


The 44<sup>th</sup> Annual International Congress of the  
**EGYPTIAN SOCIETY OF  
CARDIOLOGY**  
CardioEgypt2017





**Looks like AVNRT**

Ibrahim youssry  
Mansoura University

## ***History and presentation***

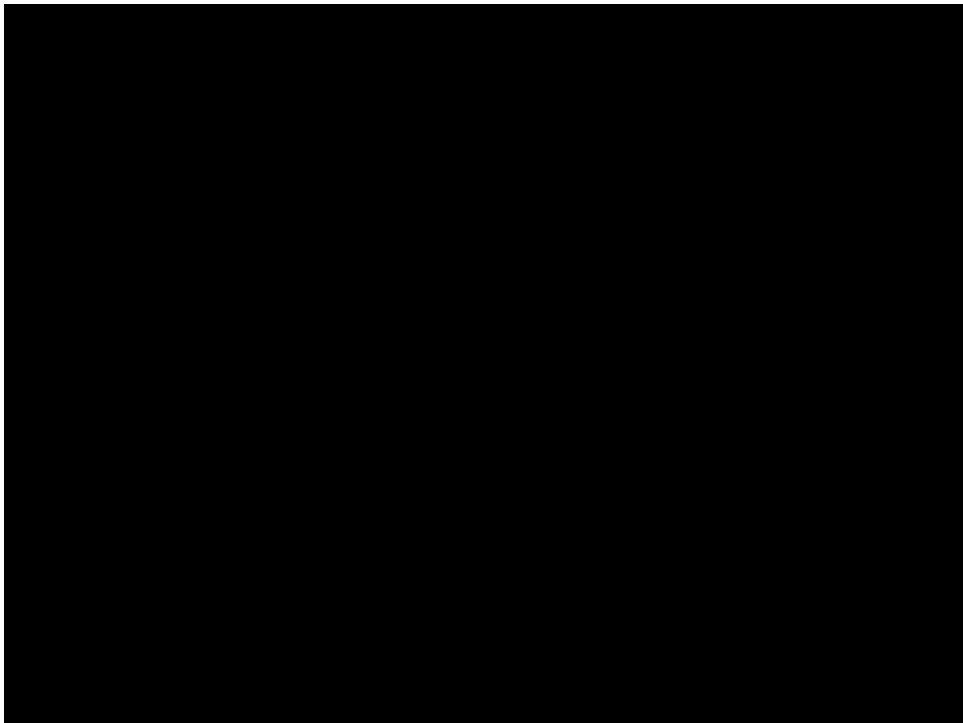
- 39 Ys old female
- Known to be rheumatic heart disease .
- Presented with recurrent ***attacks of palpitation*** that is usually stable with no Hx of syncope nor DC shocks
- Undetermined response to medical treatment either home treatment or ER treatment.





