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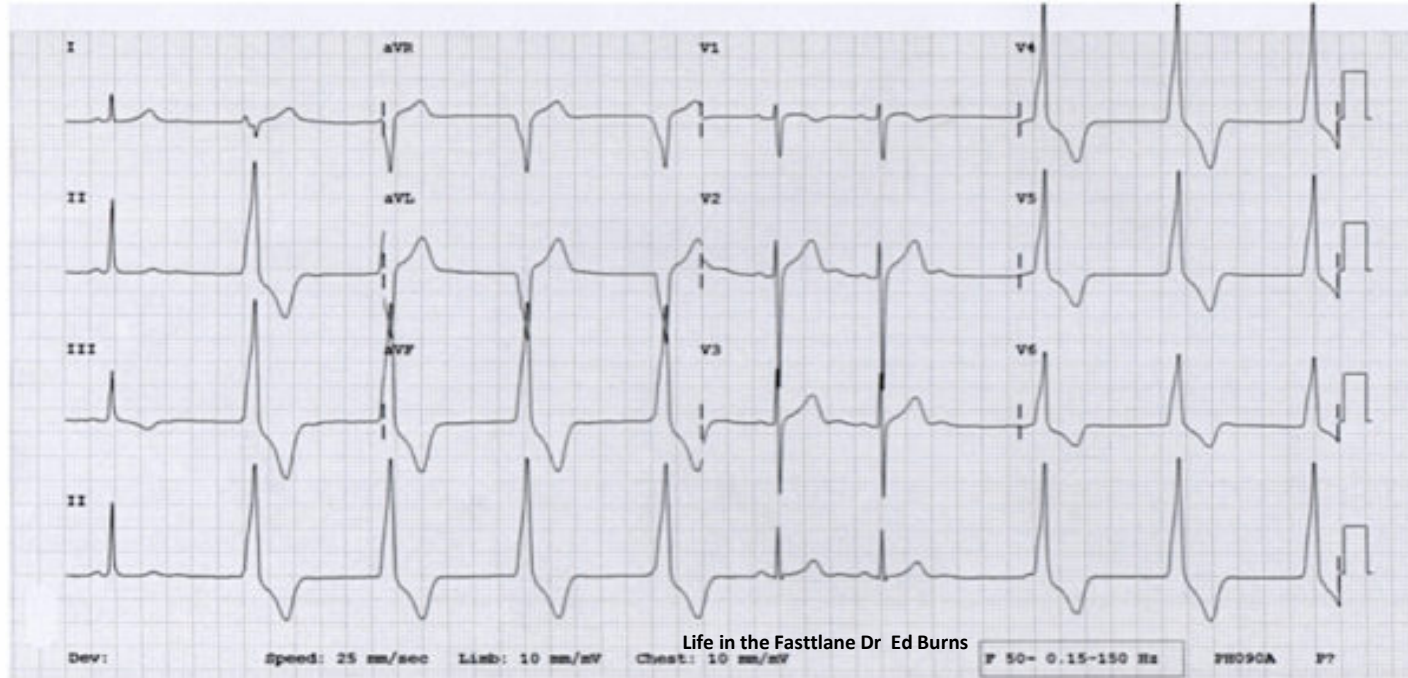


Rapid Fire ECG Challenge: Putting Your Interpretation Skills to the Test

Evert Torrejon , MD
Sociedad Peruana Cardiología
Presenter



Male 36 years old, athlete, with prior to start swimming, gastric discomfort



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Point to the Diagnostics:

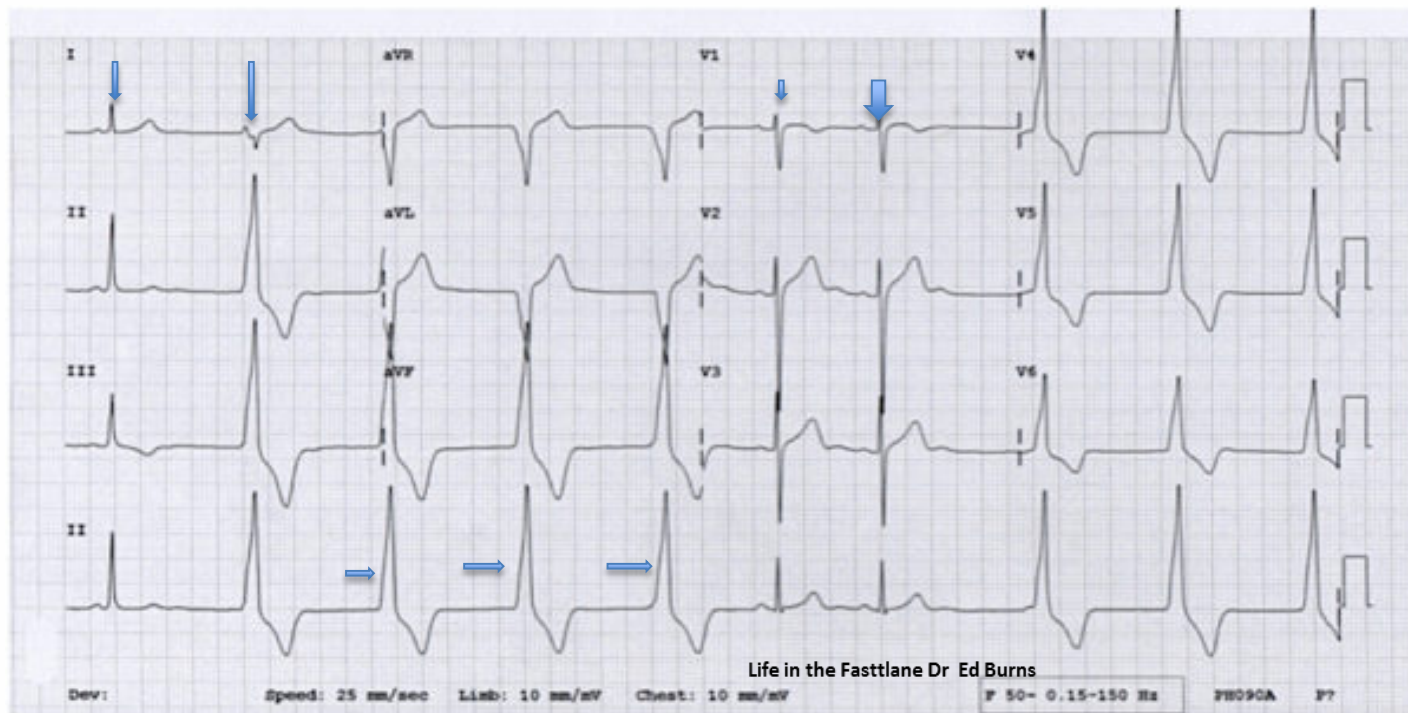
- Sinus bradycardia
- Sinus Arrhythmia
- ECG athlete
- Ventricular Tachycardia
- Accelerated idioventricular Rythm
- Junctional Escape Rhythm.



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Accelerated idioventricular
Rythm: 60 b.p.m

Sinus Arrhythmia

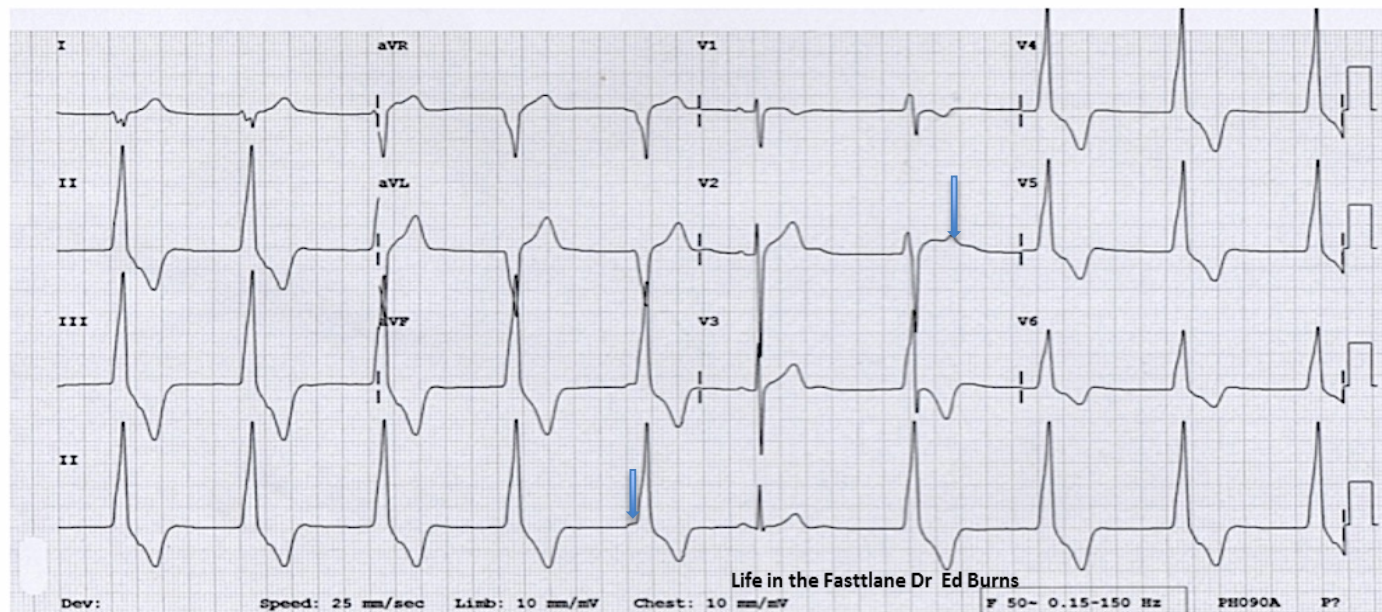
sinus capture



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isorhythmic A-V dissociation



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isorhythmic A-V dissociation:

- An ectopic ventricular rhythm that consists of three or more ventricular complexes that occur at a speed of 50-110 bpm.
- The frequency differentiates the AIVR from the ventricular escape rhythms (frequency <50 bpm) and TV (> 110 bpm).



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isorhythmic A-V dissociation

- AV dissociation with complexes of sinus and ventricular origin that occur at a similar frequency, unlike BAV III, where atrial fr is usually greater than ventricular.
- DAVI: due to functional block in the AV node due to retrograde ventricular conduction, leaving it refractory to anterograde impulses



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isorhythmic A-V dissociation: Mechanism

- Increased automaticity of ventricular ectopic pacemaker, associated with sinus bradycardia and sinus arrhythmia due to training in athletes (increased vagal tone and sympathetic decrease: hypervagotonic state)



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isorhythmic A-V dissociation : other causes

- During the reperfusion phase of an acute myocardial infarction
- Toxicity of medications, especially digoxin, cocaine and volatile anesthetics such as desflurane
- Electrolyte abnormalities
- Cardiomyopathy
- Congenital heart disease
- Myocarditis
- After the return of spontaneous circulation in the post-cardiac arrest period



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ECG athlete: anomalies due to autonomic conditioning:

- Sinus arrhythmia
- Sinus bradycardia
- Rhythms of articular or ventricular escape.
- AV Blocking I degree
- Wenckebach phenomenon
- Hypertrophy of the left ventricle on ECG
- Axis deviation
- Incomplete RBBB

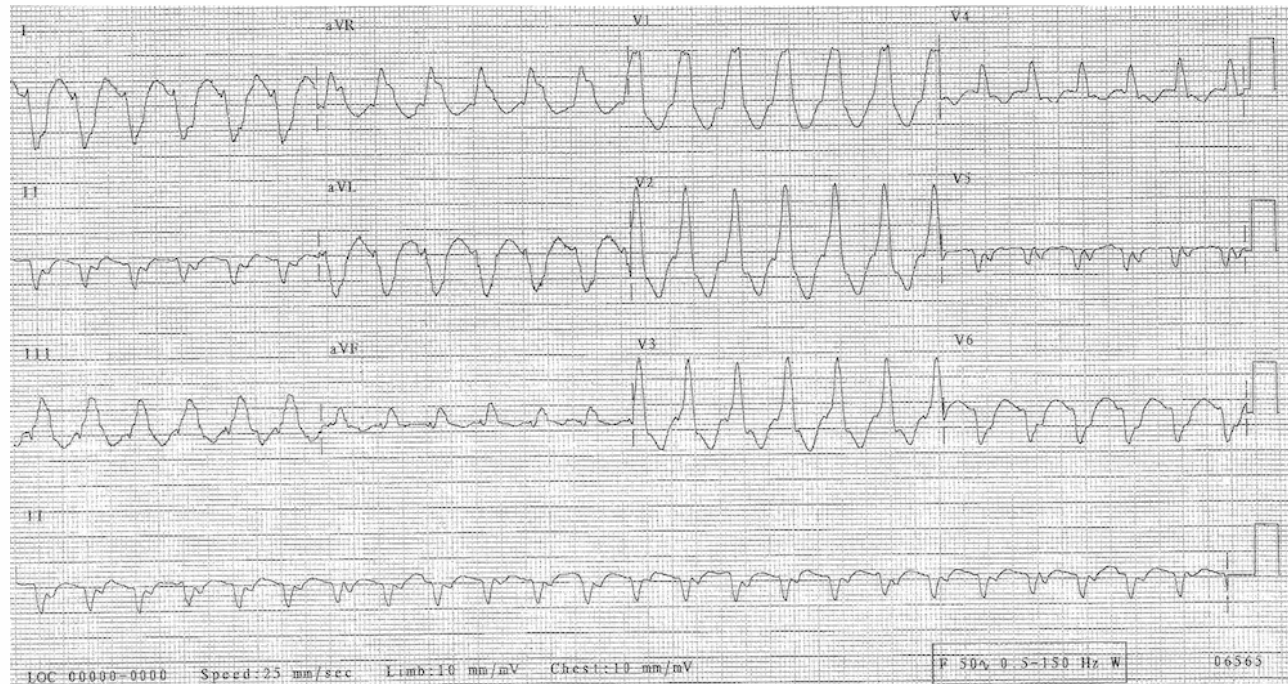


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A 70-year-old man with palpitations, dyspnea:



Fr 150
QRS 160
QRS EJE 130°



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Point correct diagnosis:

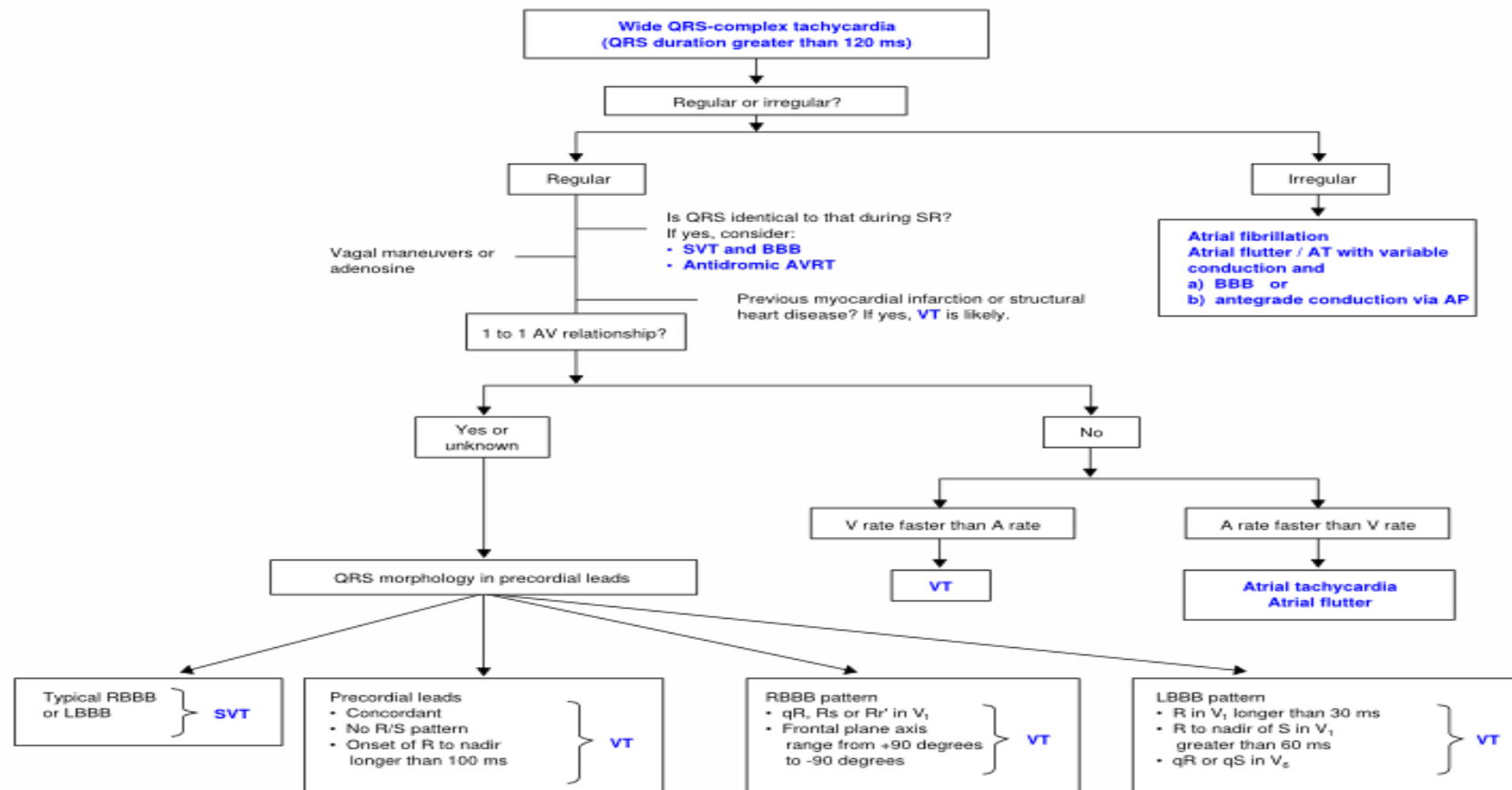
- Ventricular tachycardia
- SV tachycardia: intranodal reentry with aberrance
- AV reentrant tachycardia antidromic
- Tachycardia with pacemaker



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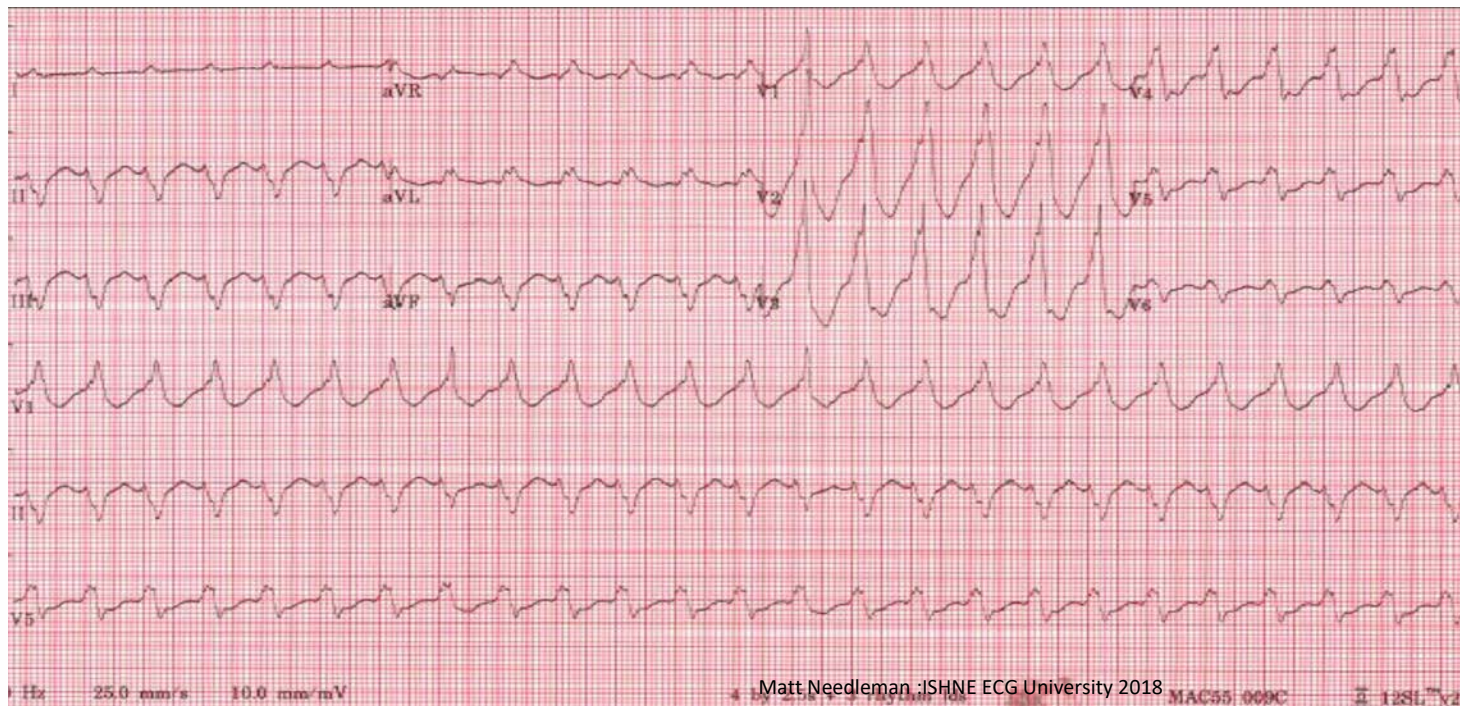


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68 years old woman with ischemic cardiomyopathy with CDI comes by fatigue and presyncope



Matt Needleman :ISHNE ECG University 2018



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What is your diagnosis?

