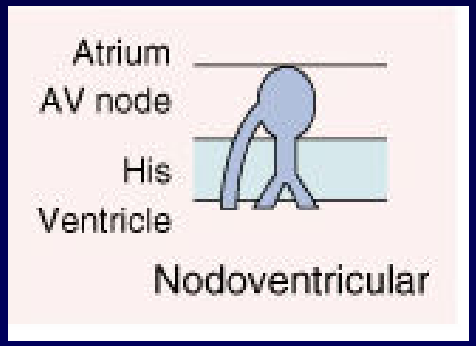
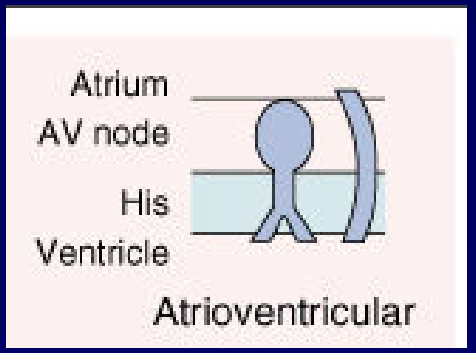
드문 상실실성빈맥의 전극도자 절제술

연세대학교 심장내과
정보영

History of Mahaim fiber

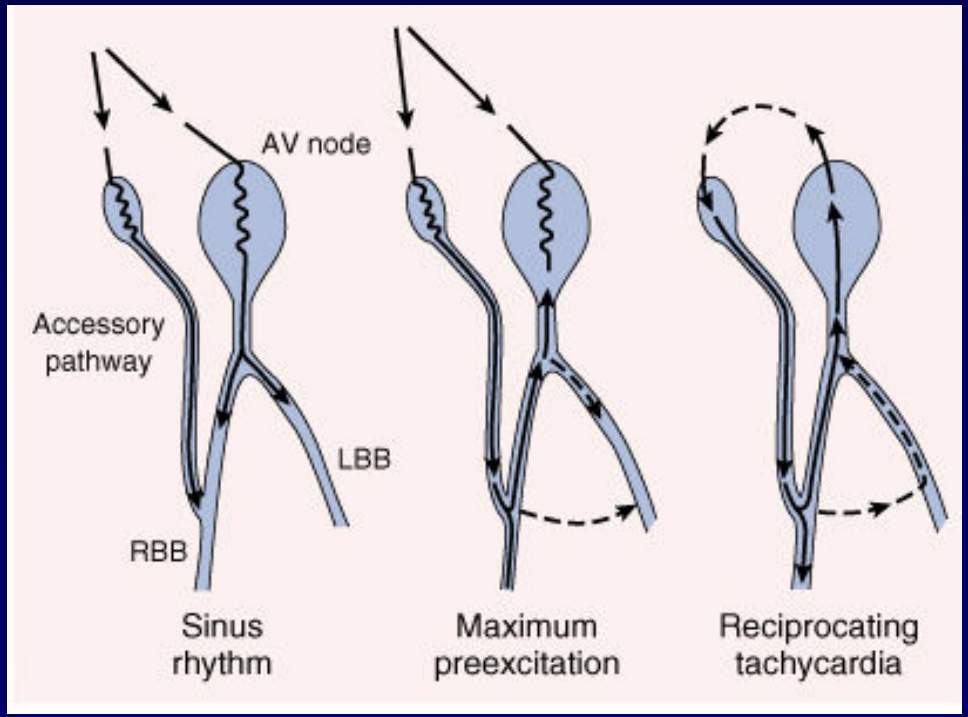
- 1941 – Mahaim I and Winston MR
  - AP : connections between AV node and distal bundle branch or adjacent ventricular myocardium
  - A variant form of WPW syndrome, a ”nodoventricular” or ”nodofascicular” variant
  - Resting ECG : often normal or subtle pre-excitation
  - Pre-excited QRS complex : LBBB, Leftward axis
  - Rate-dependent conduction properties
- 1988 – Klein GJ
  - an ”atrioventricular” or “atriofascicular AP”
  - RA – TA – distal RBB
  - Preexcitation : RAP > LAP





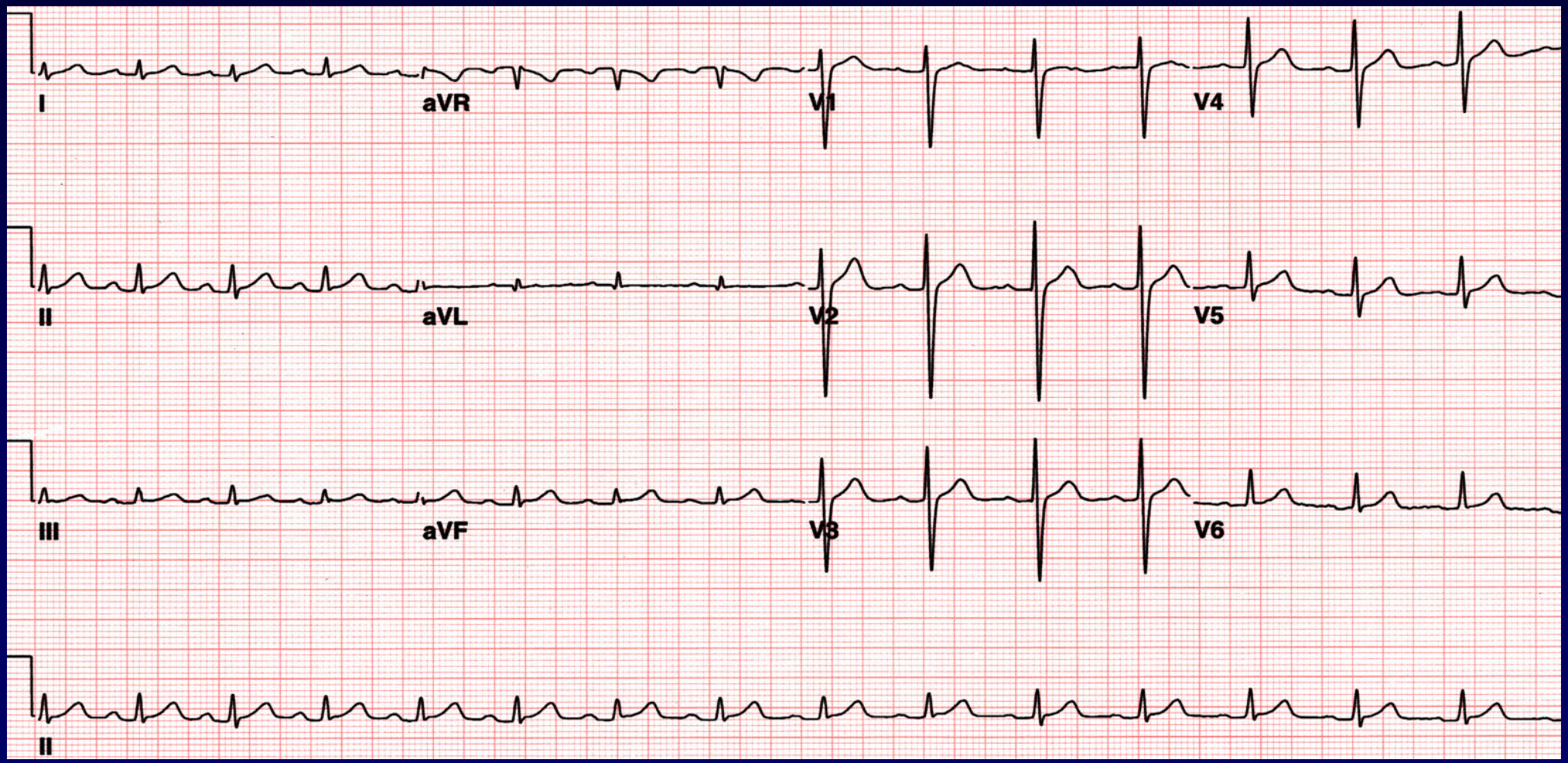
Mahaim fiber

- Incidence rate ≈ 2%
- Decremental anterograde conduction properties,
- No or slight pre-excitation during SR
- Conduction nearly always exclusively anterograde
- Clinical arrhythmia
  - regular wide QRS tachycardia
  - LBBB
  - AP → His-Purkinje
  - Bystander (Other SVT)



ARC 03, Chung SY, #3992367

34 F
Palpitation for 2 hours (onset : 20 years ago)



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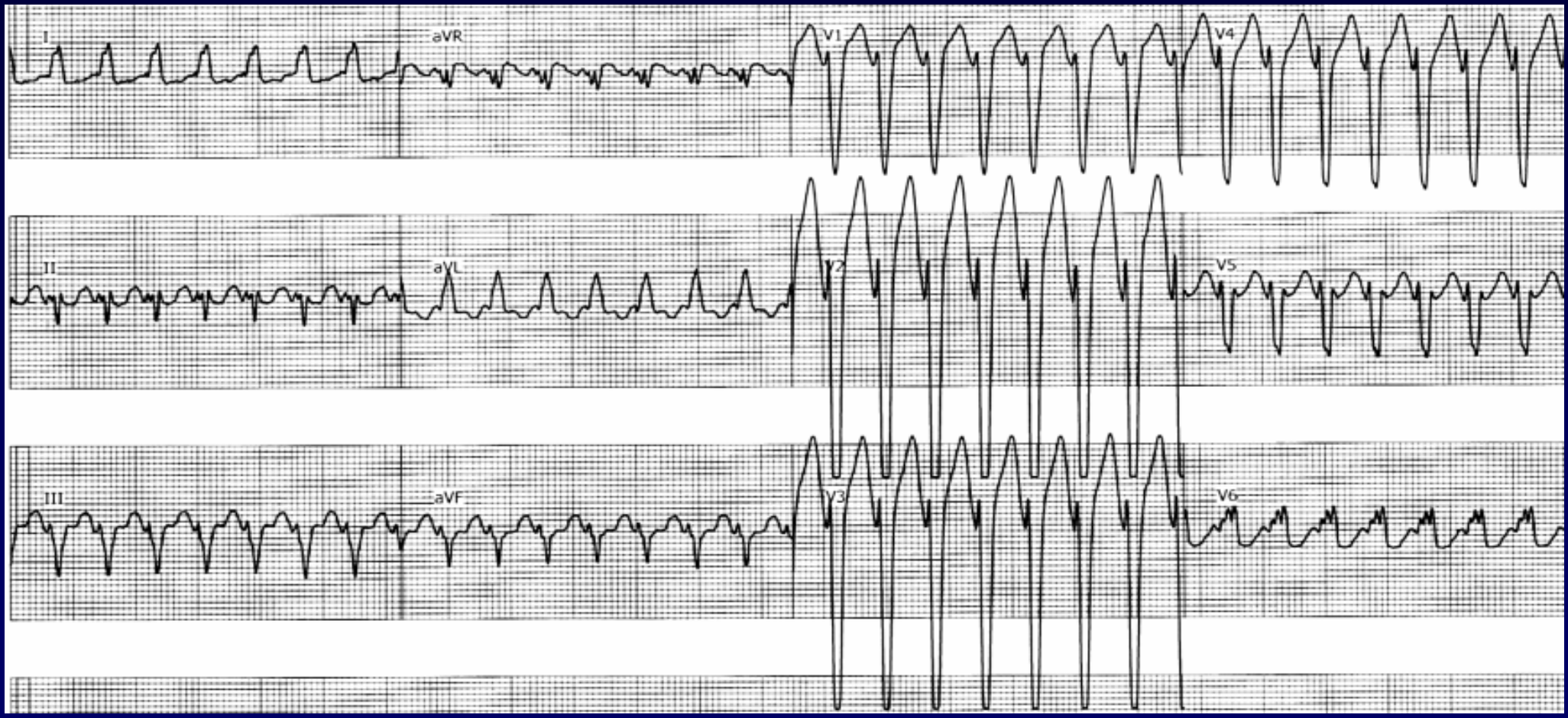
Clinical tachycardia

LBBB, LAD, TCL 300ms



CASE S-21-5

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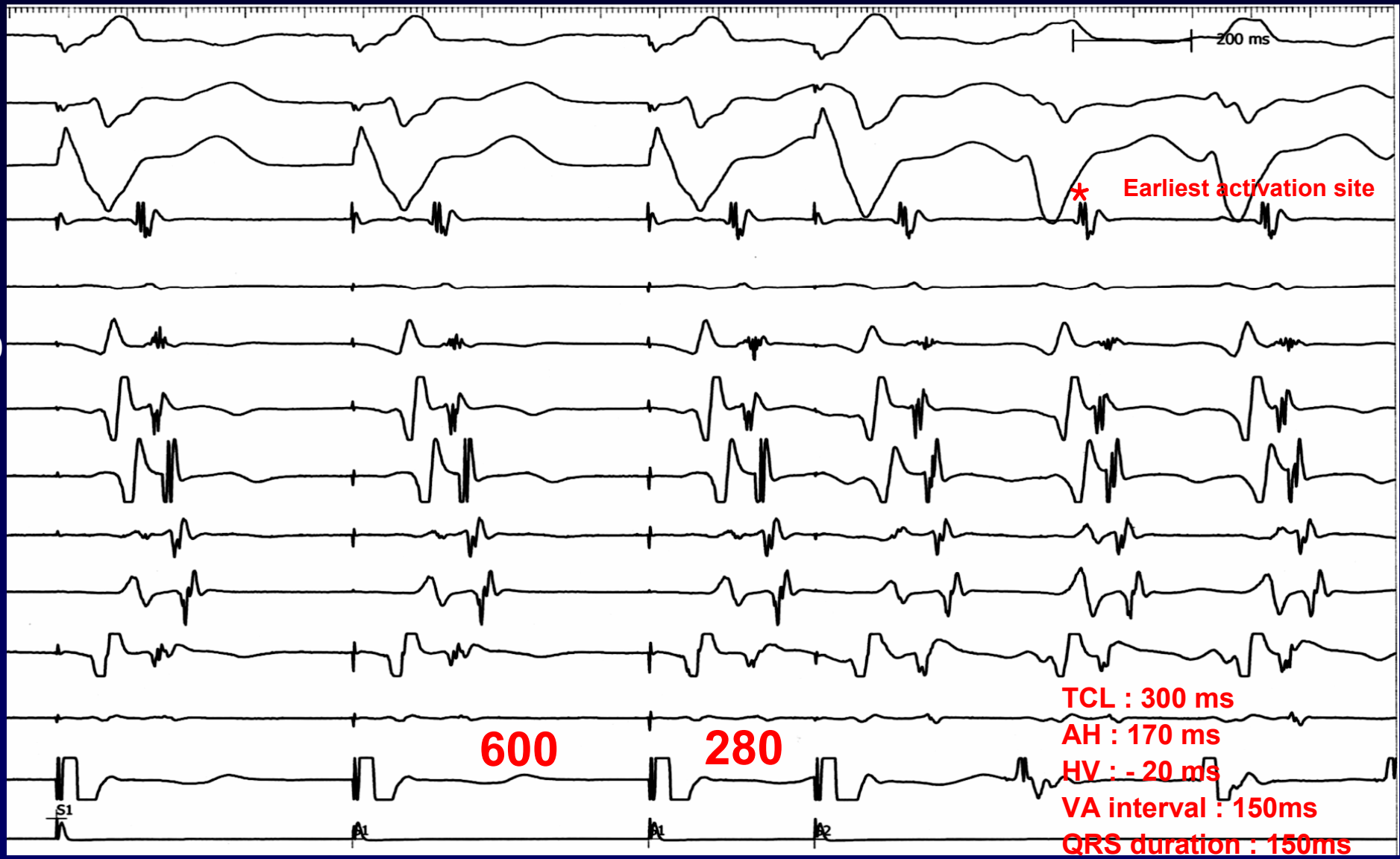
Induction of tachycardiaby SVEST



