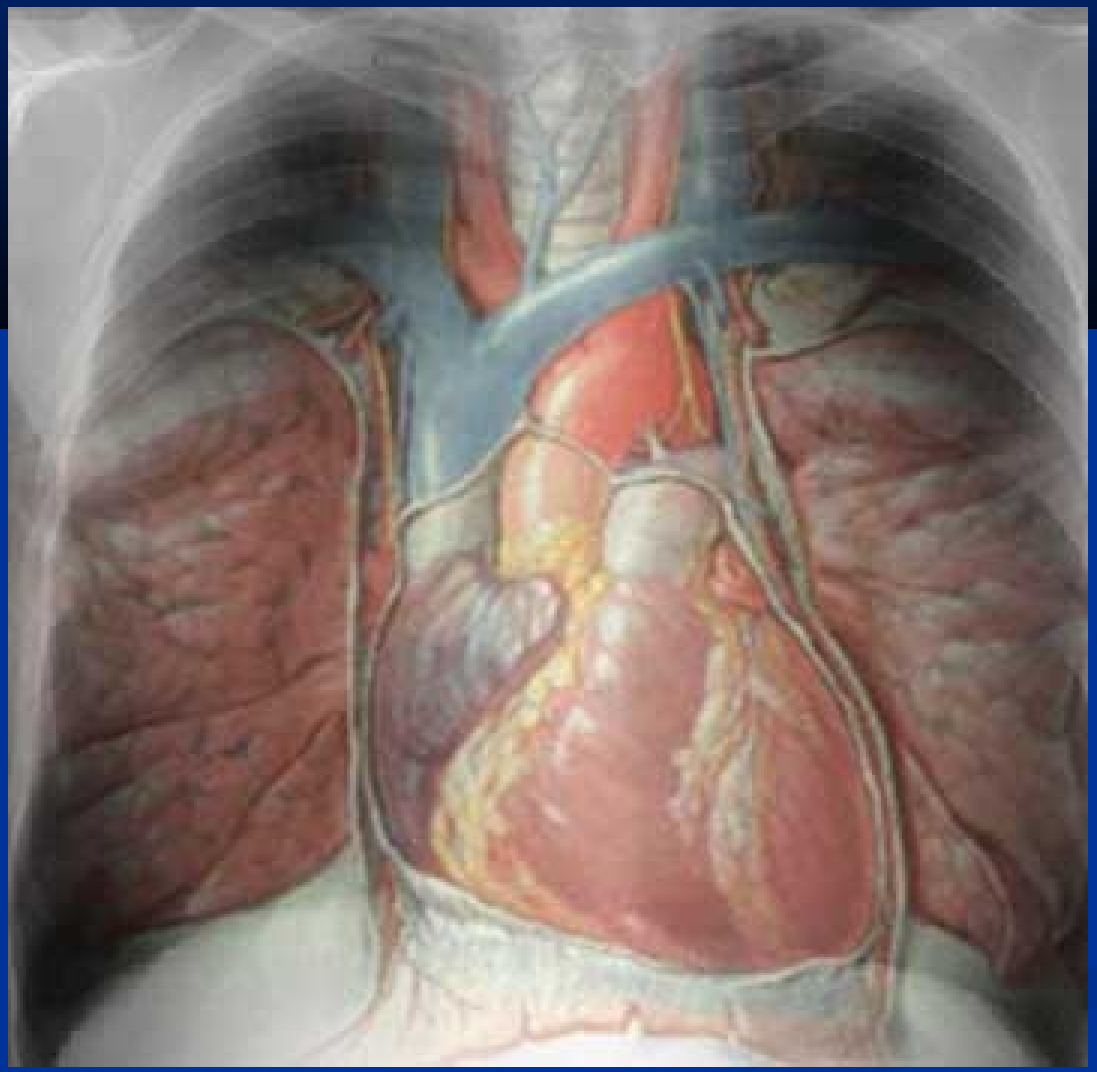
FOKKE & SUKKE

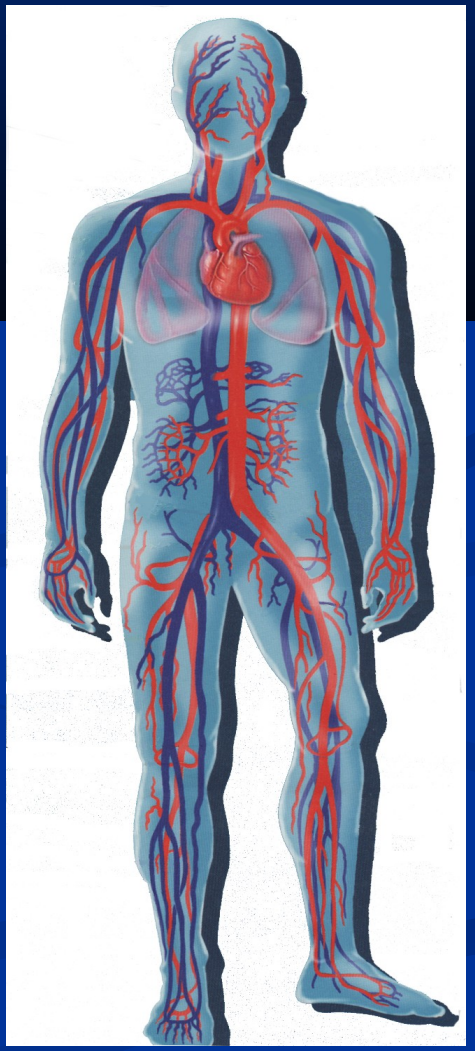
GAAN NAAR DE EINDPRESENTATIE

Anatomie van het hart

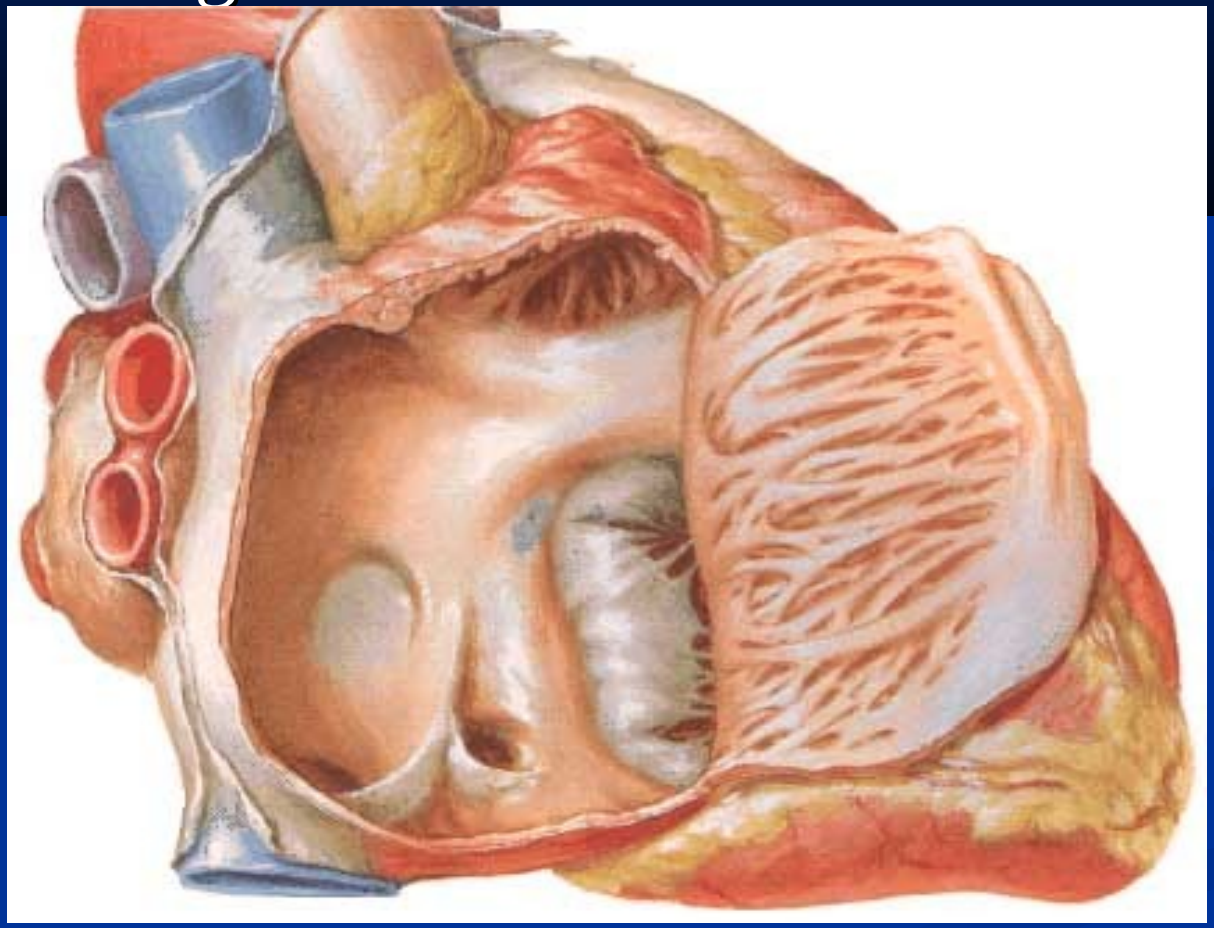
Gericht op hartritmes

Positie van het hart

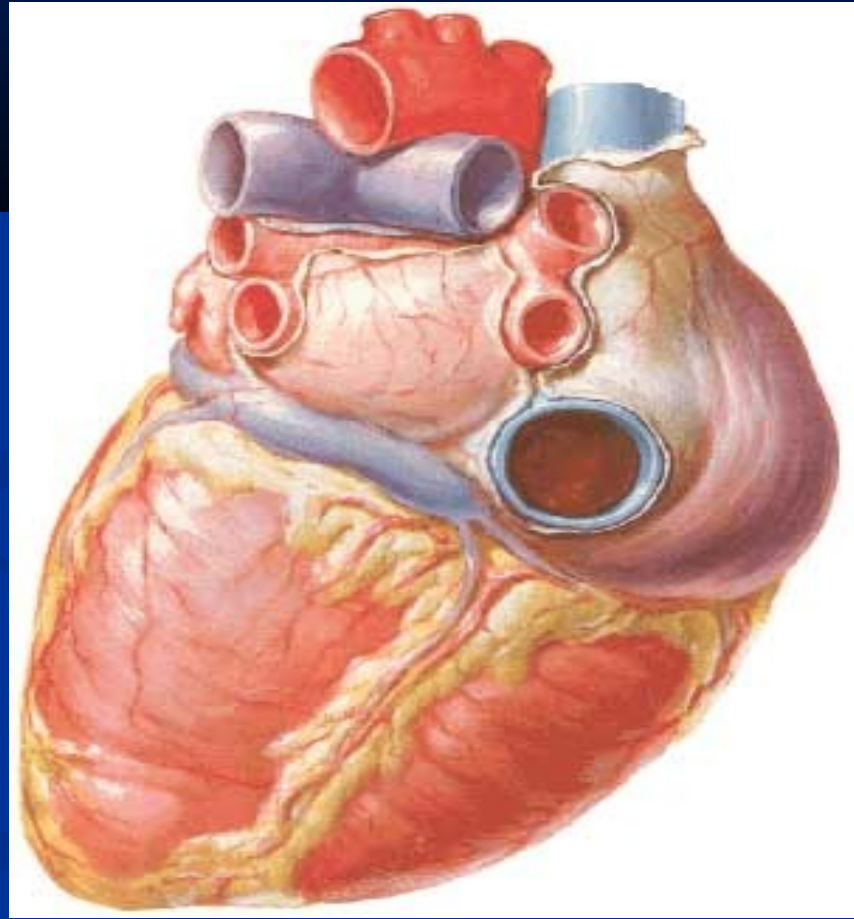




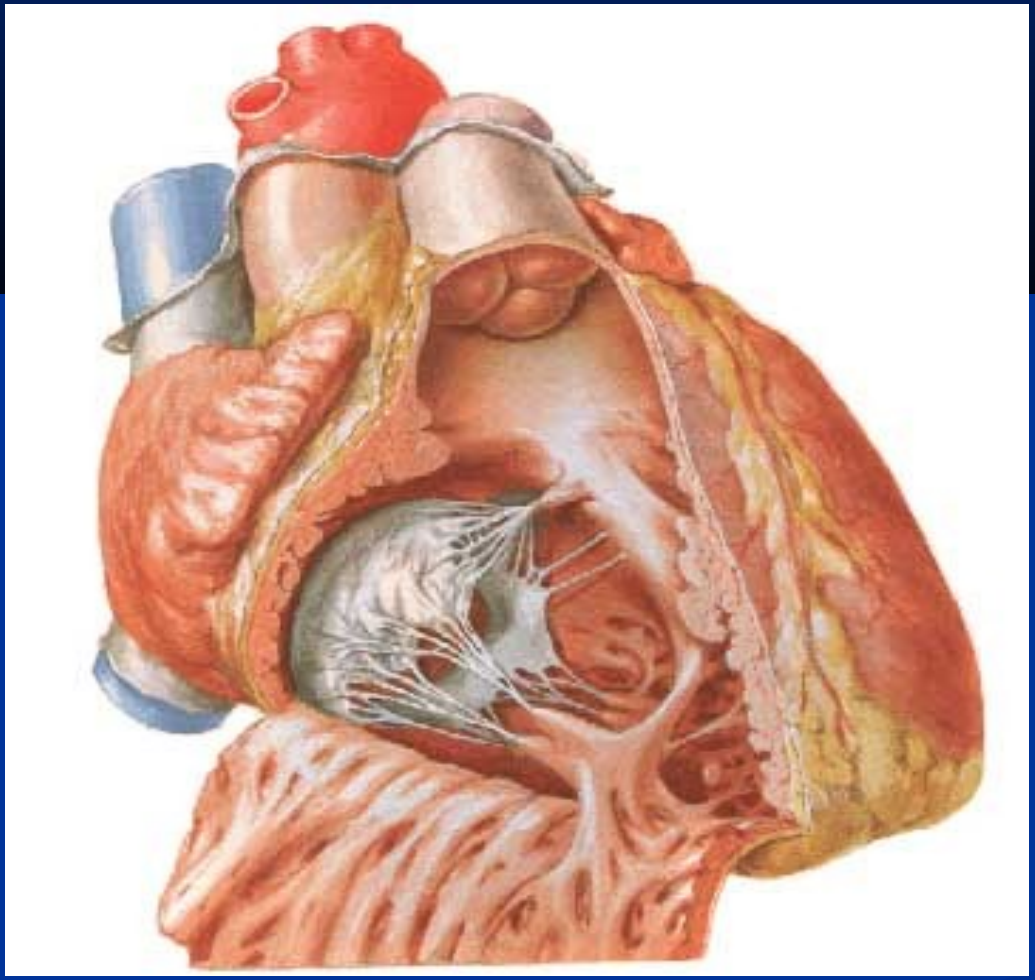
- Right Lateral view



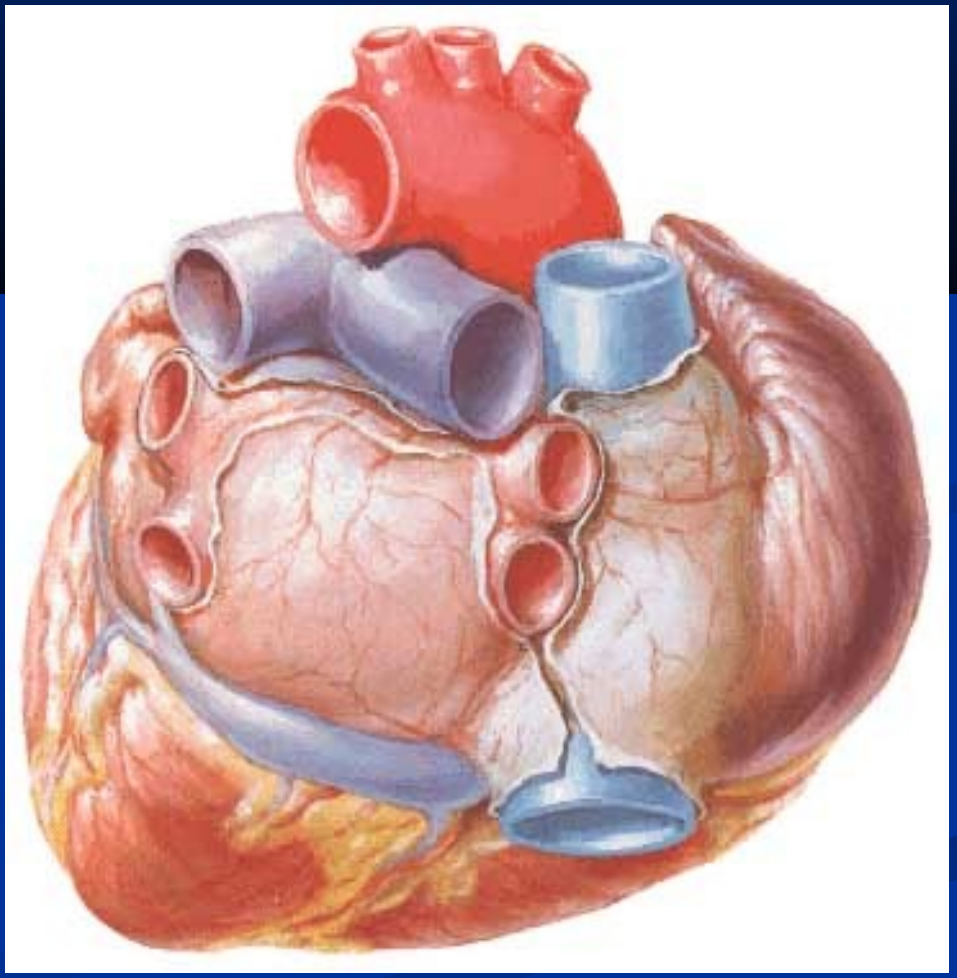
Infero posterior view



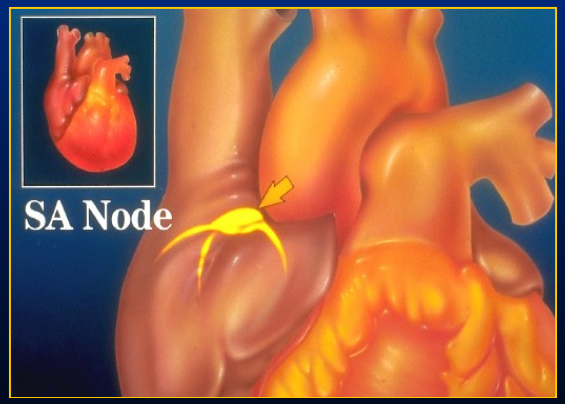
- Anterior View

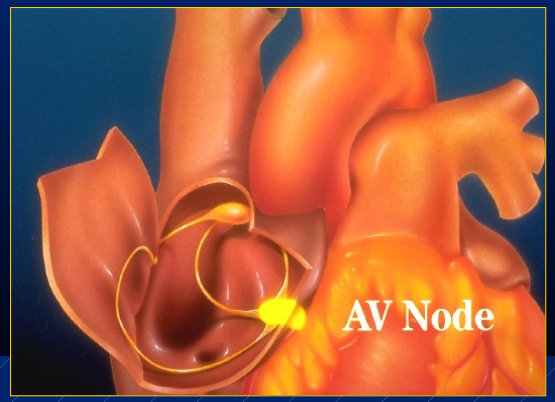


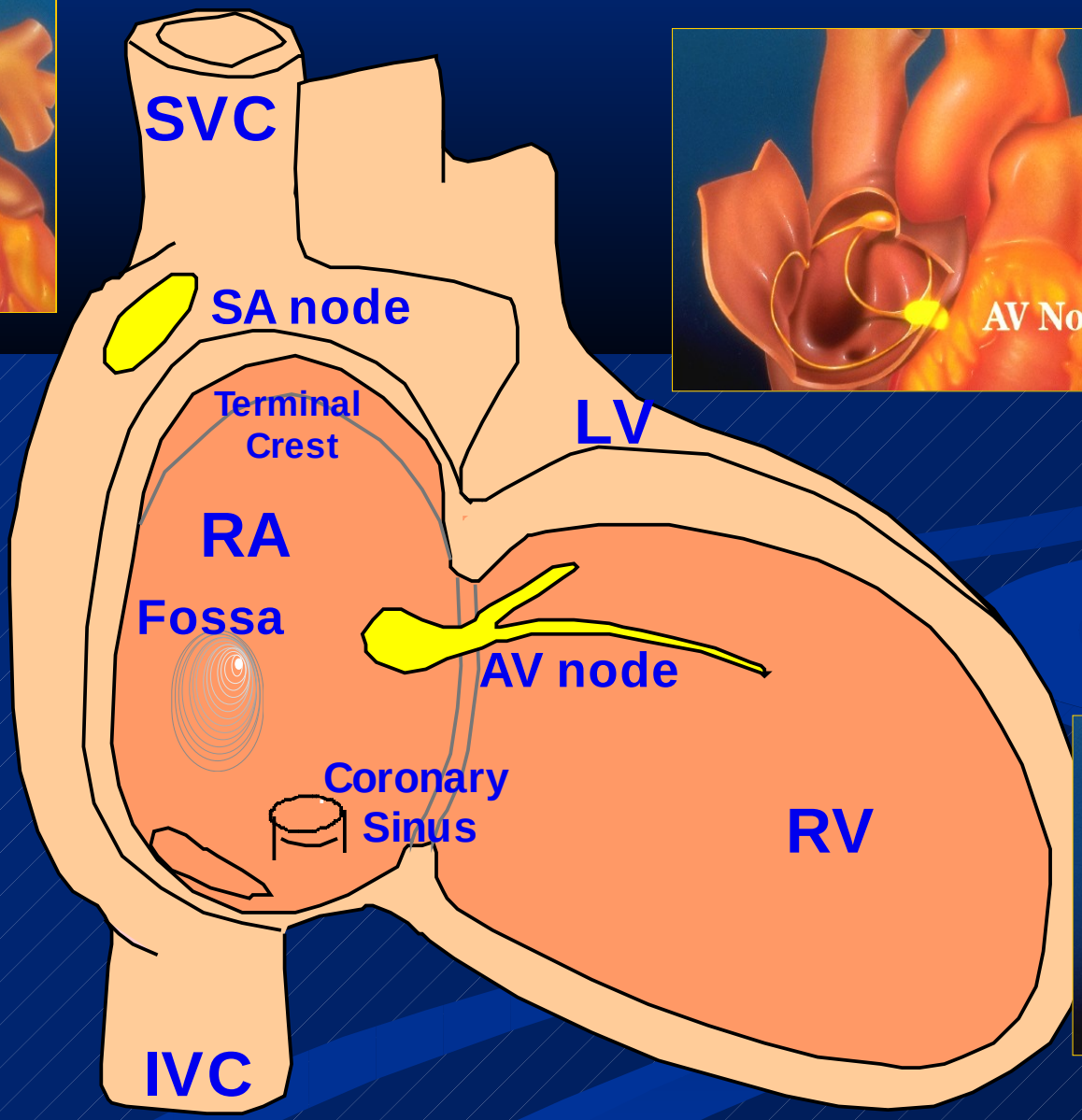
Posterior View

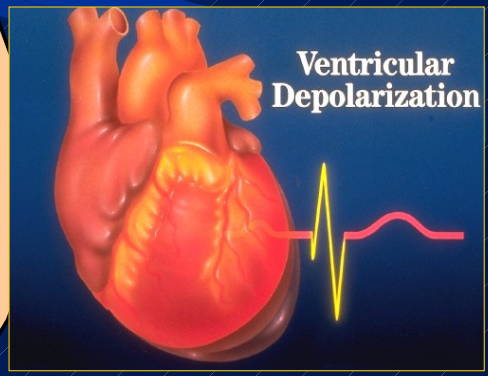


Cardiac Anatomy

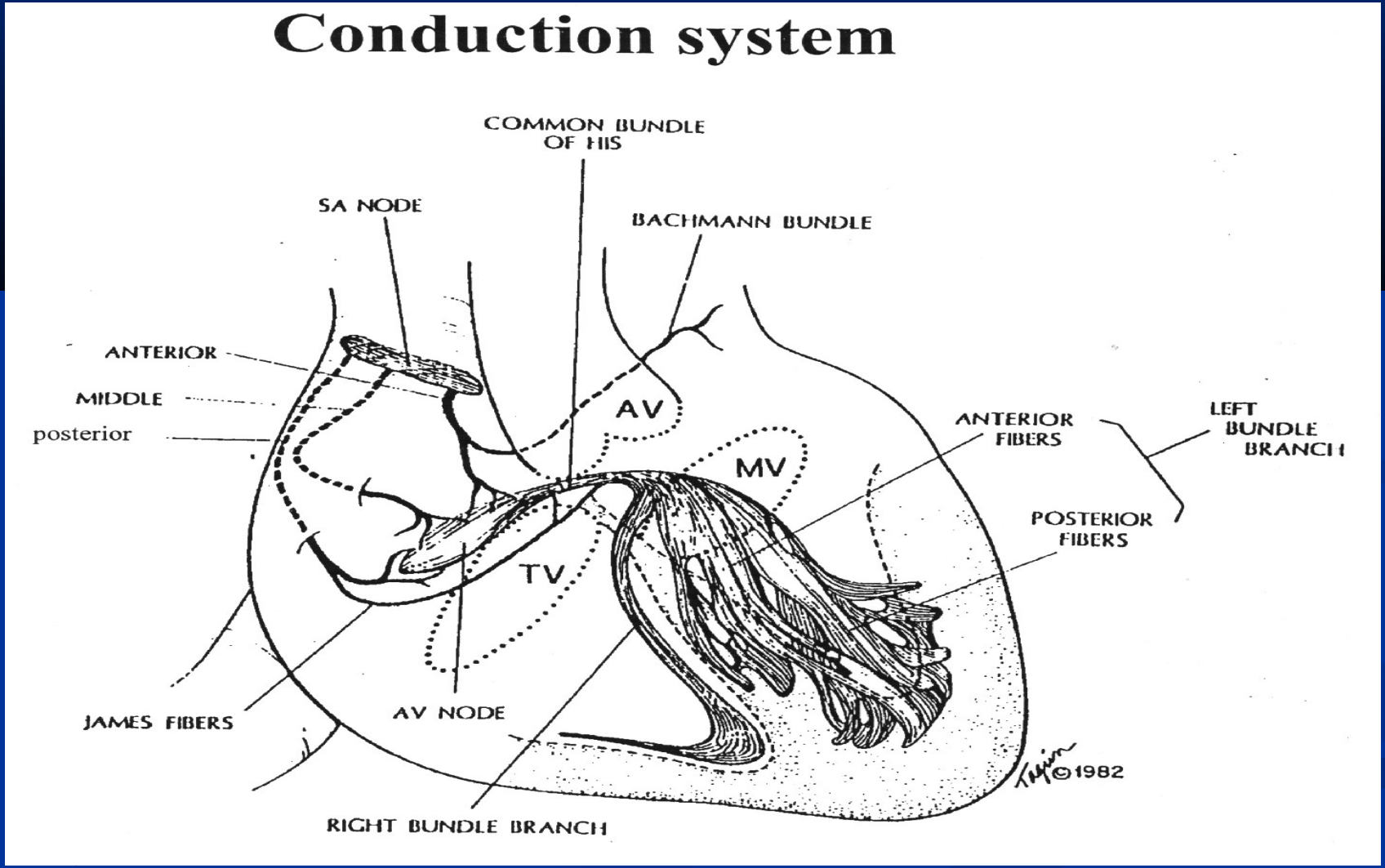




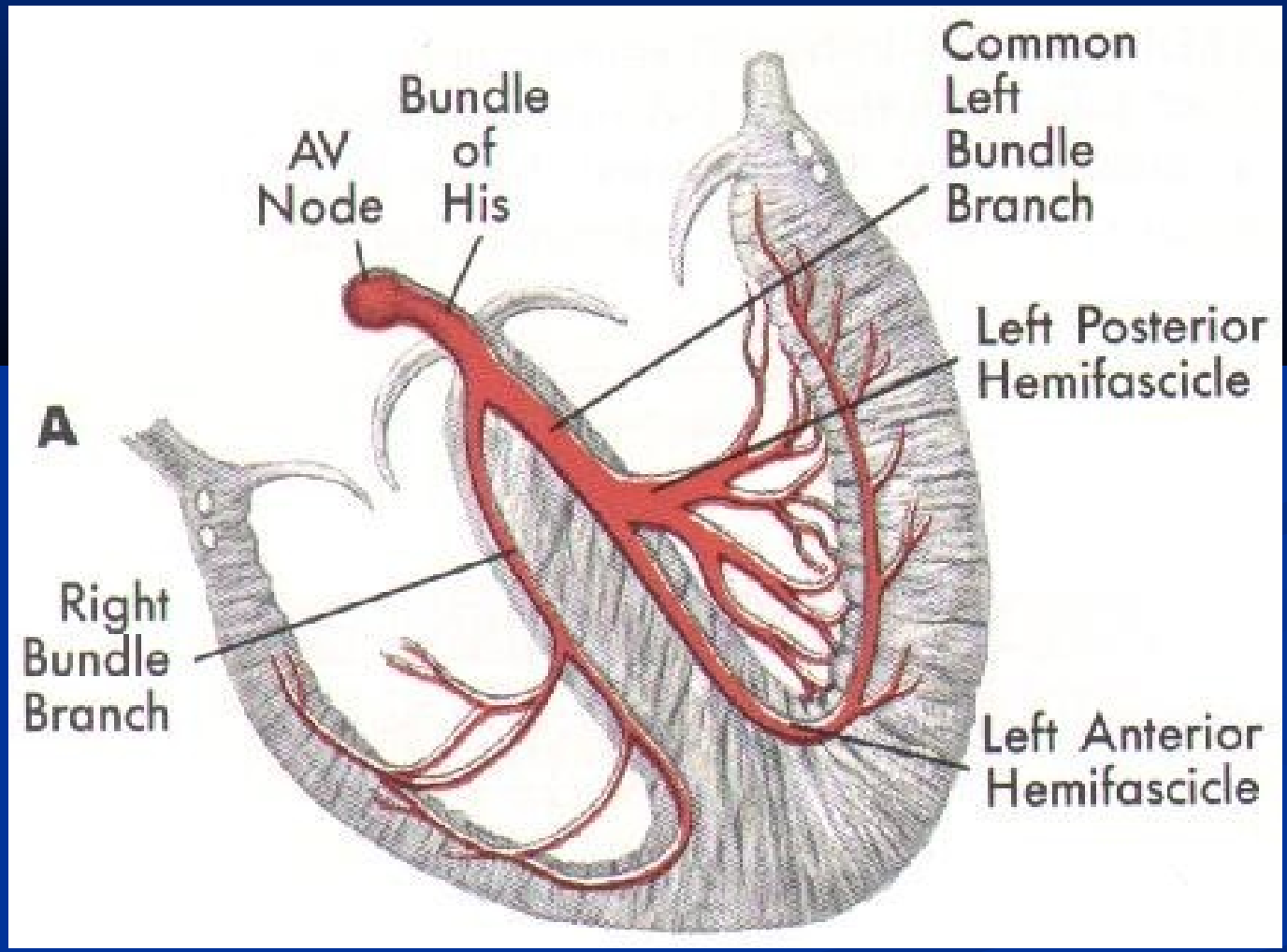




Anatomy


Conduction system
COMMON BUNDLE OF HIS
SA NODE
BACHMANN BUNDLE
ANTERIOR