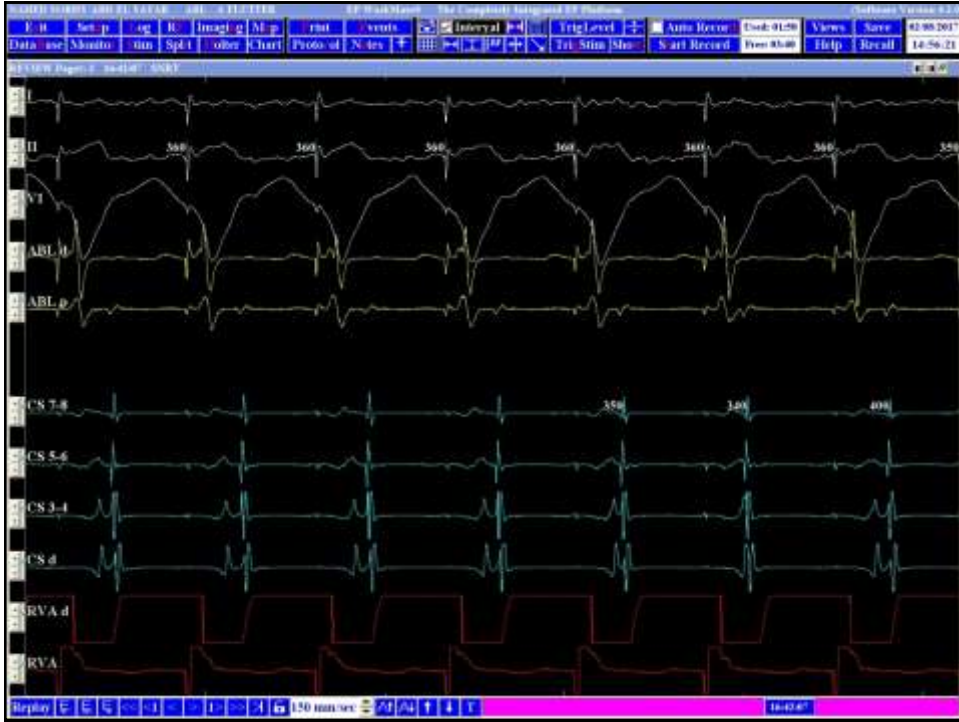
# EP LAB

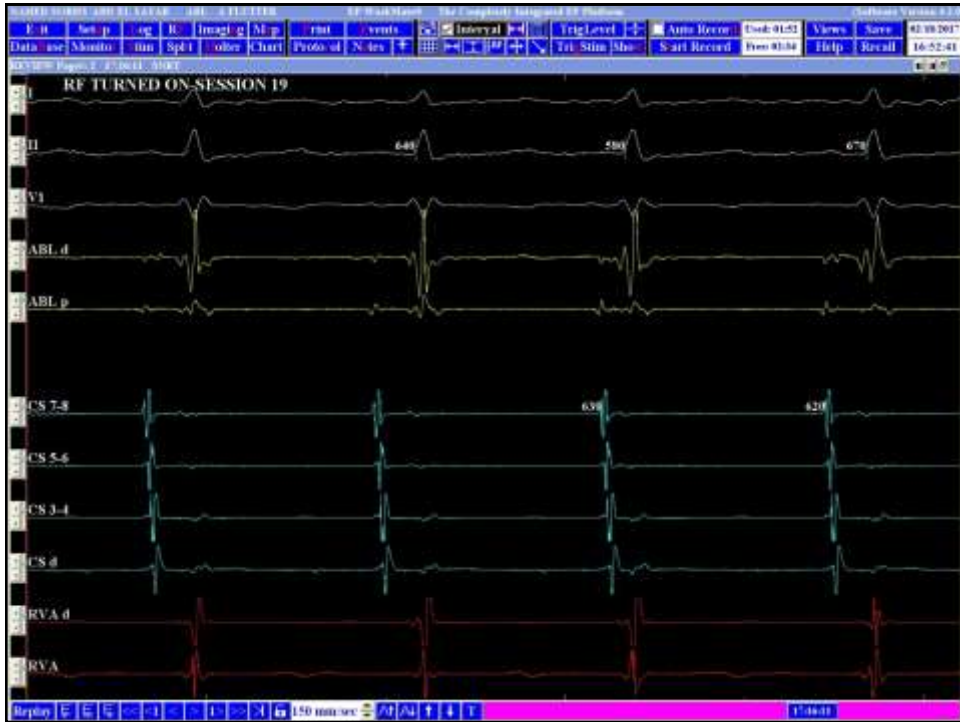
**Let us to have an overview on our patient traces determining our dilemmas**