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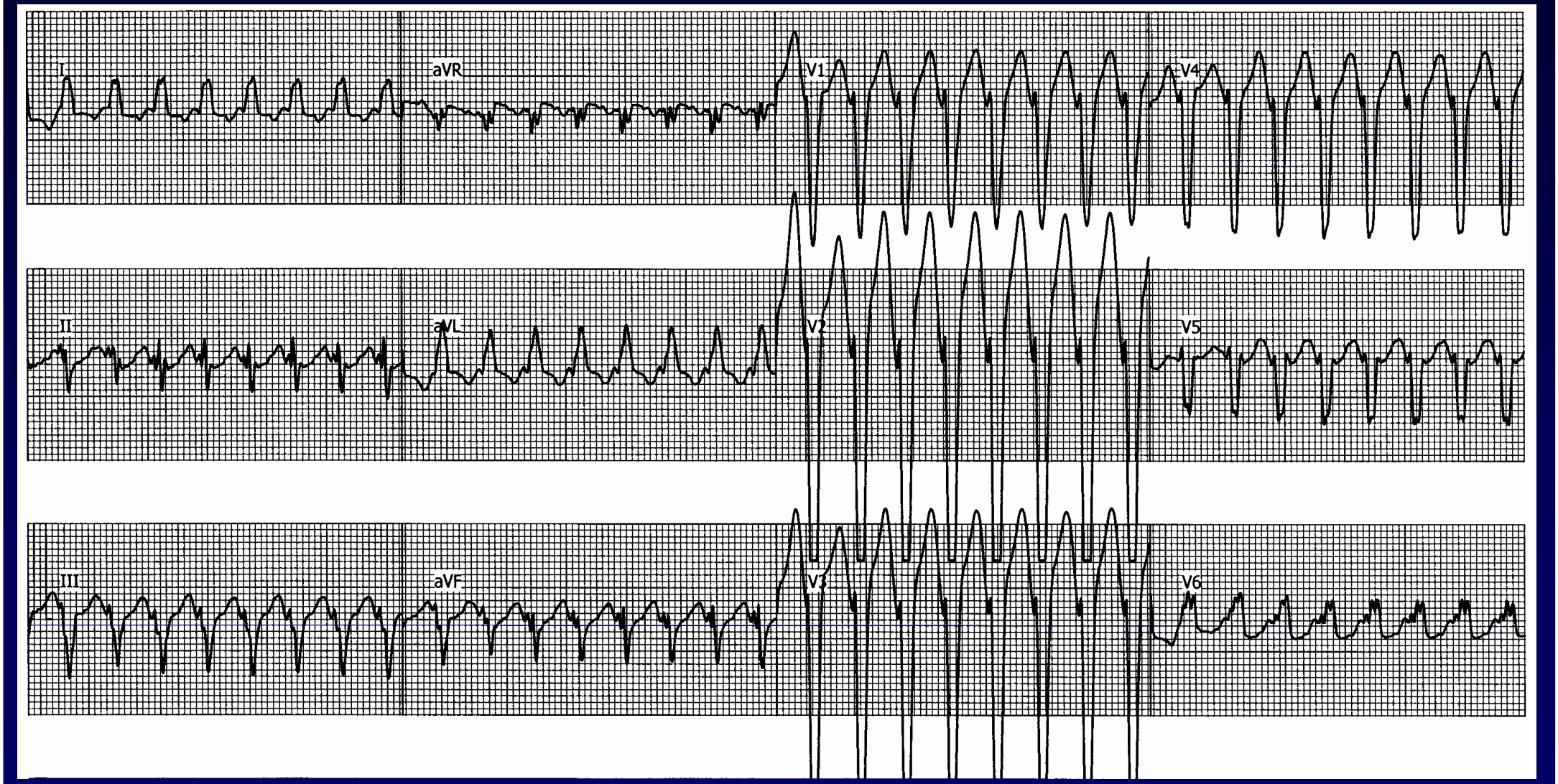
RAP 300 ms



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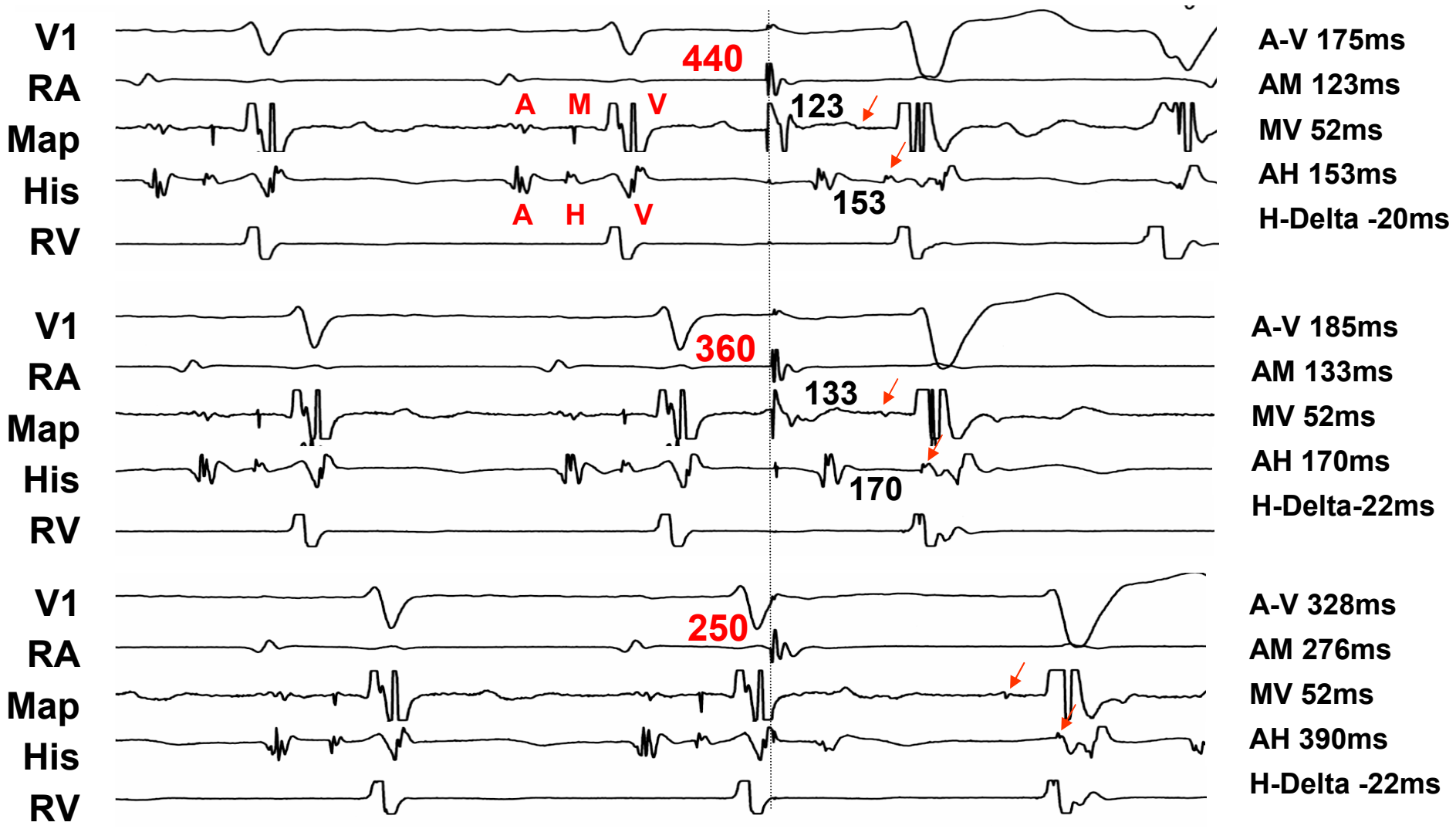
Atrial Premature Beat



Techniques for Mapping and ablation
- Atrioventricular fibers -

Atrial insertion

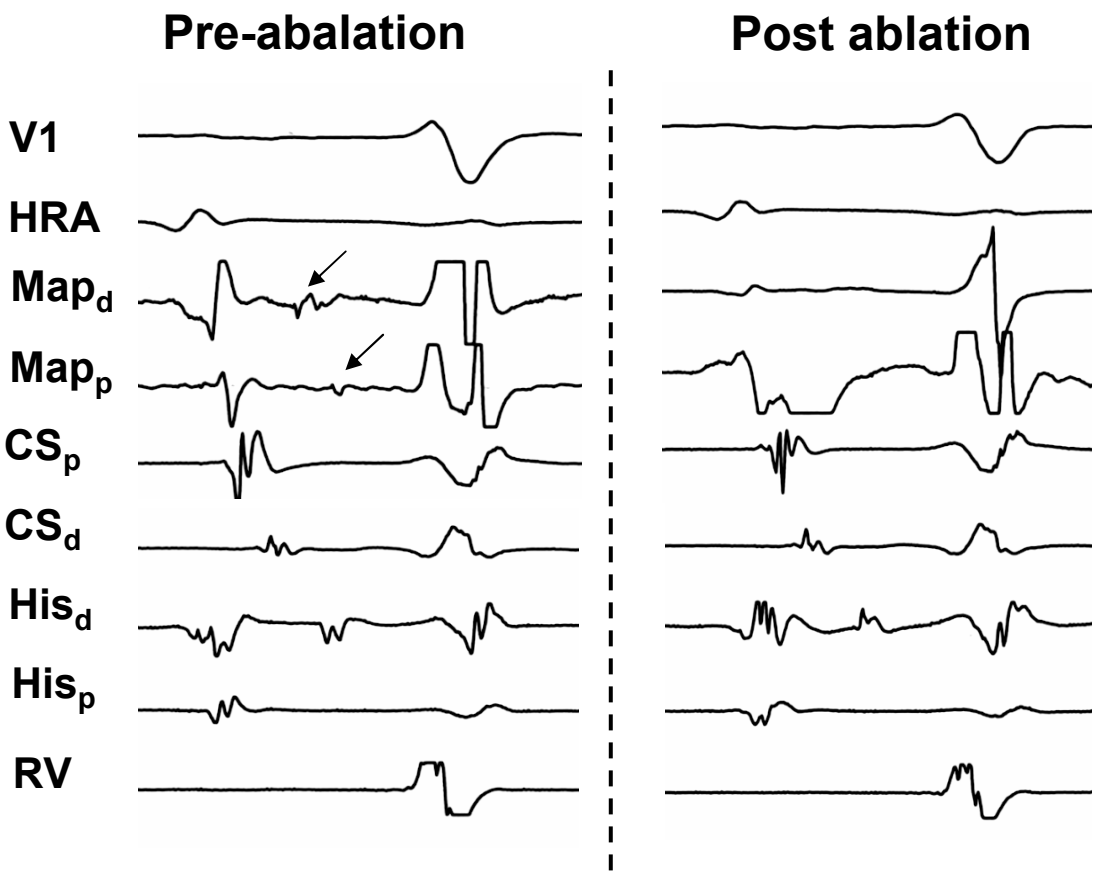
1. The recording of a local AP potential
2. The mechanical block of the AP
3. The shortest Stim-to-QRS interval of maximally pre-excited beats during pacing at a fixed rate from the TA

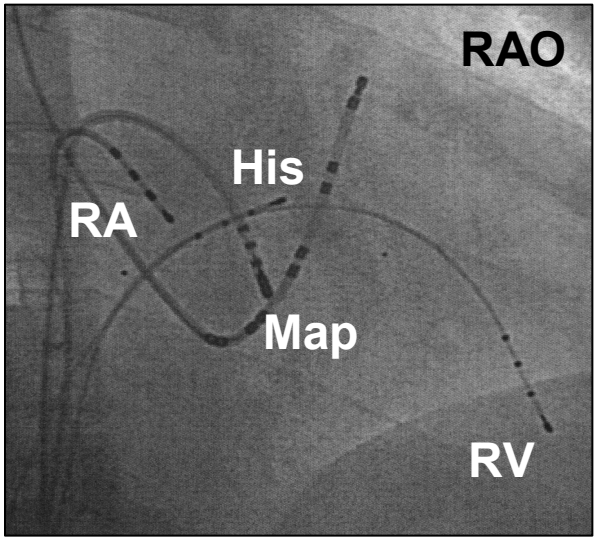
Ventricular insertion

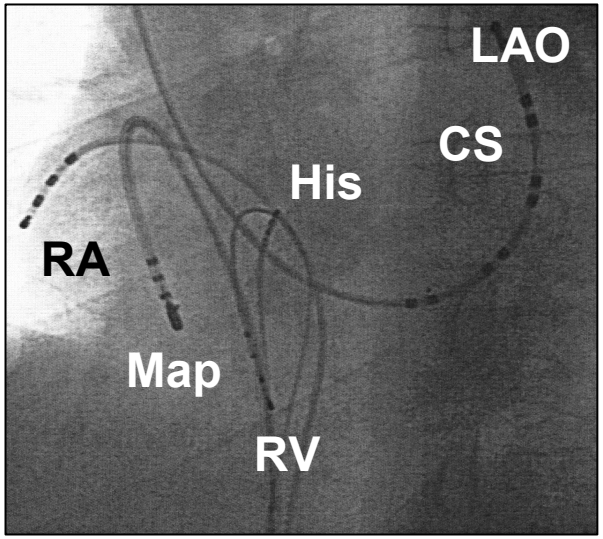
1. The earliest ventricular activation site of maximally pre-excited beats
2. The presence of a local AP activation potential
3. A paced QRS matching the tachycardia QRS

ARC 03, Chung SY, #3992367

The recording of a local AP potential







Permanent junctional reciprocating tachycardia - PJRT -

- The permanent (>12 h/day)
- An AP with slow, decremental, and predominantly retrograde conduction properties

- Common in infants and children
- May persist into adulthood
- Usually refractory to drug therapy
- Usually no or only mild clinical symptoms
- May cause tachycardia-induced CMP

9 F, 초등학교 학생
Chest discomfort and palpitation for 1 week

Medical history

1993. 8. 30 : PSVT

- Verapamil – no effect
- Adenosine – no effect
- Procainamide – no effect
- Flecainide – no effect

1993-1998 : Controlled by oral sotalol

Beyond 1998 : stop medication

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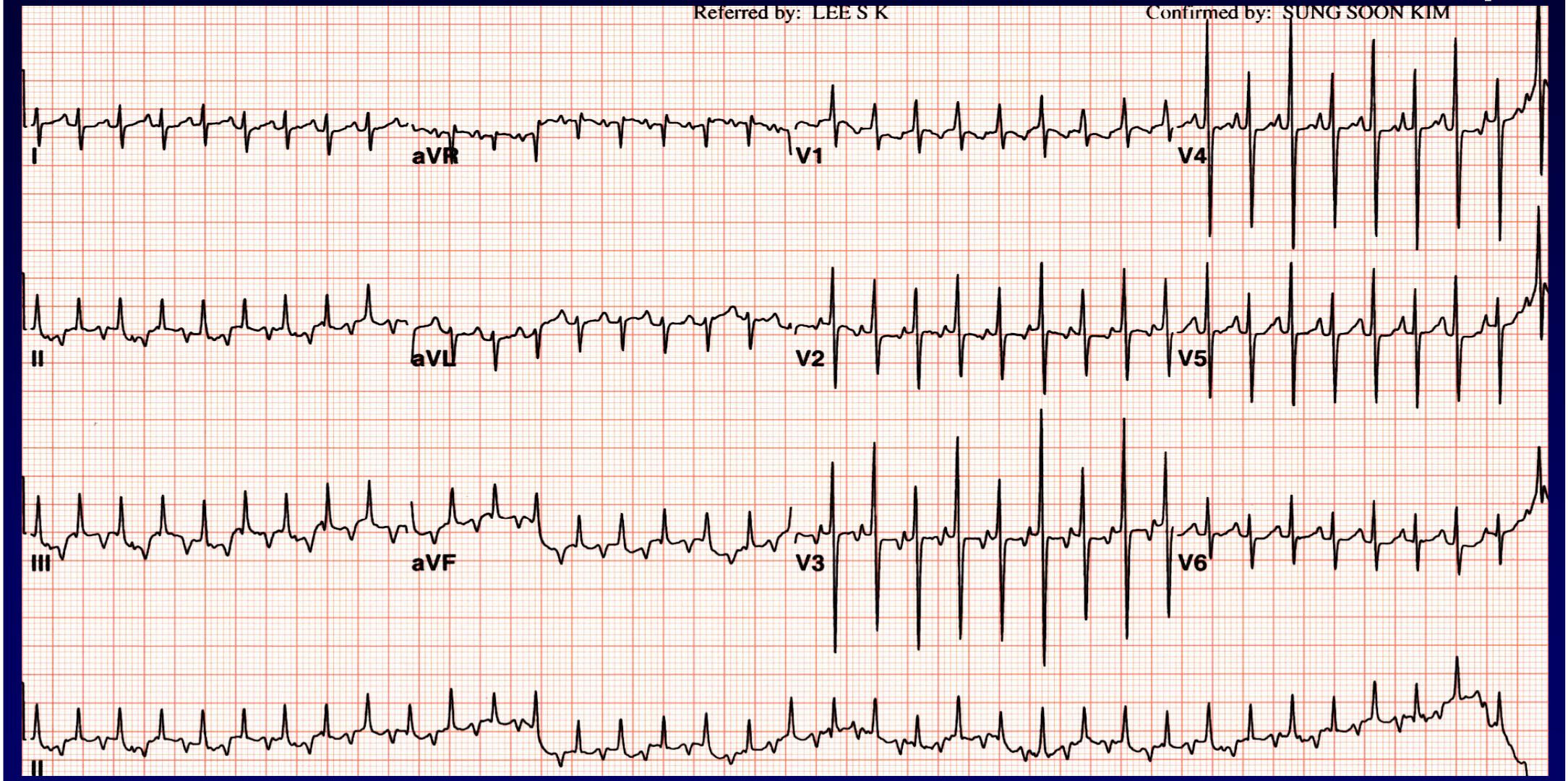
Tachycadia at birth