MIDDLE
posterior
AV
MV
TV
ANTERIOR FIBERS
LEFT BUNDLE BRANCH
POSTERIOR FIBERS
JAMES FIBERS
AV NODE
RIGHT BUNDLE BRANCH
©1982

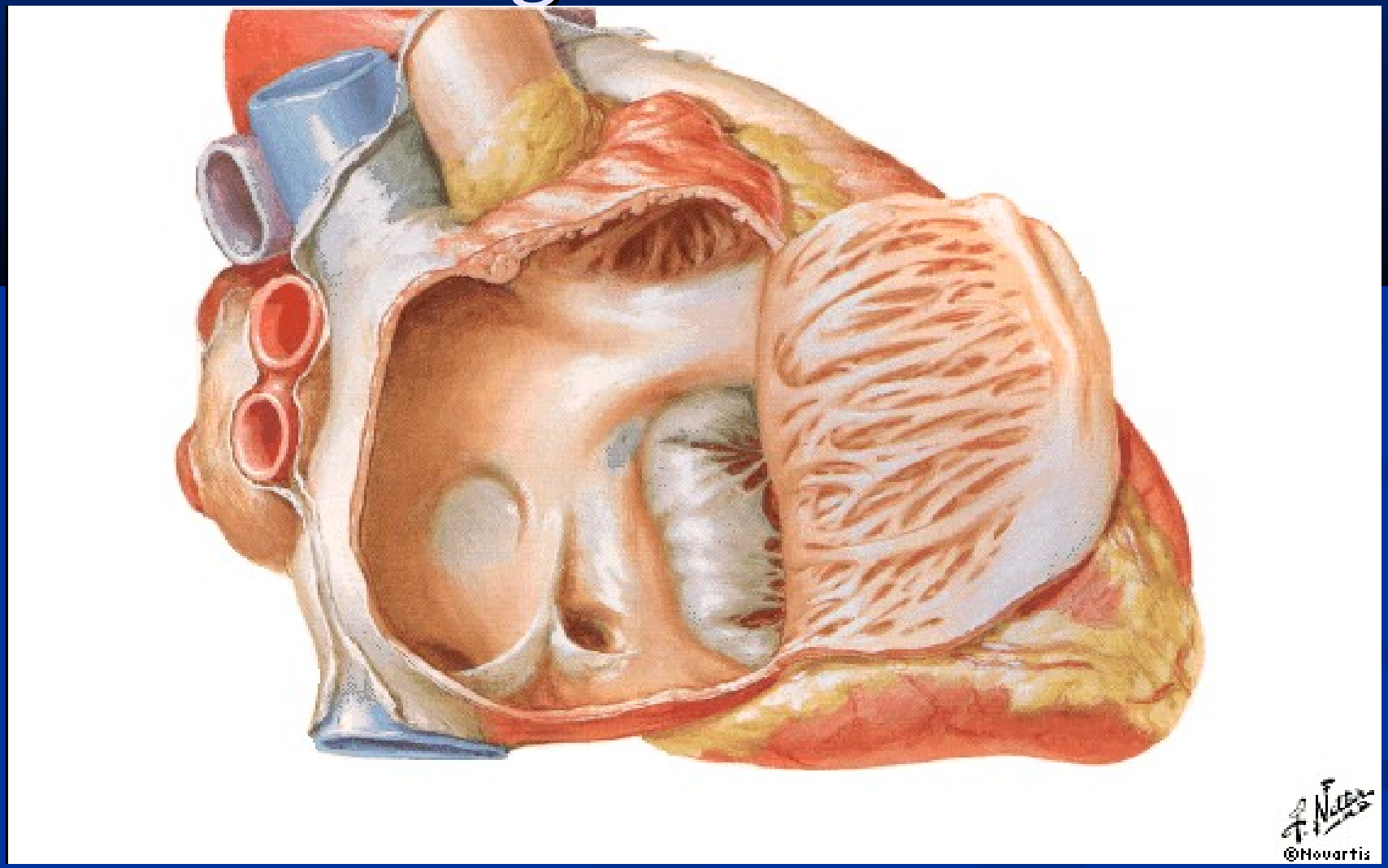
Cardiac conduction system



A Practical Guide to ECG Interpretation

Ken Grauer, M.D. Ch 7 Pg. 98

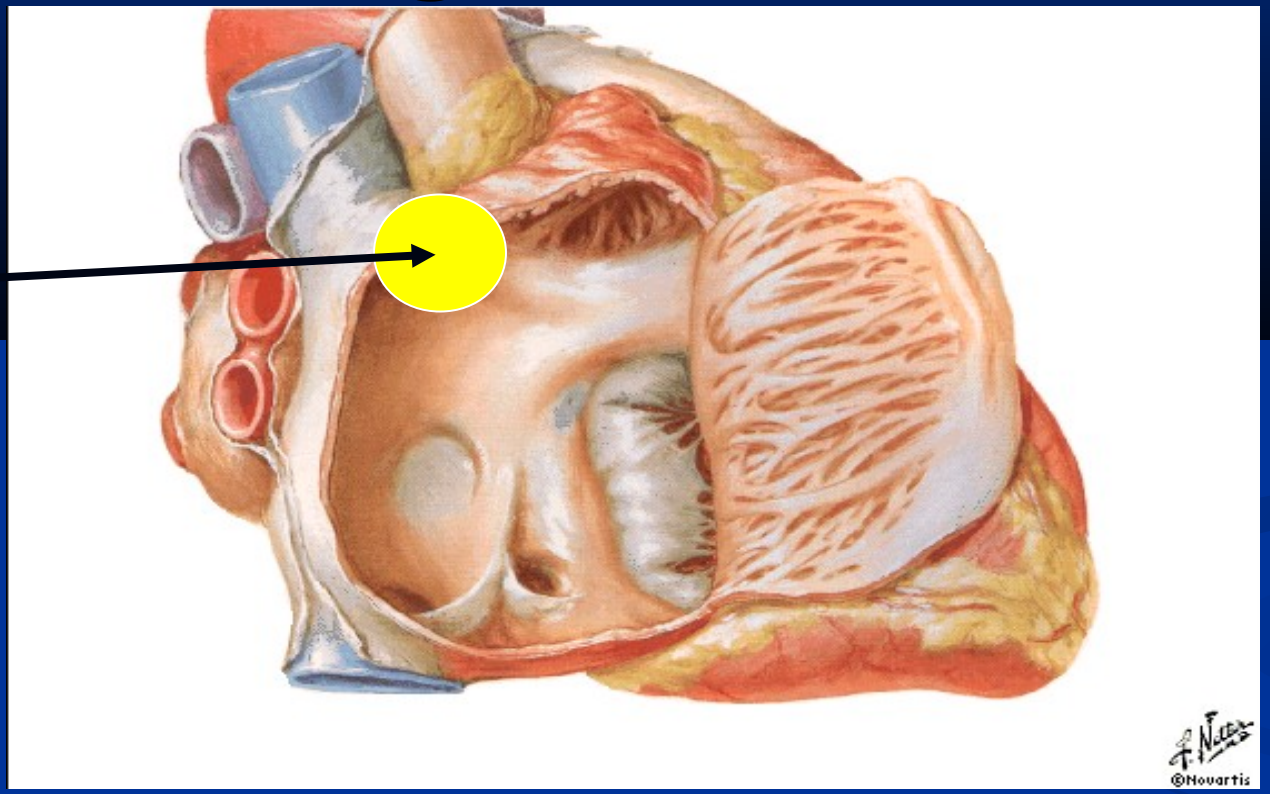
Right Atrium



Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

Right Atrium

SA Node region

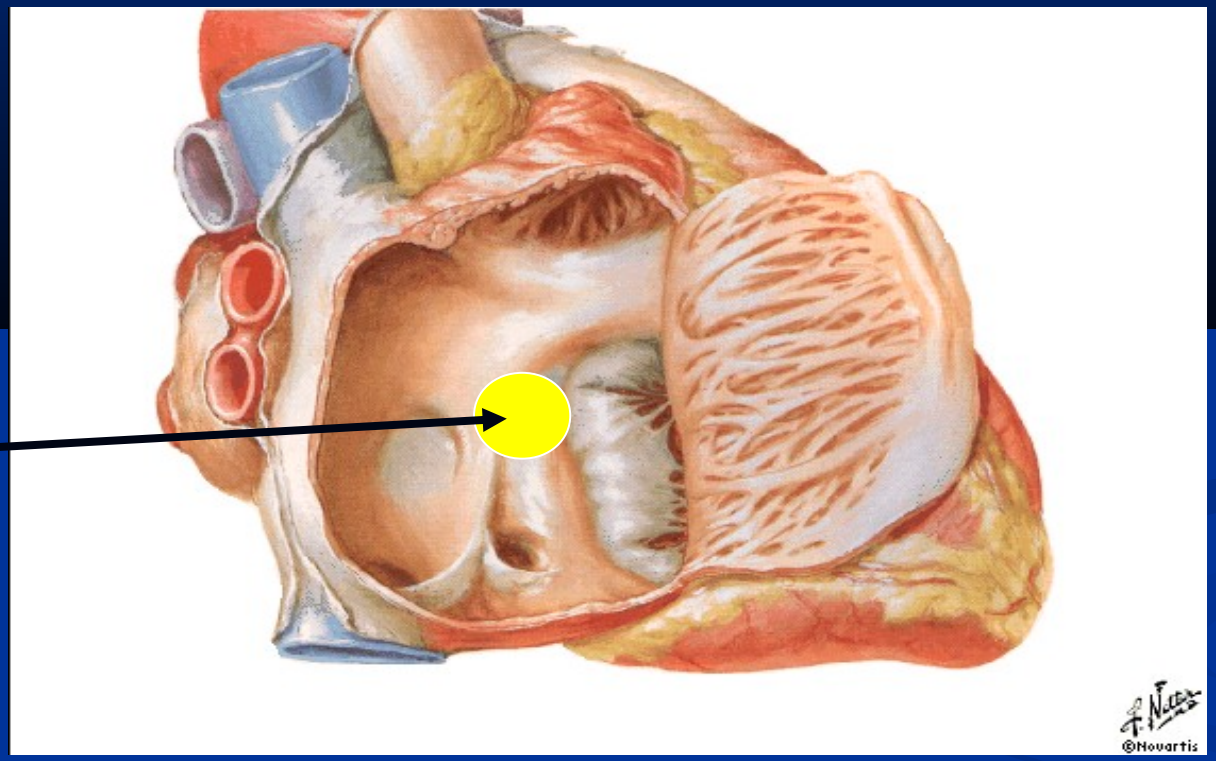


- The SA node is generally located in the high RA, posterior to the crista terminalis.

Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

Right Atrium

AV Node region

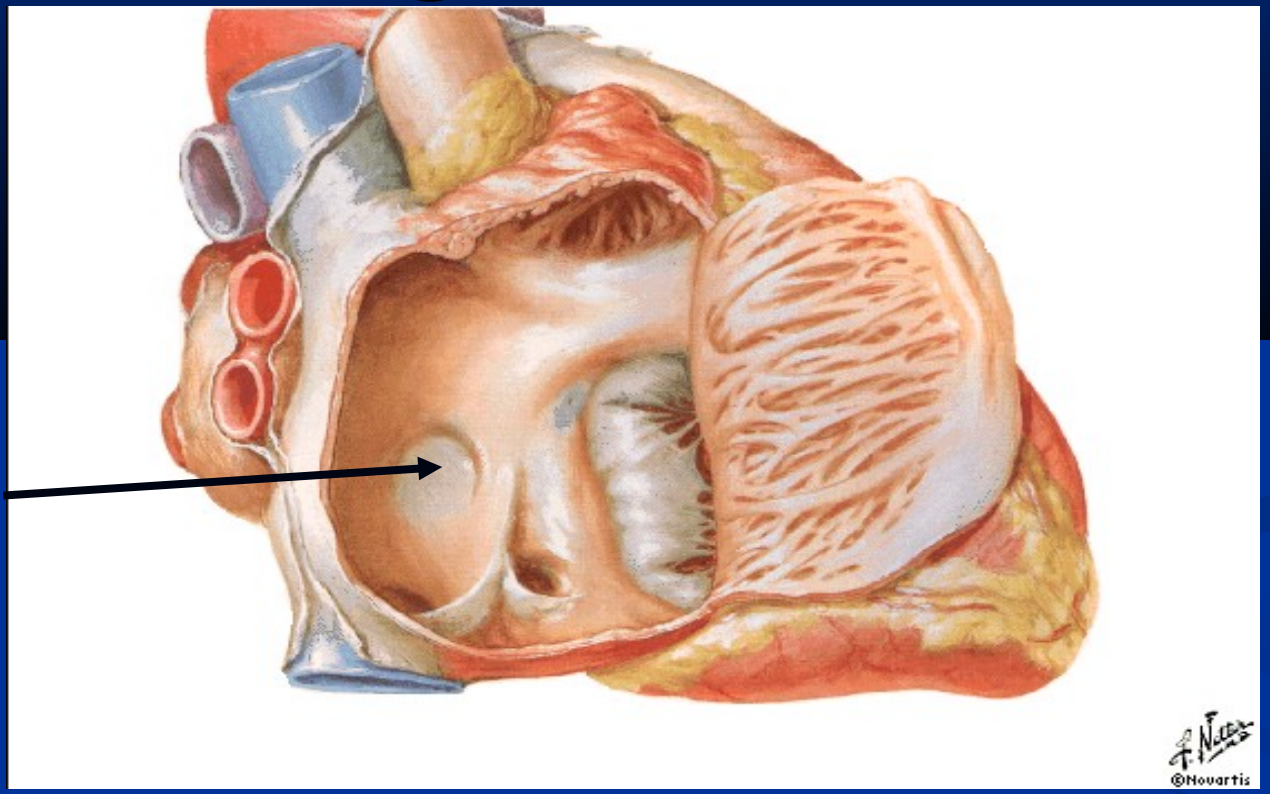


- The Atrio-Ventricular (AV) node is the only normal electrical connection between the upper and lower chambers of the heart.

Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

Right Atrium

Fossa Ovalis

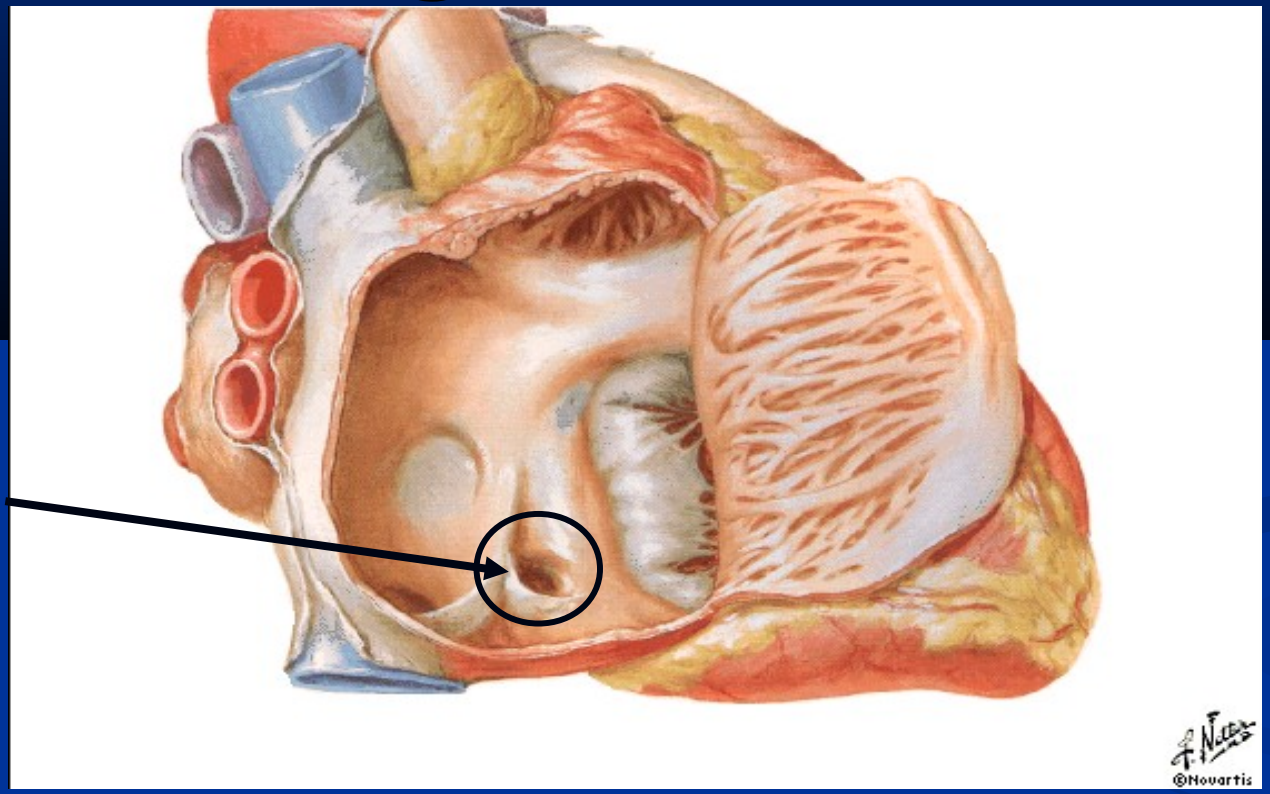


- The fossa ovalis is a thin layer of tissue that forms shortly after birth that can provide access to the left atrium using special instruments.

Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

Right Atrium

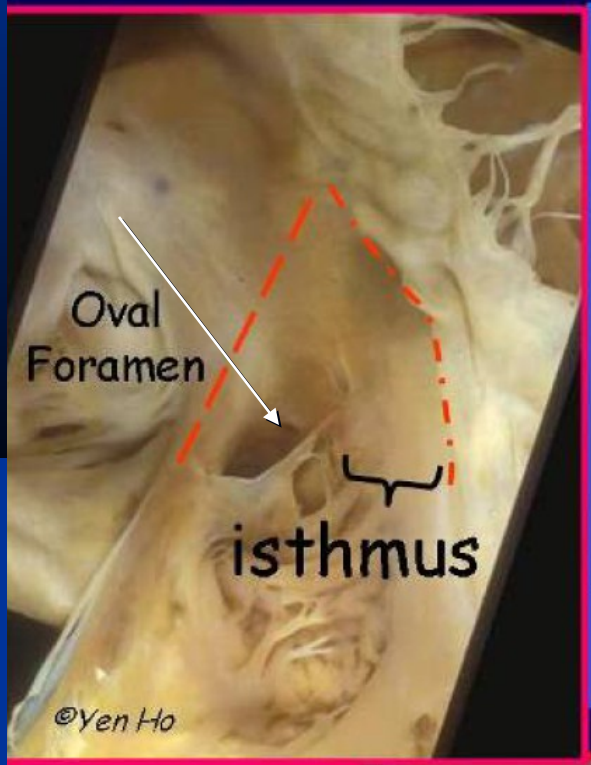
Coronary Sinus Ostium

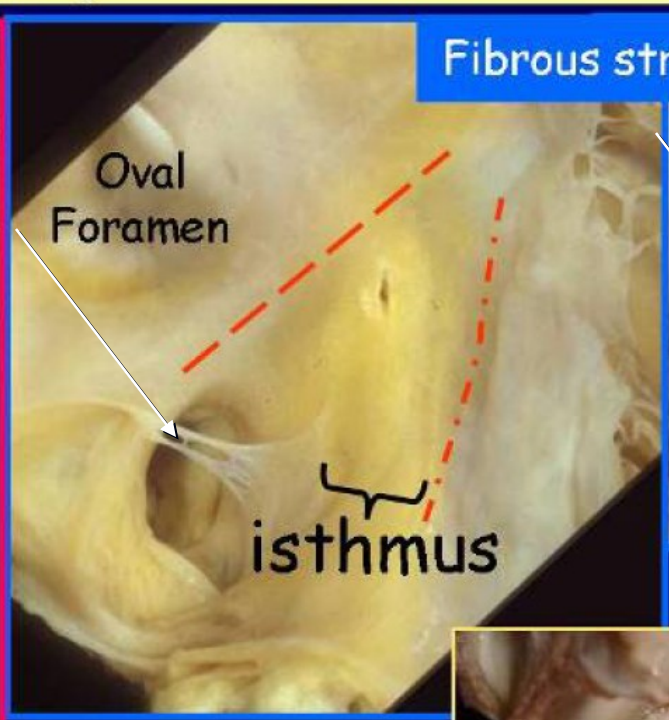


- The coronary sinus ostium (cs os) provides access to the base of the left atrium and ventricle without requiring an arterial puncture.

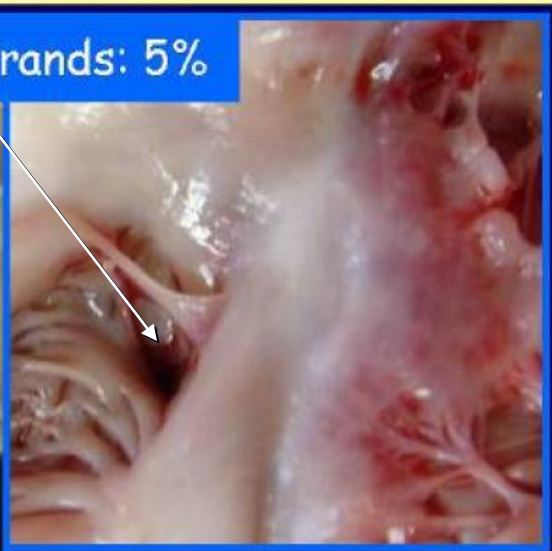
Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

the coronary sinus - thebesian valve



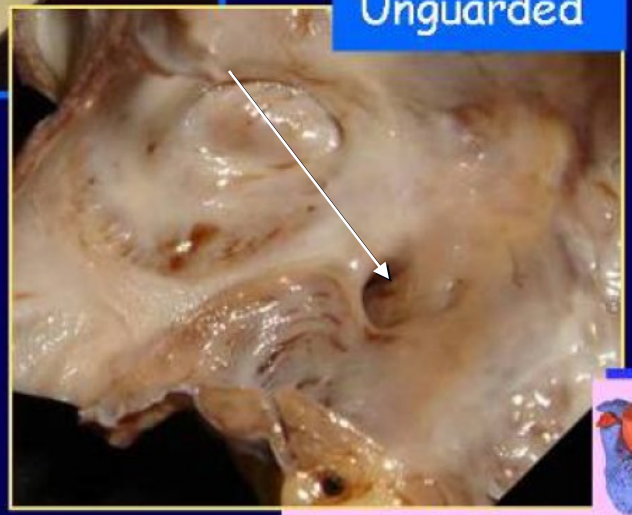


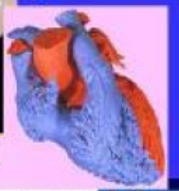
Fibrous strands: 5%



Large membrane with or without fenestrations: 30%

Unguarded



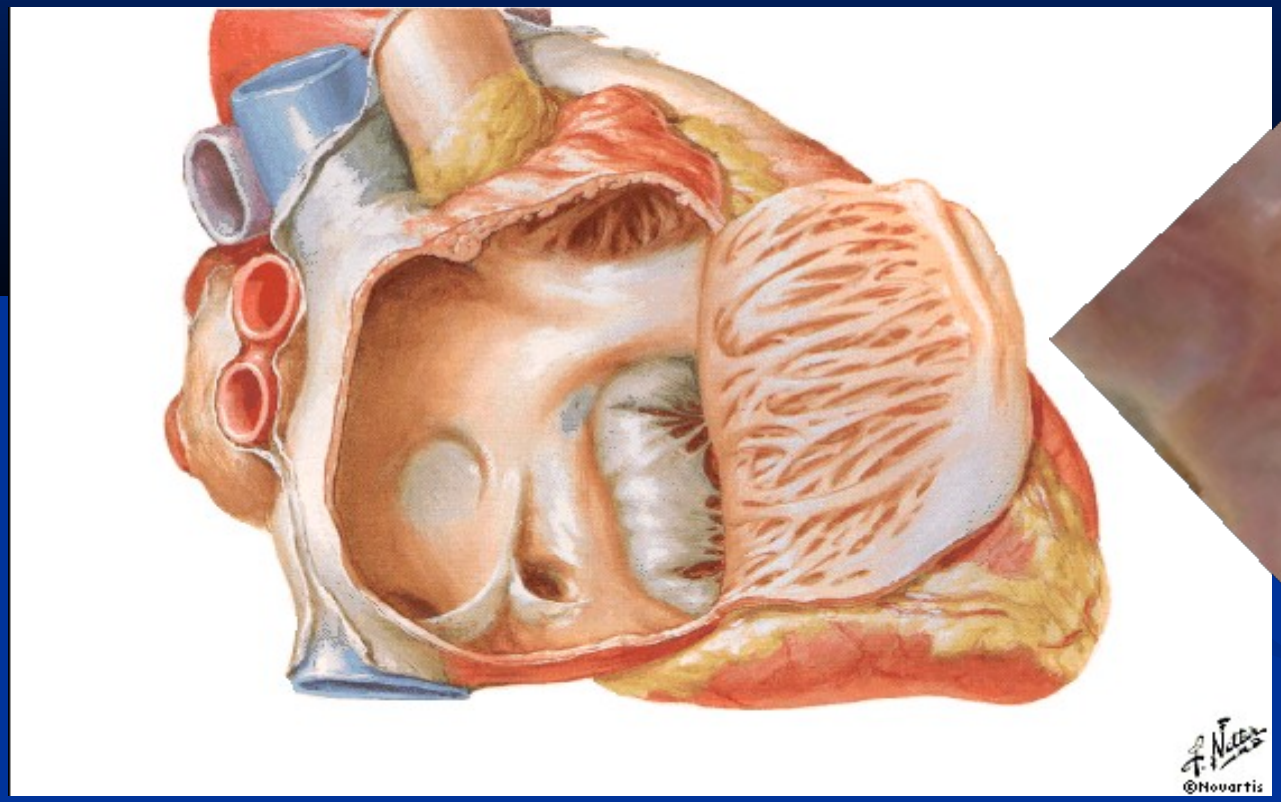


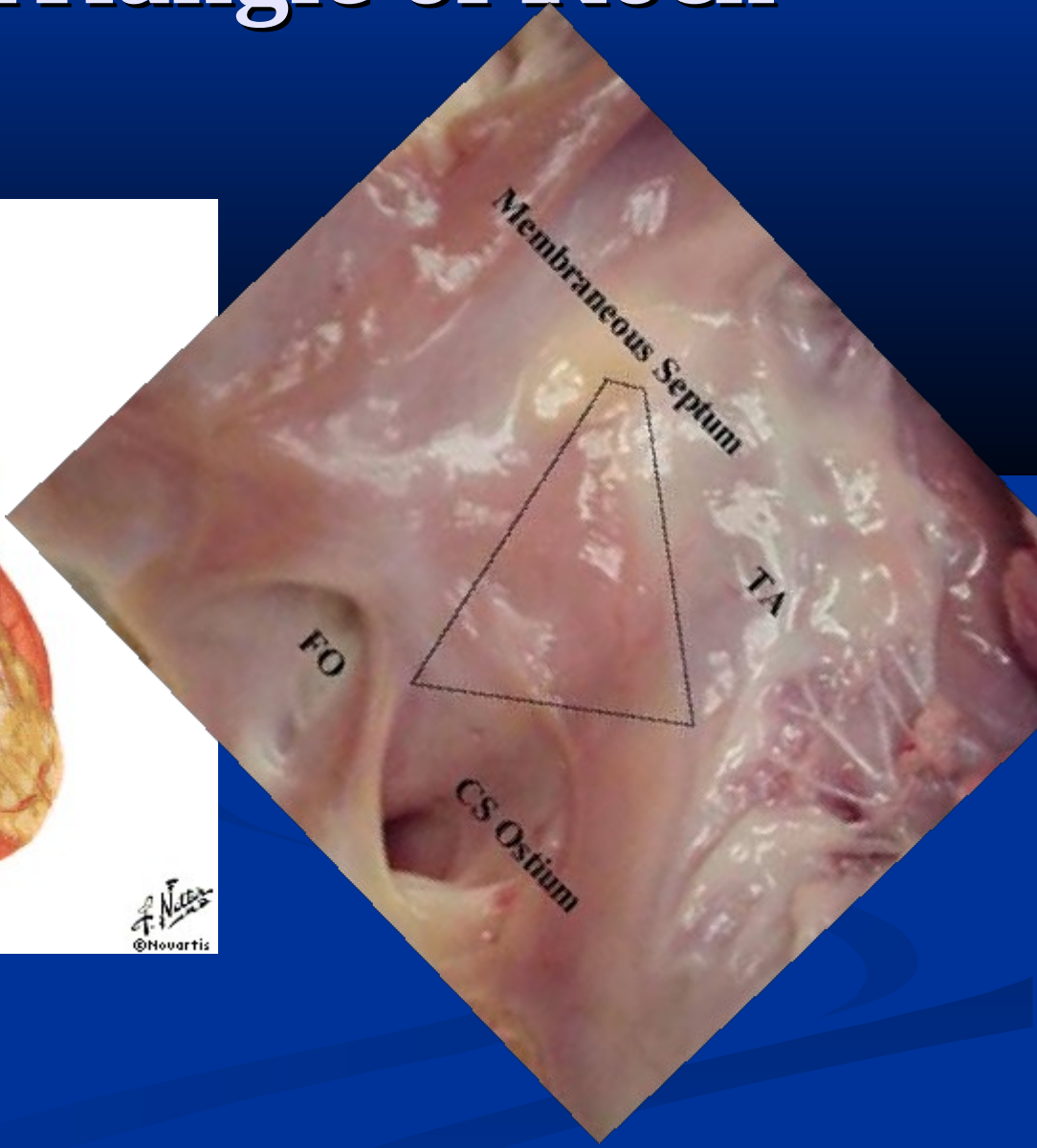
Cardiac Morphology

Royal Brompton & Harefield NHS

Imperial College London

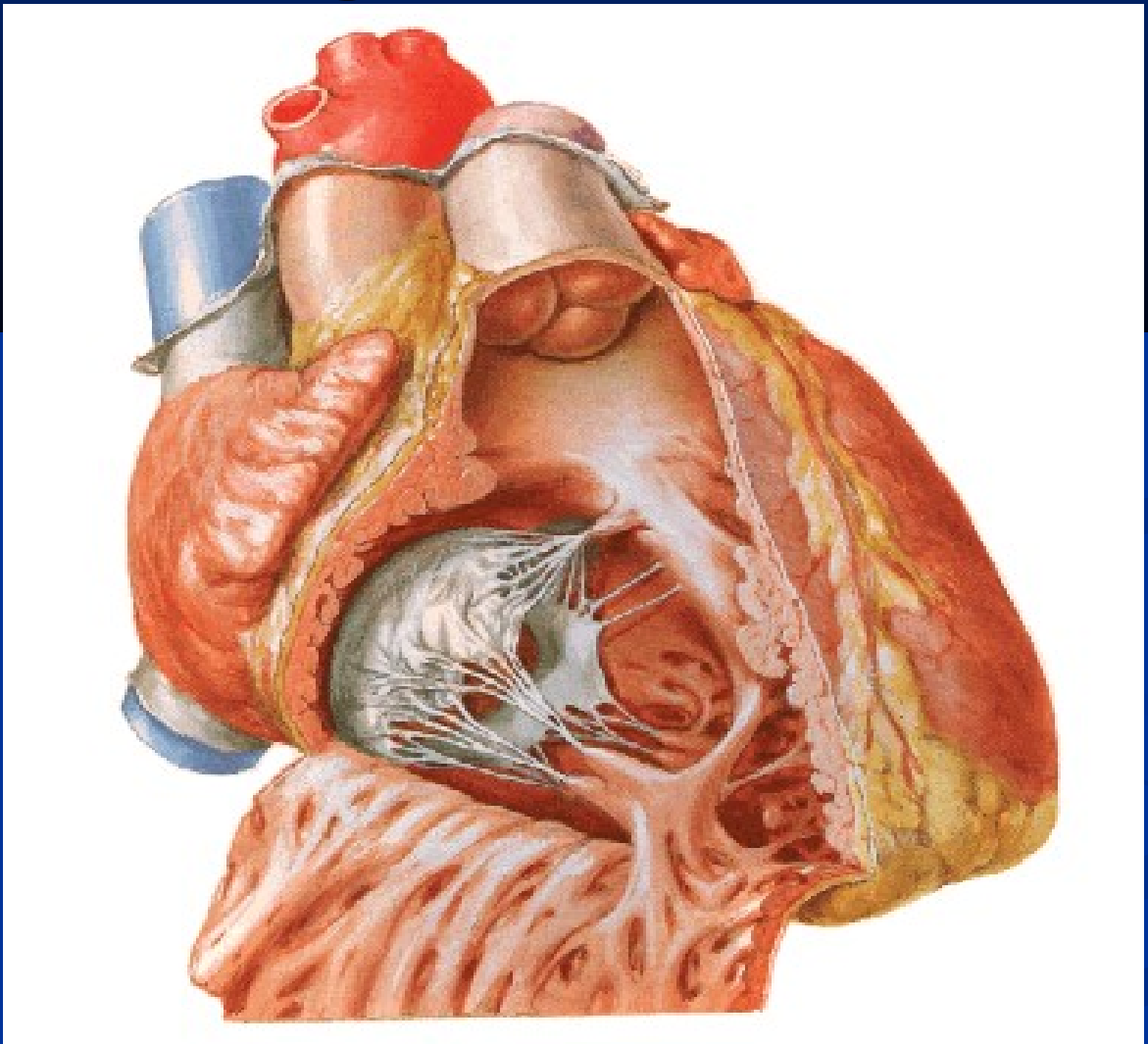
Right Atrium&Triangle of Koch





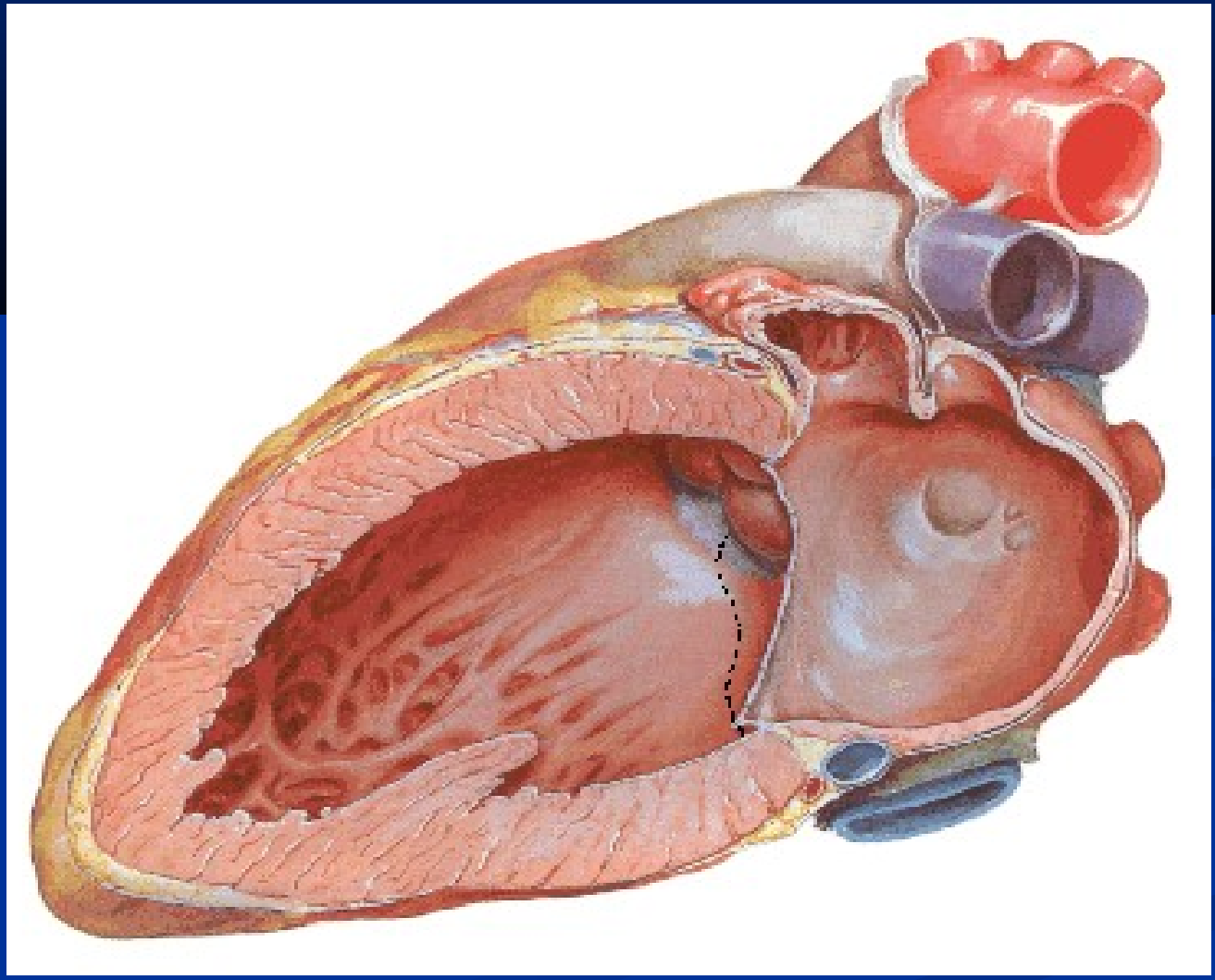
Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

