Localization of Accessory Pathways, Insights from the ECG

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The American Heart Journal

VOL. V AUGUST, 1930 No. 6

Original Communications

BUNDLE-BRANCH BLOCK WITH SHORT P-R INTERVAL IN HEALTHY YOUNG PEOPLE PRONE TO PAROXYSMAL TACHYCARDIA

LOUIS WOLFF, M.D., BOSTON, MASS., JOHN PARKINSON, M.D., LONDON, ENG., AND PAUL D. WHITE, M.D., BOSTON, MASS.

ABERRANT ventricular complexes of the type generally recognized as indicating bundle-branch block were first produced by Eppinger and Rothberger,[3, 4] by the experimental division of the right branch of the His bundle. Eppinger and Stoerk[5] observed similar curves in five patients, and at autopsy demonstrated division of the right branch of the His bundle in two of these. The work of Cohn and Lewis,[2] and of Carter[1] indicated, however, that gross lesions of the main branches

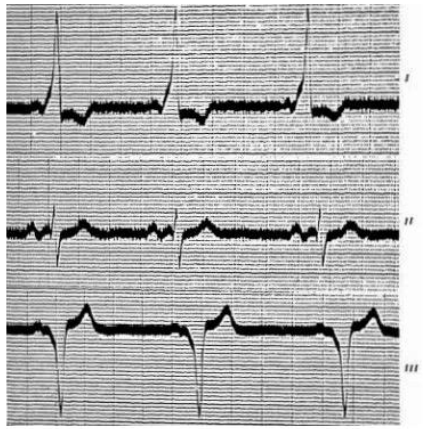
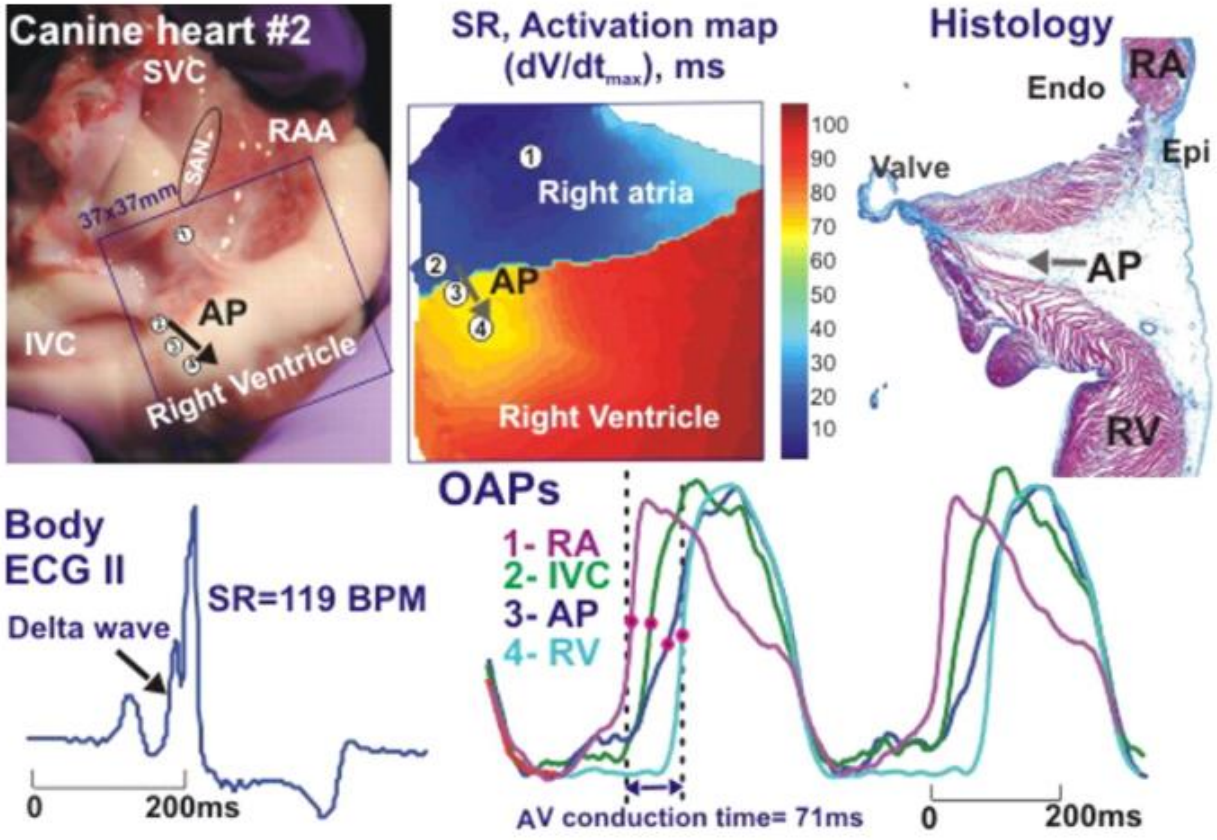
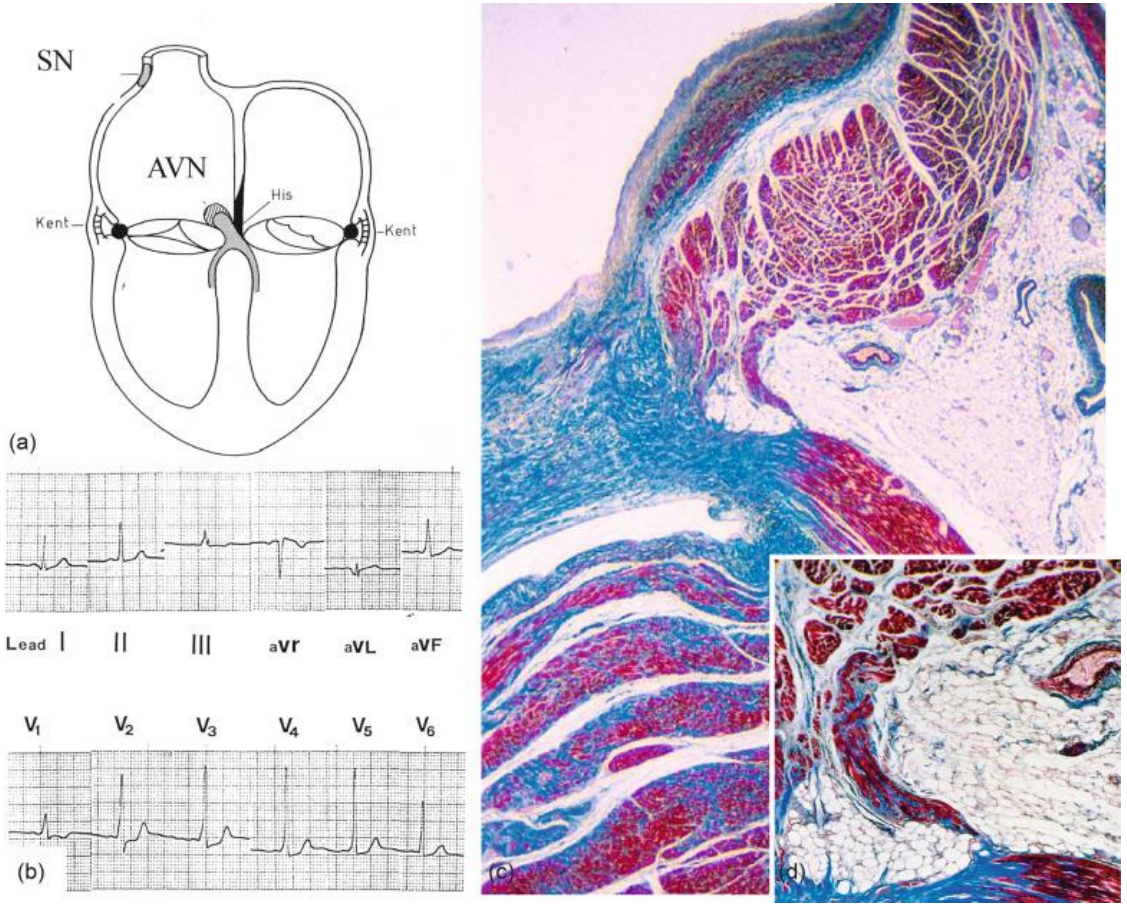


Fig 6. Case III. WPW 1930

Where is the Accessory Pathway ?

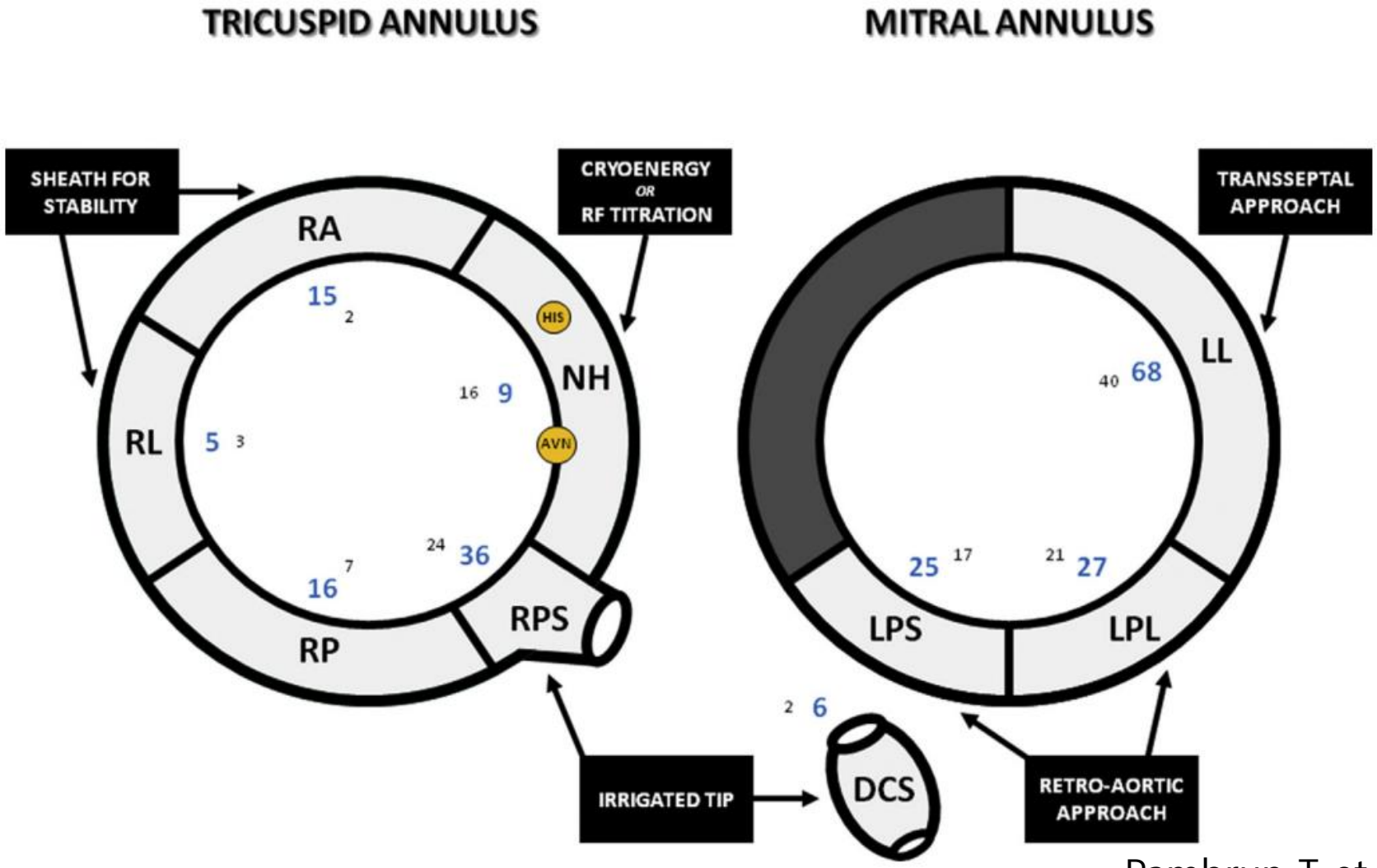


Vadim V Fedorov et al, Circulation 2010



G. Thiene, ... C. Basso, in Cardiovascular Pathology 2016

Procedure Plan by ECG algorithm

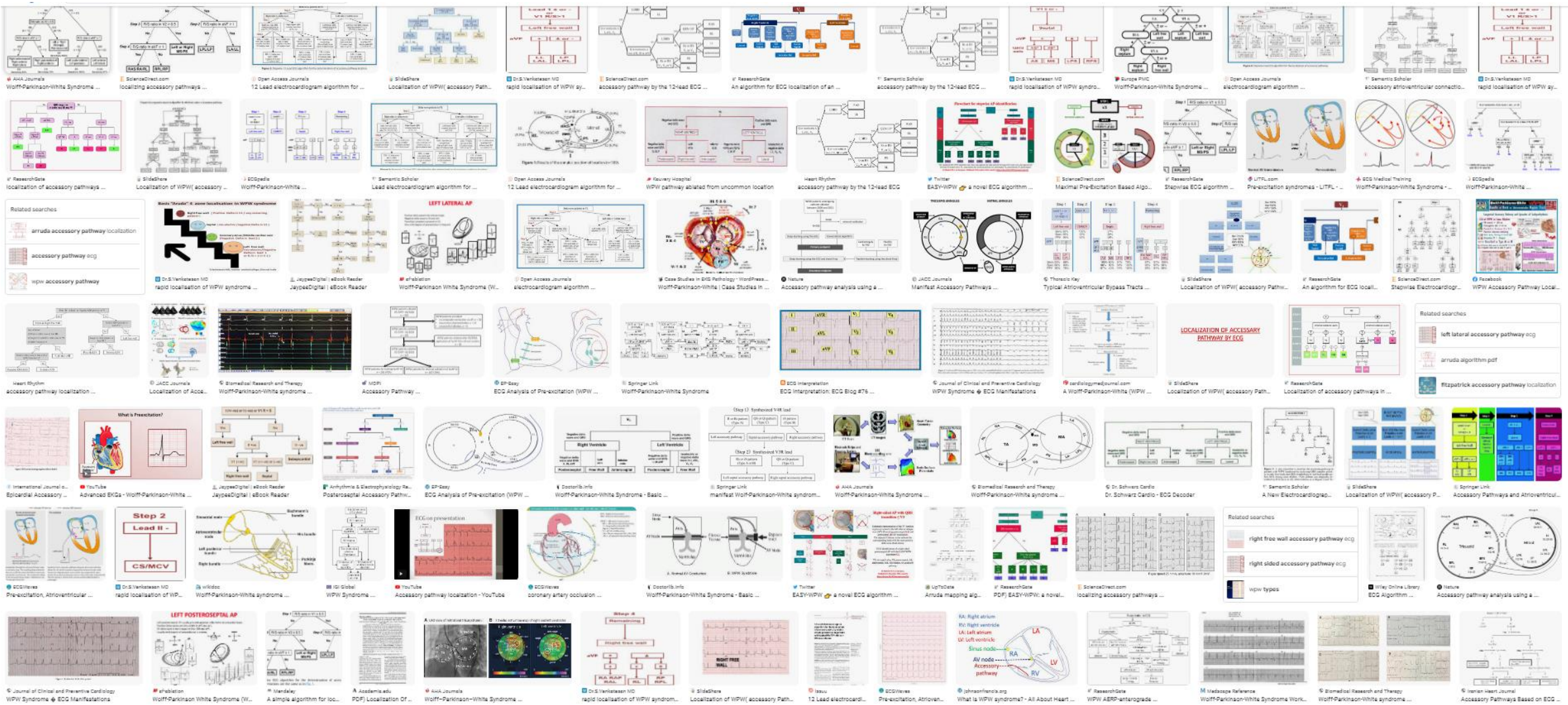


Pambrun T et al, JACC EP. 2018

Why localize ?