HR 225 bpm



1993-10-6

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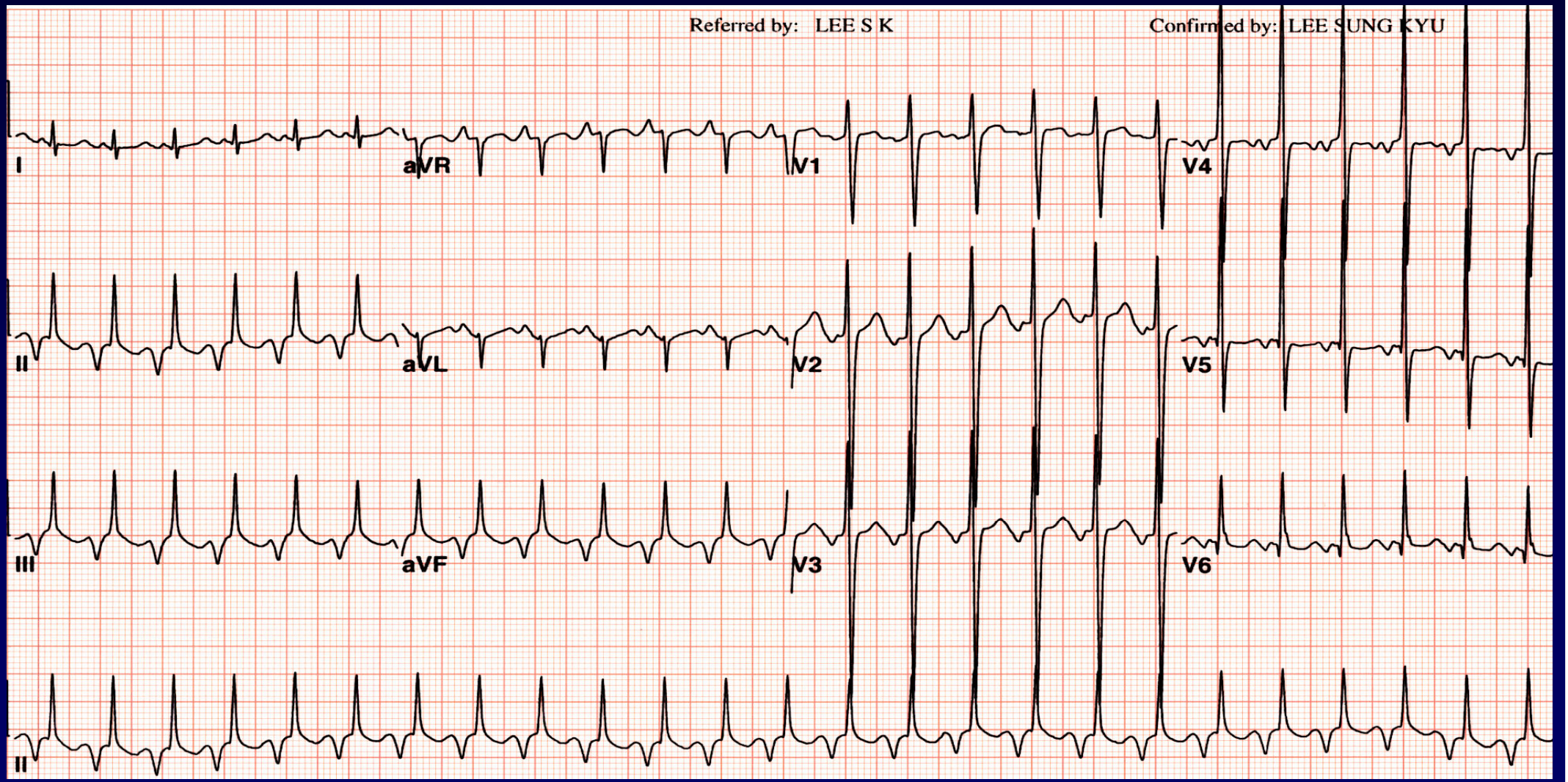
EKG on admission

HR 150 bpm



ECG Characteristics of PJRT

- A narrow QRS complex
- An initiation mode : not preceded by a prolongation of the PR interval
- A 1:1 AV relation
- PR interval > RP interval
- retrograde P wave in leads II, III and aVF : negative polarity

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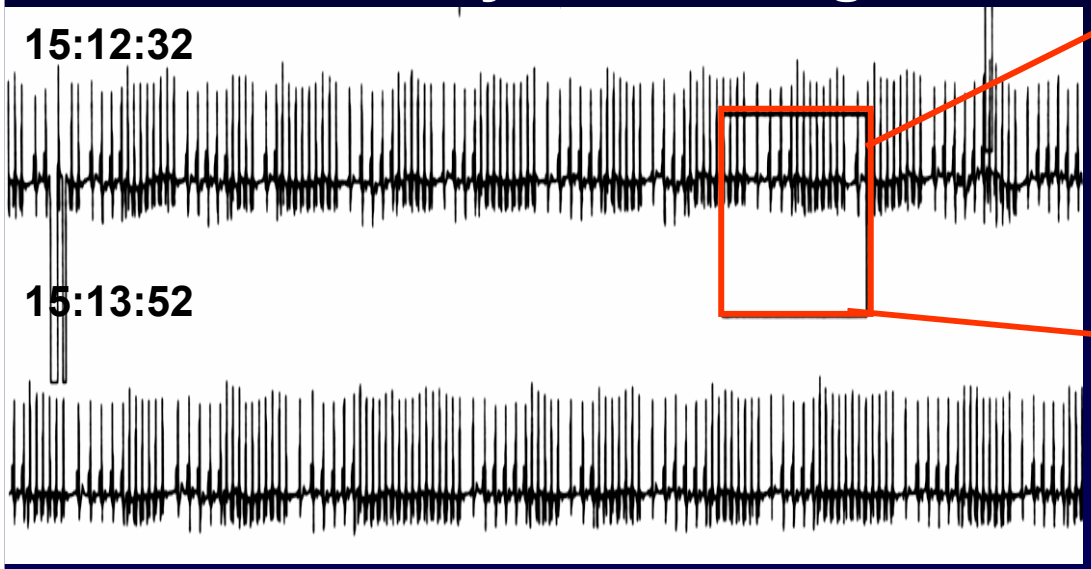
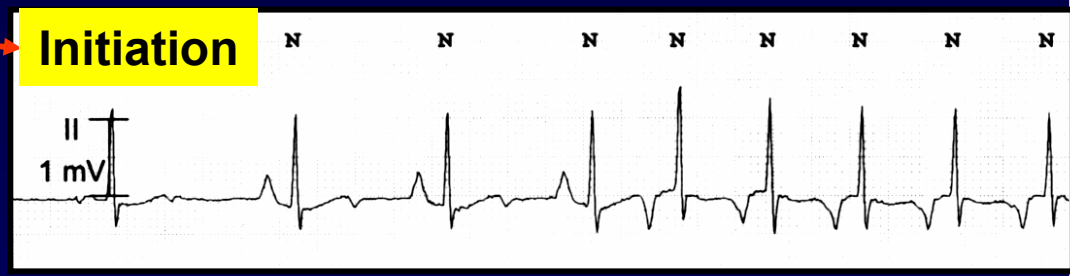
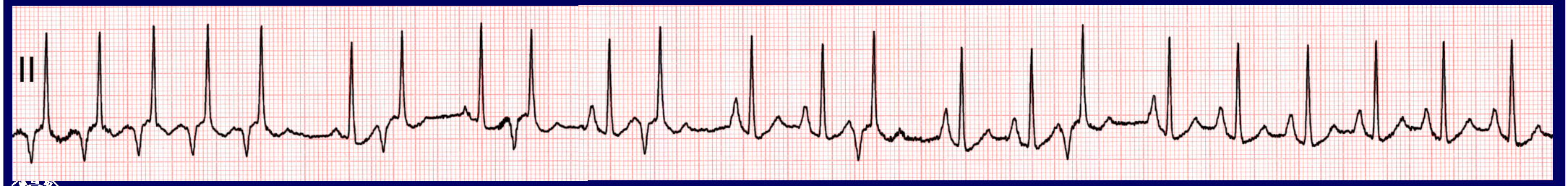
Initiation and termination of tachycardia

Telemetry monitoring





Intravenous verapamil of 5mg



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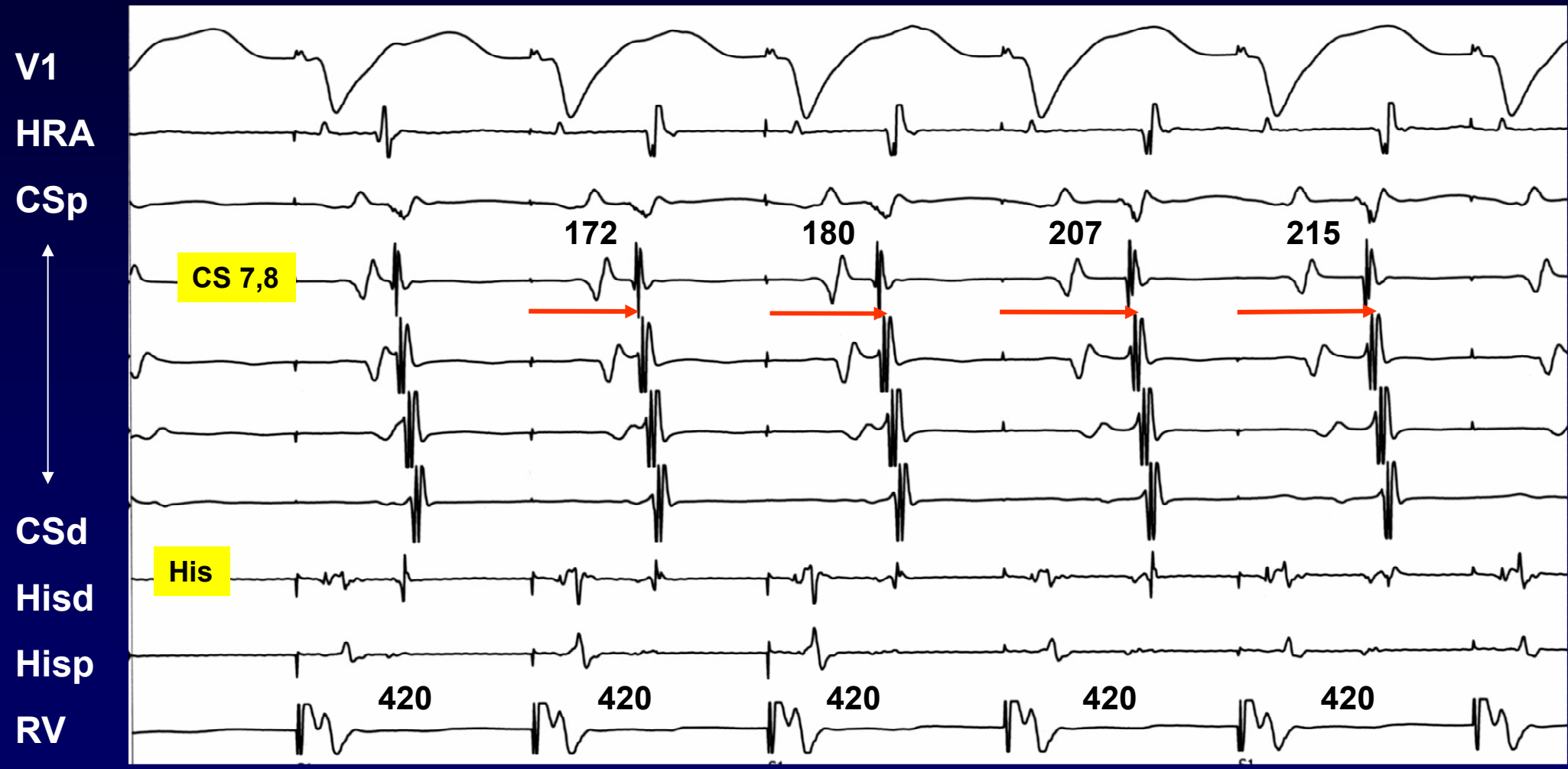
Decremental Property of AP



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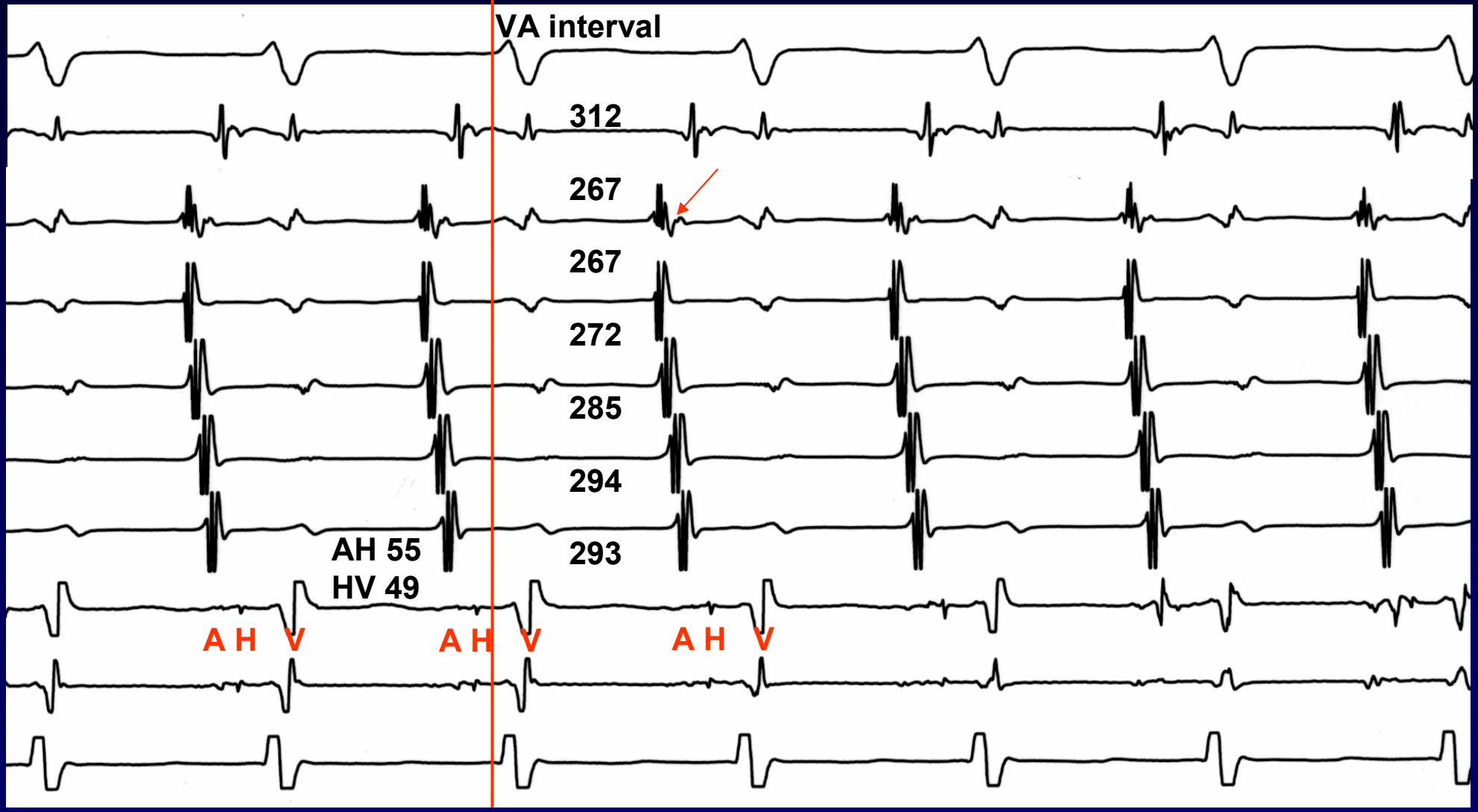
Tachycardia