Right Ventricle



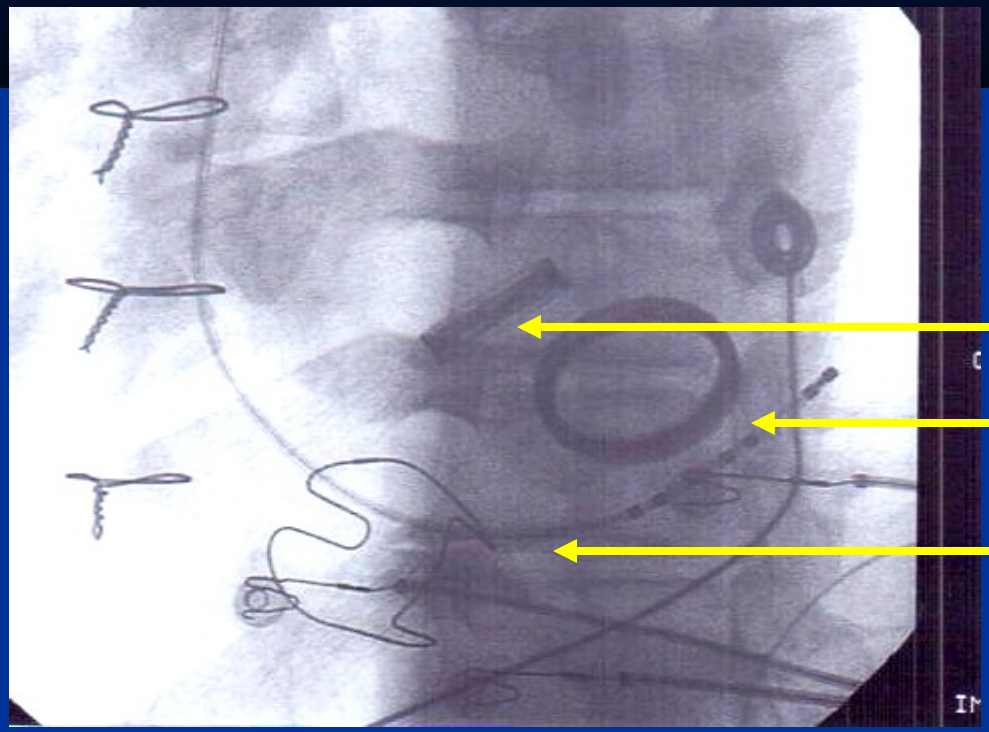
Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

Left Heart



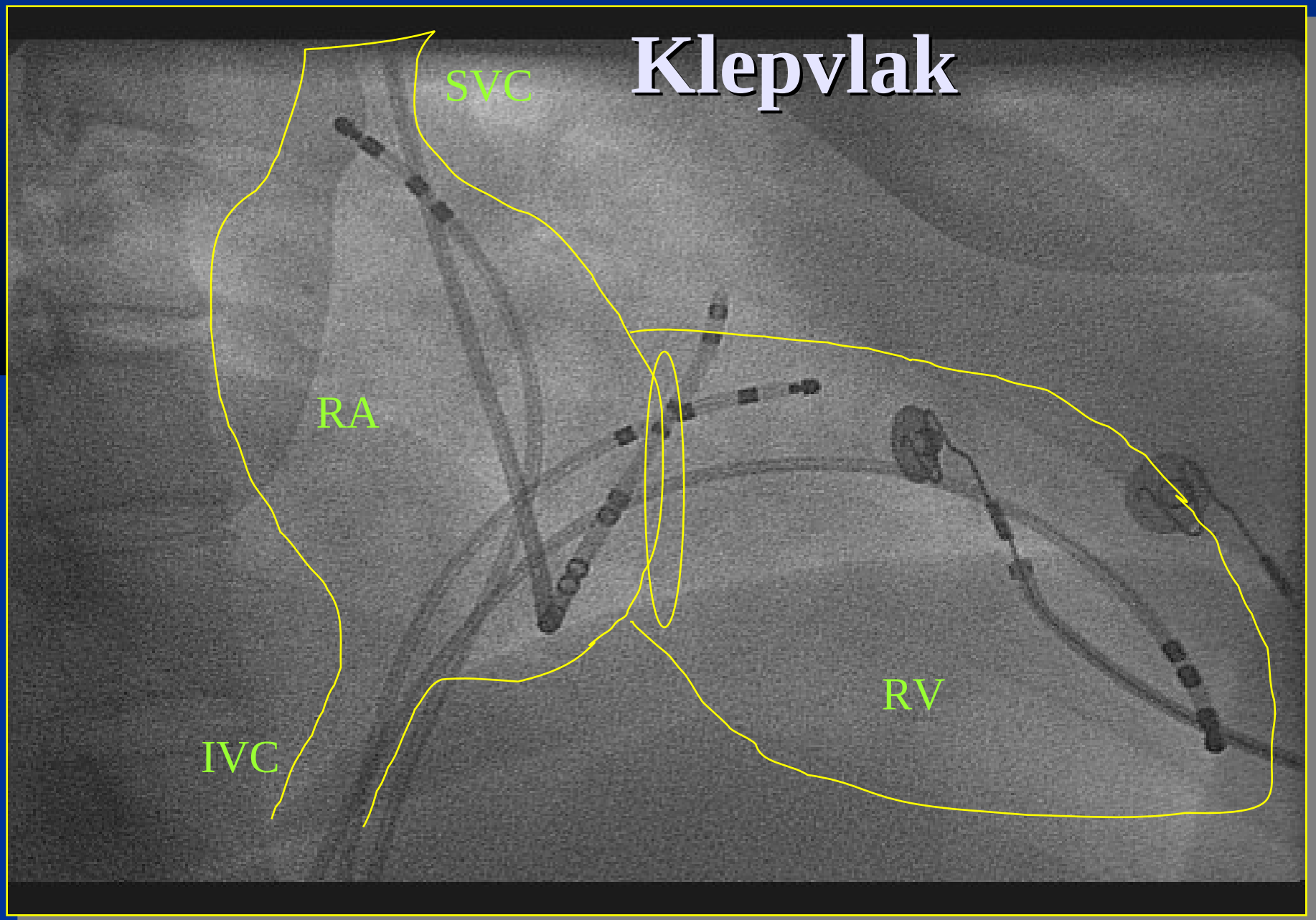
Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

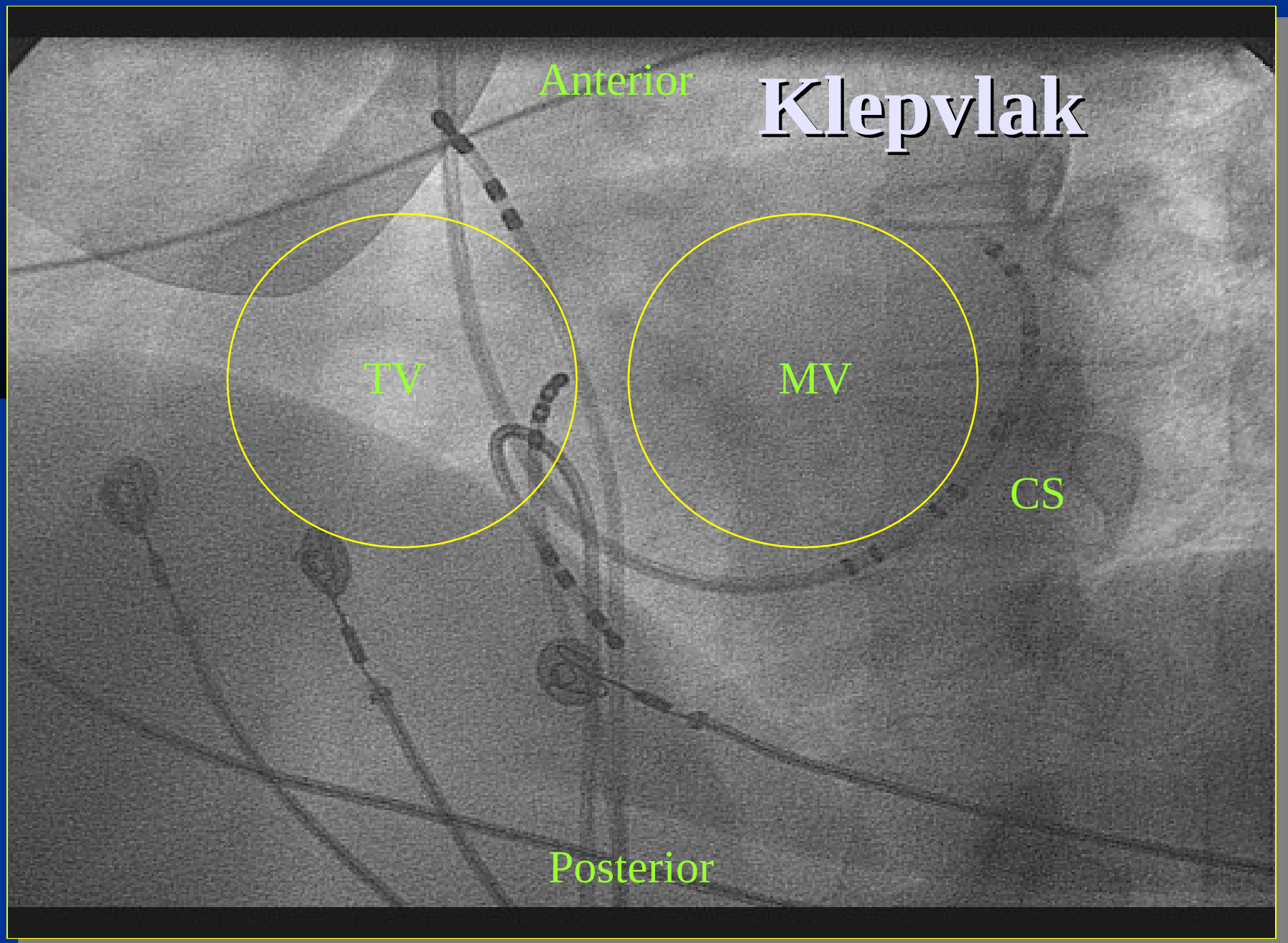
LAO



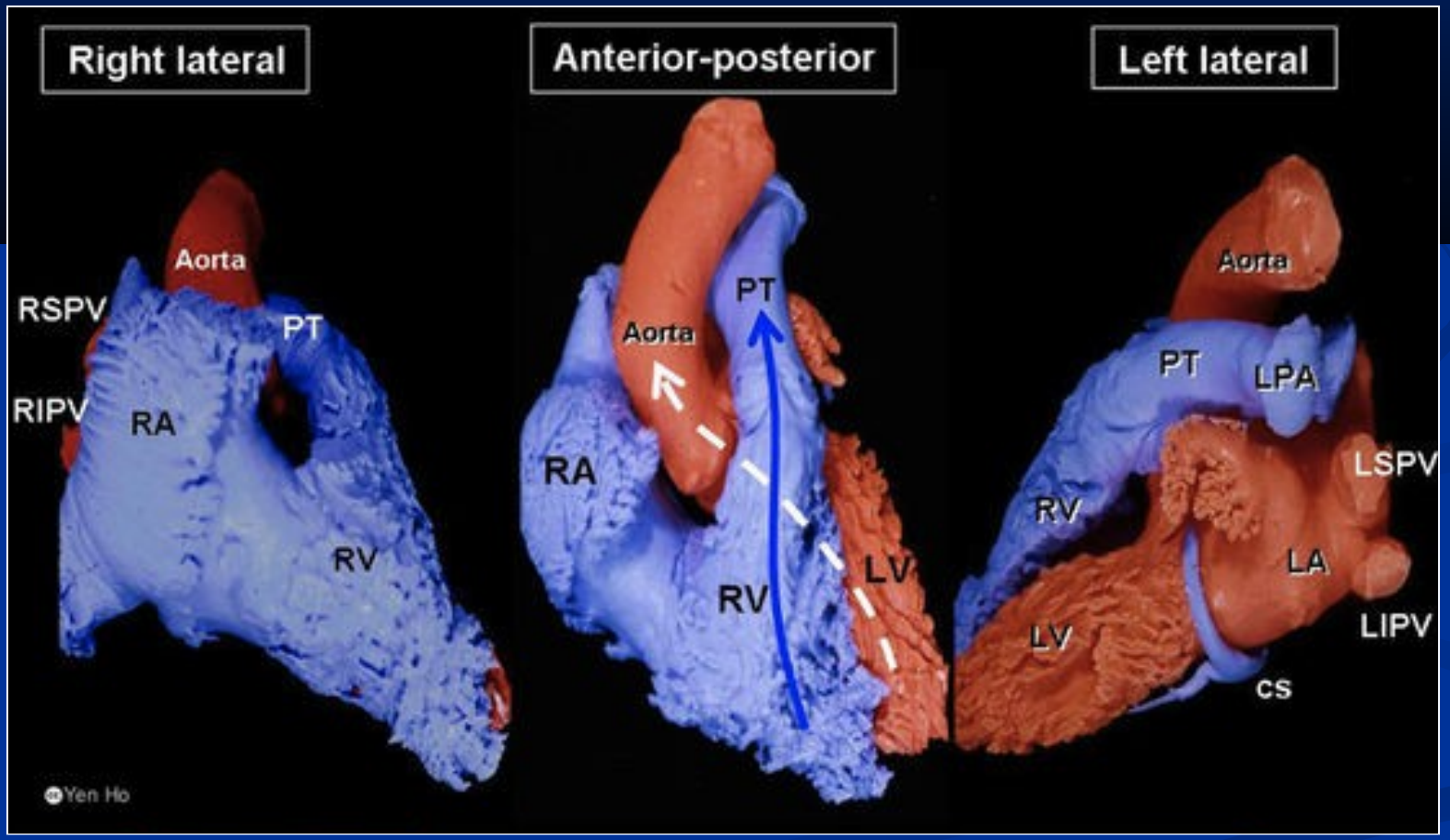
- LAO projection
- Aortic valve
- Mitral valve
- Tricuspid valve

