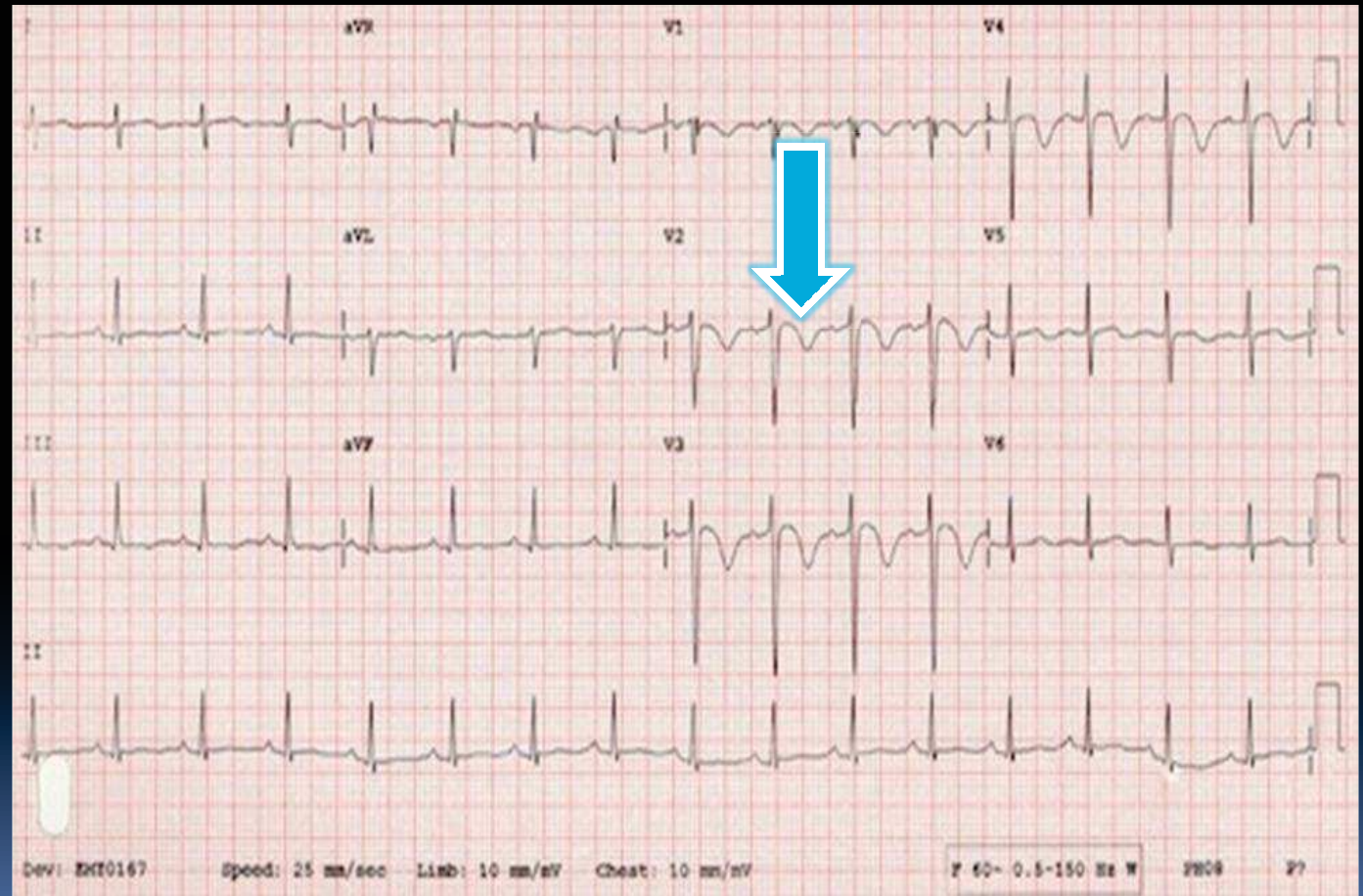
25 mm/sec  
6/27/2014 9:01:01 PM

Chest, 10 mm/mV

6/27/2014 9:01:01 PM

STAT MD MED (2849)

# Wellens' syndrome

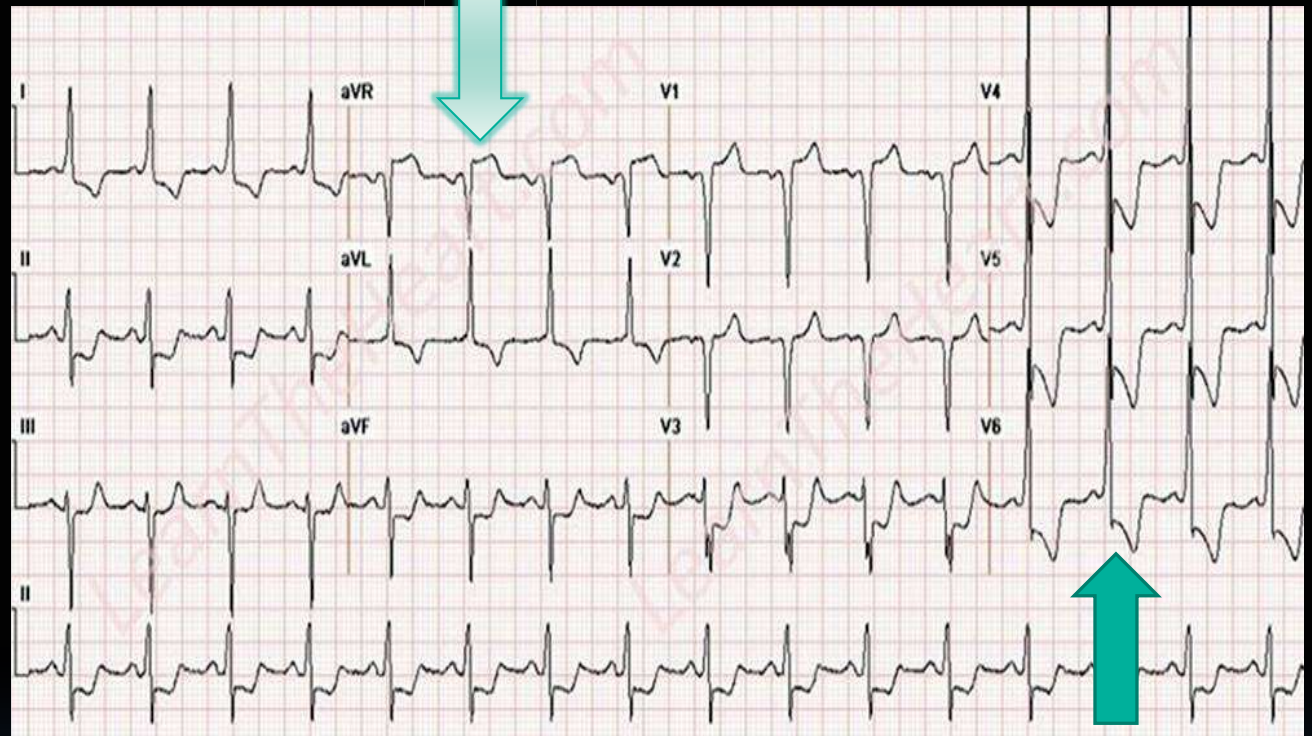


Deeply inverted,  
symmetric T waves V<sub>1</sub>-V<sub>4</sub>  
or  
Biphasic T waves V<sub>1</sub>-V<sub>4</sub>