TCL = 390ms



Distinguish PJRT from atypical form AVNRT

- A VPB during the bundle of His refractory
  1) advancement of retrograde atrial potentials (without the change of activation sequence)
  2) terminates tachycardia without retrograde atrial activation
  3) a significant (> 50 msec) prolongation of the local VA interval

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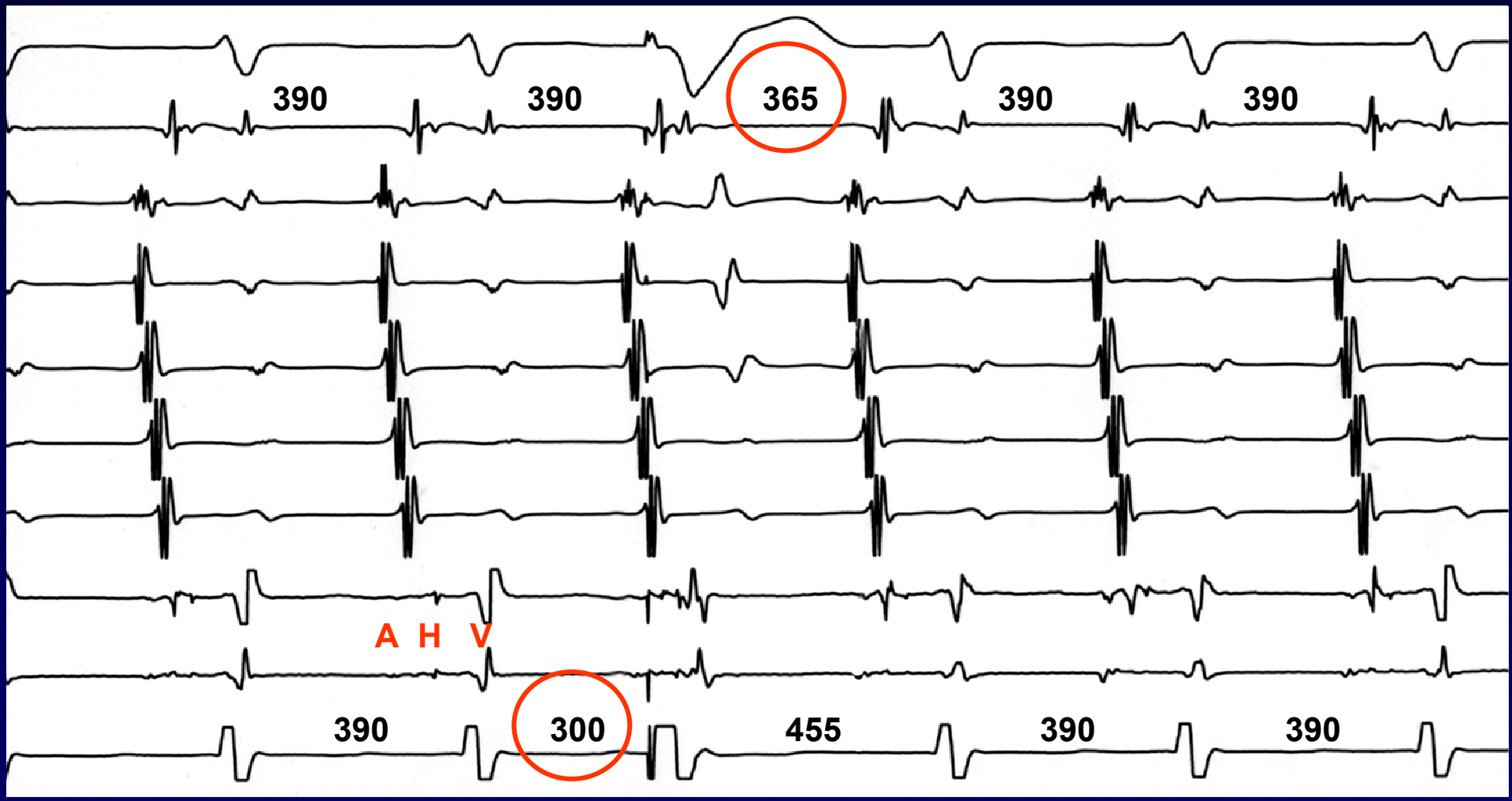
Atrial reset by VPB during the His refractory period



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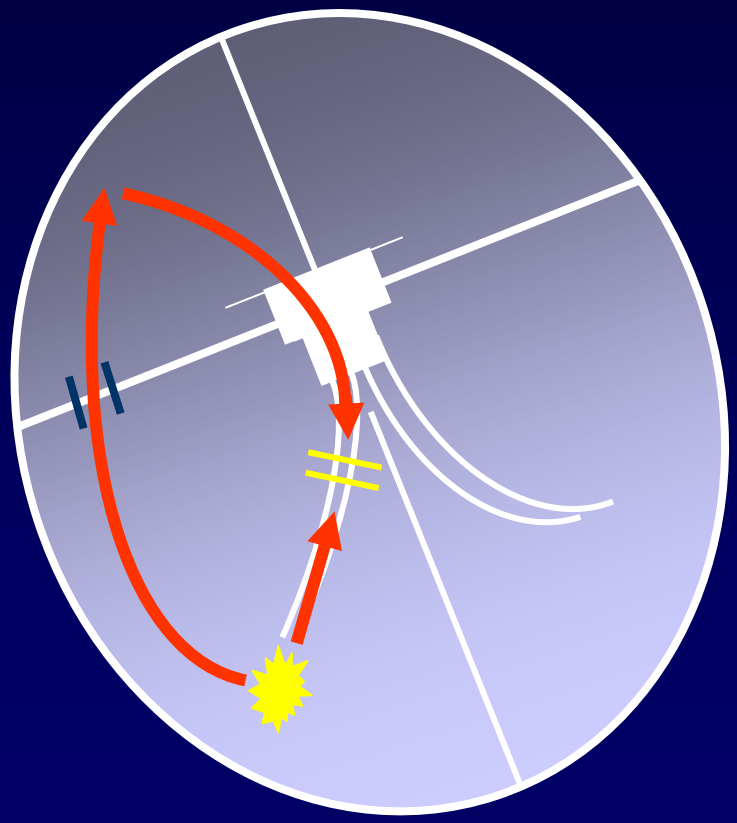
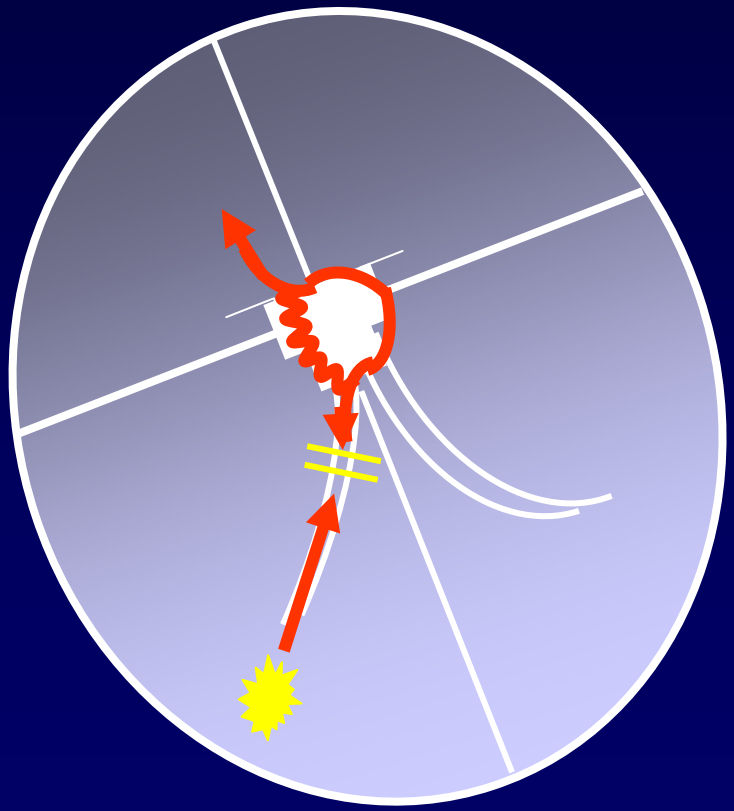
Atrial reset by SVEST during His-Purkinje refractoriness

AVRT



AVNRT



Techniques for Ablation

- The earliest retrograde atrial activation (during tachycardia or ventricular pacing)
- A distinct AP potential

- AP location
  - close to or just inside the CS orifice in > 80%
  - along the right or left free wall

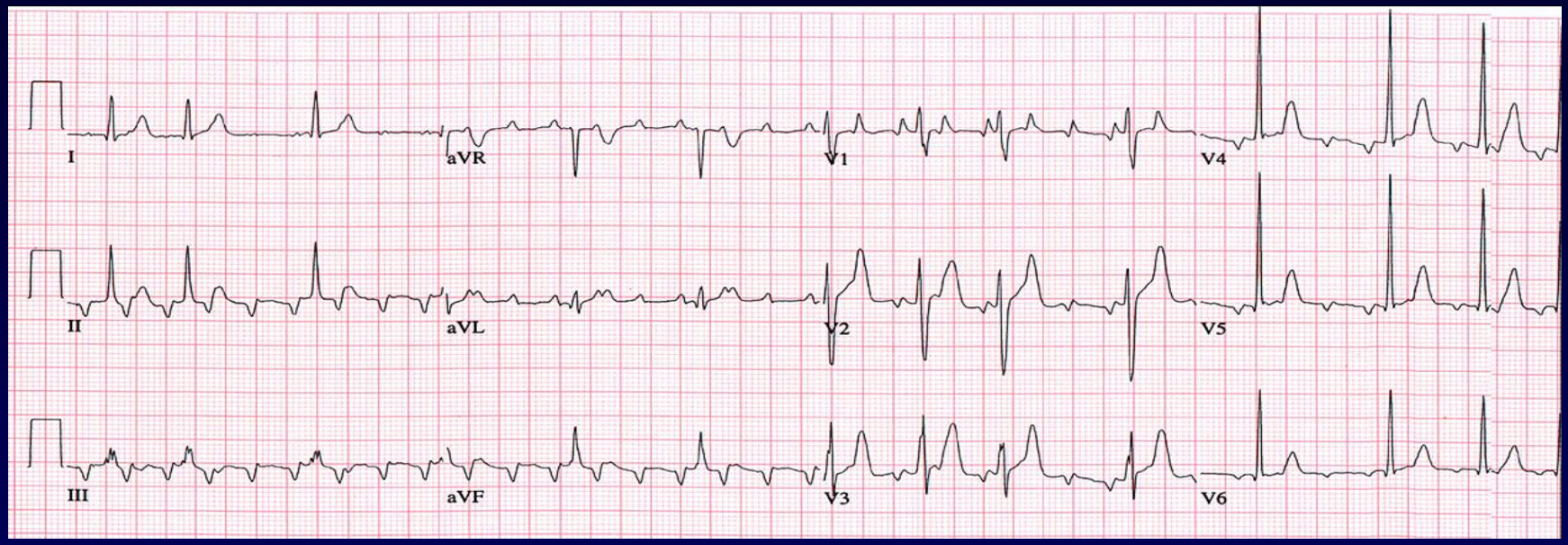
- A left-sided catheter approach (the earliest atrial activation >1cm from CS orifice)

Atrial tachycardia

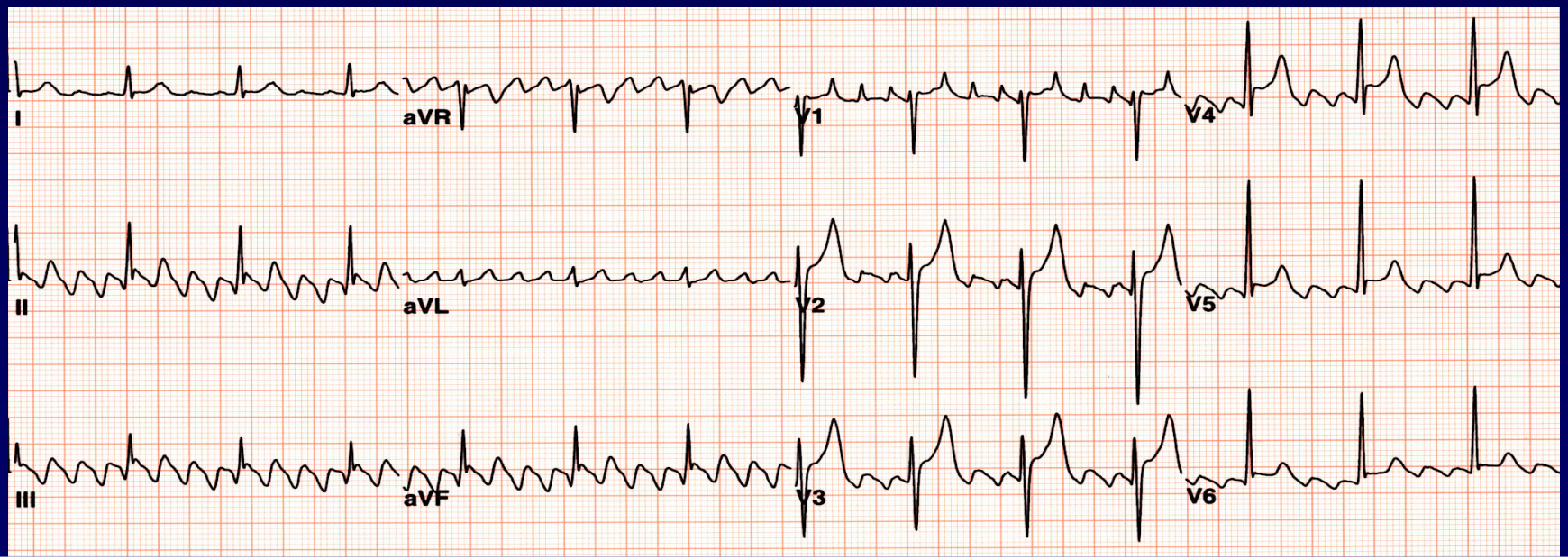
- A relatively infrequent (<10%)
- ECG criteria
  - atrial rate < 240 beats/min
  - discrete P waves separated by isoelectric baseline
- Classification
  - focal vs. macroreentant atrial tachycardia