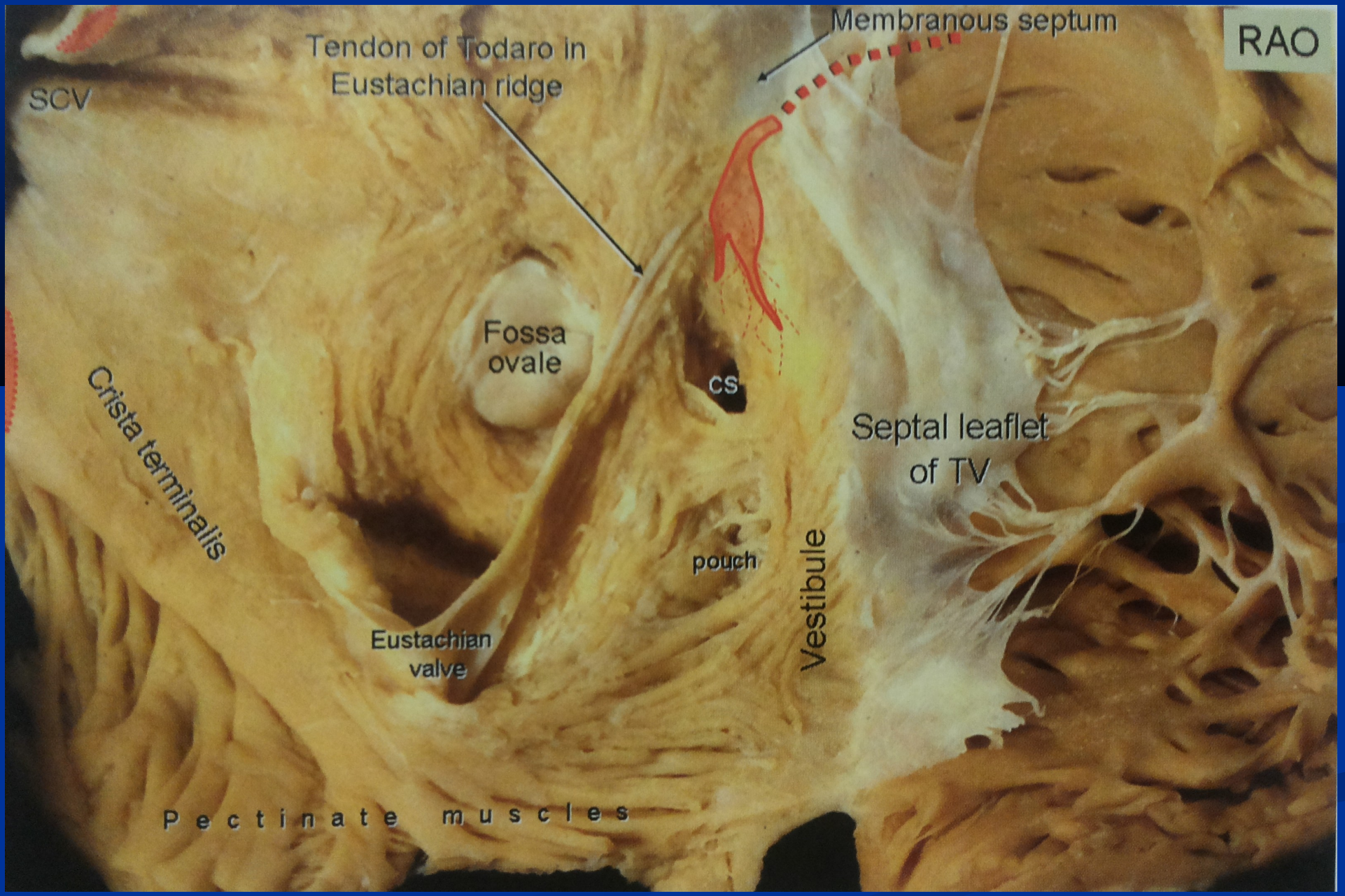
Klepvlak

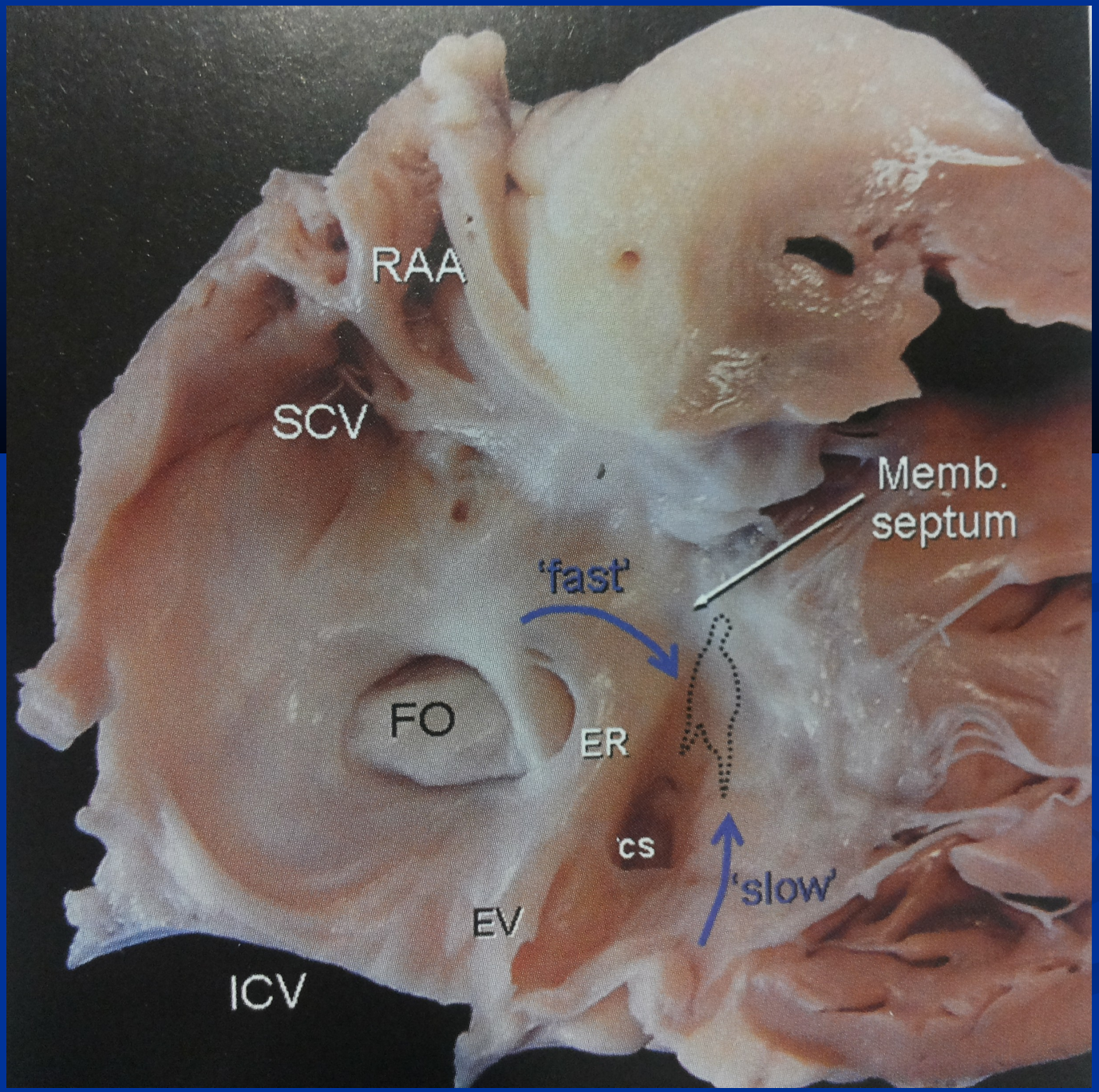


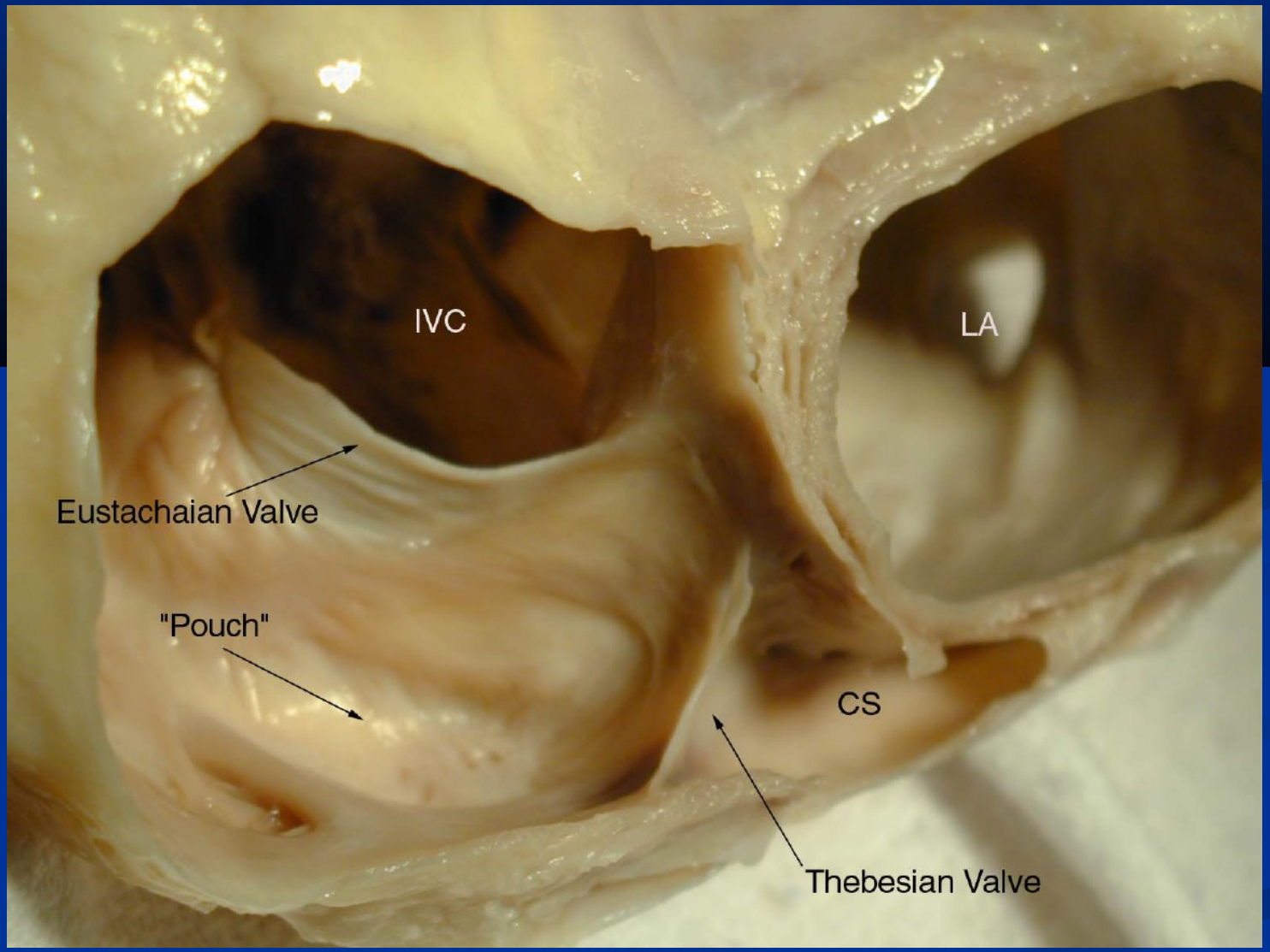

Anterior
Klepvlak
TV
MV
CS
Posterior

Klepvlak

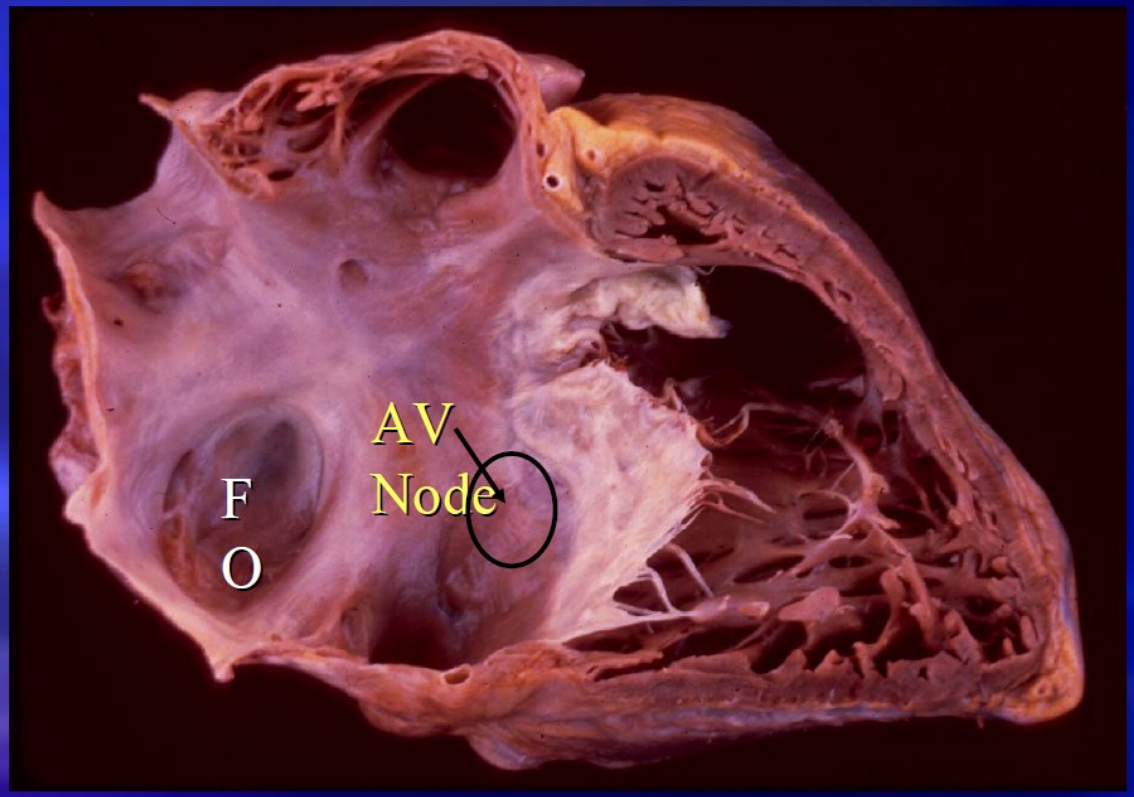

Right lateral
Anterior-posterior
Left lateral
Aorta
RSPV
PT
RIPV
RA
RV
Aorta
PT
RA
RV
LV
Aorta
PT
LPA
LSPV
RV
LA
LV
LIPV
CS
Yen Ho


Membranous septum
RAO
Tendon of Todaro in
Eustachian ridge
SCV
Fossa
ovale
CS
Crista terminalis
Septal leaflet
of TV
pouch
Vestibule
Eustachian
valve
Pectinate muscles


RAA
SCV
Memb.
septum
'fast'
FO
ER
CS
'slow'
EV
ICV

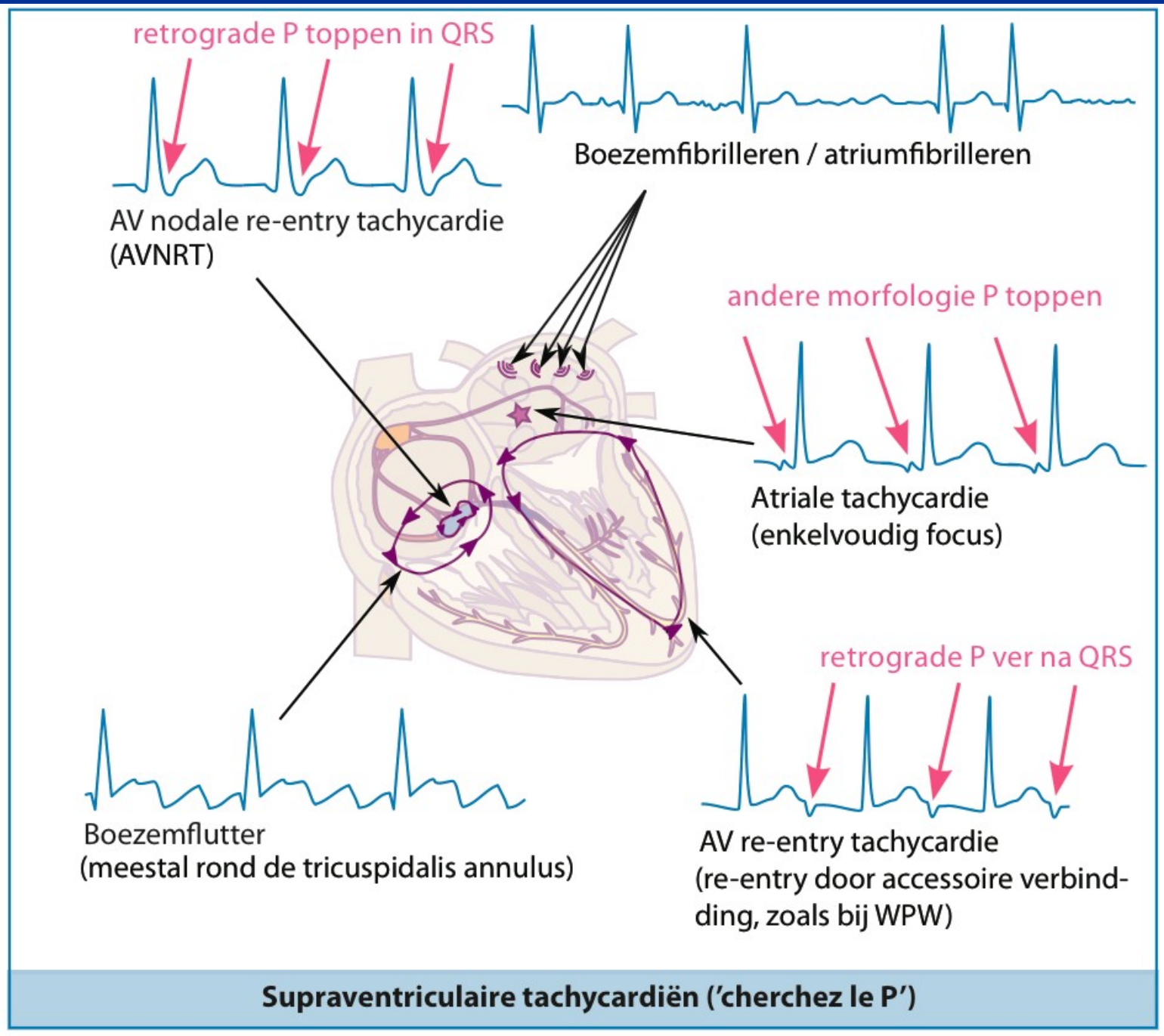

IVC
LA
Eustachaian Valve
"Pouch"
CS
Thebesian Valve

Normal Heart
Right Atrium



MAYO CLINIC

RA and RV (RAO View)


retrograde P toppen in QRS
Boezemfibrilleren / atriumfibrilleren
AV nodale re-entry tachycardie
(AVNRT)
andere morfologie P toppen
Atriale tachycardie
(enkelvoudig focus)
retrograde P ver na QRS
Boezemflutter
(meestal rond de tricuspidalis annulus)
AV re-entry tachycardie
(re-entry door accessoire verbind-
ding, zoals bij WPW)
Supraventriculaire tachycardiën ('cherchez le P')

Prevalentie SVT's	
Boezemfibrilleren	0.7-18% (55-85+ jaar)
Boezemflutter	0.05%-0.6% (<50 - 80+ jaar)
AVNRT	0.2%
AVRT	0.1-0.3%

Uiteindelijke diagnose bij regulaire SVT verwezen voor ablatie	
AVNRT	50%
AVRT	40%
AT	10%

Success Rates for RF Ablations

Type of Arrhythmia	Success Rate (%)
WPW or SVT (concealed bypass tract)	85-95
AV Node Reentry	95+
Atrial Fibrillation	95+
Typical Atrial Flutter	80-90
Atrial Tachycardia	70-80
Ventricular Tachycardia (Normal Heart)	90 95
Ventricular Tachycardia (Structural Heart Disease)	60

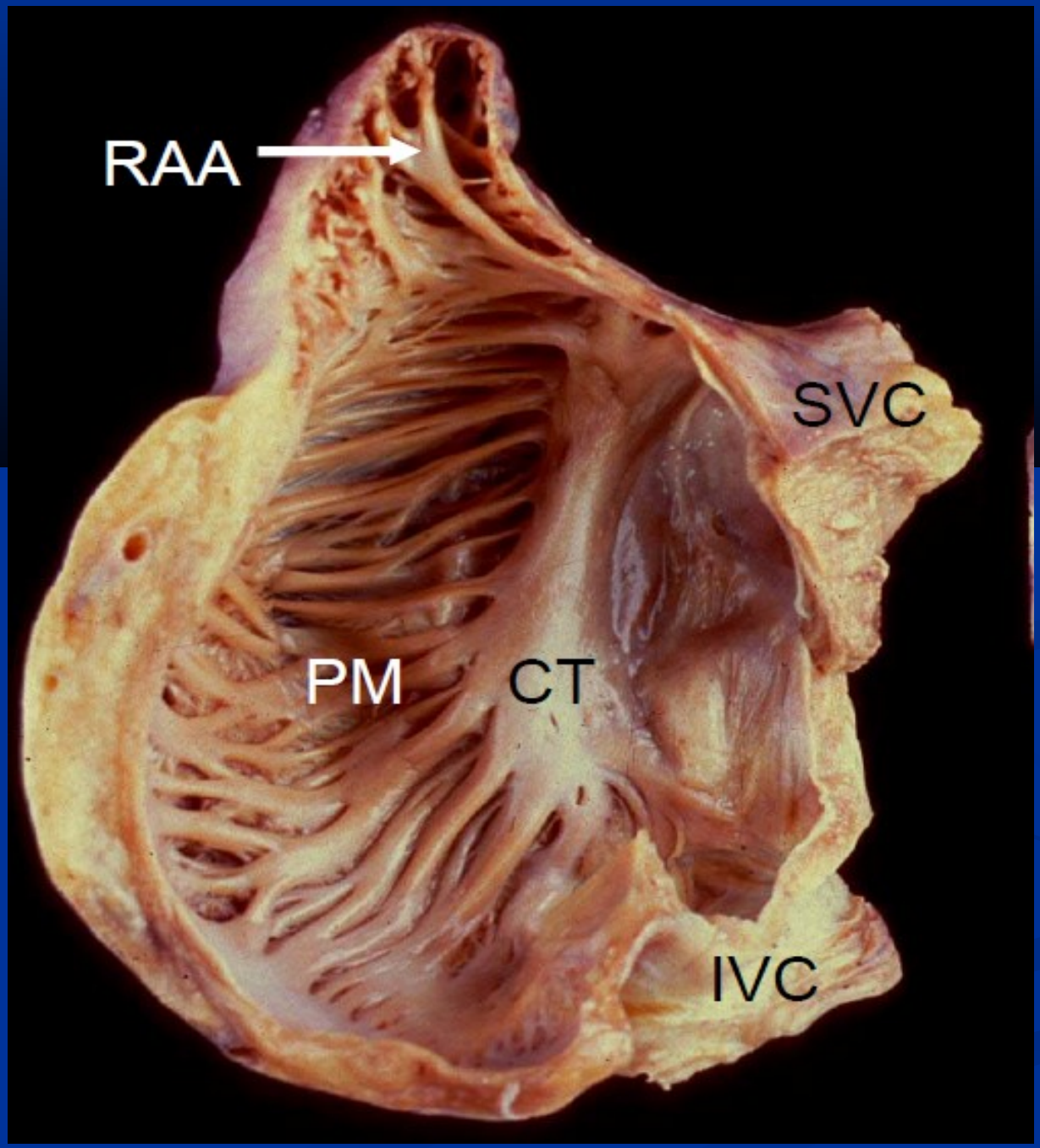
Adapted from Gallik DM. Radio-frequency Catheter Ablation for the Treatment of Cardiac Arrhythmias. Cardiology Special Edition. 1997;59-61.

RF Ablation Complications

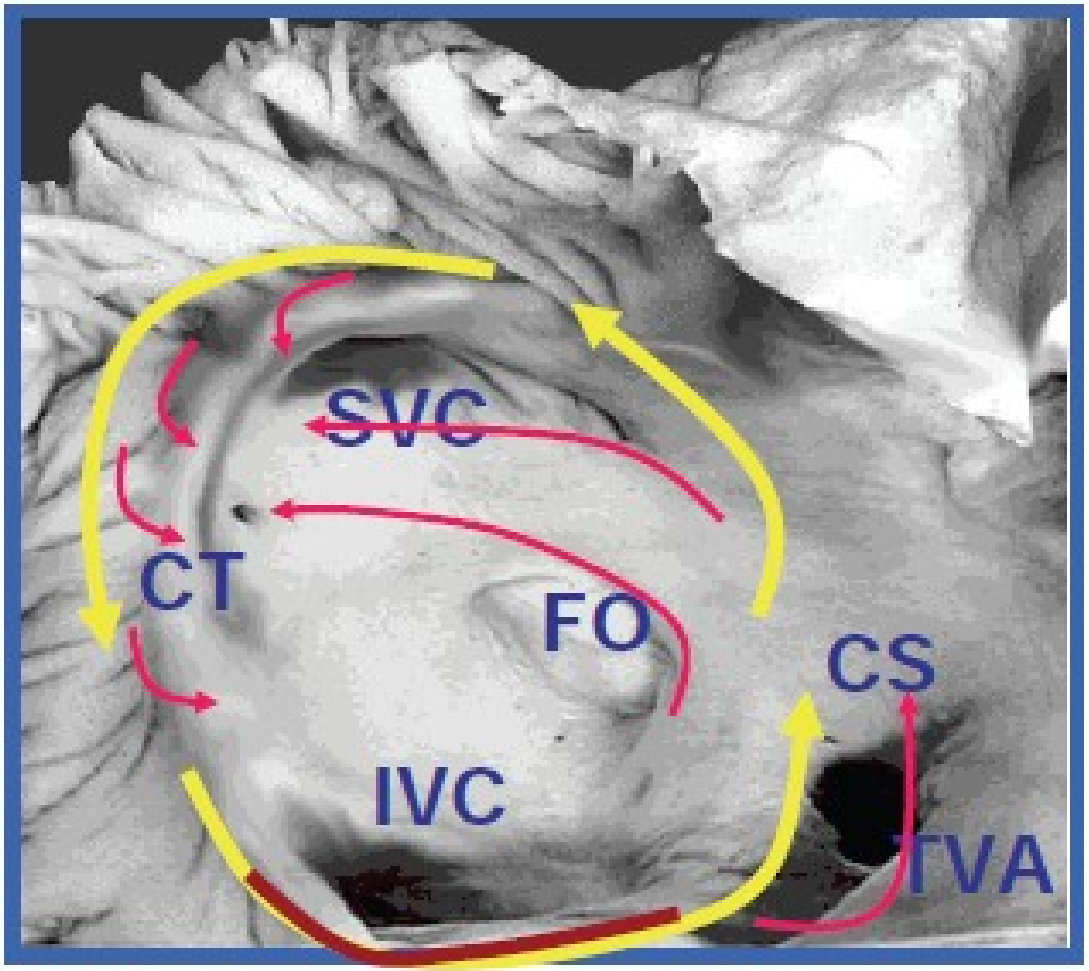
Complication	Prevalence (%)
Death	0.1
Non-fatal complications:	
Tamponade	0.5
AV block	0.5
Pericarditis	0.1
Femoral artery complications:	
Thrombolic occlusion	0.2
Hematoma	0.2
AV fistula	0.1

ACC/AHA Circ. 1995;92:673-691.
Morady F. N Engl J Med. 1999;340:534-544.