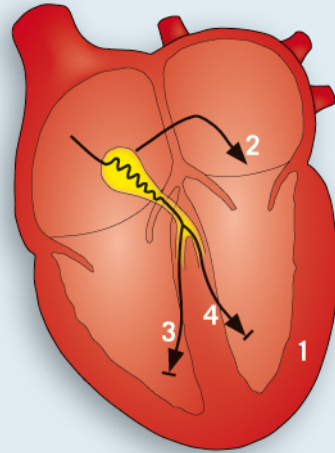
- 1. SVT with Right Bundle Branch Block
- 2. Atrioventricular reentrant antidromic tachycardia
- 3. Atrial Flutter with 2:1 AV Block and Bundle Branch Block
- 4. Ventricular tachycardia



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QRS ancho

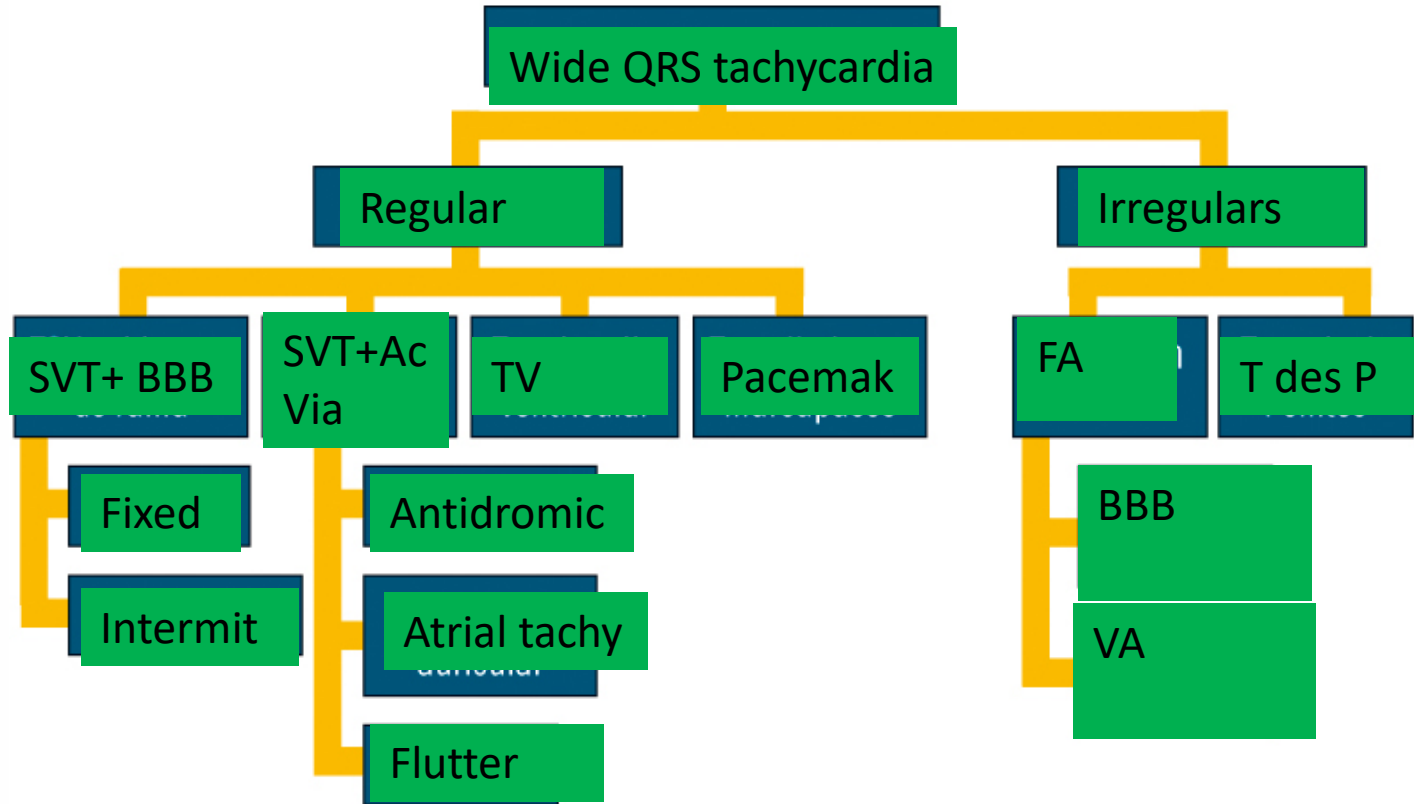
1. Origen ventricular
2. Vía accesoria auriculoventricular
3. Bloqueo de rama establecido
4. Bloqueo de rama funcional



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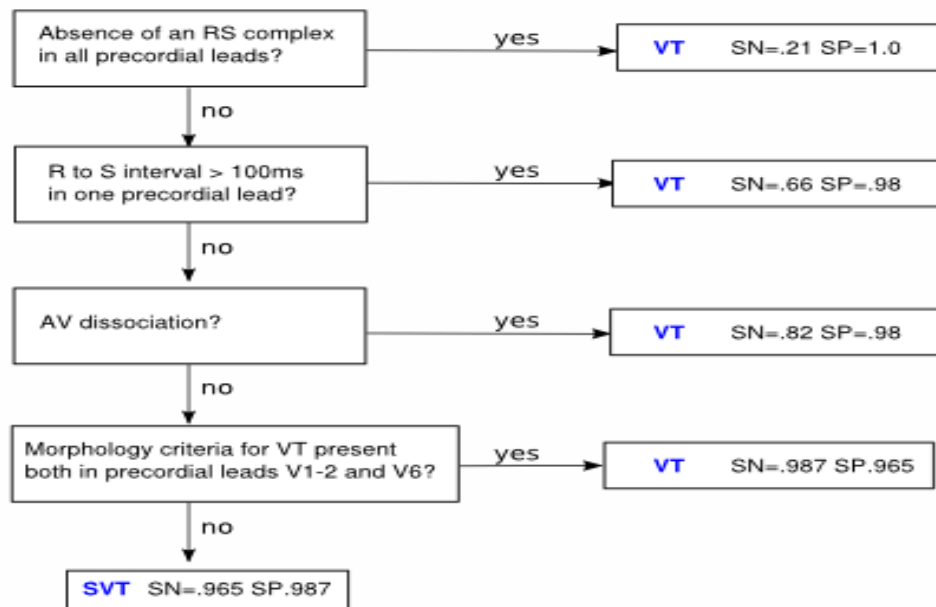


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Brugada Algorithm



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A

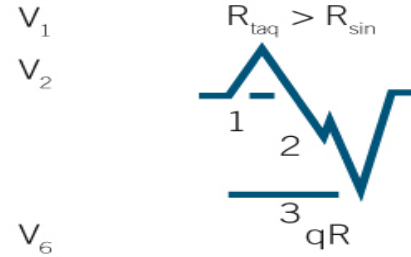
- ✓ Disociación auriculoventricular
- ✓ Duración del QRS >140 ms

- ✓ Fusiones/capturas
- ✓ Eje de QRS más a la izquierda de -30

Imagen de BRD



Imagen de BRI



B

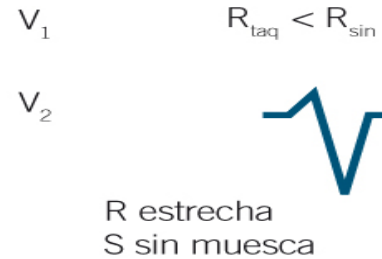
- ✓ Duración del QRS <140 ms

- ✓ Eje de QRS en rango normal

Imagen de BRD



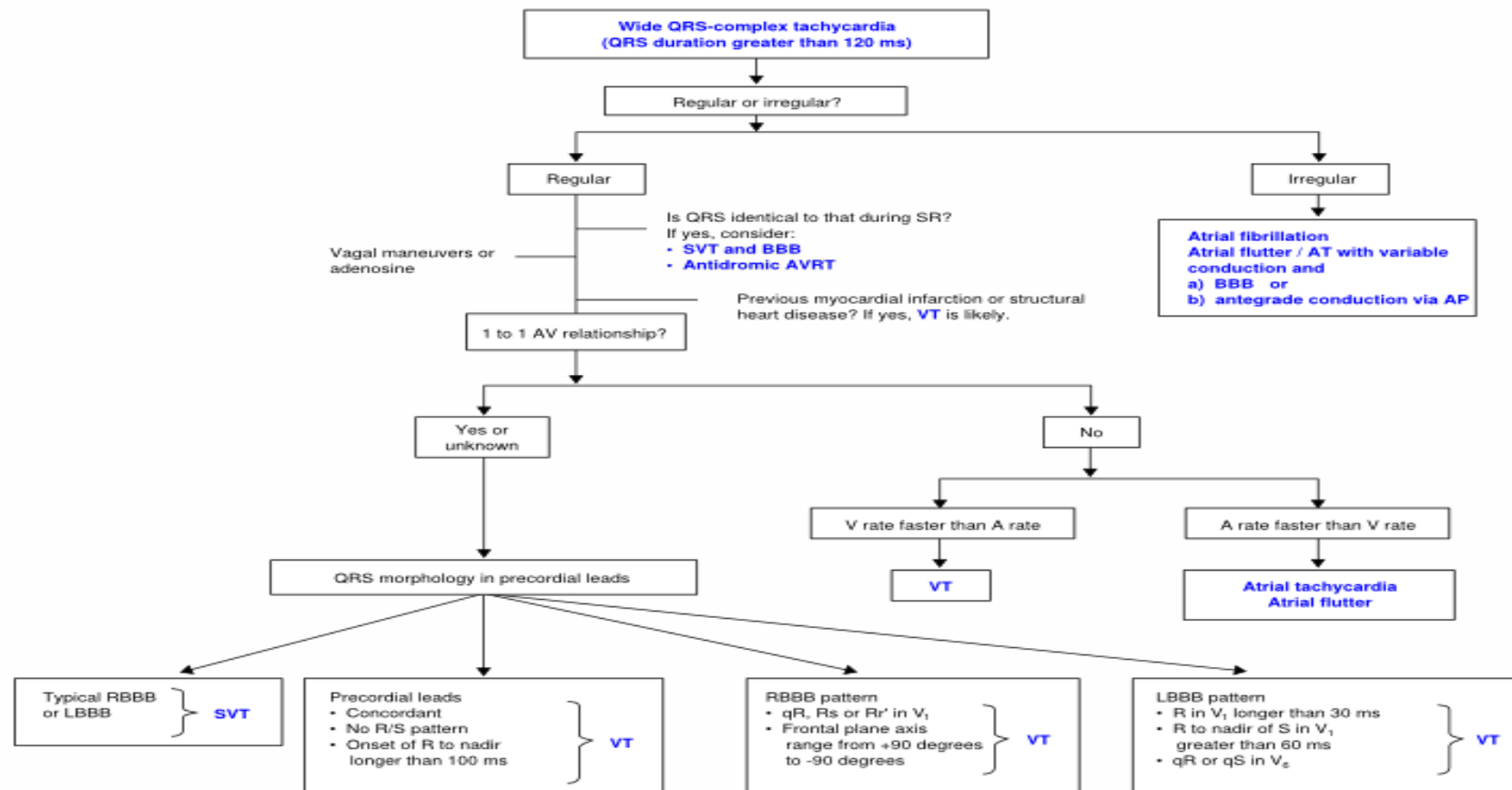
Imagen de BRI



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Vereckei Criteria for the Diagnosis of Ventricular Tachycardia

- If there is an initial R wave in aVR: It is a Ventricular Tachycardia. If not, move on to the next
- If the width of the Wave Q or of the initial R wave is greater than 40 msec (a small square): It is a Ventricular Tachycardia. If not, move on to the next
- If there are notches or notches in the initial descending portion of a predominantly negative QRS complex: It is a Ventricular Tachycardia. If not, move on to the next
- If V_i / V_t is less than 1: It is a Ventricular Tachycardia. If not, move on to the next
- If none of the previous statements are met: It is a Supraventricular Tachycardia.

Vereckei A, Duray G, Szenasi G, Altemose GT, Miller JM. New algorithm using only lead aVR for differential diagnosis of wide QRS complex tachycardia. Heart Rhythm. 2008



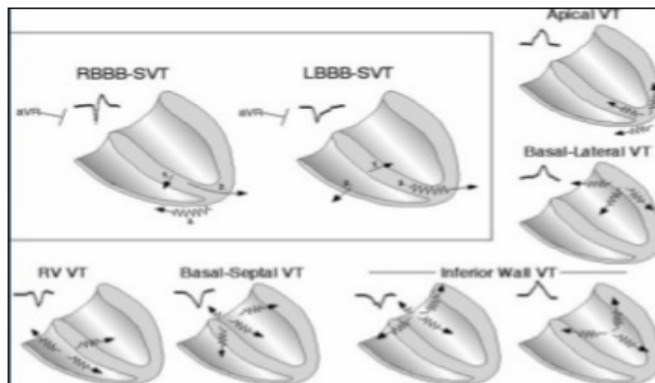
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Wide complex tachycardia

9.



aVR changes : Initial 'r' wave in aVR

During SVT with aberrancy , initial septal activation and main ventricular activation are directed away from lead aVR
→ negative QRS complex

Exceptions :

1. Inferior MI- initial r wave (rS complex) during NSR or SVT
2. VT originating from base of heart may not have initial r wave



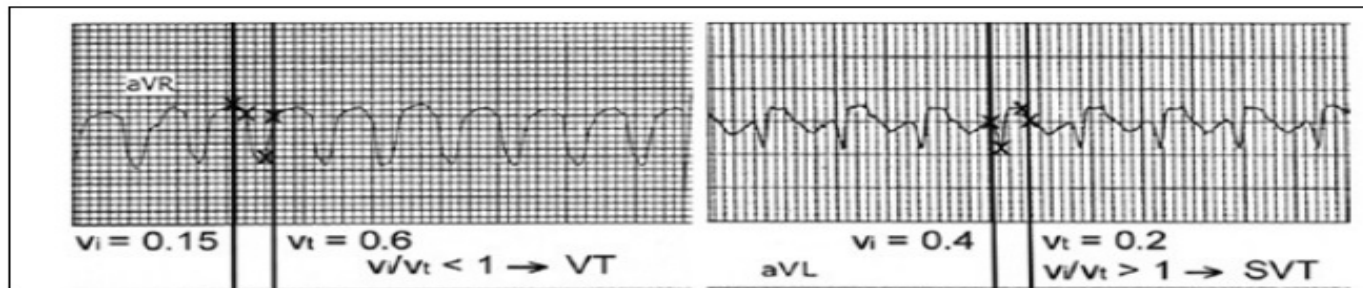
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Wide complex tachycardia

9. aVR changes : $V_i/V_t \leq 1$



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Other Ventricular Tachycardia Data

- Presence of beats with fusion and with capture
- Ventriculo / auricular ratio > 1 (more QRS than P waves)
- When they present Morphology of Right Branch Block, if QRS > 140 ms
- When they present Morphology of Left Branch Block, if QRS > 160 ms
- Cardiac axis between -90° and -180° (extreme deviation)

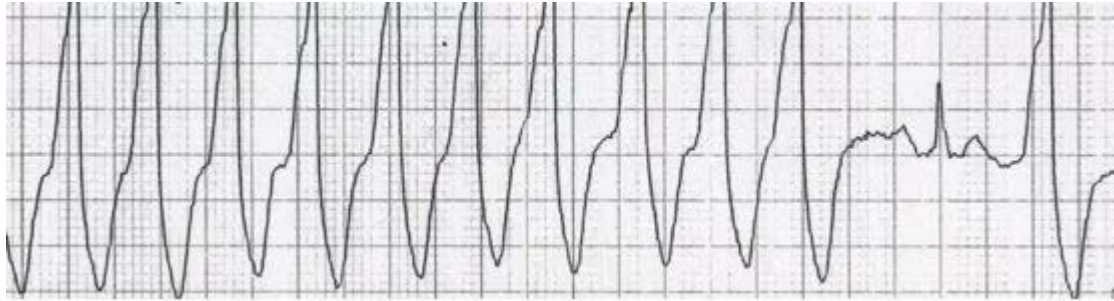


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Capture



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Fusion

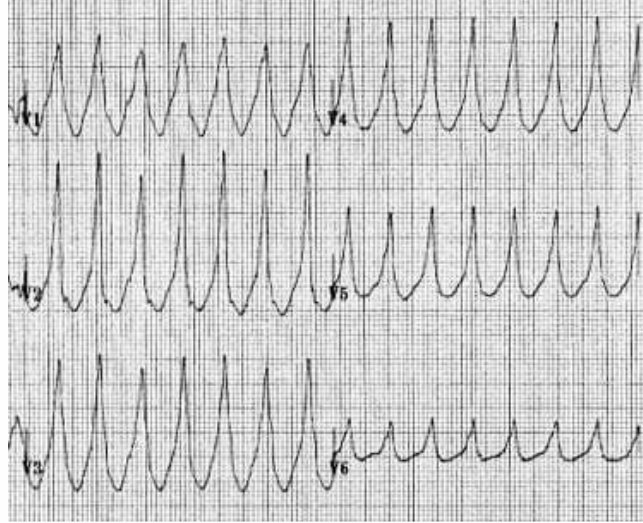


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Positive Concordance

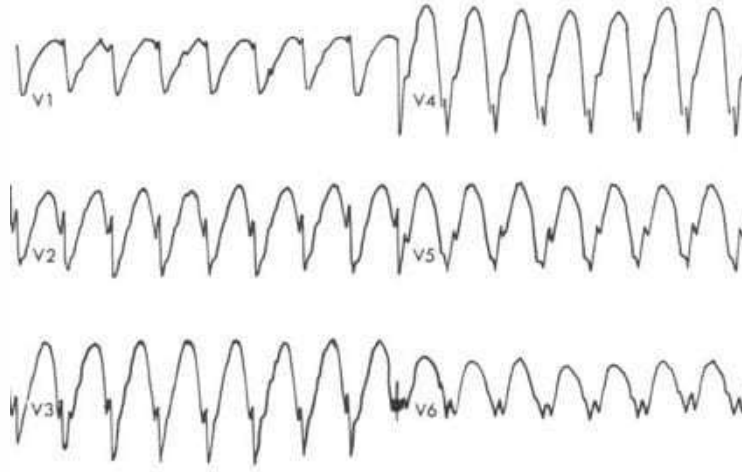


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Negative Concordance

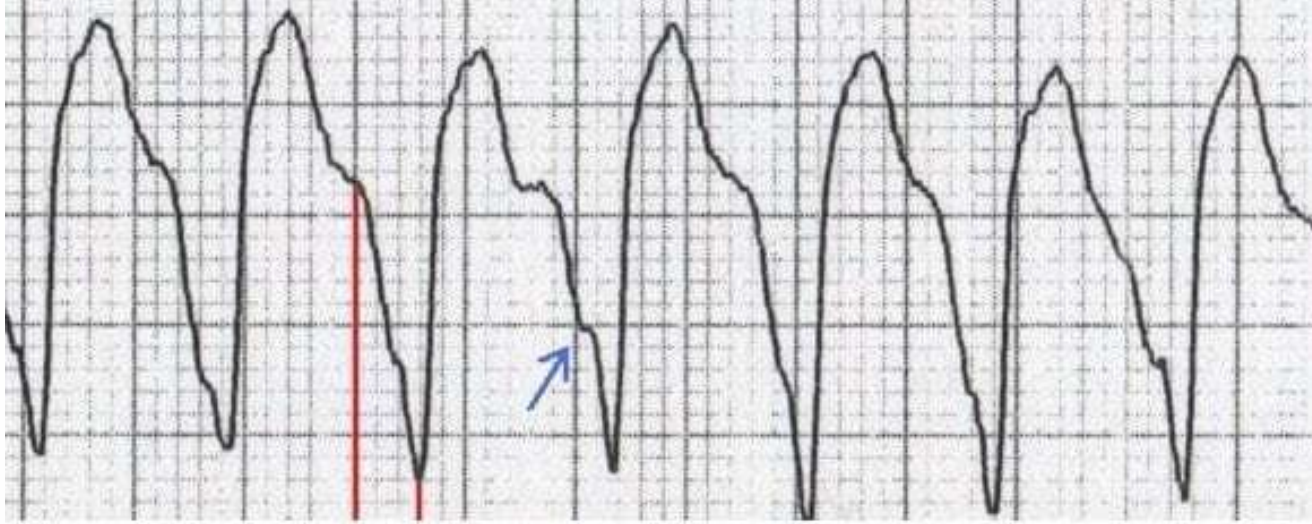


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Brugada sign (red tweezers) and Josephson's sign (blue arrow)

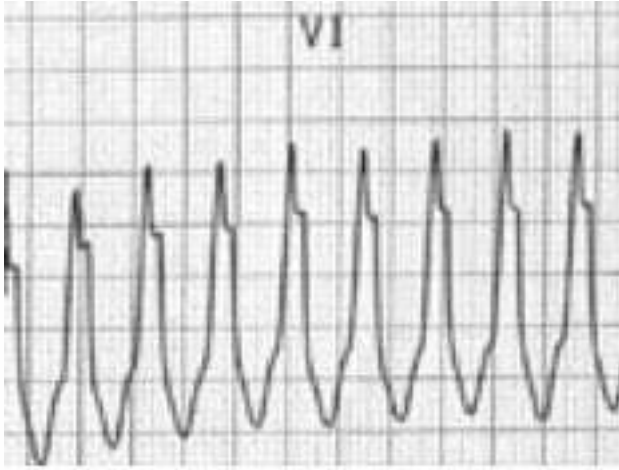


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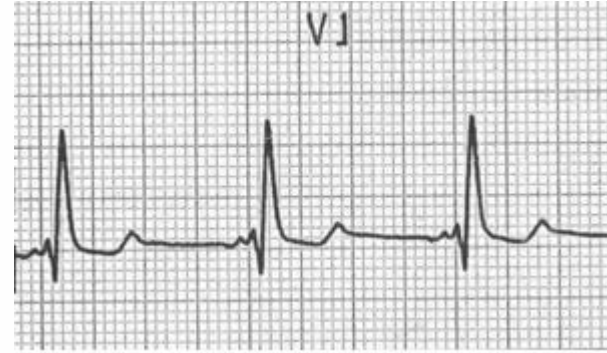
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TV criteria if it presents a picture of Right Branch Block in V1



