



Electrocardiography 501: ECG Findings You Might Miss

Christopher B. Colwell, M.D.

City of San Francisco EMS

Zuckerberg San Francisco General Hospital and Trauma Center



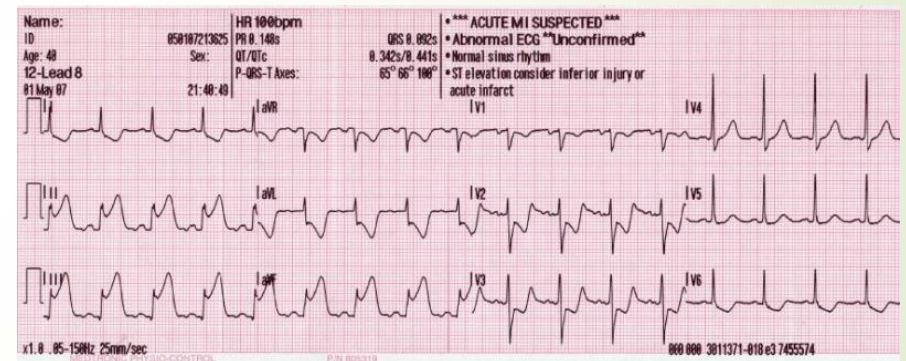
Disclosures



None

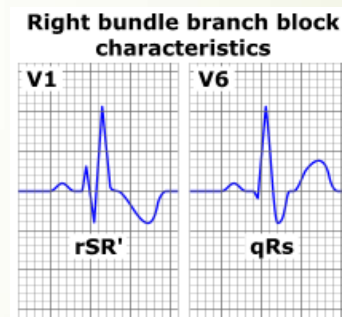
12-Lead EKG

- Paramedics are accurate
 - Aufderheide et al, 1990
 - Alghamdi et al, 2018
- Reduces door to balloon times
 - Squire et al
 - Prehosp Emerg Care, 2014



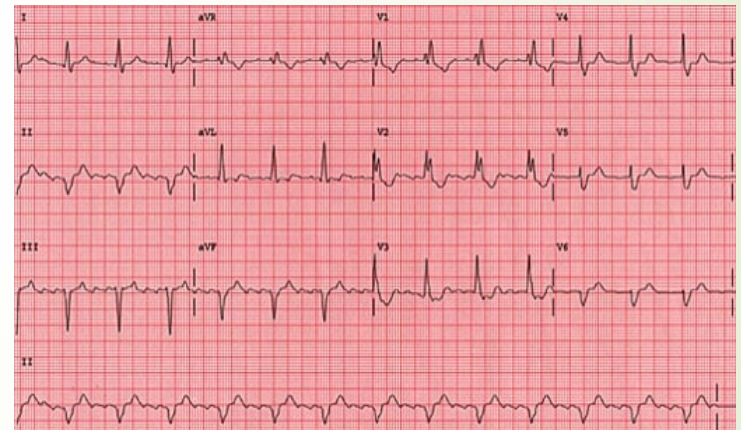
Right Bundle Branch Block

- Rabbit ears
- Terminal R wave in V1
- Slurred terminal S wave in V6

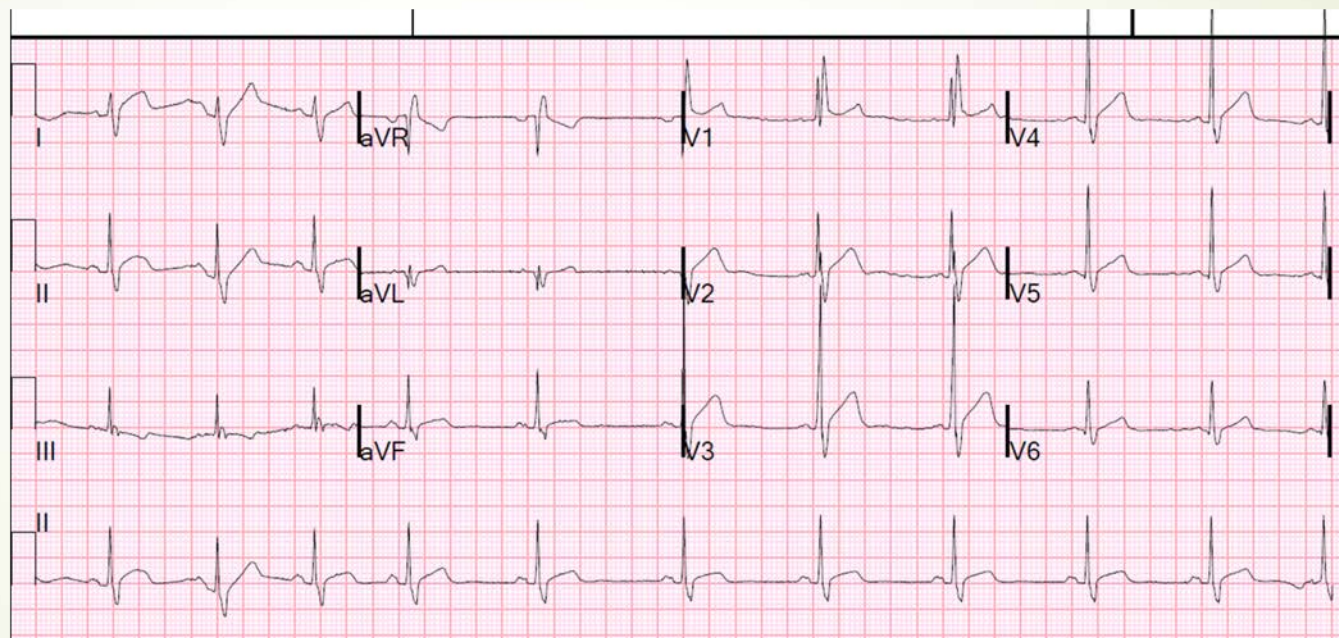


Right Bundle Branch Block

- ▶ Right ventricle is not activated
- ▶ ST depression in precordial leads is normal
 - ▶ V1-V3
 - ▶ Any ST elevation is not
- ▶ Right bundle pattern can confuse the machine

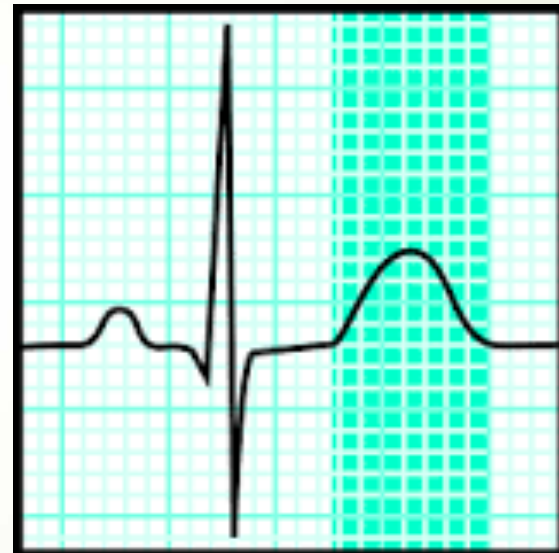


STEMI with RBBB

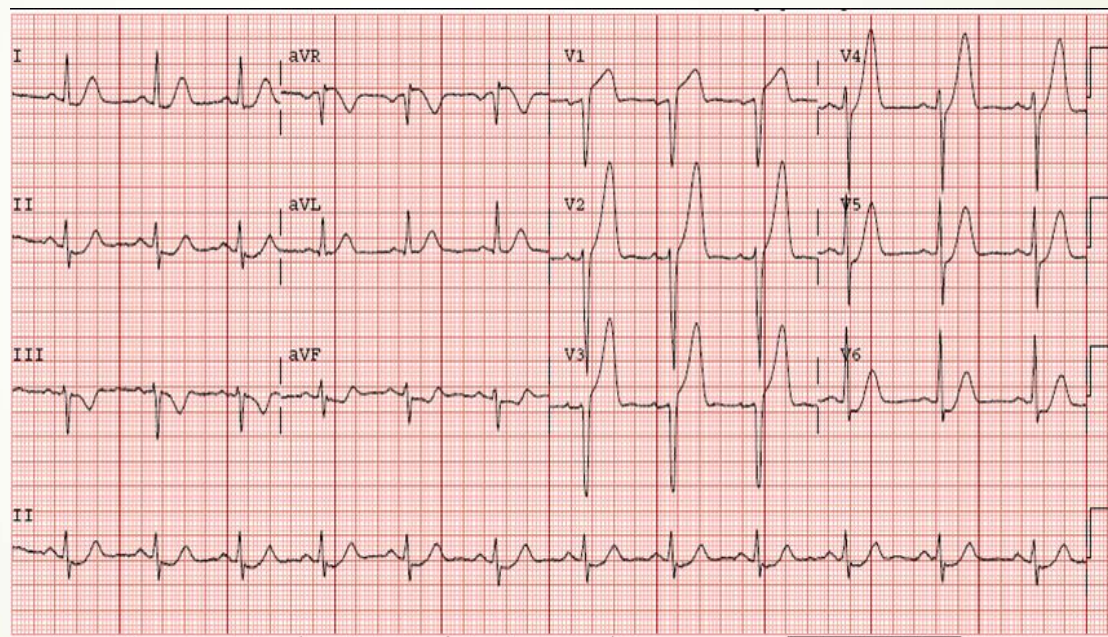


T-Waves

- Repolarization of the ventricles
- Beginning of the QRS to the apex of the T wave
 - Absolute refractory period