A - Flutter

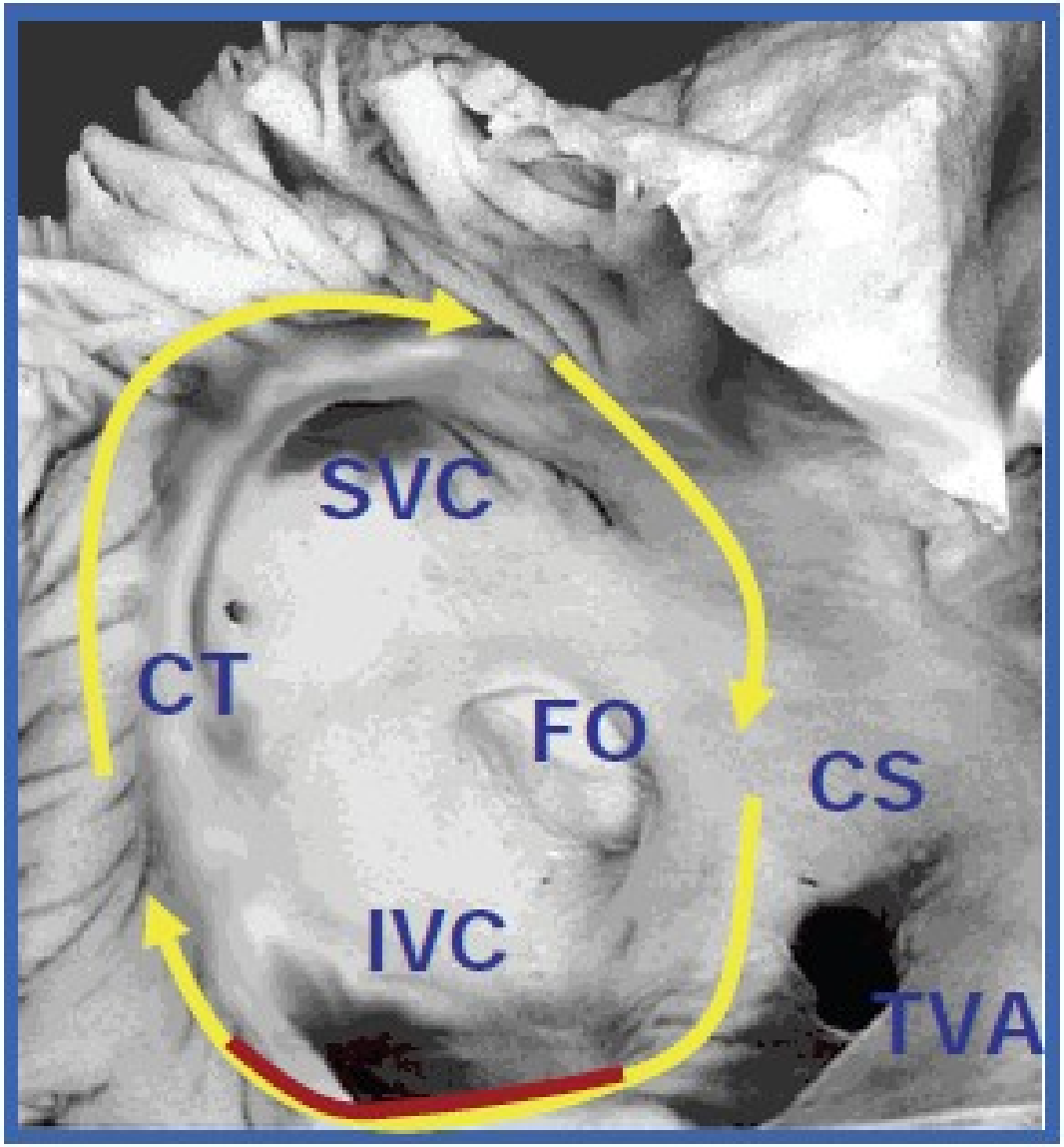

RAA
SVC
PM
CT
IVC

Counterclockwise atrial flutter

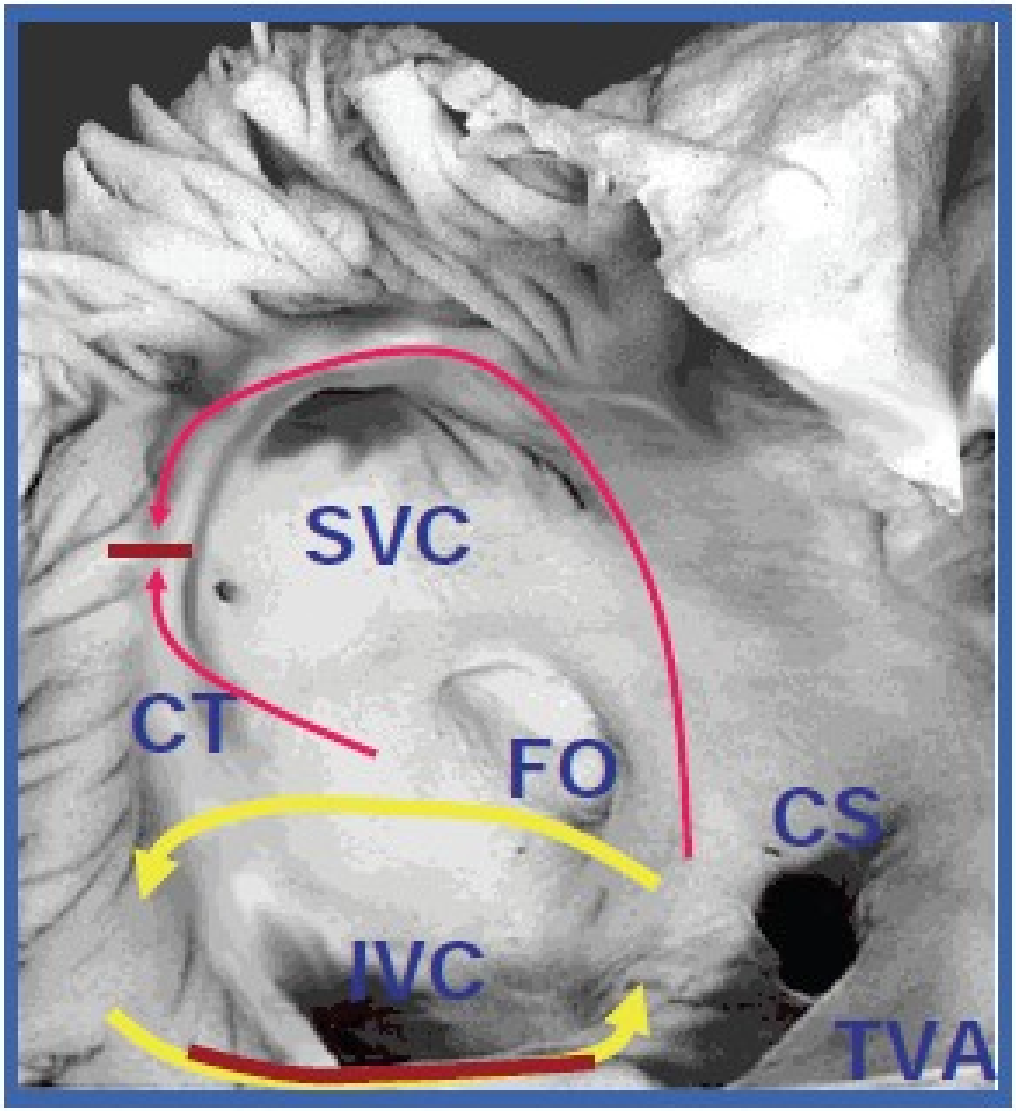


Shah Circ 96:3904, 1997; Olgin Circ 92:1365, 1995; Cosio Pace 19:841, 1996; Kalman Circ 94:398, 1996; Nakagawa Circ 94:407, 1996; Takahashi JACC 33:1996, 1999; Arenal et al Circulation 99:2771, 1999. Friedman Circ 101:1568, 2000.