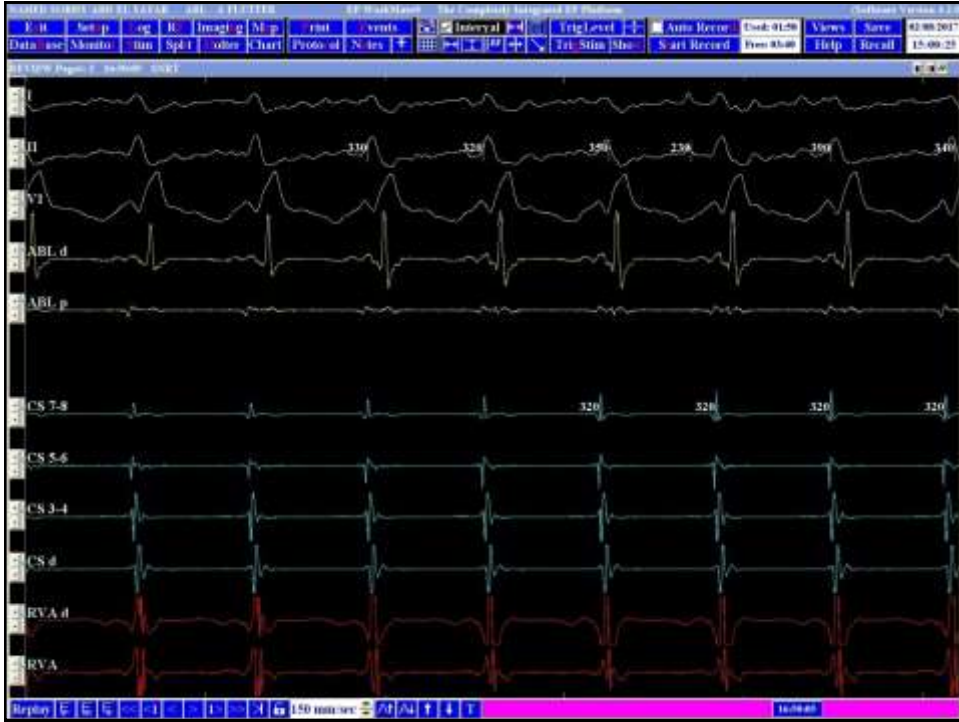






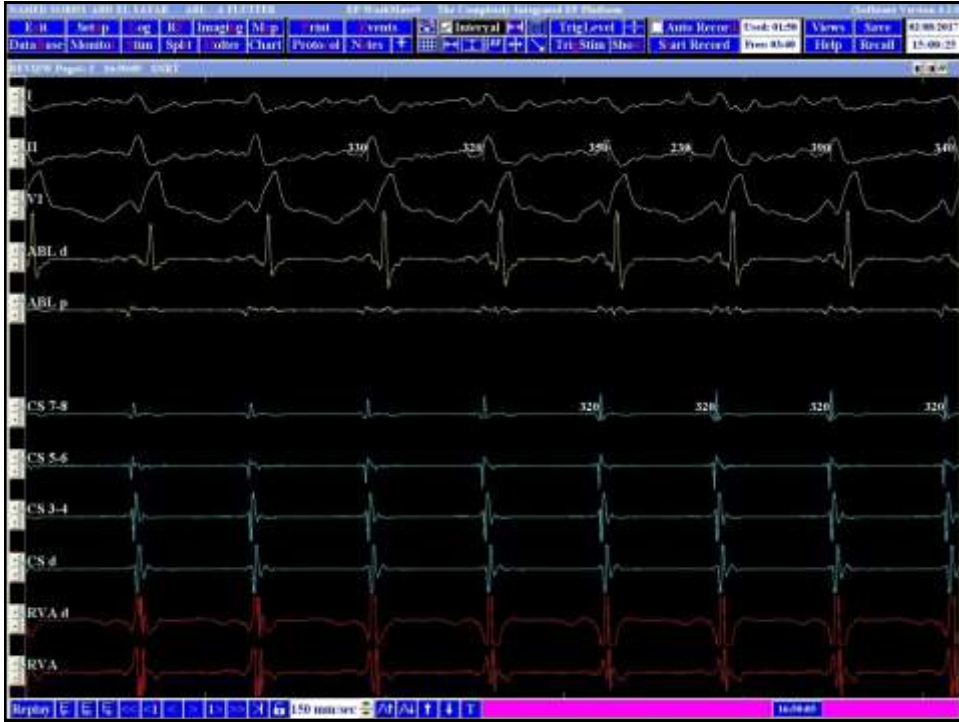














## So multiple tricks

1. Is it really AVNRT? (ablation with recurrence)
2. We have VA dissociation and so we cannot entrain the tachycardia via the ventricle so how can we exclude AT.
3. What is the DD of tachycardia with 2:1.
4. What is the justification of wide complex tachycardia change to narrow complex tachycardia trace.



## End<sup>٢٩</sup>.....Restart

- We terminated the procedure for the sake of time and patient instability .



**Review Article**

**Principles of Entrainment: Diagnostic Utility for  
Supraventricular Tachycardia**

The differentiation of a focal junctional or 'His bundle' tachycardia from typical AVNRT can sometimes be challenging. Overdrive ventricular pacing would be expected to produce an A-V response in either case. Entrainment of AVNRT by atrial pacing can be the key diagnostic



**Differentiating Junctional Tachycardia and  
Atrioventricular Node Re-Entry Tachycardia  
Based on Response to Atrial Extrastimulus Pacing**

Benzy J. Padanilam, MD, FACC, Joseph A. Manfredi, MD, Leonard A. Steinberg, MD,  
Jeff A. Olson, DO, Richard I. Fogel, MD, FACC, Eric N. Prystowsky, MD, FACC  
*Indianapolis, Indiana*



## Different techniques

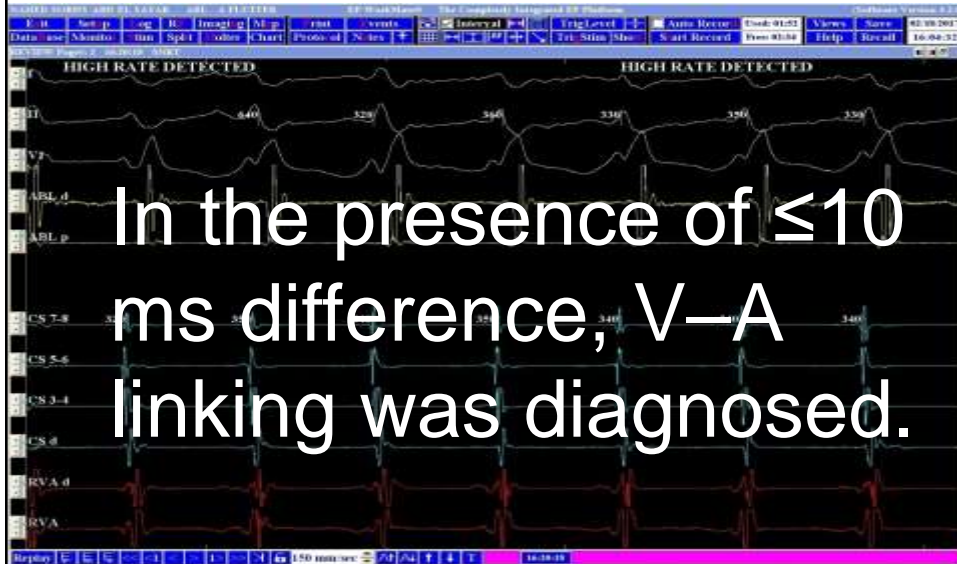
- ❖ VA linking phenomena during the tachycardia
- ❖ PAC response
  - ❑ His refractory
  - ❑ Pre His PAC
- ❖ Atrial overdrive pacing response
- ❖ Differential atrial pacing



## VA linking



VA linking **Just wait!** Often, the VA relationship becomes variable. This doesn't occur with AVNRT. If the **A moves in and out of the V electrograms**, then this can only be JT.