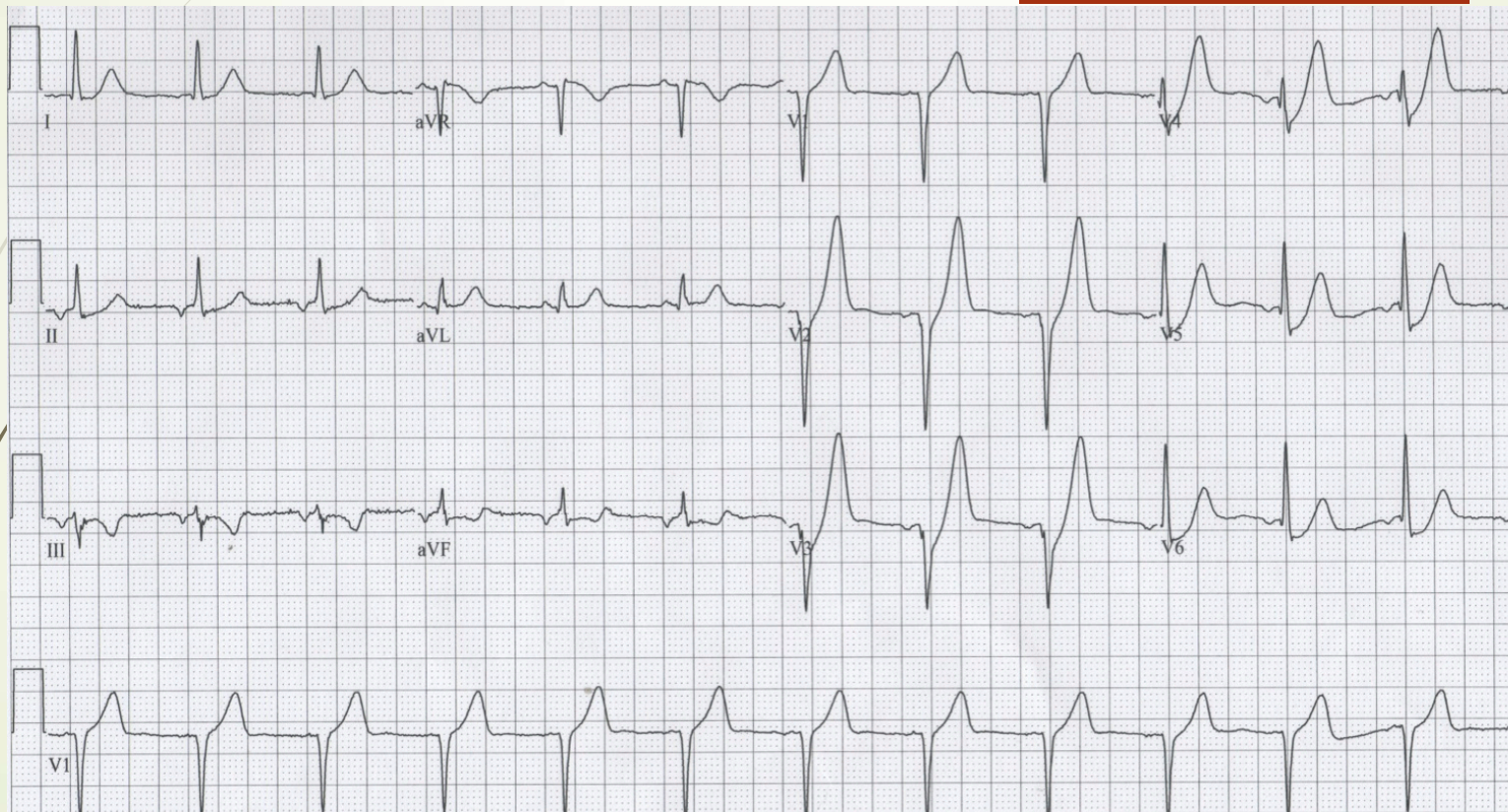


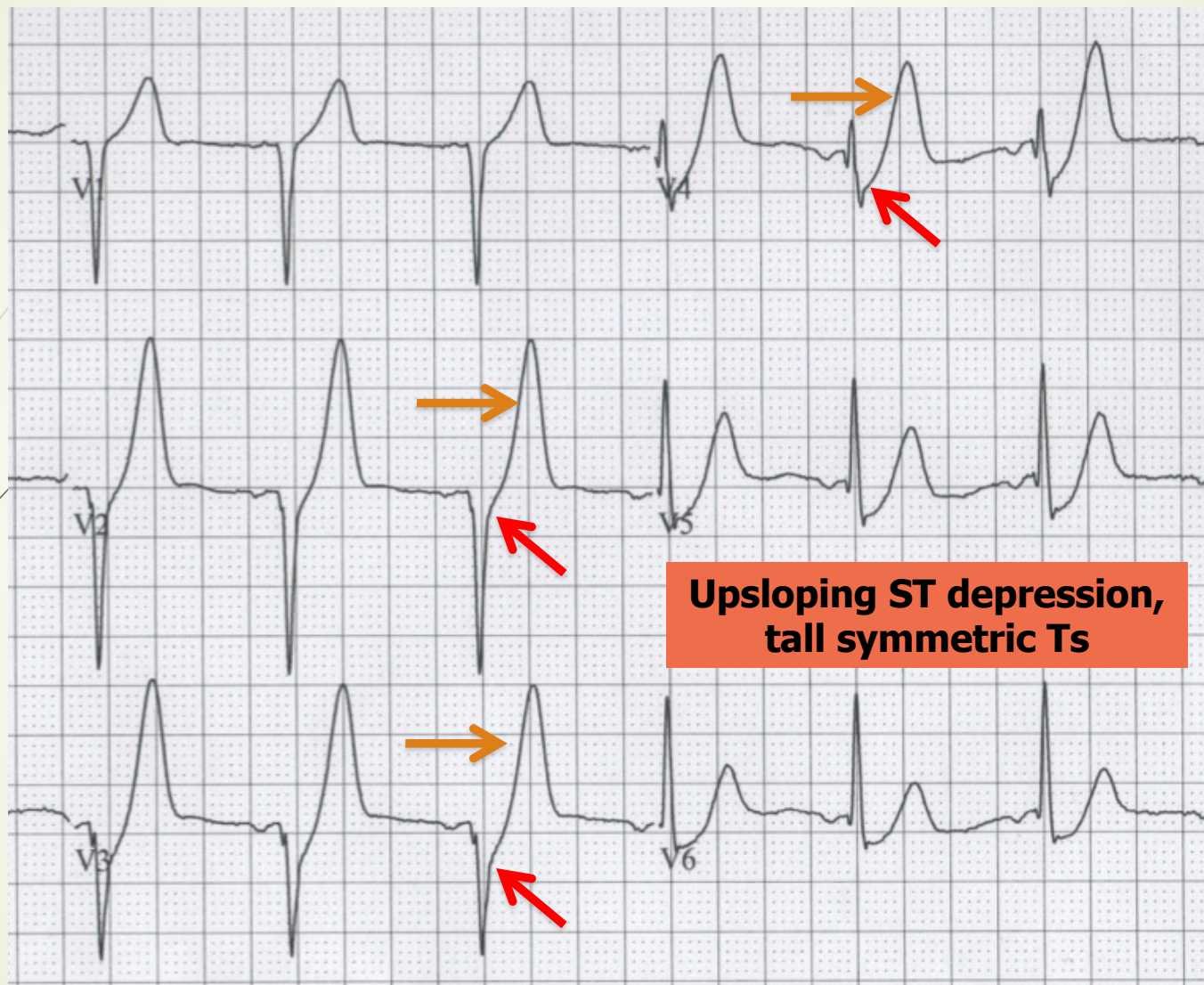
Hyperacute T-Waves



de Winter T Waves

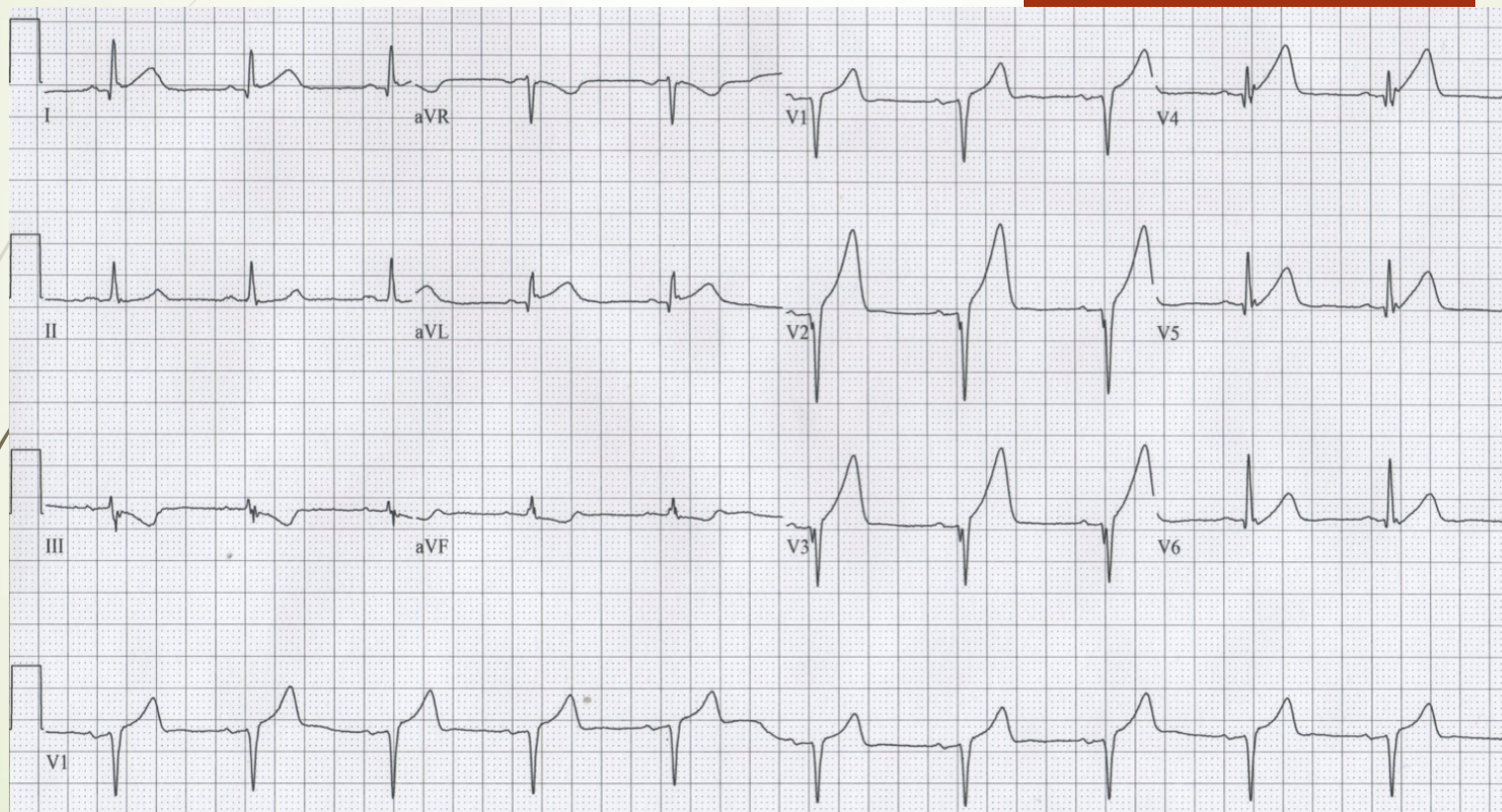
Courtesy Mat Goebel

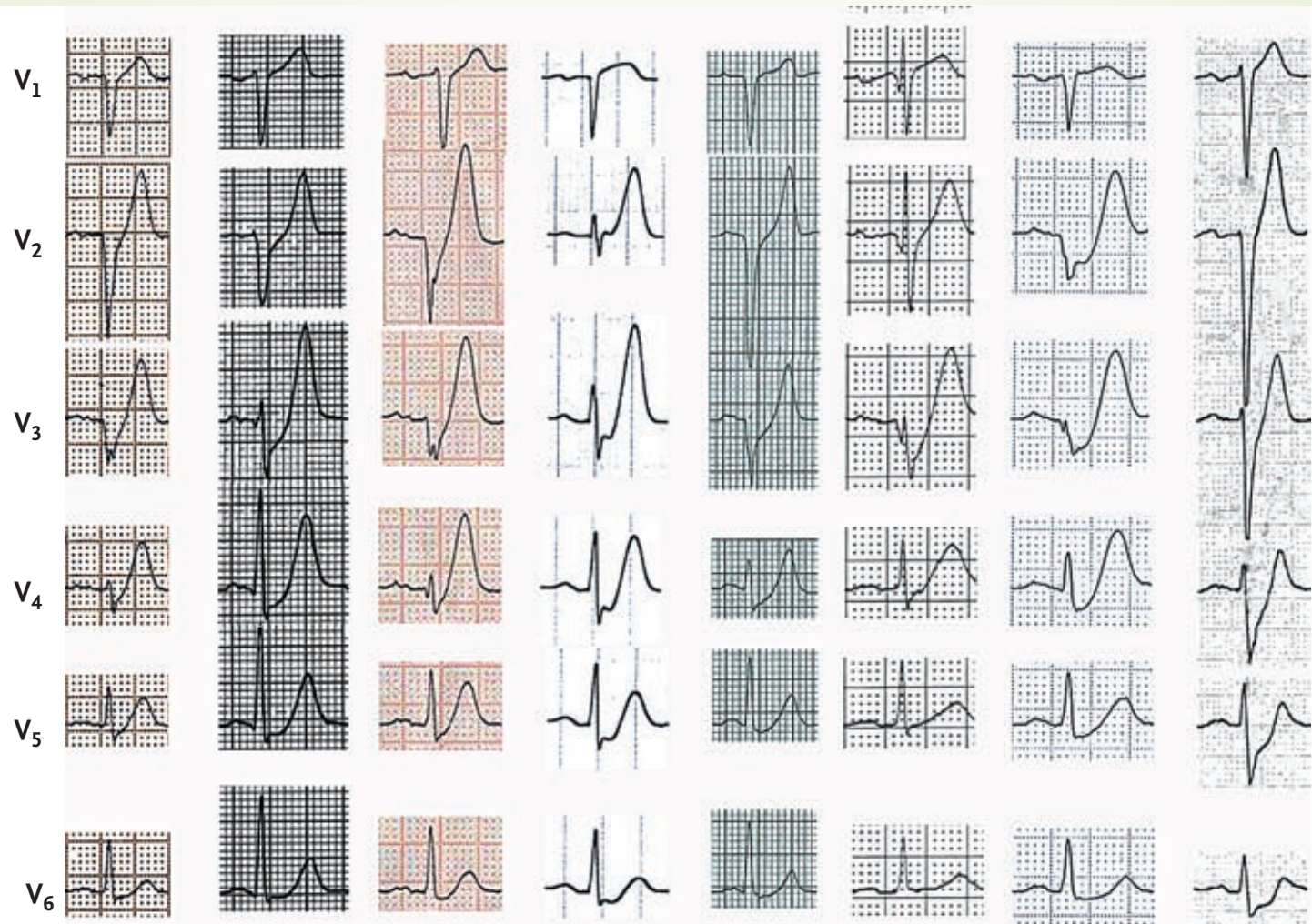




