Pediatric Readiness Program Education Session

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PRP

PEDIATRIC READINESS PROGRAM

SERVING OREGON & SW WASHINGTON

Pediatric Arrhythmias in the Emergency Room

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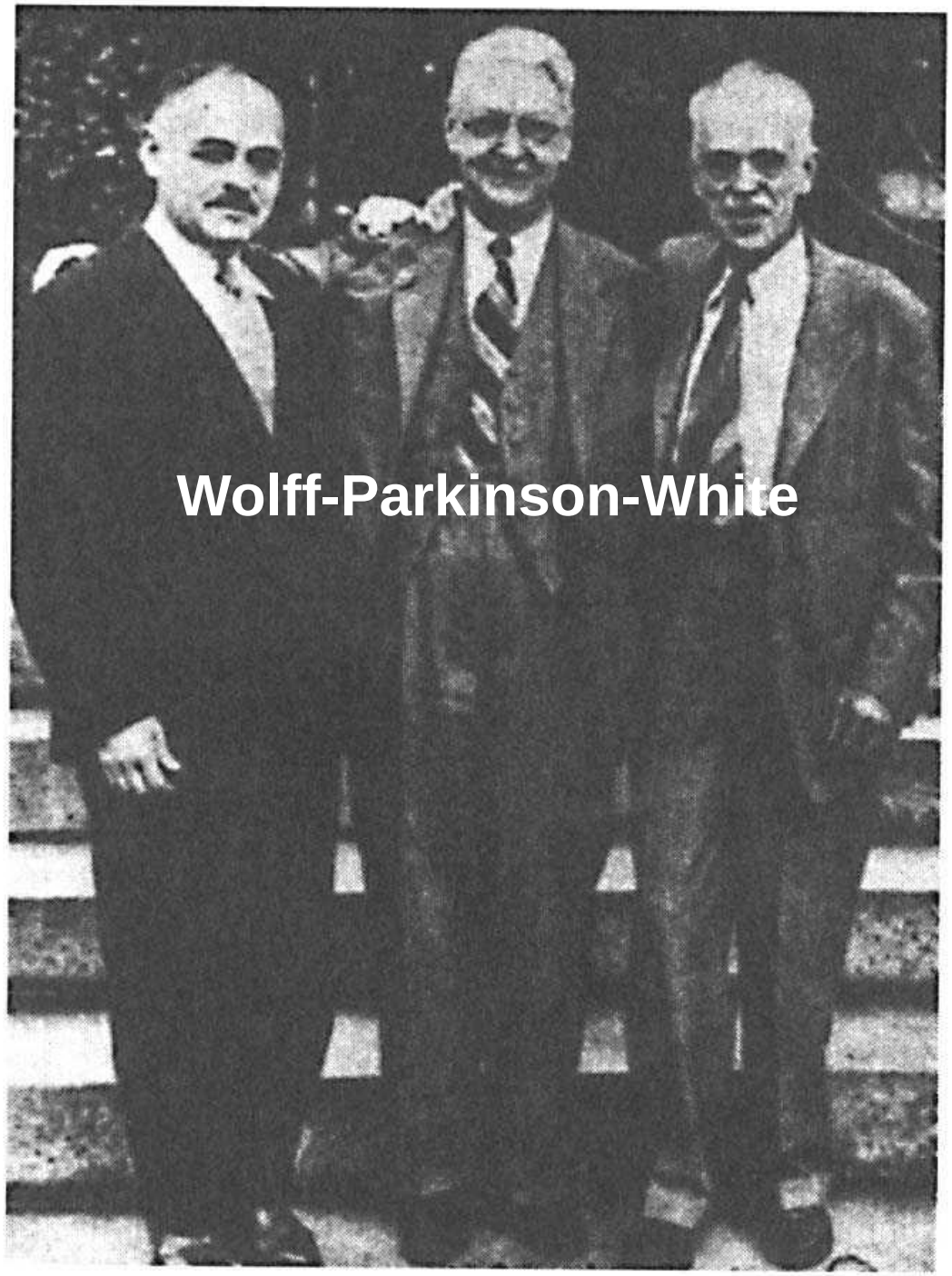
FEBRUARY 20, 2025

Objectives

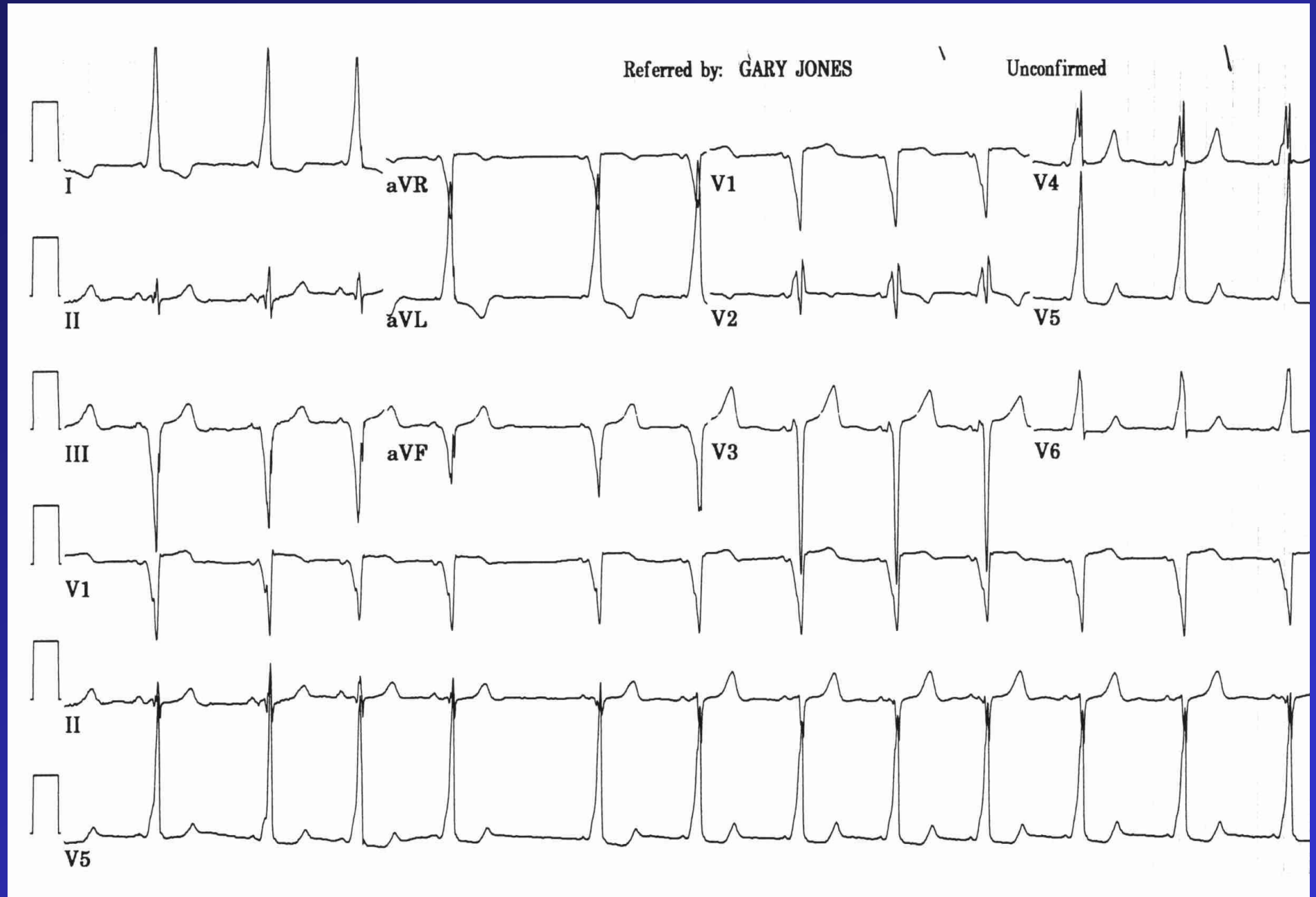
- Understand the underlying pathophysiology of WPW syndrome.
- Understand the management of symptoms associated with WPW.
- Understand the management of the asymptomatic patient with WPW.

CME Disclosure

Dr. Balaji was a consultant/advisor for Milestone Pharmaceuticals and Alta Thera Pharmaceuticals. All of the relevant financial relationships for this individual have ended. All other planners and faculty for this educational activity have no relevant financial relationship(s) to disclose with ineligible companies whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients.