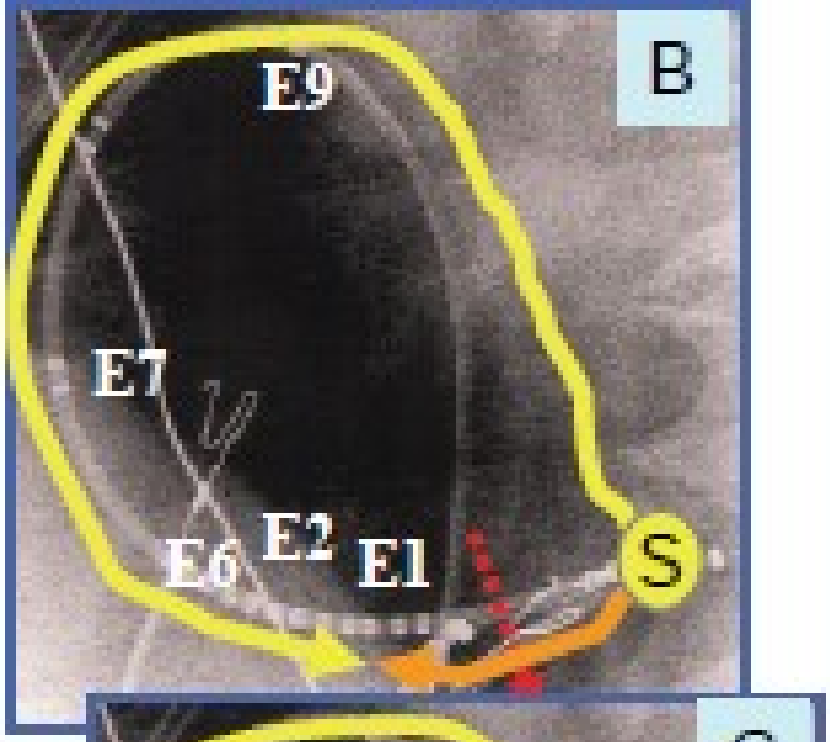
Clockwise Atrial Flutter

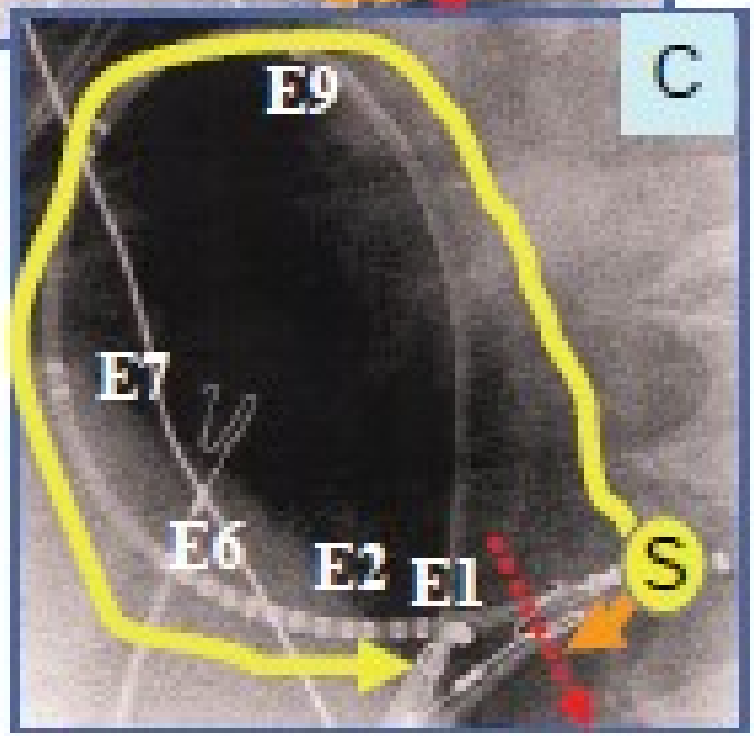


Lower Loop Reentry

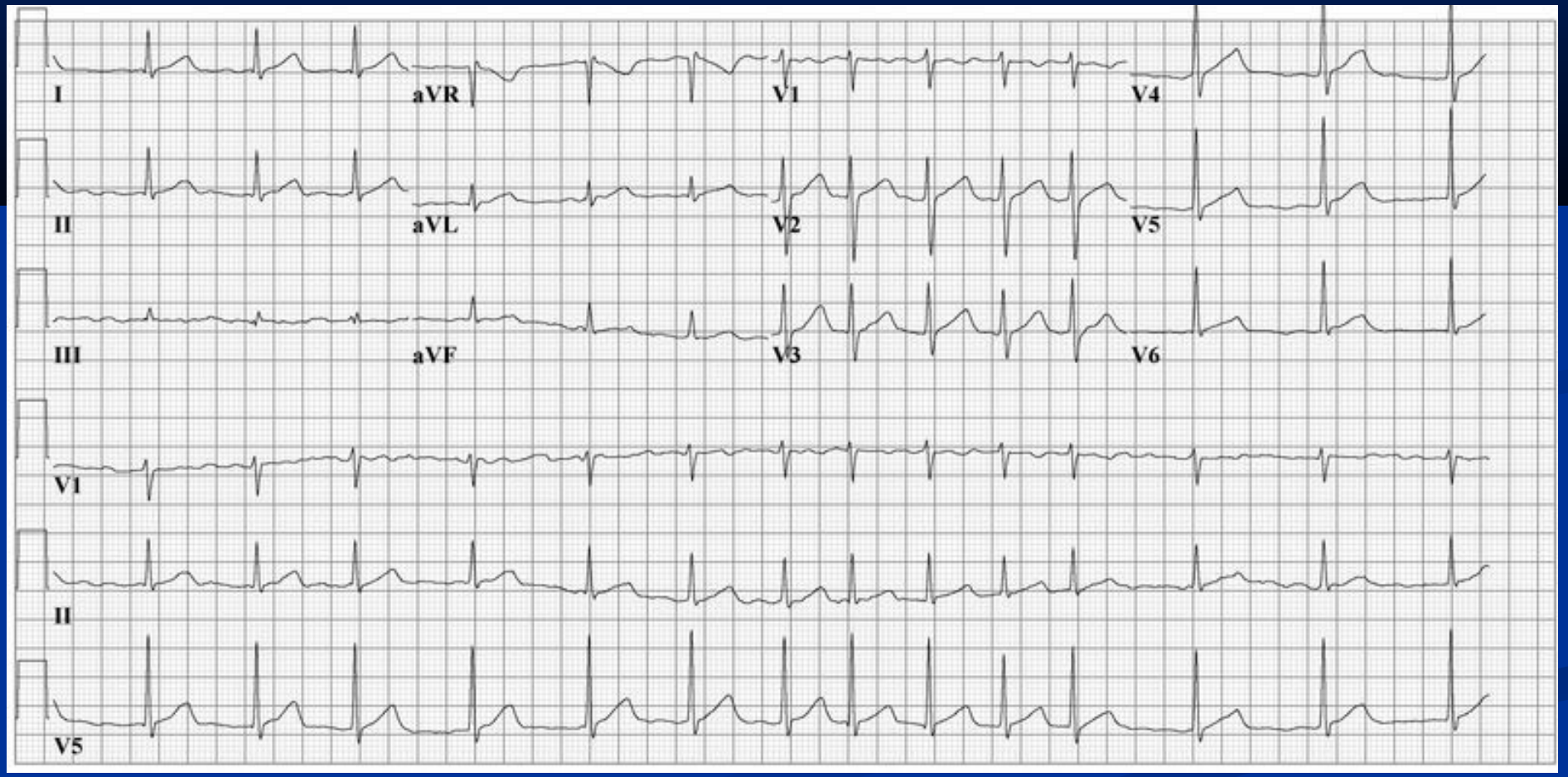


Cheng Circ 99:1700, 2000

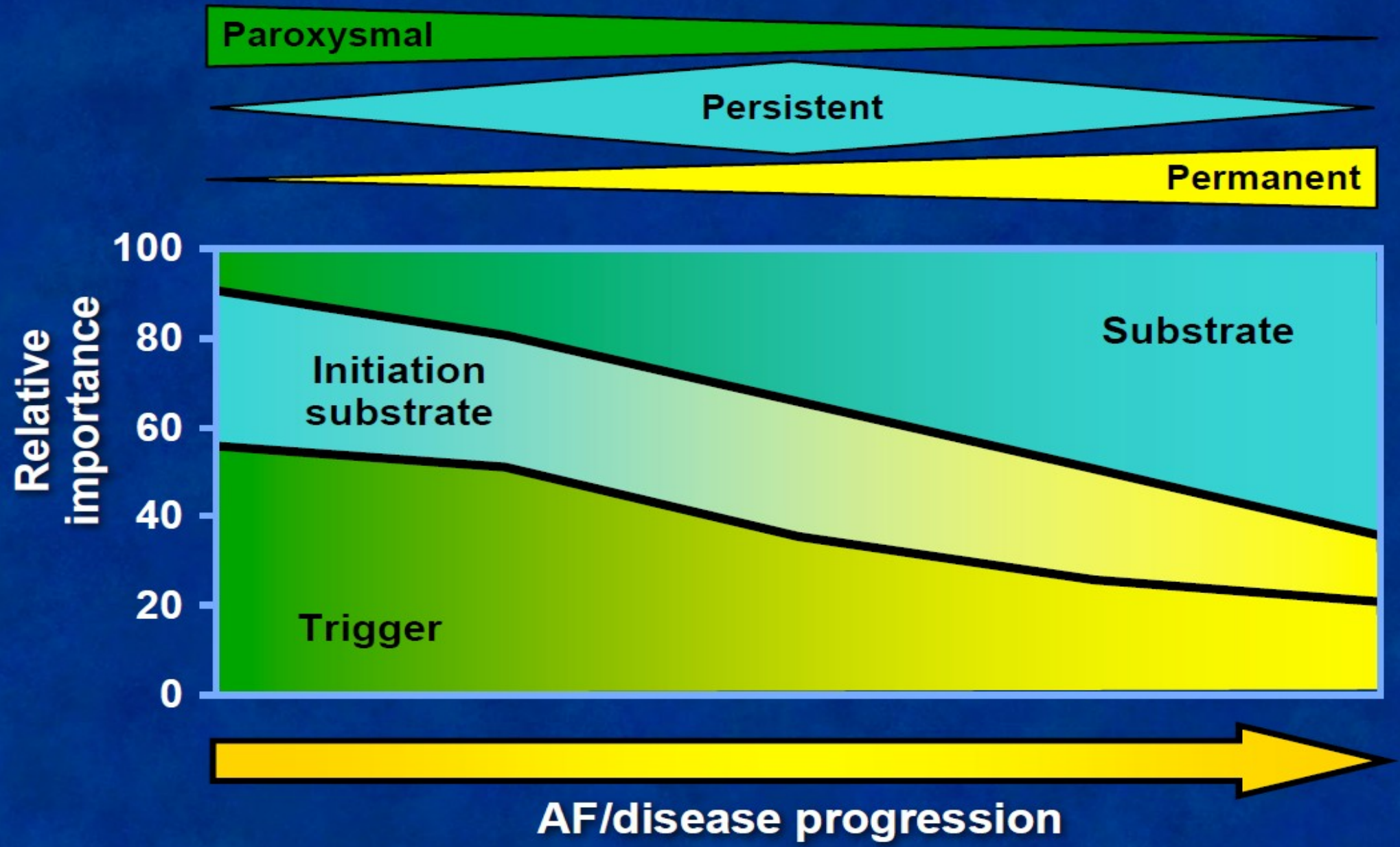

B
E9
E7
E6
E2
E1
S


C
E9
E7
E6
E2
E1
S

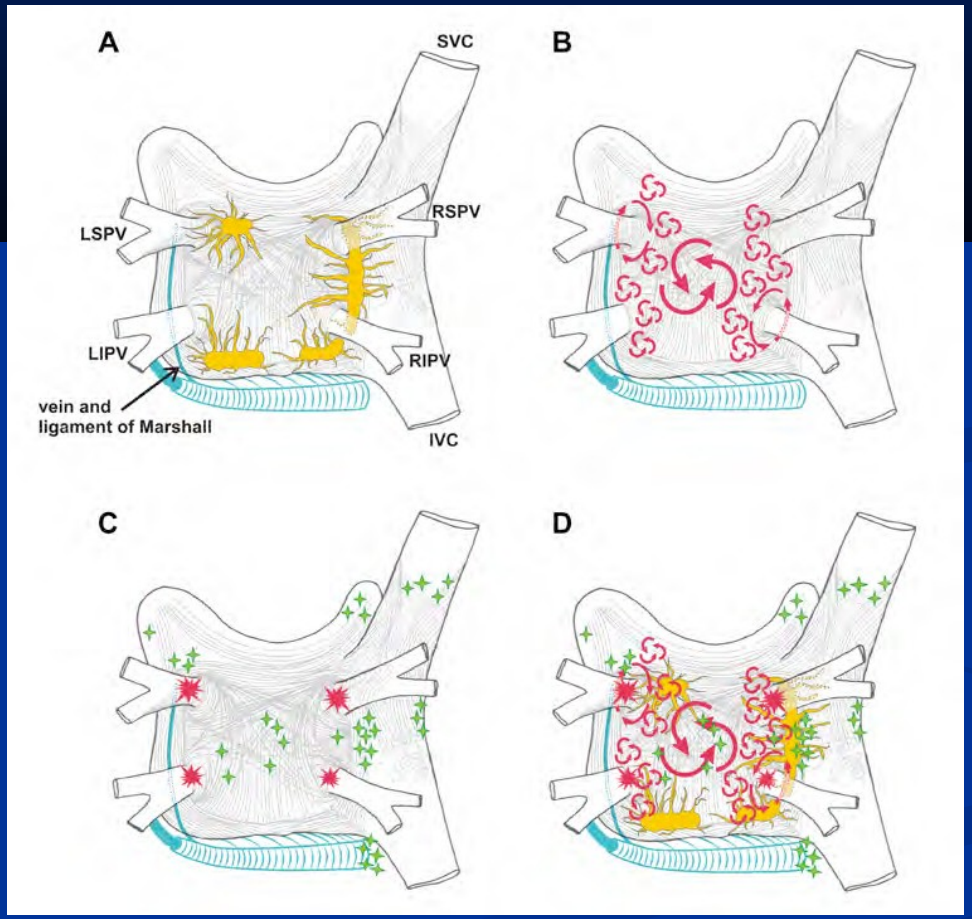
Atrium fibrillatie

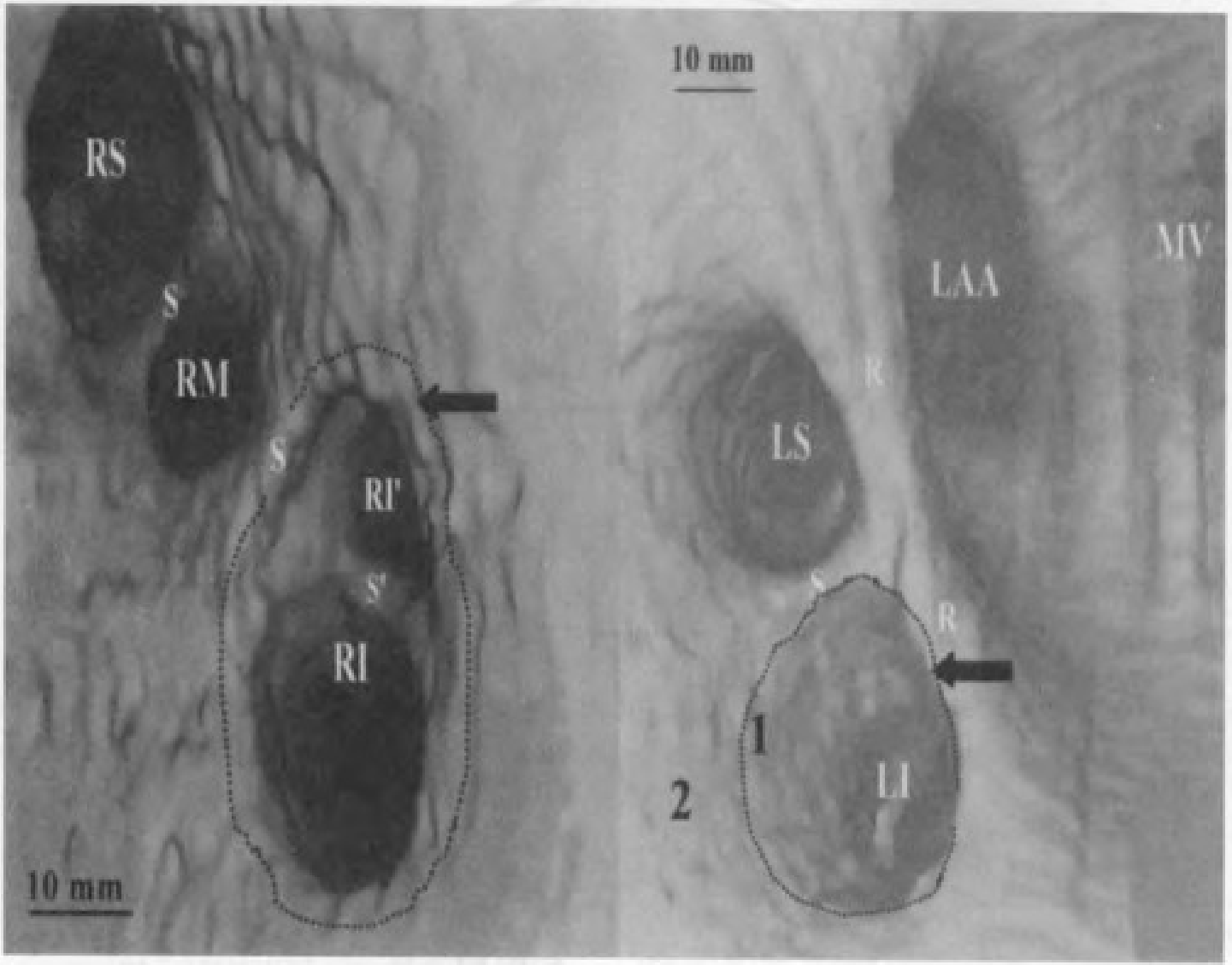


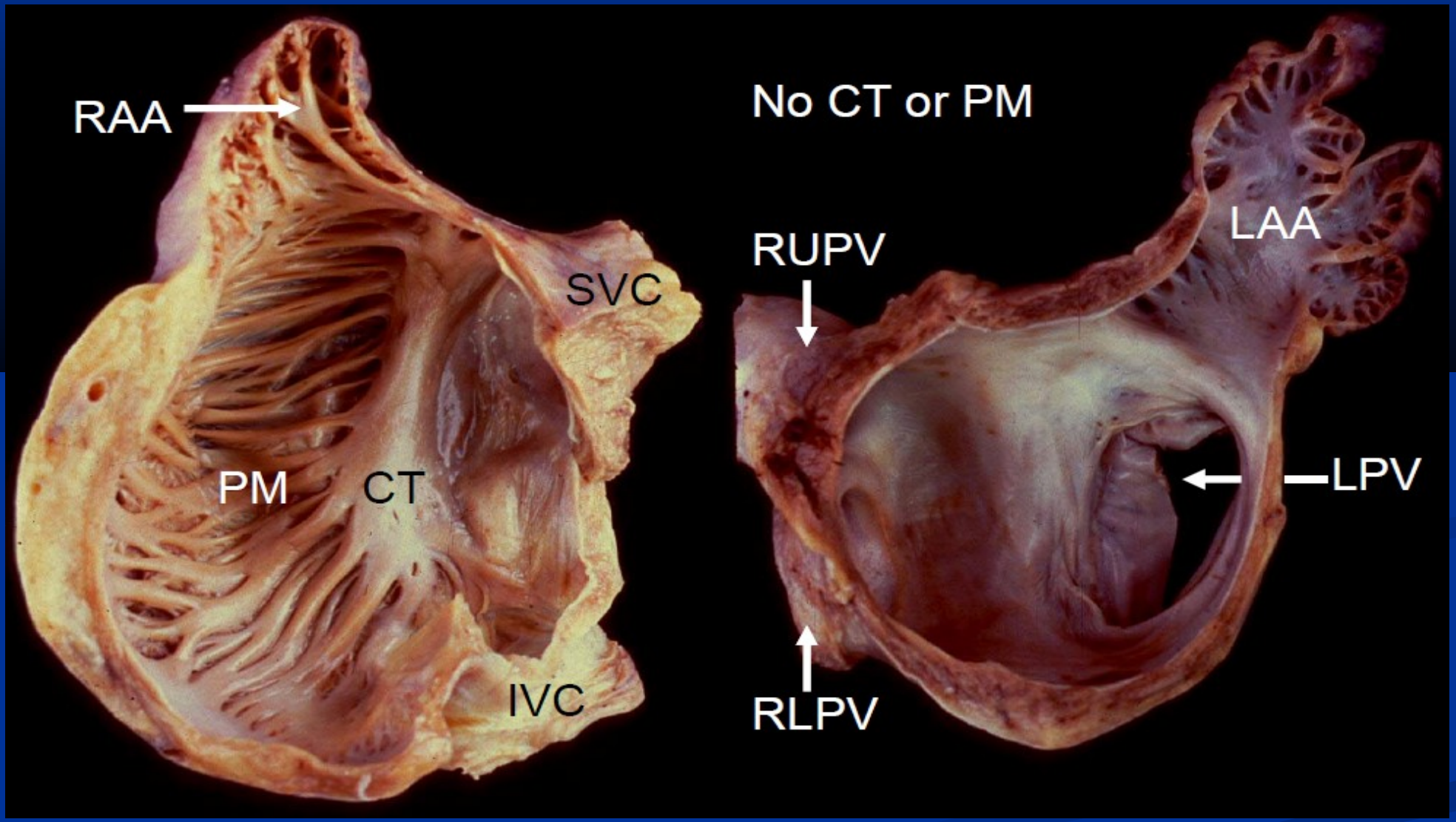
Underlying Pathogenesis of Atrial Fibrillation



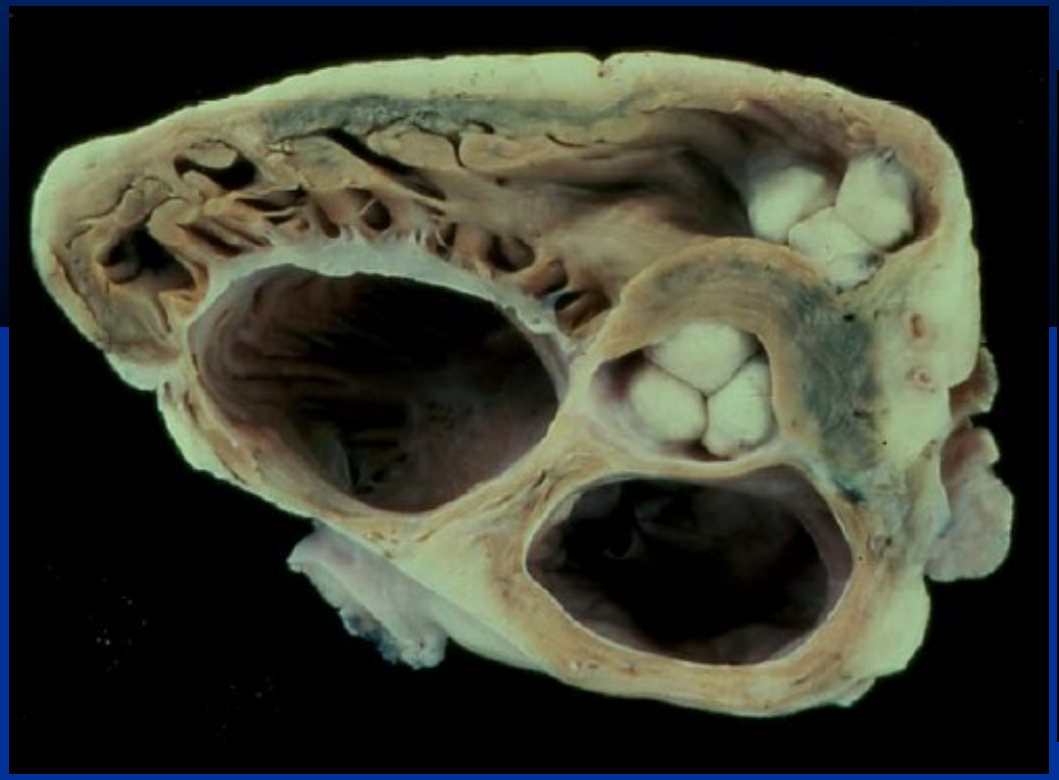
Structure and Mechanisms of AF

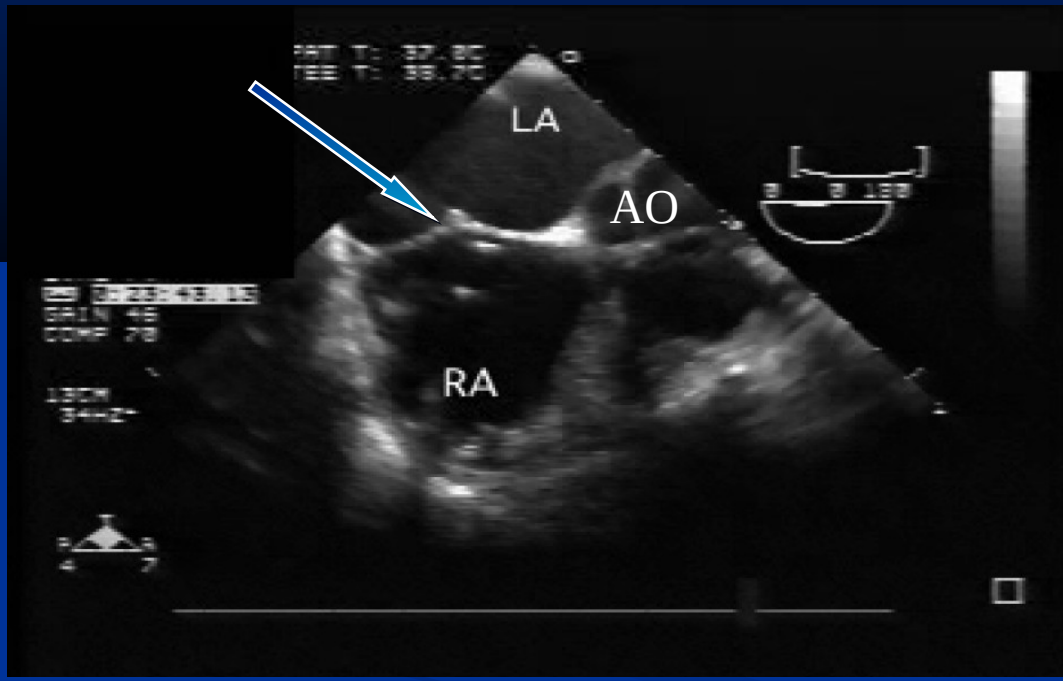



A
B
RS
S
RM
S
RI'
S'
RI
10 mm
10 mm
LAA
MV
R
LS
S
R
1
2
LI


RAA
No CT or PM
RUPV
LAA
SVC
PM
CT
LPV
IVC
RLPV

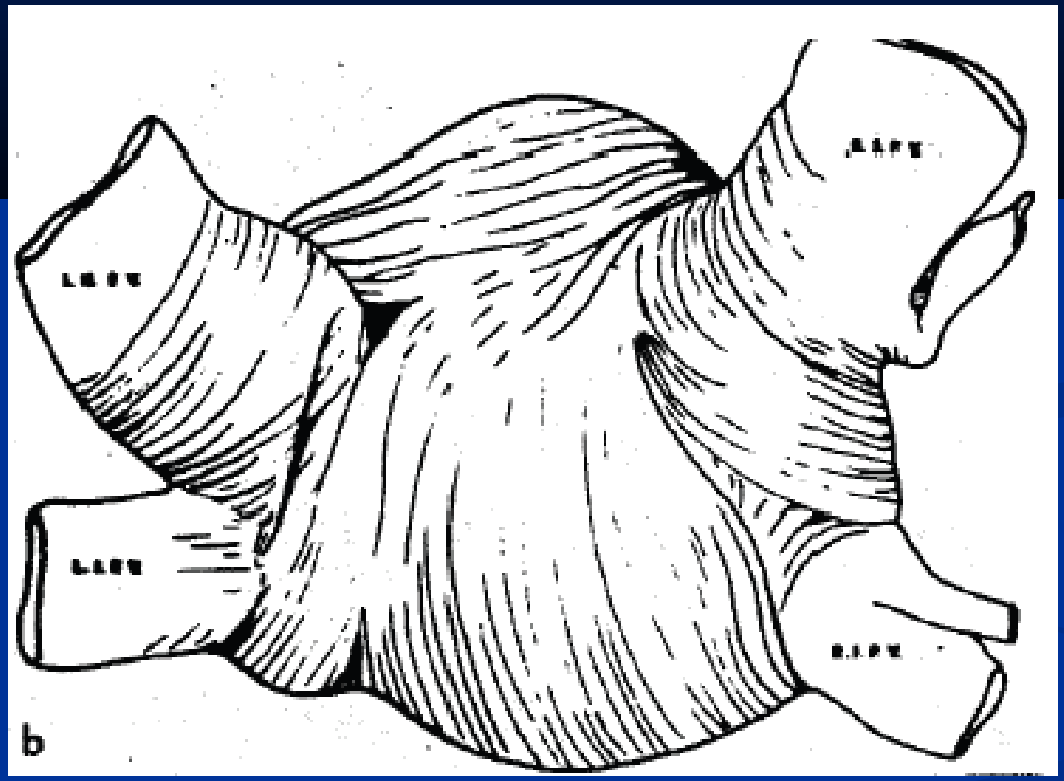
Transseptale punktie



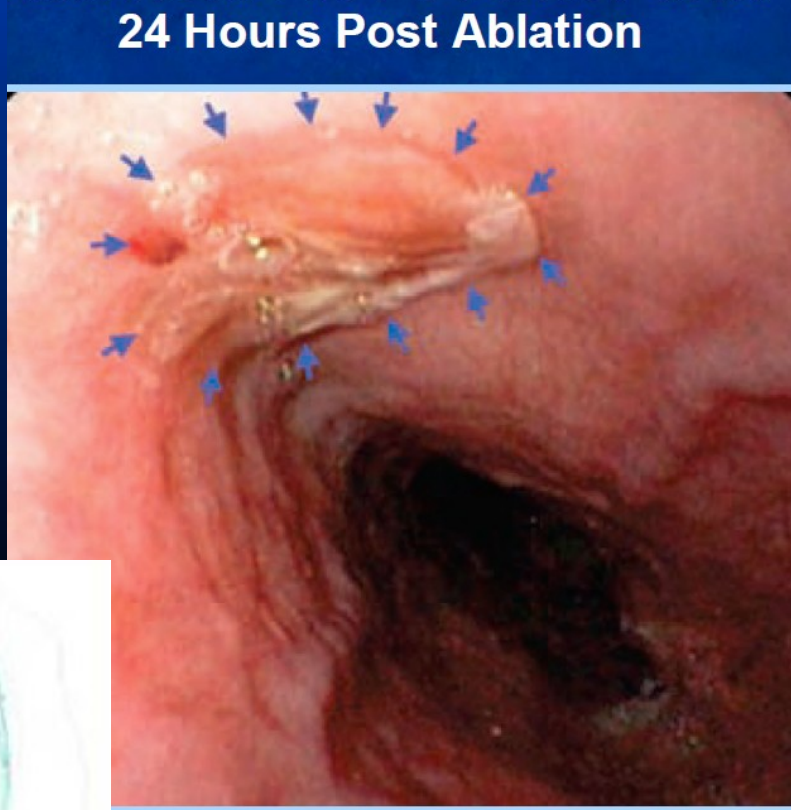


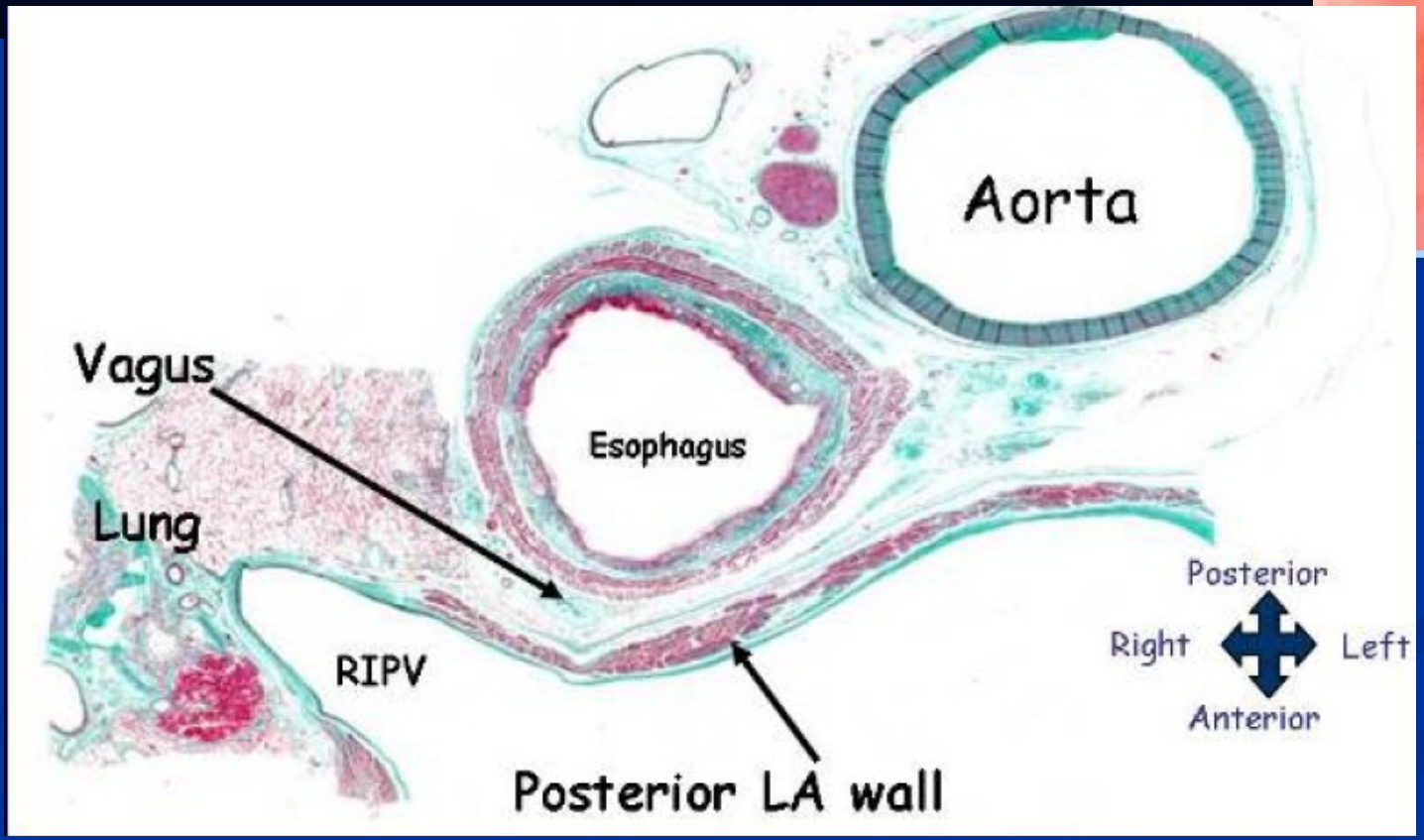
Triggered AF

- PV's found to be the primary triggers of AF: (including posterior LA)
  - Lin Circ 2003;107:3176 – 81%
  - Lee Circ 2005;46:1054 – 88%
  - Shah PACE 2003;26:1631 – redo pts – 36/160 with "non PV" – but if exclude PW LA and vein antrum – only about 5%.