Rabbit ear higher left (RSr) on TV



Right rabbit ear higher (SNR) in RBB

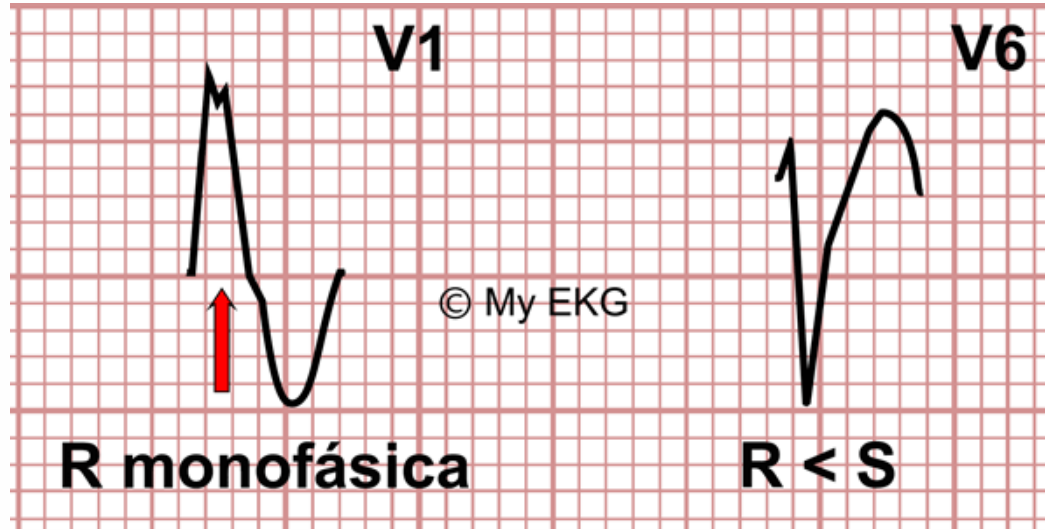


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TV criteria if it presents a picture of Right Branch Block in V1



- In **V1**: Wide R wave only or with recesses, or Wave R greater than R ' '
- In **V6**: Wave R less than Wave S

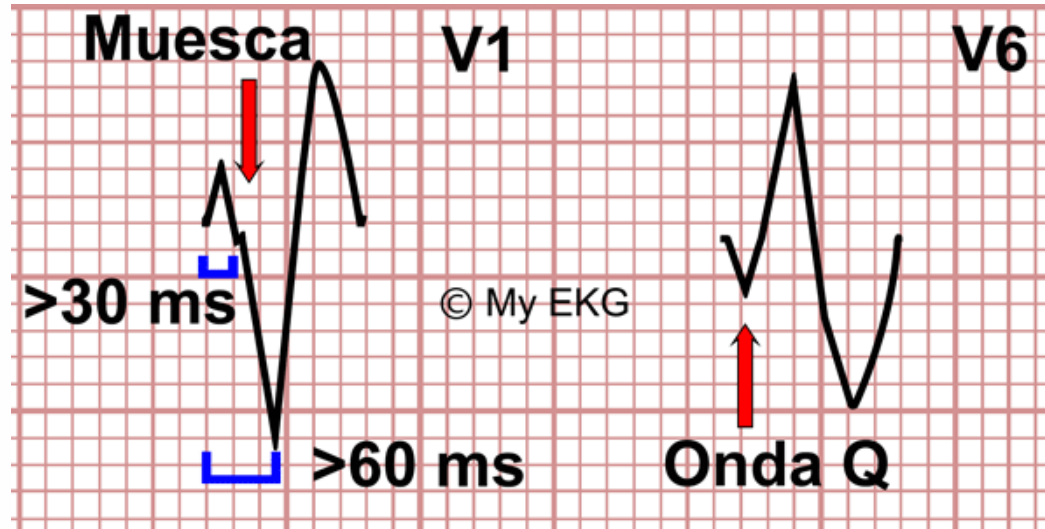


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Criteria TV if you have left bundle branch block pattern in V1



- **In V1:** initial and wide r wave (> 30 msec), S wave in its descending portion and duration from the beginning of the QRS to the deepest point of the S wave greater than 60 ms.
- **In V6:** Presence of initial Q wave (qR) or QS morphology.

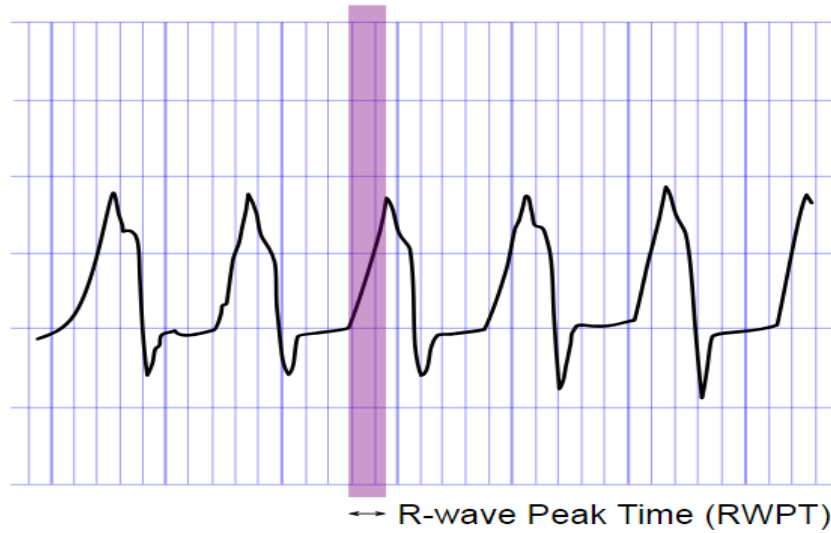


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Lead II



$RWPT \geq 50ms \rightarrow VT$

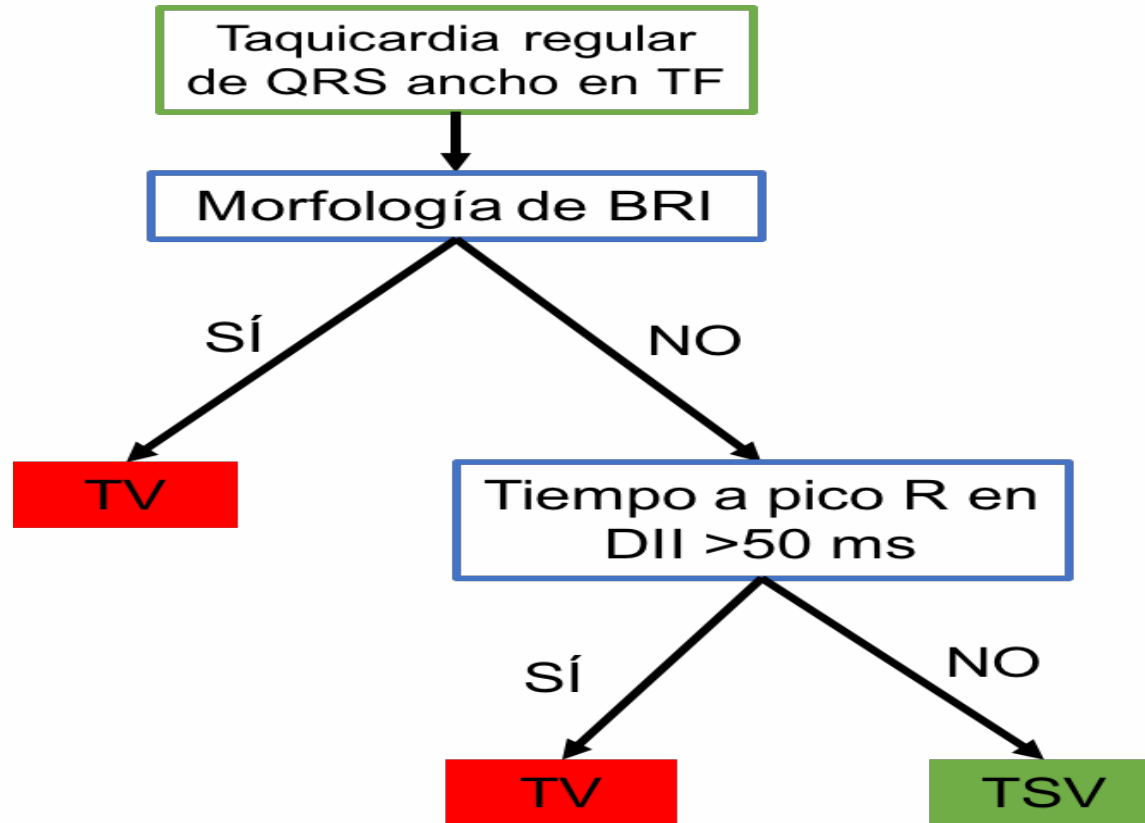
Pava et al Heart Rythm 2010 July 7(7) 922:-6



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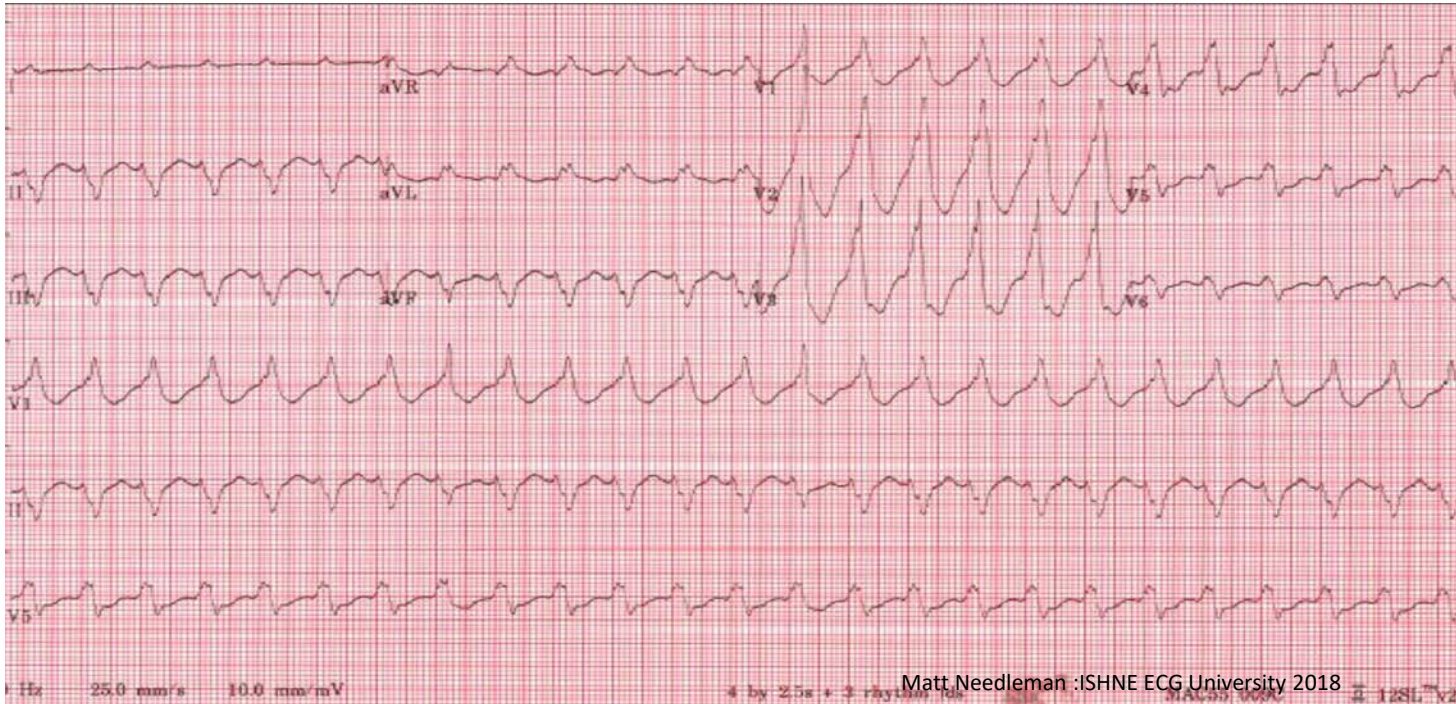


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Woman 68 years old with ischemic cardiomyopathy with CDI comes by fatigue and presyncope



- EjeQRS -90° ,
- QRS 160 msec,
- Max peak QRS in second 50% of RR,
- concordance only up to V5

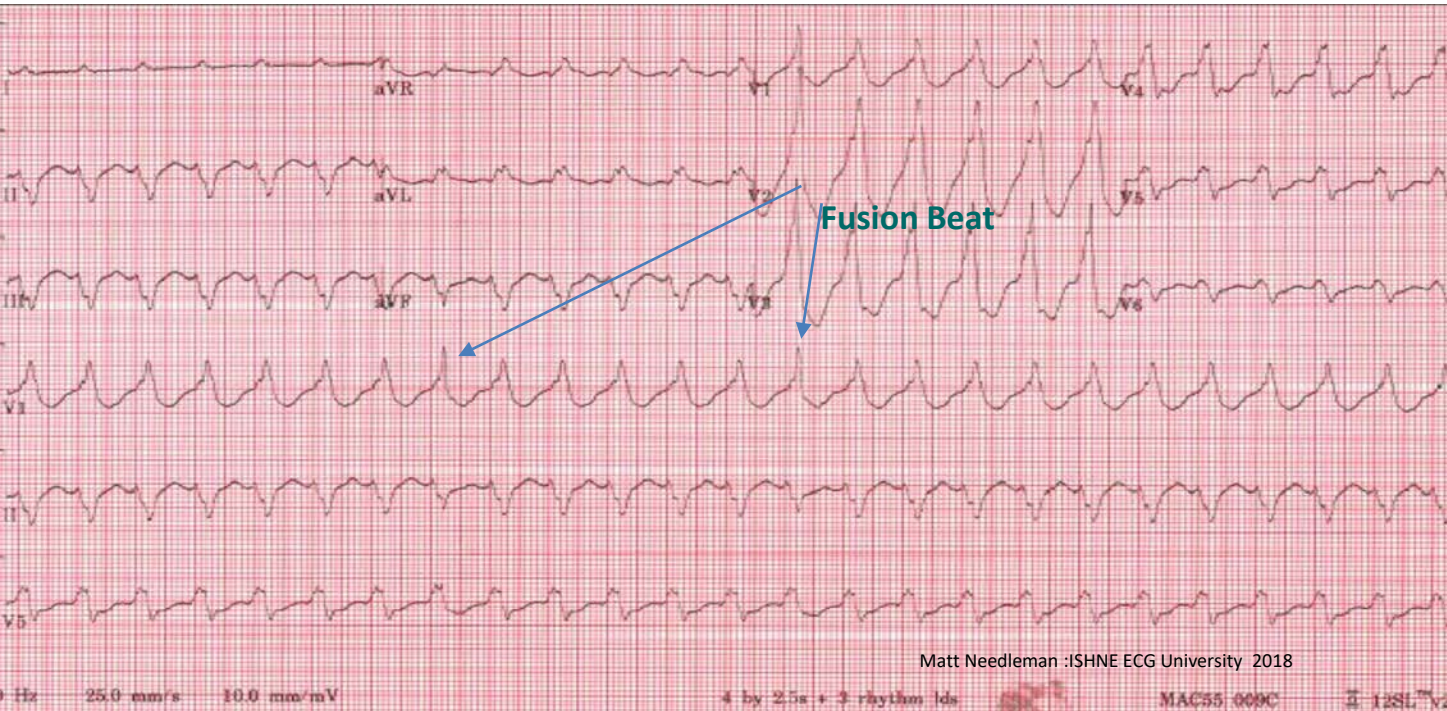
Matt Needleman :ISHNE ECG University 2018

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Woman 68 years old with ischemic cardiomyopathy with CDI comes by fatigue and presyncope



EjeQRS -90° ,
-QRS 160 msec,
-Max peak QRS
in second 50%
of RR,
-concordance
only up to V5

Fusion Beat

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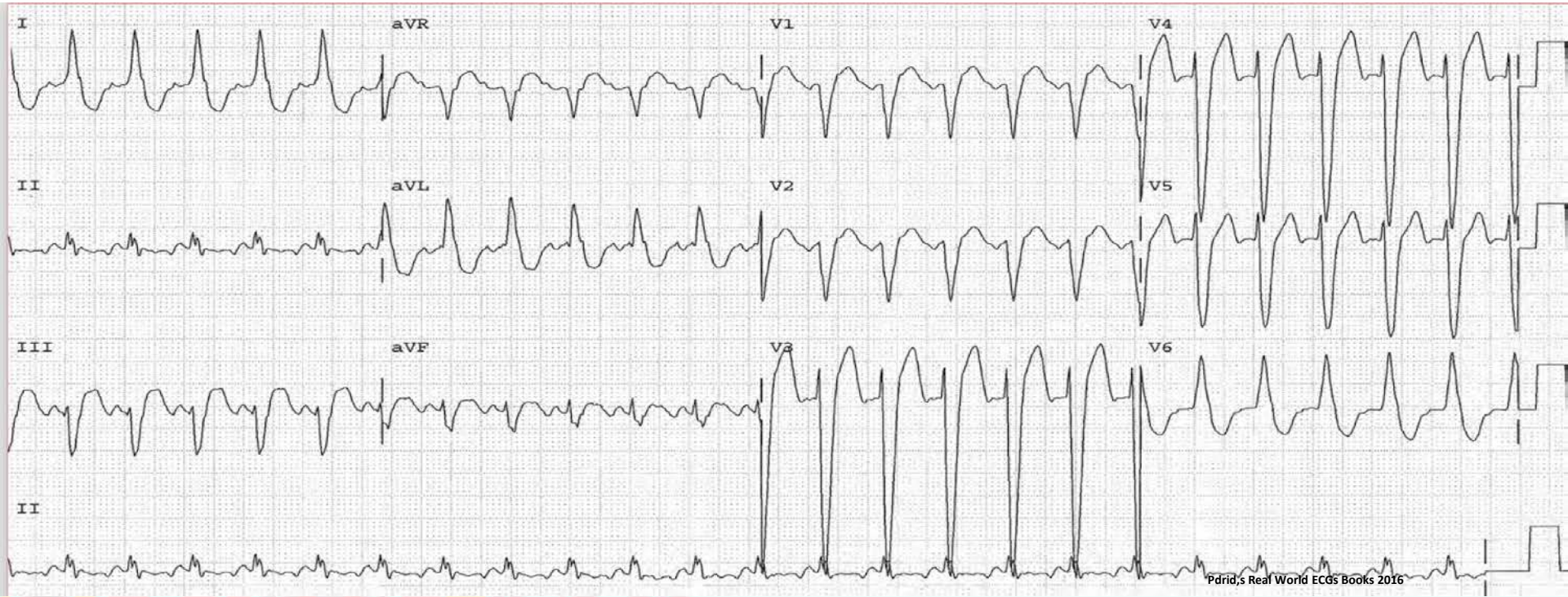


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Male, 49 years of age. myocardial infarction history, goes by shortness of breath and palpitations.



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What is your diagnosis?

- 1.- Sinusal tachycardia with left bundle branch block
- 2.- AV antidromic reentrant tachycardia
- 3.- Atrial flutter with AV block 2/1, LBBB
- 4.- Ventricular tachycardia

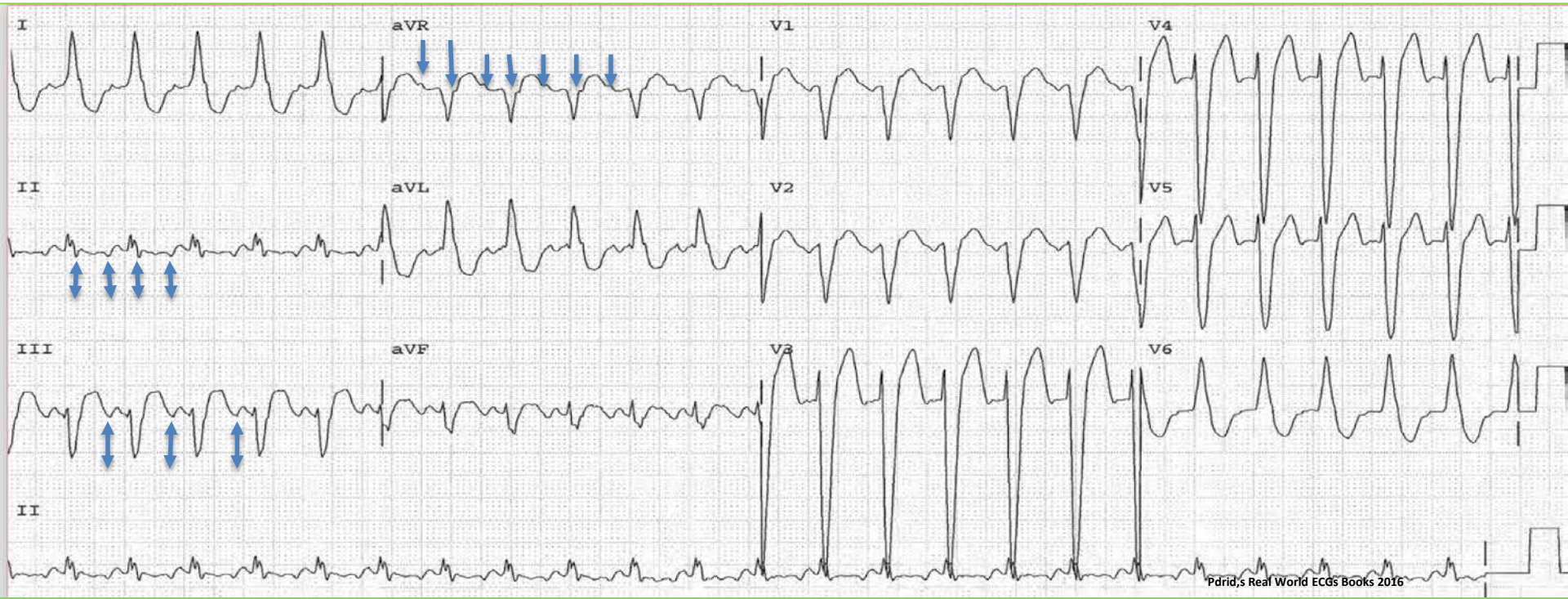


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Male, 49 years of age. myocardial infarction history, goes by shortness of breath and palpitations.