- Ablation planning
- Patient education of risks vs benefits
- prepare septal puncture
- prepare appropriate tools like curved sheath
- anticipate AV node injury
- just academic curiosity

Googling …

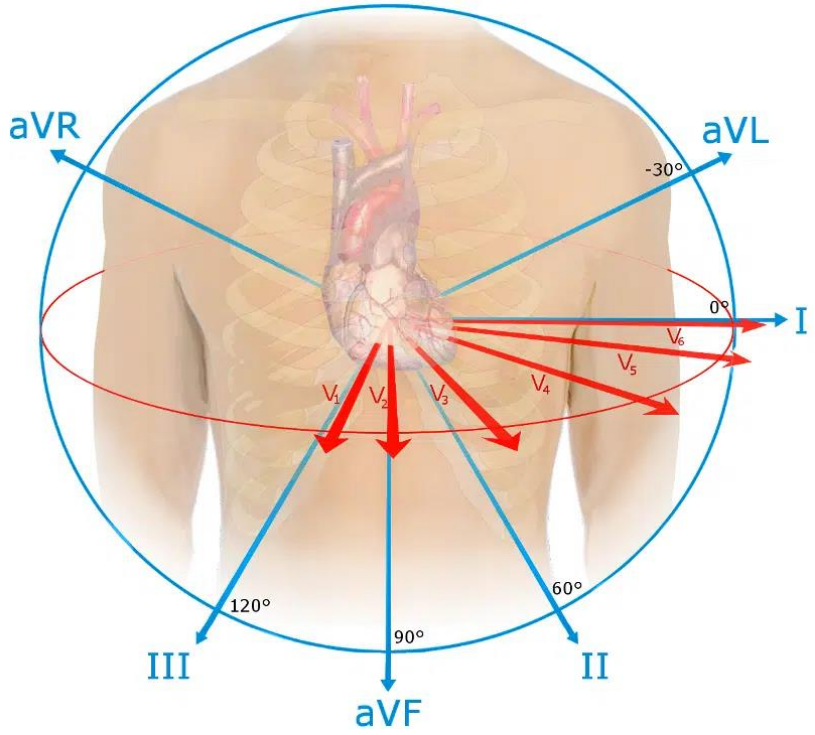

Related searches
arruda accessory pathway localization
accessory pathway ecg
wpw accessory pathway
LEFT LATERAL AP
LEFT POSTEROSEPTAL AP
LOCALIZATION OF ACCESSARY PATHWAY BY ECG
What's Preexcitation?
Step 2
Lead II -
CS/MCV
ECG on presentation
Related searches
left lateral accessory pathway ecg
arruda algorithm pdf
fitzpatrick accessory pathway localization
Related searches
right free wall accessory pathway ecg
right sided accessory pathway ecg
wpw types

Pubmed (many algorithms …)

- **Arruda MS** et al. Development and validation of an ECG algorithm for identifying accessory pathway ablation site in Wolff-Parkinson-White syndrome. J Cardiovasc Electrophysiol 1998
- Fitzpatrick AP at al. New algorithm for the localization of accessory atrioventricular connections using a baseline electrocardiogram. J Am Coll Cardiol 1994
- **Pambrun T** et al. Maximal Pre-excitation based algorithm for localization of manifest accessory pathways in adults. JACC Clin Electrophysiol 2018
- d'Avila A et al. A fast and reliable algorithm to localize accessory pathways based on the polarity of the QRS complex on the surface ECG during sinus rhythm. Pacing Clin Electrophysiol 1995
- Chiang CE et al. An accurate stepwise electrocardiographic algorithm for localization of accessory pathways in patients with Wolff-Parkinson-White syndrome from a comprehensive analysis of delta waves and R/S ratio during sinus rhythm. Am J Cardiol 1995
- Iturralde P et al. Gonzalez-Hermosillo JA. A new ECG algorithm for the localization of accessory pathways using only the polarity of the QRS complex. J Electrocardiol 1996
- **Mustapha El** et at. EASY-WPW: a novel ECG-algorithm for easy and reliable localization of manifest accessory pathways in children and adults.EP Europace, 2023
- … … …

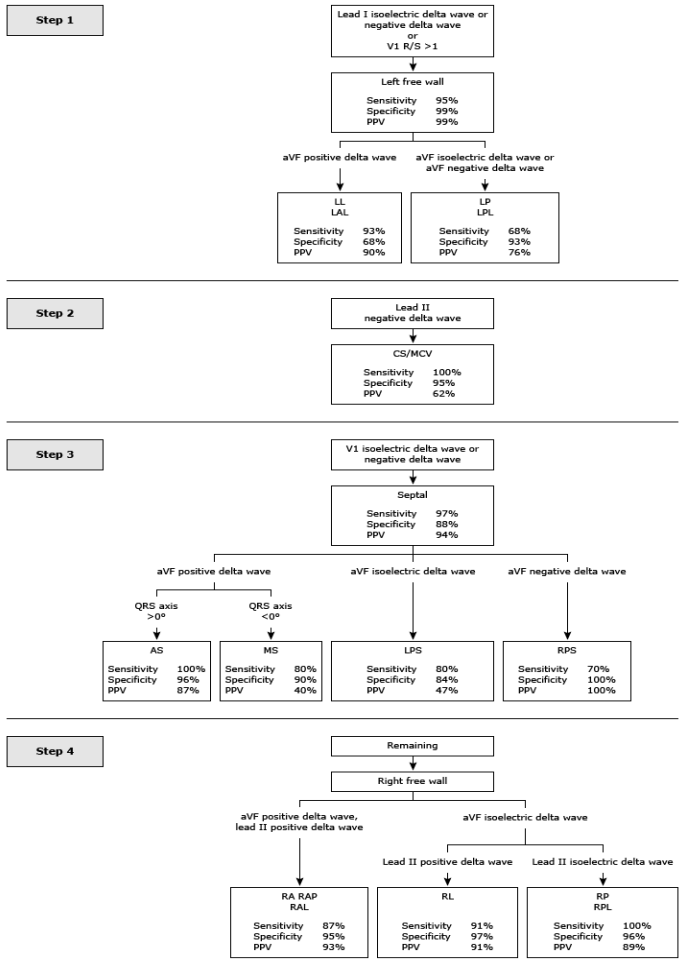
Today

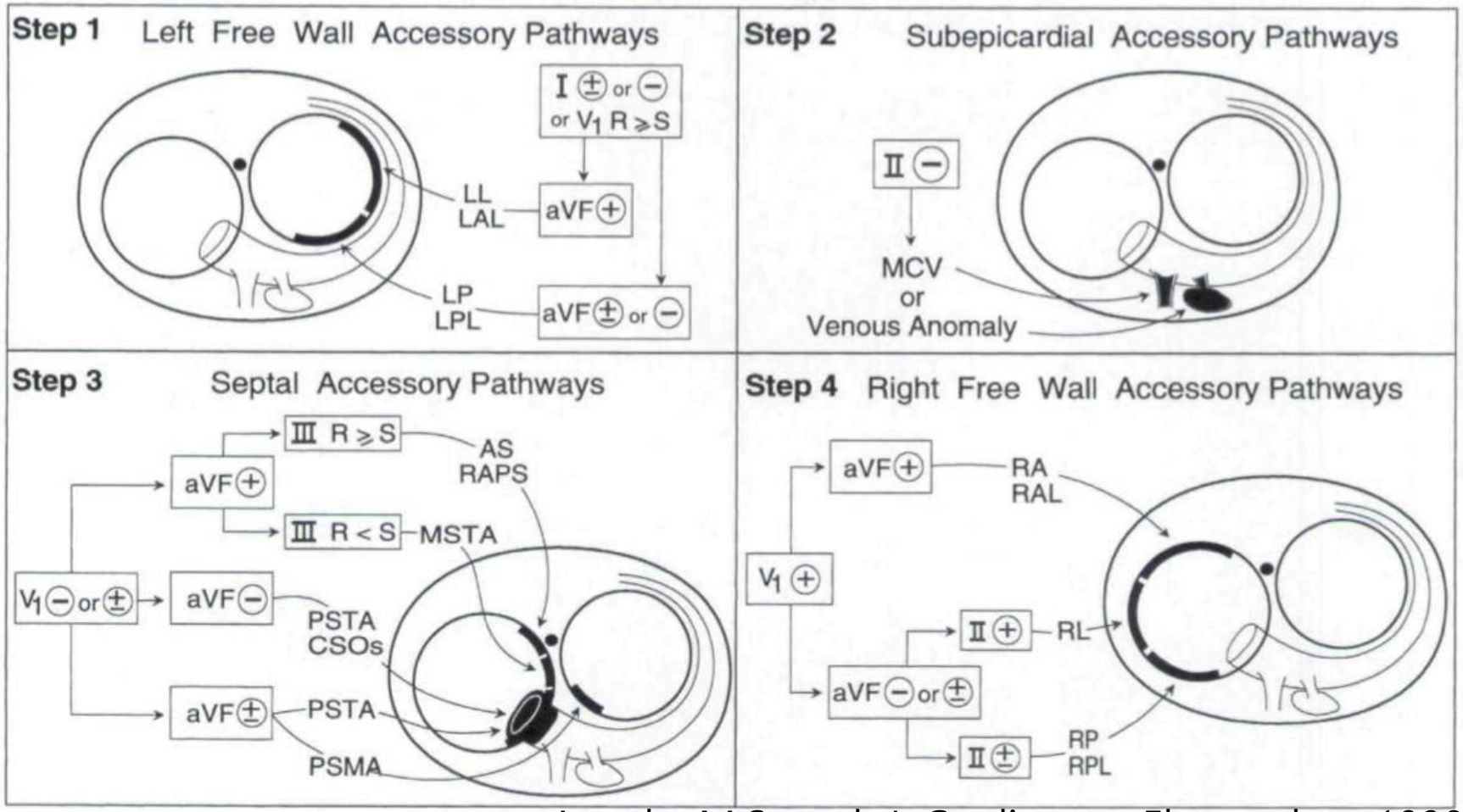
- ✓ Classic algorithm with delta wave and maximal Pre-Excitation QRS
- ✓ Negative p-wave during tachycardia
- ✓ Multiple Accessory pathways
- ✓ Specific site in WPW syndrome



1. Classic algorithm with delta wave or QRS wave

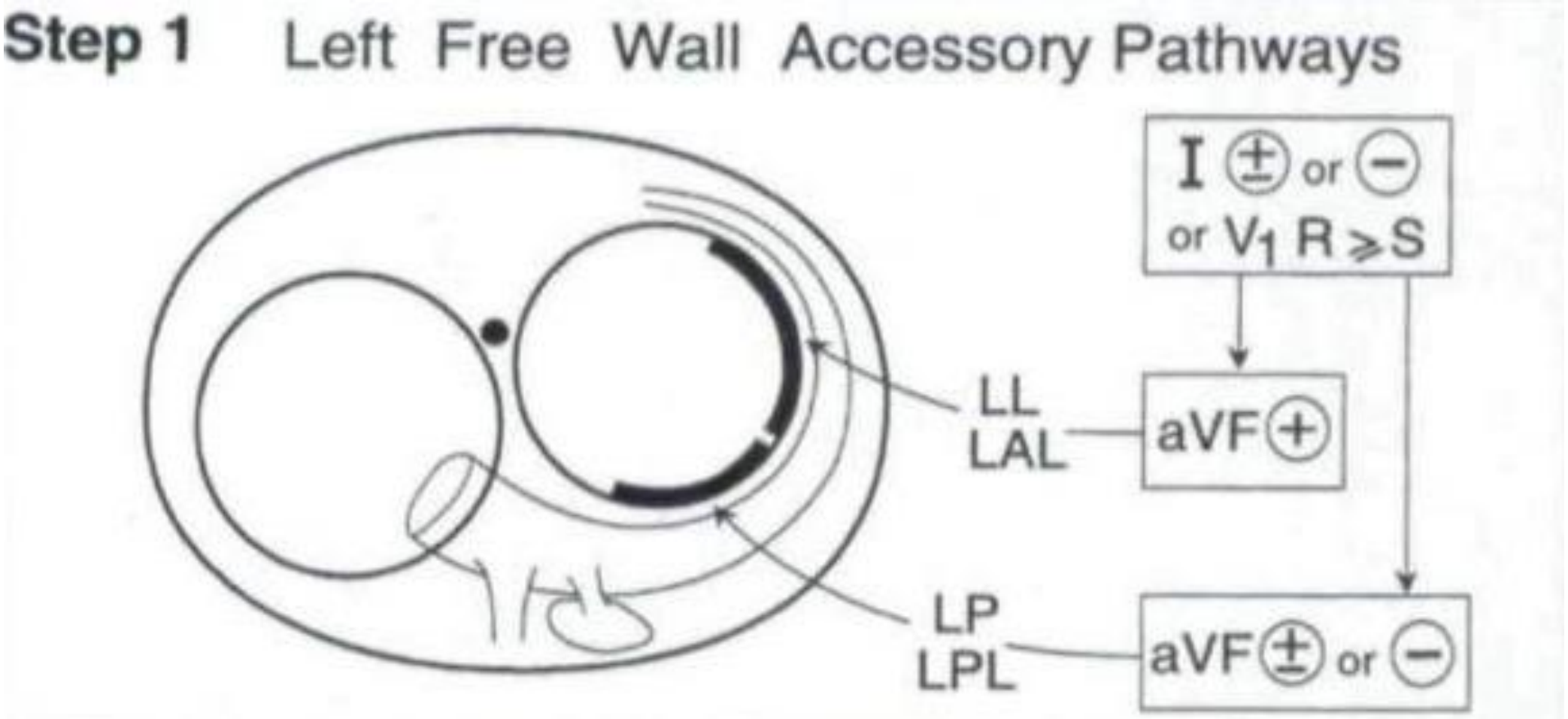
in 1998 Development and Validation of an ECG Algorithm for Identifying Accessory Pathway Ablation Site in Wolff-Parkinson-White Syndrome : The Arruda Algorithm



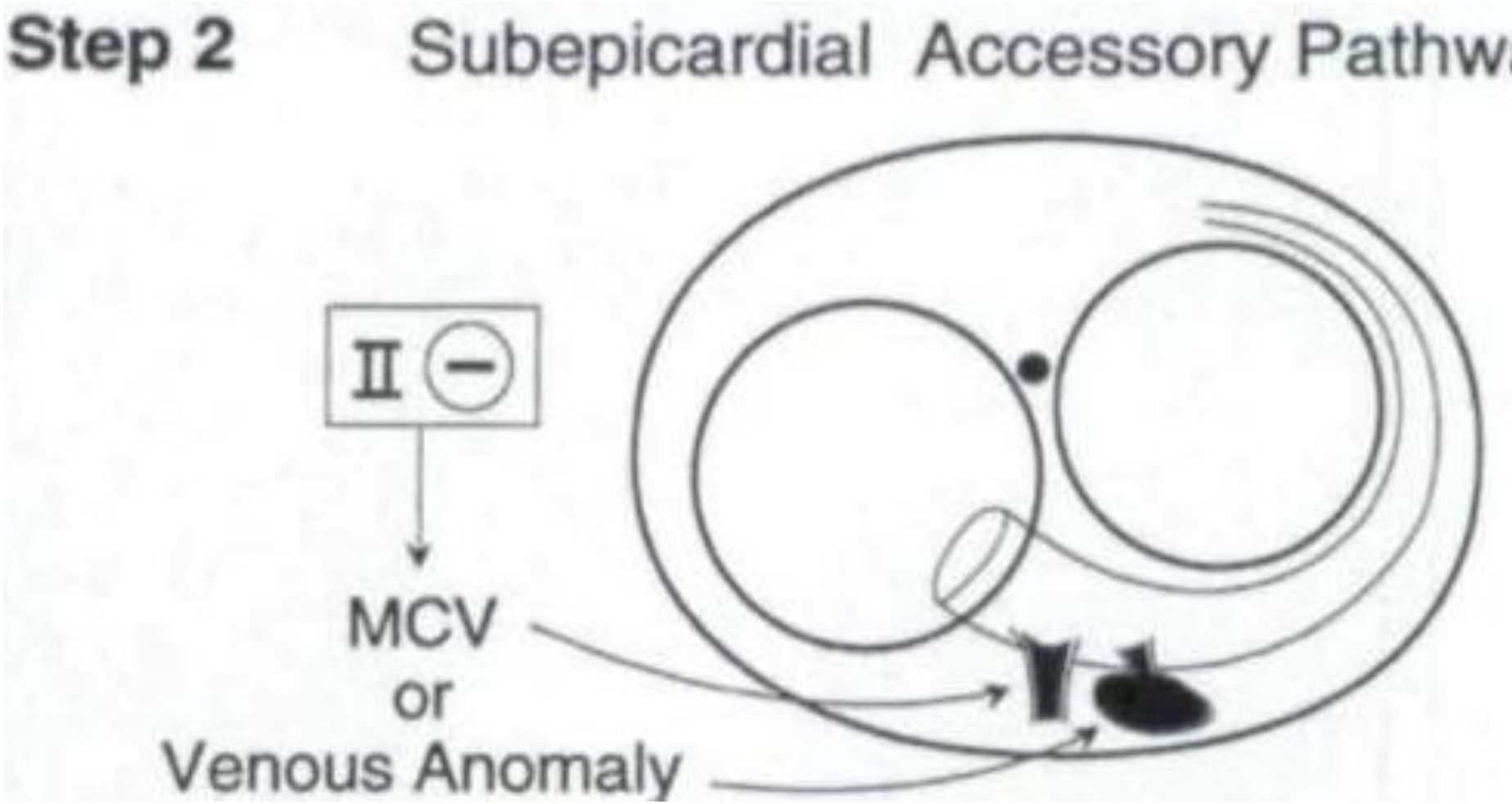


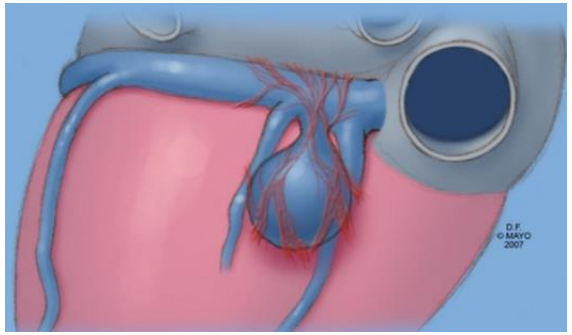
Arruda, M.S et al, J. Cardiovasc. Electrophys. 1998