Focal vs. macroreentrant AT

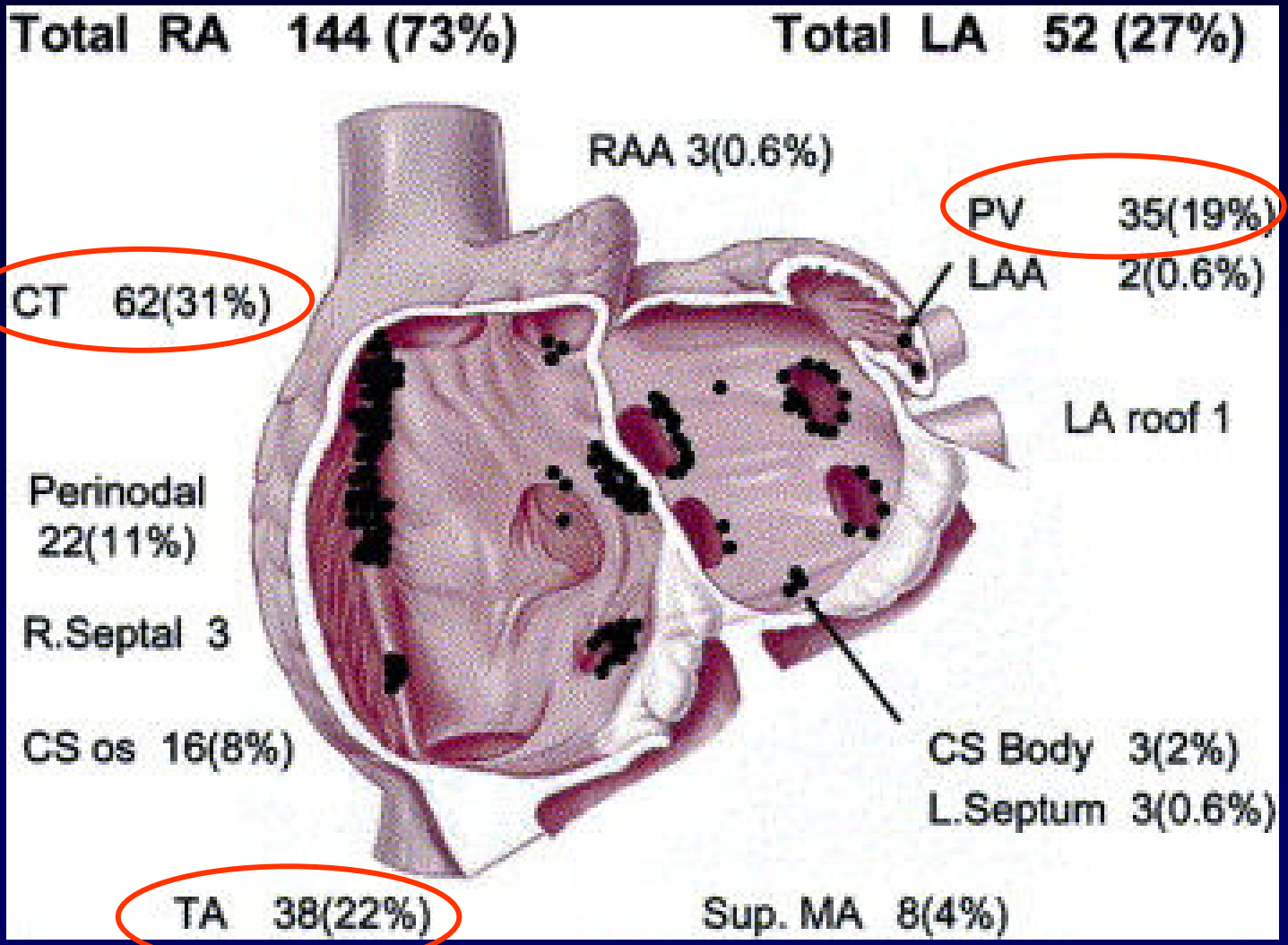
33 M



47 M



Origin of focal AT



Kistler P. et al. JACC 2006;48:1010-7

EP Diagnostic Criteria of AT

(1) Atrial activation sequence :

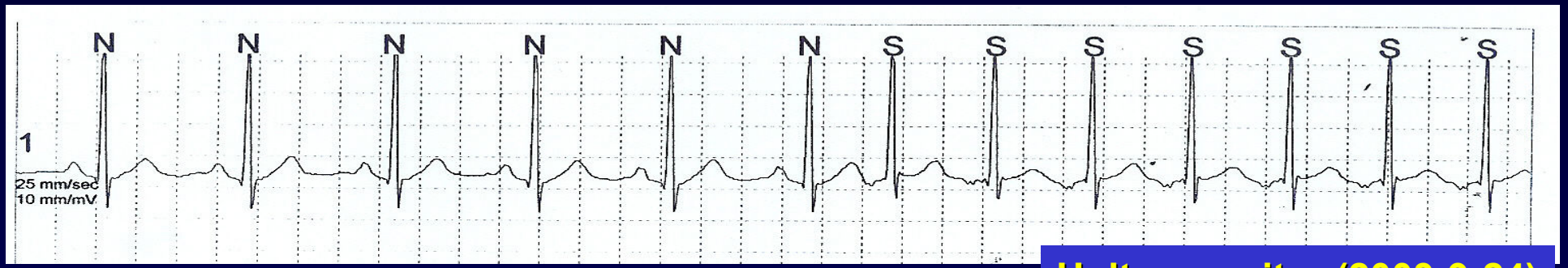
tachcyardia ≠ SR, ventricular pacing

(2) Presence of AV block without affecting the tachycardia

(3) Change in the A-A interval during tachycardia preceding a change in the V-V interval

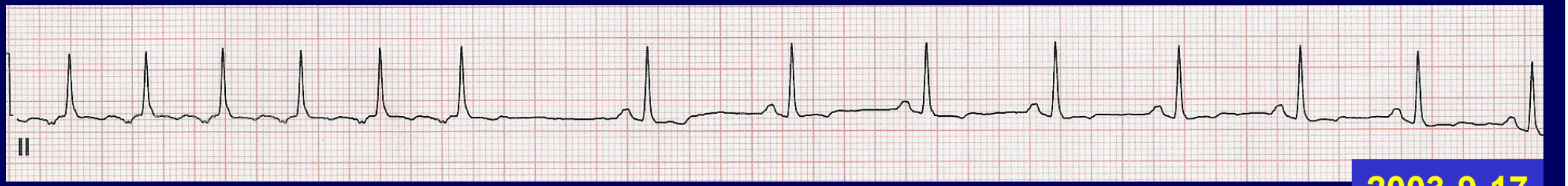
ARC 04, Moon SH , #2172410

Initiation of tachycardia



Holter monitor (2003-9-24)

Termination of tachycardia



2003-9-17

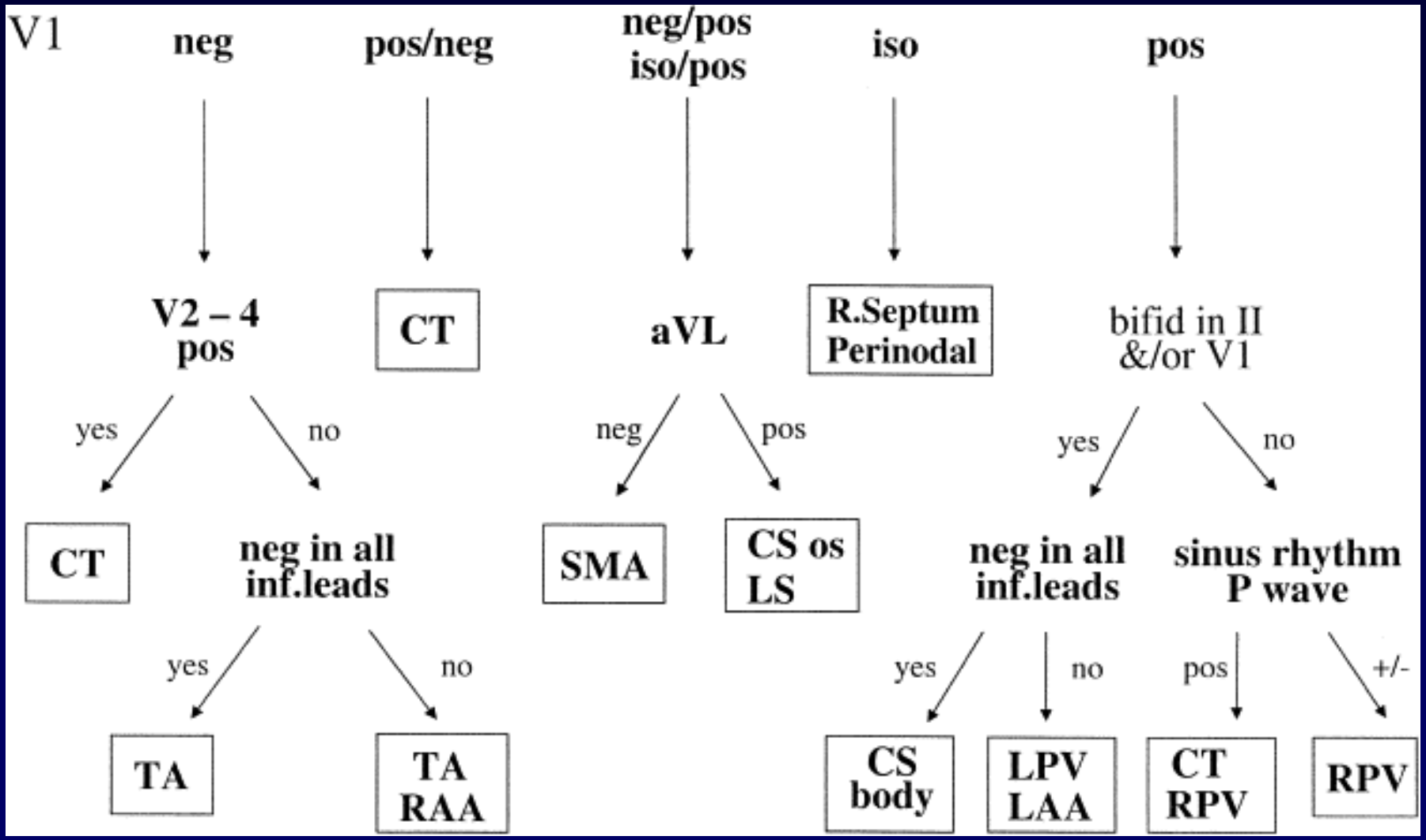
Several Pacing maneuvers to determine the tachycardia mechanism

- The 1st step : VPB during tachycardia
- The 2nd step : RV pacing during tachycardia
- The 3rd step : Atrial pacing at a CL
  (= CL of tachcyardia)
- The 4th step : Atrial pacing during tachycardia

Mapping and ablation techniques

- P-wave Polarity
- Endocardial Activation Mapping
- Paced Activation Sequence Mapping
- New Mapping Systems