Wolff-Parkinson-White

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

WPW

- 1930
- “Preexcitation” i.e. short PR + delta wave
- Episodic tachycardia: WPW “syndrome”.
- No symptoms, only ECG findings: WPW “pattern”

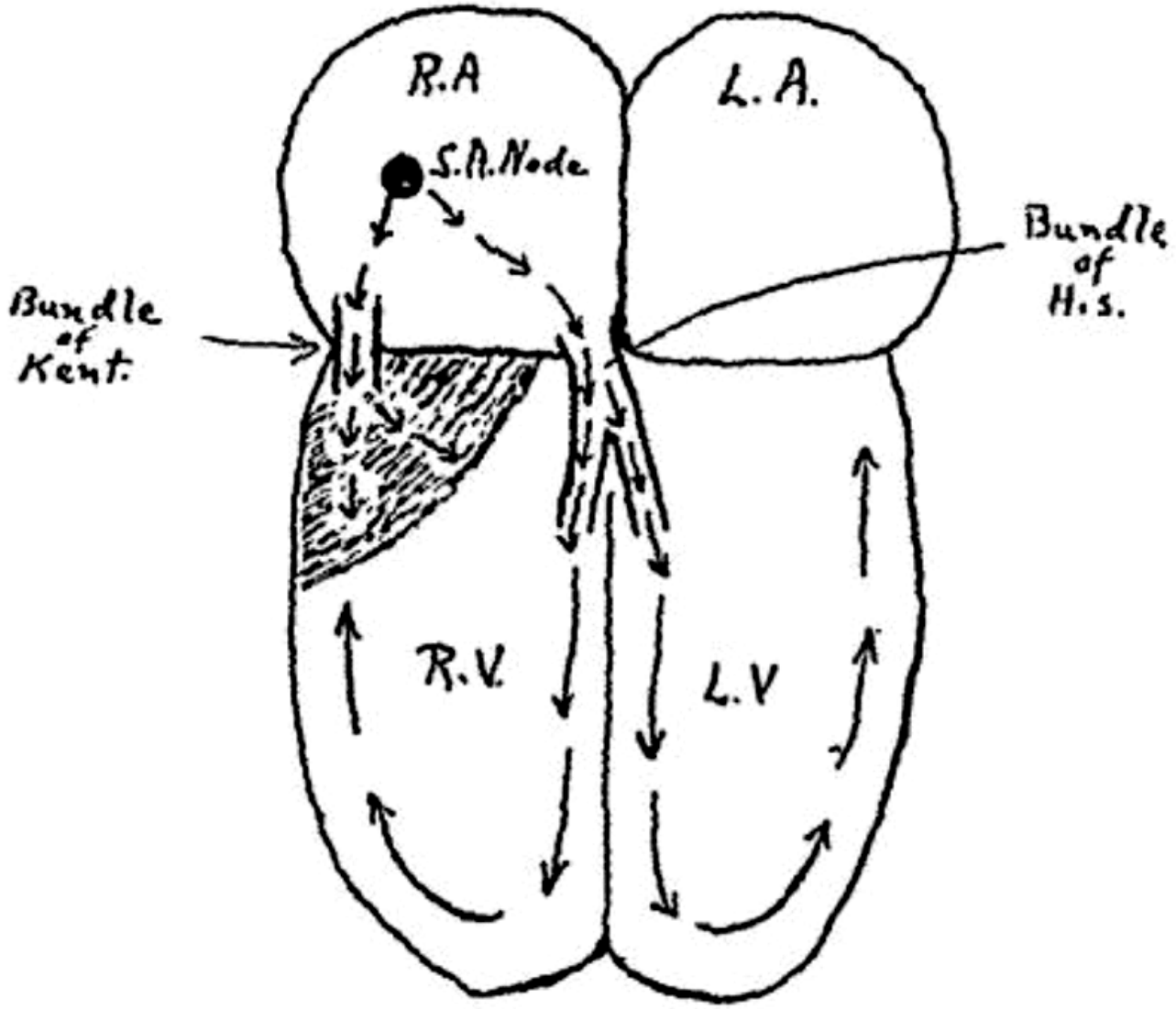

R.A
L.A.
S.A.Node
Bundle of Kent
Bundle of His
R.V.
L.V

Fig. 4

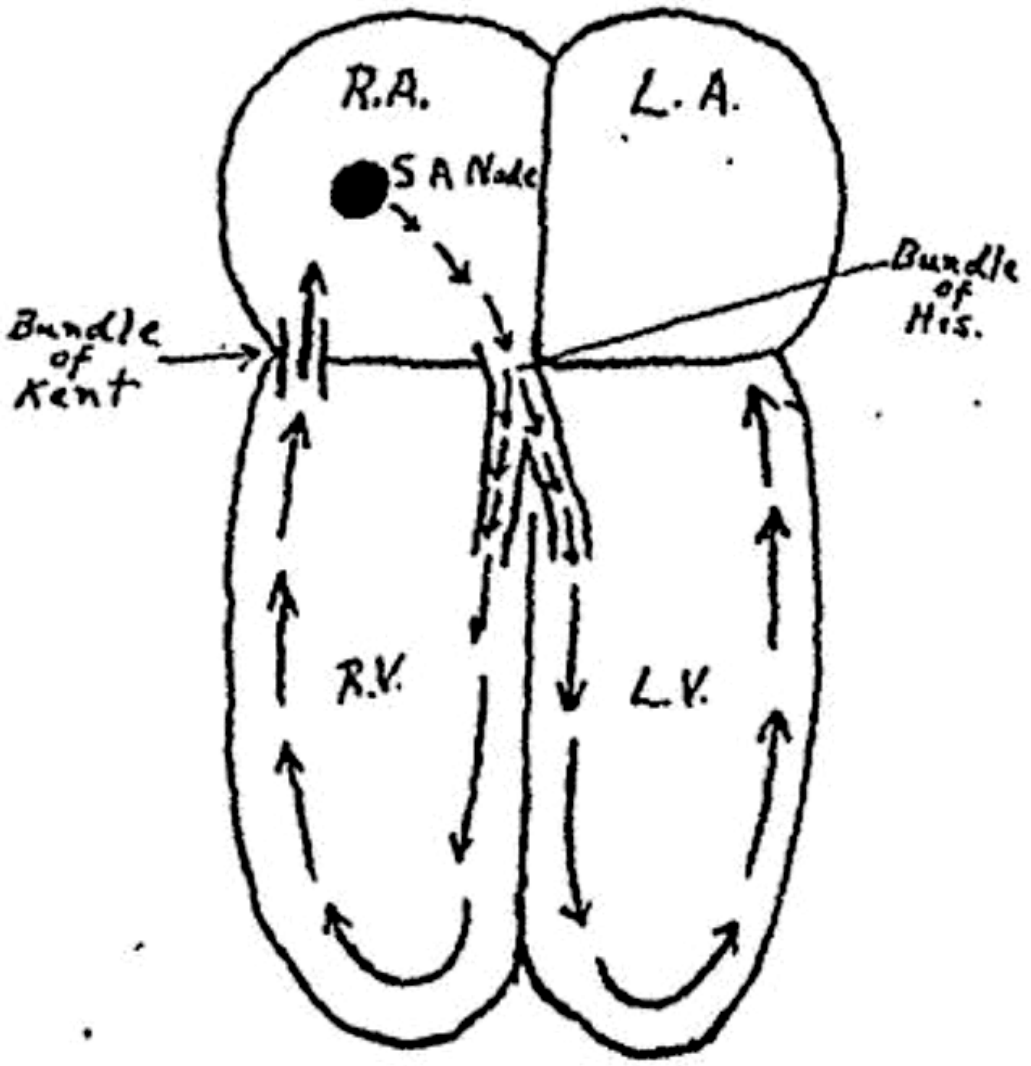
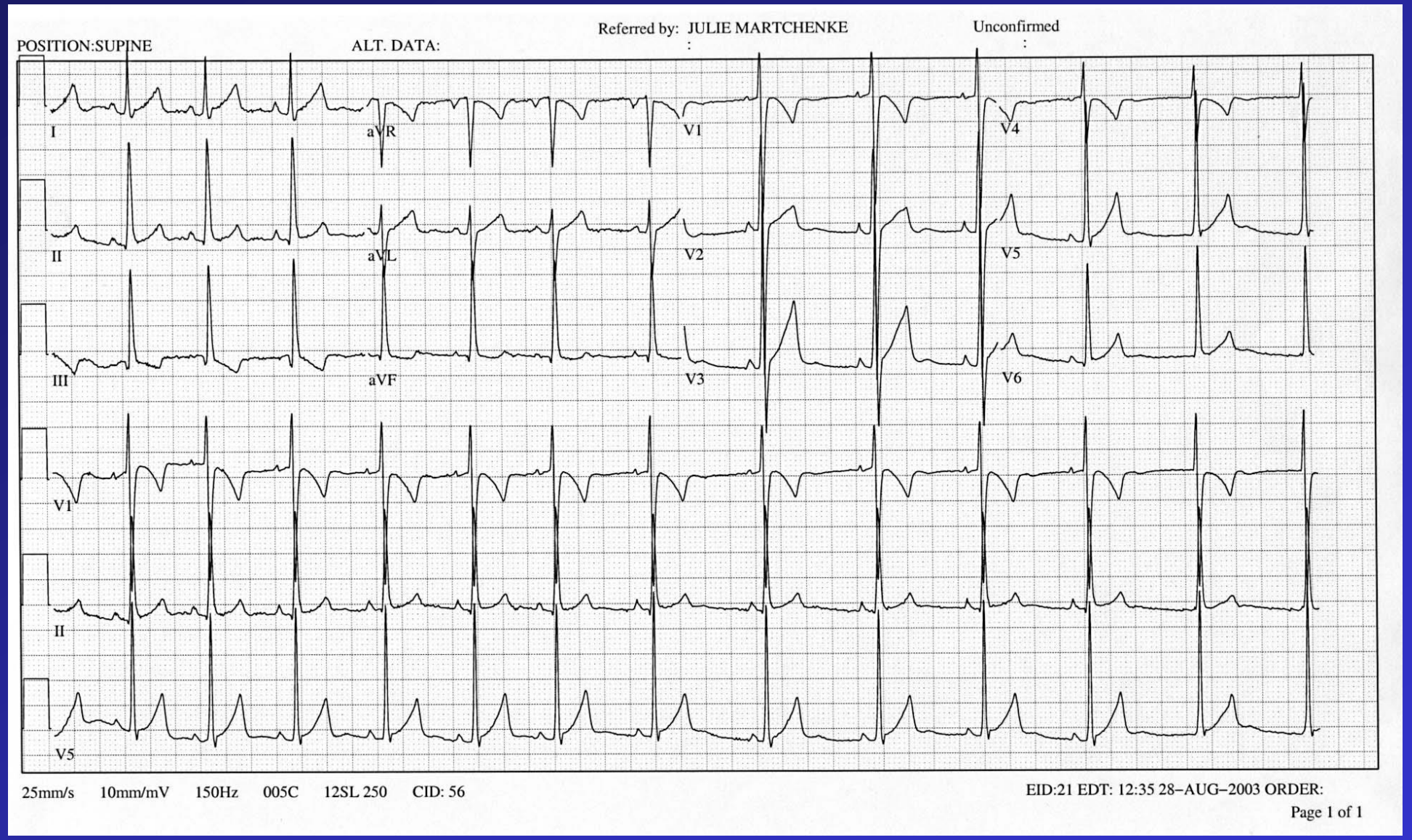