Proximal LAD  
occlusion  
No provocative  
testing

ST Elevation in aVR and/or  
widespread ST depression

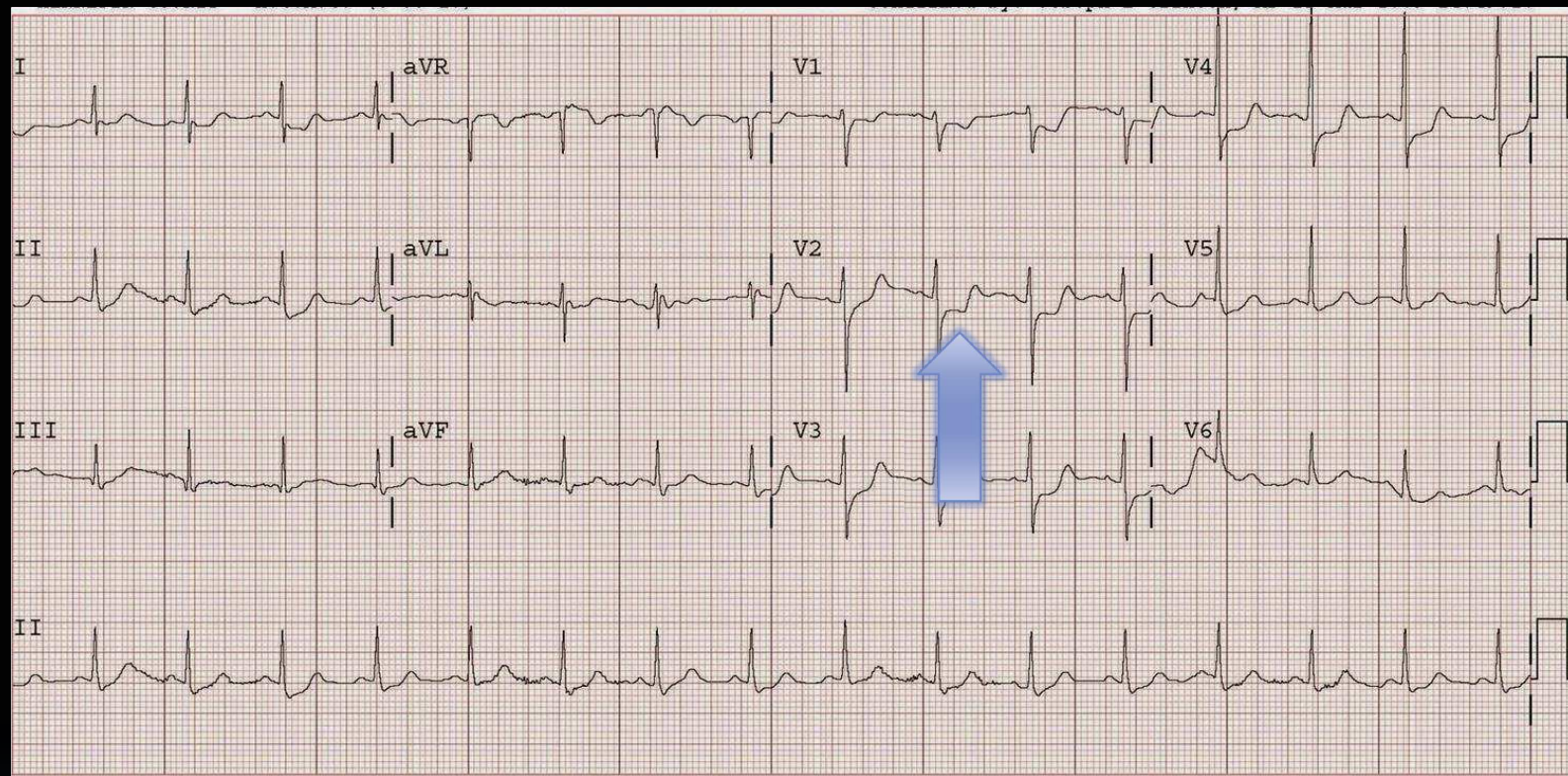
Left main



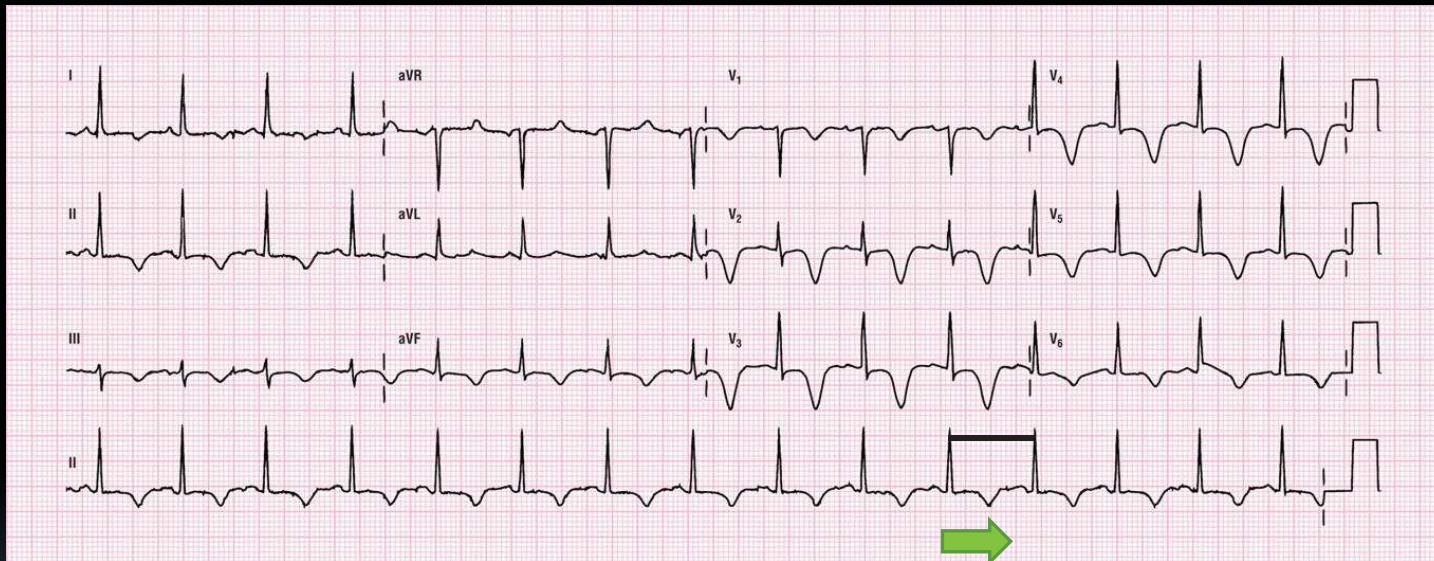


Posterior MI-  
Horizontal or  
flat ST  
depression  
V<sub>1</sub>-V<sub>3</sub>

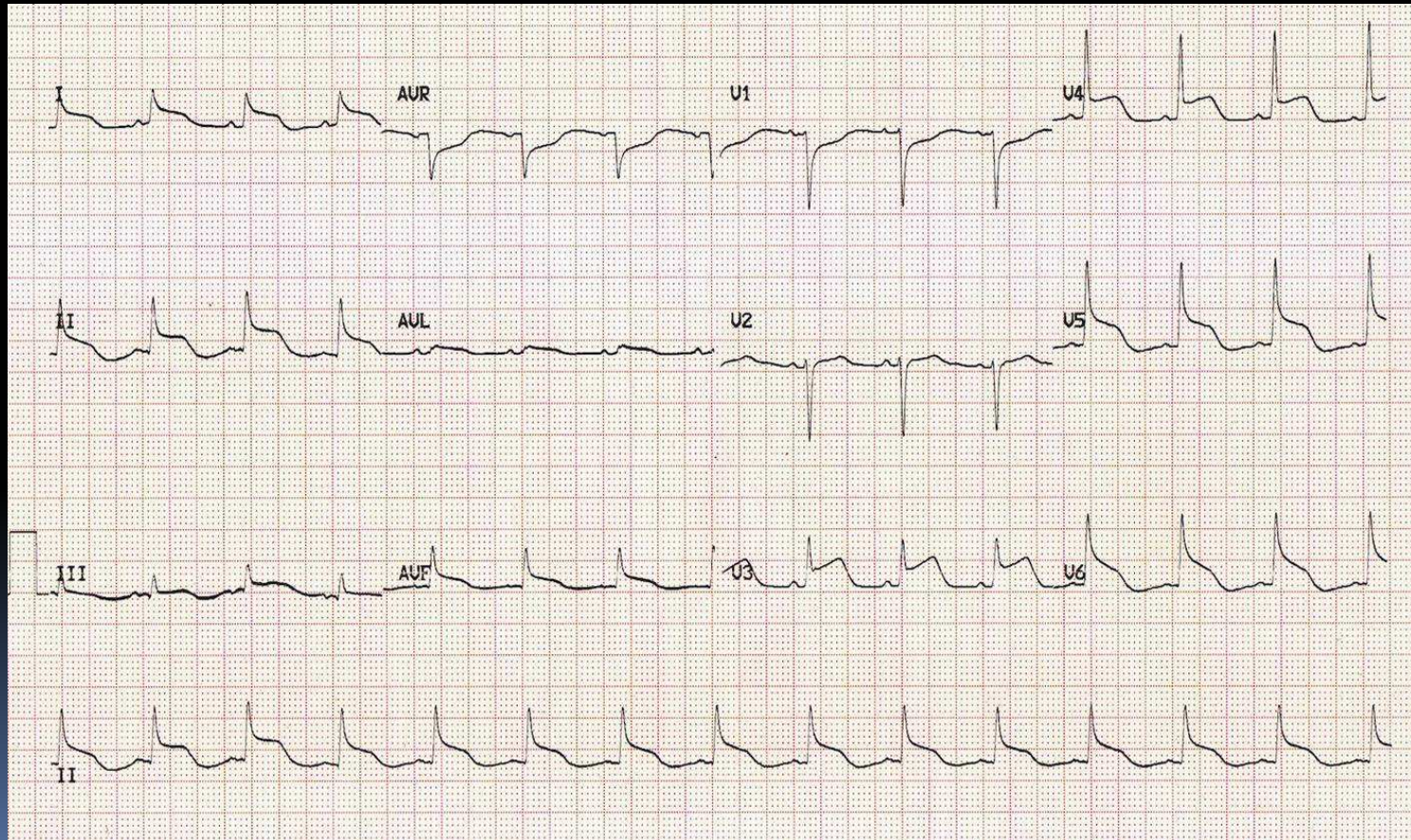
Prominent R  
waves V<sub>1</sub>, V<sub>2</sub>