A P-wave algorithm



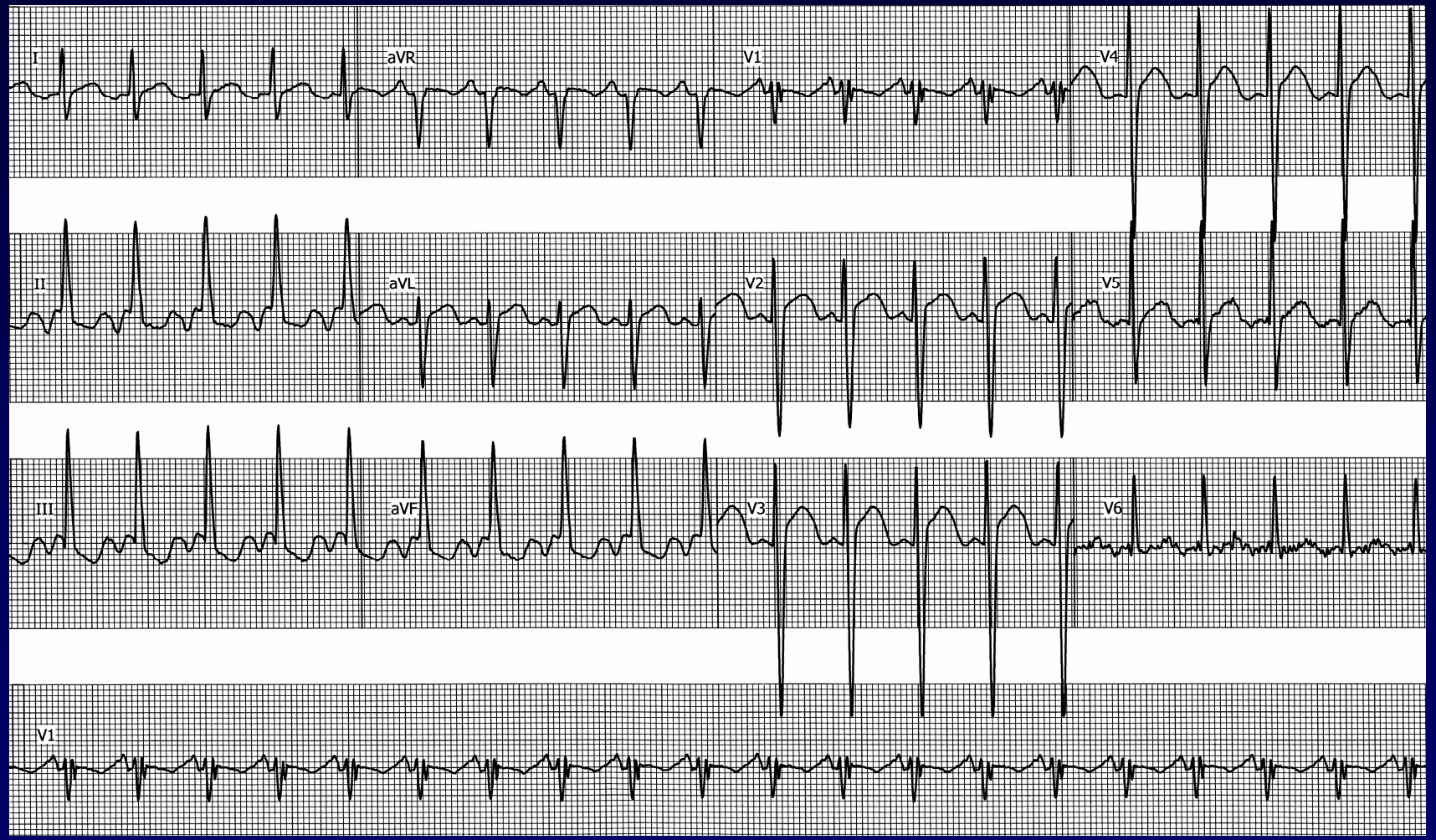
Kistler P. et al. JACC 2006;48:1010-7

ARC 05, Shin YJ, # 4231026

60 F, House wife, ASD secondum (1.5cm)

Intermittent palpitation for 3 months

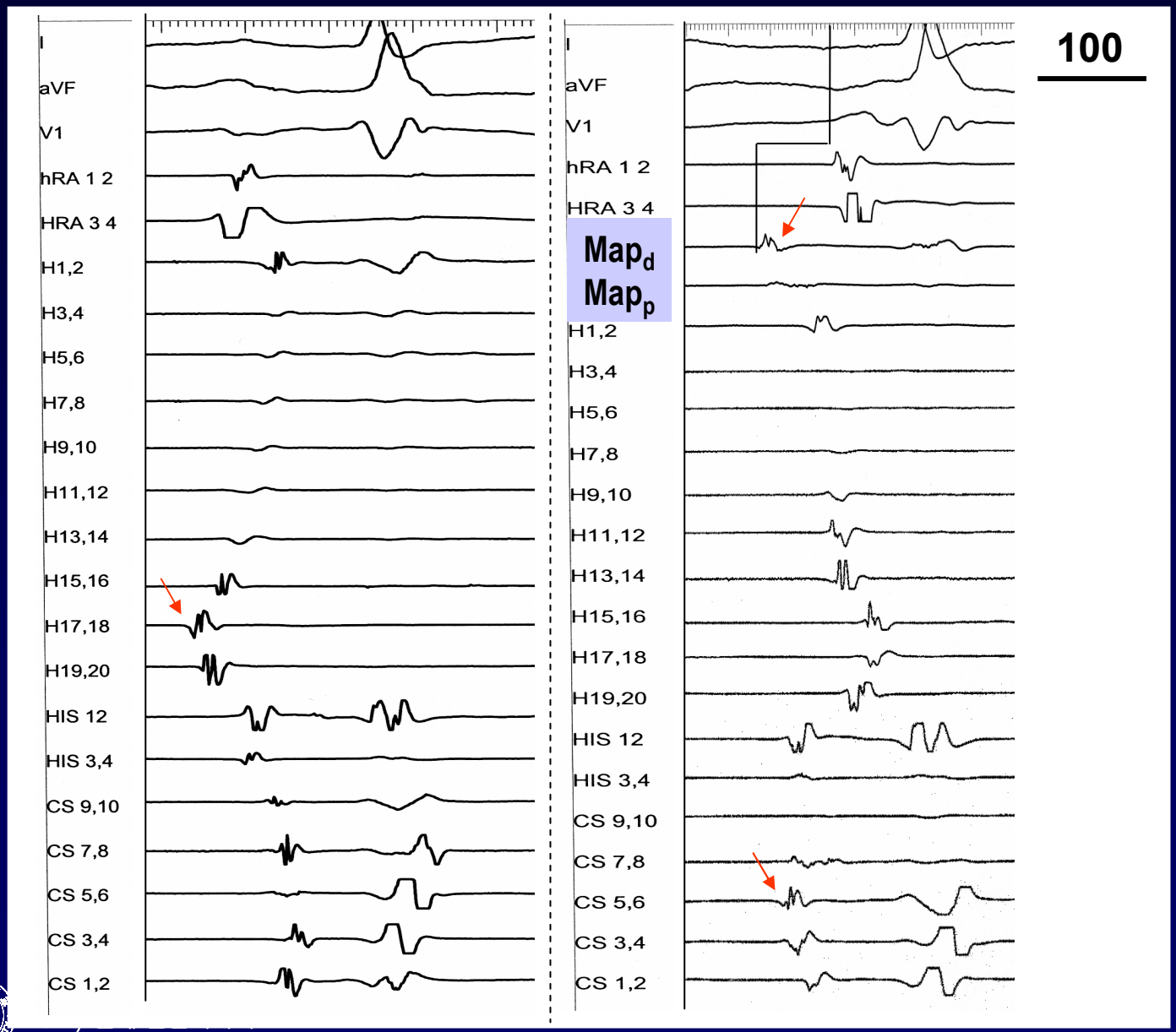
HR 121 BPM



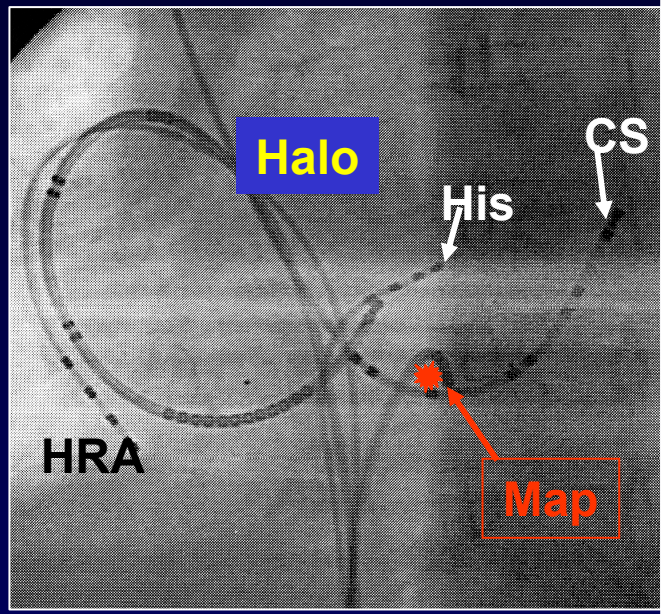
2005-2-13

ARC 05, Shin YJ, # 4231026

AT with earliest activation site at CS orifice



LAO



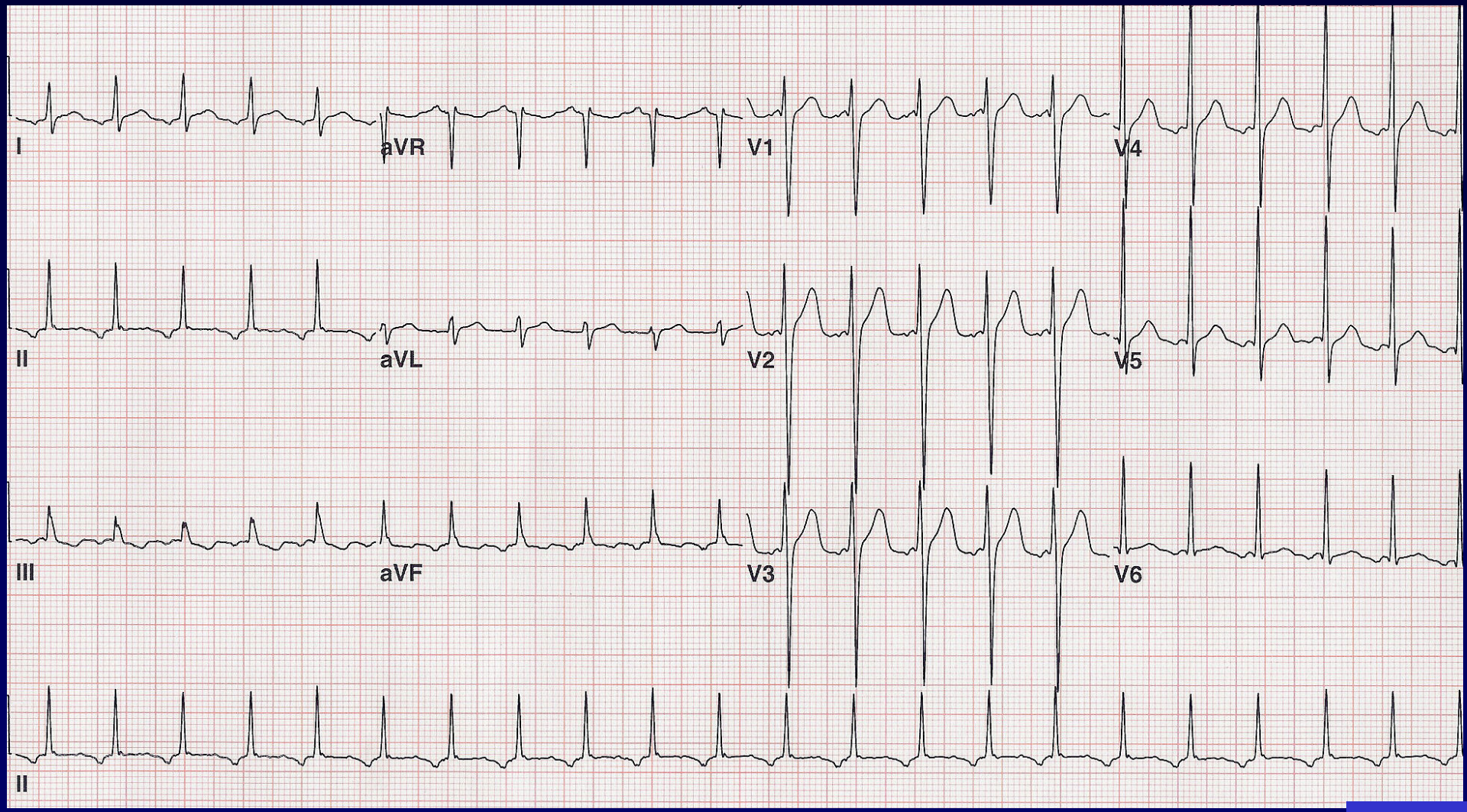
Endocardial Activation Mapping

- Usually > 30 msec before the P wave
- Local EGM features
  - Unipolar : negative deflection, rapid initial intrinsic slope
  - Fractionated or prepotential (spike)
  - Intermittent block of the tachycardia during catheter manipulation

ARC 04, Moon SH , #2172410

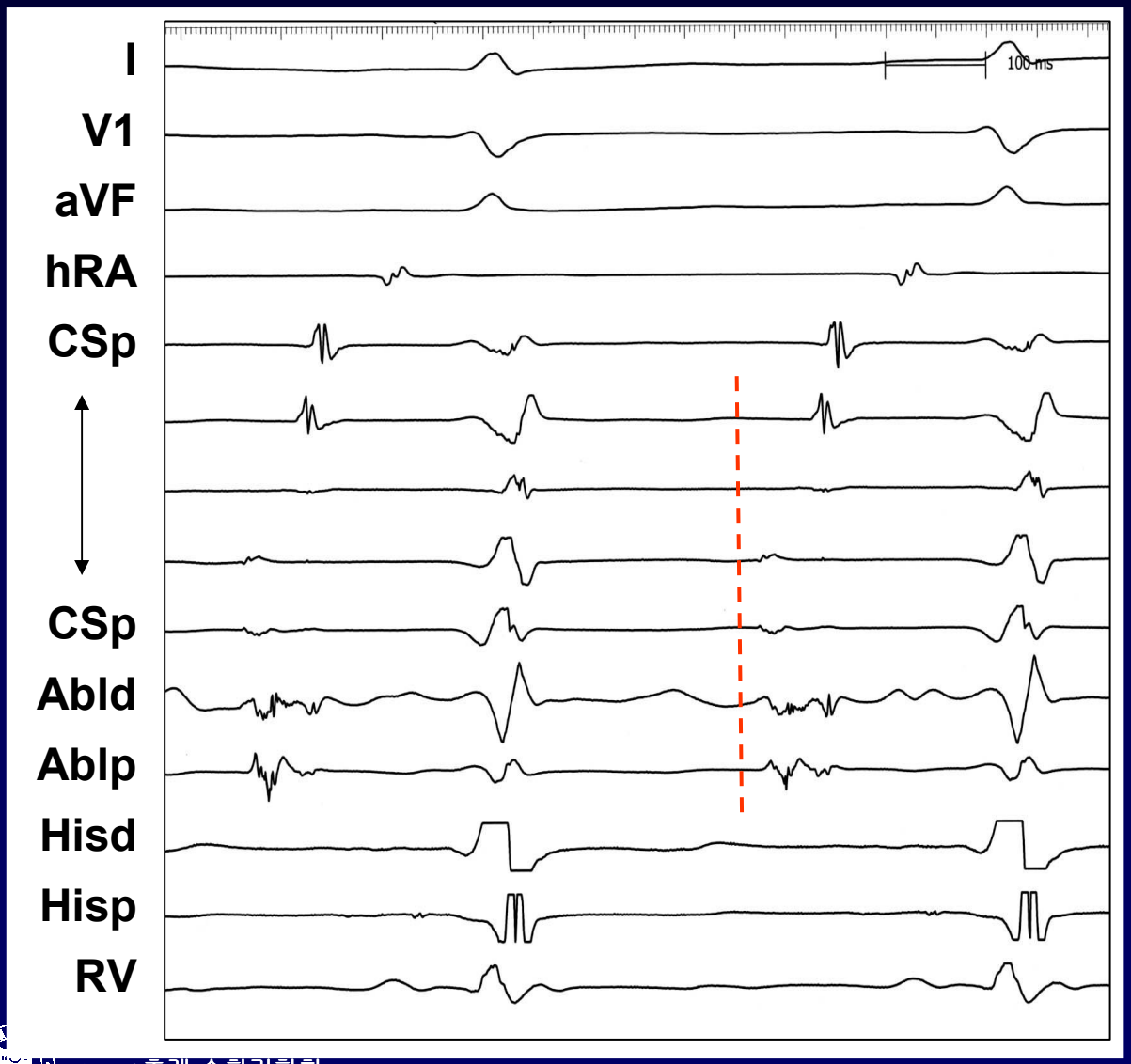
35 M 오성기전 회사원

Recurrent palpitation for 8 years

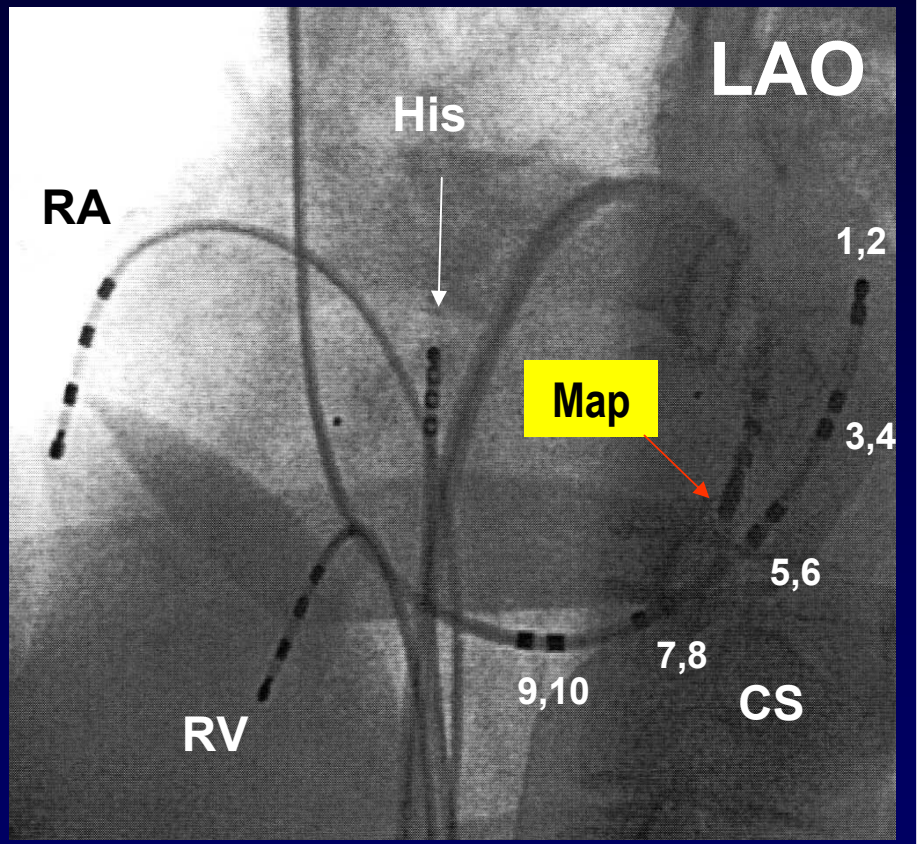


1995-12-29

Early activation and fractionization of atrial activity at mapping site



RF ablation via transseptal approach



Mapping and ablation techniques

- P-wave Polarity
- Endocardial Activation Mapping
- Paced Activation Sequence Mapping
  - Only adjunctively used
- New Mapping Systems
  - Contact mapping system : CARTO
  - Noncontact mapping system : EnSite

Focal Ablation

- Predictor for successful ablation
  - Acceleration of tachycardia before termination
  - Rapid termination < 10 seconds
- The failure to reinduce AT before and during isoproterenol infusion
- Success rate : 93%, Recurrence rate : 7%
- Poorer success rate : left, older age, multifocal