PAC ( premature a trial contraction )

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J Am Coll Cardiol. 2008 Nov 18;52(21):1711-7. doi: 10.1016/j.jacc.2008.06.030.

**Differentiating junctional tachycardia and atrioventricular node re-entry tachycardia based on response to atrial extrastimulus pacing.**

Pandeyam RJ<sup>1</sup>, Mantrik JA, Steinberg LA, Olson JA, Fozal R, Prystowsky EN

Author information

**Conclusions** The response to PACs during tachycardia can distinguish JT and AVNRT with 100% specificity in adult patients. (J Am Coll Cardiol 2008;52:1711-7) © 2008 by the American College of Cardiology Foundation

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## His refractory PAC

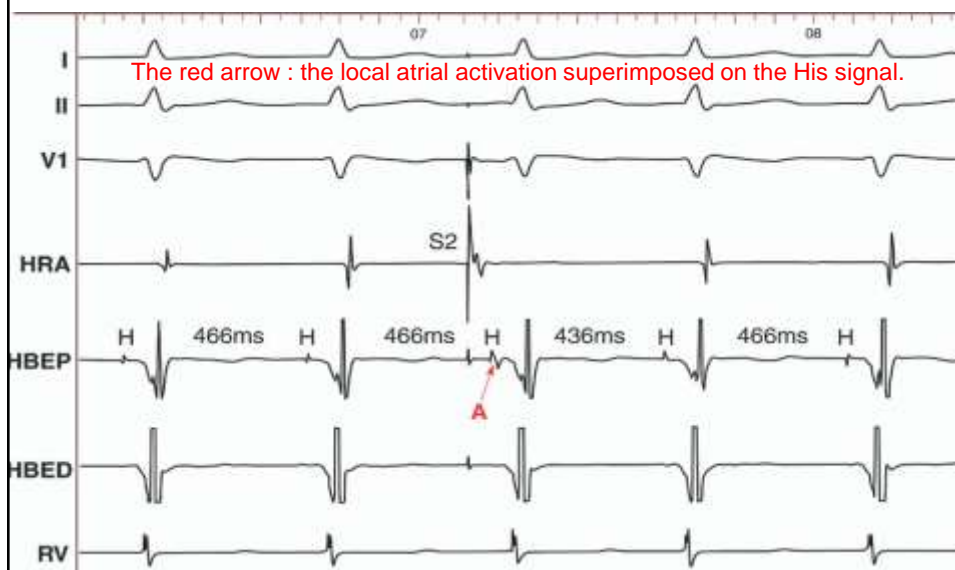
The following responses were identified with PACs during His refractoriness:

**Resetting** of the **subsequent** tachycardia beat (advancement, delay or termination) after a his refractory PAC as the junction is refractory indicates anterograde conduction via slow AV nodal pathway and effectively excludes the diagnosis of JT.... Other reponses are non specific ( no change )



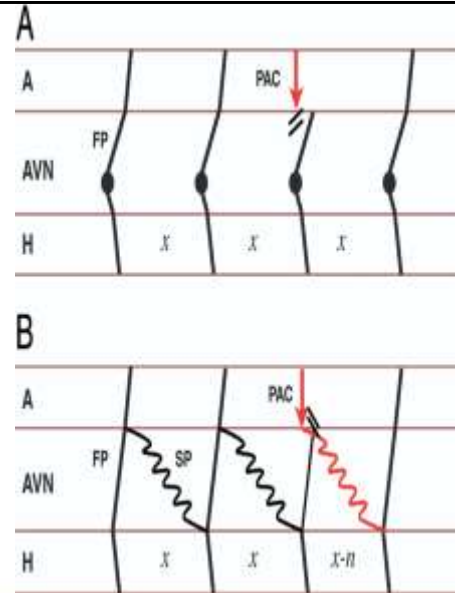
## PAC Response in AVNRT

The premature atrial complex (PAC [S2]) timed to junctional (His) refractoriness advances the next His by 30 ms.





- Response to (PAC) delivered when junction is refractory (local atrial activation from PAC occurs at or after His activation).
- (A) focus has already depolarized blocks at the (AVN) and is unable to influence the immediate or the next junction beat. Solid circles represent junction focus. Black lines show conduction through AVN
- (B) Response in (AVNRT): a similarly timed PAC can influence the next beat of AVNRT by early engagement of the slow pathway. Black lines show conduction through AVN, His (H), and atrium (A), and red lines show PAC and its response. Although this figure shows advancement of the next beat, *delay of the next beat or termination of tachycardia* are also specific to AVNRT. Red arrow indicates PAC.