R.A.
L.A.
S A Node
Bundle of Kent
Bundle of His
R.V.
L.V.

Fig. 5


Referred by: JULIE MARTCHENKE
Unconfirmed
POSITION:SUPINE
ALT. DATA:
I
aVR
V1
V4
II
aVL
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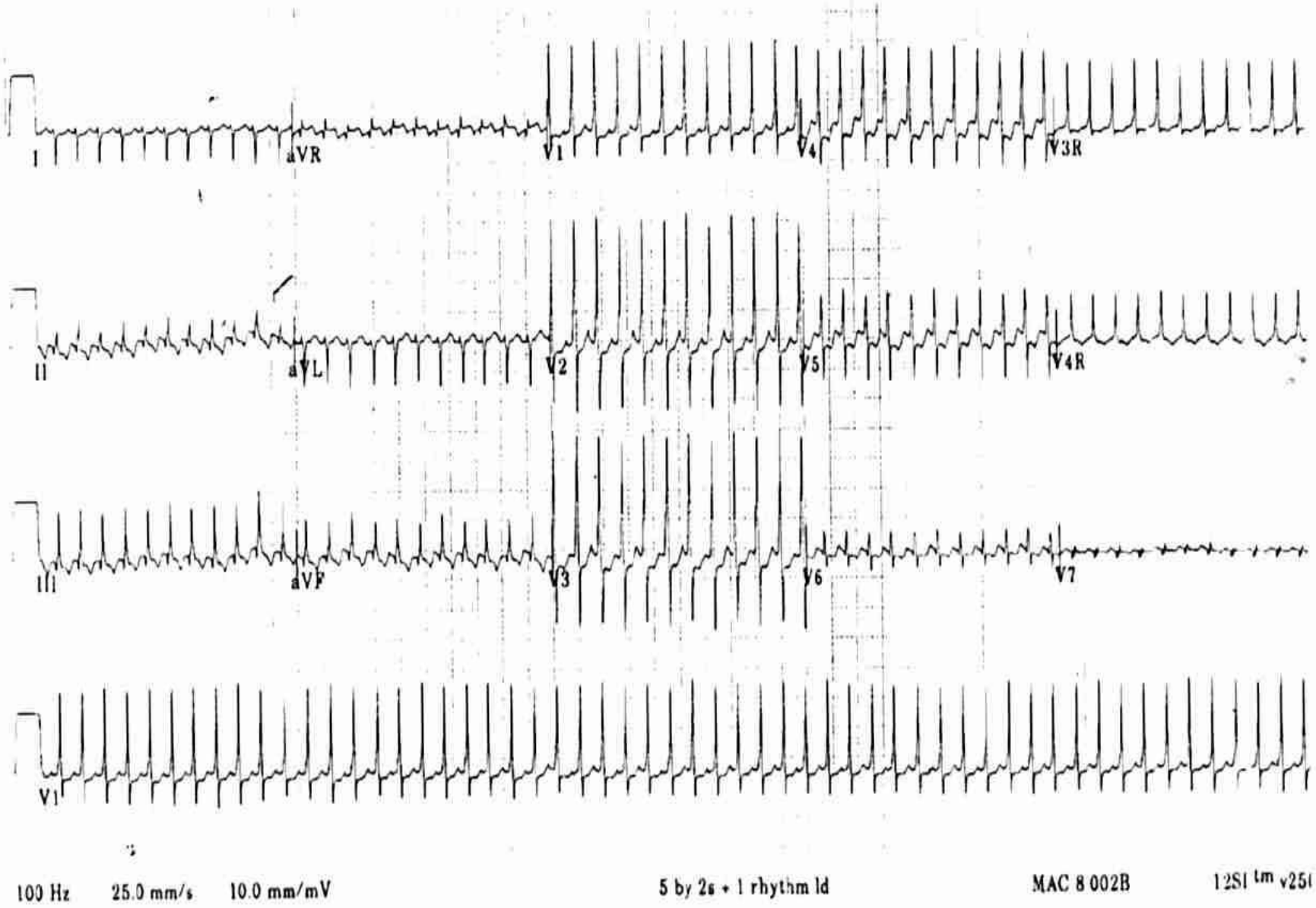
V5
III
aVF
V3
V6
V1
II
V5
25mm/s 10mm/mV 150Hz 005C 12SL 250 CID: 56
EID:21 EDT: 12:35 28-AUG-2003 ORDER:
Page 1 of 1

WPW presentation

- Palpitations:
  - Usually random
  - Sudden start
  - Sudden stop
  - Variable duration
  - Responsive to vagal maneuvers
- Incidental/accidental: ECG done for other reasons
- Sudden death/cardiac arrest