The Arruda Algorithm : STEP 1



The Arruda Algorithm : STEP 2





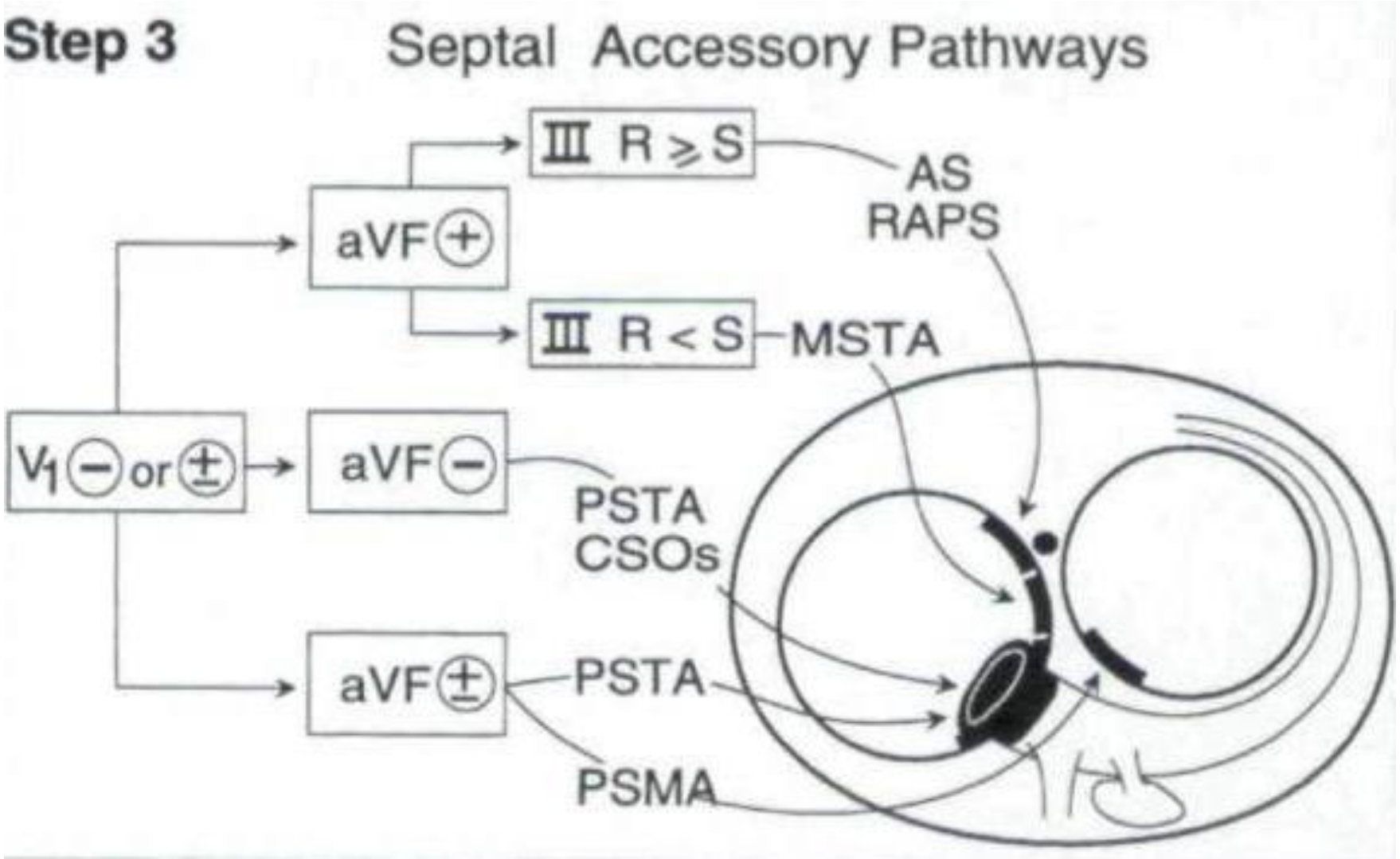
Lead II
negative delta wave

↓

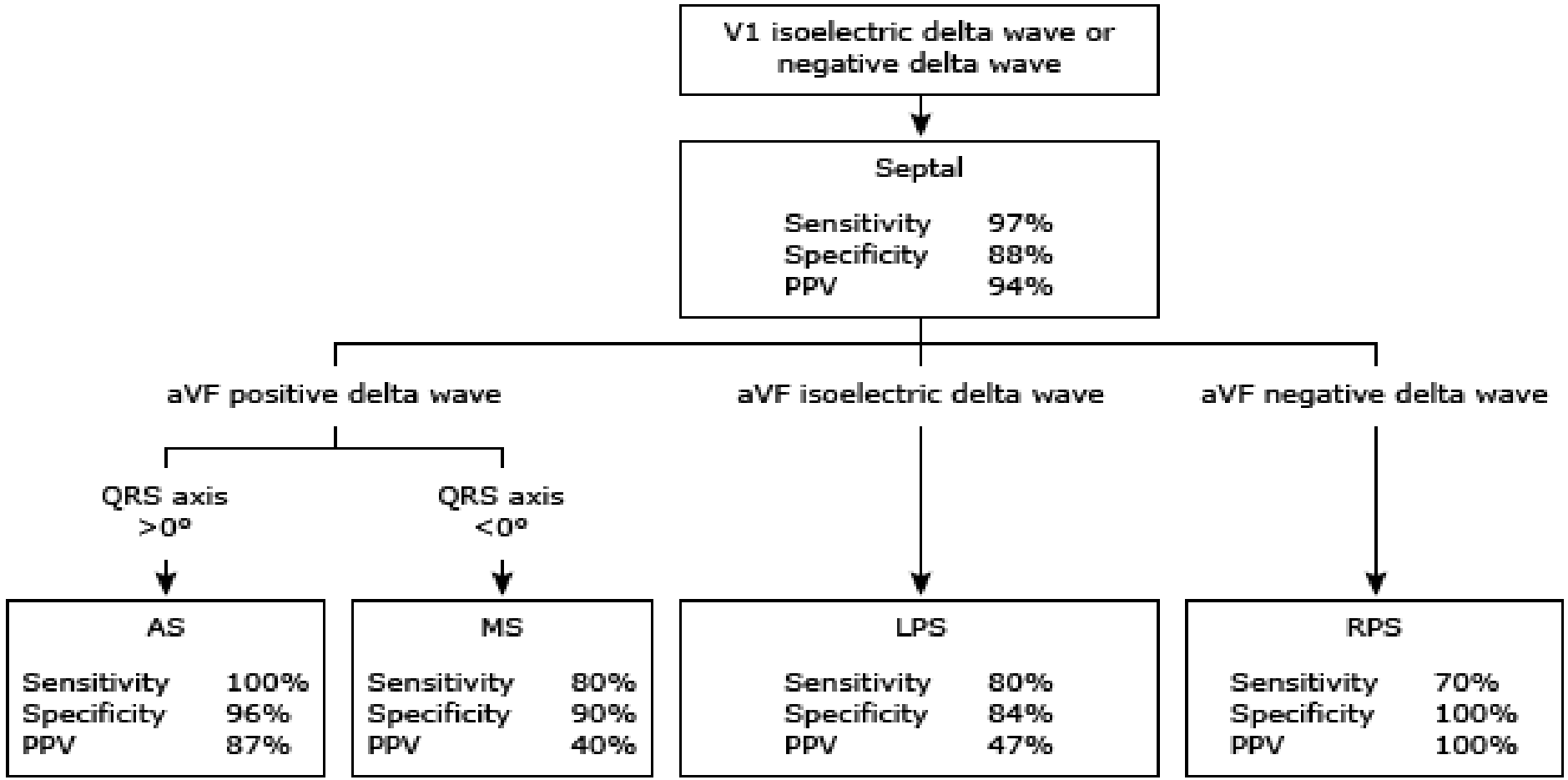
CS/MCV

Sensitivity	100%
Specificity	95%
PPV	62%

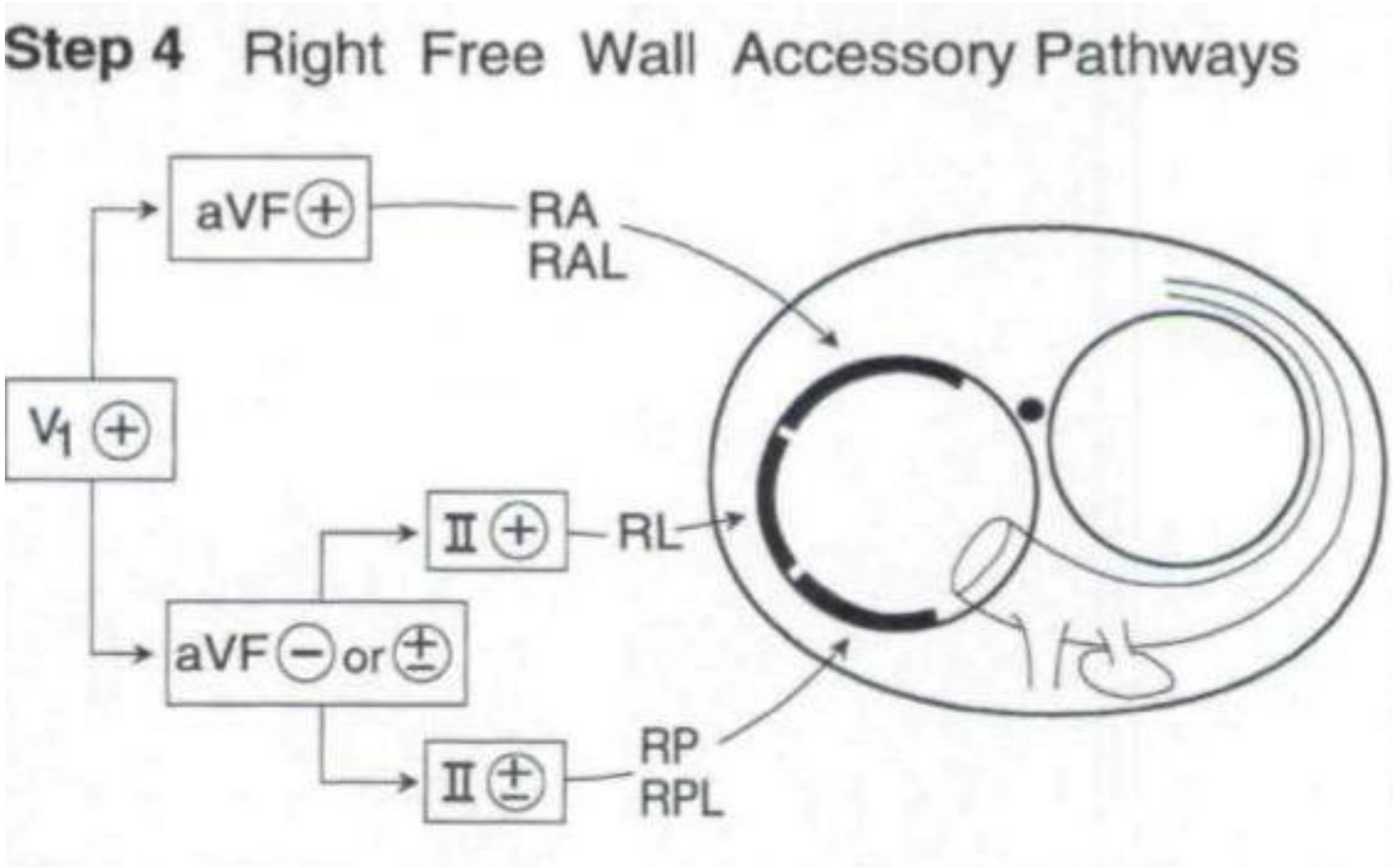
The Arruda Algorithm : STEP 3



The Arruda Algorithm : STEP 3

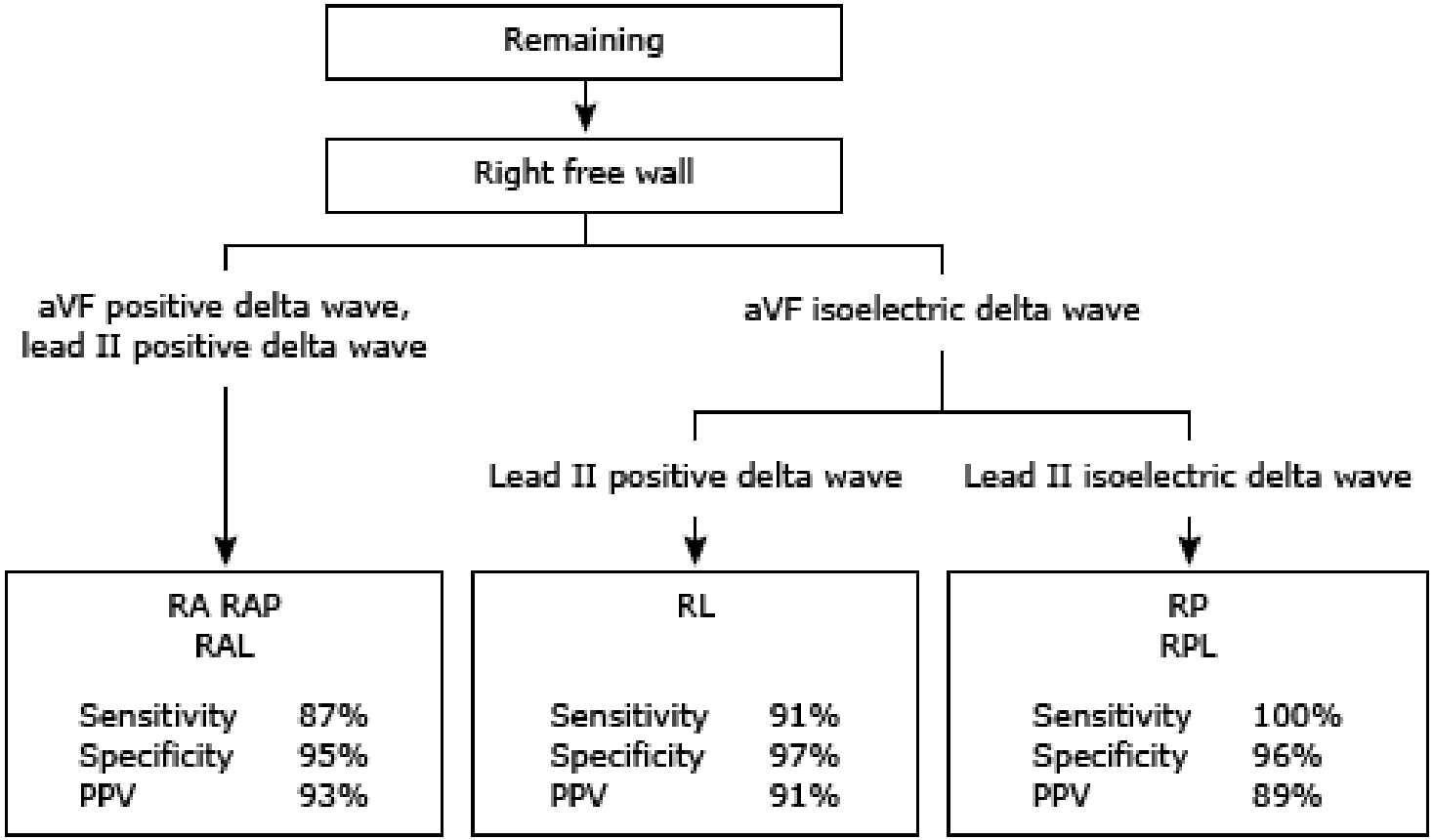


The Arruda Algorithm : STEP 4



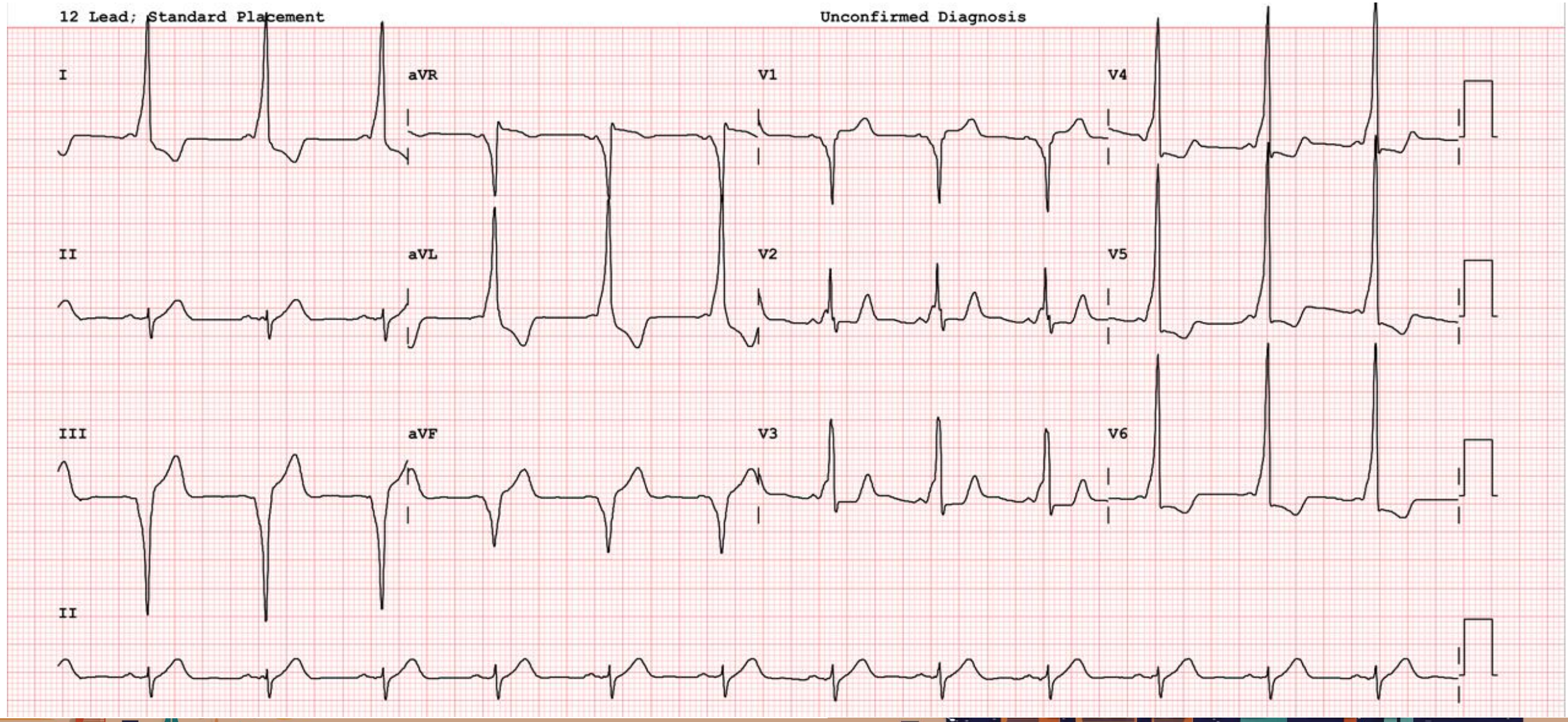
The Arruda Algorithm : STEP 4

Step 4