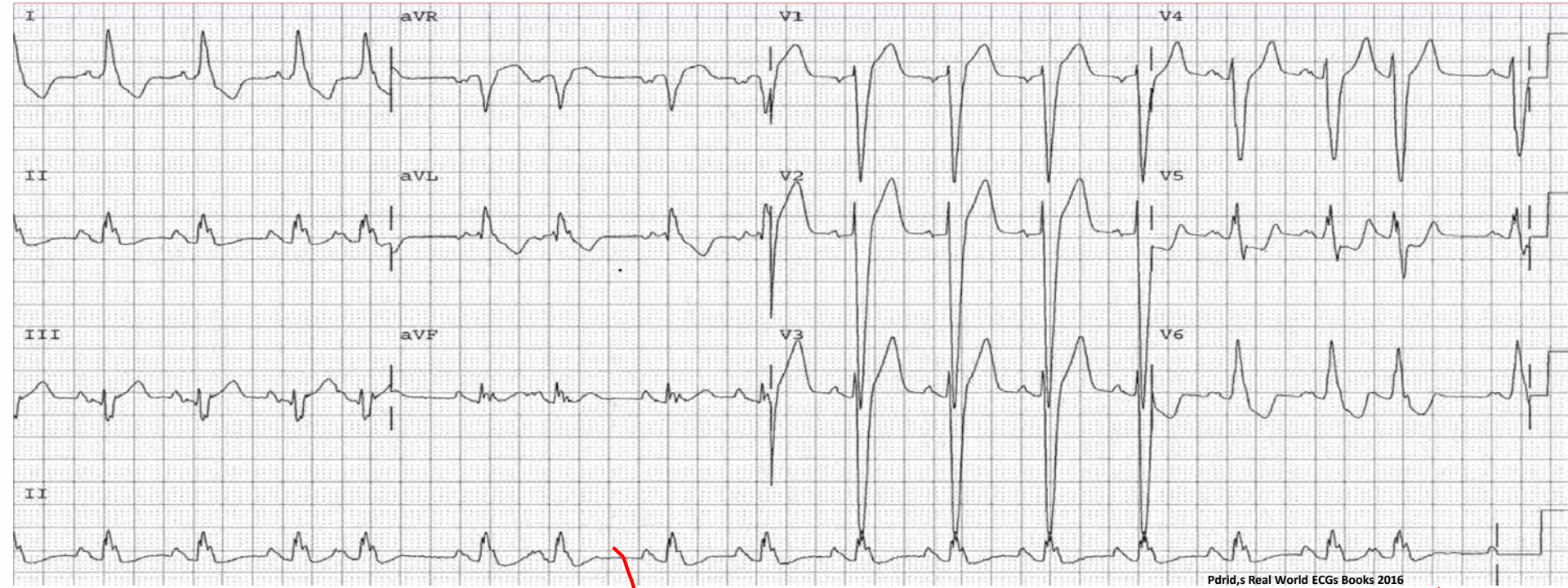


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Electrocardiogram after treatment

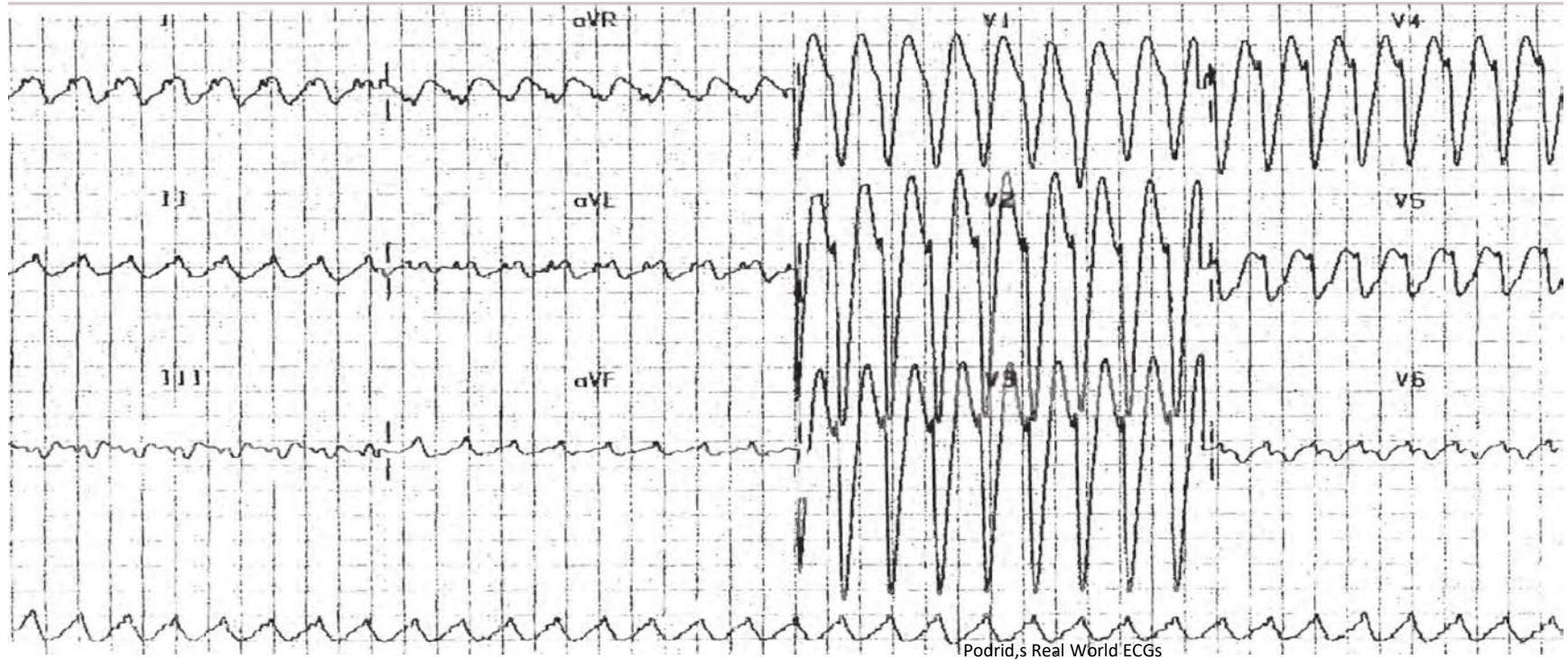


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Female 71 years old: Sudden shortness of breath and dizzy: first ECG



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What are possible diagnoses?

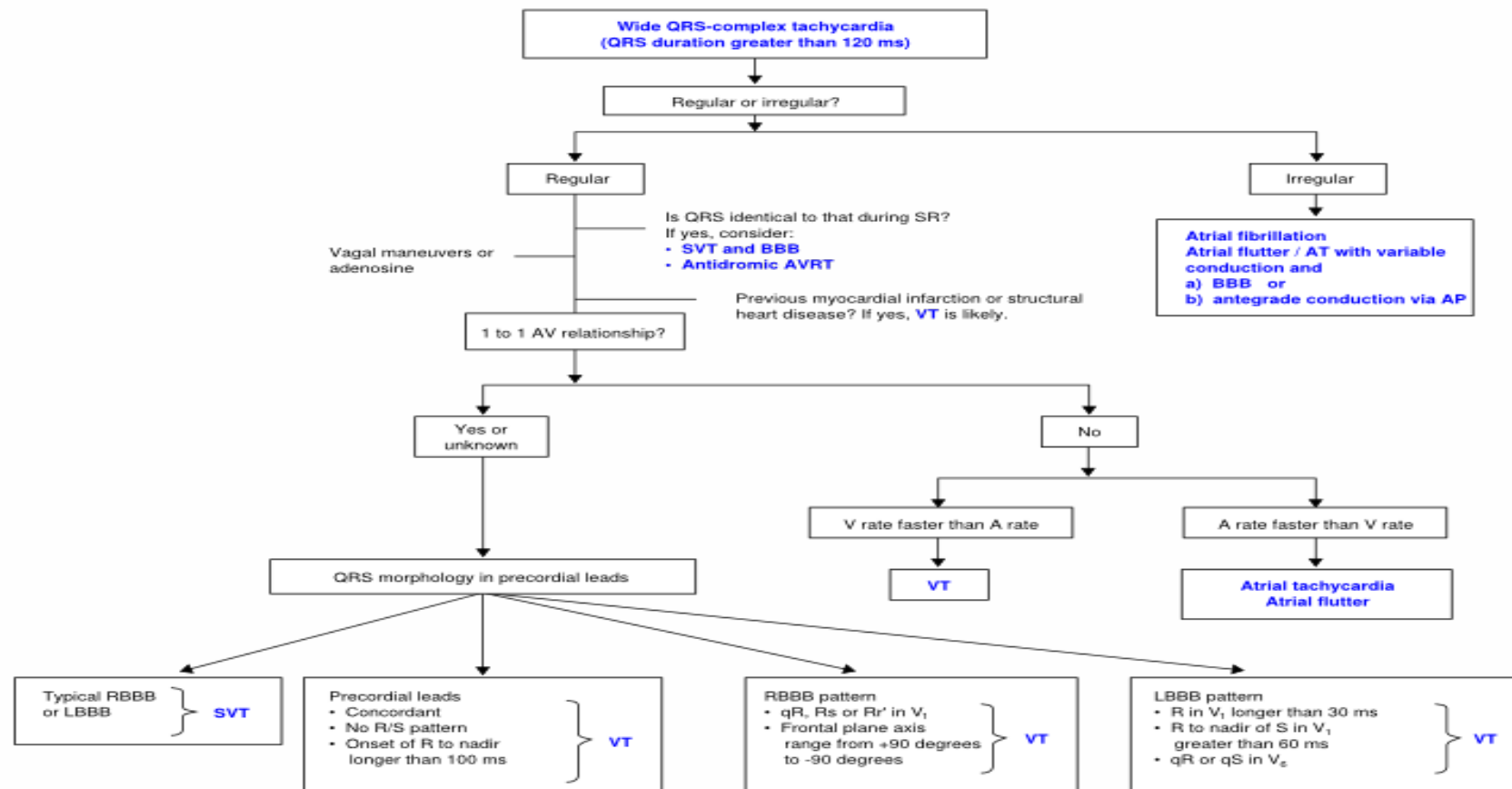
- 1.) Ventricular Tachycardia: Flutter V
- 2.) AV reentry tachycardia antidromic
- 3.) Sinus Tachycardia with Left Branch Block
- 4.) Atrial tachycardia with aberrance
- 6.) Tachycardia Atrial Flutter 1: 1 conduction



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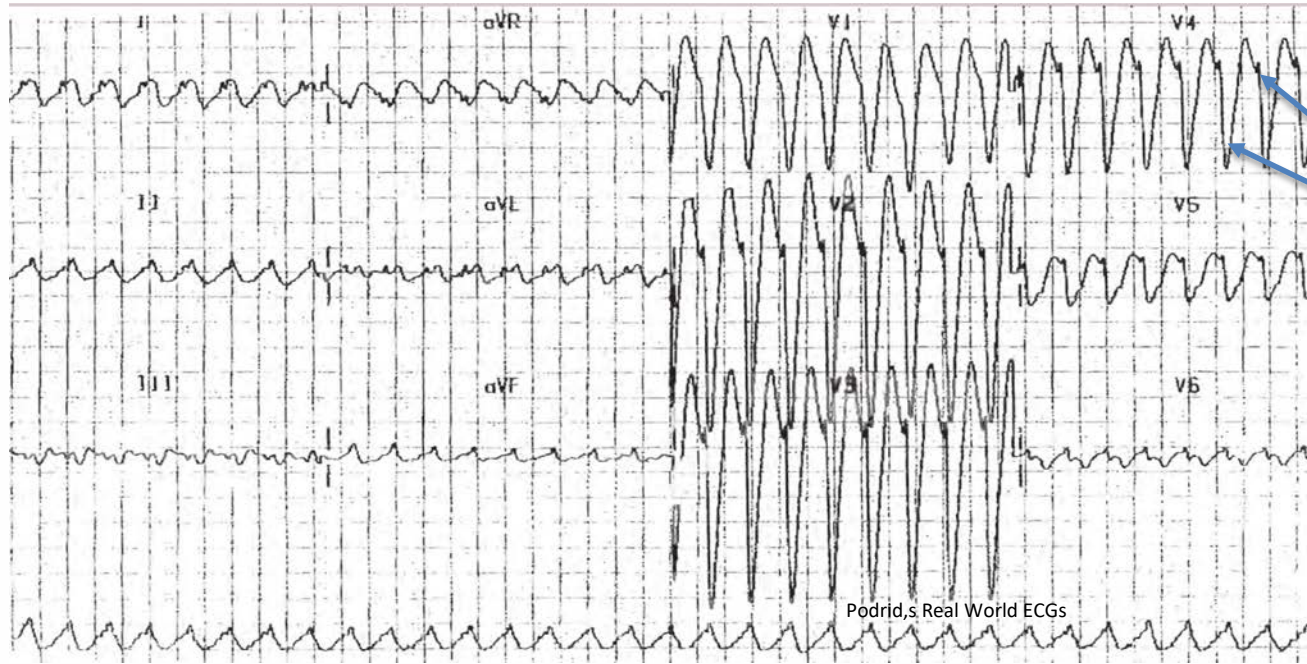


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Female 71 years old: Sudden shortness of breath and dizzy: first ECG



- Regular rhythm at 250 x min
- QRS: 0.16 sec Typical LBBB.
- For frequency atrial Flutter with 1:1 conduction vs ventricular flutter
- Wave R is narrower (<0.08 msec) than the S wave in V2 to V4: consistent with SV rhythm with aberration of the Left Branch because the initial forces are normal, while the terminal portions, which is the aberrated part responsible for the spreading of the QRS, for example a branch block.

**Dg: atrial Flutter with LBBB
conduction 1:1**



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ECG , A few minutes in Emergency:



**Regular rhythm 125 lpm
without LBB
QRS 0.08 sec**

**Atrial activity: 250 bpm with
continuous flutter undulation**

**V4 to V6 transient conduction
one to one with LBB**



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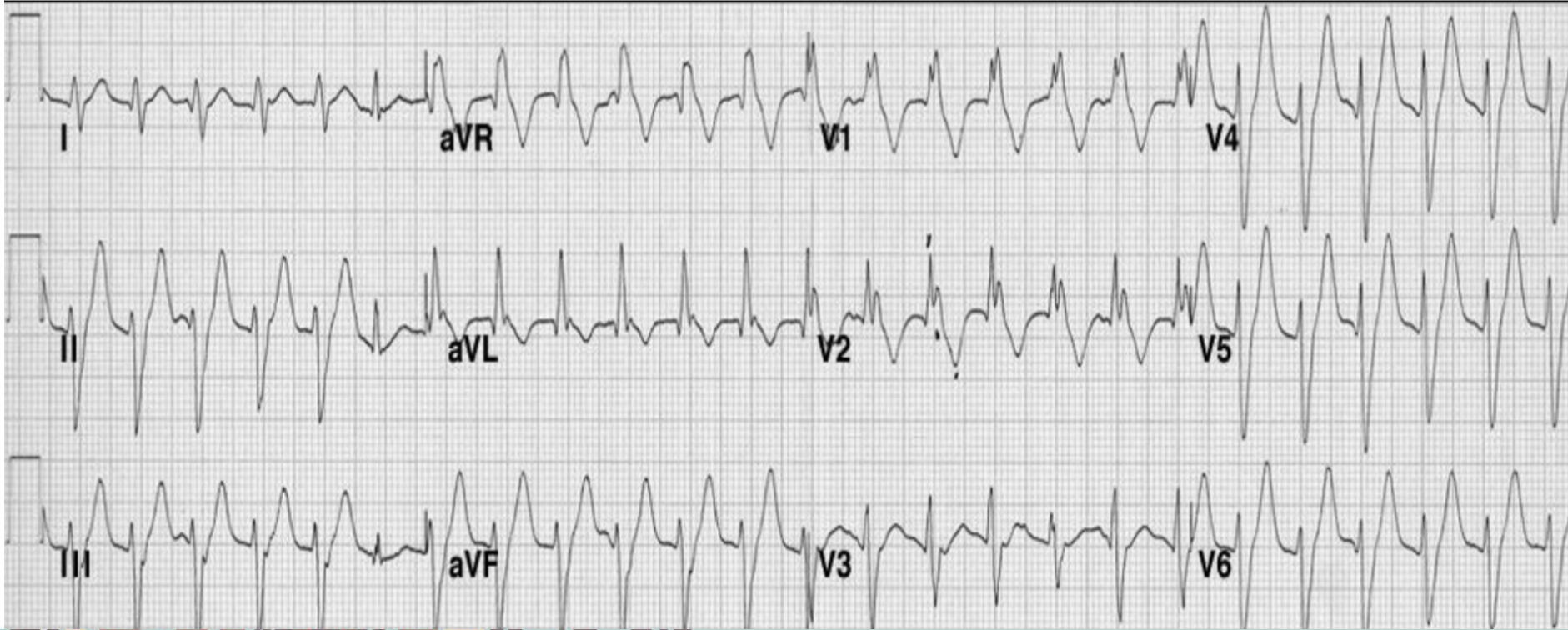


Rapid Fire ECG Challenge: Putting Your Interpretation Skills to the Test

Evert Torrejon , MD
Sociedad Peruana Cardiología
Presenter



48 year old woman with palpitations



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What is your diagnosis ?:

- 1.-Sinus tachycardia with branch block
- 2.-Atrial tachycardia with aberrance
- 3.-Ventricular tachycardia left posterior fascicle
- 4.-SV tachycardia with bifascicular block RBB + LAFB

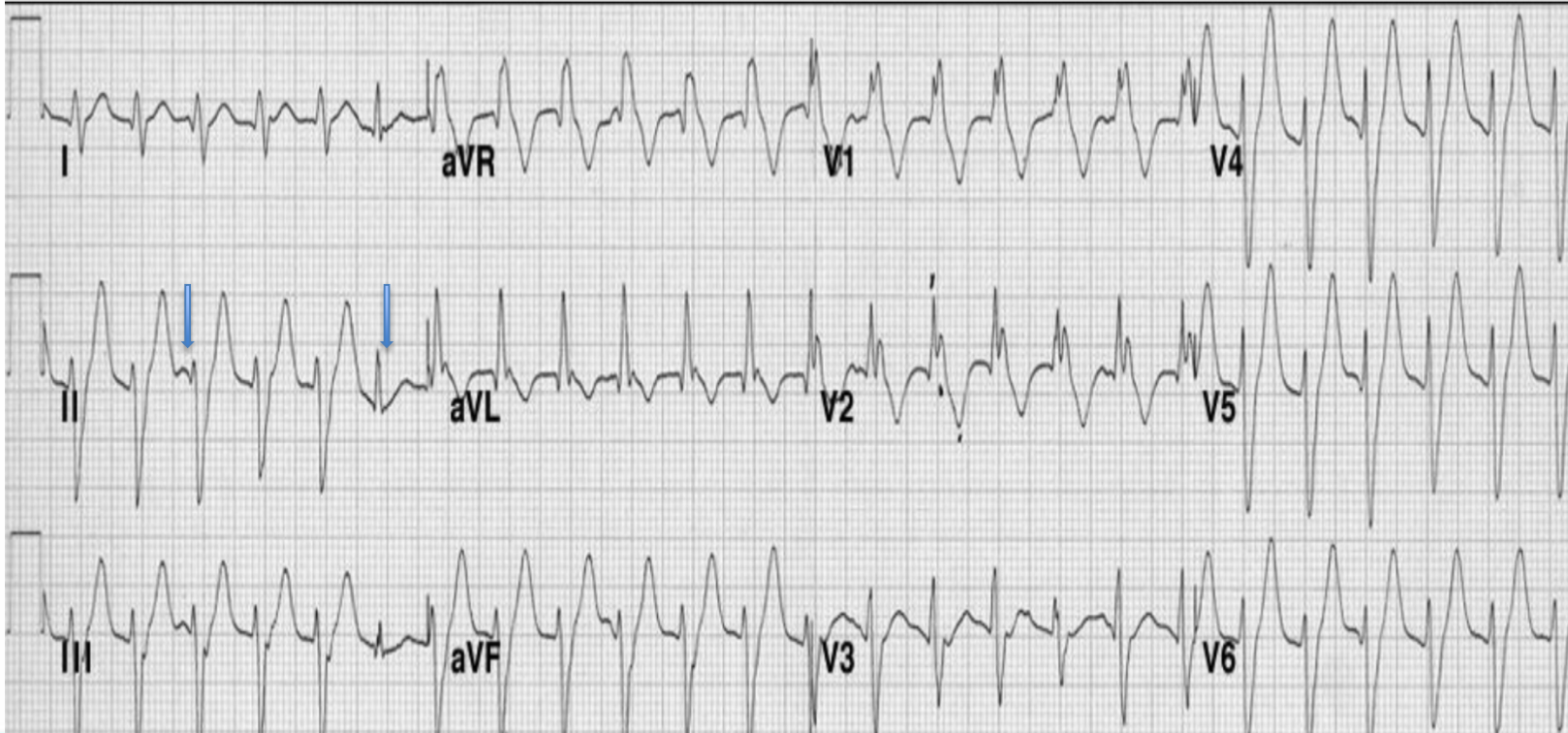


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48 year old woman with palpitations