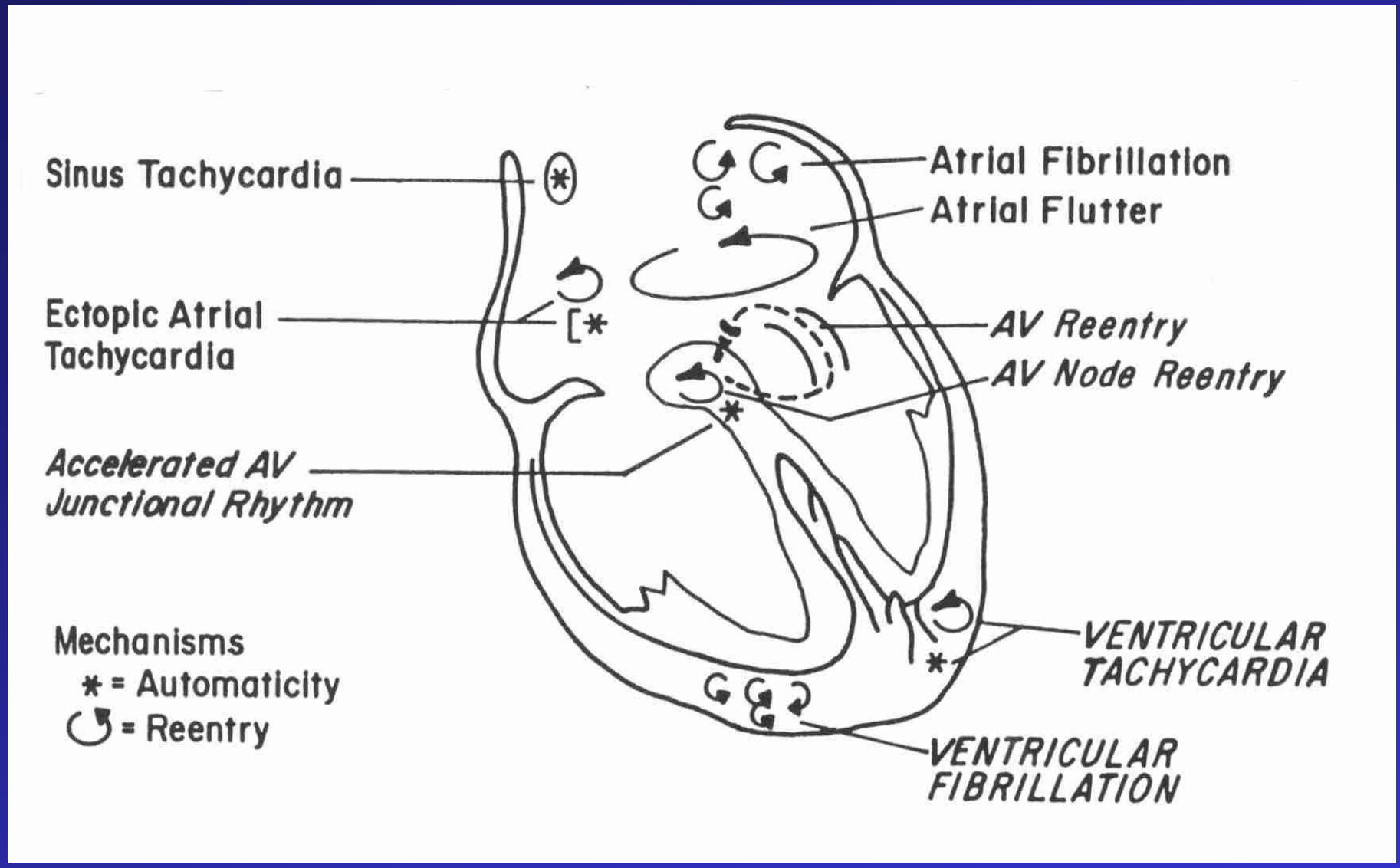
SVT

- A regular narrow QRS tachycardia



Narrow QRS Tachycardia: SVT

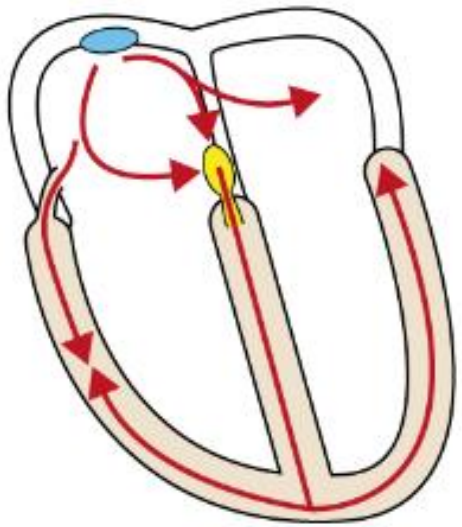
SVT, Adenosine, WPW


Sinus Tachycardia
Ectopic Atrial Tachycardia
Accelerated AV Junctional Rhythm
Atrial Fibrillation
Atrial Flutter
AV Reentry
AV Node Reentry
VENTRICULAR TACHYCARDIA
VENTRICULAR FIBRILLATION
Mechanisms
* = Automaticity
= Reentry

Is the tachycardia in WPW always "narrow"

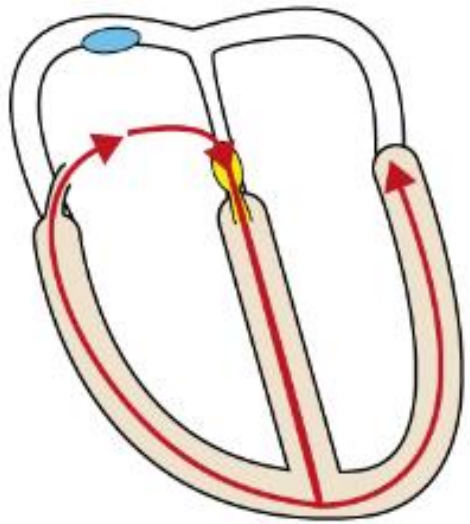
- NO
- SVT with bundle branch block
  - Can be narrow sometimes and change to broad or vice versa
- Antidromic tachycardia.
  - A regular, wide QRS tachycardia.
- Atrial tachycardia conducted through an accessory pathway
  - A regular broad QRS tachycardia
- Atrial fibrillation conducted through an accessory pathway
  - An irregular broad QRS tachycardia.

Pre-excitation



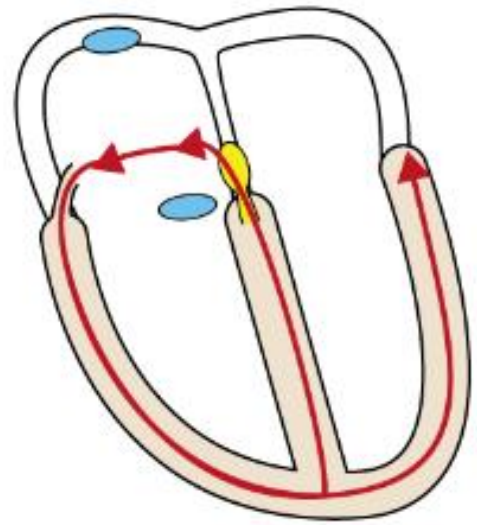
- Short PR interval
- In this case the PR segment cannot be seen.