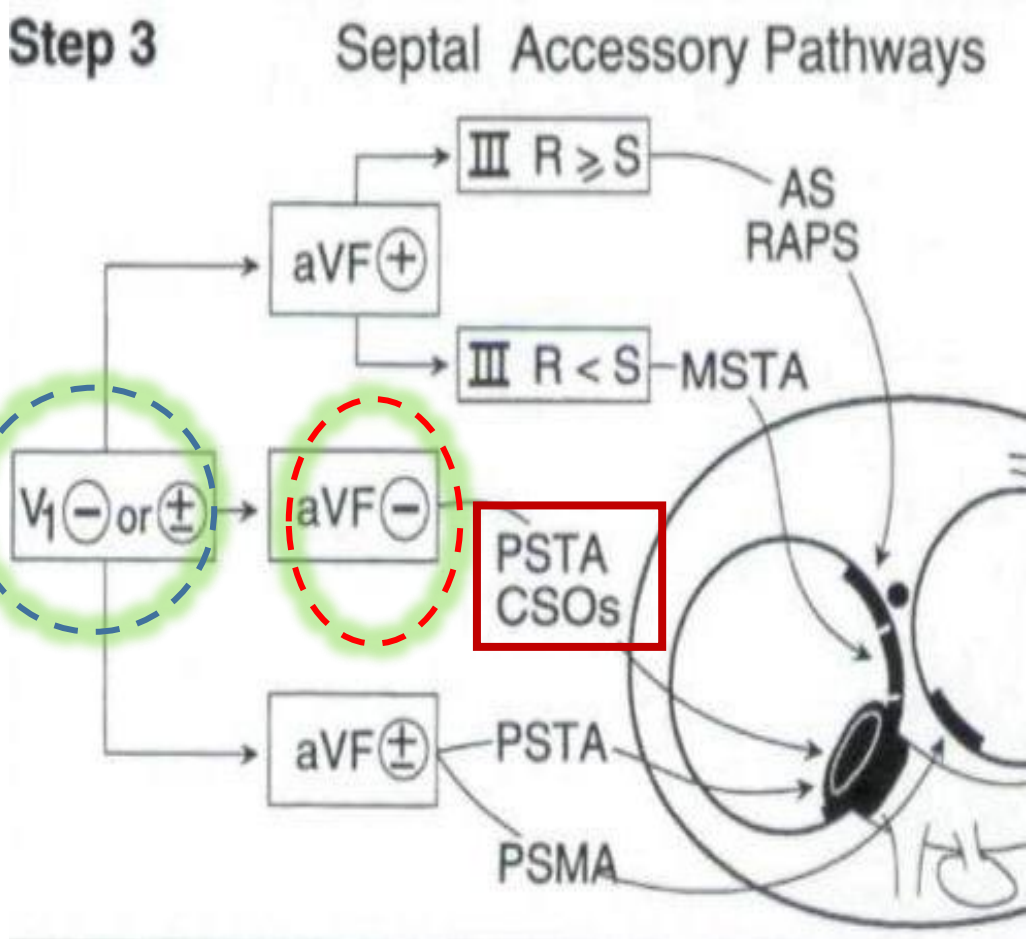


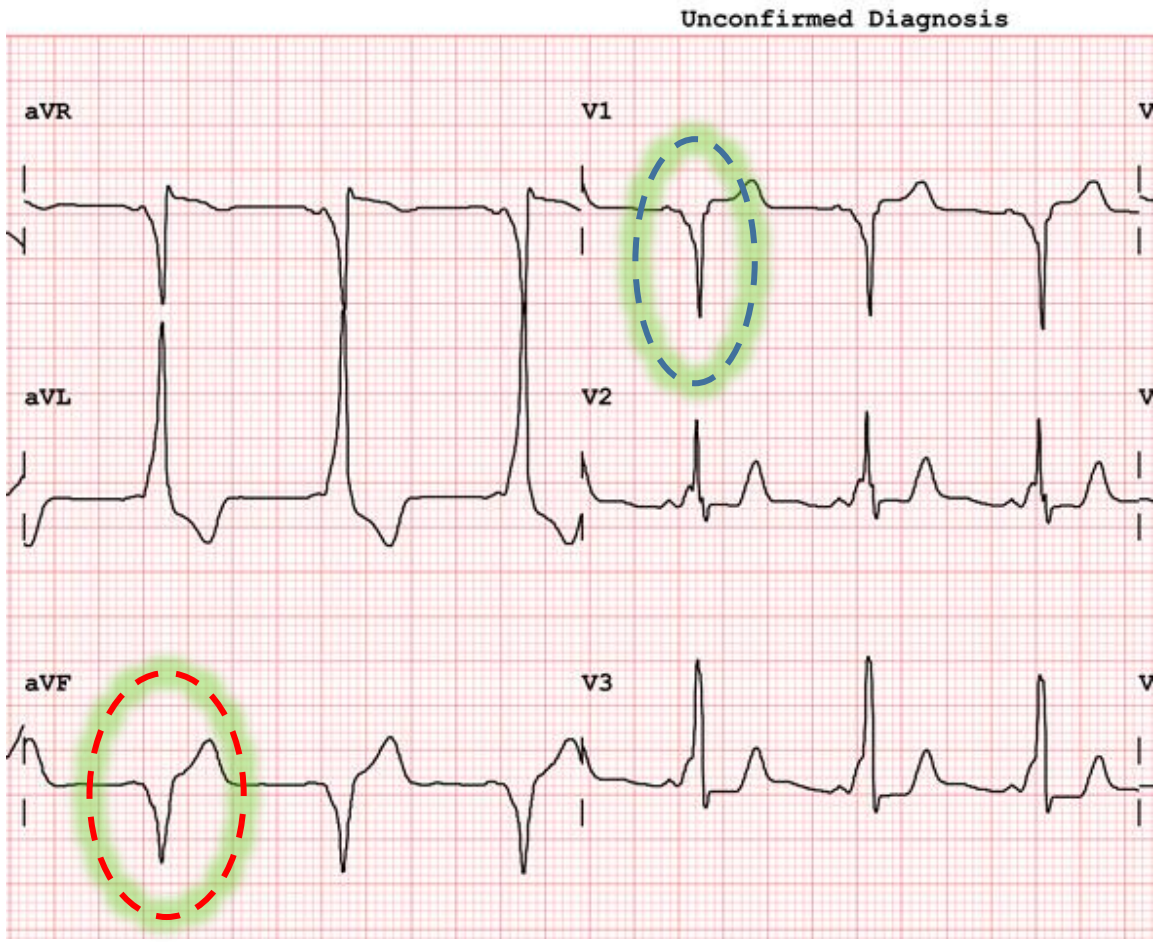
- CASE 1 -

M/37 palpitation

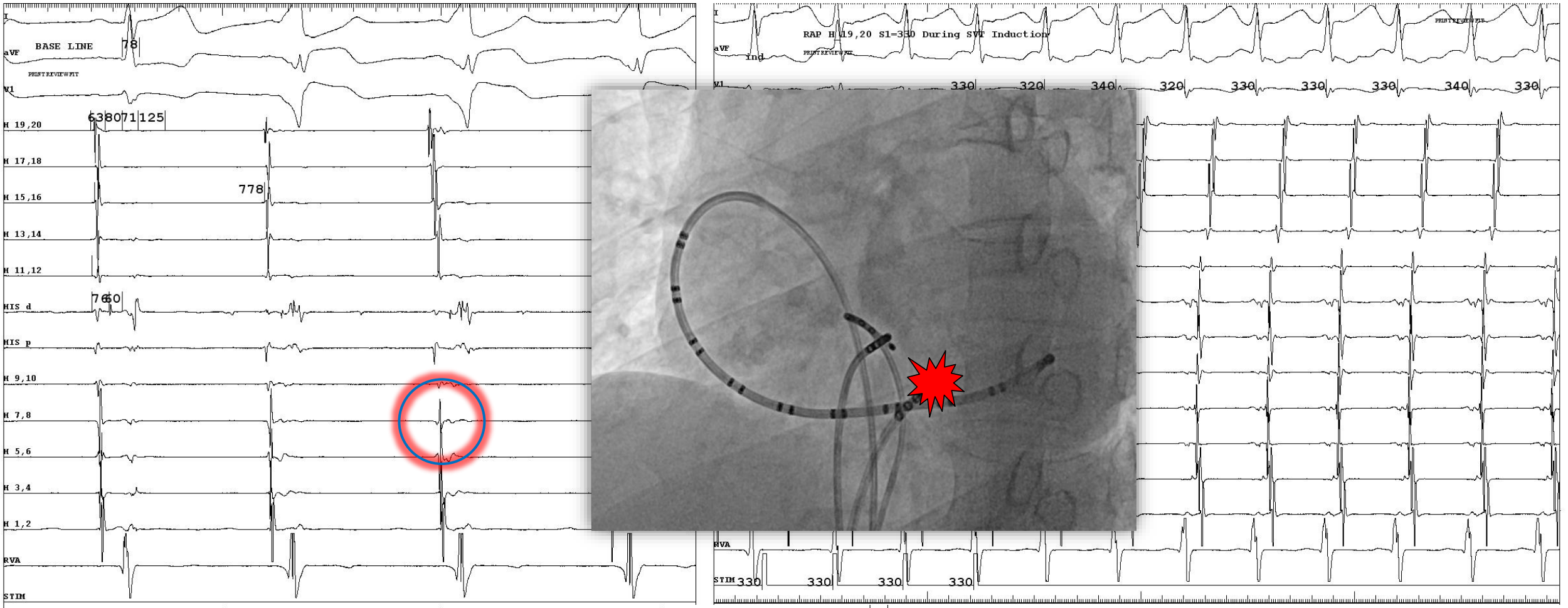


by Arruda Algorithm

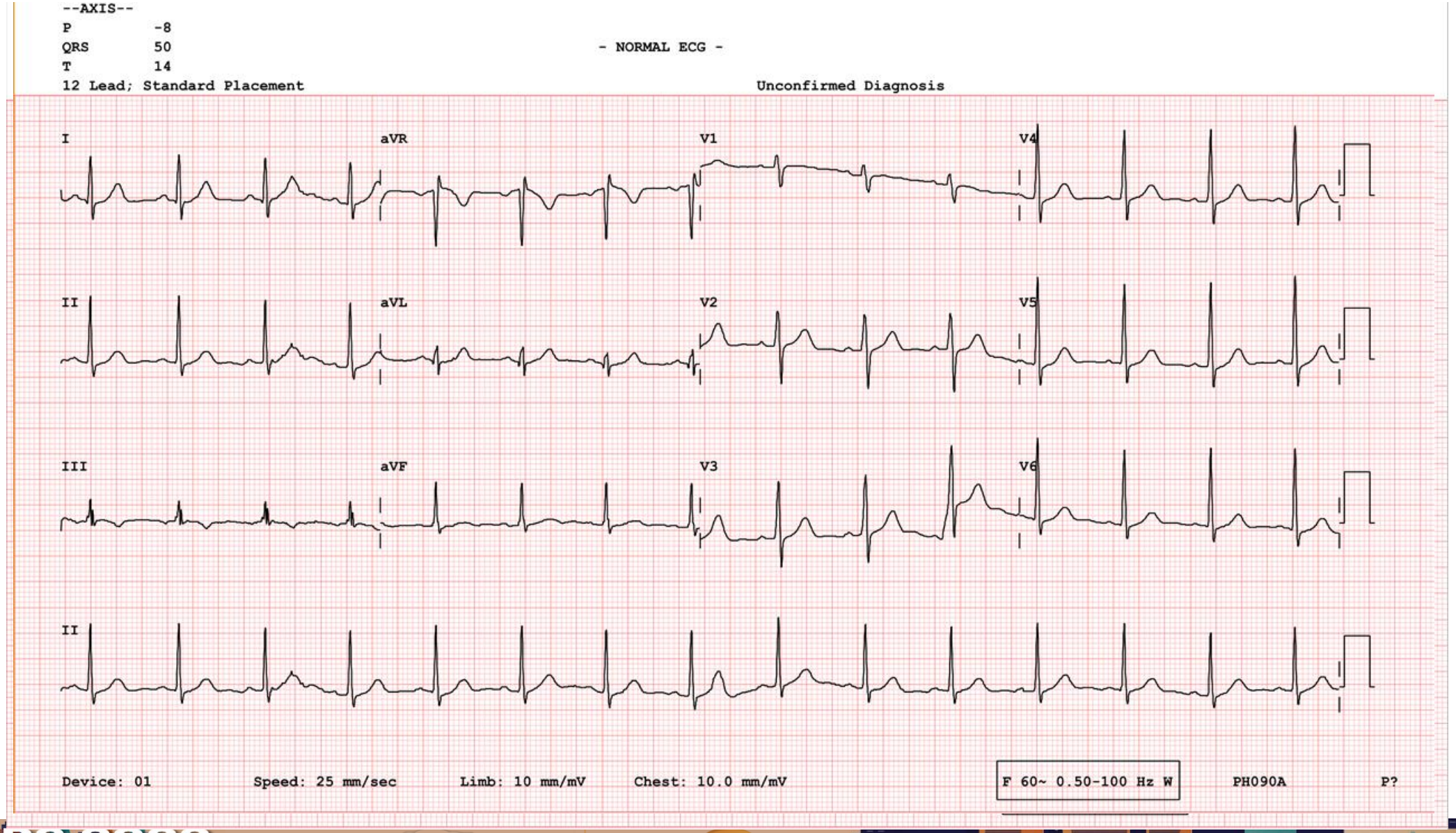




EPS & RFCA at CS Os



After RFCA


--AXIS--
P -8
QRS 50
T 14
- NORMAL ECG -
12 Lead; Standard Placement
Unconfirmed Diagnosis
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
Device: 01
Speed: 25 mm/sec
Limb: 10 mm/mV
Chest: 10.0 mm/mV
F 60~ 0.50-100 Hz W
PH090A
P?