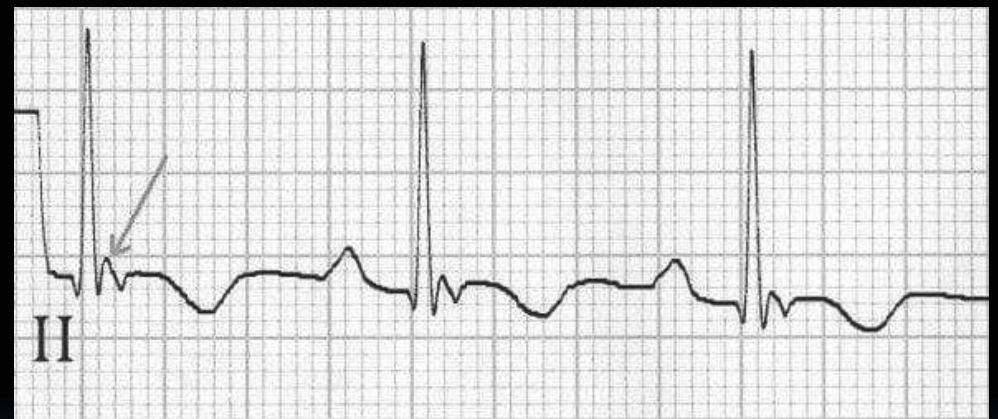
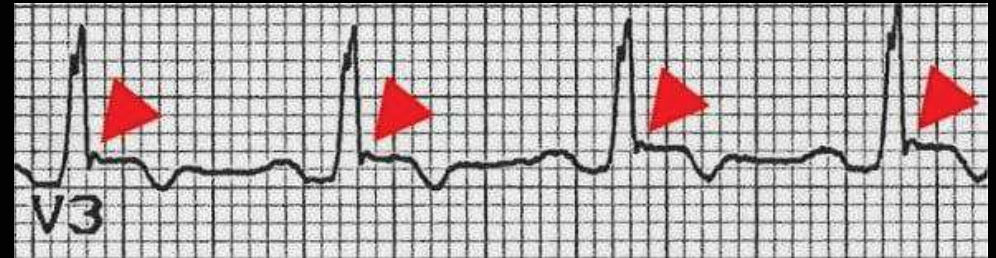
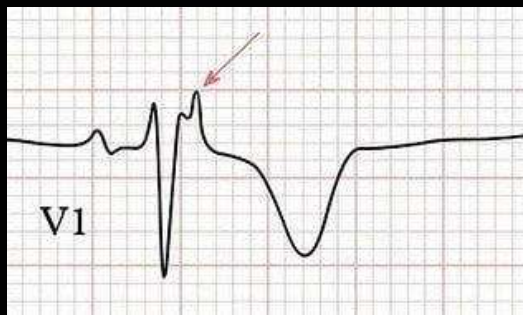
# QT PROLONGATION



# SAH



# Epsilon waves



Arrhythmogenic Right Ventricular Dysplasia (ARVD) or Arrhythmogenic Cardiomyopathy (ARVC)

Epsilon wave

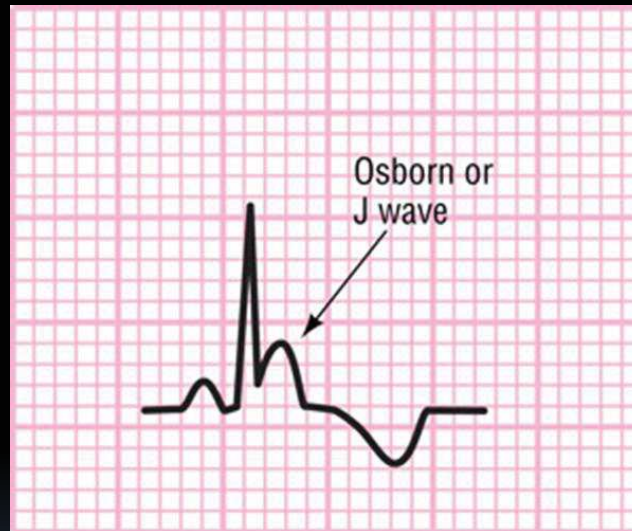
T inversion in V<sub>1</sub>-V<sub>3</sub>

Positive QRS in V<sub>1</sub>

## ARVD or ARVC

- Ventricular dysrhythmias in children and young adults
- Predominately in males
- 30-50% - familial
- Syncope , Dyspnea, Palpitations
- **RV outflow tract tachycardia due to monomorphic VT**
- Fatty infiltration and fibro-fatty infiltration of RV
  - Cardiac MRI
- **Epsilon wave due to slowed intraventricular conduction**

# HYPOTHERMIA



## Case #2 A Pregnant woman with Chest Pain

- 42 y.o. BF
- PHx **NSTEMI**
- **35 weeks pregnant**
- CP since last night
- 3 NTG last night
- 2 NTG today

## Case #2

- Nausea and Vomiting
- Moderate to severe distress
- 36.7, 102, 18, **179/97**, 94% sat
- **Chest Tightness**



1231/2011C

Possible left atrial enlargement  
ST elevation consider anterior injury or acute infarct  
\*\* \*\* ACUTE MI \*\* \*\*  
Abnormal ECG

QRS duration 62 ms  
QT/QTc 368/493 ms  
P-R-T axes 42 20 29

Room: ER 1

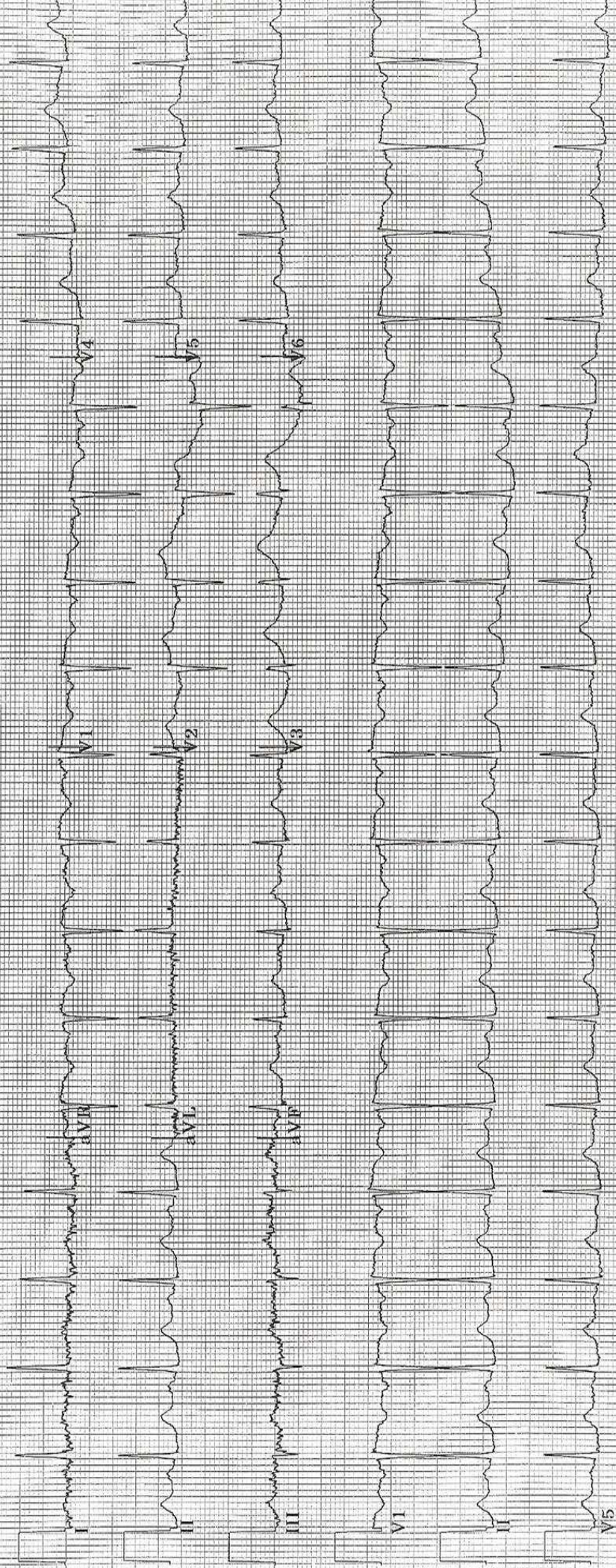


Technician: 594

Unconfirmed

Referred by:

Comments:



150 Hz 25.0 mm/s 10.0 mm/mV

4. kv 2.5s 1.3 rhythm TRs

MACRES 000A


0 1951 TM 99

## Case #2

- Spoke with OB/Gyne
  - ASA
  - B blocker
  - NTG if needed
  - Bedside monitoring of the baby
- I did not want to anticoagulate the patient
- Cardiologist
  - **No cath!**




## Case #2

- HR would increase to 140's
    - Symptomatic
  - Bedside Echo
  - Bedside Ultrasound
  - Bedside Fetal Monitoring
  - Repeat EKGs
- 



## Case #2

- Echo
    - Normal cardiac wall motion
    - No pericardial effusion
    - No evidence for an enlarged Right Ventricle
- 

7/31/97 JCM/C

Posterior bundle branch enlargement  
Septal infarct, age undetermined  
Abnormal ECG

QRS duration 58 ms  
QT/QTc 302/454 ms  
P-R-T axes 83 32 72

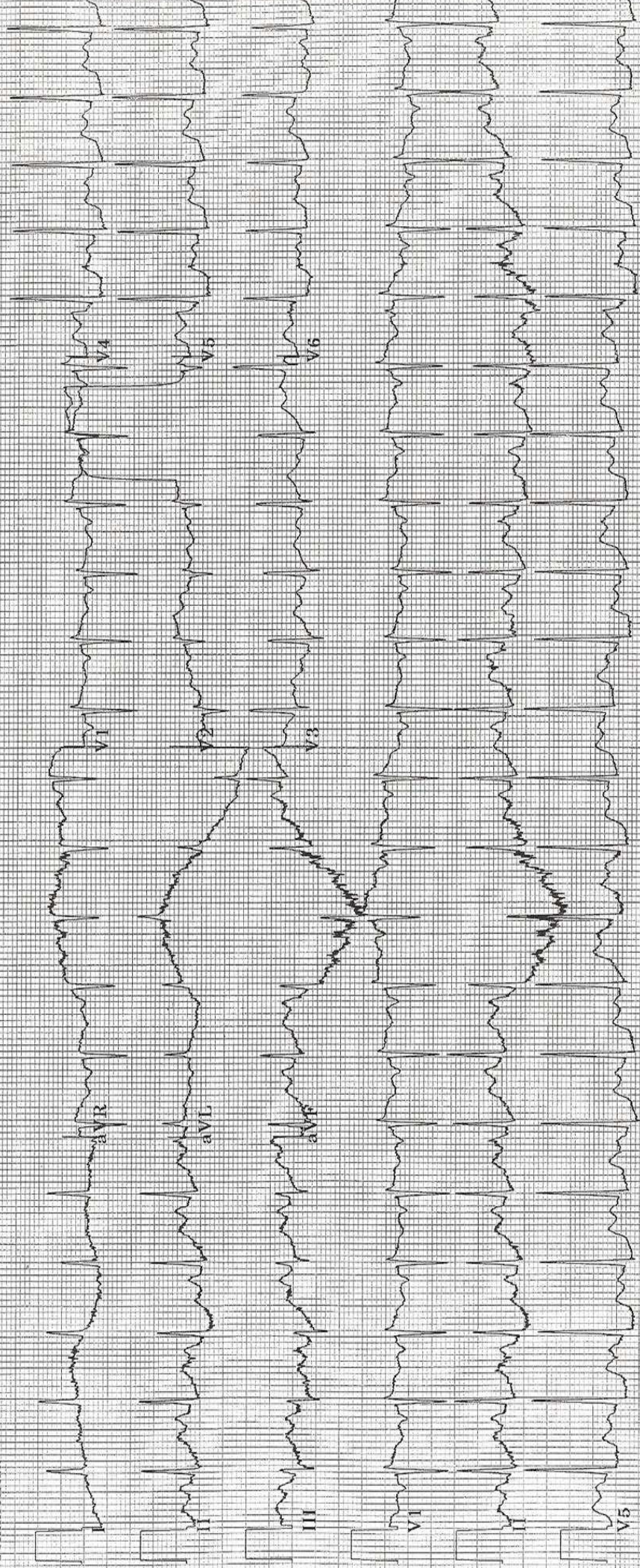
Room: ER 1

Technician: 594

Unconfirmed

Referred by:

Comments:



150 Hz 95.0 mm/s 10.0 mm/mV

## Case #2

- Lopressor IV controlled HR and improved symptoms
  - HR would later increase
- BP remained > 110
- Esmolol started
- **Labs:**
  - **Troponin T +**
  - **CPK MB +**

F131107  
RMC

Abnormal ECG

QRS duration 68 ms  
QT/QTc 402/460 ms  
P-R-T axes \* 28 64

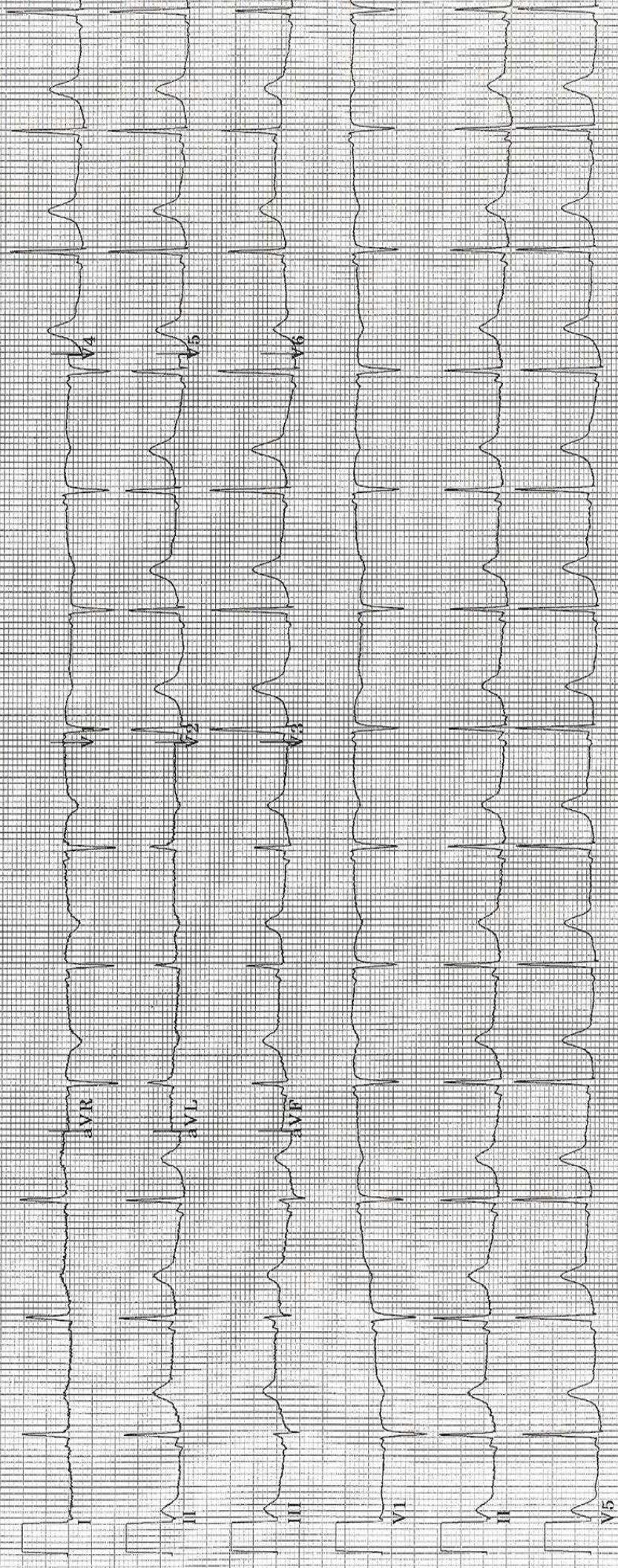
Room: ER01

Technician: 726

Comments: 2ND REPEAT

Referred by: DR ISCOFF

Unconfirmed



150 Hz 25.0 mm/s 10.0 mm/mV

4. Nov 95 19 04:00:00

MACOFF 0004

19 OCT 79 00

## Case #2

- OB/Gyne wanted to observe and stabilize patient
- Differential
  - NSTEMI or
  - Coronary vasospasm
- **No current evidence of:**
  - PE
  - Aortic Dissection
  - Tamponade
  - Preeclampsia