Orthodromic AVRT
Antegrade conduction through atrioventricular node



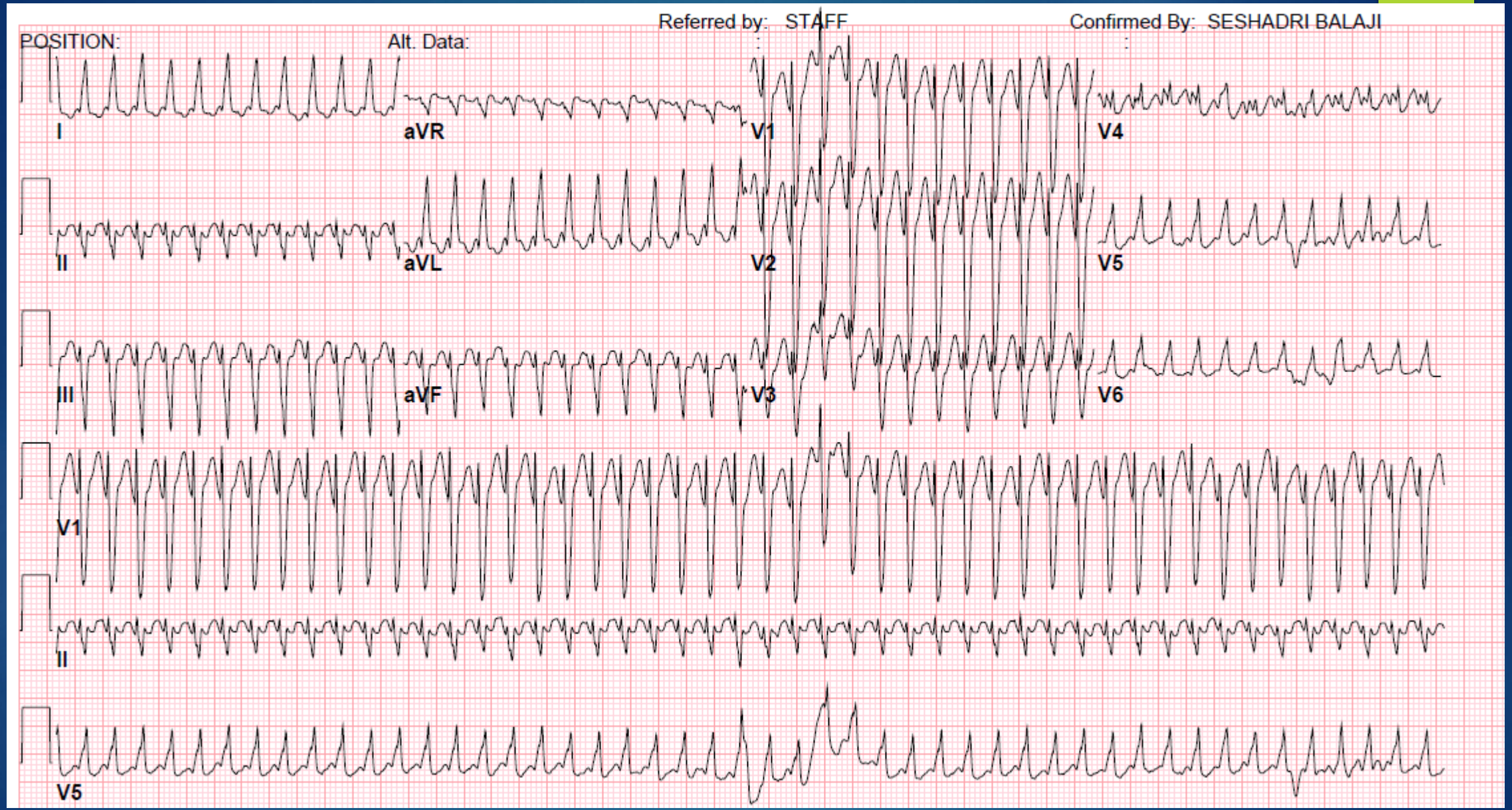
- Normal QRS duration
- No delta wave
- Retrograde P-wave after QRS

Antidromic AVRT
Retrograde conduction through atrioventricular node



- Wide QRS complex with delta wave
- P-wave rarely seen
- If P-wave visible, it is retrograde and occurs just before the QRS

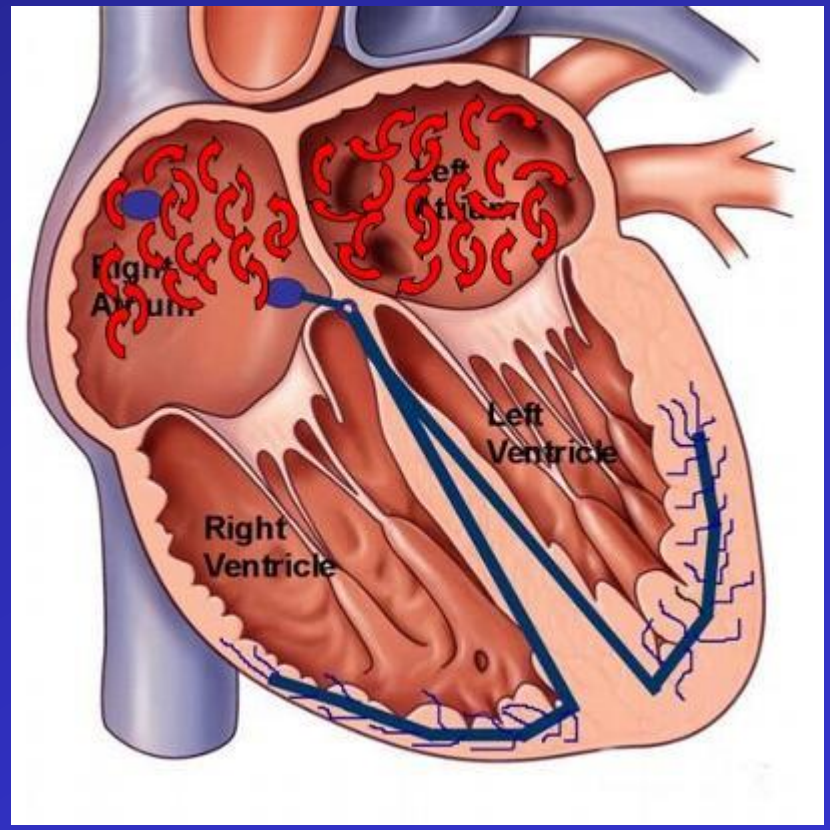
Figure 3. Antidromic and orthodromic AVRT.



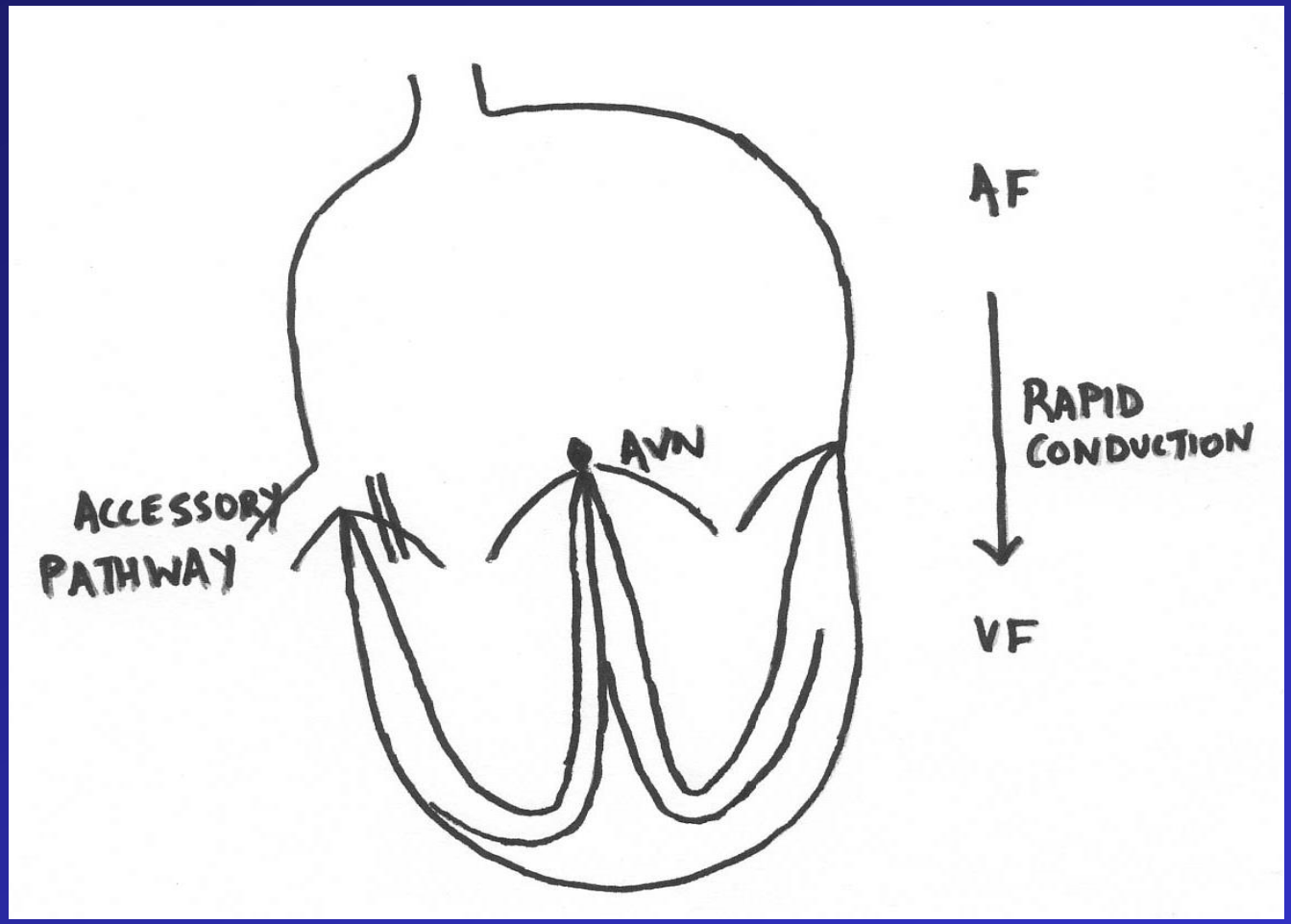
Child with ART responsive to Adenosine

Sudden Death

- Maybe the first presenting symptom.
- Requires 2 simultaneous “rare” events
  - **Atrial Fibrillation**
    - Rare in young adults
    - More common in WPW (10-25%)
  - **Rapidly conducting AP**