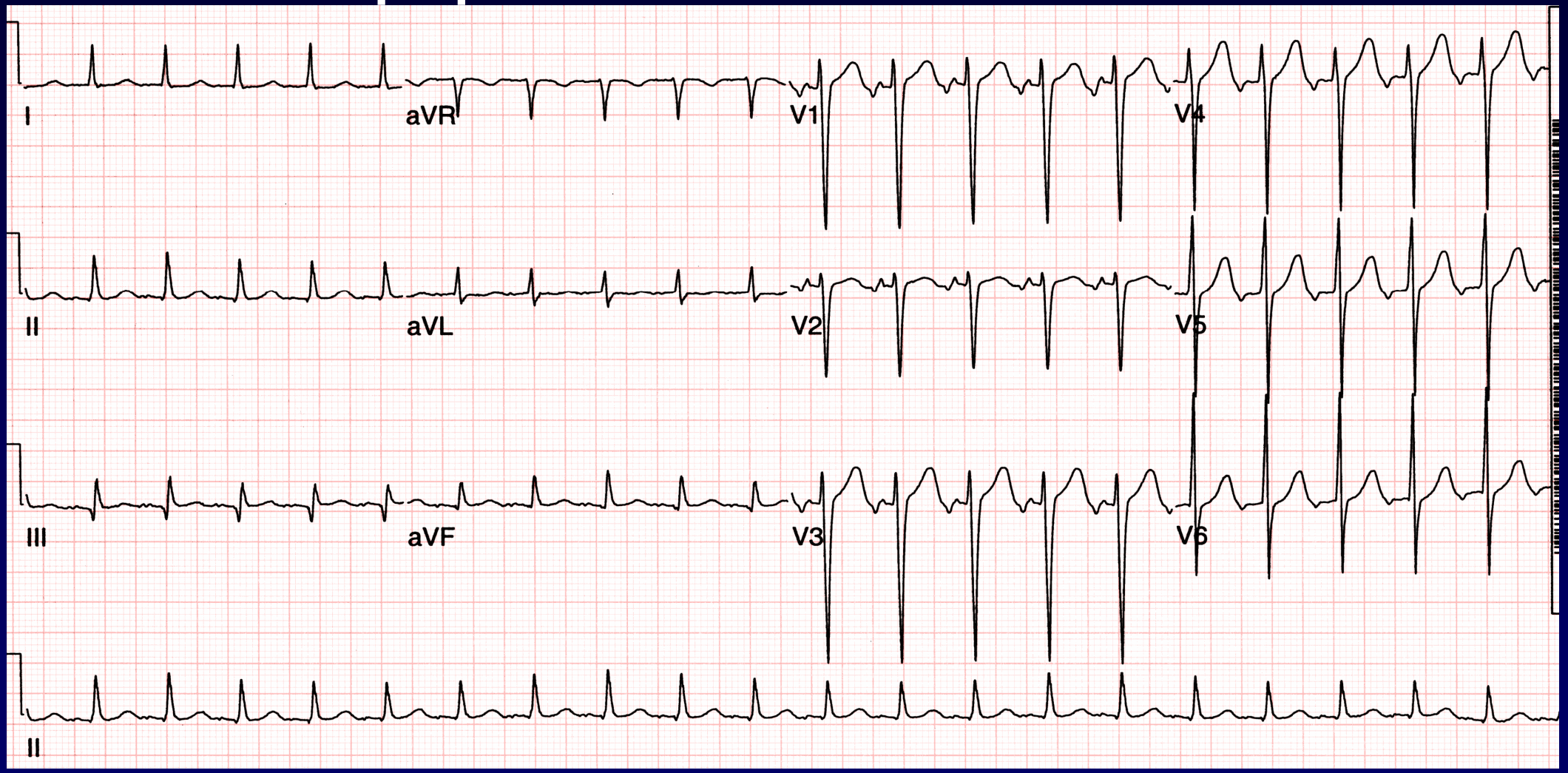
Several Issues, the difficulty and safety

1) SN modification for treating inappropriate sinus tachycarda : SN dysfuction, SVC syndrome, phrenic nerve injury
2) Annulus AT : same with AP ablation
3) AT from the atrial septum or Koch's triangle
   : AV block
4) high-frequency spike potential preceding atrial activation and P waves : AT from the thoracic veins

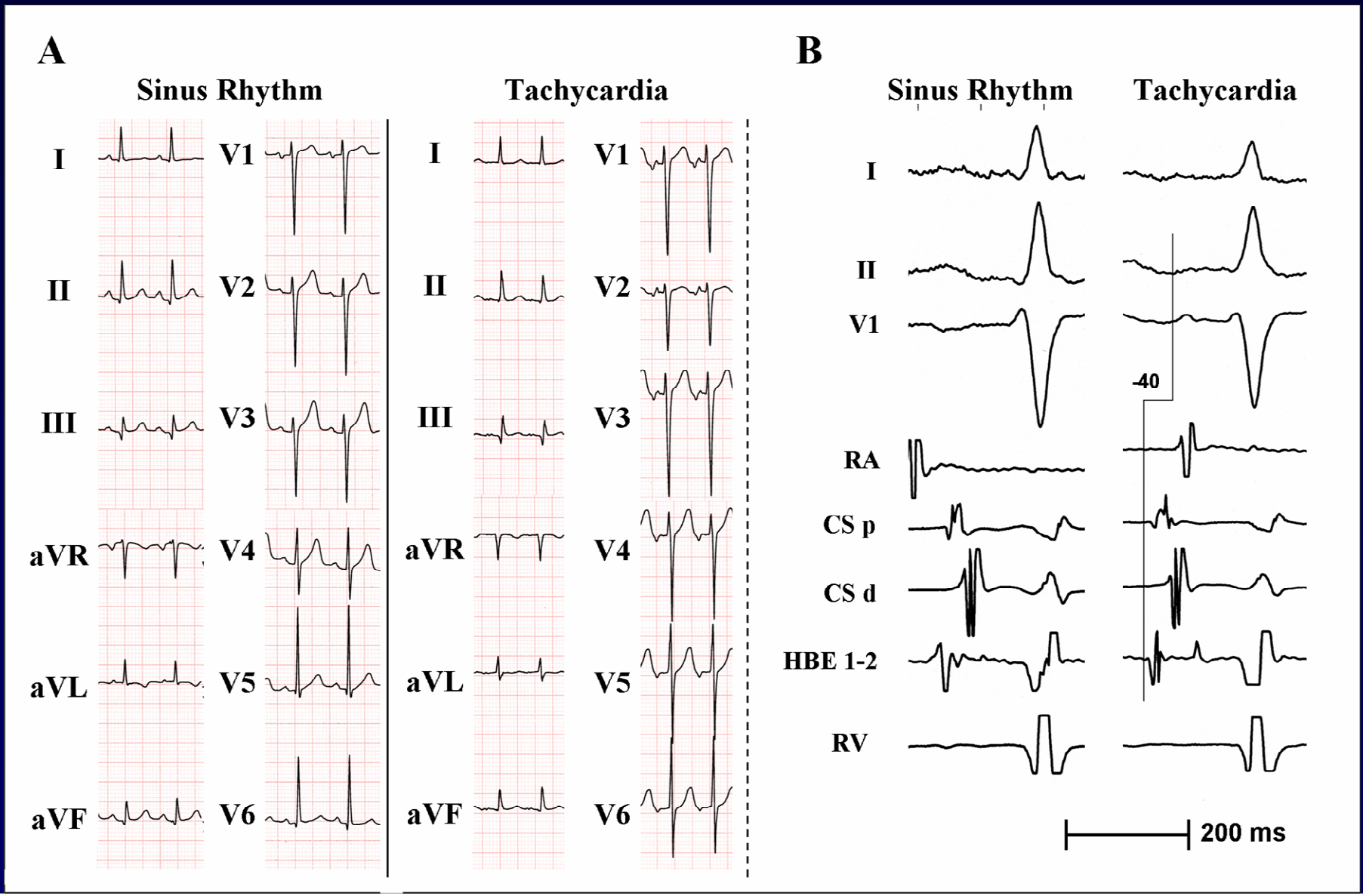
ARC 07, Yang MS, # 5100217

55 F, Housewife

Intermittent palpitation and dizziness for 6 months

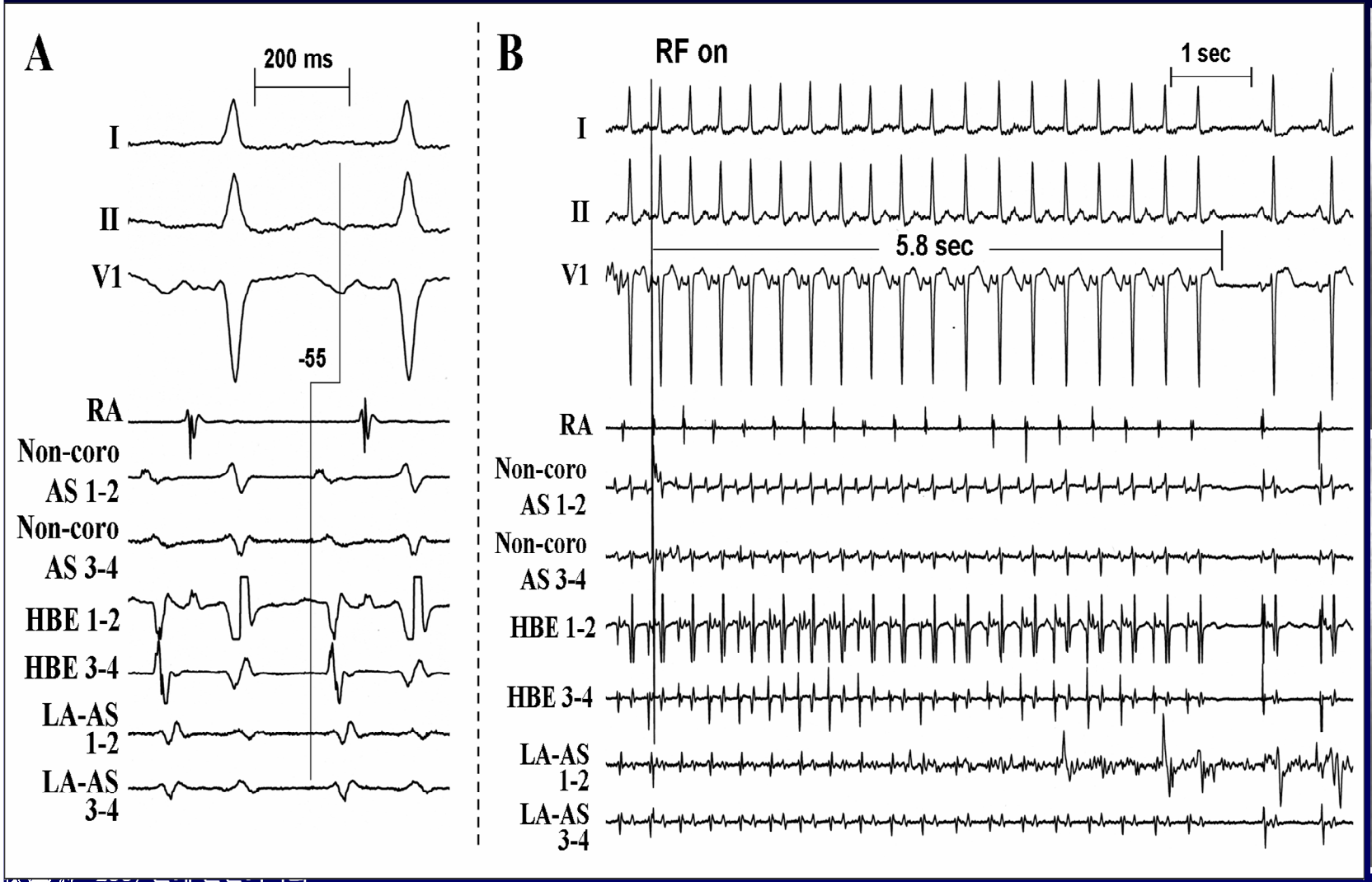


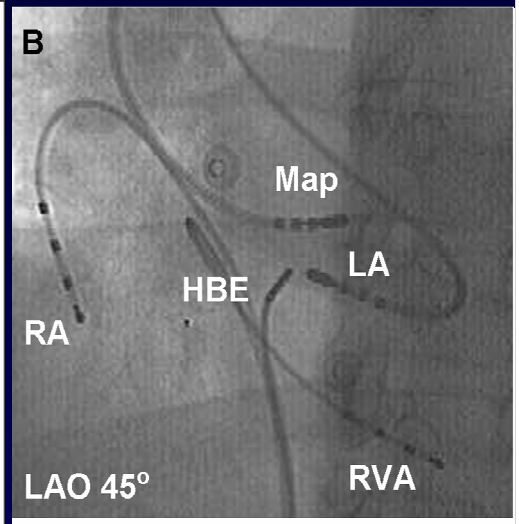
AT from the atrial septum or Koch's triangle ?