# FETAL MONITORING

## Early Decelerations –

Benign

Head compression

$\geq 30$ sec from start of deceleration to Nadir

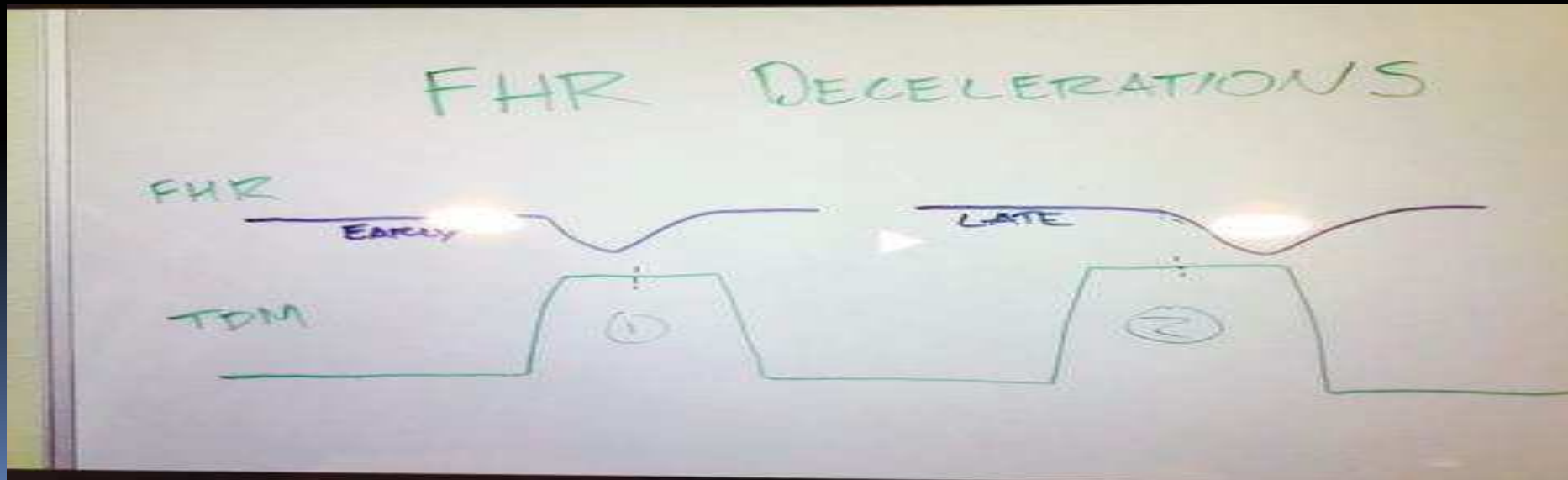
Nadir must occur at or prior to the peak of contraction

## Late Deceleration

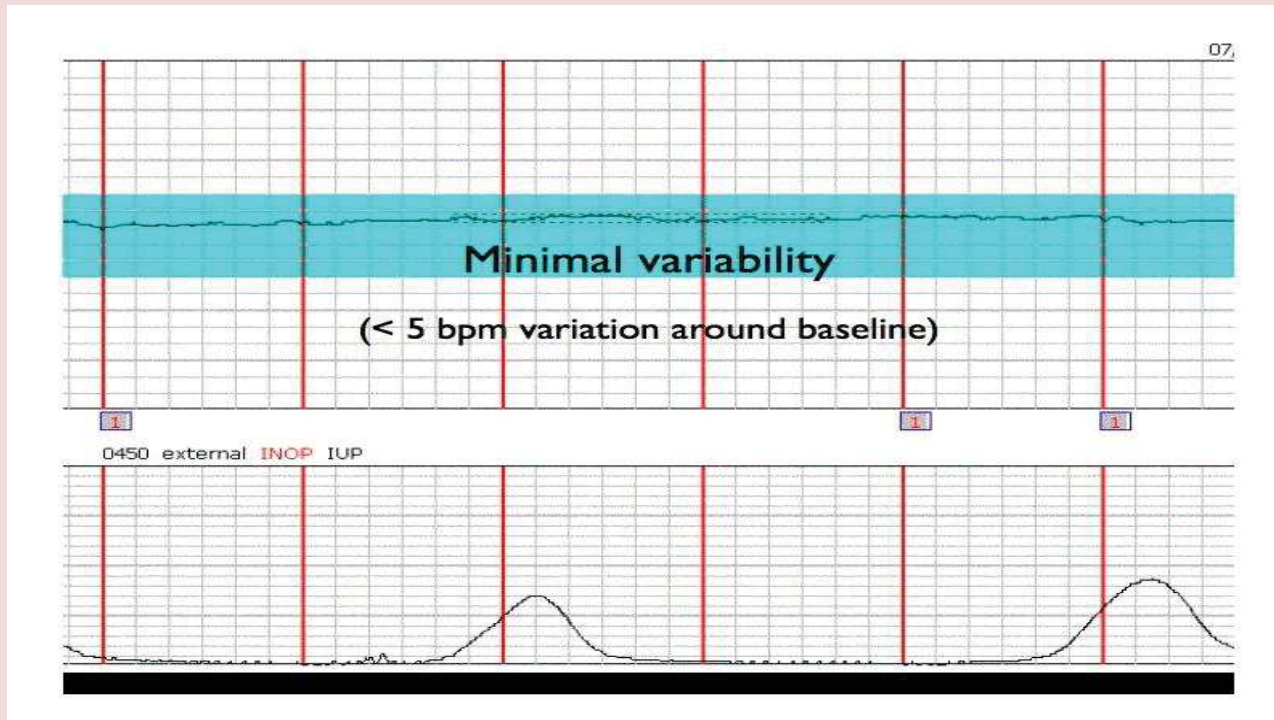
Placental insufficiency

Nadir after peak

of contraction



# Fetal Monitoring



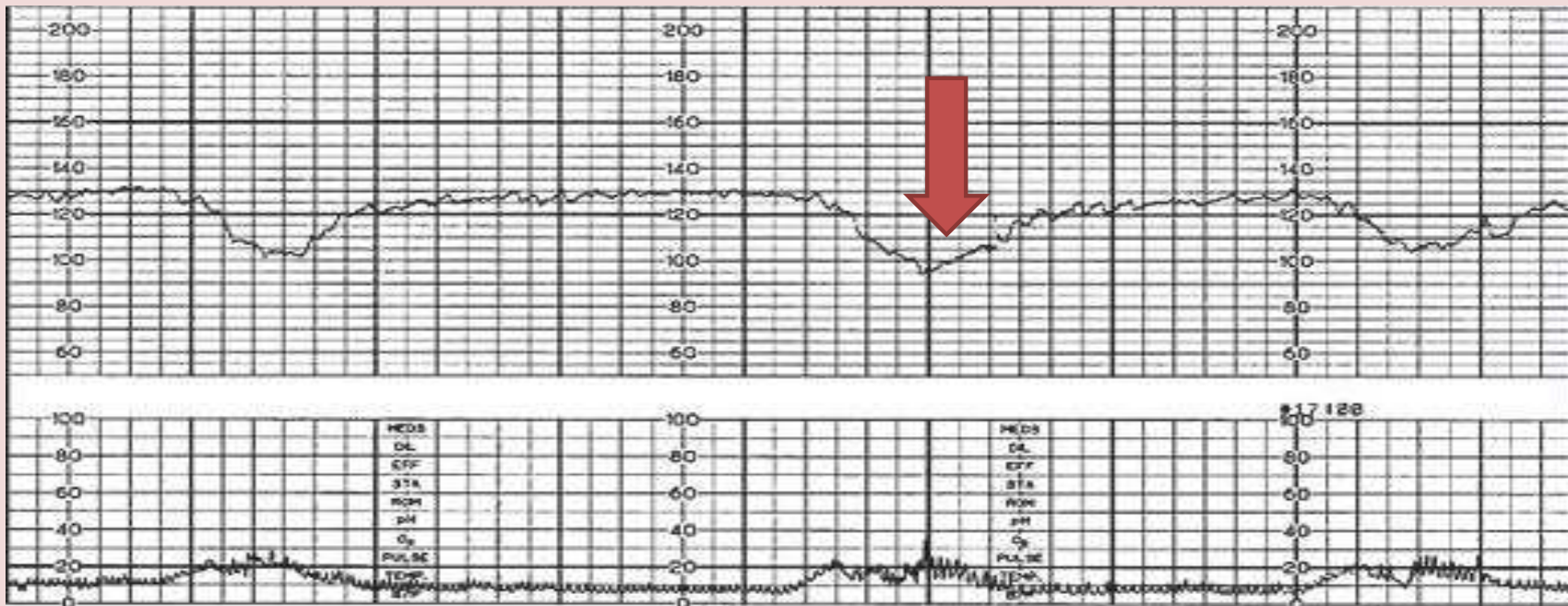
- Hypoxemia/acidosis
- Fetal sleep cycles
- Drugs (CNS depressants)
- Prematurity
- Arrhythmia
- Fetal Tachycardia
- Underlying neurologic abnormality
- Congenital abnormalities