## Early (pre-His) PAC

The following responses were identified with early PACs :

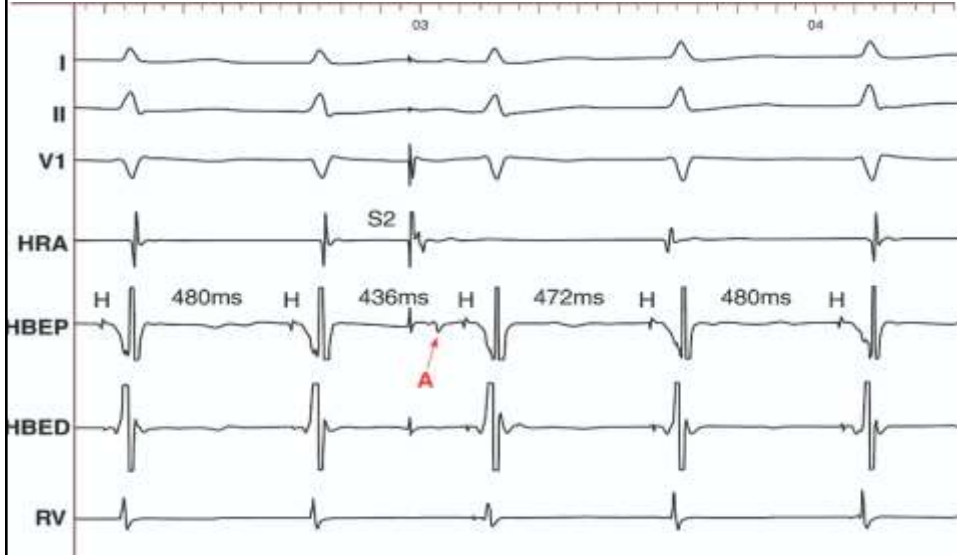
**Advancement** of the **immediate** his with continuation of the tachycardia confirm the diagnosis of JT....

Other responses are non specific :

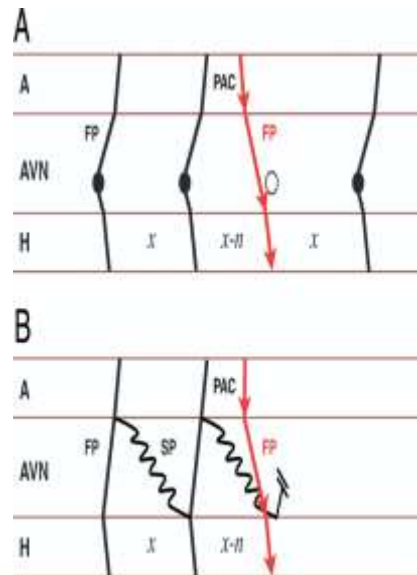
- Advancement of the immediate His with termination of tachycardia.
- No change in the immediate His timing with advancement/delay of the next His or termination of tachycardia.

## PAC response in JT

Early PAC (S2) advances patient the immediate His by 44 ms, and the tachycardia continues. The red arrow : atrial activation occurs before the His activation.



- (A) Response in (JT): the open circle represents the JT beat . An early PAC advances the immediate JT beat and His timing by atrioventricular (AV) nodal fast pathway activation and JT continues.
- (B) Response in AVNRT: an early PAC may advance the immediate His by activation of the AV nodal fast pathway. However, that makes the fast pathway refractory and unavailable for retrograde conduction, terminating the AVNRT circuit. Red arrow indicates PAC and its response.