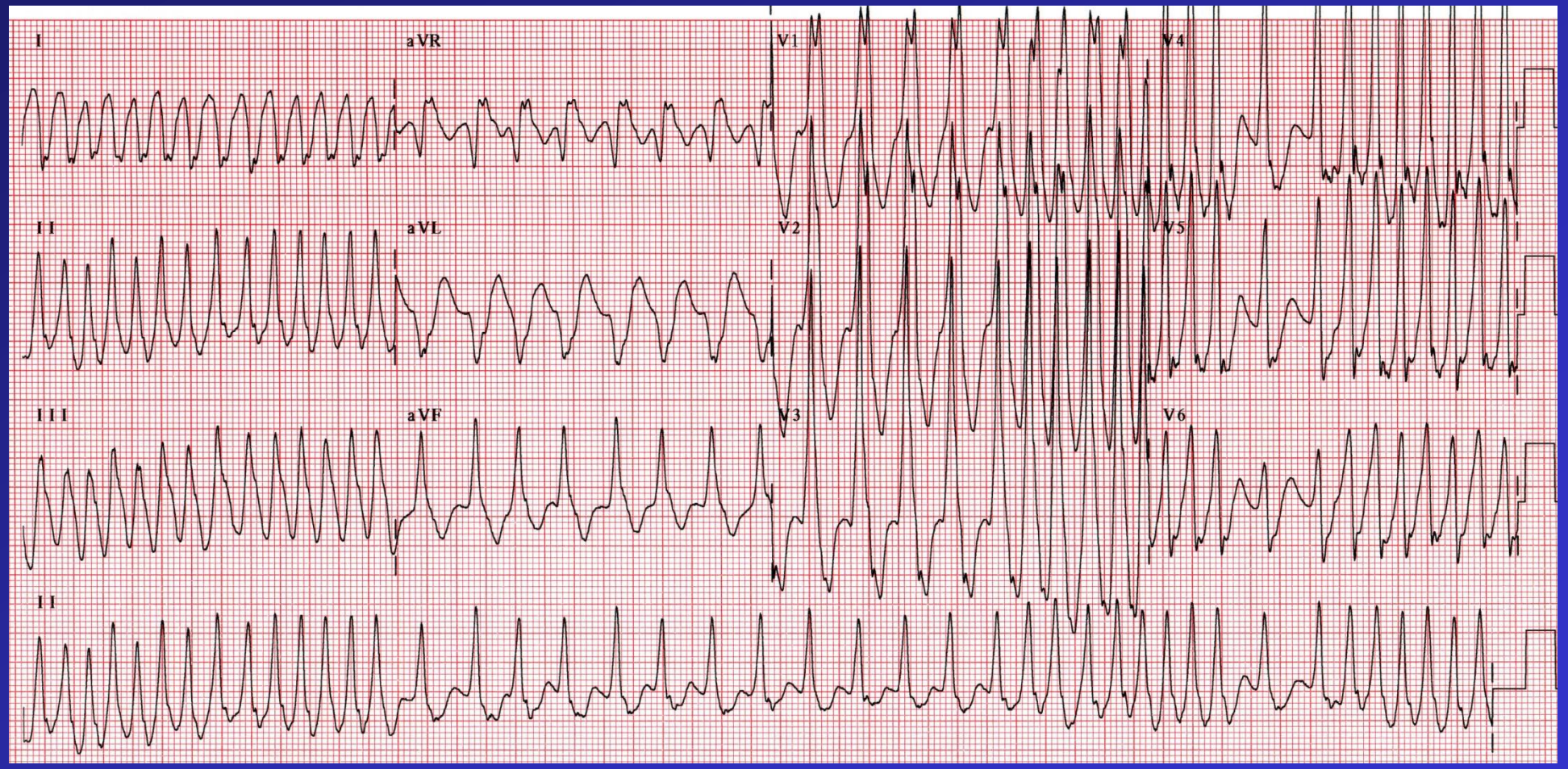


WPW: Sudden Death

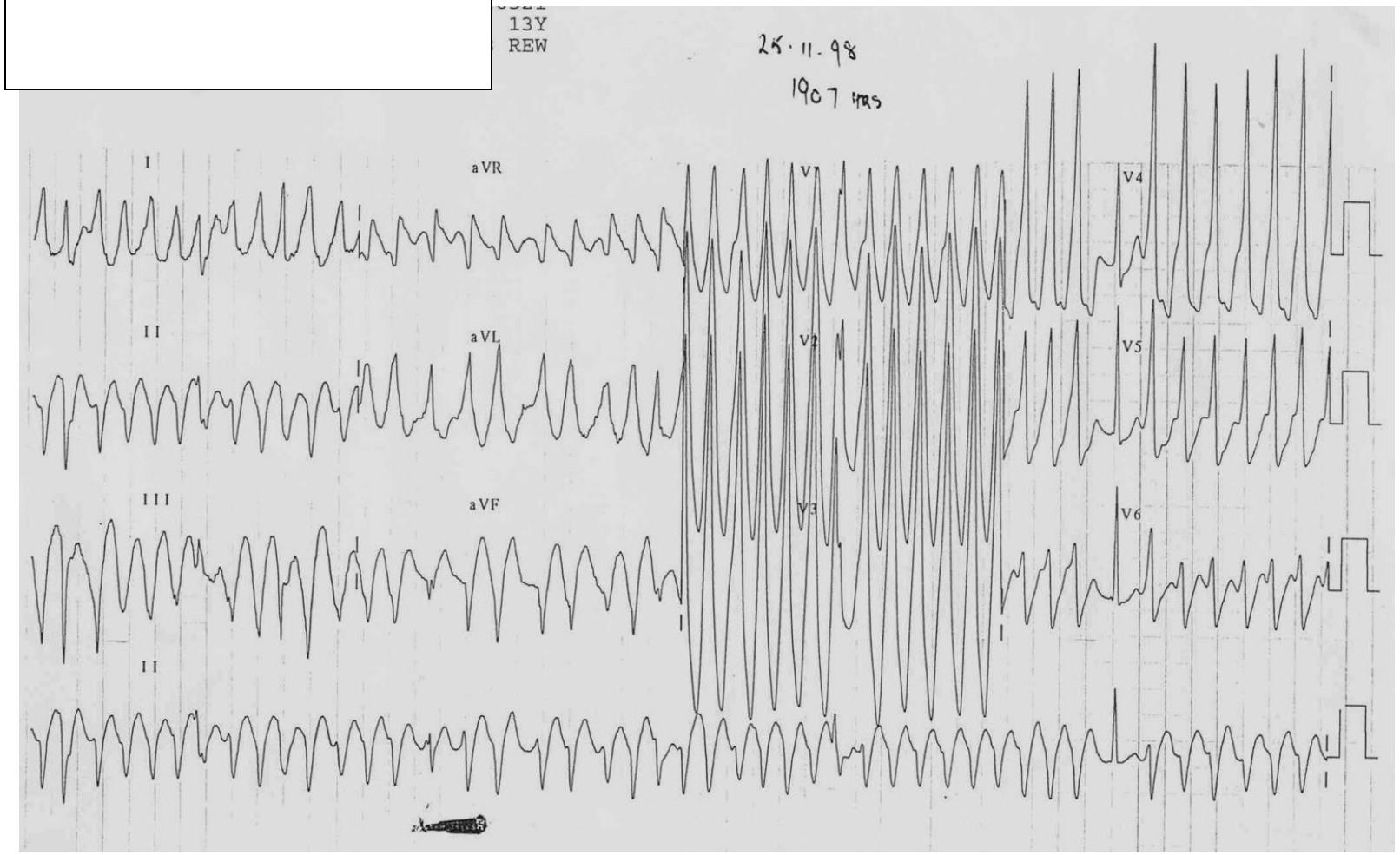


- Approx 1/1000 patient years.
- Munger et al, Mayo clinic, Circ ‘93

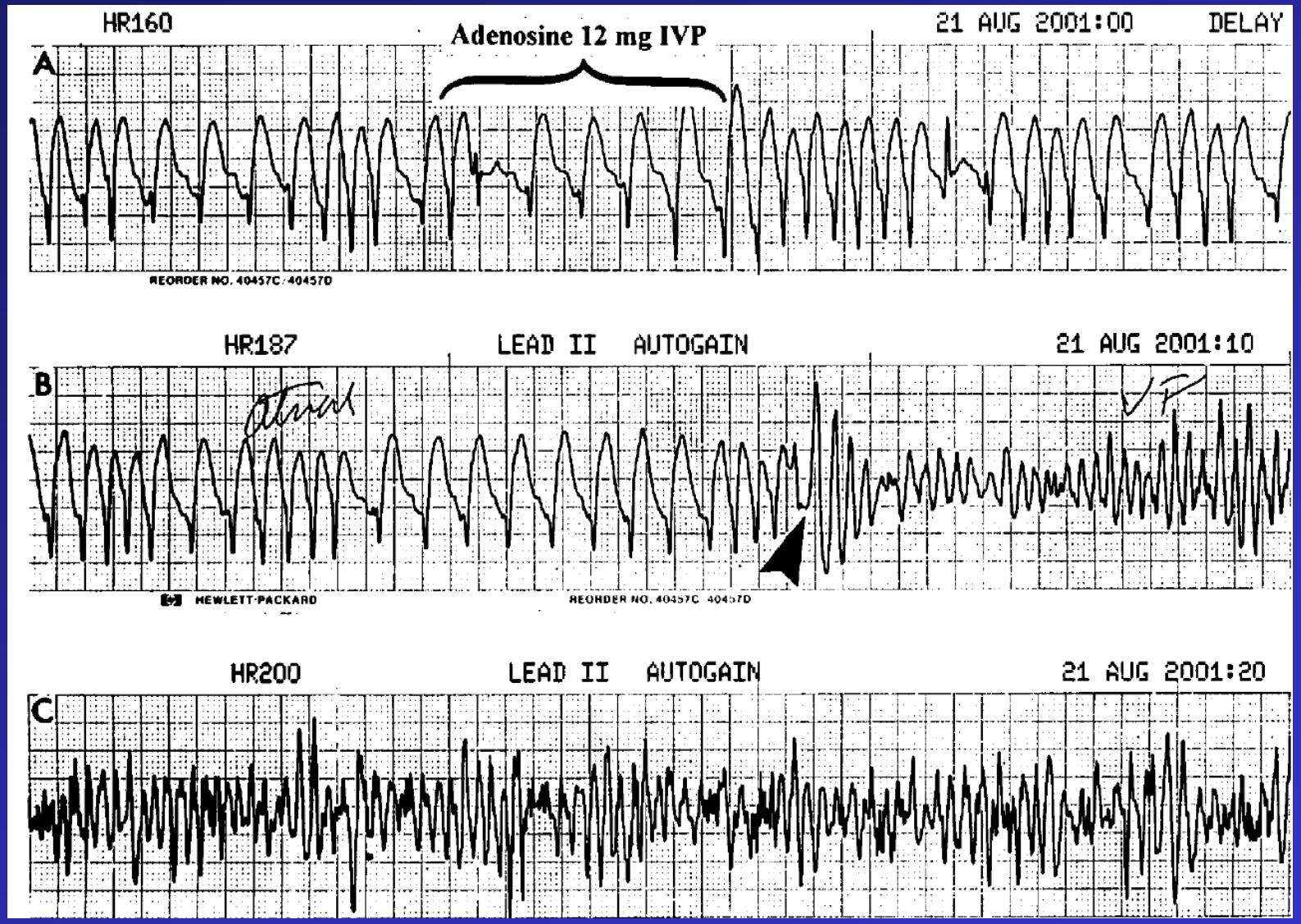
Broad QRS irregularly irregular rhythm
Pre-excited atrial fibrillation



12 lead ECG AF WPW



Adenosine, what's the worst that could happen?



Adenosine

- Ultra-short acting
- Rapidly Denatured by blood
- Very useful therapeutic drug
- Also useful as a diagnostic tool
- Always run ECG/rhythm strip while giving Adenosine
- Beware: Pre-excited AF, asthmatics, heart transplant

SVT Management

- Acute
  - Vagal maneuvers
  - Adenosine iv push