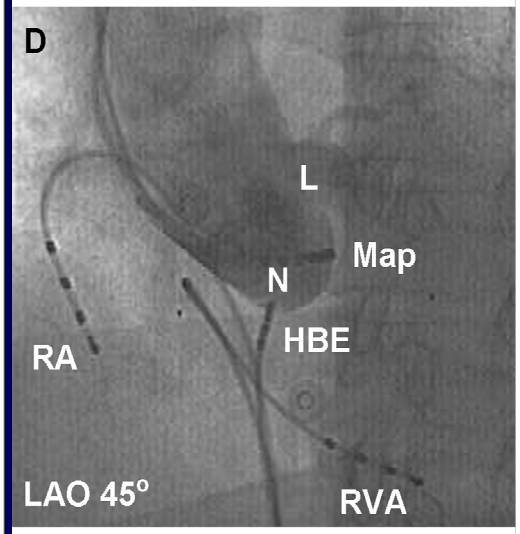


ARC 07, Yang MS, # 5100217

AT from the Non-Coronary Aortic Sinus





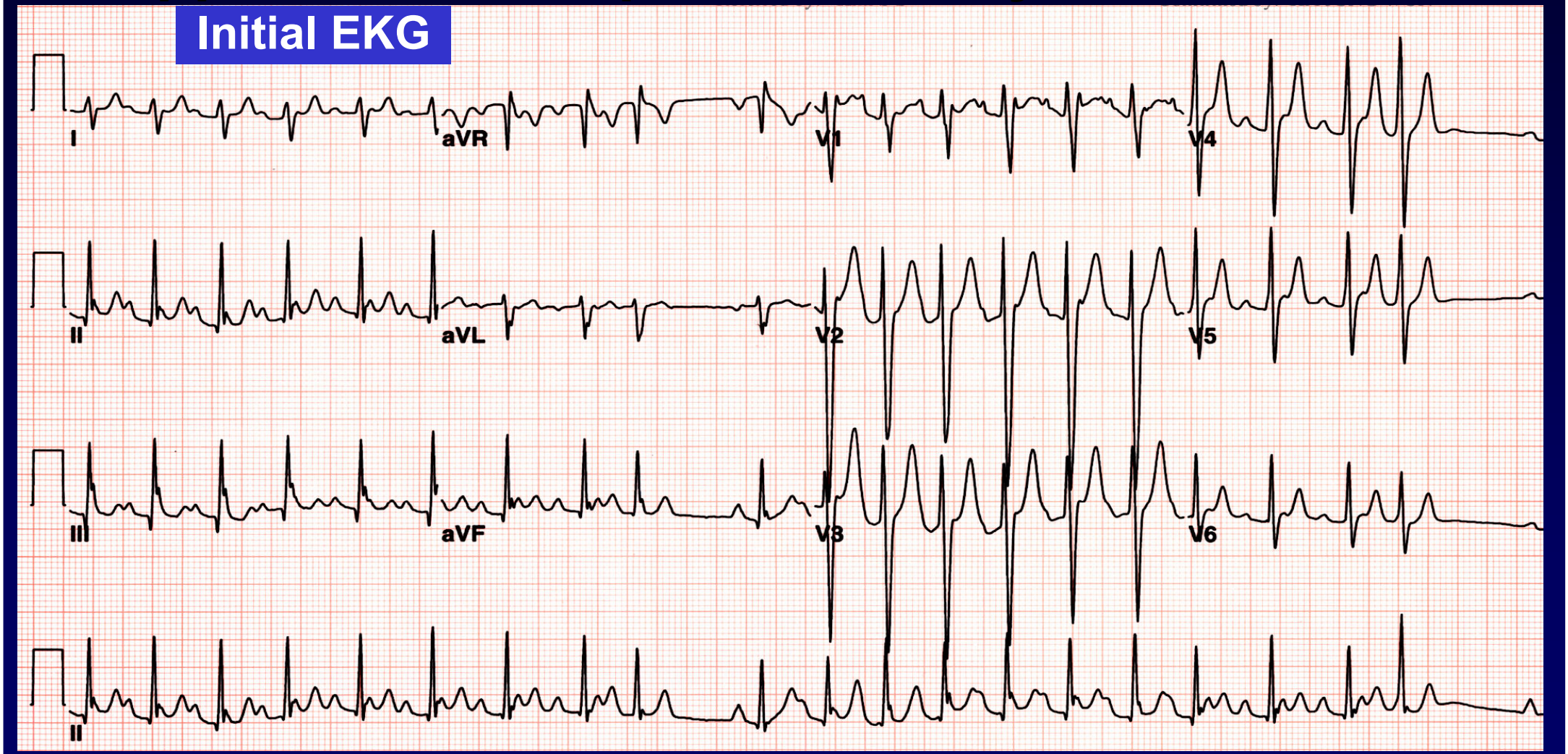


ARC 03, Chun KP, #3593158

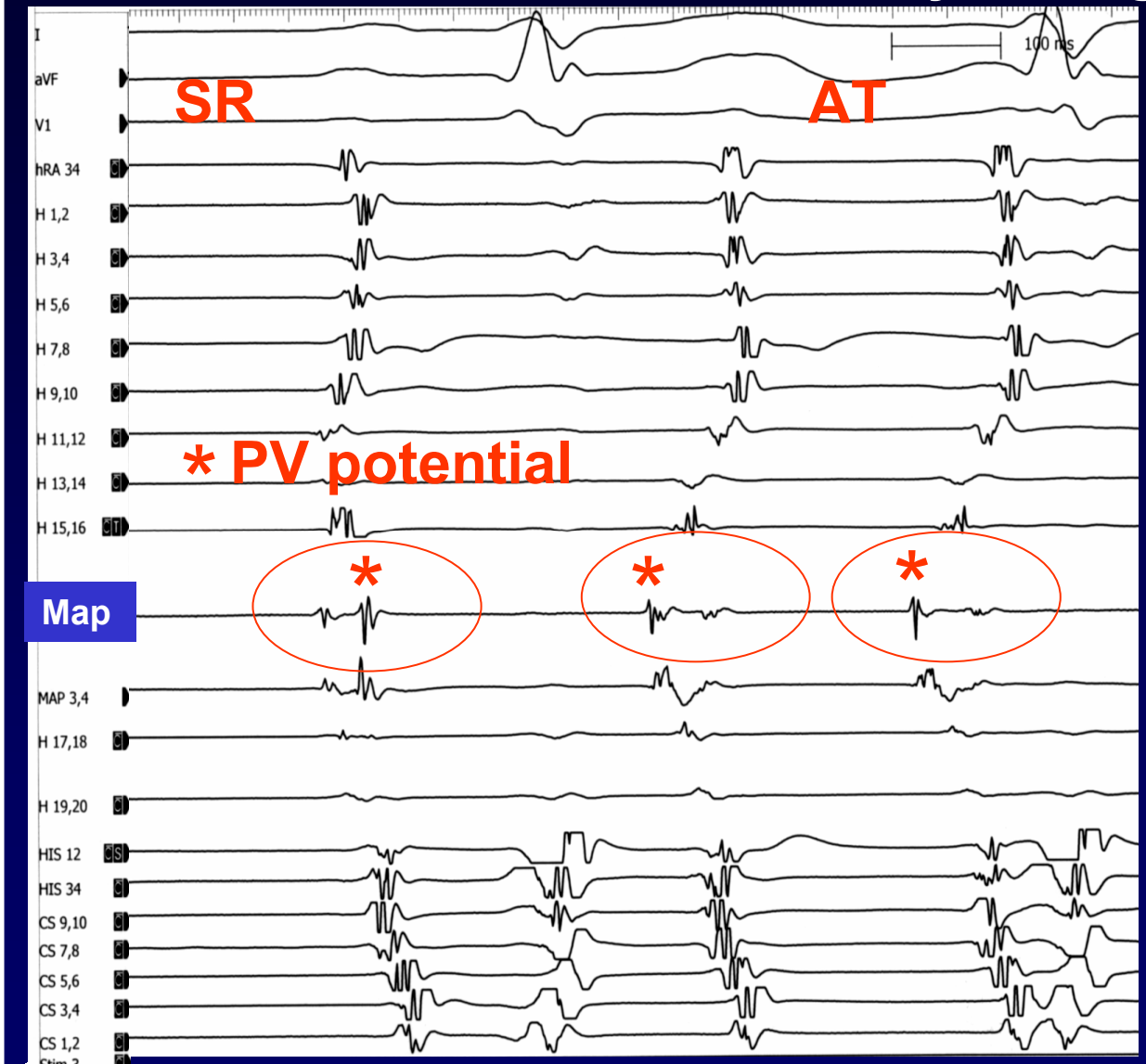
21 M, 대학생

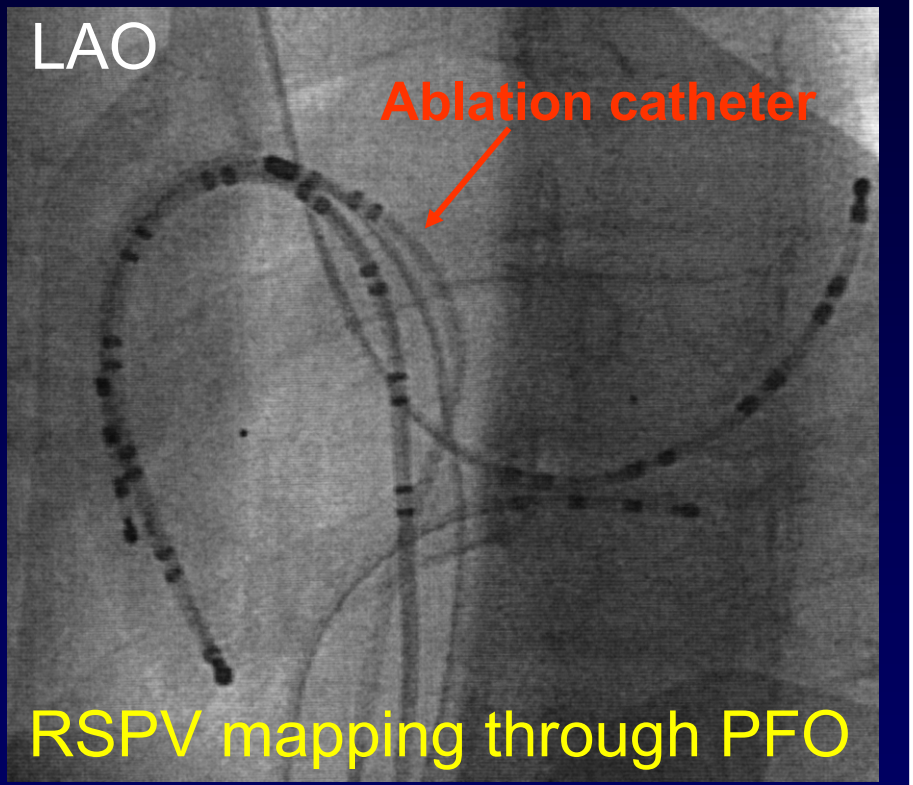
Skipped beat & Palpitation for 6 years

Initial EKG



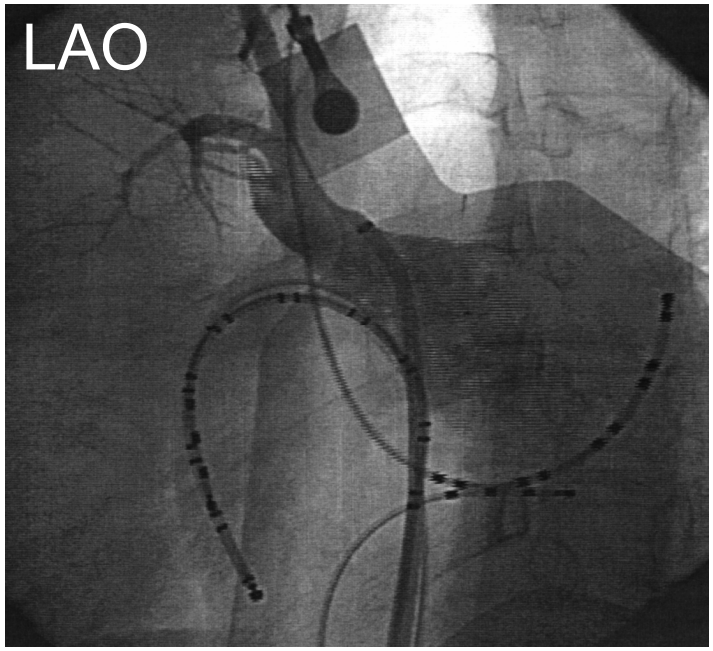
PV potential was recorded later than atrial activity during NSR but, earlier than atrial activity during ectopic activity

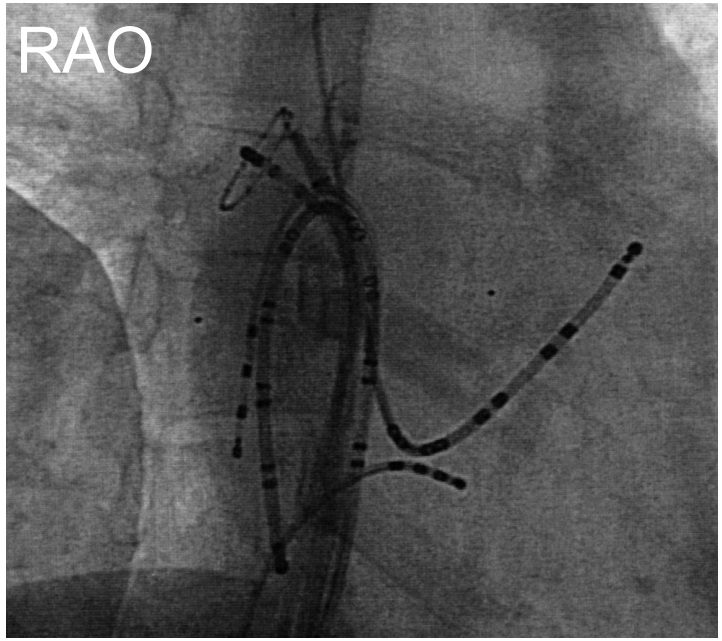


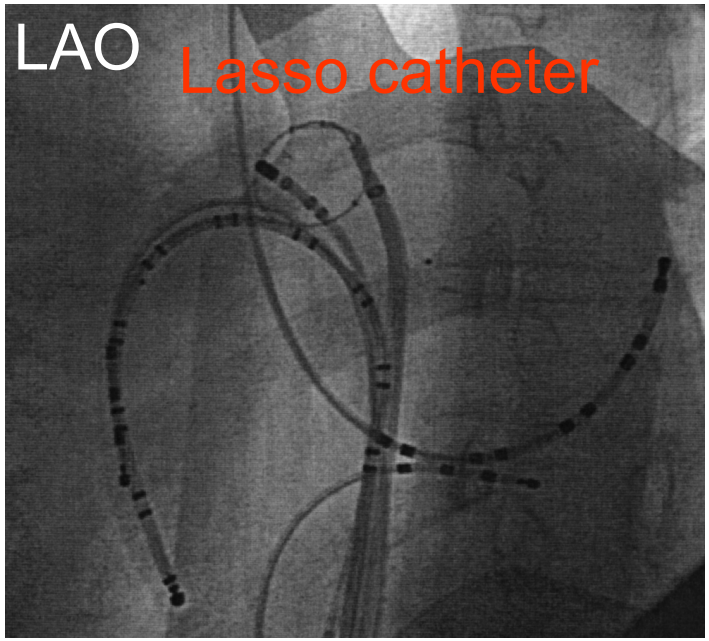


ARC 03, Chun KP, #3593158

Pulmonary vein mapping using Lasso catheter







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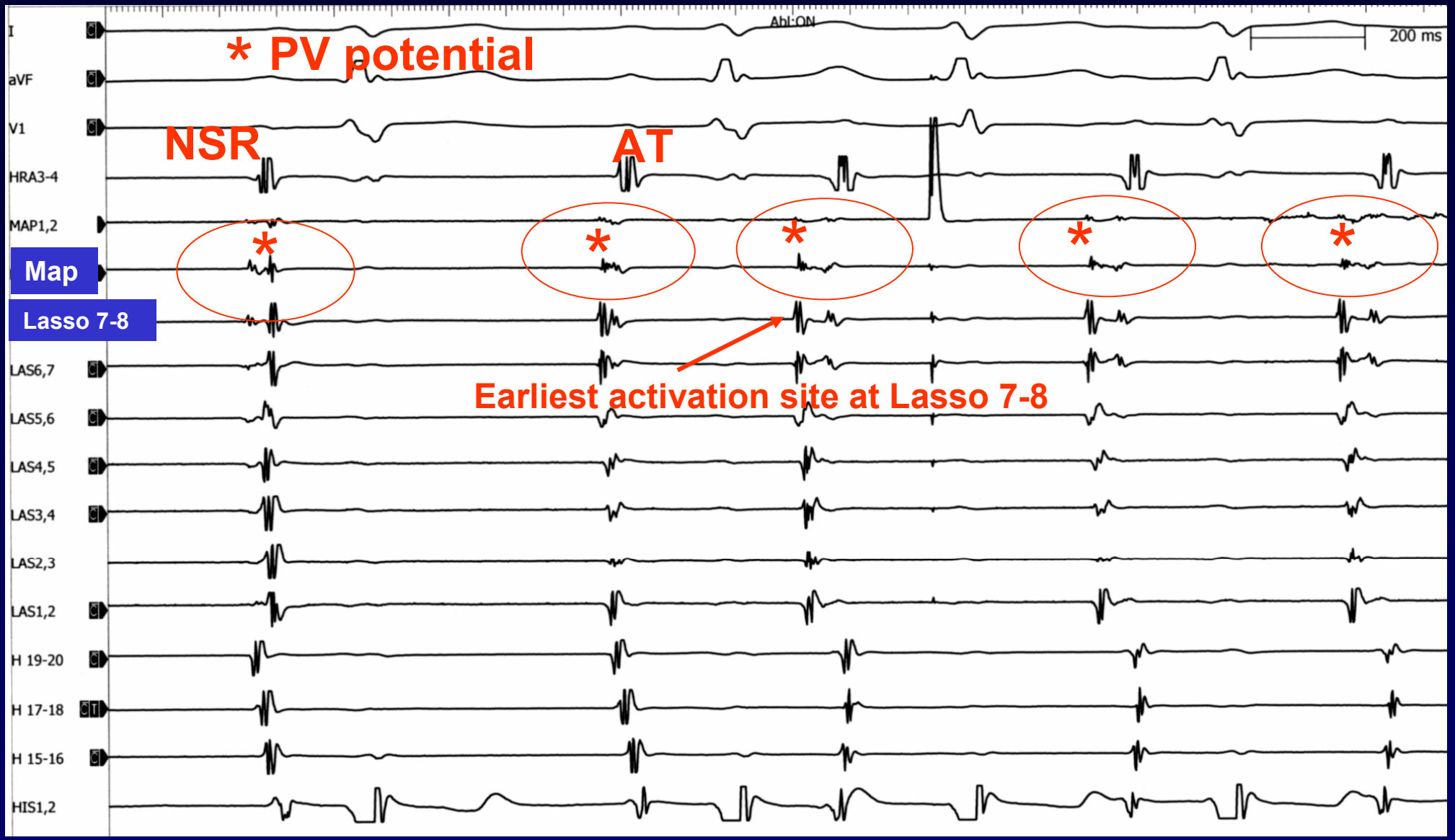
Pulmonary vein mapping using Lasso catheter



ARC 03, Chun KP, #3593158

AT termination during RF ablation at Lasso 7-8 site of RSPV