in 2018 Maximal Pre-Excitation Based Algorithmfor Localization of Manifest AccessoryPathways in Adults: Pambrun algorithm

FIGURE 3 New Stepwise Algorithm Depicted as an Anatomical Scheme

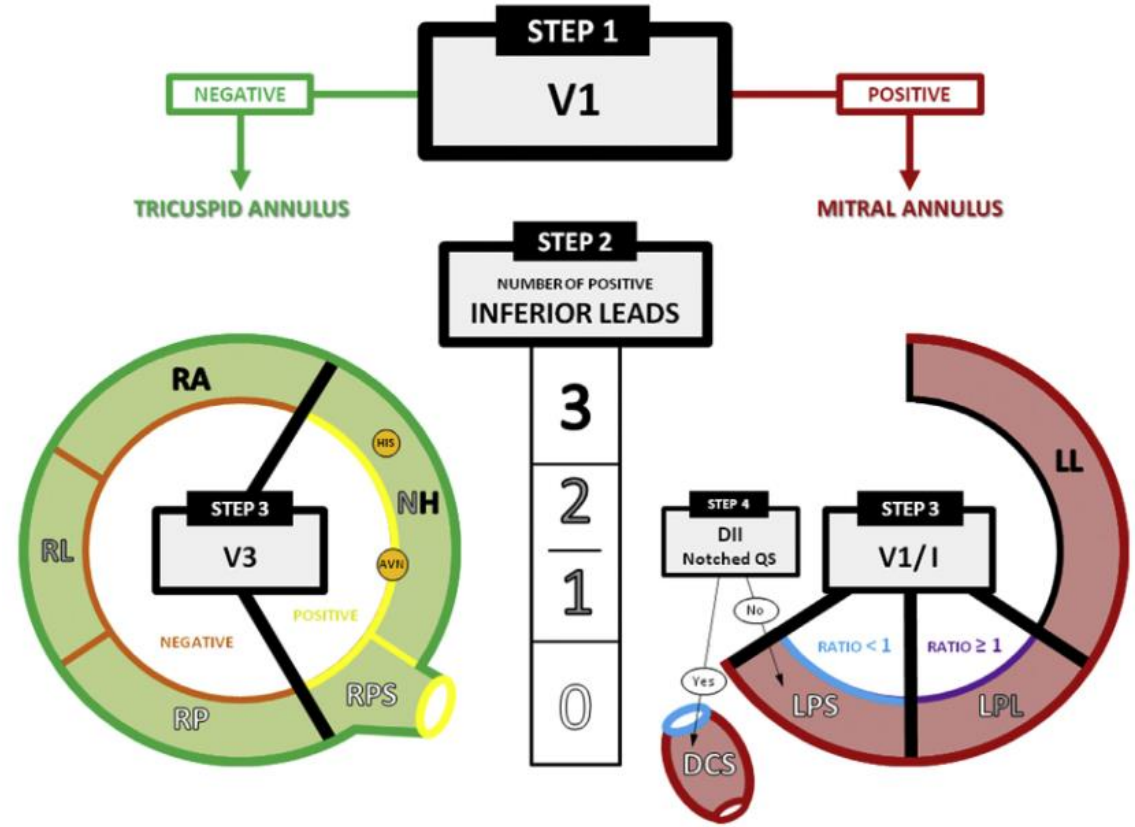
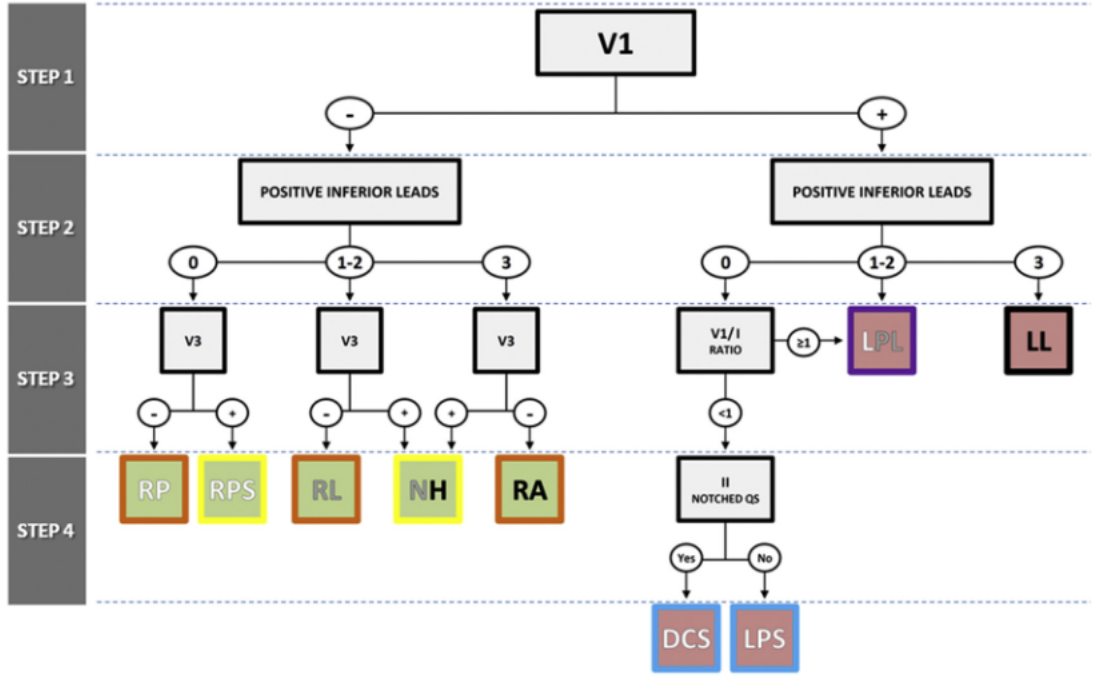
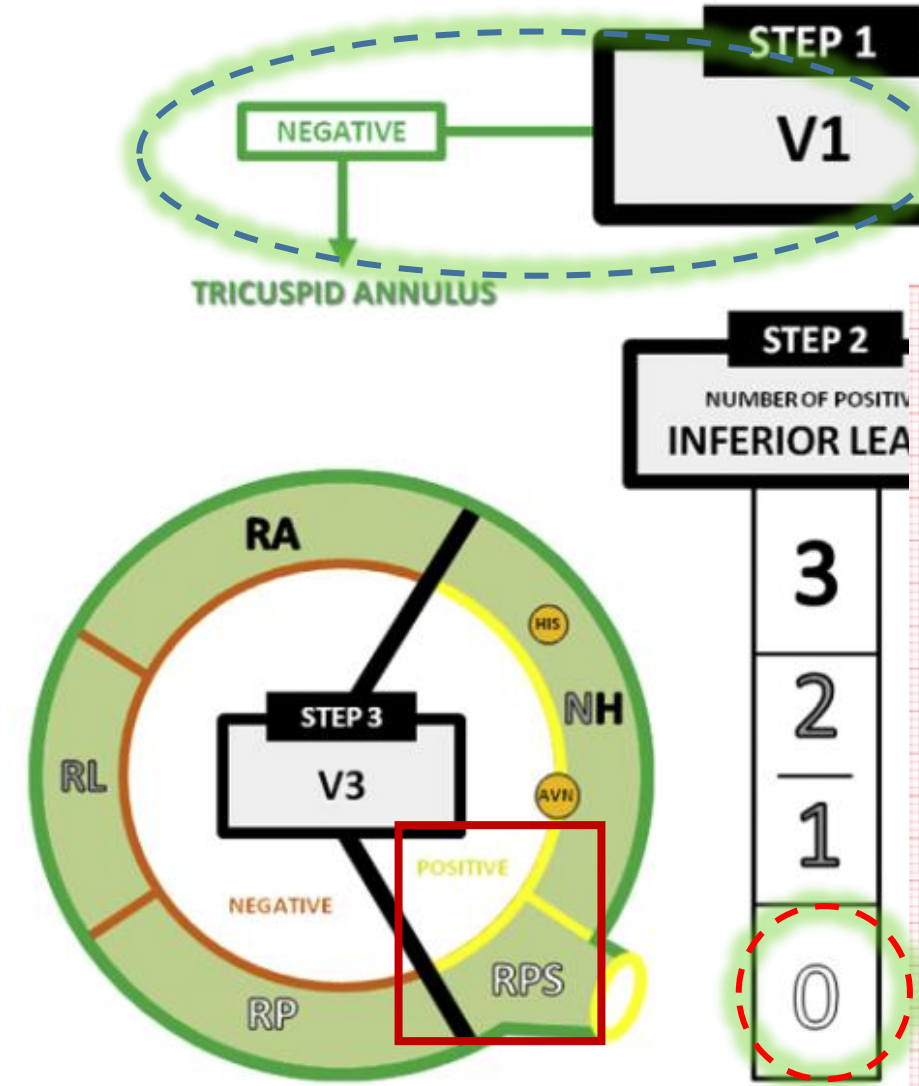


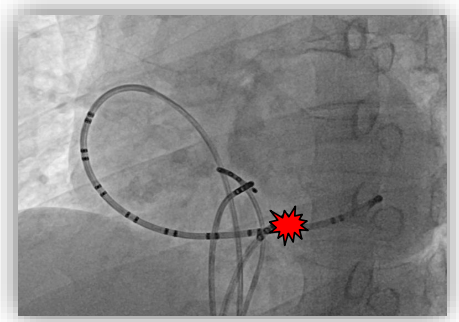
FIGURE 4 New Stepwise Algorithm Depicted as a Decision Tree