# Fetal Monitoring

How would you describe the below decelerations? \_\_\_\_\_ EARLY

What does this finding likely indicate? \_\_\_\_\_ HEAD COMPRESSION

How would you describe the baseline variability? \_\_\_\_\_ MODERATE/ NORMAL





## Case #2

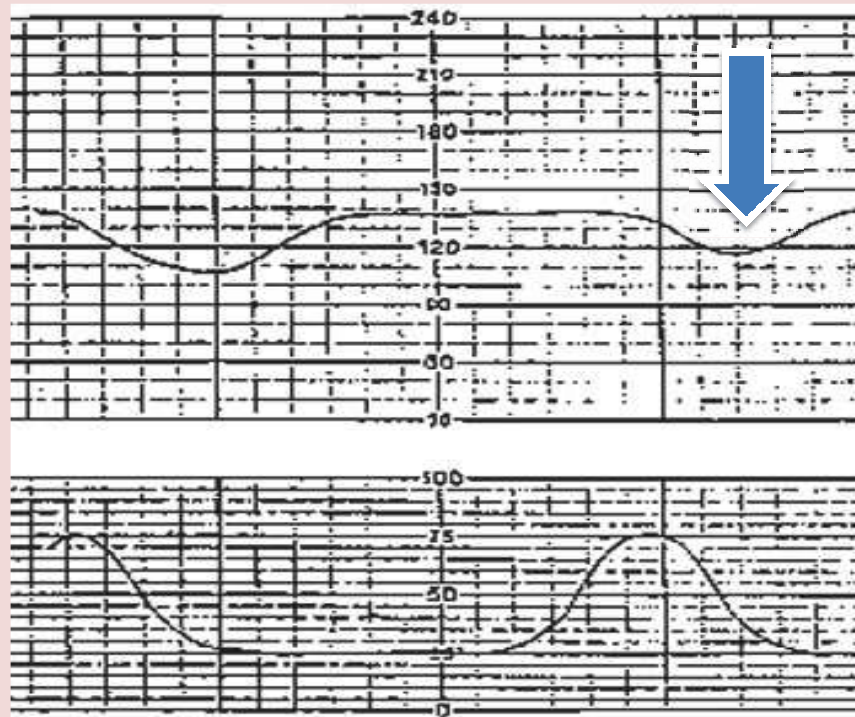
- **Concerns regarding:**
  - NSTEMI and mom
  - **Fetal distress**
    - **Decelerations**
  - **Drugs and labor**
    - Beta-blocker and labor
    - Calcium blocker – coronary vasospasm
  - **Timing of C section**

# Fetal Monitoring ( LATER)

How would you describe the decelerations? \_\_\_\_\_ LATE DECELERATIONS

How would you describe the baseline variability? \_\_\_\_\_ ABSENT

What does this finding likely indicate? \_\_\_\_\_ SEVERE FETAL DISTRESS



## Case #2

- CCU
- Shortly thereafter,
  - Operating room for STAT C section
- **"Baby Save"**
- Mom at 24 hours hypertensive,
  - Nipride
  - Cardizem



## Case #2

- Pregnant mom
    - **NSTEMI**
  - CT scan
    - **PHEOCHROMOCYTOMA**
- 




## Case #3

- 54 yo African American female
- **Status Asthmaticus**
- **1 word dyspnea**
- Prehospital:
  - Albuterol
  - Atrovent
  - Epi 0.3 mg IM
  - Magnesium
  - Solumedrol



## Case #3

- Agitated
  - Nonverbal
  - Saturations in the 90's
  - **Rolling eyes**
  - Bilateral Inspiratory and Expiratory wheezing
- 

# Case #3

- Epinephrine 0.3 mg IM
- Epinephrine drip at 0.1 mcg/kg/min
- Epi increased to 0.15 mcg/kg/min
- **BIPAP at 20-30/ 5**

## Epinephrine 1:1000

### EPINEPHrine PEN KIT

#### Adult dosing:

0.3mg (0.3ml) IM once- every 5-15 minutes  
AS NEEDED

### INTRAMUSCULAR ONLY

#### Pediatric dosing:

0.01mg/kg (0.01mL/kg) IM Once-MAX  
0.3mg/dose  
every 5-15 minutes  
AS NEEDED

## Epinephrine (1:1000) Pen Kit

- Epinephrine ( 1 mg/ 1 ml)
- TB syringe with luer lock
- 18 G filter needle
- 23 G IM needle
- Label with clear instructions:  
**For adults:**  
0.3 mg / 0.3 ml
- **For children:**  
0.01 mg /kg = 0.01 ml / kg  
**At 30 kg, dose is 0.3 ml**



# AGH ED

- Push Dose EPI
- 10 mcg/ml

PUSH DOSE EPINEPHRINE



PUSH DOSE EPINEPHRINE - 10 MCG/ML, 10 ML SYRINGE, (100 MCG IN 10 ML)



## HOW TO MAKE AN EPI DRIP?

- Epinephrine (**5 – 1 mg**) vials
- Add to a 250 ml bag
- Concentration:  $5 \text{ mg}/250 \text{ ml} = 20 \text{ mcg/ml}$
- **Start at 0.1 mcg/kg/minute**
- Want / Have - Keep math easy --- 100 kg patient
- $(0.1 \text{ mcg}/100 \text{ kg}/\text{min}) / (20 \text{ mcg/ml})$
- $10 \text{ mcg/min} / 20 \text{ mcg/ml} = 0.5 \text{ ml/min} = 30 \text{ ml/hour}$

# EPI DRIP at 0.1 mcg / kg / min

- **5 mg in 250 ml bag = 20 mcg/ ml**
- $70 \text{ kg} = 0.1 \text{ mcg/kg/min} \times 70 = 7 \text{ mcg/min}$
- $7 \text{ mcg/min} / 20 \text{ mcg/ml} = 0.35 \text{ ml/min} \times 60 \text{ min} = \mathbf{21 \text{ ml/hr}}$

## Epinephrine kit ( Infusions )

- D5W 250ml
- Epi ( 1 mg/ml )
  - 5 ampules
- 18 G filter needle
- Label
- Dosing chart




## EPI DRIP AT 0.1 MCG/KG/MIN

- 70 Kg                      21 ml/hr
- 100 kg                    30 ml/hr
- 140 kg                    42 ml/hr




## Case #3

- Increased expansion noted
  - Bilateral wheezes
  - Limited air movement
  - No emesis
  - Sats at 100%
  - **ABG CO<sub>2</sub> 103**
- 






## Case #3

- After about 40 minutes on IV Epi drip:
    - Awake
    - Talking
    - Complaining that she is hot
    - Speaking full sentences
- 



## Case #4

- 28 y.o. BF
  - **Syncope then cardiac arrest at PNC park**
  - ACLS, Intubation
  - Pulses regained
  - Taken to AGH
  - Regained pulses
- 

15-NOV-1987 08:30  
Female Black  
Room: 07 N  
Loc: J

Heart rate 147 BPM  
PR interval 124 ms  
QRS duration 102 ms  
QTc 368-418 ms  
P-R-T axis 75 104 10

MAJOR ABNORMAL FINDINGS: High PR  
Slowness in precordial leads  
Rightward axis  
Isospecific right bundle branch block  
Isospecific ST depression, probably normal  
Echocardiogram (ECG)  
When compared with ECG of 09-10-87-2013 11 UT  
Heart rate has increased by 44 BPM  
Isospecific right bundle branch block is new pattern