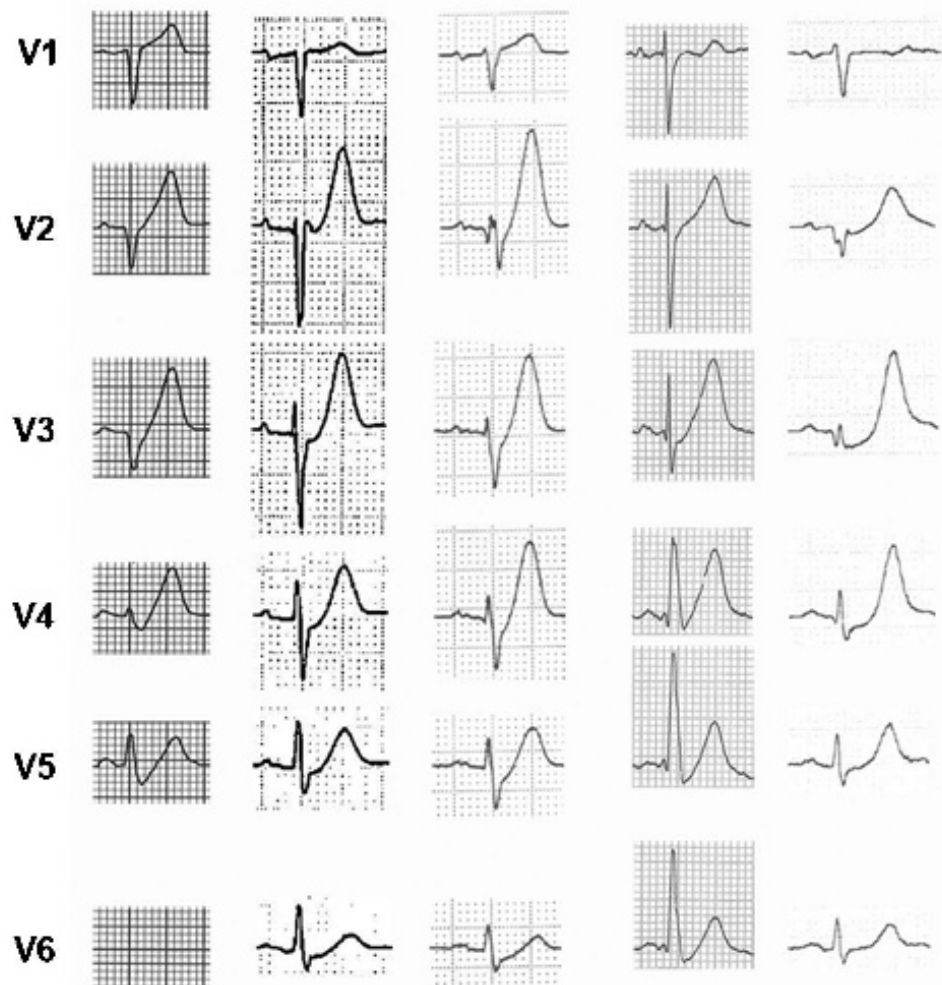
20 min later

Courtesy Mat Goebel



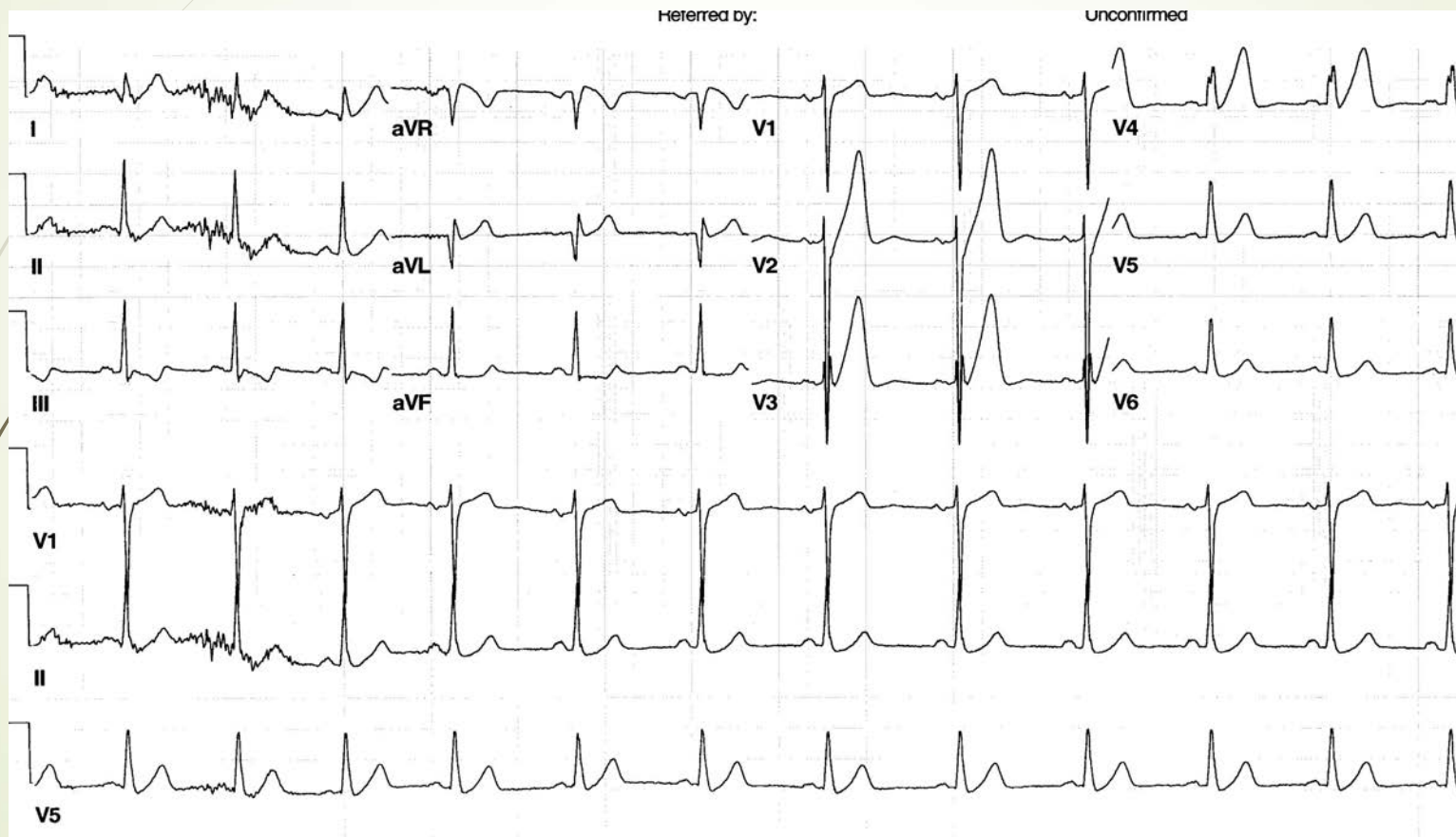


From de Winter, NEJM 2008



From Verouden, Heart 2009

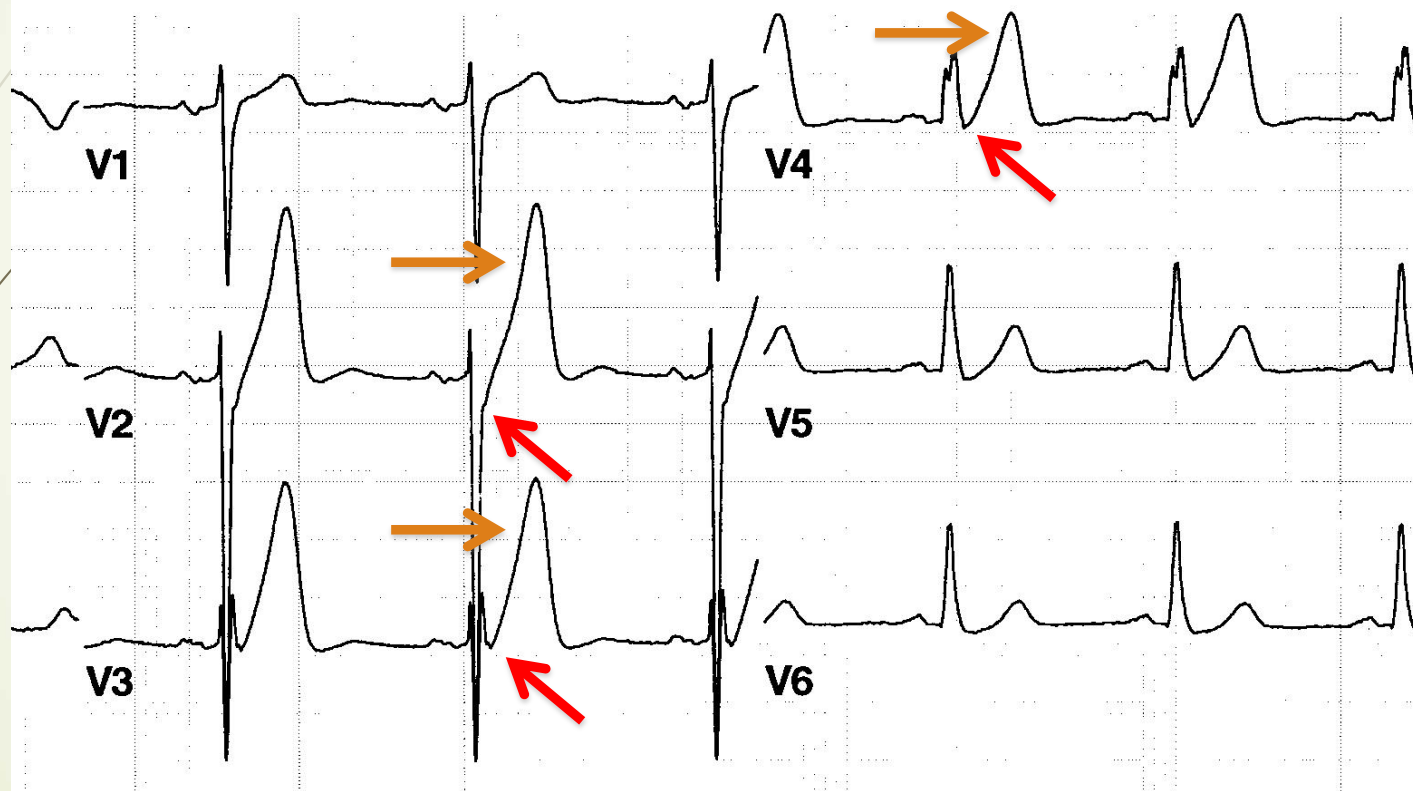
63 Year Old Male with CP