- Avoid Verapamil in neonates, infants: can cause cardiovascular “collapse” with hypotension and bradycardia

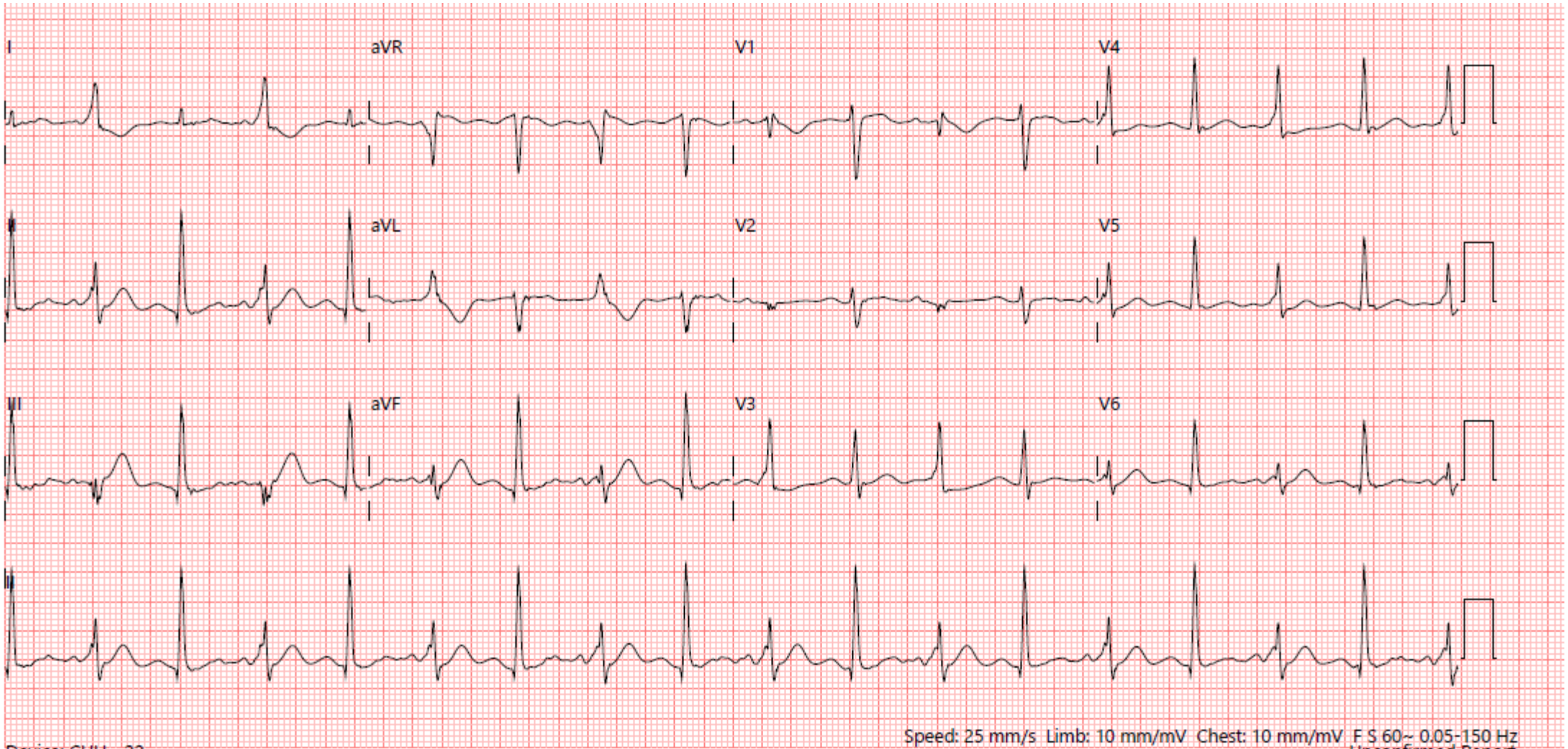
IV drugs in WPW

- ~~Digoxin~~
- ~~Verapamil/Diltiazem~~
- Beta blockers
- Na channel: procainamide
- K channel: sotalol, amiodarone, ibutilide

Oral Drugs in WPW

- ~~Digoxin~~
- ~~Verapamil~~
- Beta blockers
- Na channel: Flecainide, propafenone
- K channel: Sotalol, amiodarone

Intermittent WPW


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
Speed: 25 mm/s Limb: 10 mm/mV Chest: 10 mm/mV F S 60~ 0.05-150 Hz
Device: CHH - 22
Unconfirmed Report

Intermittent WPW

- Historical view: low risk.
- Current view: 10% chance of being a dangerous WPW.