QRS 120
Morfología
BRD:RSR' en
V1
Eje -90°
Captura
Ondas P
disociadas en II

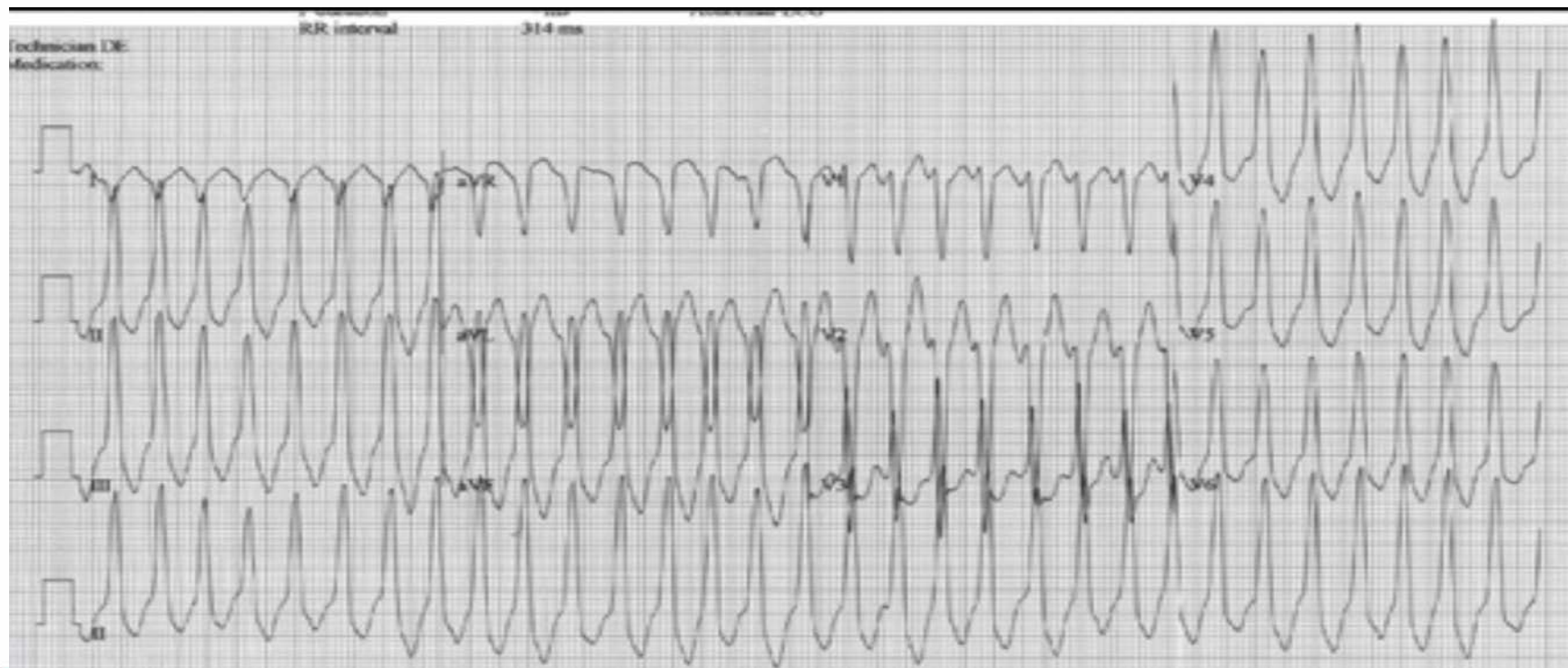


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Male 27 years: palpitations, pre-syncope, normal ECG, negative troponins and during stress test is observed:

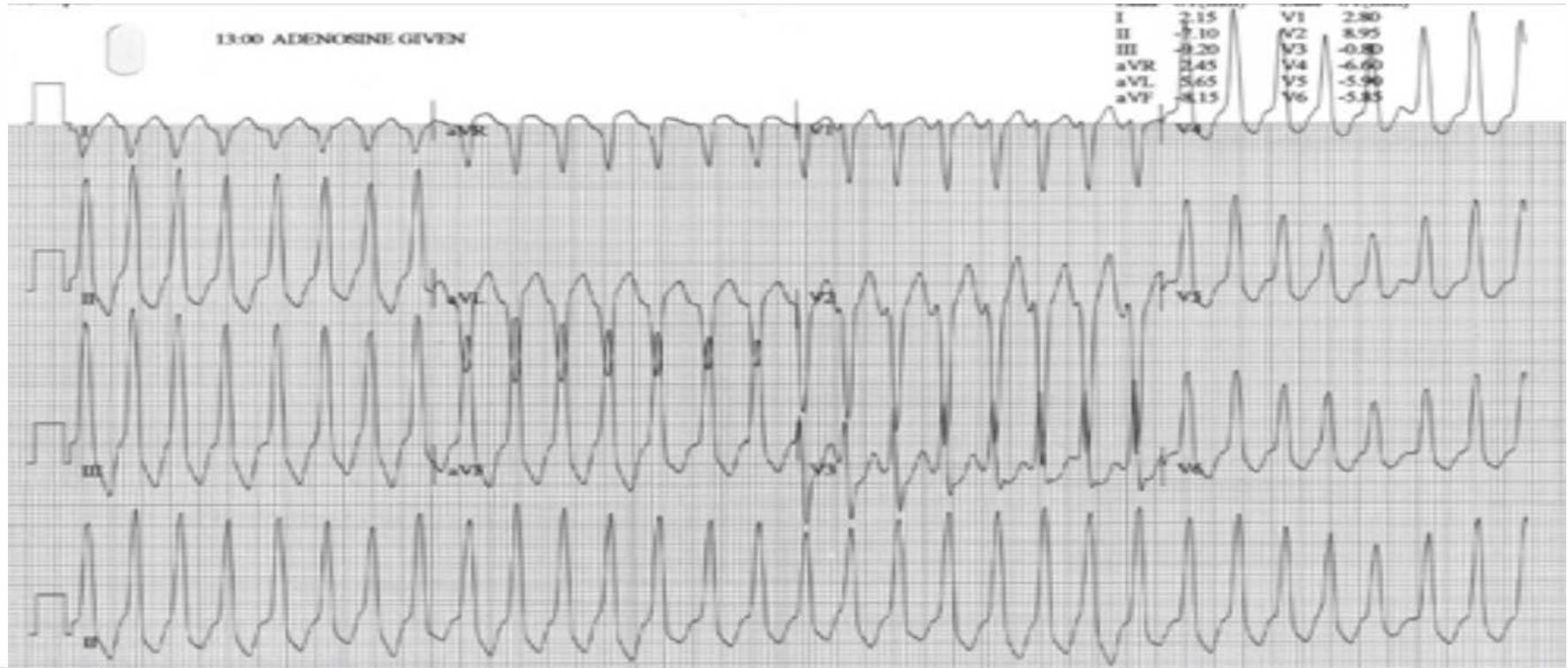


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After endovenous BB:



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What is your diagnosis?

- Sinus tachycardia with aberrance
- Atrial Tachycardia with Left Branch Block
- Antidromic AV reentrant tachycardia
- Ventricular tachycardia
- Atrial fibrillation with blocking Left Branch

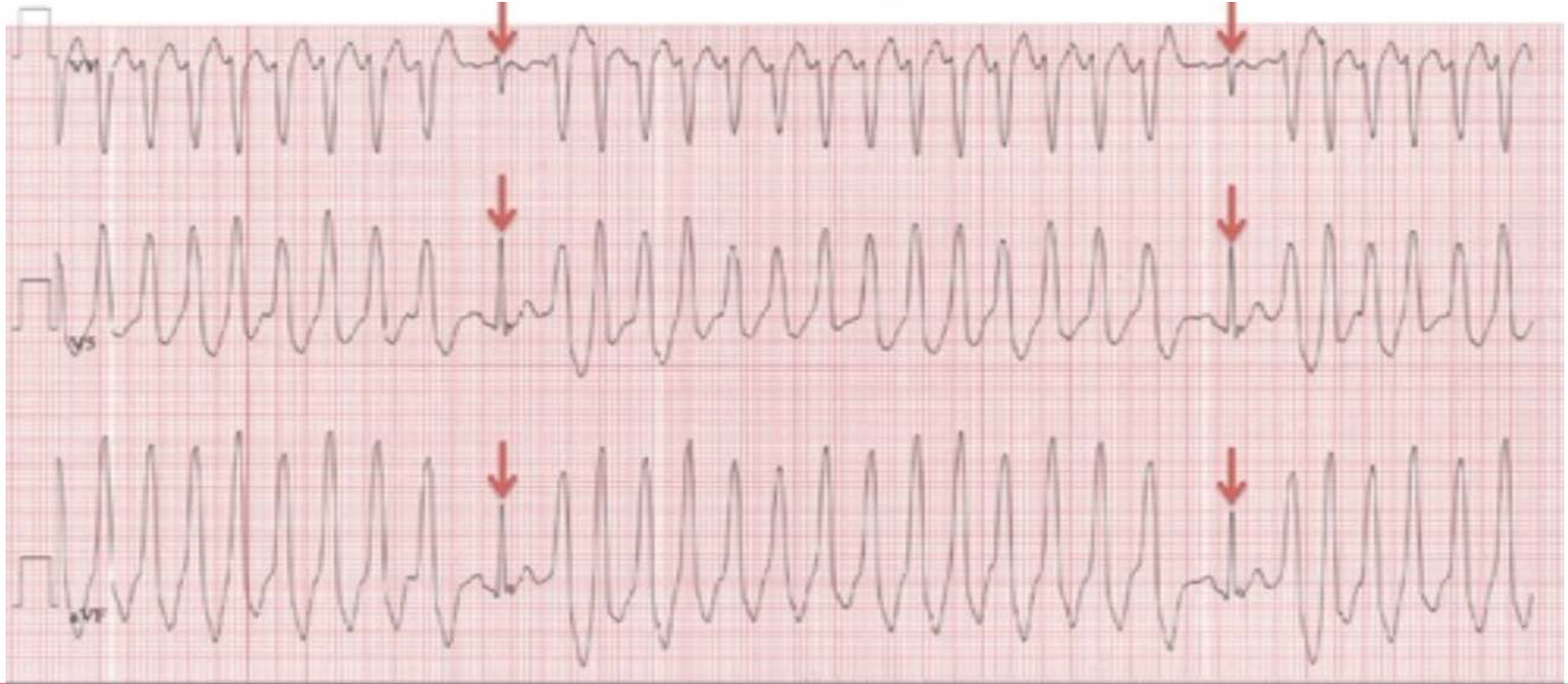


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Male 27 years: palpitations, pre-syncope, normal ECG, negative troponins and during stress test is observed:



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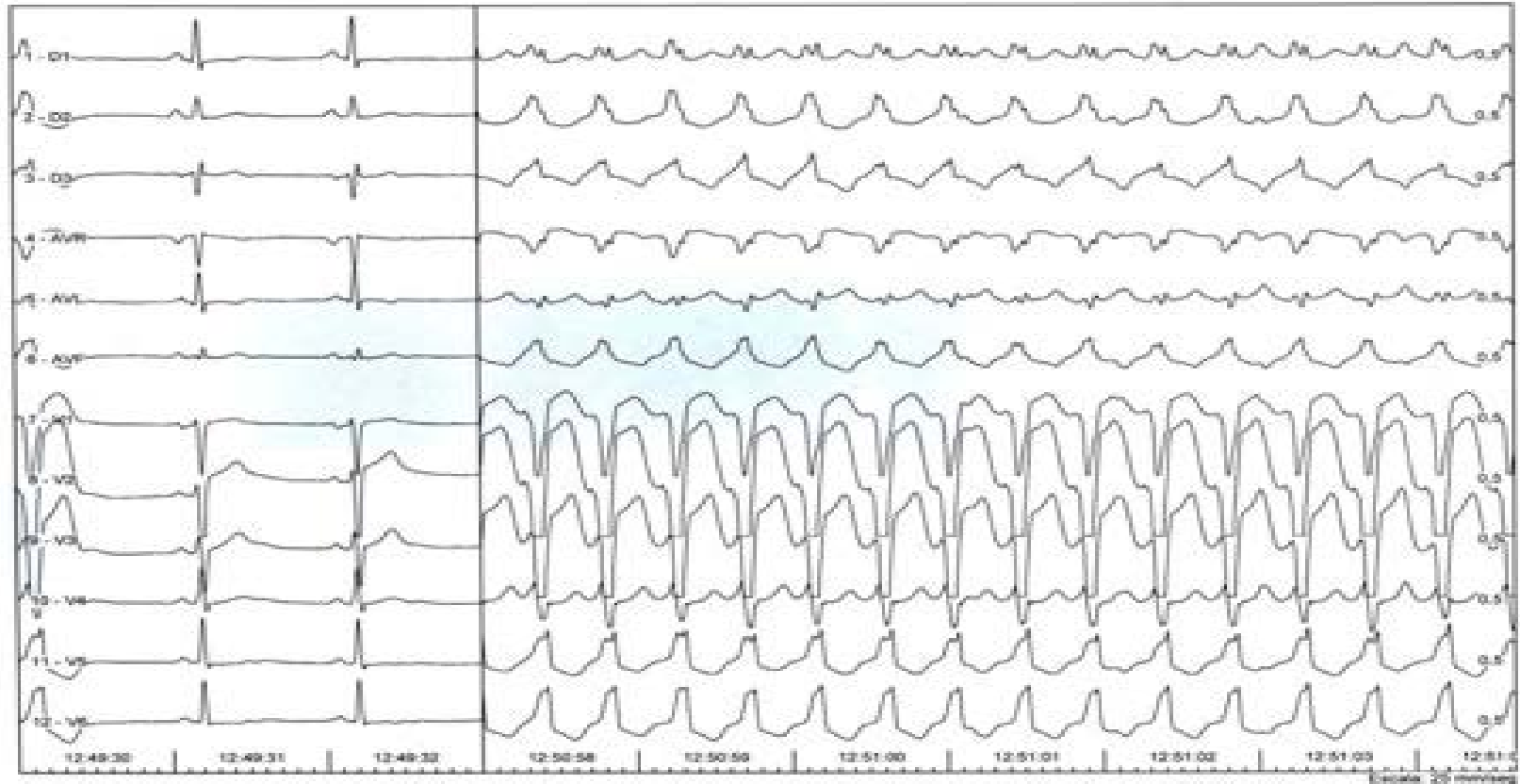
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No pre-excitation, conclusion: TV tract output VD, "malignant"



Male, 22 years old, consulted for presyncope preceded by rapid palpitations



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What is your diagnosis?

- Sinus tachycardia with aberrance
- Atrial Tachycardia with Left Branch Block
- Antidromic AV reentrant tachycardia
- Ventricular tachycardia origin tract output Right Ventricle
- Atrial fibrillation with LBB



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Male, 22 years old, consulted for presyncope preceded by rapid palpitations

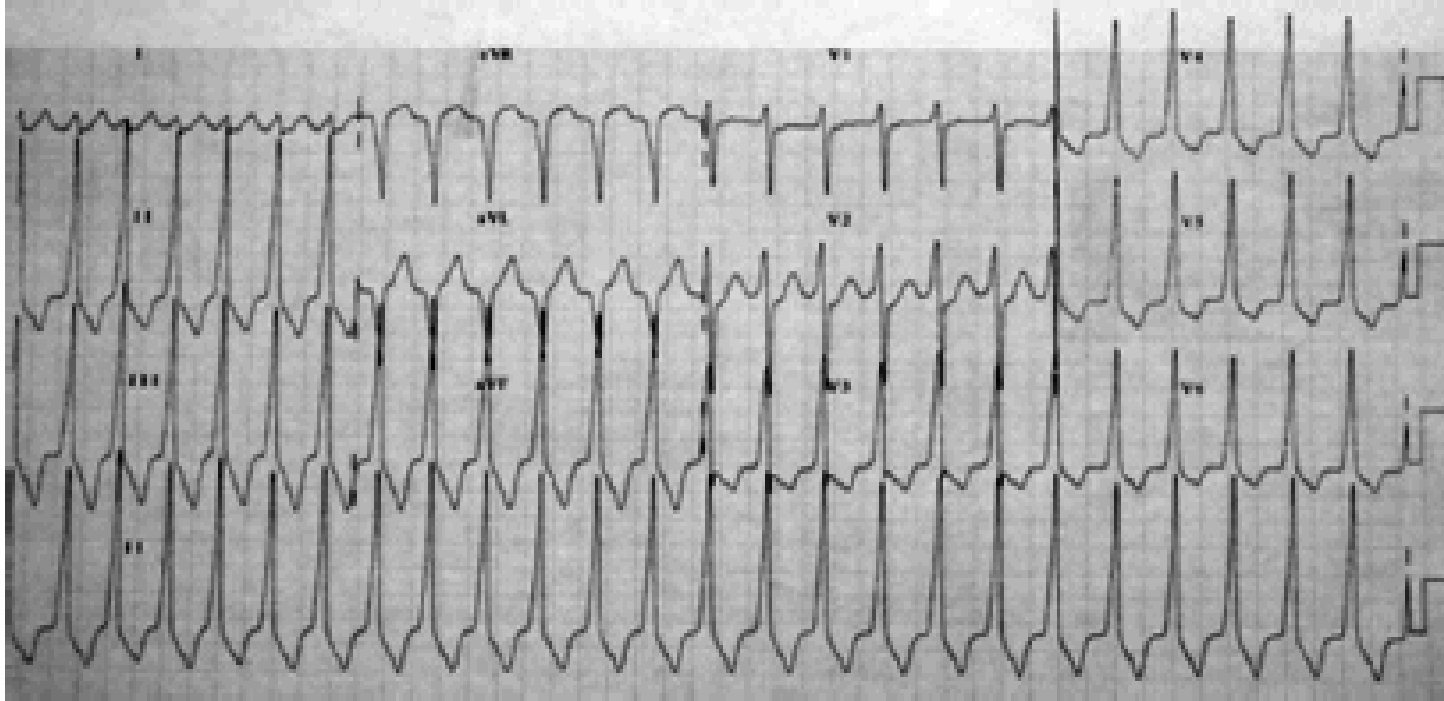


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Woman, 18 years old, attends by palpitations,
precordialgia, syncope

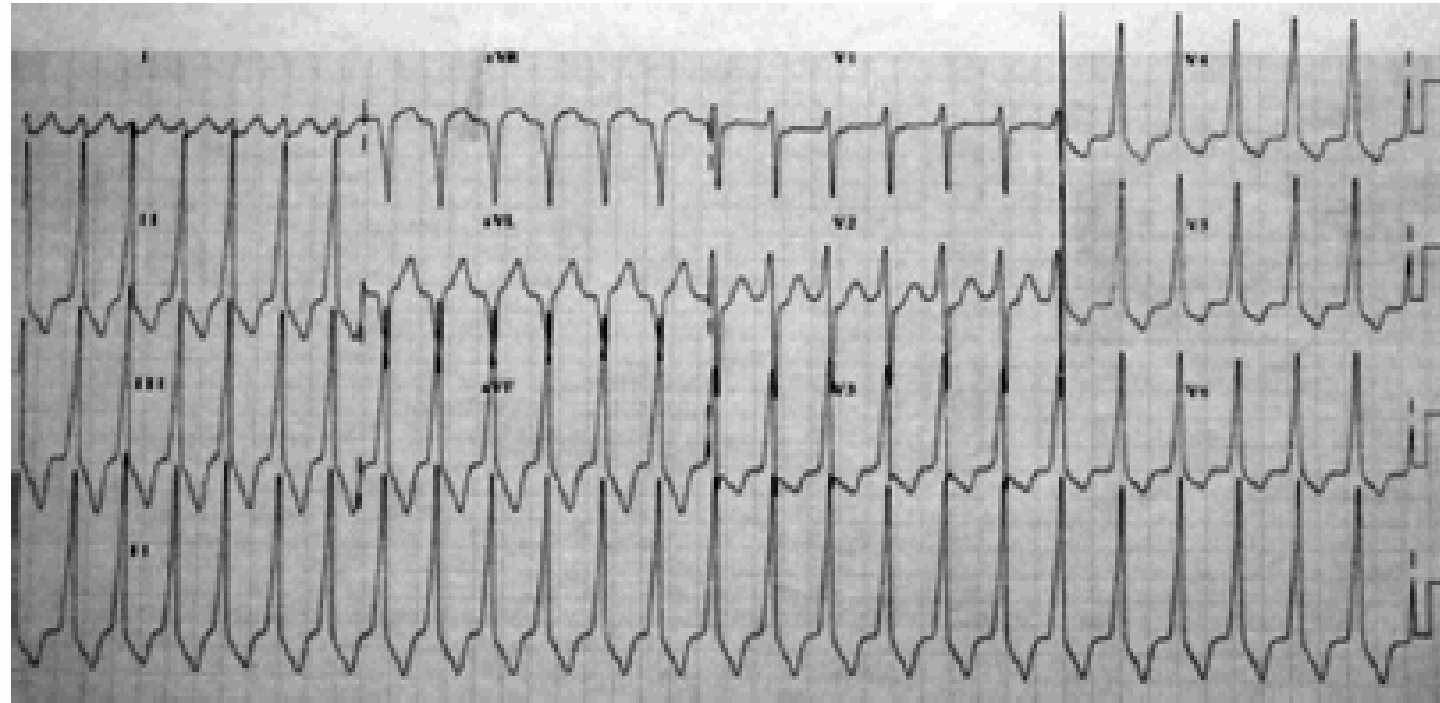


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Woman, 18 years old, attends by palpitations, precordialgia, syncope



Wide QRS, similar to LBBB
QRS Front axle: Inferior

Predominant R II III aVF

Transition R / S > 1
beyond V2

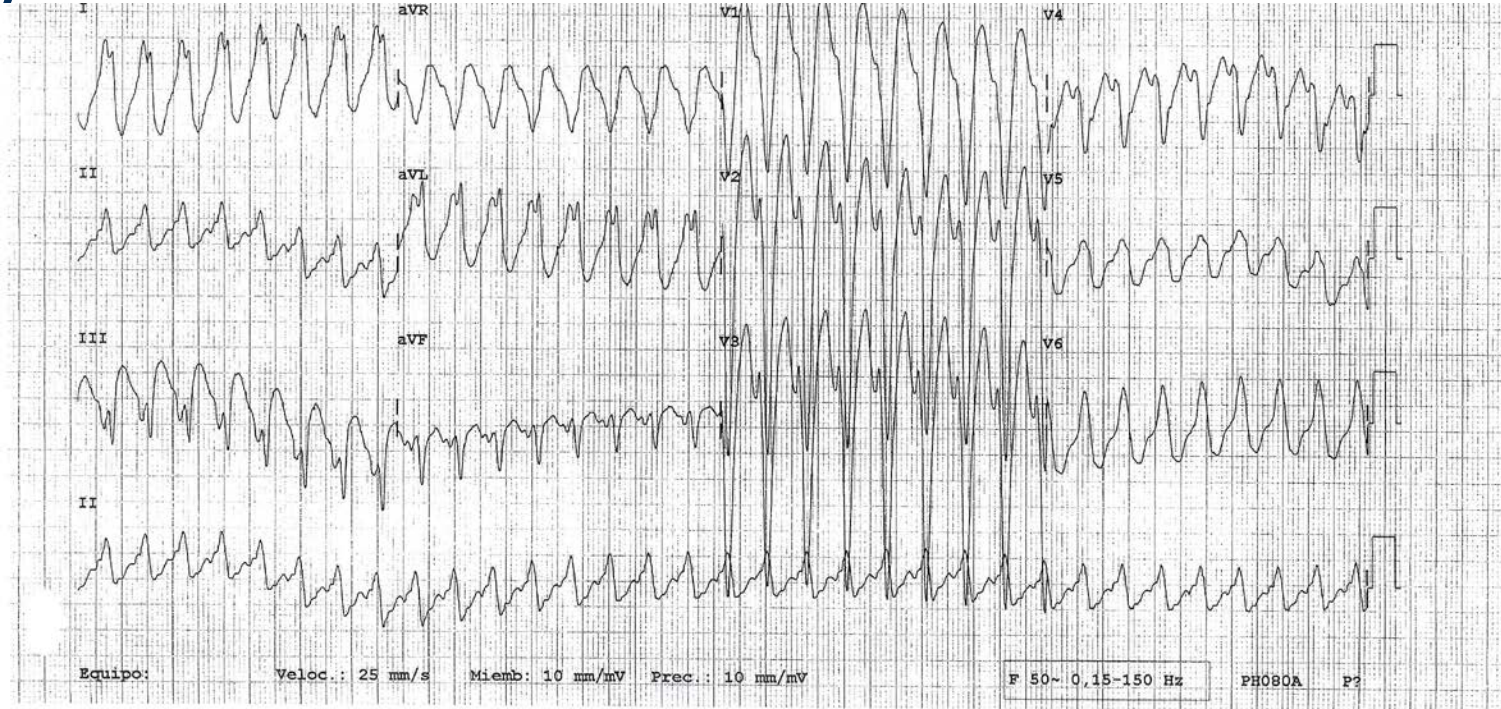


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Male 17 years old, with palpitations: passes to sinus rhythm with adenosine



Fr : 198
QRS 180
QT 288
QTc 523
Eje QRS -20



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ECG Criteria for Distinguishing Left from Right Ventricular Outflow Tract Tachycardia

- Outflow tract (OT) ventricular arrhythmia represents the most common subgroup of idiopathic premature ventricular contractions (PVCs)/ventricular tachycardia (VT). It typically occurs in healthy young to middle-aged patients without structural heart disease and can be provoked by emotional stress, exercise, or dietary stimulants.¹) Prognosis is generally excellent; OTVT can be effectively treated by drugs or radiofrequency (RF) catheter ablation.