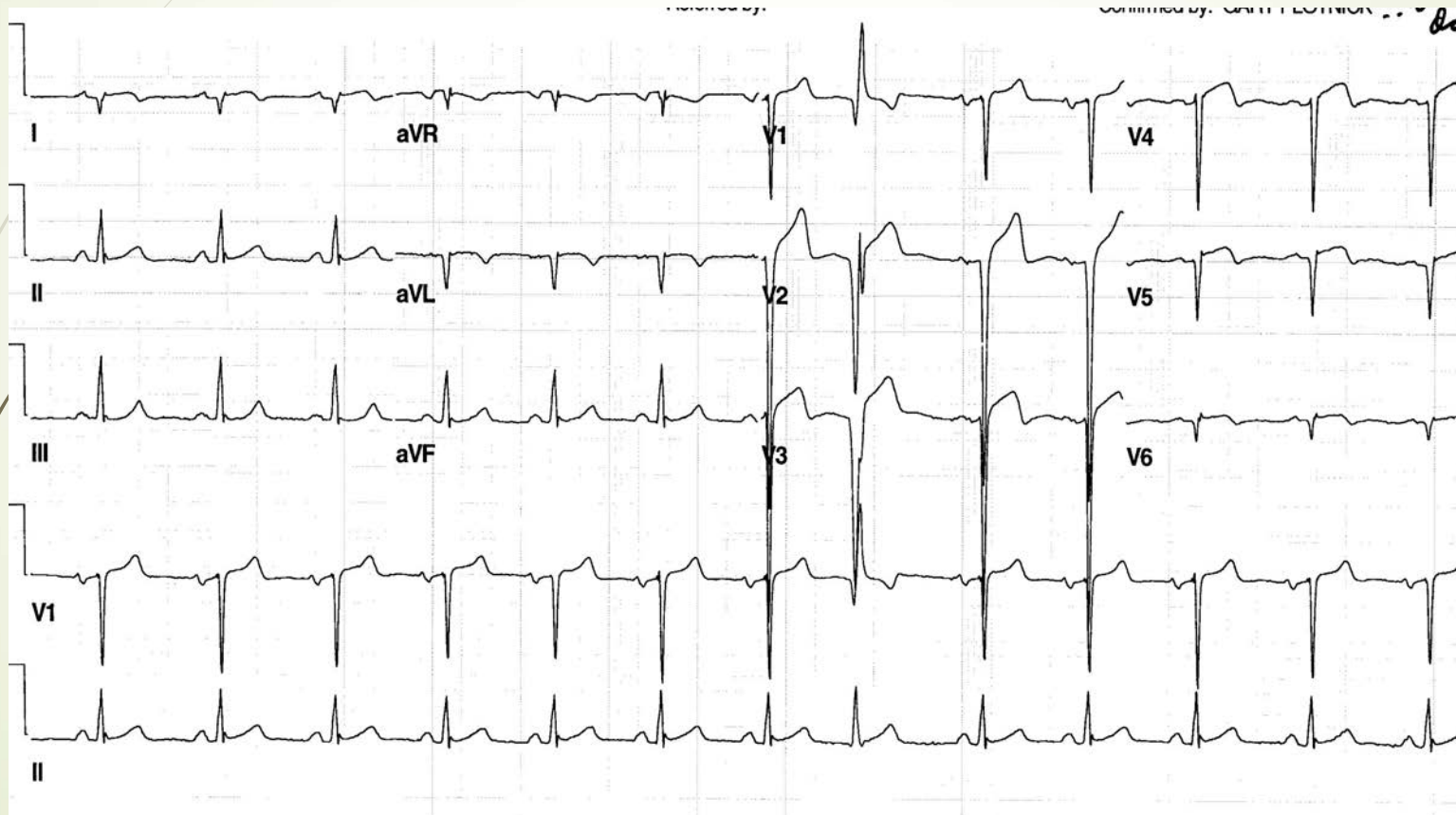
Elderly M with CP

ed by:

Unconfirmed

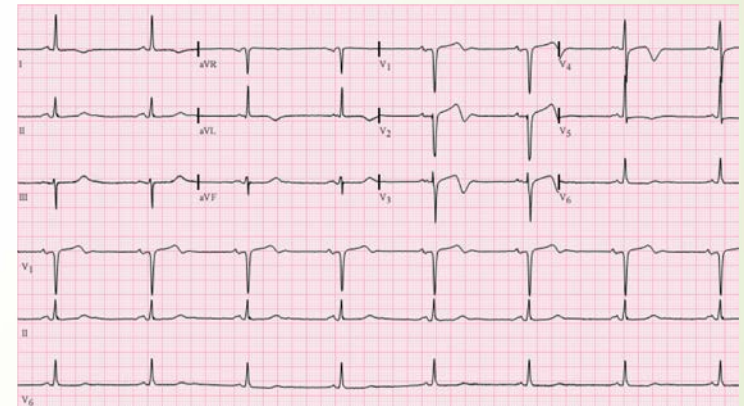


15 Minutes Later →
Anterior STEMI, LAD

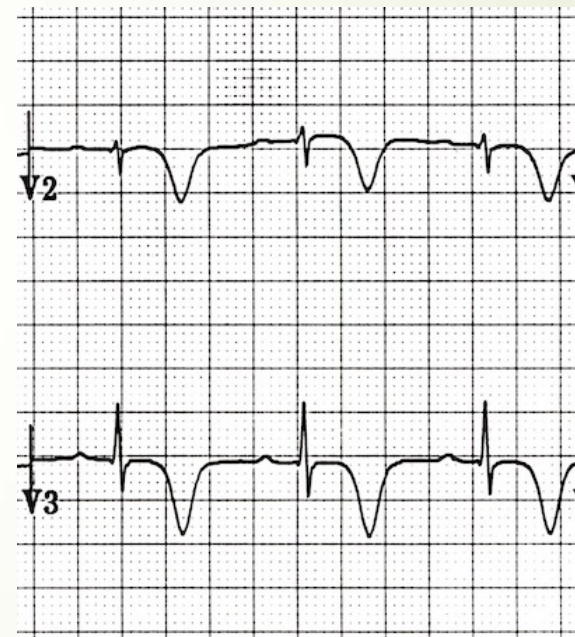
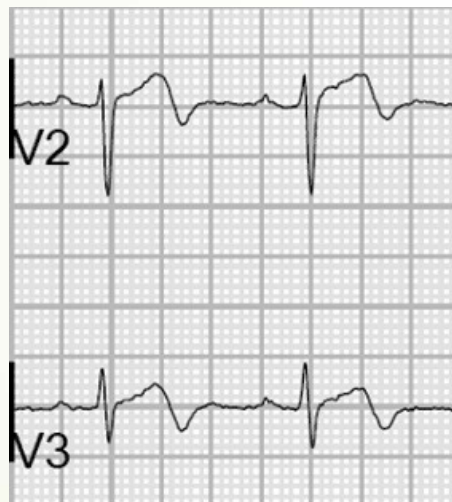