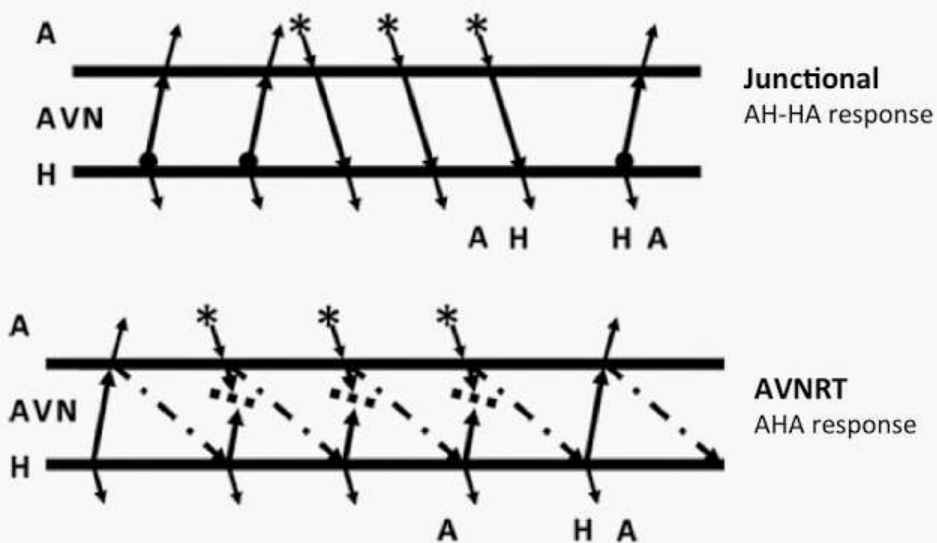


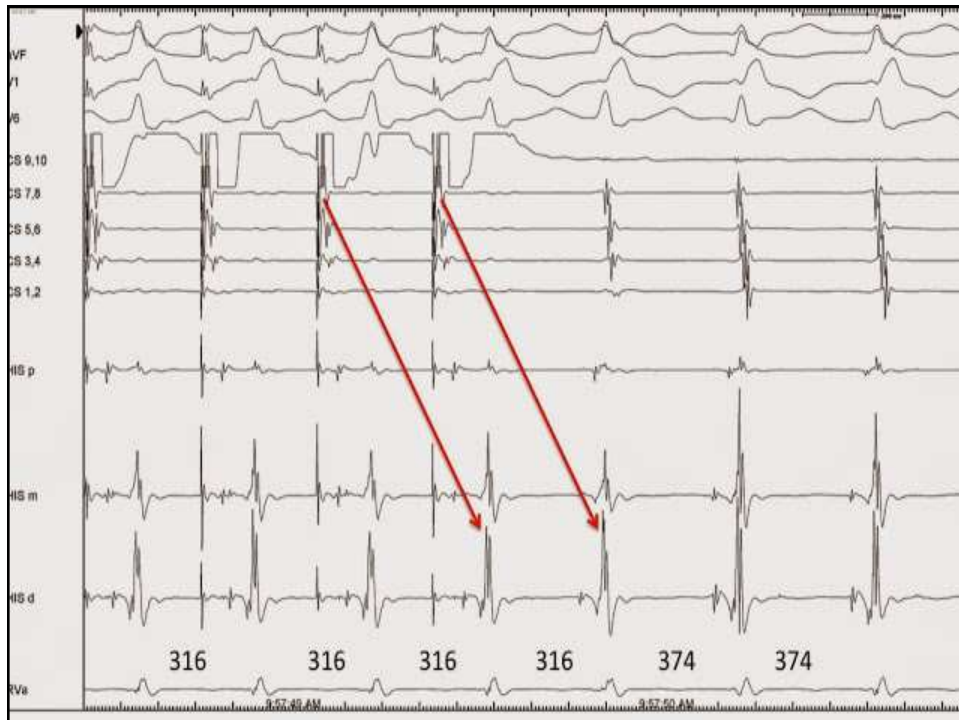
## Atrial overdrive pacing:

- Entrainment of AVNRT by atrial pacing can be the key diagnostic maneuver: the demonstration of a long AH interval between the last paced atrial beat and the last entrained ventricular electrogram should identify the tachycardia as AVNRT because this observation demonstrates antegrade conduction through a slow AV node pathway.
- Variable VA time : the variation is between the last paced VA time and the tachycardia VA time or return VA on different atrial pacing cycle length
- With atrial entrainment, response would be either a A-H-A response (consistent with AVNRT) or A-H-H-A (consistent with JT)