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ECG Criteria for Distinguishing Left from Right Ventricular Outflow Tract Tachycardia

- Detailed intracardiac electrical mapping has shown that the vast majority of OTPVCs/OTVTs originate from the right ventricular (RV) OT.³ However, in approximately 10% to 15% of cases, the arrhythmia originates from the left ventricular (LV) OT and can be mapped to the region of the aortic cusps.⁴ Typically, OTPVCs/VT originating in the RV manifests as an inferior axis in the frontal ECG plane and a left bundle branch block (LBBB) configuration with precordial R/S transition at or after V3.⁵ In contrast, LVOT PVCs/VT usually manifests either as a right bundle branch block (RBBB)/inferior axis or LBBB/inferior axis with a precordial R/S-wave transition at or before lead V3.⁶ Criteria to distinguish an RVOT from an LVOT origin for patients with precordial transition occurring at lead V3 are lacking

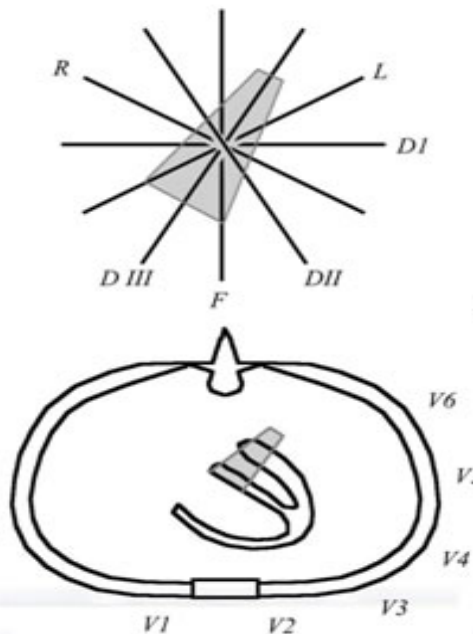


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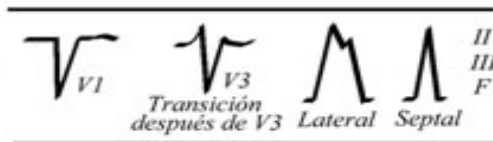
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Taquicardia ventricular de tracto de salida del VD

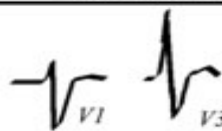


TV TSVD



Septal: $aVL > aVR$
Lateral: $aVR = 0 > aVL$

TV sub pulmonar



Transición
antes
de V3

TV TSVI



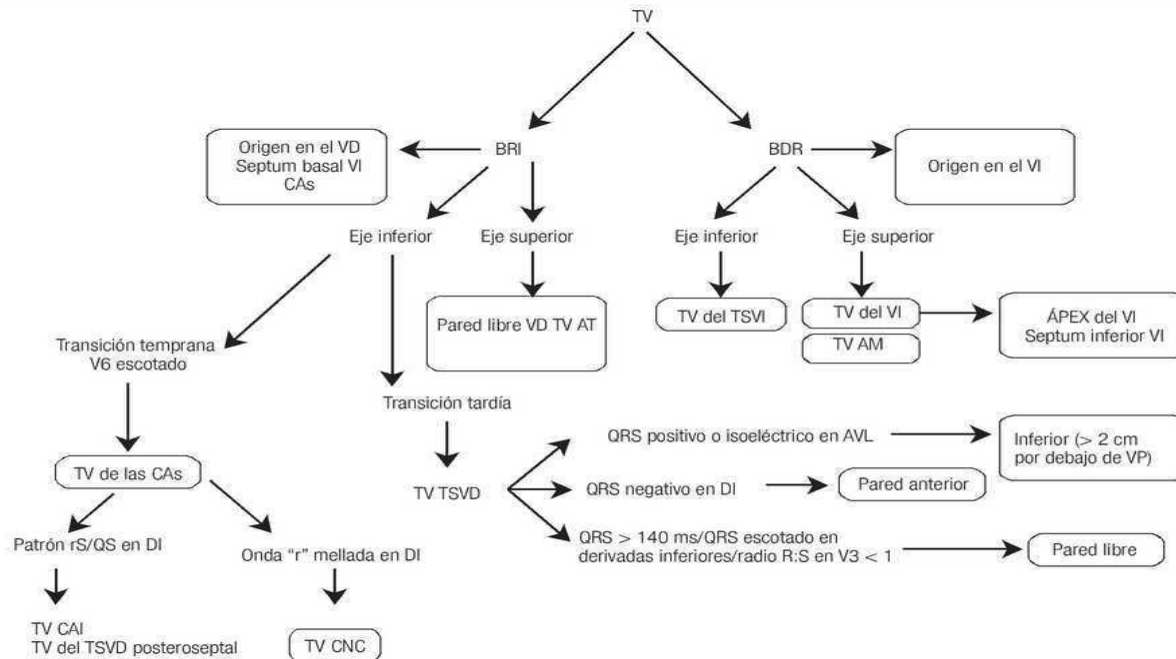
R ancha en V1: en seno de valsava.



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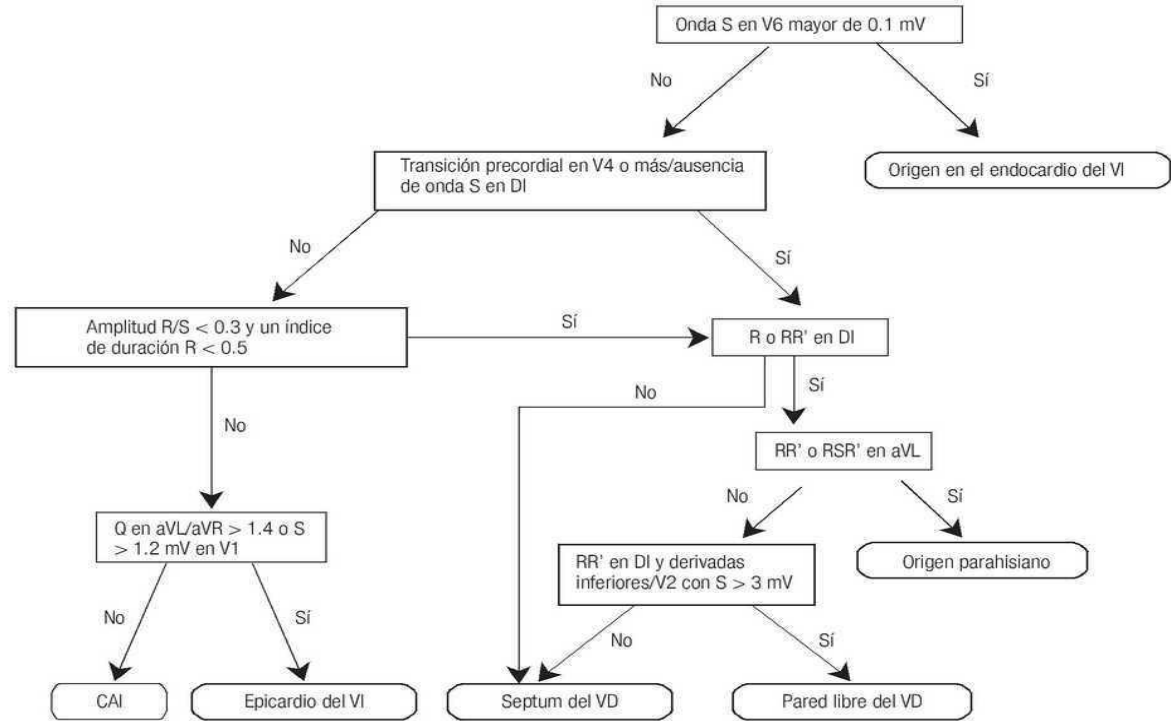
Abreviaturas: TV=taquicardia ventricular; BRI=bloqueo de rama izquierda; BRD=bloqueo de rama derecha; VI=ventrículo izquierdo; VD=ventrículo derecho; CAs=cúspides aórticas; AT=anillo tricúspideo; AM=anillo mitral; TSVI=tracto de salida del ventrículo izquierdo; TSVD=tracto de salida del ventrículo derecho; VP=válvula pulmonar; CAI=cúspide aórtica izquierda; CNC=cúspide no coronaria.



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Abreviaturas: VI=ventrículo izquierdo; VD=ventrículo derecho; CAI=cúspide aórtica izquierda.



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Idiopathic TV

- No Heart disease is demonstrated.
- It represents 10% of all TV.
- Subgroups: 1) TV of the outflow tract (TS), (88-90%):
 - RVOT (80-90%) (septal region posterosuperior most)
 - LVOT (10-20%): basal endocardium 60% cases in mitral-aortic continuity - epicardial 40%
- 2) Fascicular TV, (10-12%)
- The TV of the aortic cusps represents 0.7% of all TV.
-



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Idiopathic TV

- Focal electrophysiological mechanism: Activity triggered by late postpotentials **dependent on cAMP-Calcium** and less frequently increased automatism.
- **Sensitive to adenosine and verapamil**, appears with exercise or adrenergic influence, and are not inducible or present ??? entrainment ?? transient during the programmed electrical stimulation.
- The most frequent symptoms are palpitations with or without dyspnea and dizziness; Syncope is rare.
- From the electrocardiographic point of view, they can present as frequent **ventricular extrasystoles (VS), repetitive non-sustained TV and sustained TV induced by exercise**



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TIPS :

- 1.- **wide QRS rhythmic tachycardia: first choice :TV** (the most frequent), mainly if the patient has a structurally ill heart (ischemic heart disease, cardiomyopathy, etc.)
- 2- Tachycardias with **previous branch blocks (BRI or BRD) will maintain their QRS** width. Important to compare with previous ECG.
- 3- In case of doubt the administration of ADENOSINE, in bolus, can help us by its transitory effect on the AV node:
 - a) It **interrupts intranodal reentry** and restores sinus rhythm.
 - b) It slows down the ventricular response, transiently, and allows us to see the F waves of the flutter or the f of atrial fibrillation.
 - c) **Adenosine has no effect on the ventricle** so it does not modify the TV (with some exception: idiopathic TV), nor does it affect the conduction of the accessory pathways, only to the AV NODE.
 - d) Caution: Adenosine can sometimes cause degeneration to ventricular fibrillation, particularly in patients with coronary artery disease



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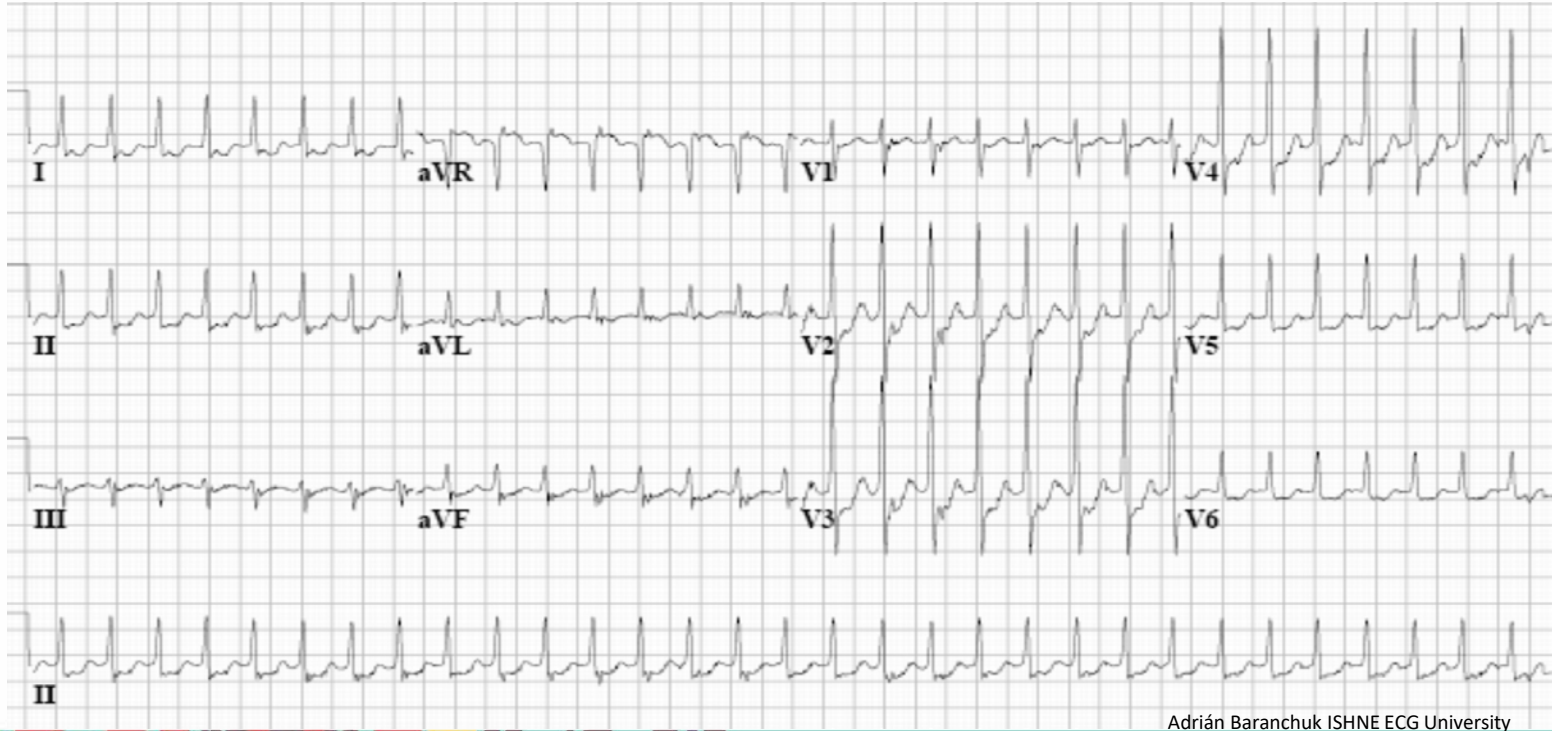


Rapid Fire ECG Challenge: Putting Your Interpretation Skills to the Test

Evert Torrejon , MD
Sociedad Peruana Cardiología
Presenter



42-year-old woman with rapid heart beat for 2 hours ago



Adrián Baranchuk ISHNE ECG University



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Choose option that is correct:

- 1. Sinus Tachycardia
- 2. Atrial Tachycardia
- 3. Atrial flutter with conduction 2/1
- 4. Fascicular tachycardia
- 5. Typical AVNRT
- 6. Atypical AVNRT
- 7. AVRT Orthodromic AV reentrant tachycardia
- 8. Junctional tachycardia

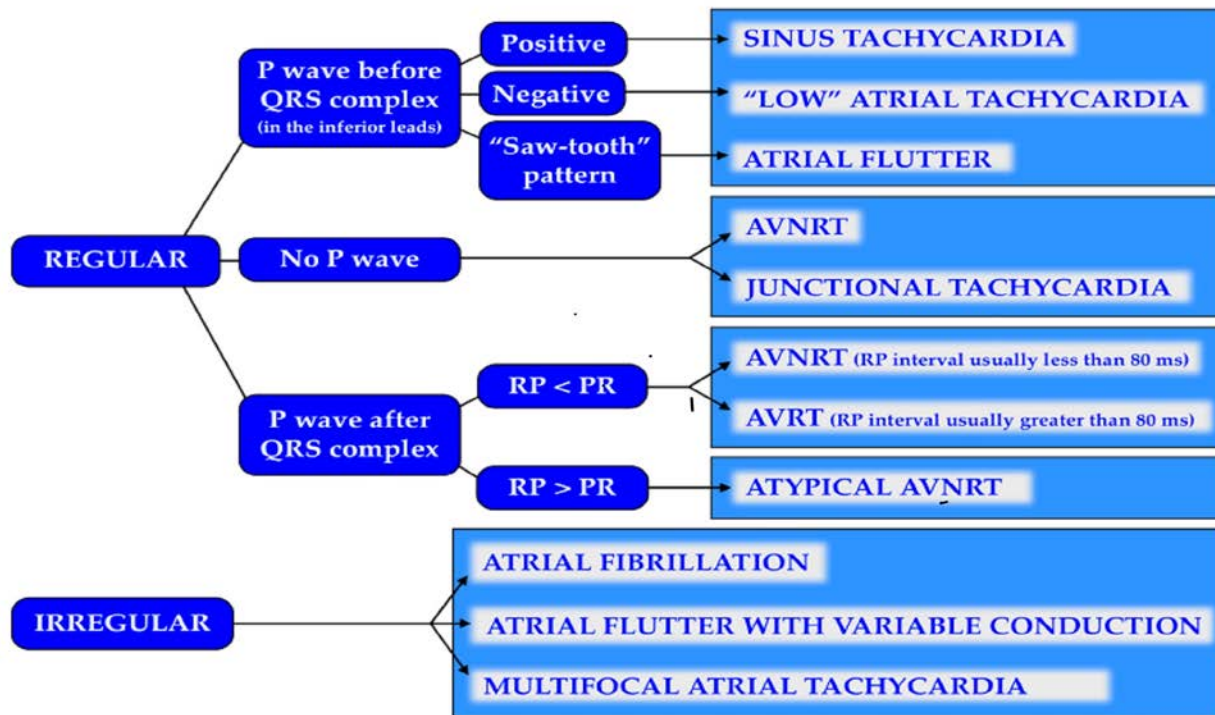


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Figure 1. Algorithmic approach to the most common “narrow QRS” tachycardias in adults.