Wellens' Syndrome

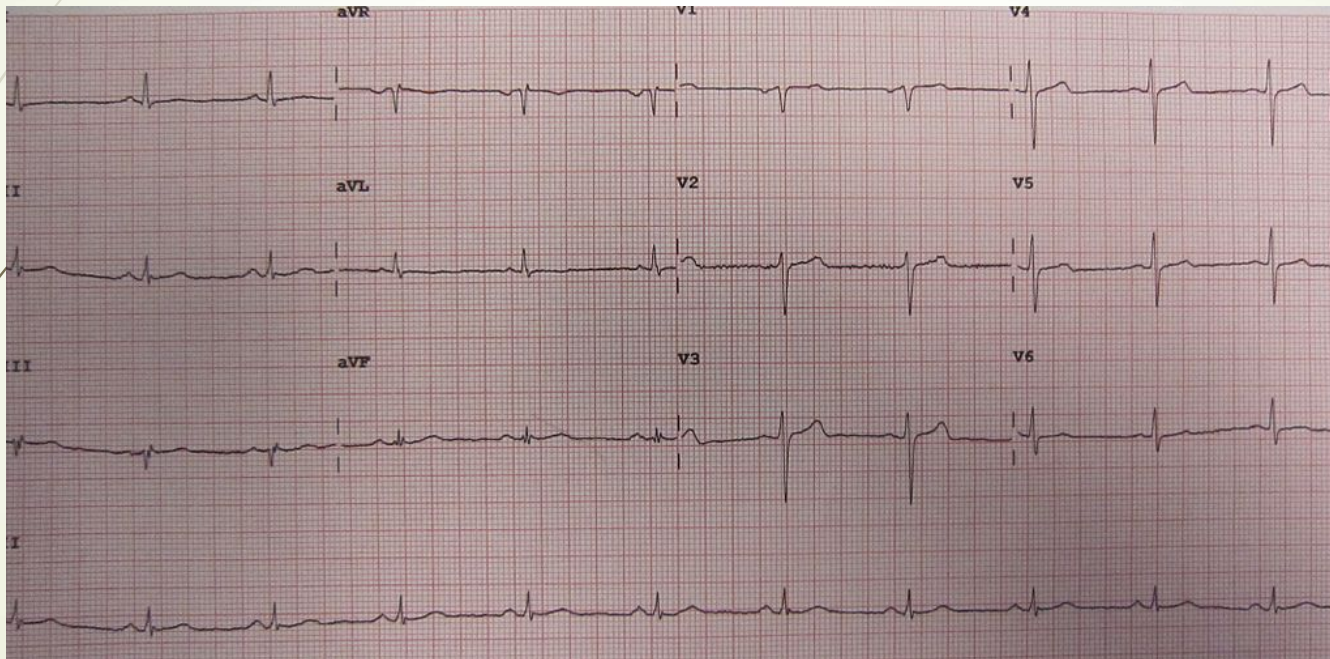
- Also called Wellens' Warning
- An evolving wave form
 - Biphasic t-wave inversions
 - Becoming symmetrical and deep
- Indicate critical proximal Left Anterior Descending (LAD) artery stenosis



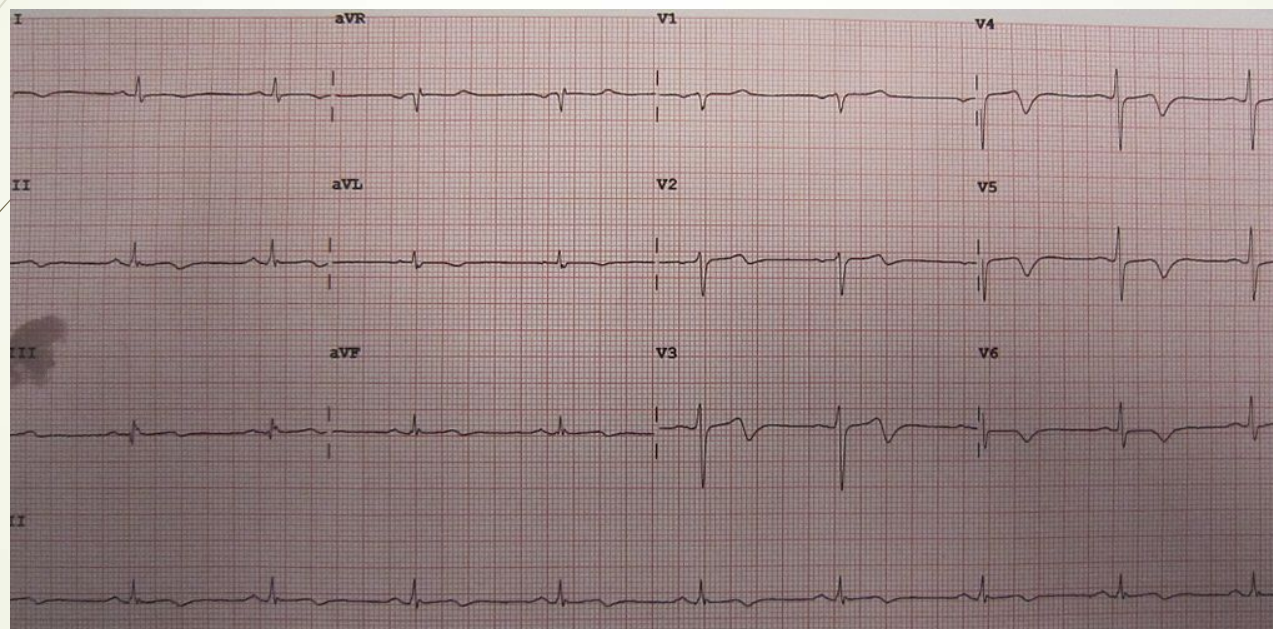
Wellens



68 Year Old Male with Chest Pain



Now Pain Free



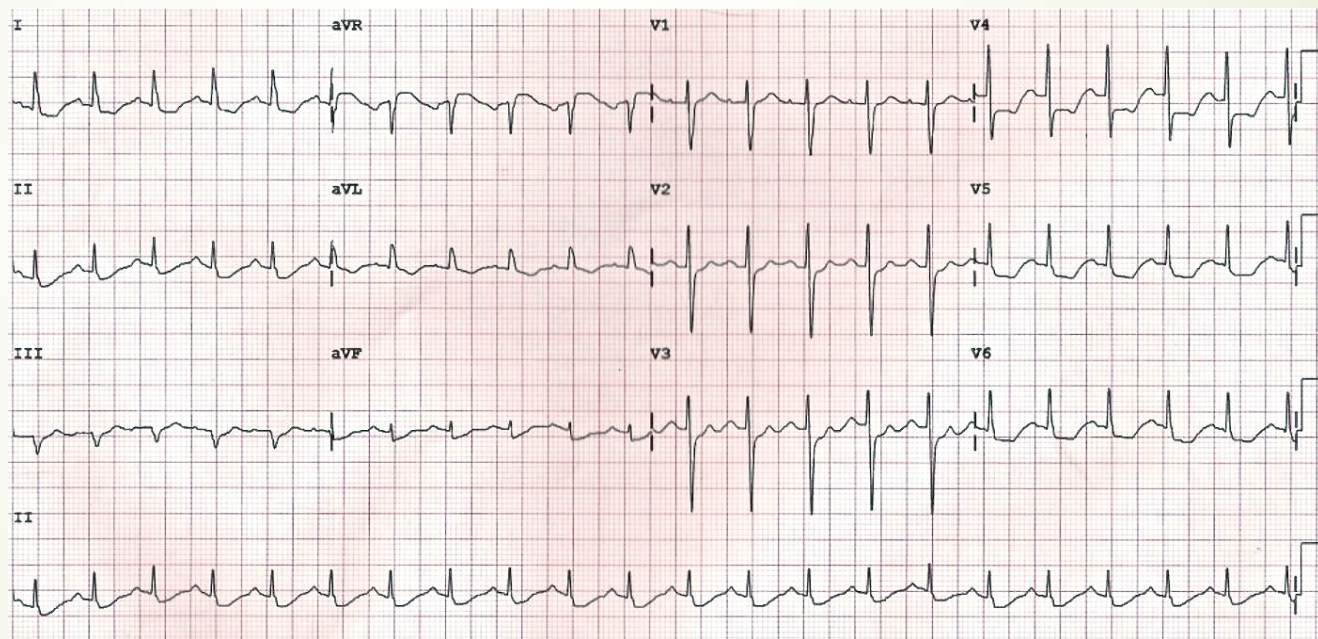
The Forgotten Lead: aVR



Like aVR: No Respect!

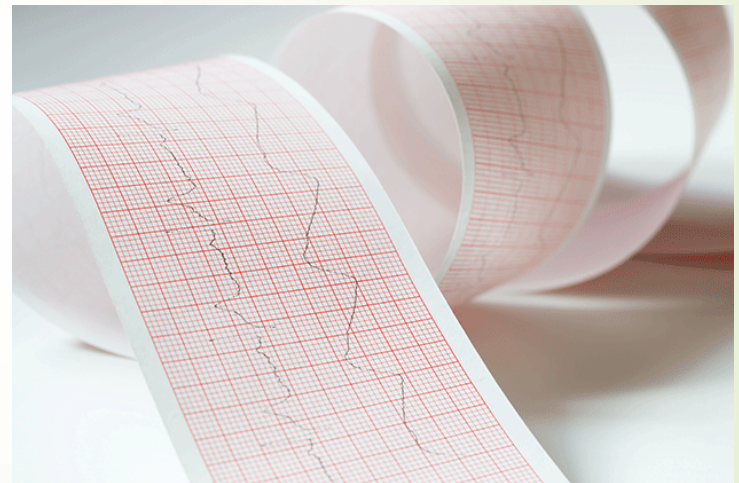


The Forgotten Lead



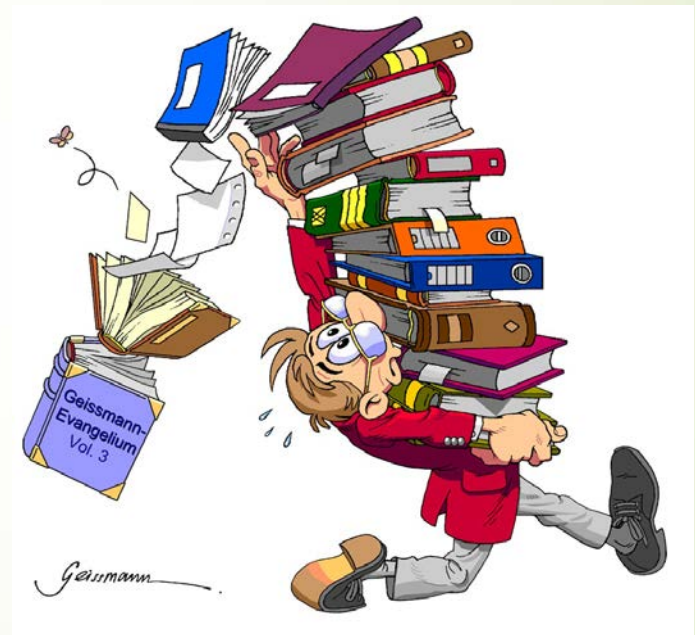
Serial EKGs

- Detected STEMI in 8% with initially normal EKGs
 - Tanquay et al
 - Prehosp Emerg Care, 2018
- Single EKG missed over 15% of prehospital STEMI's
 - Verbeek et al
 - Prehosp Emerg Care, 2012
- Reduces missed STEMI's
 - Aver et al
 - J Electrocardiol, 2014




In Conclusion

- Look closely at the precordial leads in RBBB
- Pay attention to T-waves
 - Hyperacute
 - Look for de Winter
- Wellens' warning
- Keep an eye on aVR
- Repeat EKGs if you can





Thank You!