## AOD to Differentiate AVNRT and JT

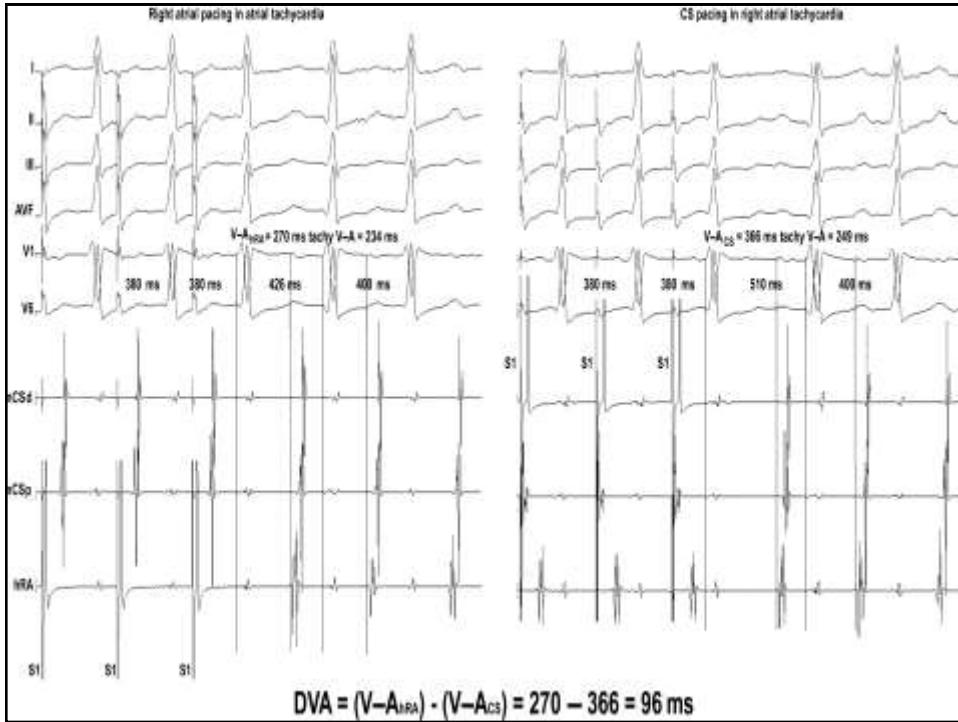




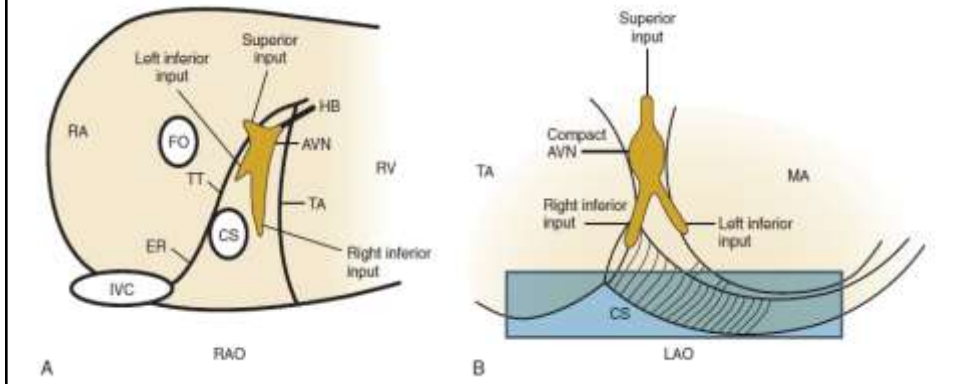
## Differential overdrive pacing

- pacing from multiple atrial sites and assessment of post pacing VA interval ( the timing of the first return atrial impulse will depend on the proximity of the pacing site to the origin of the AT )
- It was reported that the maximal difference in post pacing VA intervals after atrial overdrive pacing at 3 sites was <14 ms for AVNRT and >14 ms for septal AT.





**Figure 21-11.** A, Schematic representation of atrioventricular node (AVN) inside the triangle of Koch as viewed from the right anterior oblique (RAO) projection. The boundaries of the triangle of Koch are defined by the tendon of Todaro (TT), the tricuspid annulus (TA), and the ostium of the coronary sinus (CS). The superior, left inferior, and right inferior inputs are shown. B, Schematic representation of AVN as viewed from the left anterior oblique (LAO) projection. The AVN is shown above the CS along with the mitral annulus (MA) and the TA. The superior extension (anterior in the old anatomic nomenclature) is in contact with both atria. The right inferior input is in contact with the CS. The left inferior input is in contact with the MA. ER, Eustachian ridge; FO, fossa ovalis; HB, His bundle; IVC, inferior vena cava; RA, right atrium; RV, right ventricle. (Modified from Gonzalez MD, Contreras LJ, Cardona F, et al. Demonstration of a left atrial input to the atrioventricular node in humans. *Circulation*. 2002;106:2930-2934. With permission).



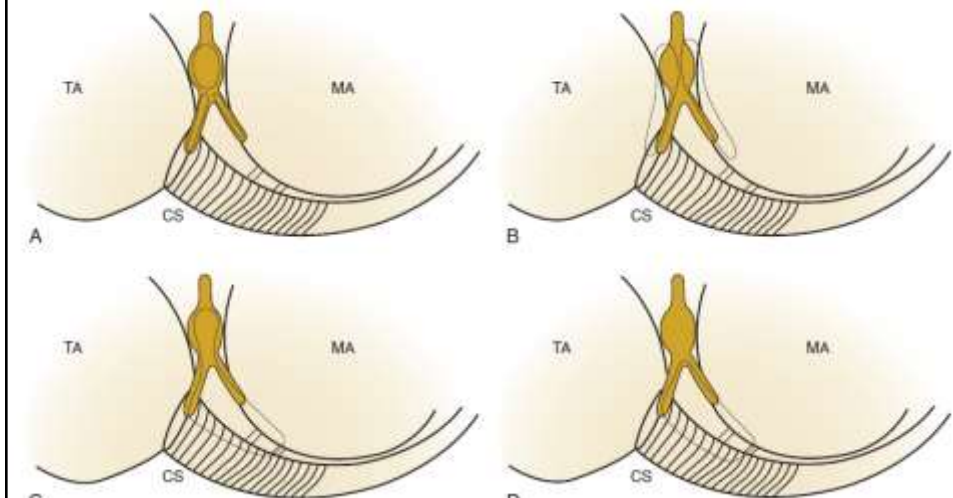
**Hypothetical reentrant circuits underlying different forms of atrioventricular nodal reentrant tachycardia (AVNRT).**