KECGT
INITIATIVE

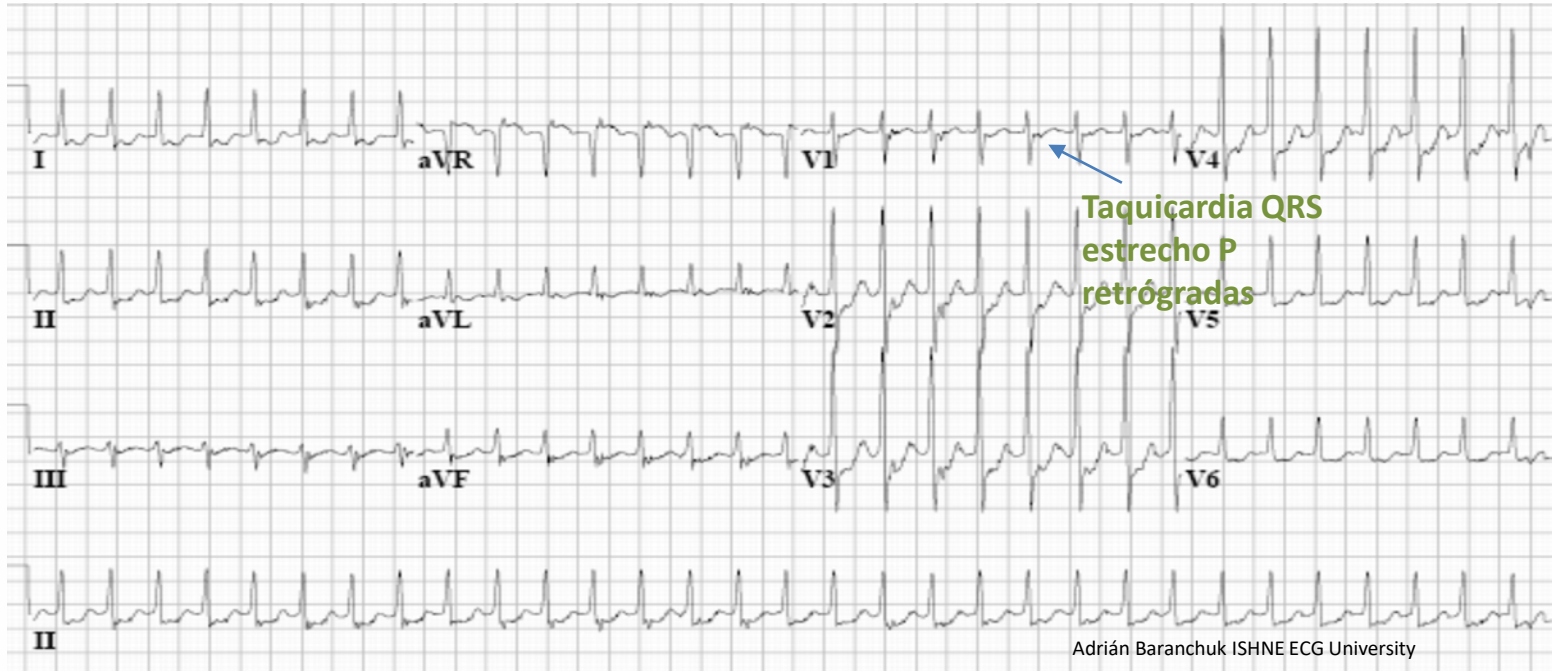


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42-year-old woman with rapid heart beat for 2 hours ago

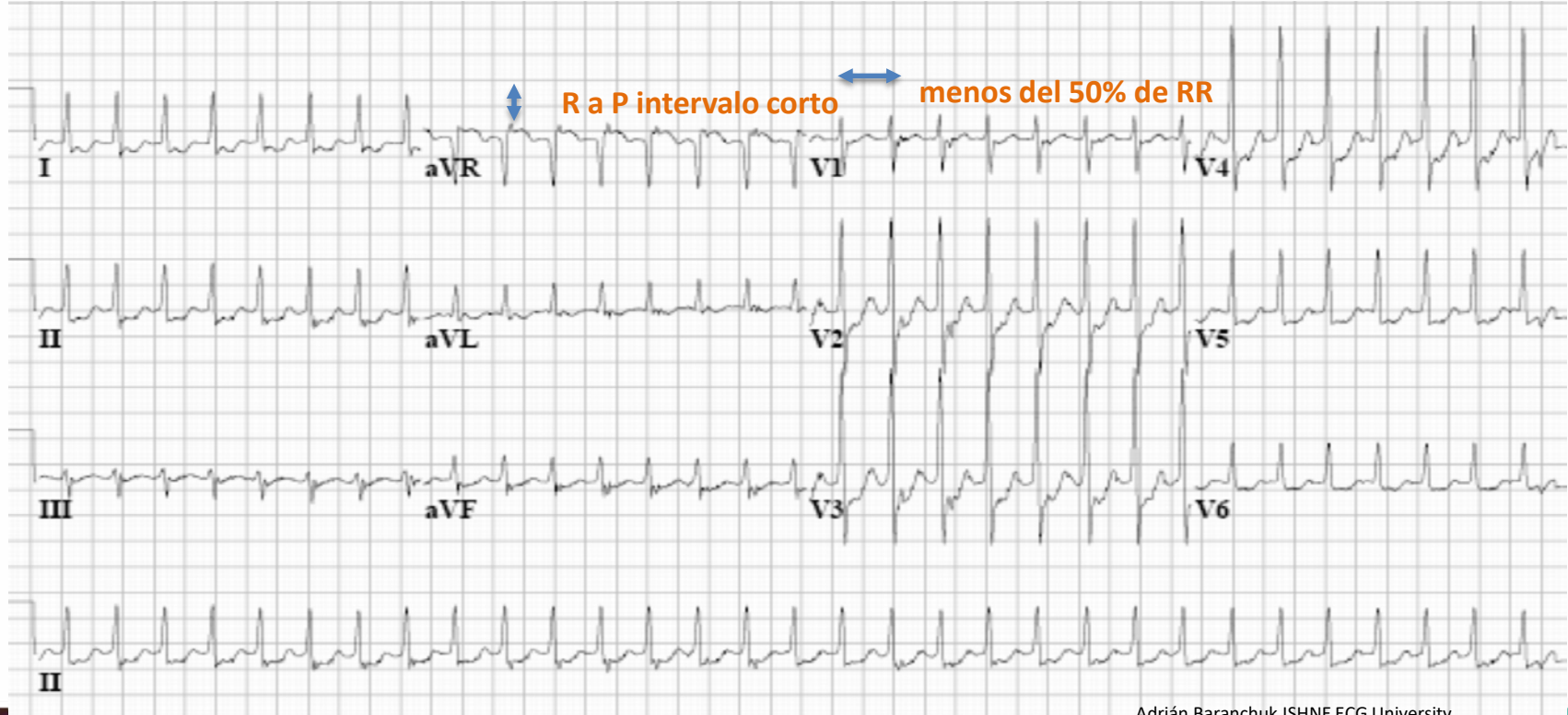


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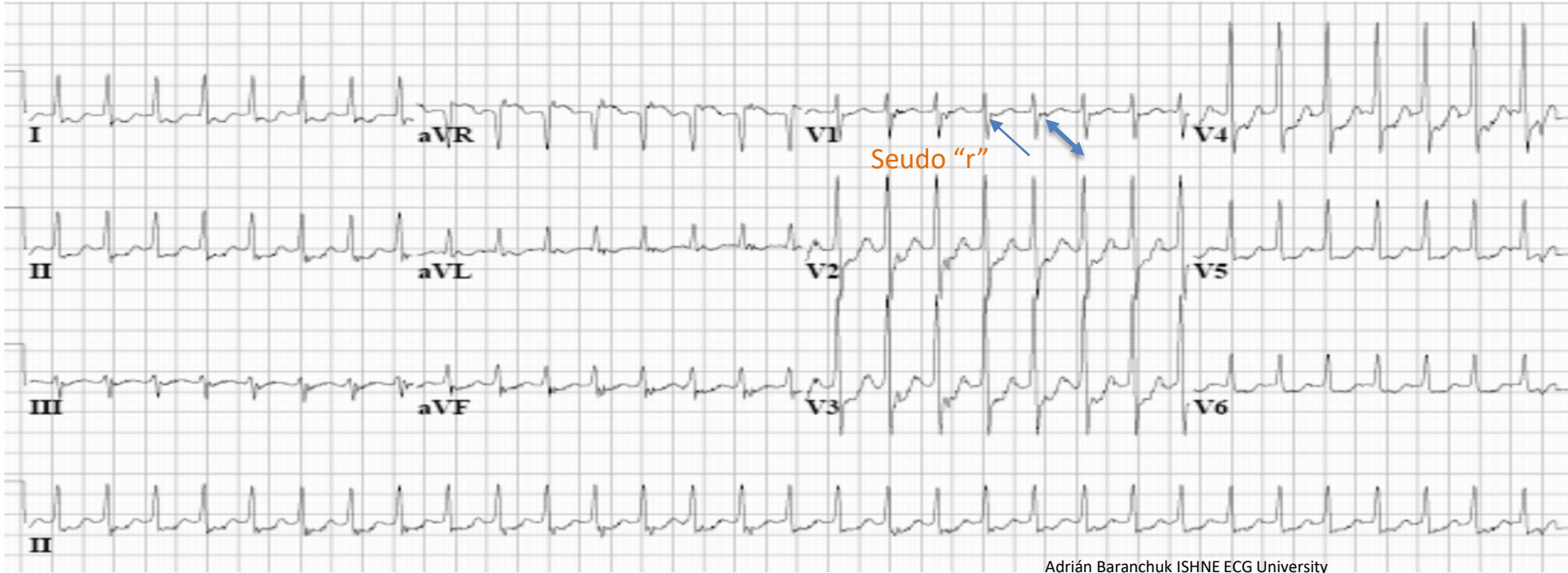


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42-year-old woman with rapid heart beat for 2 hours ago



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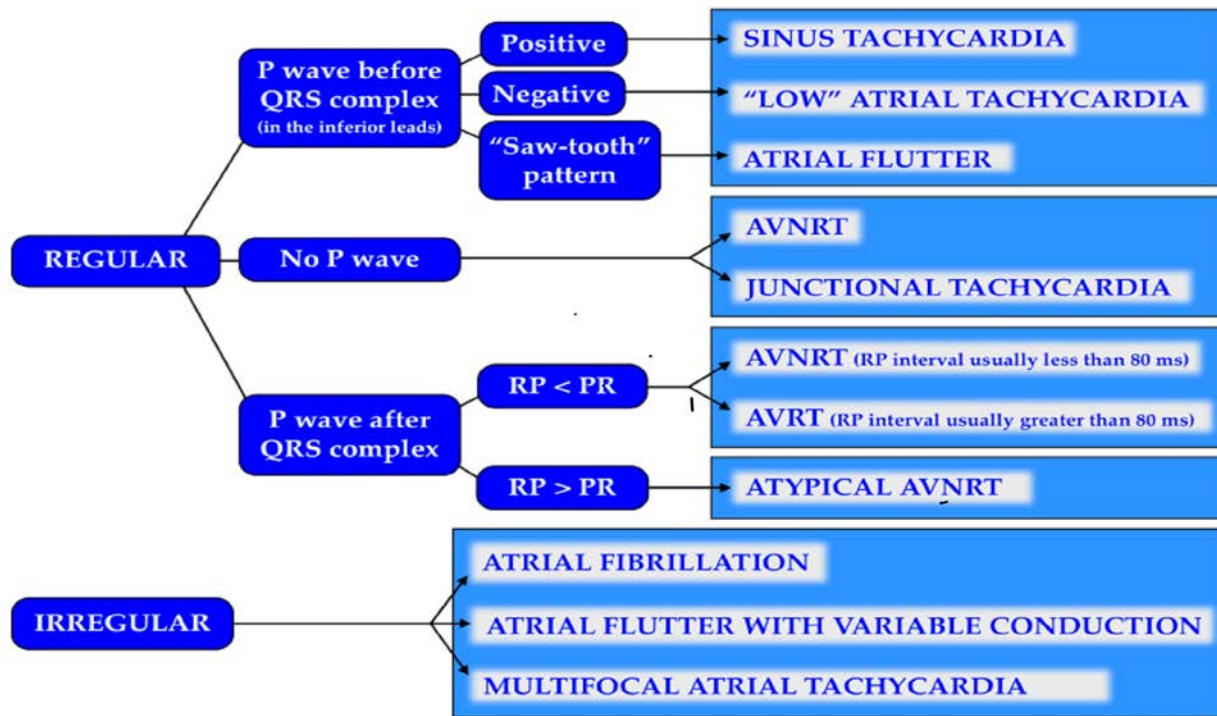


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Figure 1. Algorithmic approach to the most common “narrow QRS” tachycardias in adults.



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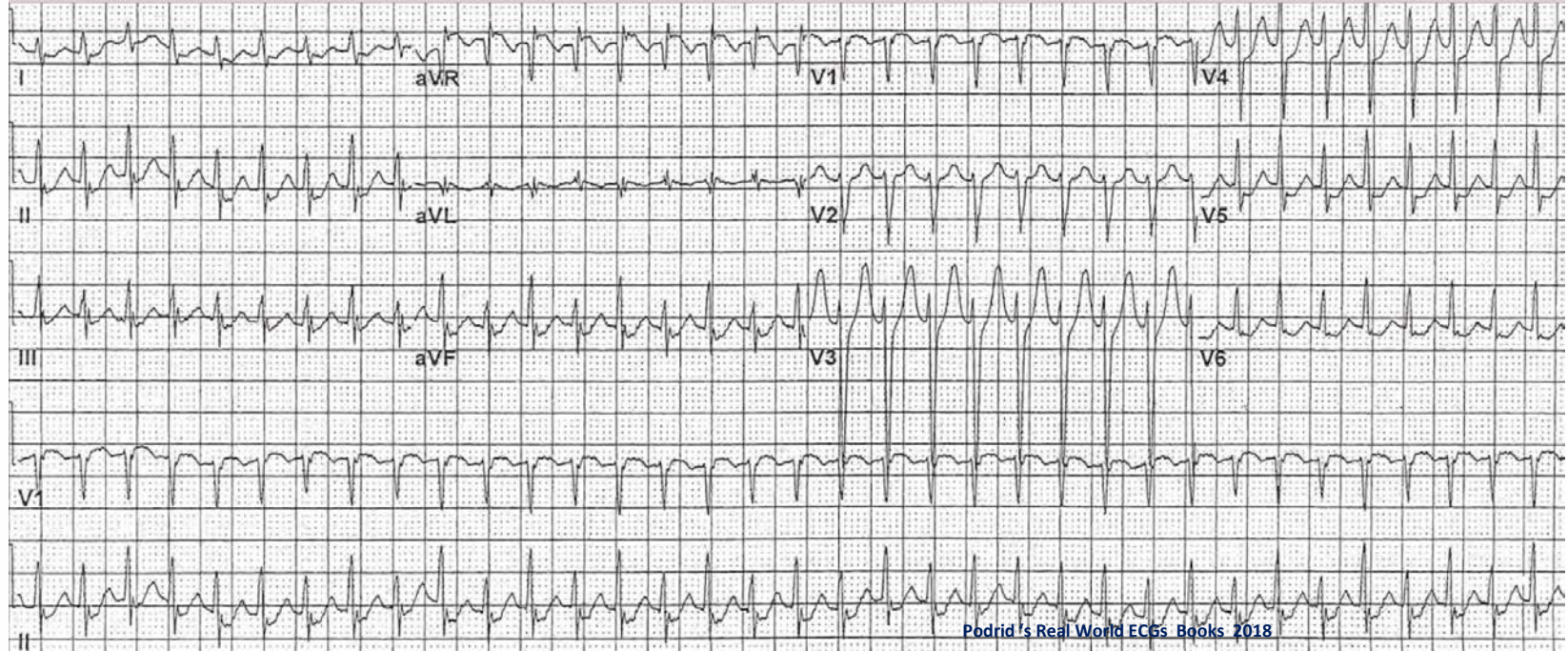


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27 year old woman with palpitations last months, calm with cough:



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Choose option that is correct:

- 1. Sinus Tachycardia
- 2. Atrial Tachycardia
- 3. Atrial flutter with conduction 2/1
- 4. Fascicular tachycardia
- 5. Typical AVNRT
- 6. Atypical AVNRT
- 7. AVRT Orthodromic AV reentrant tachycardia
- 8. Junctional tachycardia

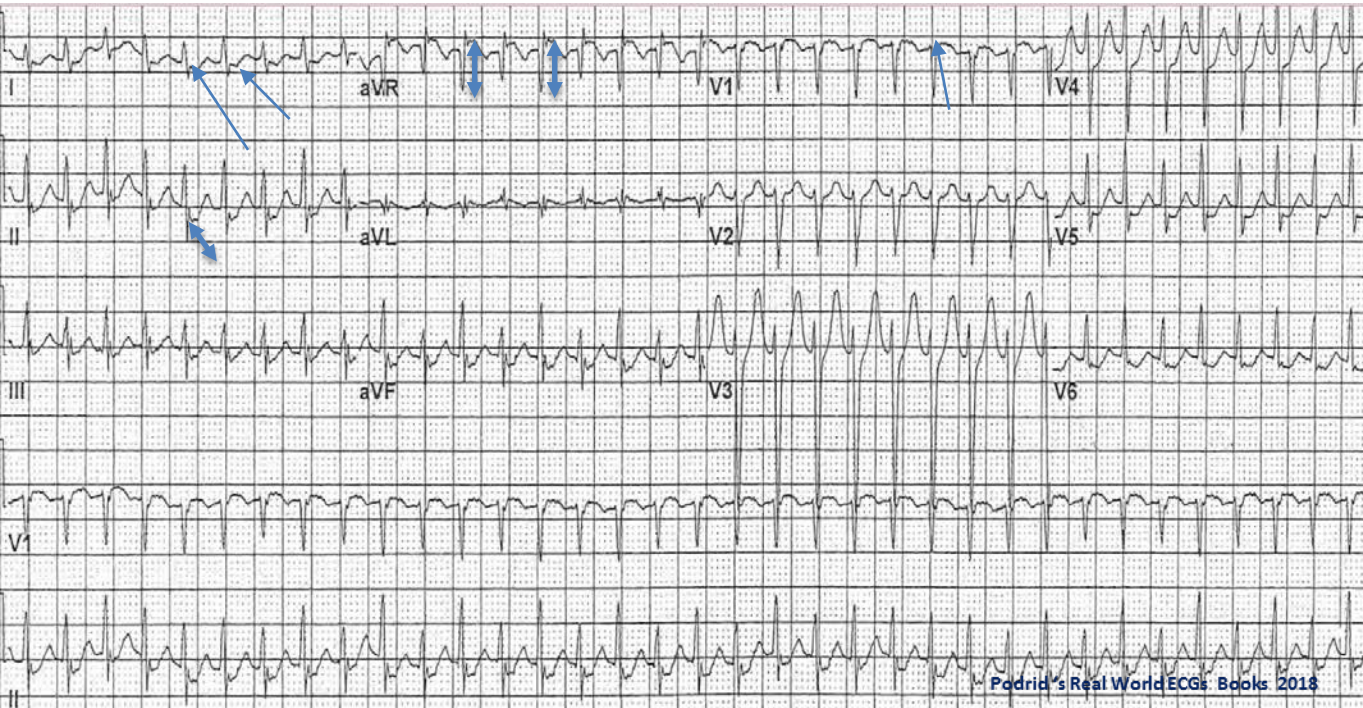


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27 year old woman with palpitations last months, calm with cough



- 1- Narrow QRS tachycardia 0.08 sec,
 - 2- Fr: 220 lpm,
 - 3- axis: 0 to 90°,
 - 4- QT / QTc: N, 220/420 ms
 - 5- notch in ST in I, II, III, aVF, aVR, V1:
- tachycardia with short RP, (interval RP = 0.12, PR = 0.20 sec)**

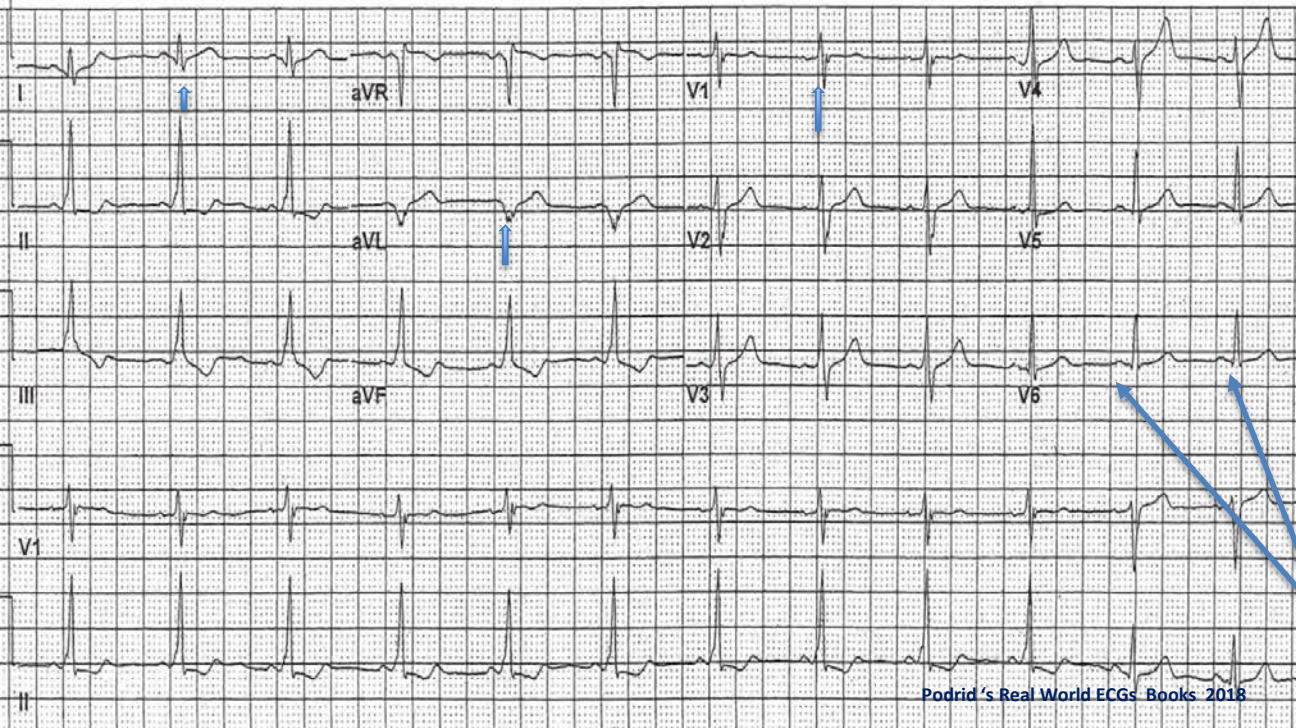


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ECG without tachycardia



1. Sinus rhythm 75 bpm,
2. Normal P-waves
3. short PR interval 0.12,
4. QRS wide 0.12, by delta waves,
5. QT / QTc 360/140 and 360/410 when QRS is considered prolonged.
6. Negative Delta I and aVL, positive V1: left lateral tract.
7. intermittent preexcitation: The last two beats, without preexcitation of similar morphology during tachycardia