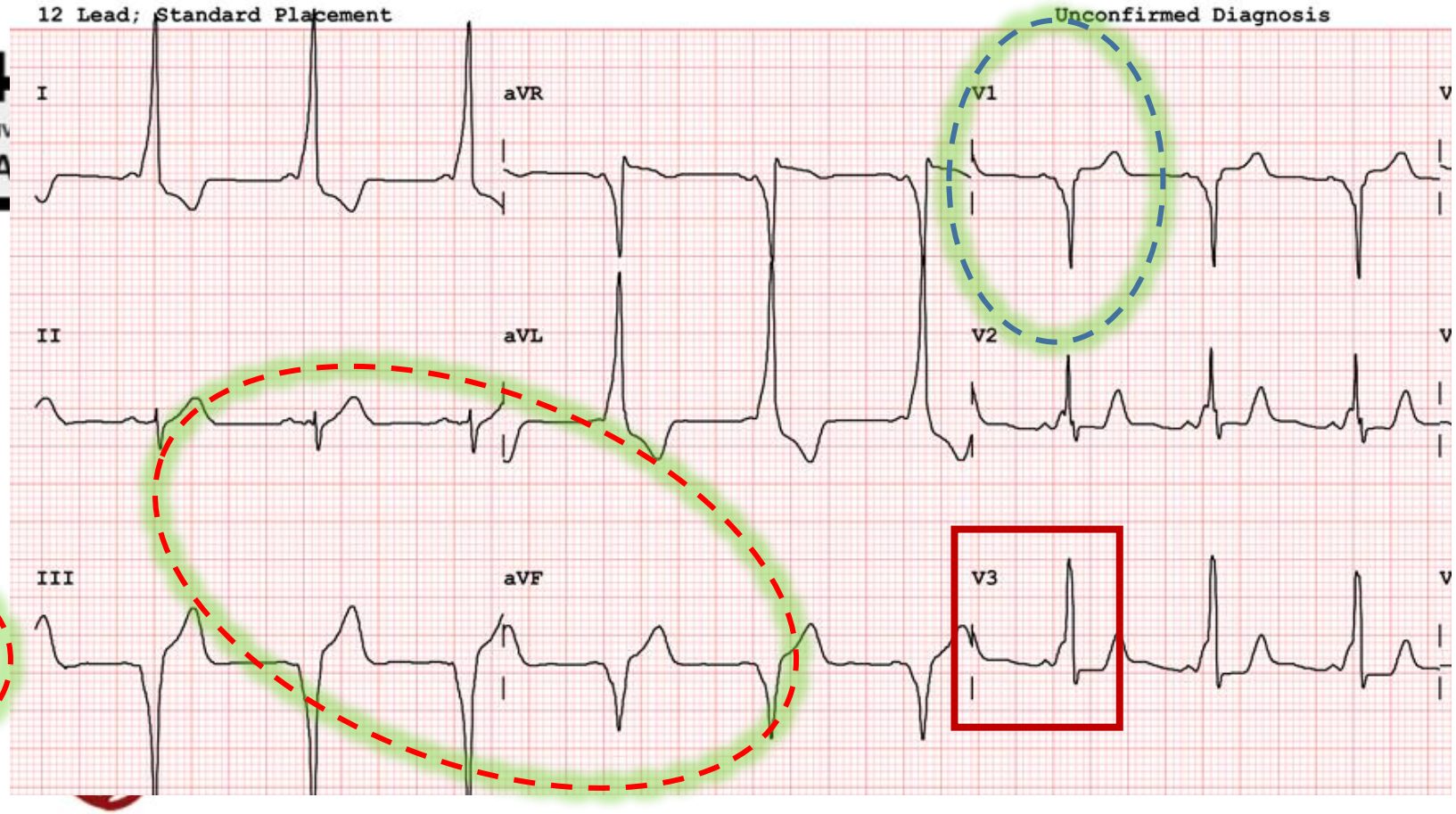


Pambrun T et al, J Am Coll Cardiol EP. 2018

FIGURE 3 New Stepwise Algorithm Depicted as an Anatomical Scheme

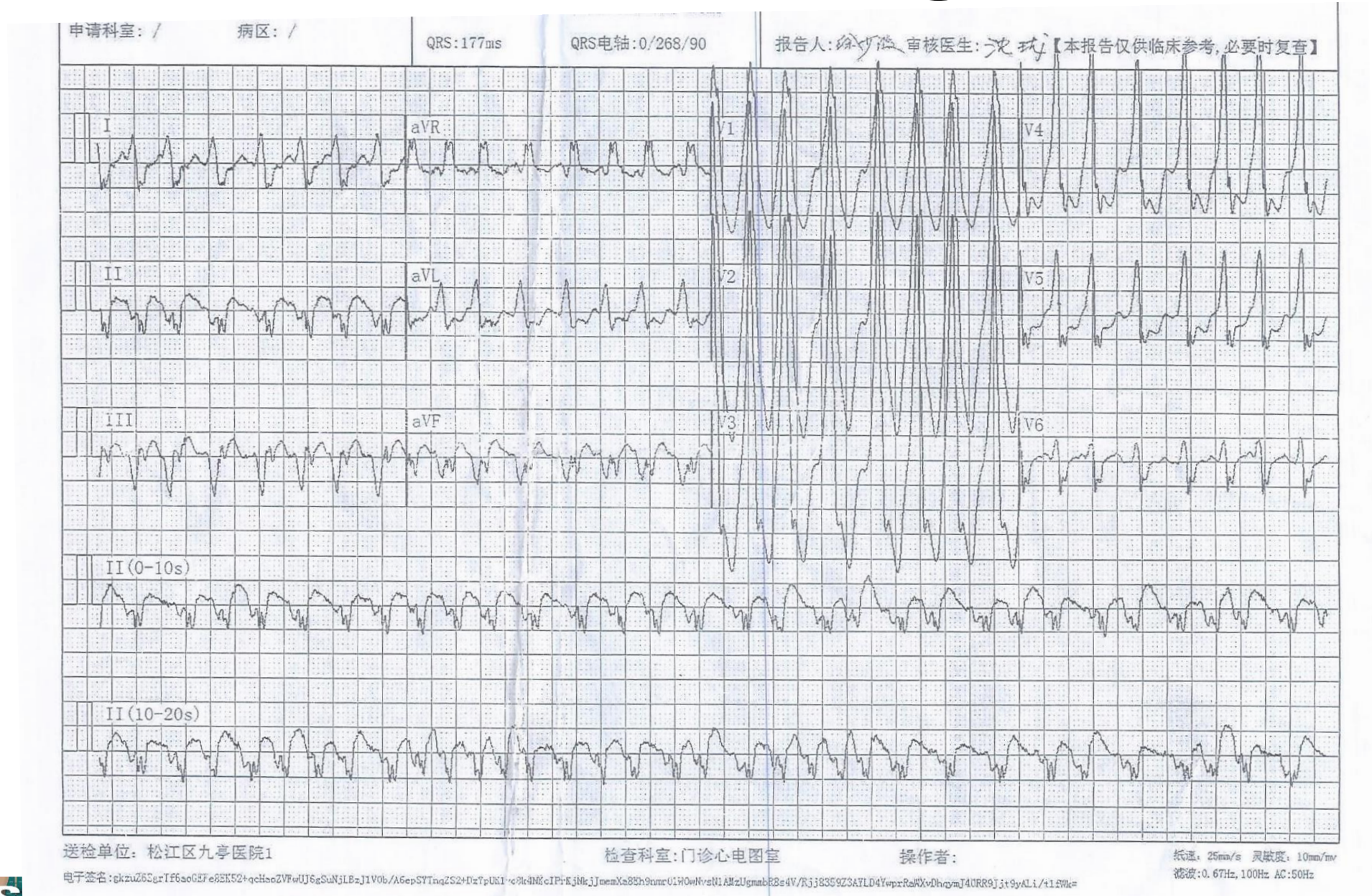




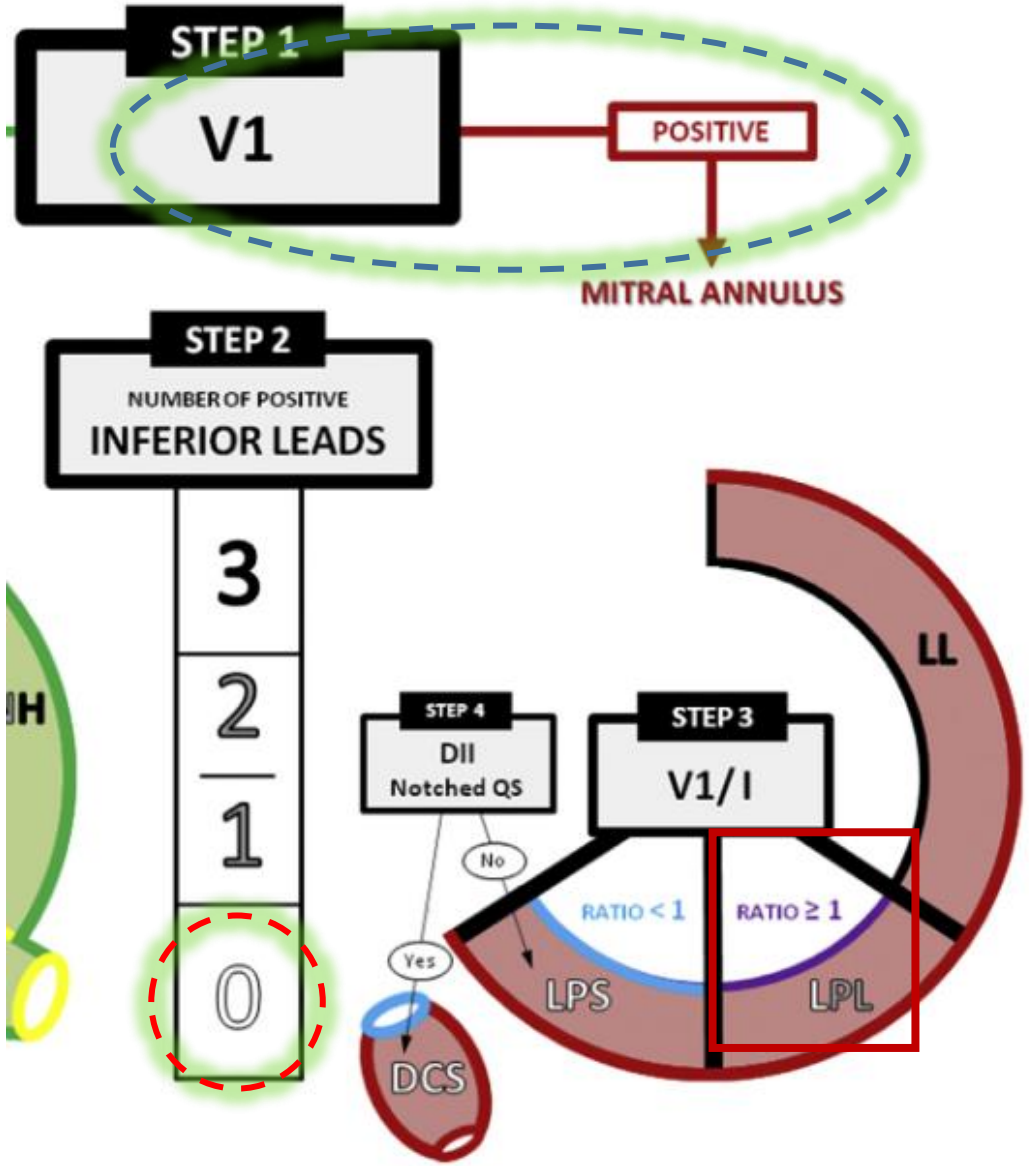


- CASE 2 -

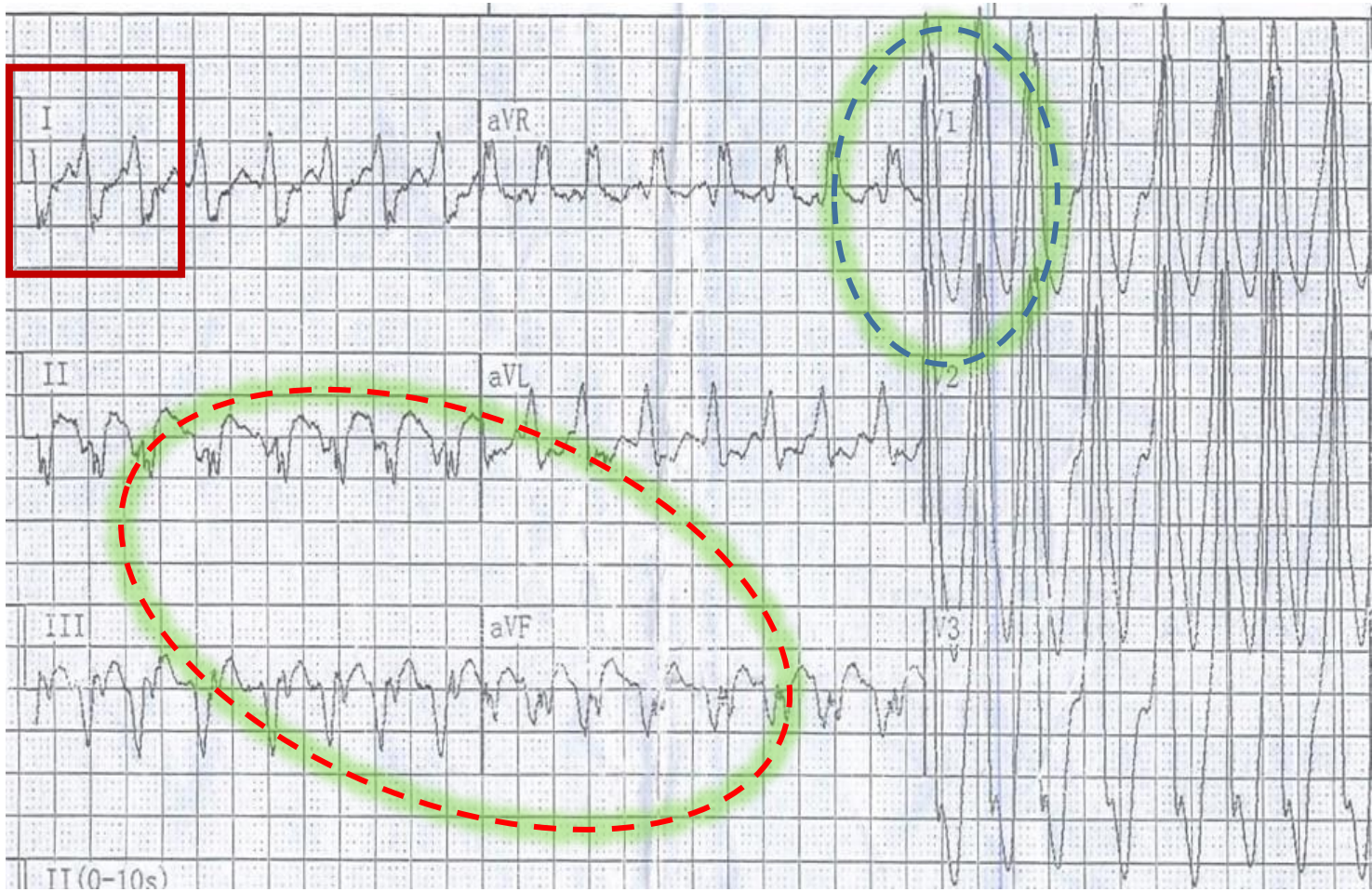
22.9.15 M/45 palpitation during exercise in China