- Concerns? Thoughts?
 - Christopher.Colwell@UCSF.edu
- 

Eagles 2019

Hyperkalemia

ECG Changes You Should Know

Corey M. Slovis, M.D.

Vanderbilt University Medical Center

Metro Nashville Fire Department

Nashville International Airport

Nashville, TN

Hyperkalemia is the
Most Dangerous Acute
Electrolyte Emergency

HyperK = ECG

ECG Changes Serum Level

| | |
|---------------|-----------|
| Tall Peaked T | 5.5 - 6.5 |
|---------------|-----------|

| | |
|----------------|-----------|
| Loss of P Wave | 6.5 - 7.5 |
|----------------|-----------|

| | |
|-------------|---------------|
| Widened QRS | usually > 8 |
|-------------|---------------|

What are the 5 ECG Changes Seen in Hyperkalemia

- **Tall Peaked T-Waves**
- **Prolonged P-R Interval**
- **Loss of P Wave**
- **Widening of QRS**
- **Sine Wave**











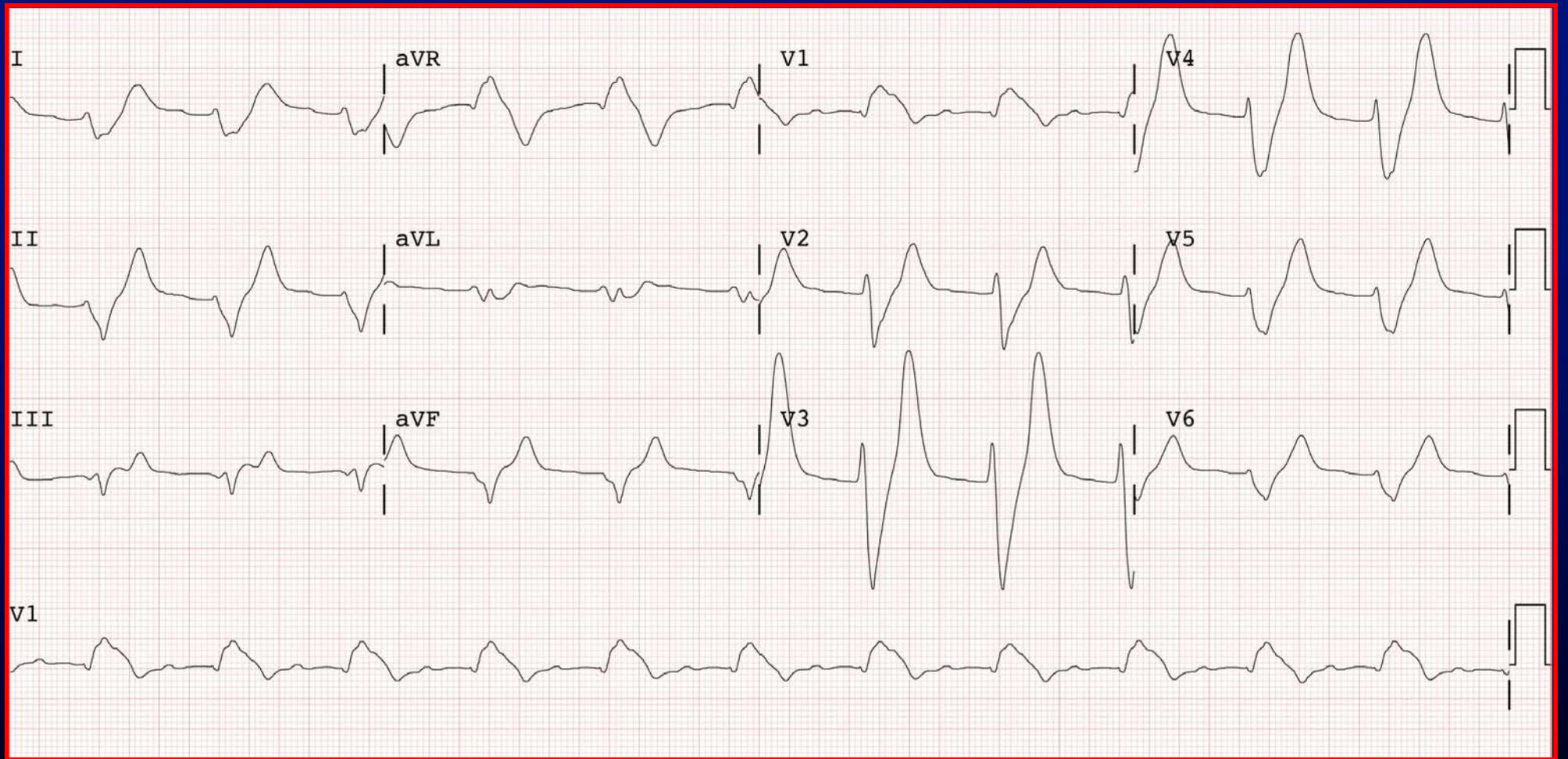


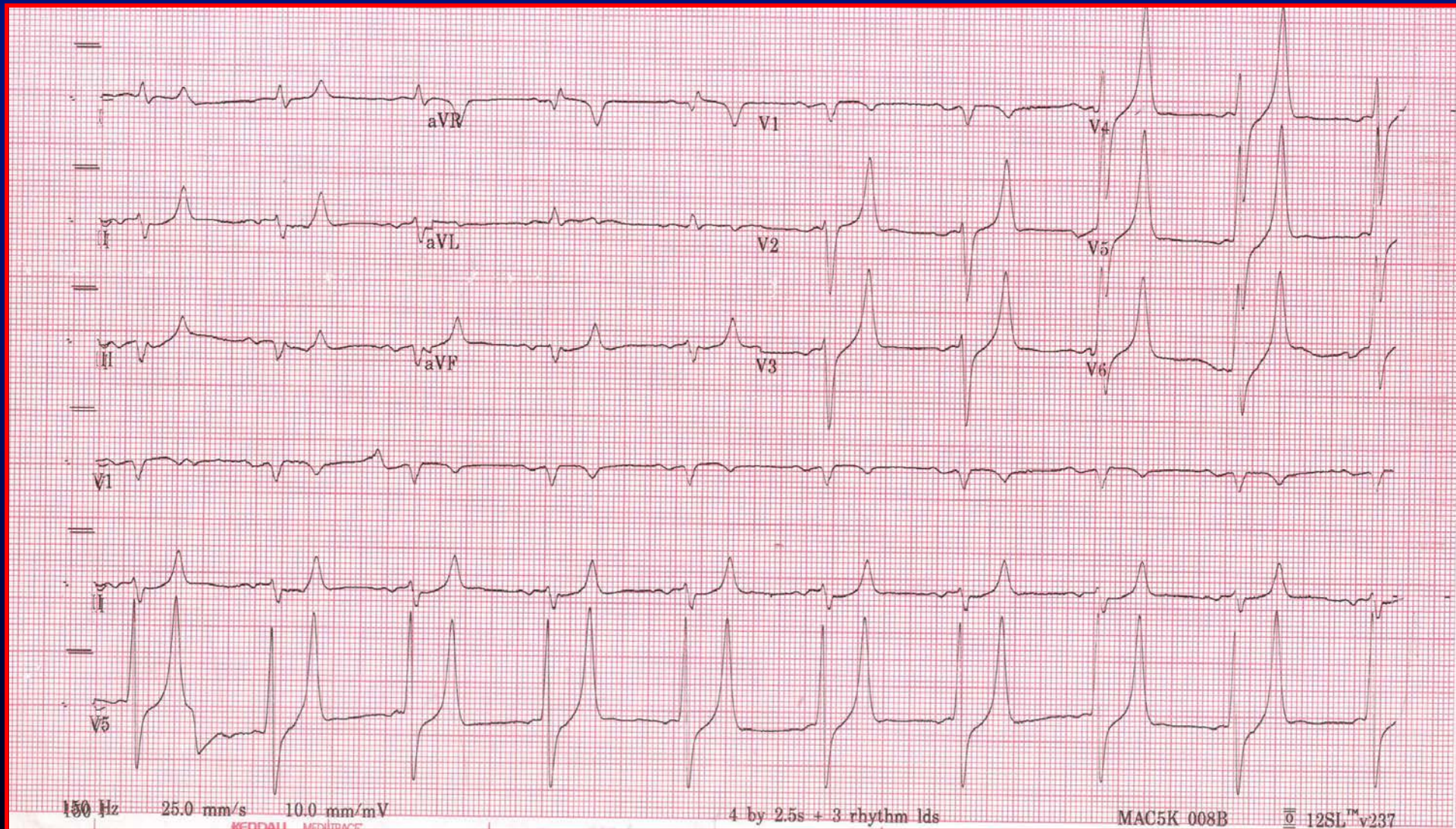


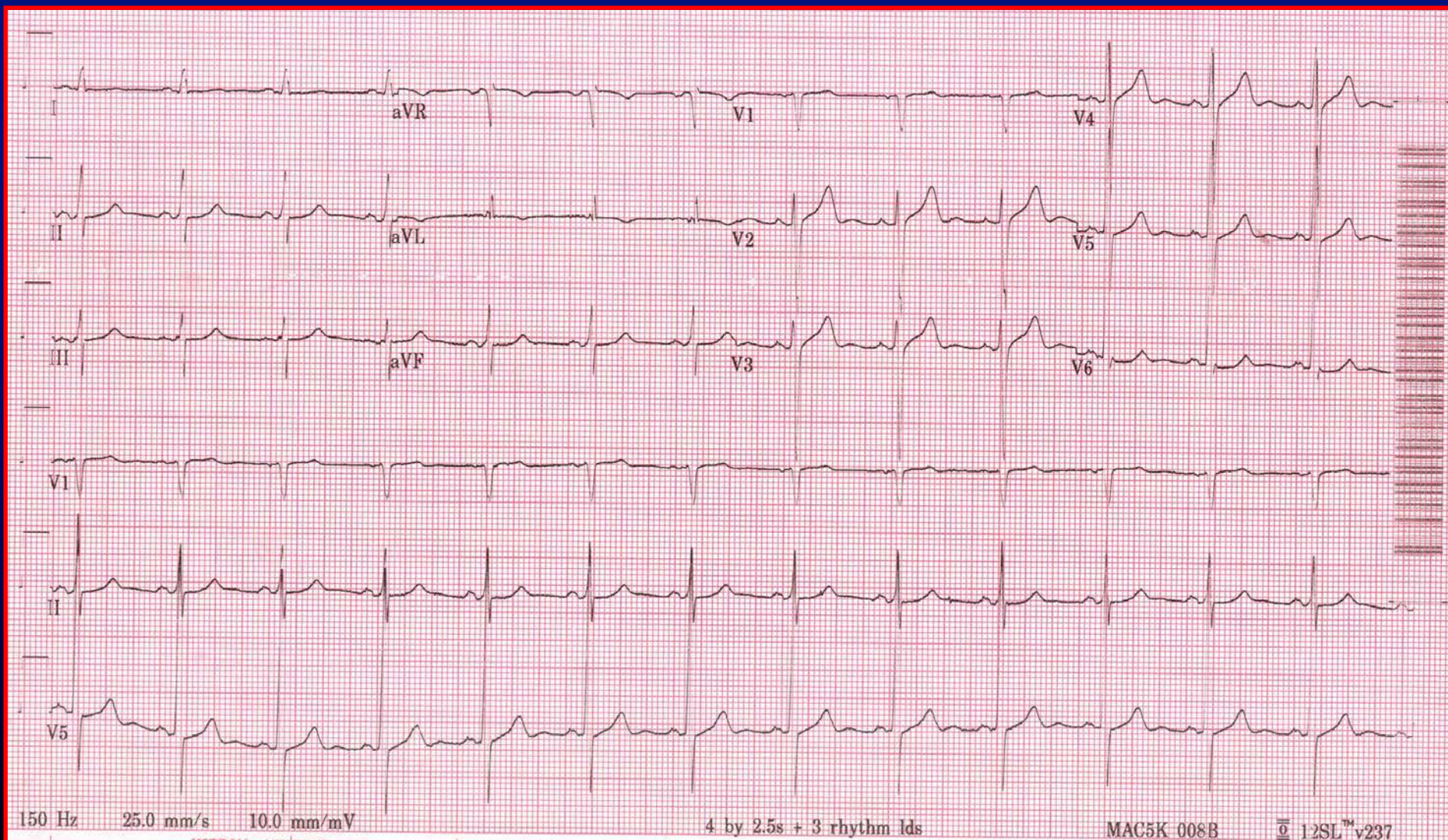








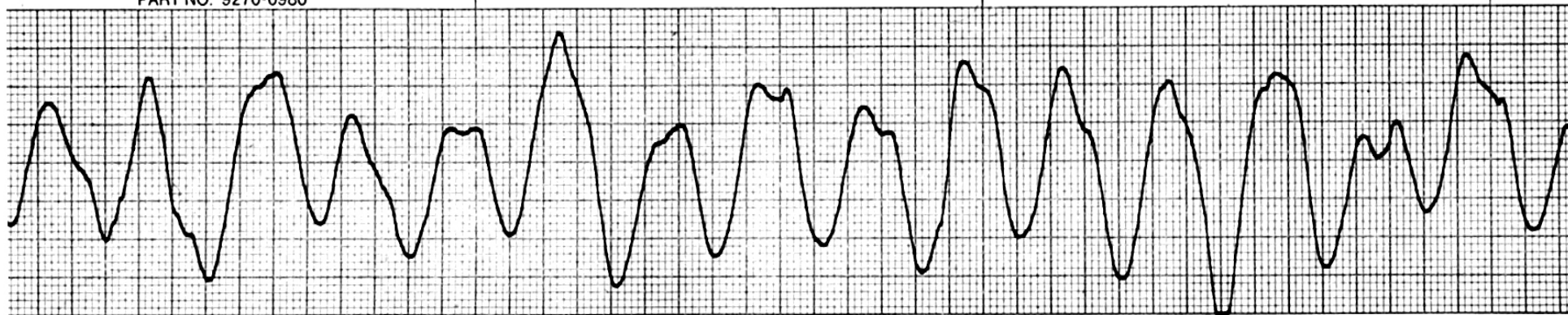




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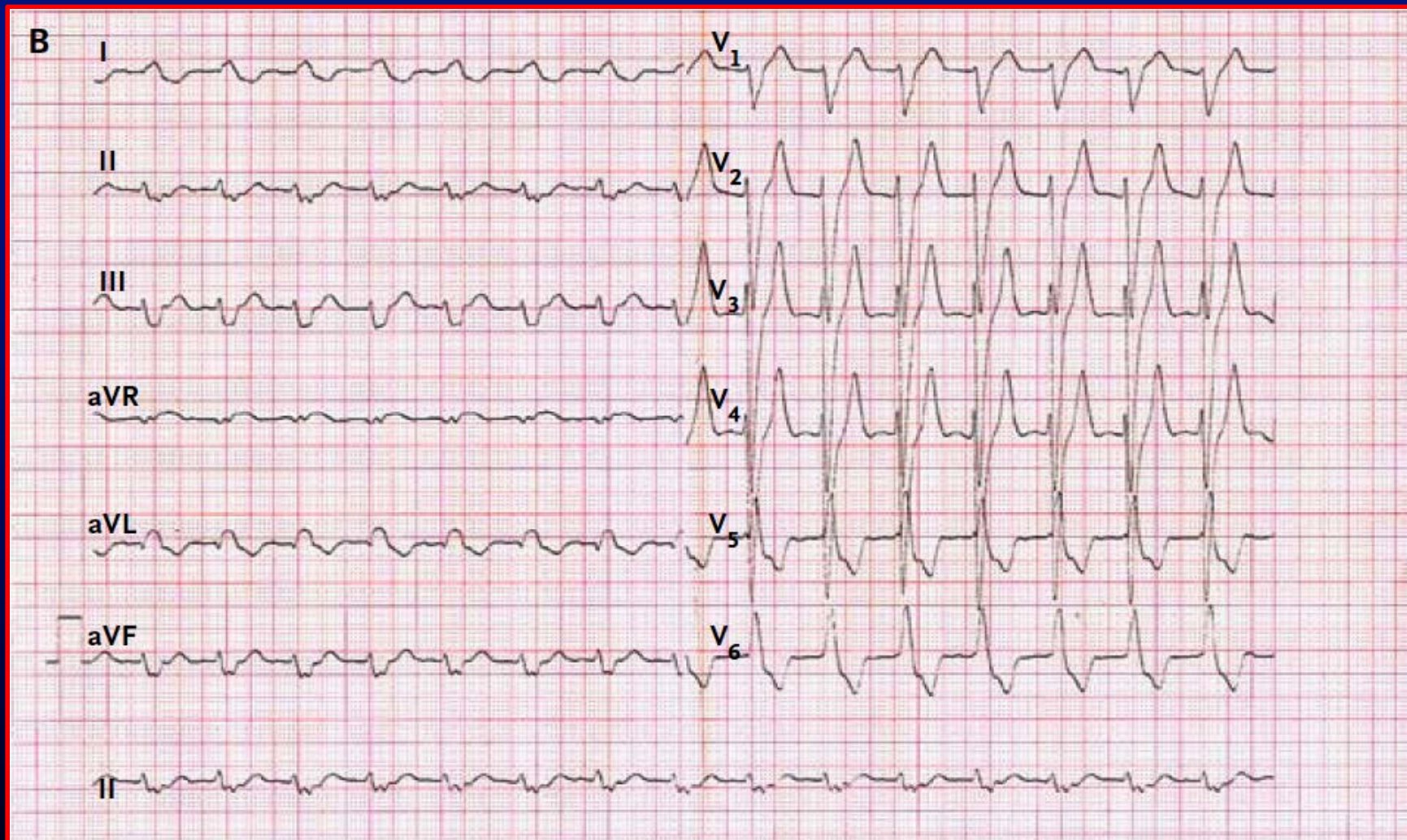
HR 0