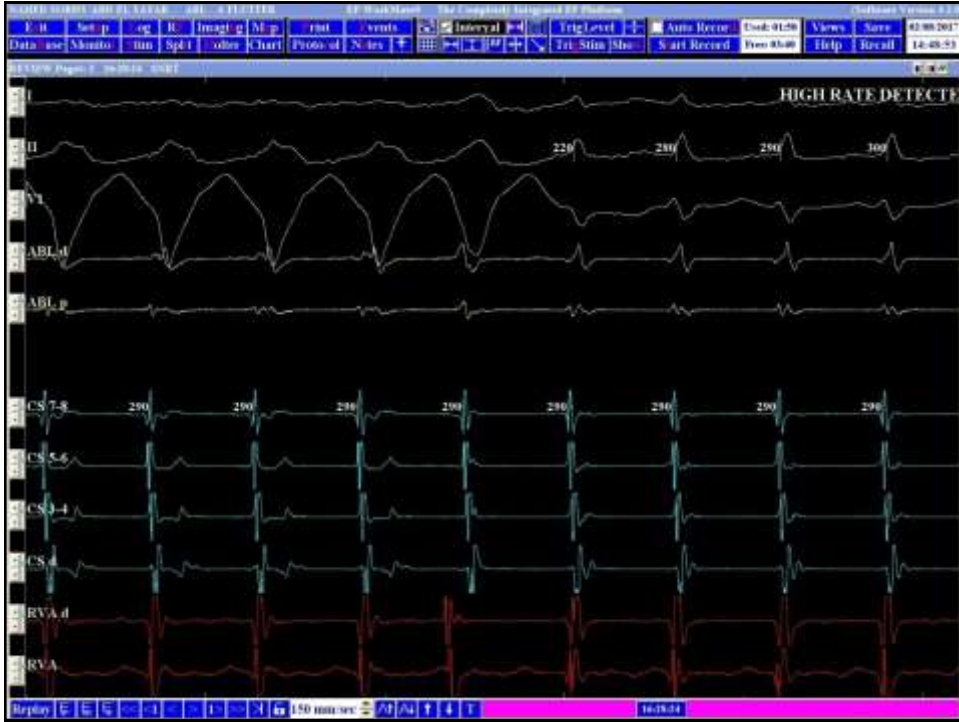
**A, Reentry (broken lines) confined to different segments of the AV node without participation of the atria.**

**B, Reentry involving atrial tissue and different segments of the compact AV node and its inputs.**

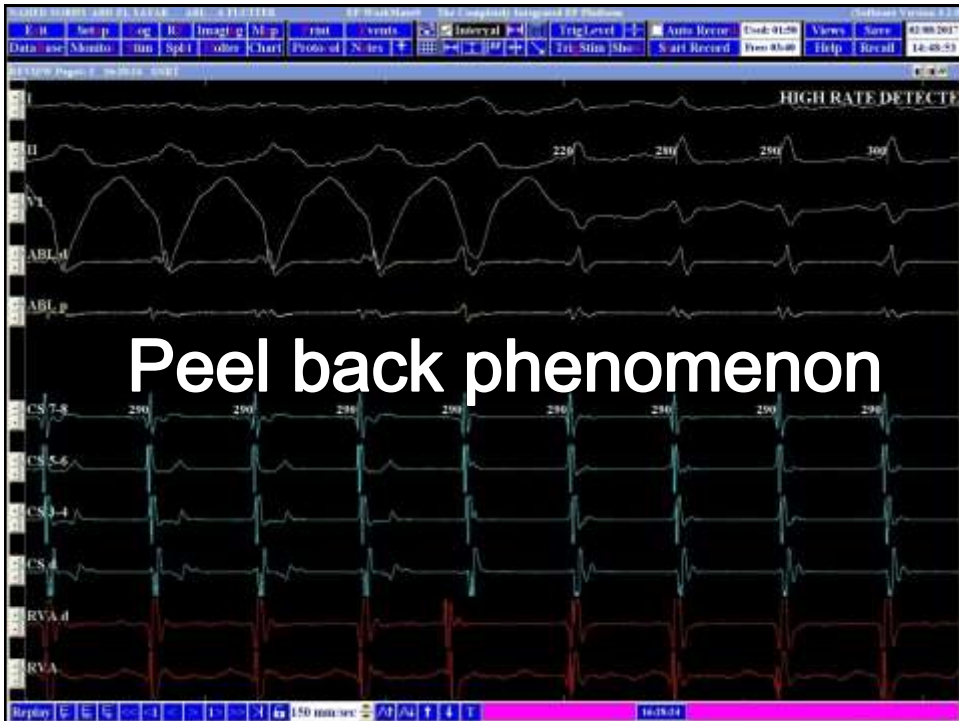
**C, Reentry involving the musculature of the coronary sinus connecting both inferior inputs and the compact AV node.** This circuit has been proposed to describe slow-fast AV nodal reentry.

**D, Reentry similar to that in C without involvement of the compact AV node.** This circuit has been proposed to describe slow-slow and fast-slow AV nodal reentry. Within a given reentrant circuit, opposite wave fronts will give rise to different forms of AVNRT.





Peel back phenomenon







# Home message

- Let's to be aware of different maneuvers in differentiating JET from AVNRT.
- JET gives VAV response on V entrainment
- VA dissociation on V entertainment trial is mostly AT but cannot exclude absolutely AVNRT.
- 2:1 tachycardia DD with help of His
- Peel back phenomena is a normal physiological phenomena.



Thank you!