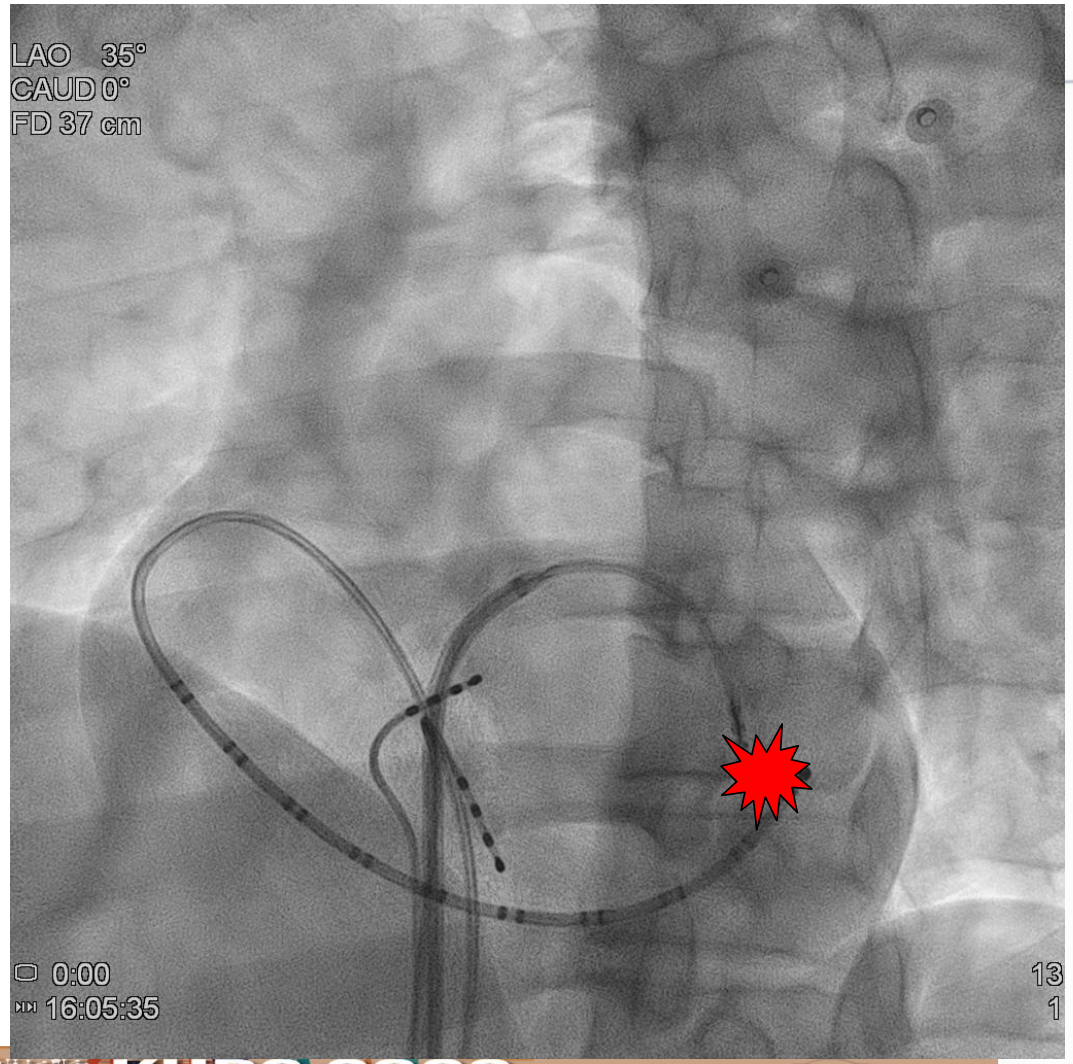
s an Anatomical Scheme



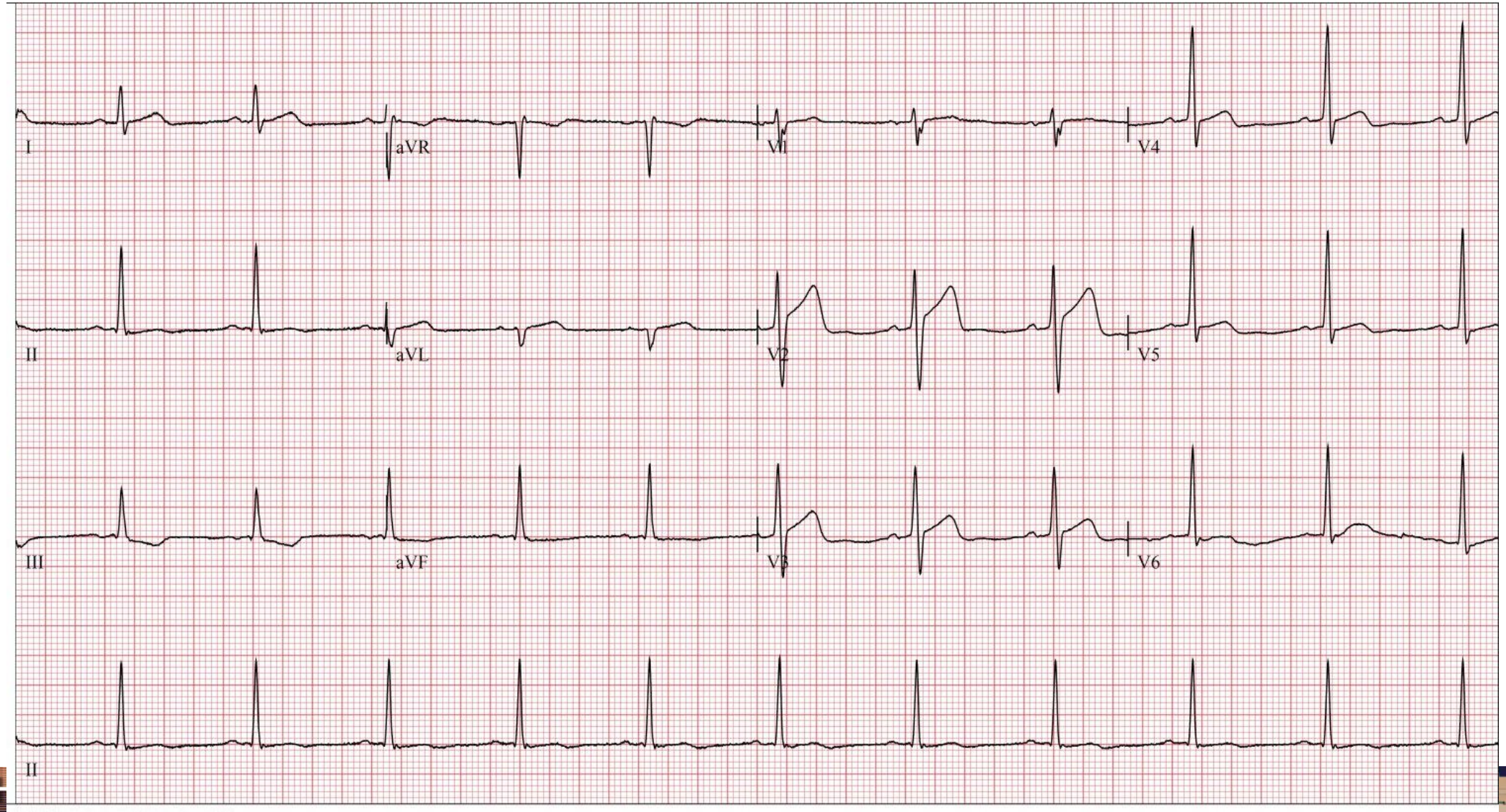
By Pambrun algorithm



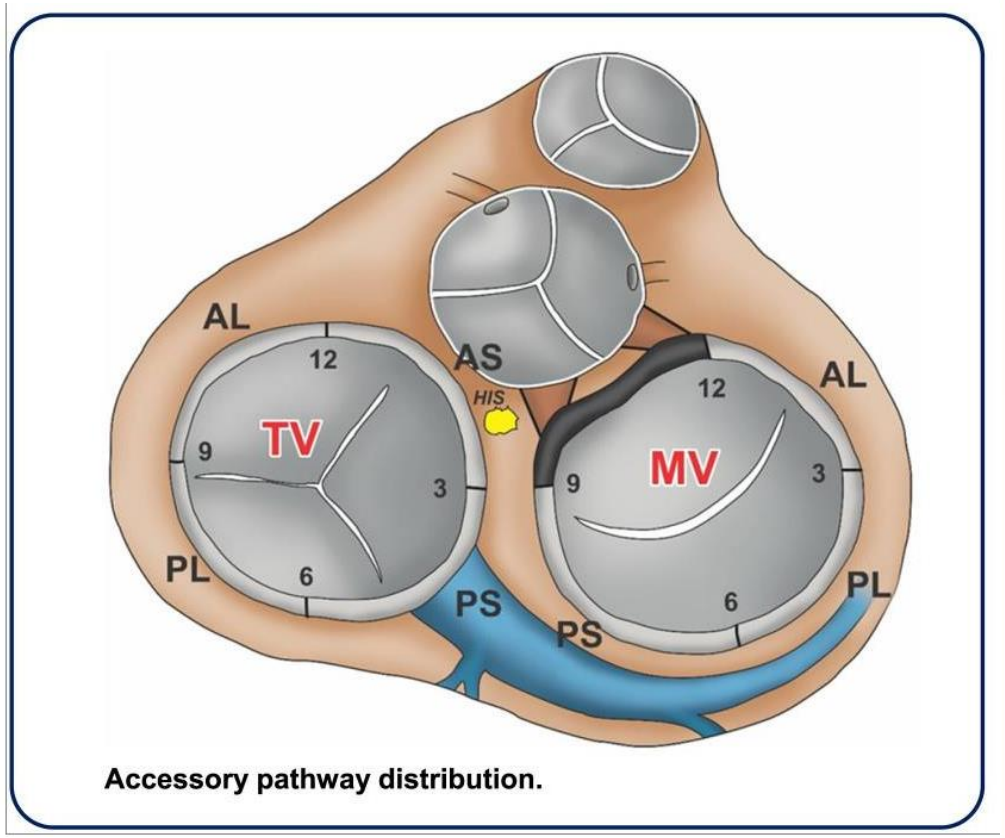
RFCA at left postlateral AV groove



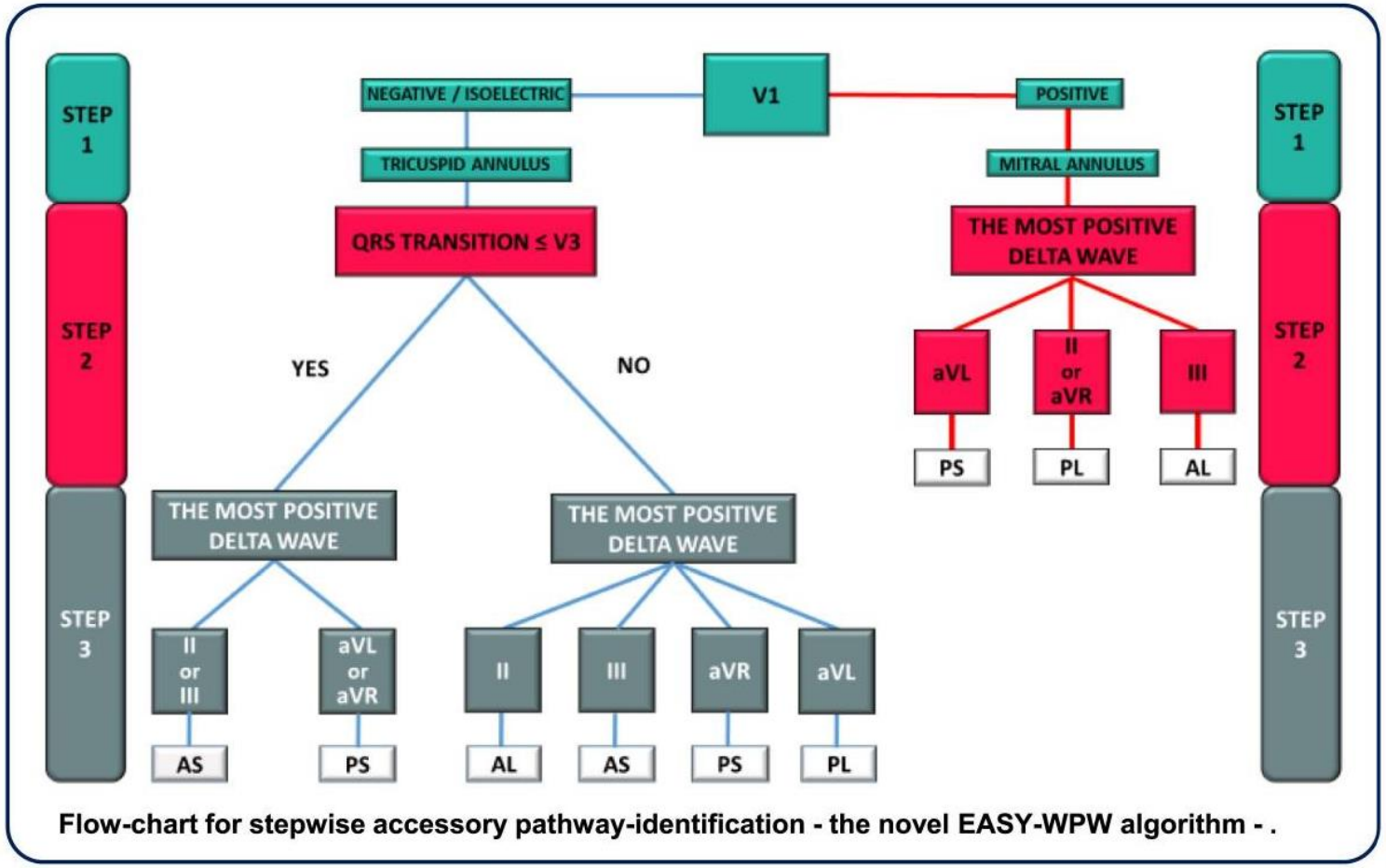
Post RFCA ECG



in 2023 EASY-WPW: a novel ECG-algorithm for easy and reliable localization of manifest accessory pathways in children and adults: Hamriti



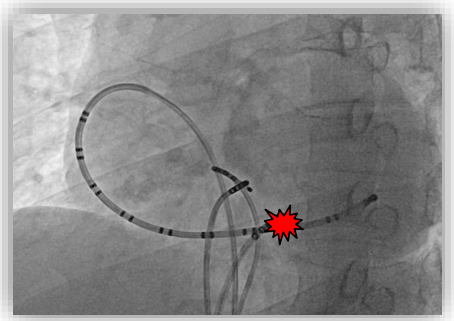
Accessory pathway distribution.

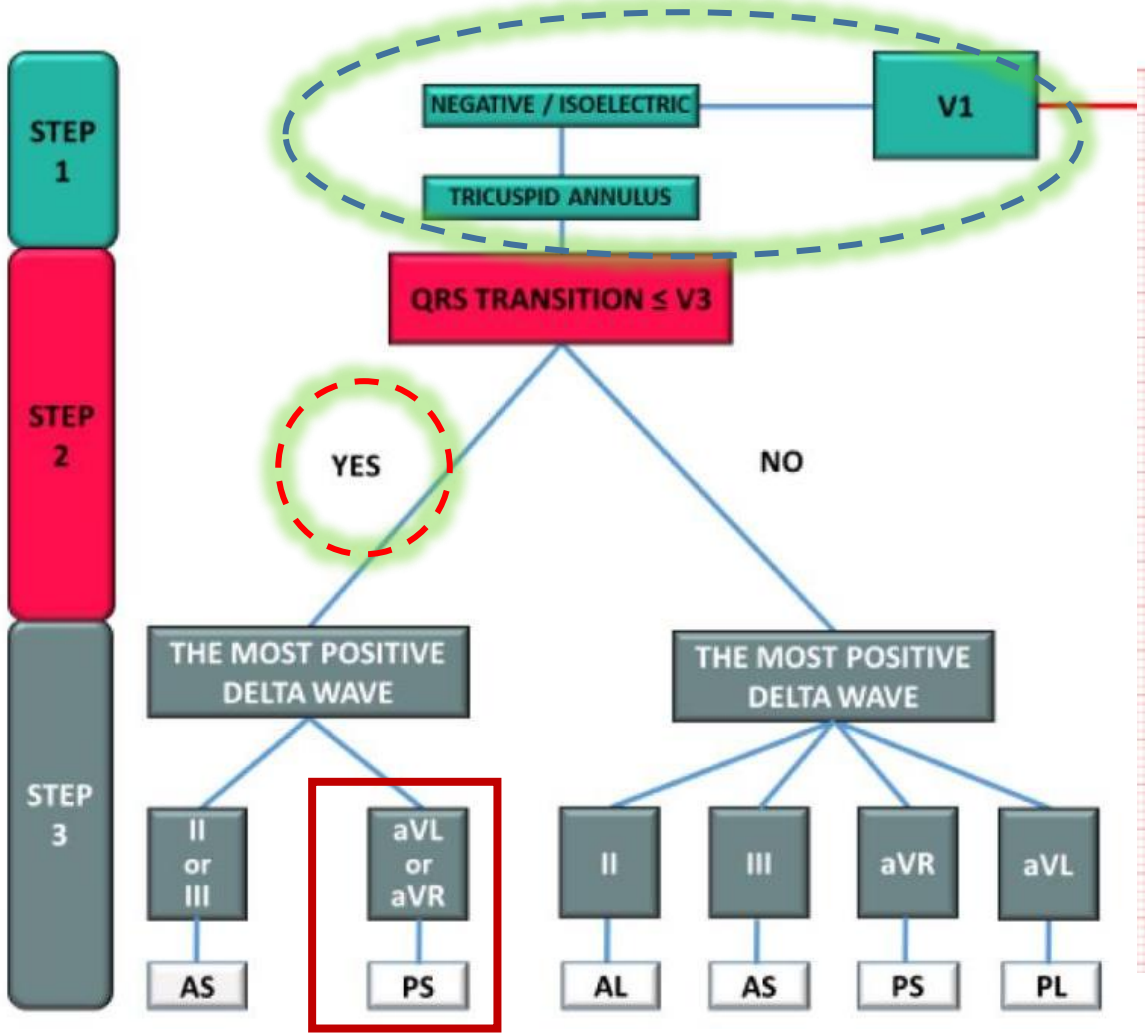


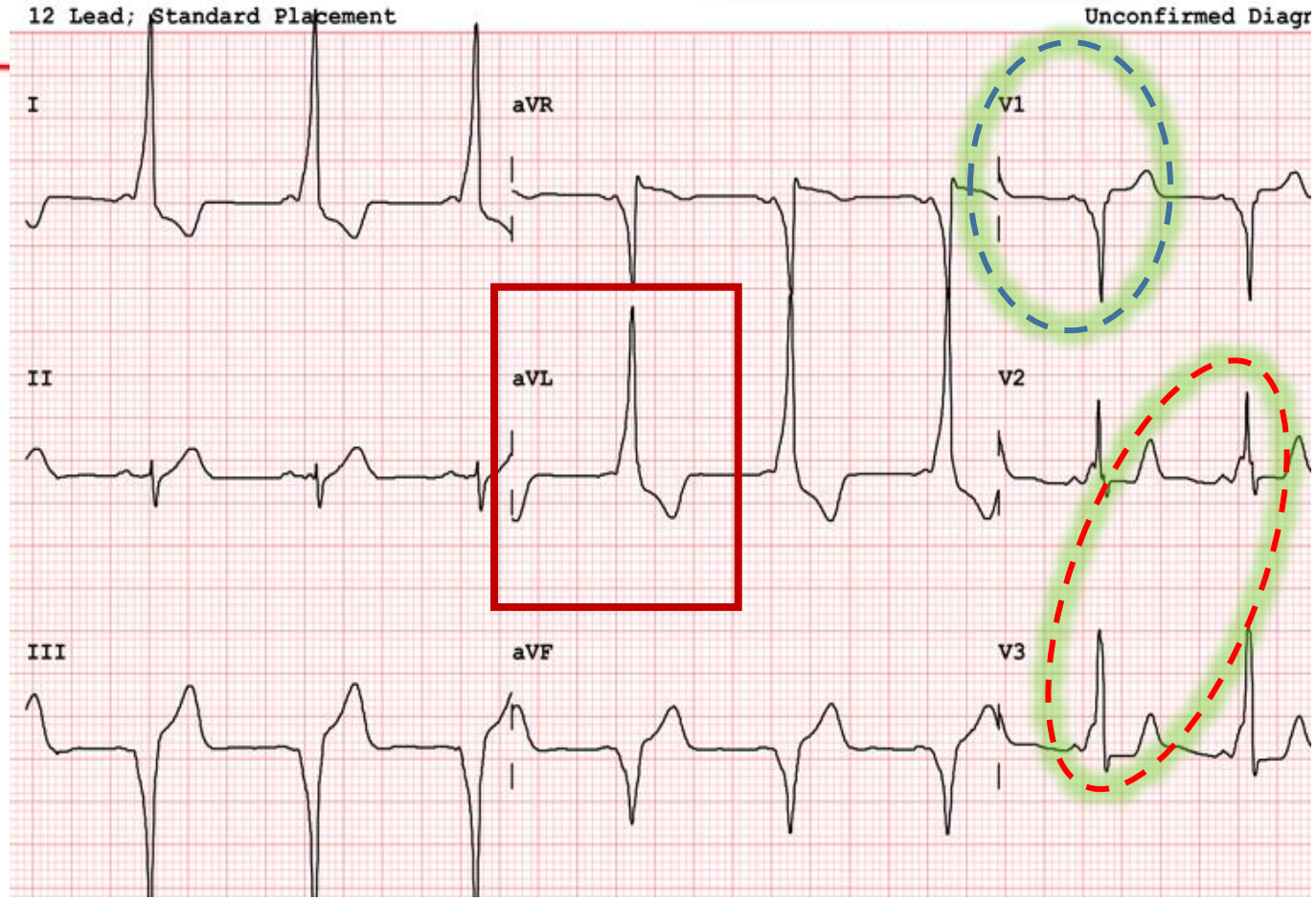
Flow-chart for stepwise accessory pathway-identification - the novel EASY-WPW algorithm - .