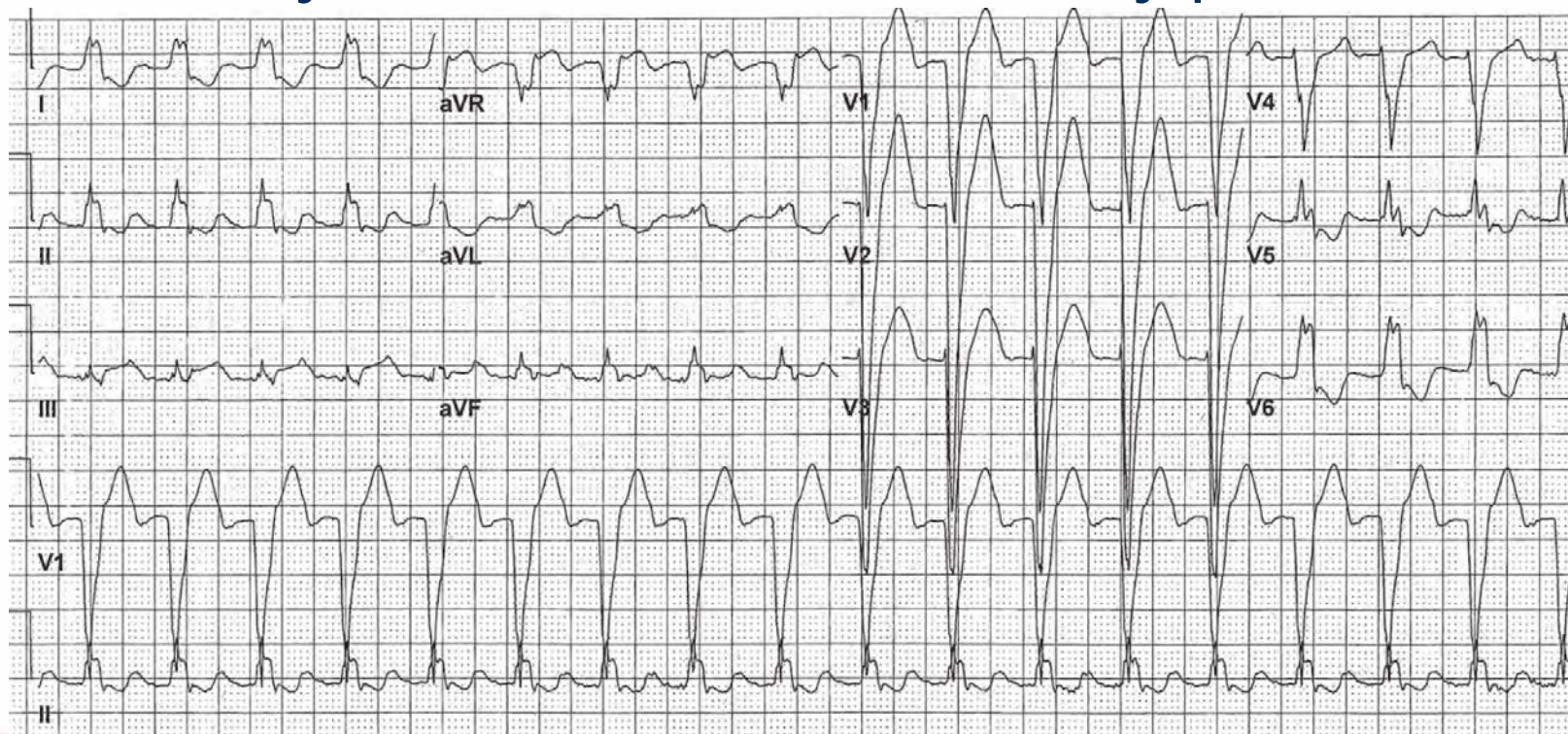


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In partnership with:



Woman 88 years old, with severe CMD, with dyspnea



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Choose option that is correct:

- 1. Sinus Tachycardia with BAV I and LBB
- 2. Atrial Tachycardia With BAV I and LBB
- 3. Atrial flutter with conduction 2/1
- 4. Ventricular tachycardia
- 5. Typical AVNRT
- 6. Atypical AVNRT
- 7. AVRT tachycardia

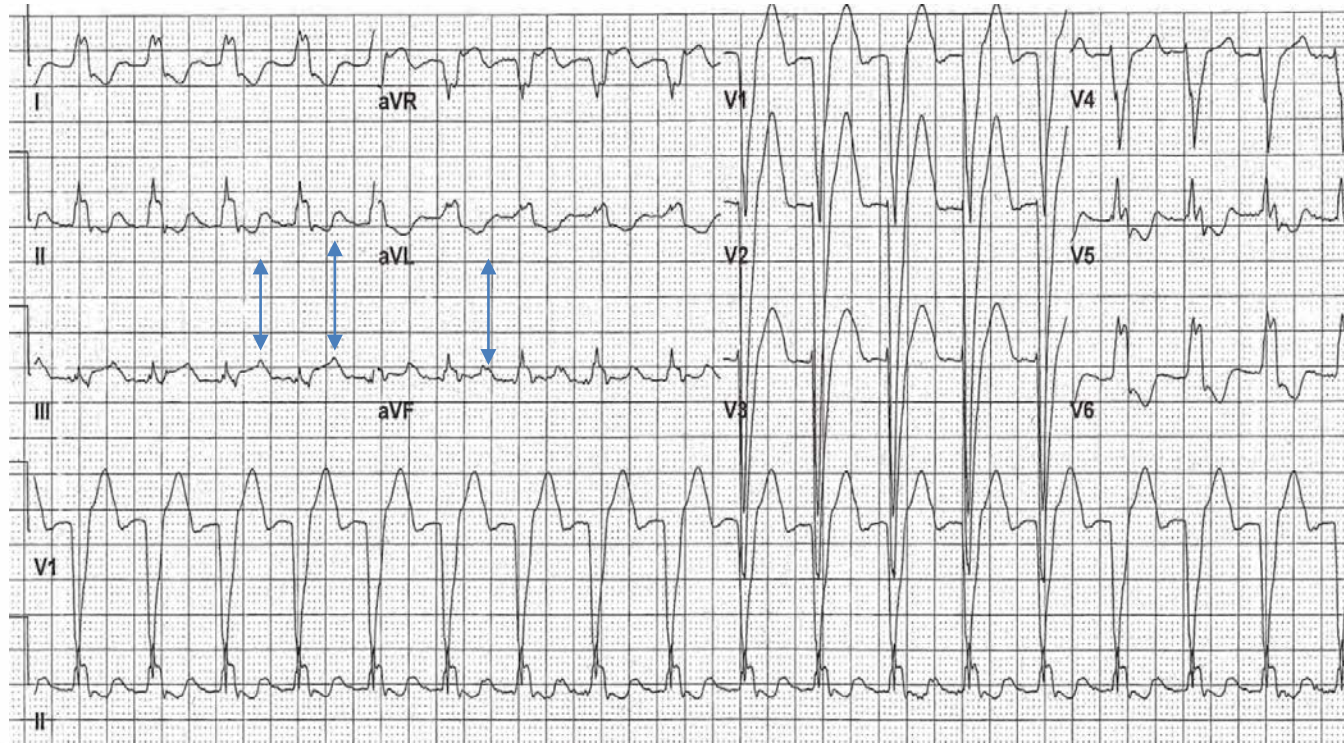


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Woman 88 years old, with severe CMD, with dyspnea



Fr 112 bpm
QRS :0.16seg BCRI

PR o RP :0.24
seg

SinusTachycardia vs Atrial T.

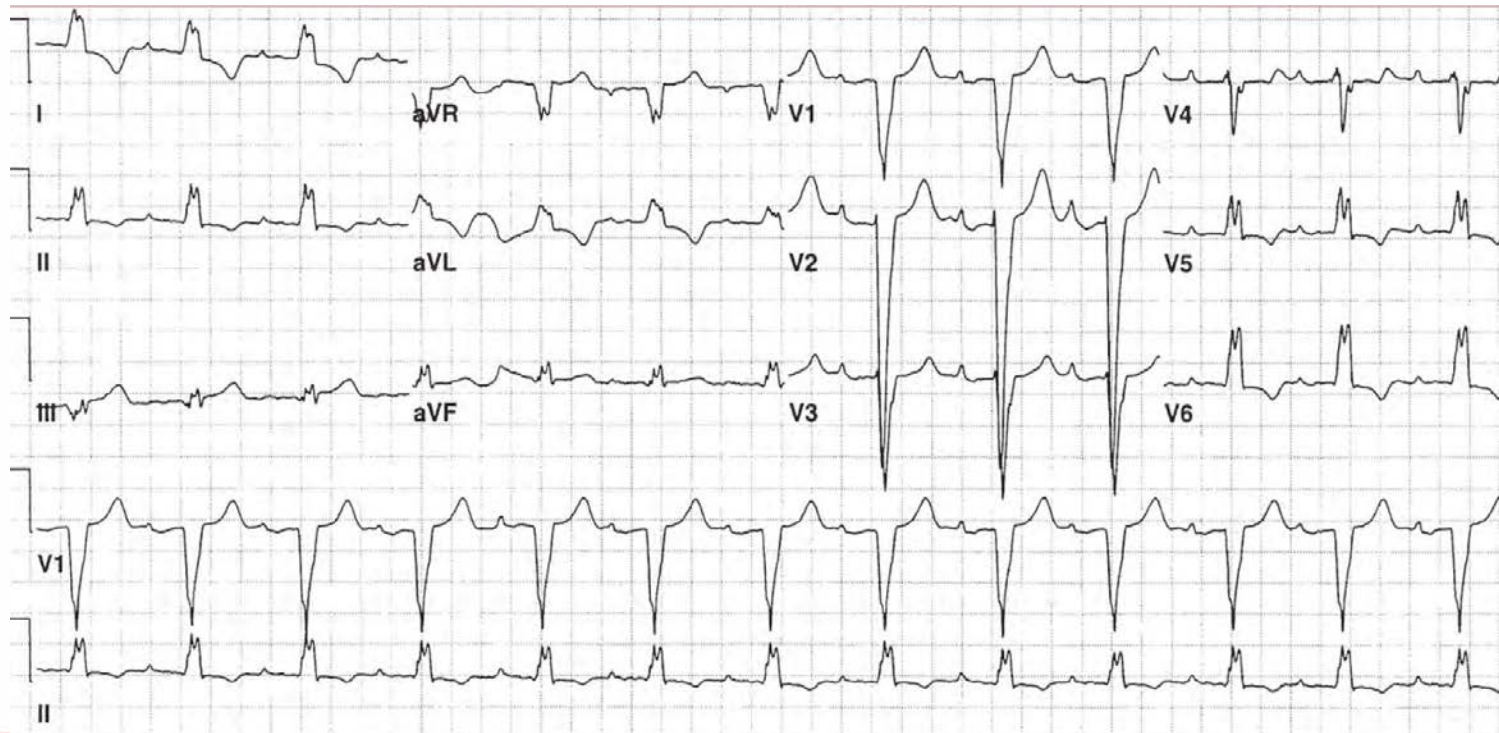


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Woman 88 years old, with severe CMD, with dyspnea : ECG taken months before

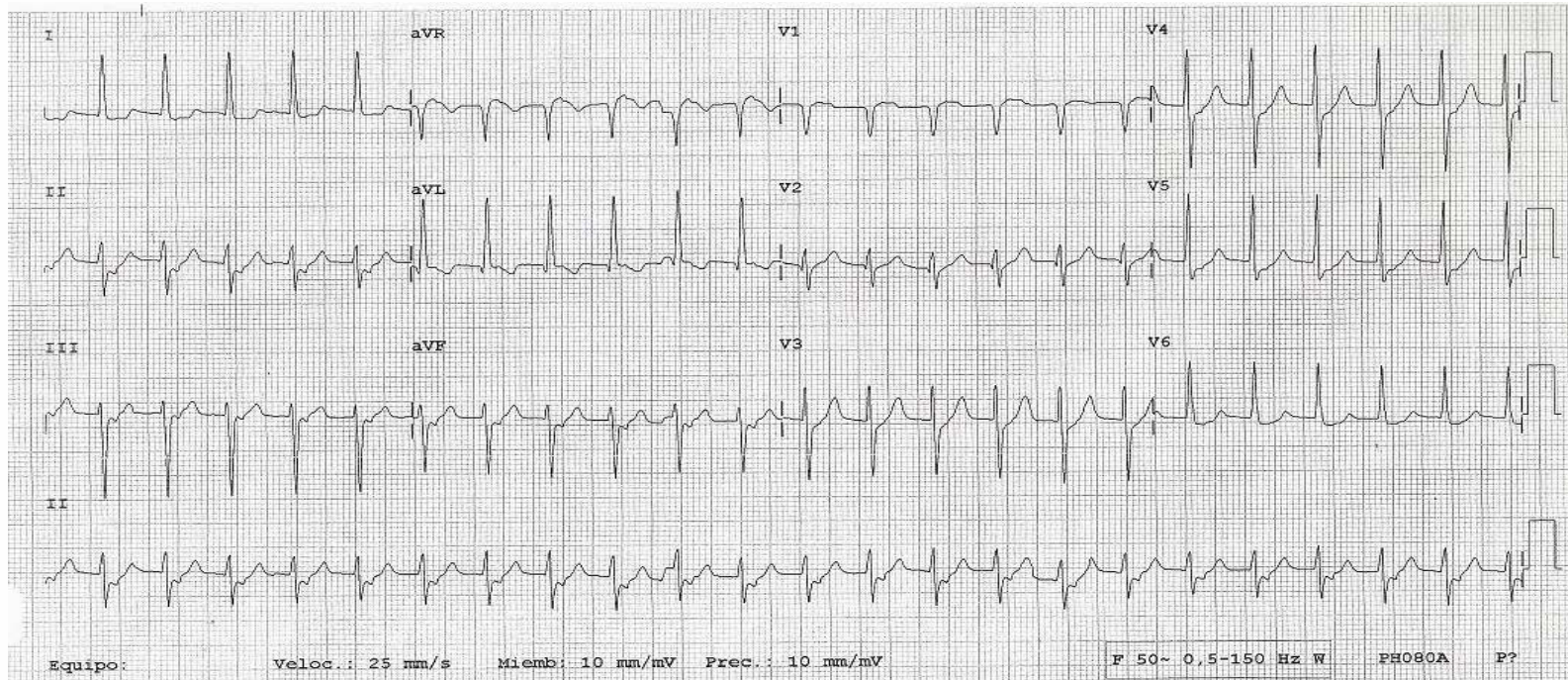


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In partnership with:



80-year-old man with precordial discomfort



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Choose option that is correct:

- 1. Sinus Tachycardia
- 2. Atrial Tachycardia
- 3. Atrial flutter with conduction 2/1
- 4. Fascicular tachycardia
- 5. Typical AVNRT
- 6. Atypical AVNRT
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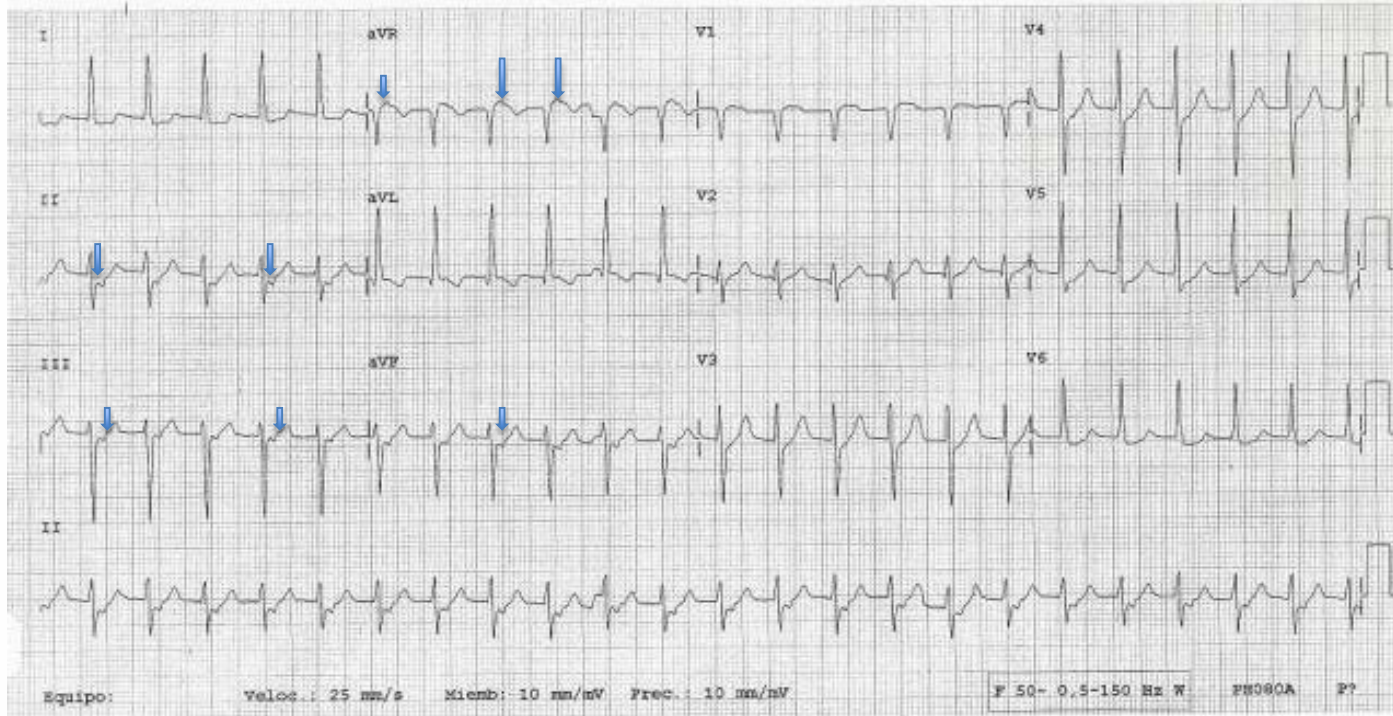


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80-year-old man with precordial discomfort



QRS estrecho
139 por min

P retrogradas
II III aVF

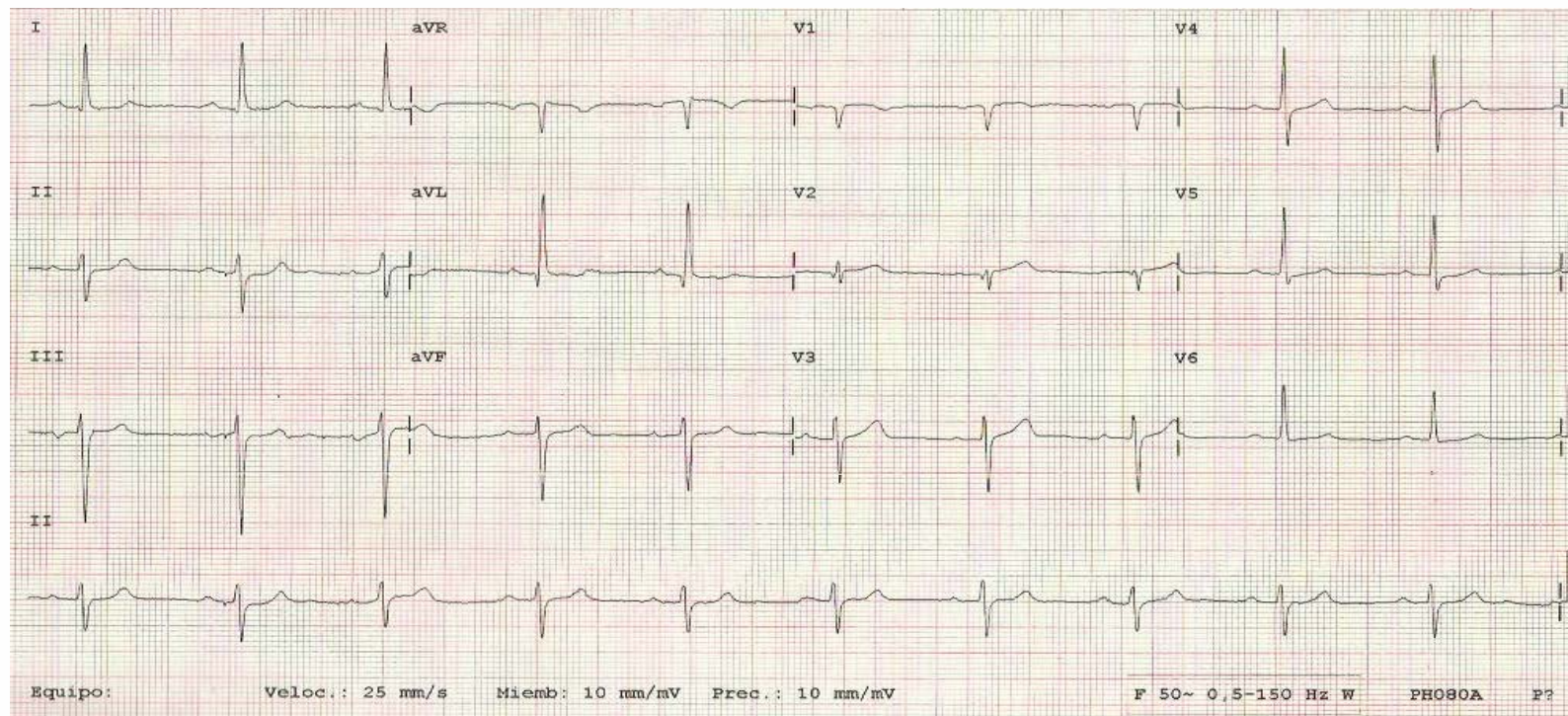


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Despues de 6 mg en bolo de Adenosina EV :



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Paroxysmal supraventricular tachycardia: TYPES of reentry:

- I) INTRANODAL reentry (the most frequent).
- II) Reentry accessory pathway with two forms of presentation:
 - a) Orthodromic: narrow QRS and
 - b) antidromic: wide QRS (more rare).



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P' waves after QRS :

- 1) P' waves not visible or attached at the end of the QRS, giving the false appearance of S in inferior derivations or of R 'in derivation V1 -> COMMON INTRANODAL REENTRANT (slow-fast). Most common (80-90%)
- 2) P' waves separated from the QRS -> REENTRANT by ACCESSORY ROUTE or ATYPICAL AV NODE REENTRY (fast-slow or slow-slow). -> only by means of an EEF can we differentiate them.



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