15 FEB 2001:00





NEJM 2012;366:1824



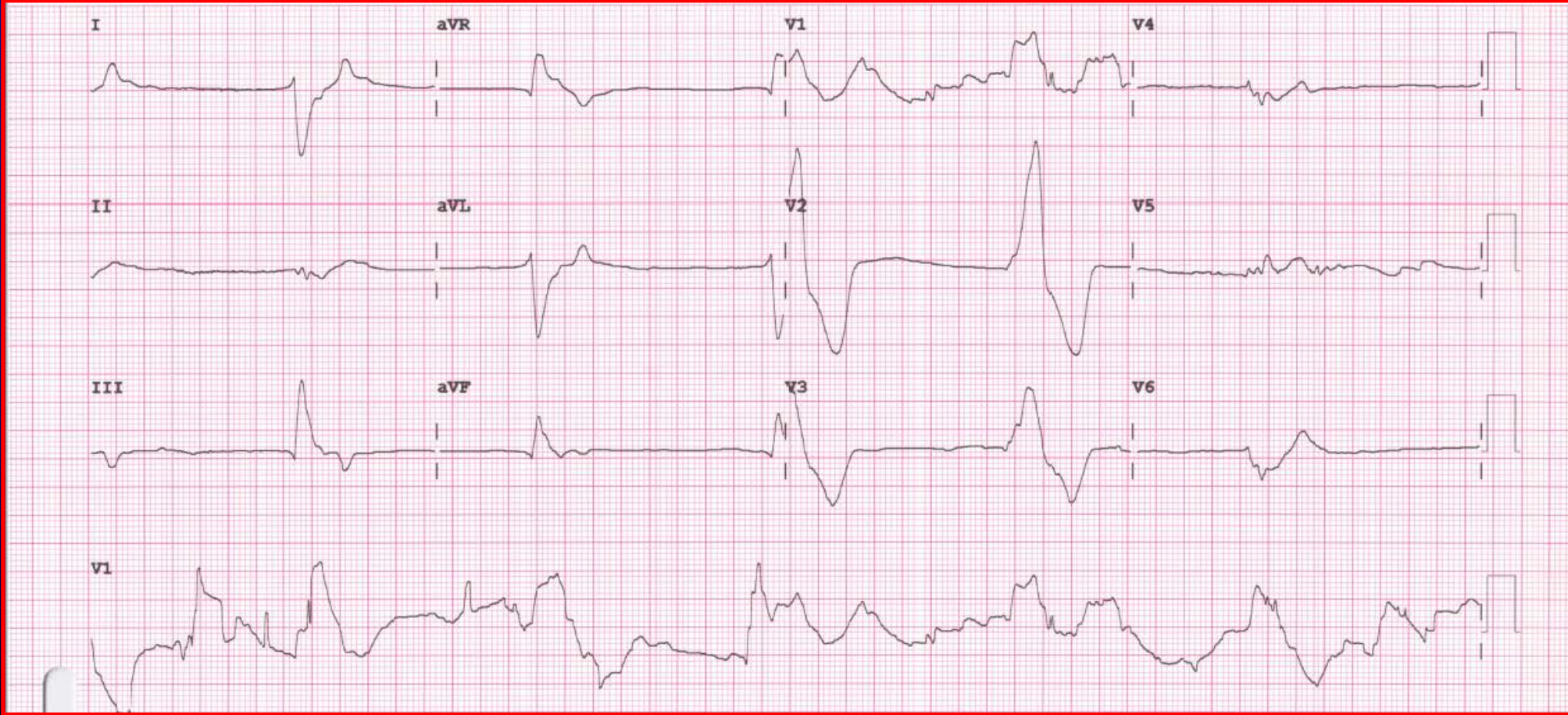
Calcium in Hyperkalemia

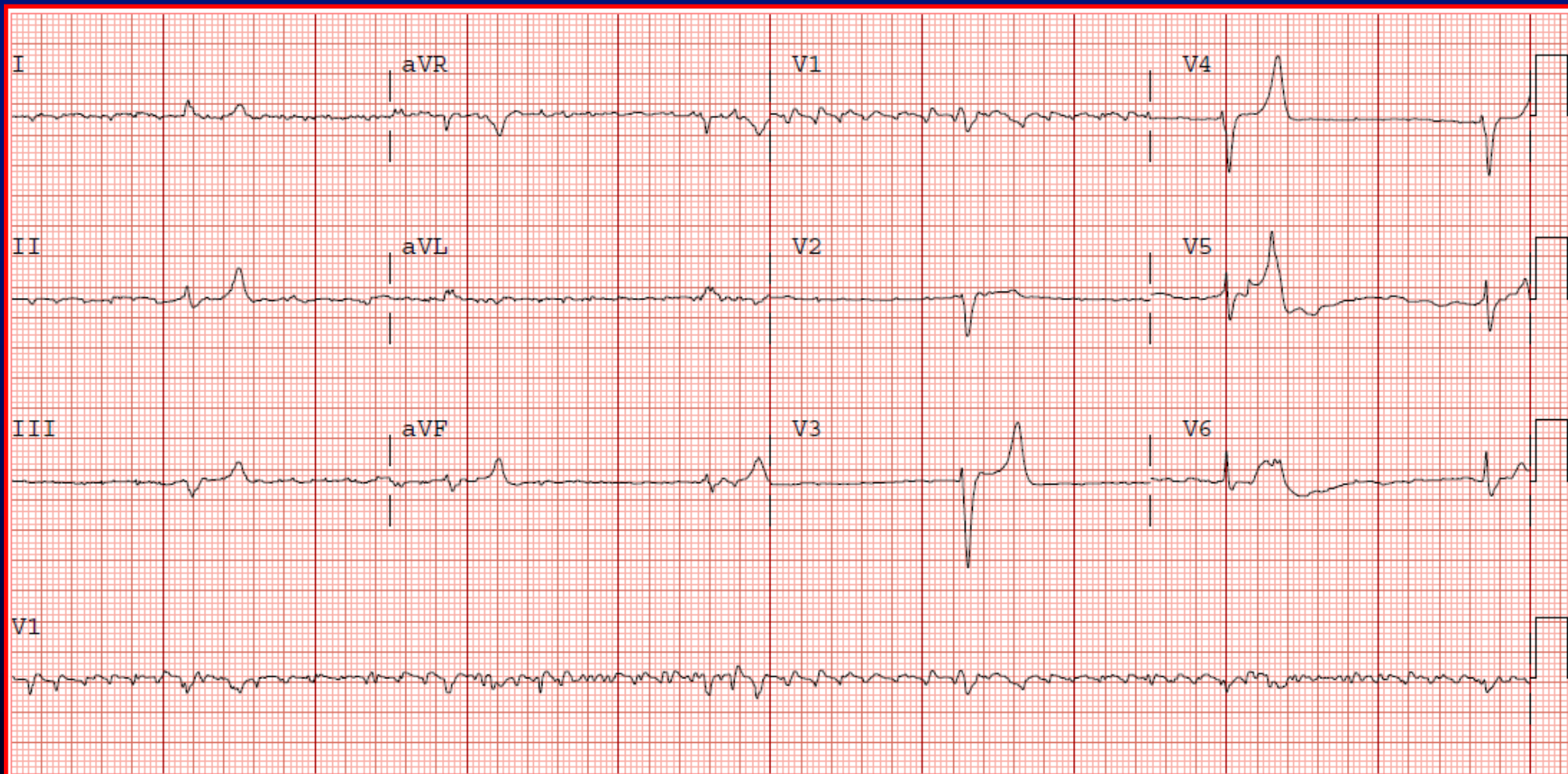
- Tricks Cell
- Recreates Electrical Gradient
- Temporary, lasts only 5-20 minutes
- Dose is 5-20 cc CaCl IV
- Potentially Dangerous

Be sure before using!

Only give calcium if . . .
there is a wide QRS







Hyperkalemia

Indications for CaCl

- Wide QRS
- Sine Wave
- Bradycardia and/or Heart Block

Only give calcium if . . .
there is a wide QRS



ECG Changes Serum Level

| | |
|---------------|-----------|
| Tall Peaked T | 5.5 - 6.5 |
|---------------|-----------|

| | |
|----------------|-----------|
| Loss of P Wave | 6.5 - 7.5 |
|----------------|-----------|

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|-------------|---------------|
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|-------------|---------------|

Hyperkalemia

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- Wide QRS
- Sine Wave
- Bradycardia and/or Heart Block



Teaching Brugada to paramedics

Marc Gautreau, MD, MBA, FACEP, FAEMS
Stanford University
Medical Director - San Jose Fire Department

Why do they need to know?



Imagine a 20-year
old healthy athlete
has syncope during
football practice...

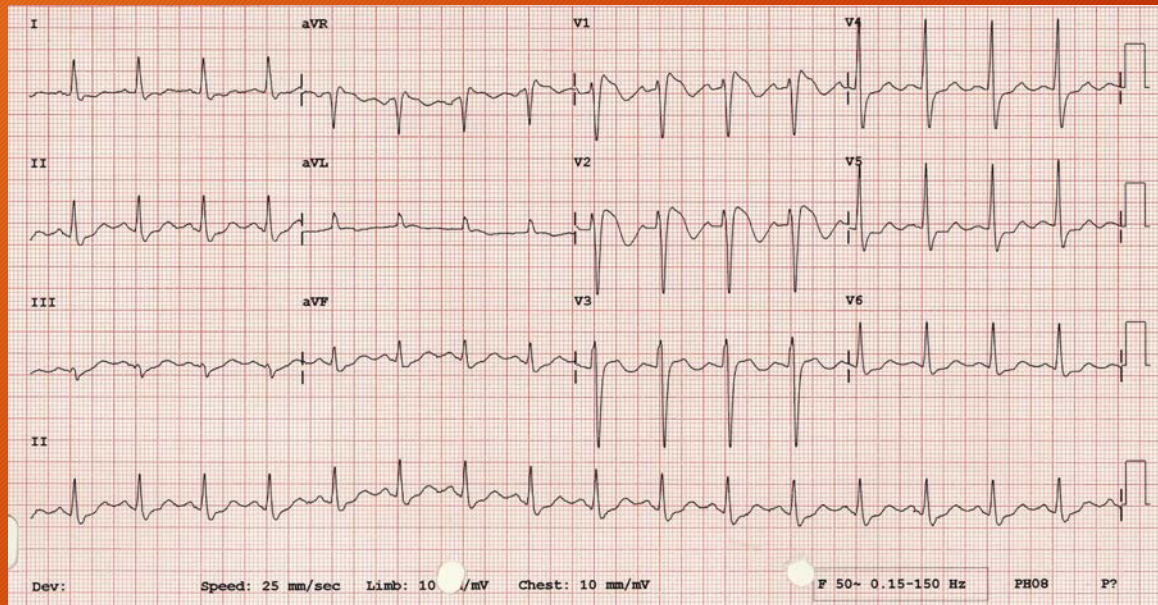


The medics show
up - he declines
transport



2 weeks later, his Mom can't wake him up

Alternatively, the paramedic obtains this ECG



What the heck is Brugada anyway?



- Genetic
- Channelopathy
- Causes ventricular arrhythmia
- Kills young people

SO, why I
teach
Brugada to
paramedics...

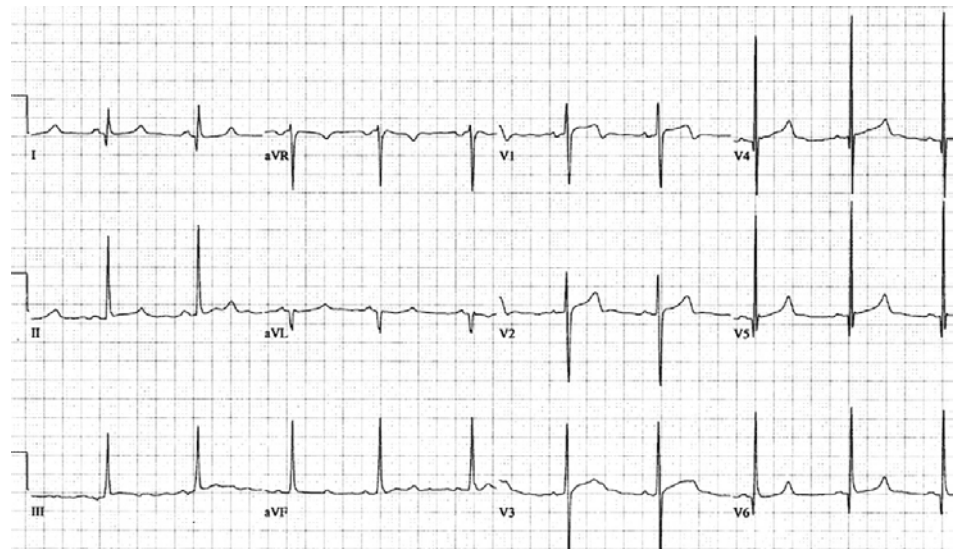
Prevents ill informed refusals

Creates a culture of excellence
and continued learning

Improves morale

Increases respect for EMS in
healthcare community

And by the way, I teach this too



Thanks!



Stanford
MEDICINE

Emergency Medicine
EMS and Disaster Medicine