M. El Hamriti et al. Europace 2023

By Hamriti

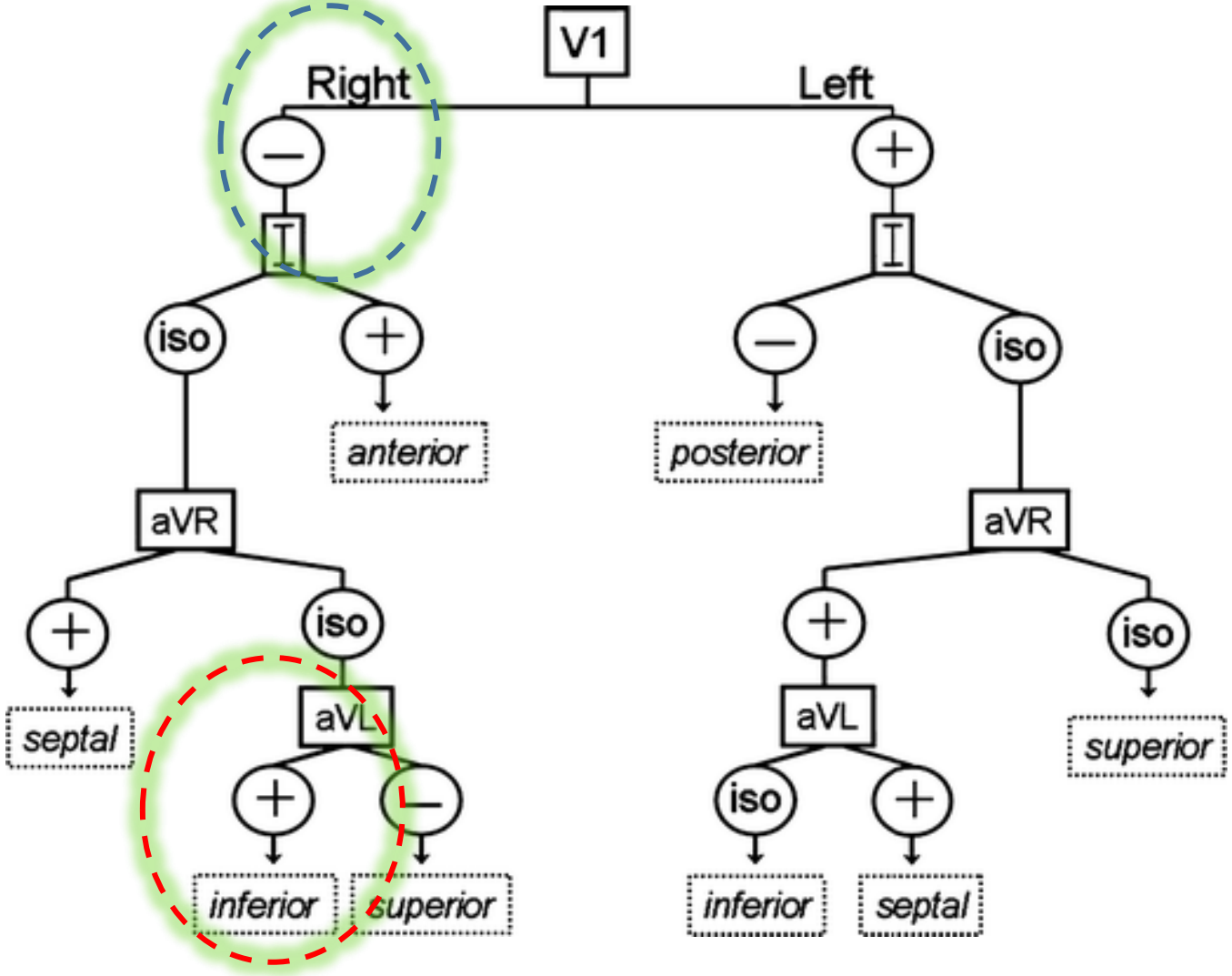


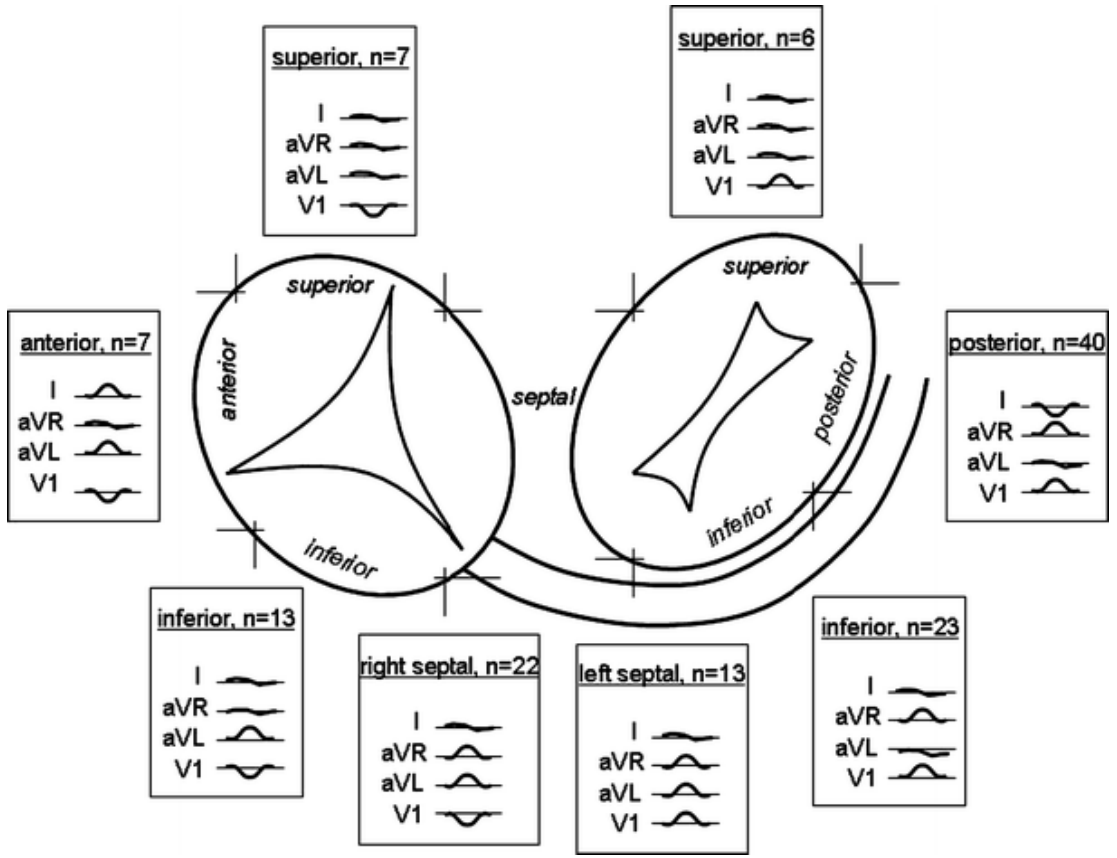

STEP 1
STEP 2
STEP 3
NEGATIVE / ISOELECTRIC
V1
TRICUSPID ANNULUS
QRS TRANSITION ≤ V3
YES
NO
THE MOST POSITIVE DELTA WAVE
THE MOST POSITIVE DELTA WAVE
II or III
aVL or aVR
II
III
aVR
aVL
AS
PS
AL
AS
PS
PL


12 Lead; Standard Placement
Unconfirmed Diagr
I
aVR
V1
II
aVL
V2
III
aVF
V3

2. retrograde P-wave polarity during orthodromic AVRT

Retrograde P-wave during oAVRT





Rostock, T et alJ Interv Card Electrophysiol 2008

A new algorithm for concealed accessory pathway localization using T-wave-subtracted retrograde P-wave polarity during orthodromic atrioventricular reentrant tachycardia.

- retrograde P-wave polarity during orthodromic AVRT and developed an algorithm to predict the localization of concealed accessory pathways
- Four leads of the surface electrocardiogram (ECG) were identified to accurately distinguish AP locations assigned to four different regions around each AV annulus: I, aVR, aVL, and V1
- Retrograde P-wave in lead I was negative in left posterior APs exclusively and became more positive with an AP location shifting towards right anterior. P-wave polarity in lead aVR demonstrated a shift from a positive polarity from left APs to isoelectric in right APs. The opposite direction (shift from positive to isoelectric) was observed for lead aVL

Rostock, T et alJ Interv Card Electrophysiol 2008

3. ECG Clue for Mutiple Accessory Pathway ?

in1990, Clue for multiple AP

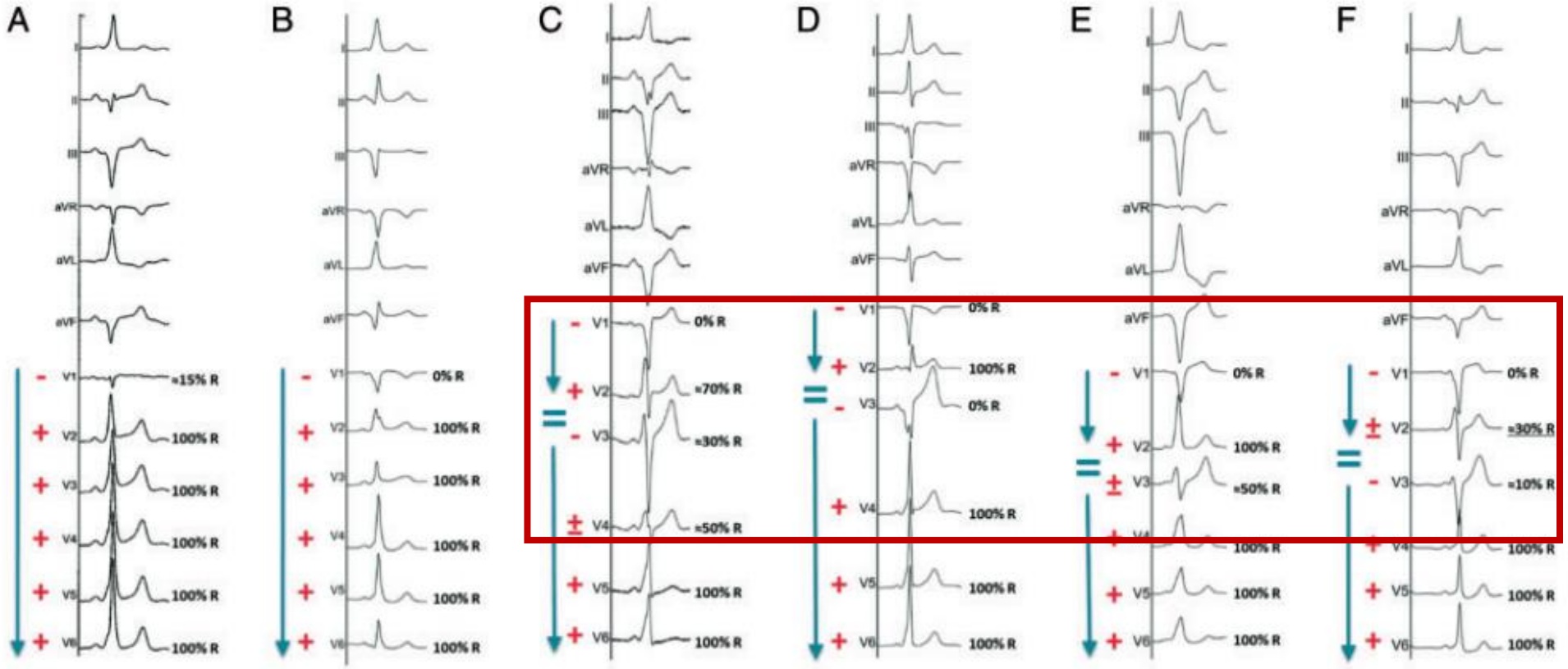
- Diffent P wave during oAVRT
- Discre ar
  ends
- Atrial
- Direct
- Variab
- Change of pre-excitation pattern after AAD

> The retrospective nature of this study does not allow conclusions as to the true value of the ECG in predicting the presence of more than one accessory pathway. This issue needs to be evaluated in a prospective study.
>
> *(J Am Coll Cardiol 1990;16:745–51)*

Wellens HJ et al. JACC 1990 …

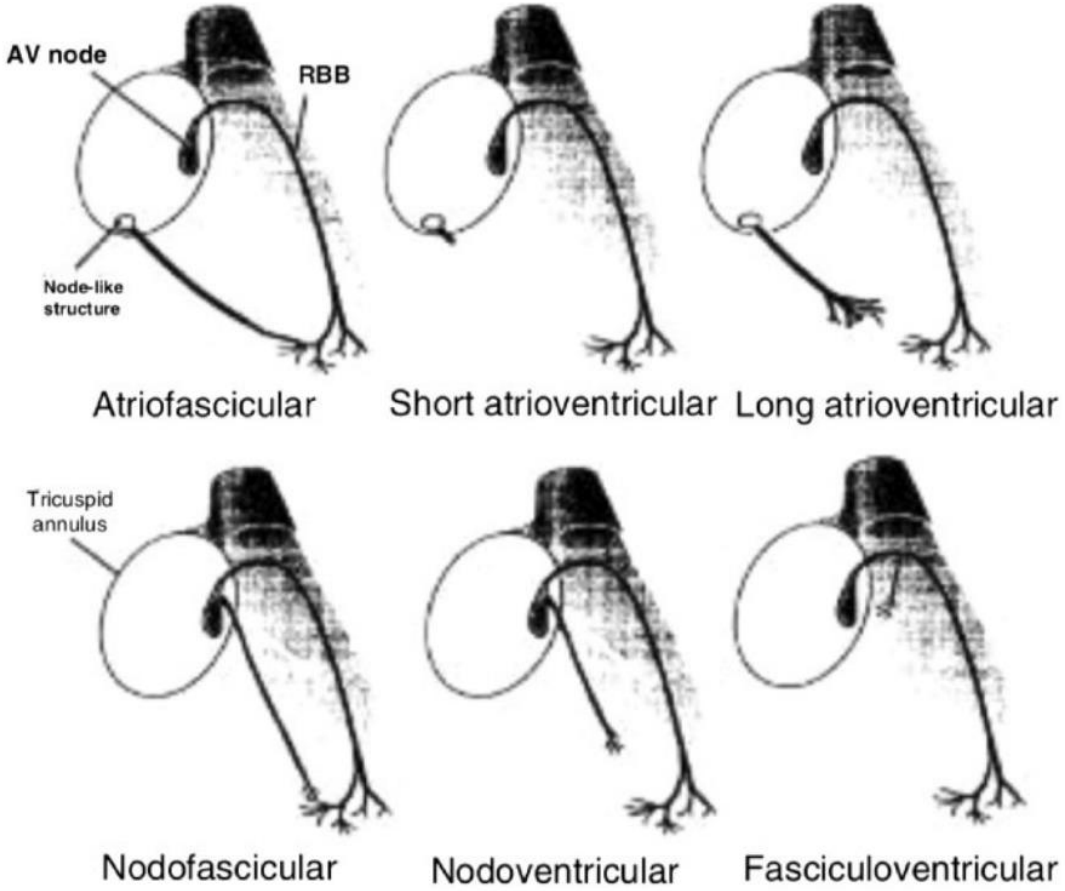
4. Specific Accessory Pathways

The ‘double transition’: a novel electrocardiogram sign to discriminate posteroseptal accessory pathways ablated from the right endocardium from those requiring a left-sided or epicardial coronary venous approach



P. Pascale et al. EROPACE 2020

Atypical bypass tracts: can they be recognized during sinus rhythm?



- Rare anatomic structures often with decremental conduction
- ECG of those structures may be difficult in sinus rhythm
- No overt ventricular pre-excitation is present
- ECG often shows a subtle pre-excitation pattern (less contribution to ventricular activation over the slow and decremental conducting bypass)

J.N. de Alencar Neto et al. EROPACE 2019

Summary

- Localization of Accessory Pathways(AP) is important for prepare ablation
- Many algorithm developed based on delta wave or pre-excited QRS waves. Minimal pre-excitation is not helpful
- Retrograde P-wave axis during oAVRT is often useful for localization for AP
- There is weak ECG clue for multiple AP
- Atypical AP may take into consideration in specific cases.

Thank You for Attentions !!

2023 新DESIGN병원

2023.3.7

심장센터

대자인병원
DESIGN HOSPITAL