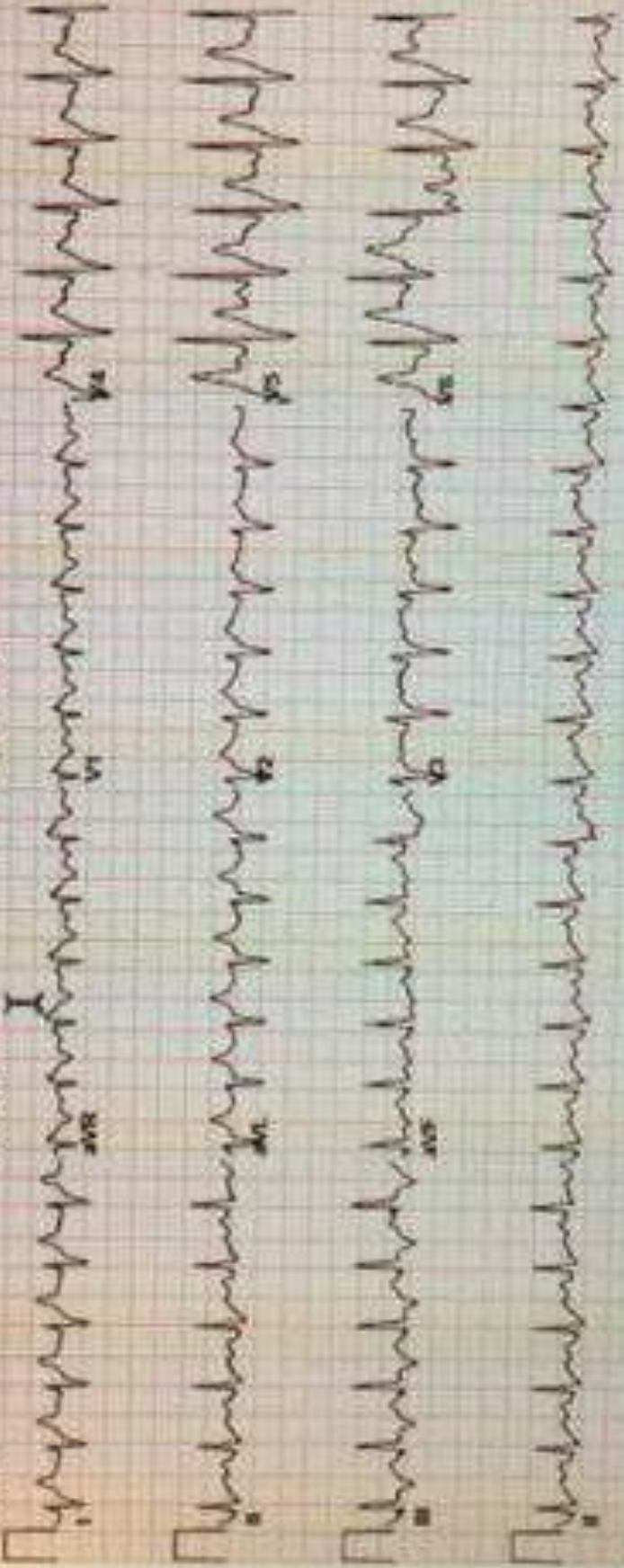
Technician, KD  
Test and report

CRITICAL:

AGH NAME:

Refused by: DAVID CHURRAZZI  
DATE/TIME:

Confirmed By: EKG EMERGENCY



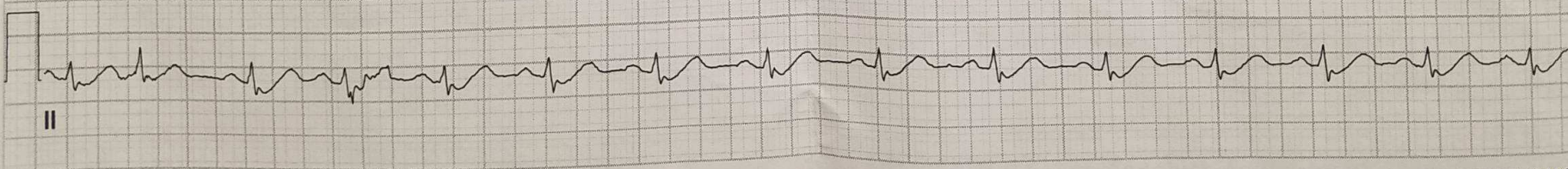
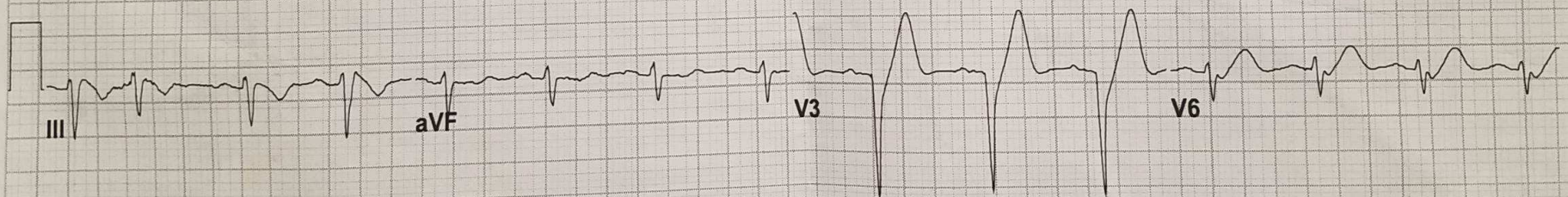
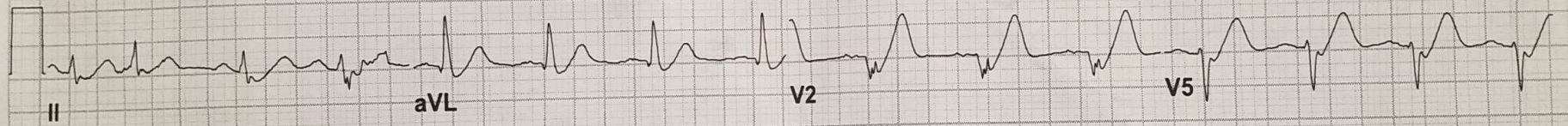
CRITICAL:

AGH NAME:

Referred by:



# CASE #1 DE WINTER'S WAVES




25mm/s 10mm/mV 40Hz 8.0 SP2 12SL 241 HDCID: 24

EID:695 EDT: 13:20 28-MAY-2018 ORDER: 70714043 ACCOUNT: 8907896



# ED

- CPR
  - ACLS
  - Pressors
  - Phone calls:
    - **Interventional cardiology**
    - **SICU attending**
    - **ECMO**
  - Bedside ultrasound
  - CT scan
- 