Asymptomatic WPW

Asymptomatic WPW

- Rare risk of Sudden death from Atrial fibrillation
- Risk assessment:
  - Holter or Ambulatory monitor: PAC's which do not have a delta wave. Therefore, the accessory pathway was refractory!
  - Exercise test: abrupt loss of pre-excitation
  - EP testing: fastest rate of conduction through the AP. If > 250: concerning. Either through pacing or through induced Atrial fibrillation. AKA: SPERRI (shortest pre-excited RR interval).
  - SPERRI < 250 ms (= rate > 250 bpm): concerning.
  - EP testing recommended if asymptomatic and over 12 years old.

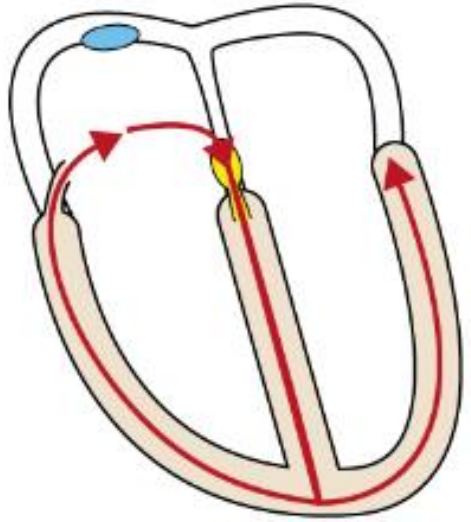
Concealed accessory pathways

"CONCEALED WPW"

Concealed AP

- No WPW pattern on ECG.
- Narrow QRS SVT.
- An AP which only conducts Ventricle> atrium.
- Can support ORT but never ART.
- No risk of Sudden death as Afib cannot conduct over the AP.
- Manage as per "SVT" protocol.
- Does not need "risk stratification" EP study.

Orthodromic AVRT
Antegrade conduction through atrioventricular node



- Normal QRS duration
- No delta wave
- Retrograde P-wave after QRS

ER management scenarios

ER presentation

- Regular narrow QRS SVT:
  - Convert (vagal, adenosine). Repeat ECG: WPW may be present. If QRS still "Normal" consider AVNRT vs a concealed pathway.
  - Refer to cardiology regardless.
- Regular wide QRS tachycardia in a young person
  - If stable: try vagal or adenosine
  - No conversion: treat as VT.

ER presentation

- Irregular wide QRS tachycardia: (pre-excited Afib)
  - Do not use adenosine/verapamil.
  - Can use drugs like IV ibutilide, procainamide, sotalol, amiodarone.
  - Or just DC cardiovert.
- Incidental Pick-up of WPW:
  - Outpatient referral to cardiology.

Pediatric EP approach to WPW

- Ablation is the ultimate option except in neonates and infants
  - Neonates and infants can grow out of their WPW
- How big is the child?
  - < 15 kg: medications as 1st and 2nd line. Rarely ablate.
  - 15-30 kg: medications as 1st line. Ablation as 2nd line.
  - > 30 kg: ablation as 1st line.
- Medications:
  - 1st line: beta blockers
  - 2nd line: flecainide, sotalol
  - Note*: Digoxin and Calcium blockers are contraindicated in WPW.

Things to do in the ER

- Triage patients with an arrhythmia without delay.
- Get an ECG or rhythm strip ASAP.
- Rhythms can be transient.
- Make lots of recordings.
- Get recordings from ambulance EMTs, etc.
- Make sure the recordings get into the patient's chart.
- Do a rhythm strip while perturbing a rhythm.
- Be prepared.
- If in doubt: ask/call.
- Except in very rare cases: adenosine is the EP's best friend.

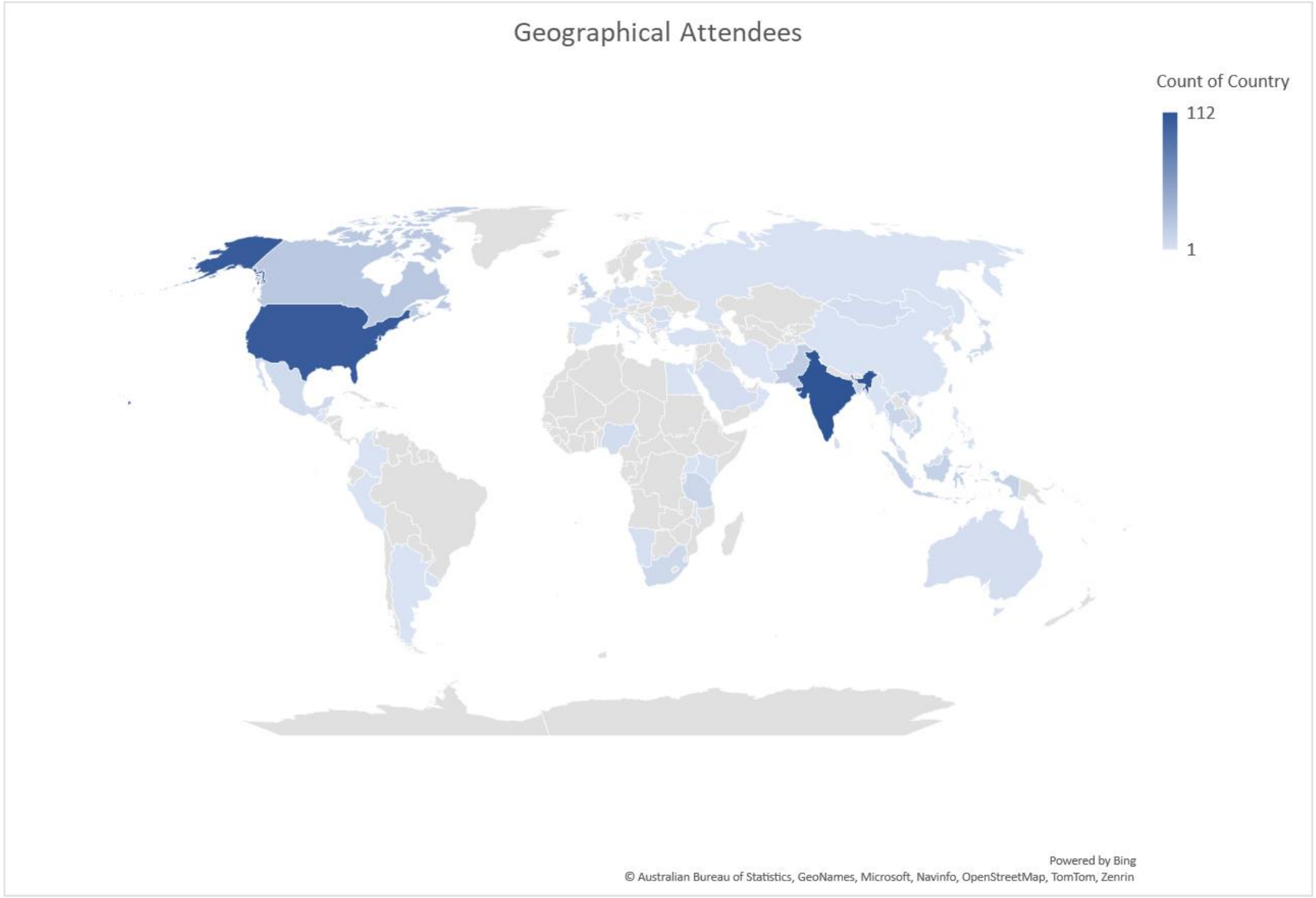
Things not to do in the ER

- Do the same thing again and again expecting a different result.
- Use a DC shock in someone who responded to adenosine but reverted back to SVT.
- Refuse to use adenosine because “it is contraindicated in WPW”
- Tell the family their child has a dreadful, life-threatening condition called WPW.

Children’s Heartbeat

Children's Heartbeat

- Monthly. Last Friday each month.
- 7-830 am PST.
- Spread knowledge on management of pediatric arrhythmias.
- Case discussion for one hour followed by a didactic summing up by a pediatric EP.
- CME eligible.
- Need to register.
- Can watch video recording later (but No CME for that)
- Contact balajis@ohsu.edu or holiman@ohsu.edu
- More information can be found through:
  - https://sads.org/resources/healthcareprofessionals/webinars-seminars-conferences/childrensheartbeat/


Geographical Attendees
Count of Country
112
1
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PRP

PEDIATRIC READINESS PROGRAM

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