# Flattened septum



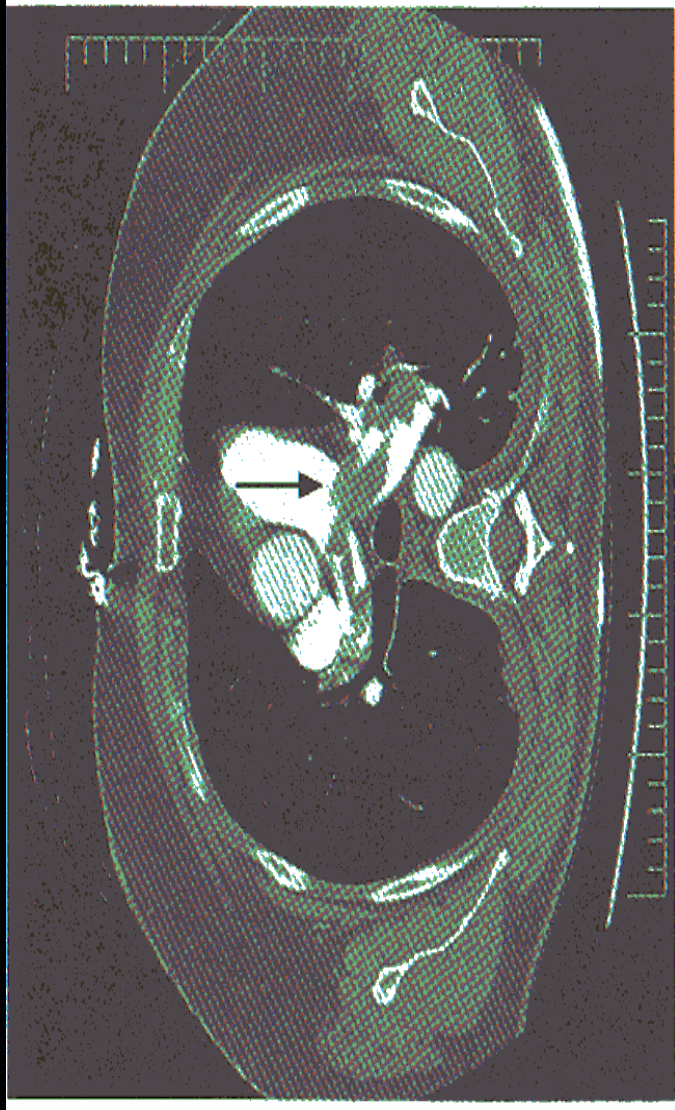
# Enlarged RV



# Thrombus RA--RV







# CATH LAB

- EKOS catheter directed TPA

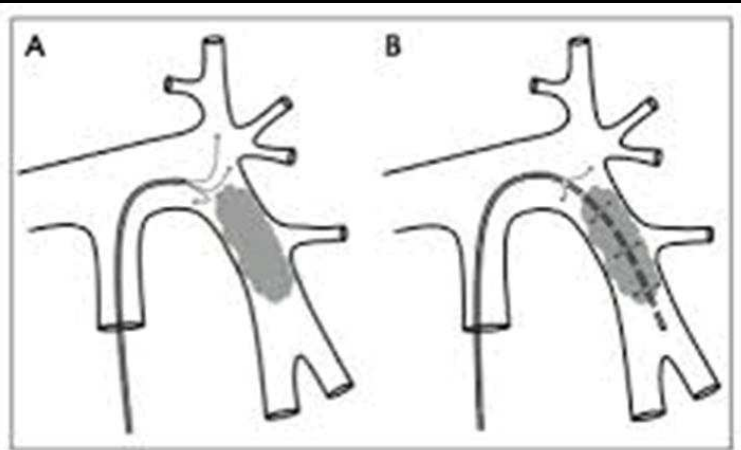
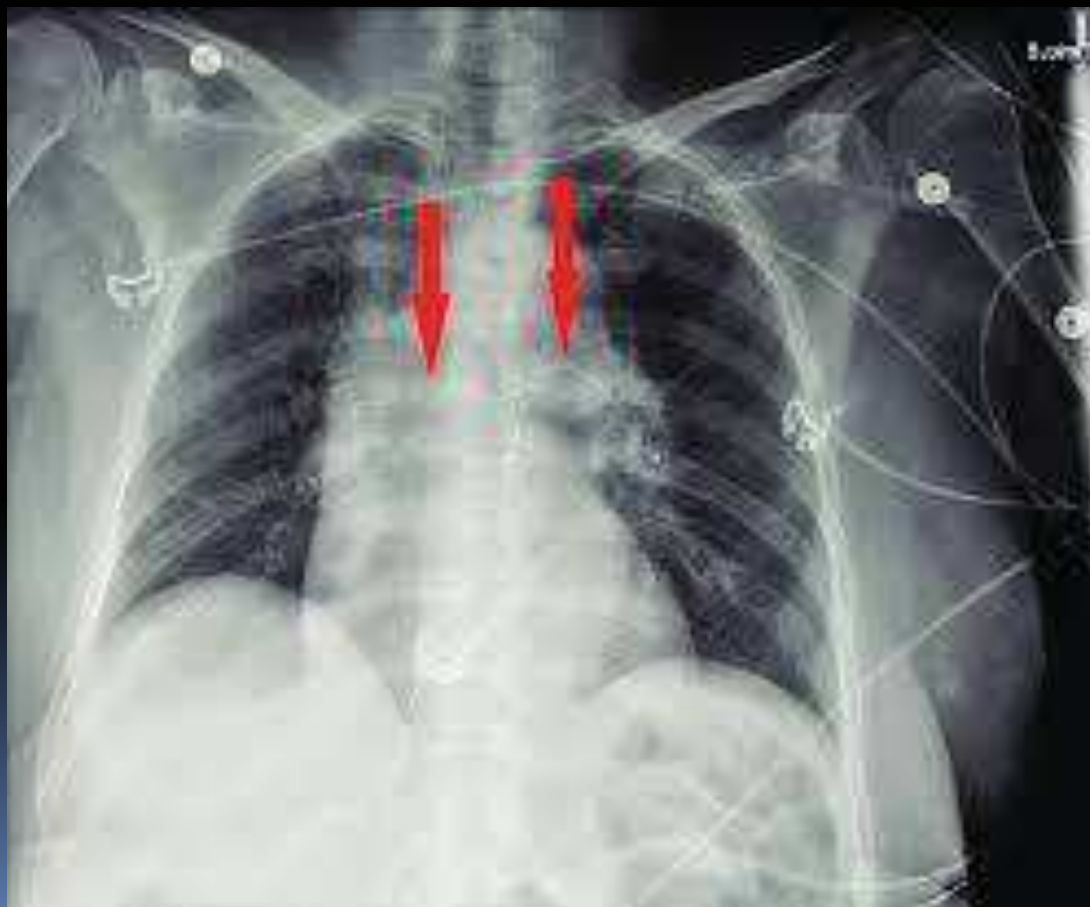


Figure 1. Infusion of a thrombolytic through a nonembedded catheter results in rapid dissipation of the drug through non-obstructed pathways (A). A multisidehole infusion catheter is embedded within an embolus in the left lower lobe, allowing thrombolytics to be infused directly into the clot (B).




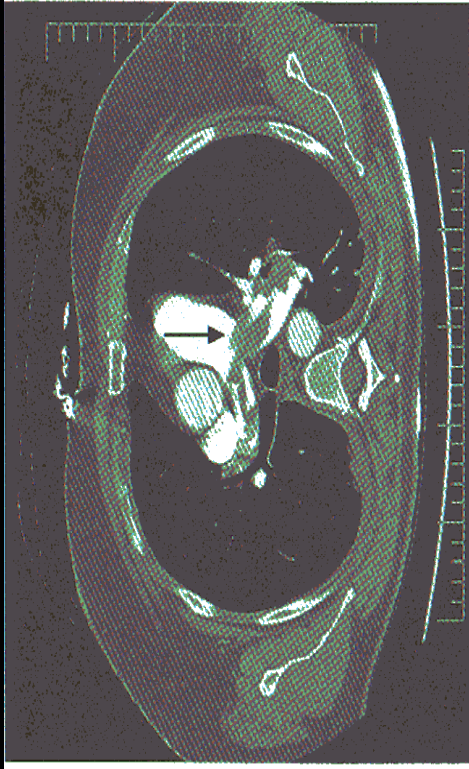
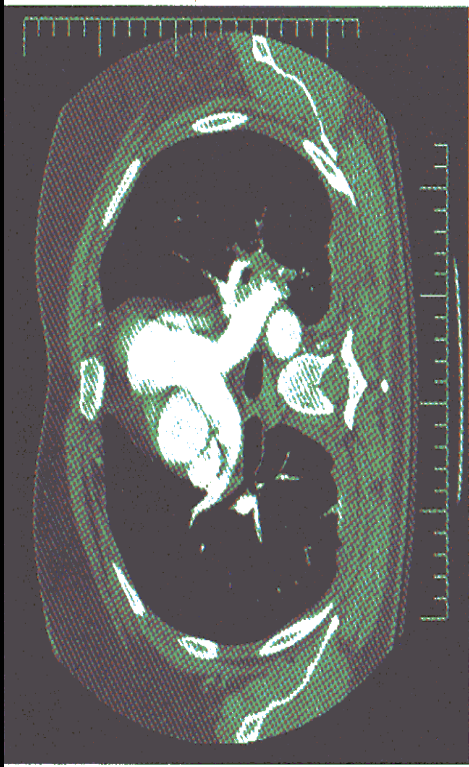
# EKOS





## Cath Lab

- Catheters placed in each pulmonary artery
  - 2 mg **TPA** injected in each pulmonary artery
  - TPA infusion at 1 mg/hr x 12 hrs
- 





## FOLLOW-UP

- **Patient was discharged home**
    - **Neurologically Intact**
- 

# FOUR SAVES

- **Cardiac arrest-**
  - ECMO
- **Pregnancy, MI, Pheochromocytoma**
  - Treatment of chest pain
  - Close monitoring of baby
  - Delivery
- **Status asthmaticus**
  - IM Epi , BIPAP, Epi drip
- **Respiratory Failure, Cardiac Arrest, Massive PE**
  - Catheter directed TPA

**THANKS!!!!**