b

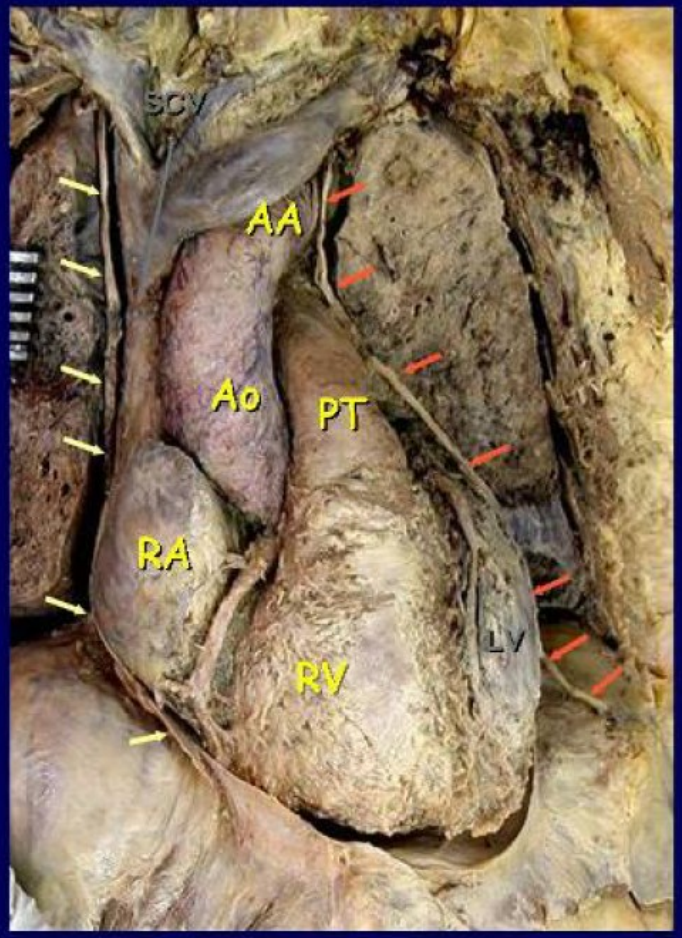
Esophagus


24 Hours Post Ablation

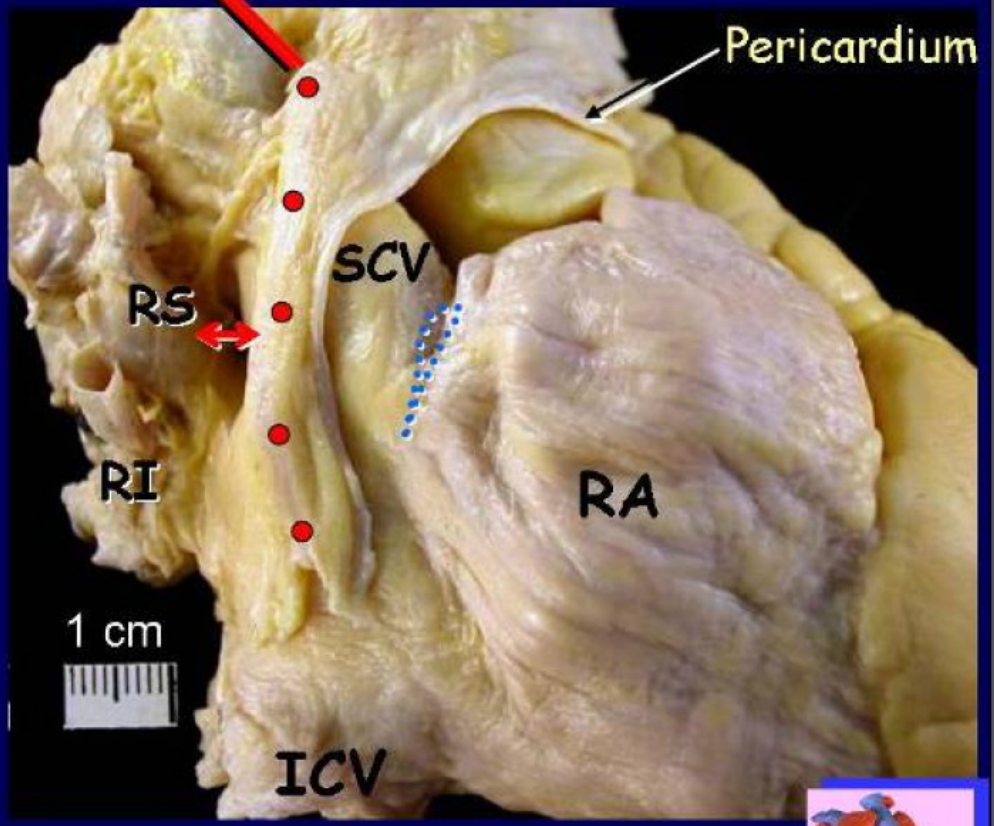

Aorta
Vagus
Esophagus
Lung
RIPV
Posterior LA wall
Posterior
Right
Left
Anterior

Cardiac anatomy: Ablating in the RA

Right pulmonary veins and phrenic nerve



Front view



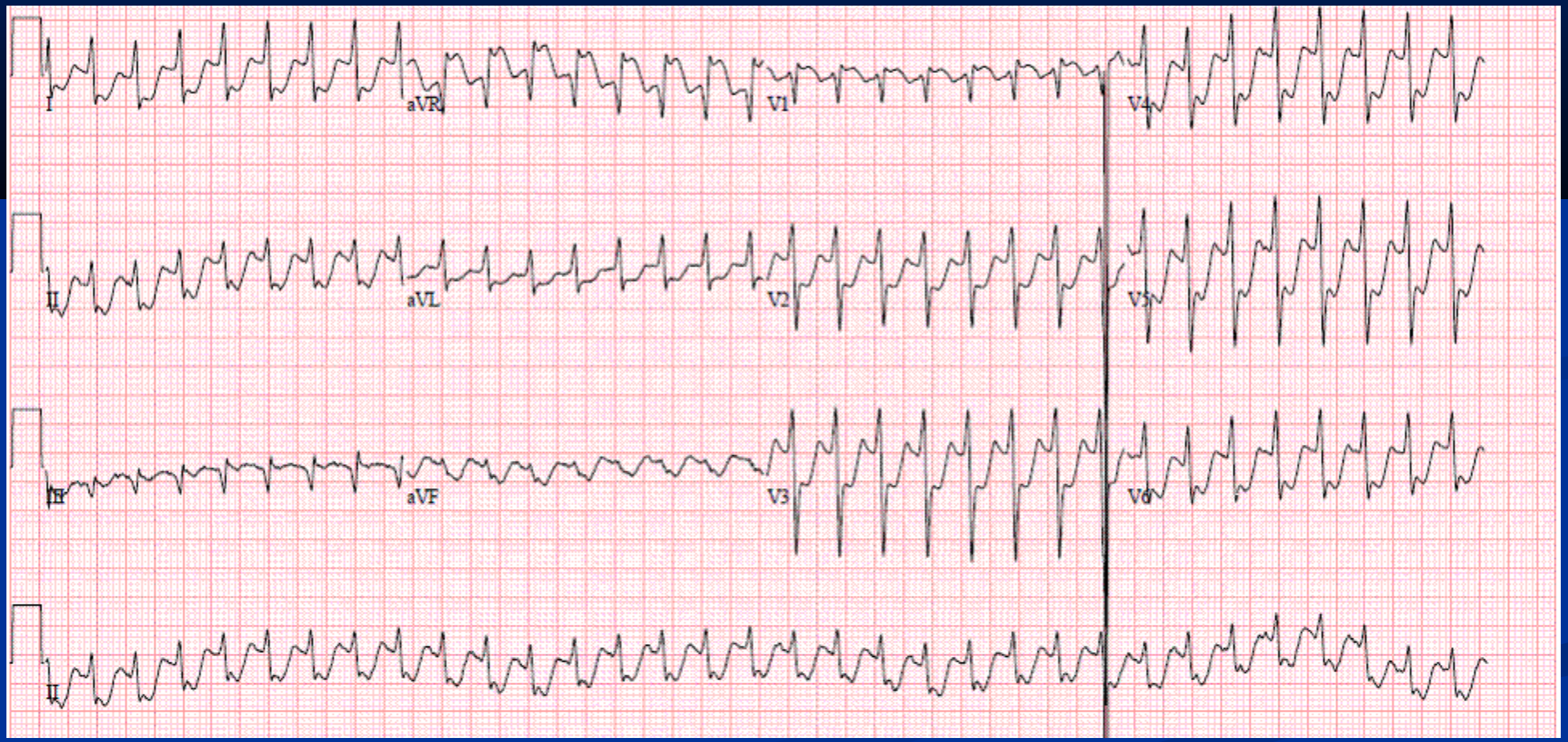
Right view

Cardiac Morphology

Royal Brompton & Harefield NHS

Imperial College London

AVNRT



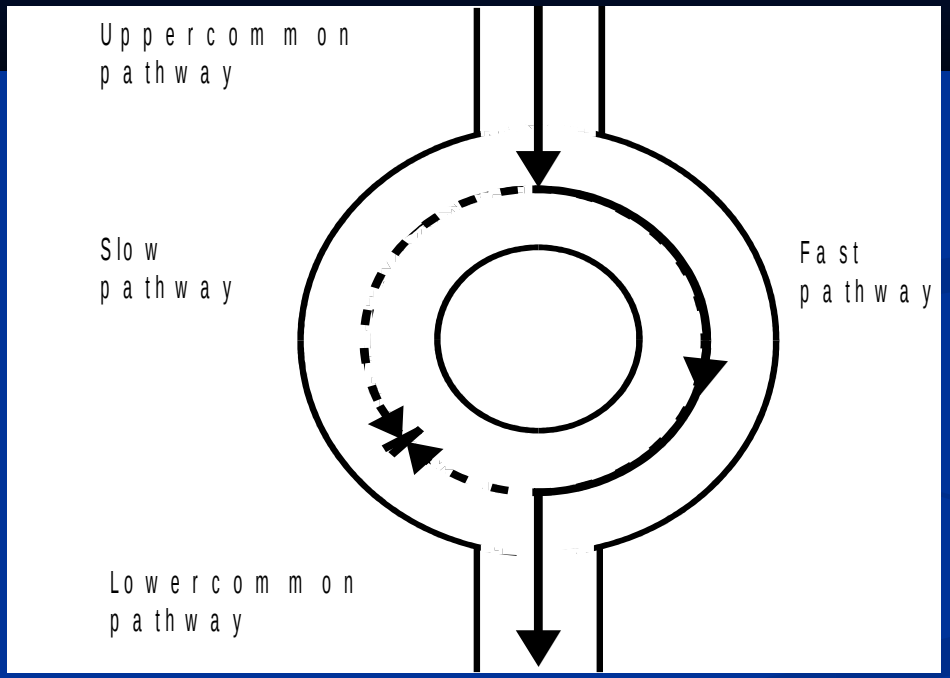
Substraat bij common type

Dual AV nodal pathways:

Slow pathway:

trage geleiding

snel herstel



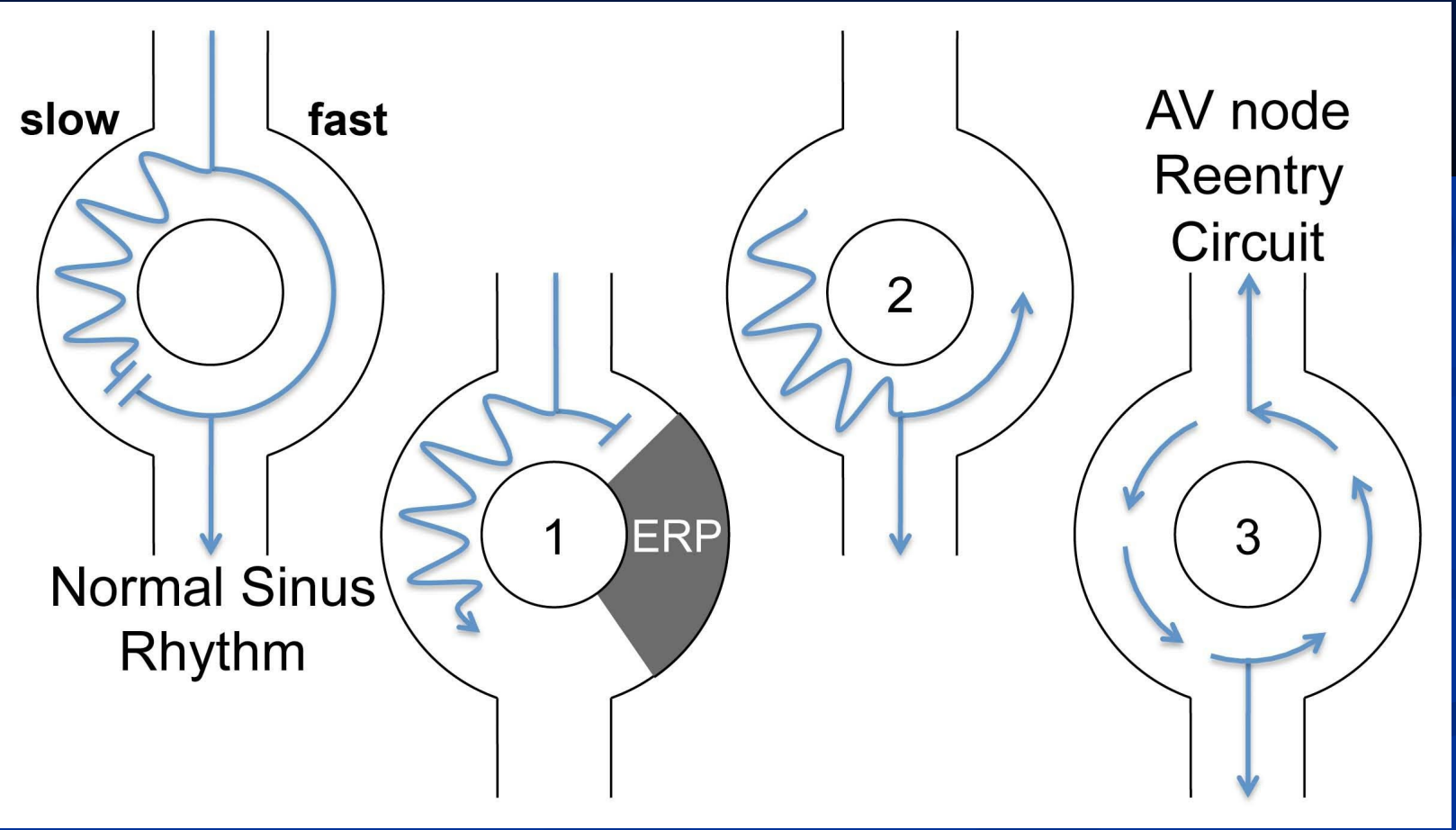
Fast pathway:

snelle geleiding

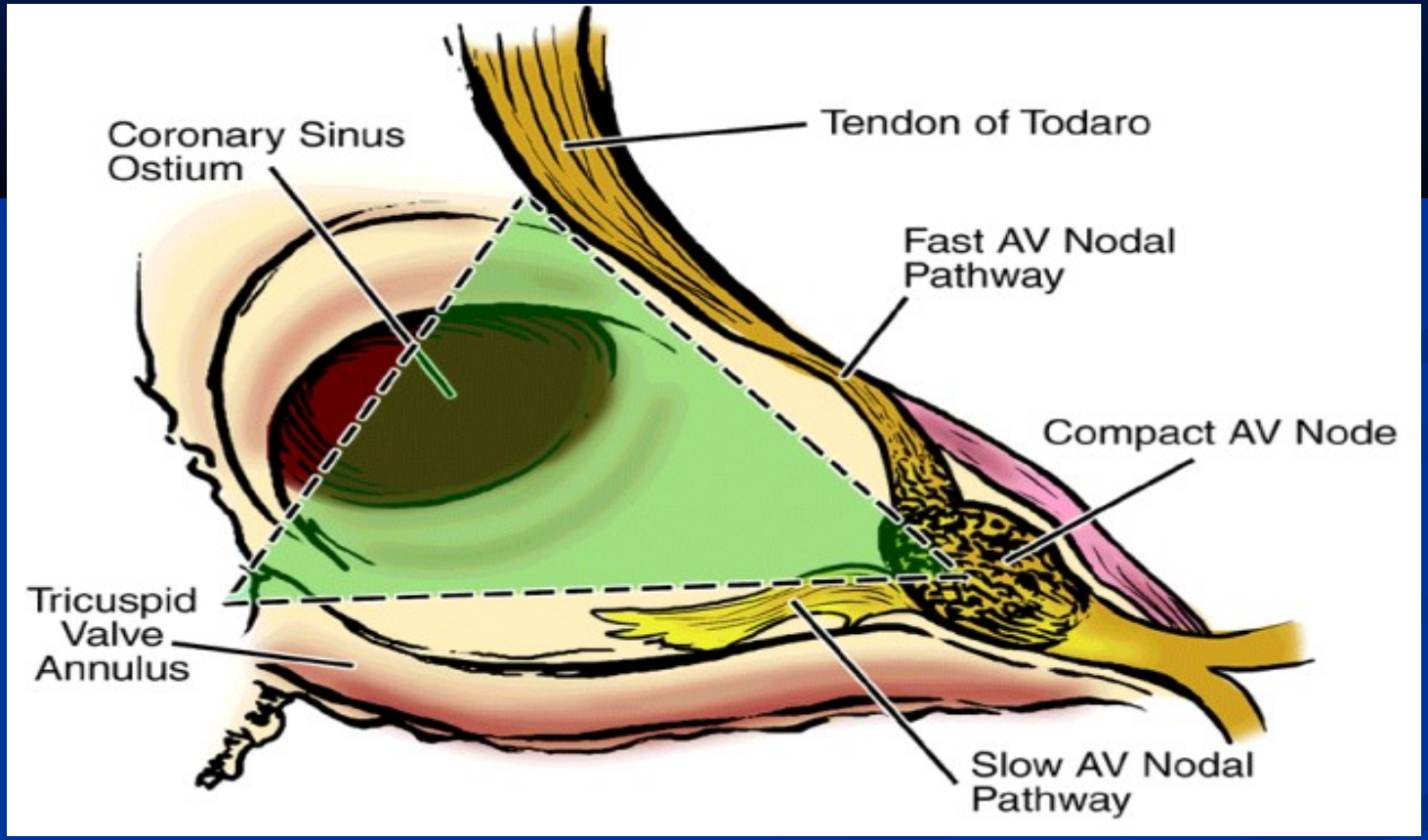
traag herstel

Trigger:

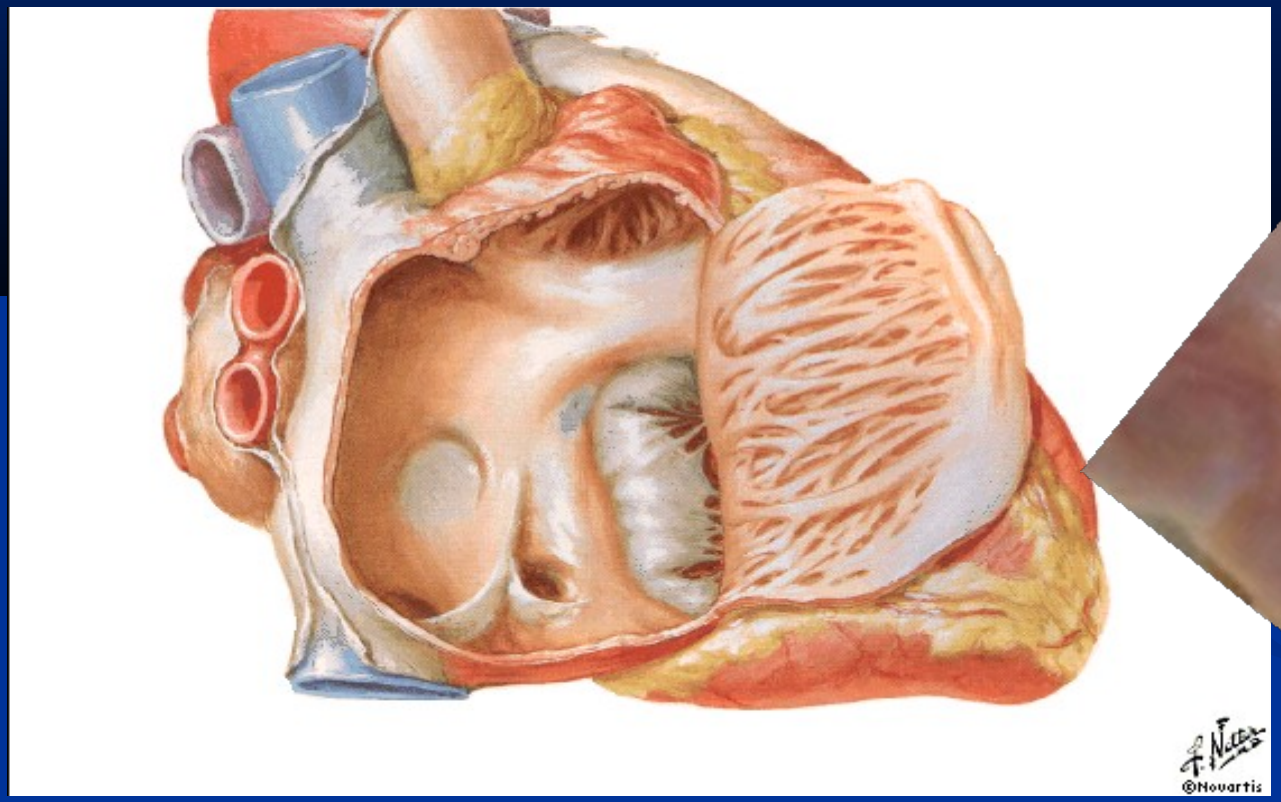
bijv. boezemextrasystole:

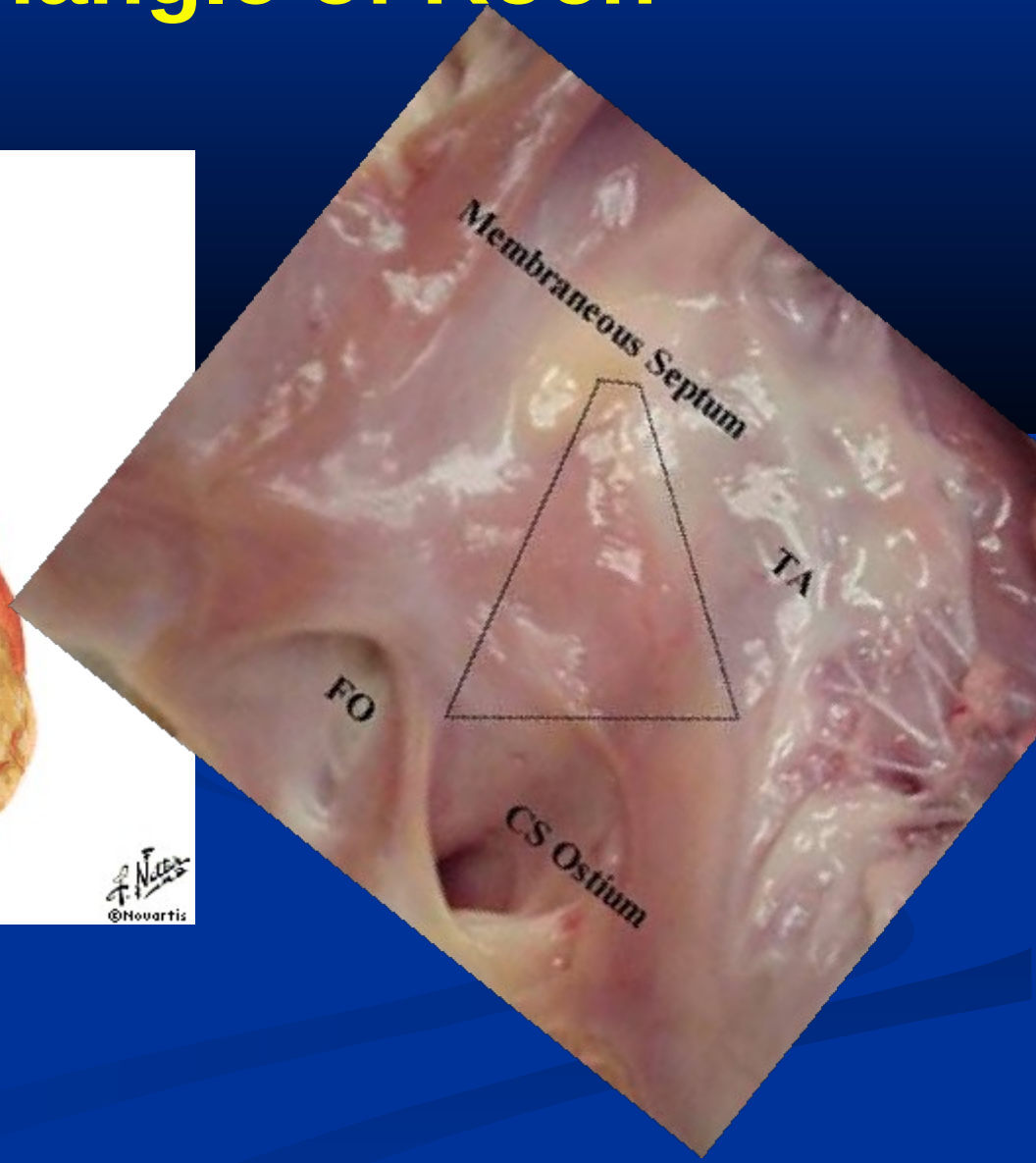


Anatomy of the Human Atrioventricular Node



Right Atrium&Triangle of Koch

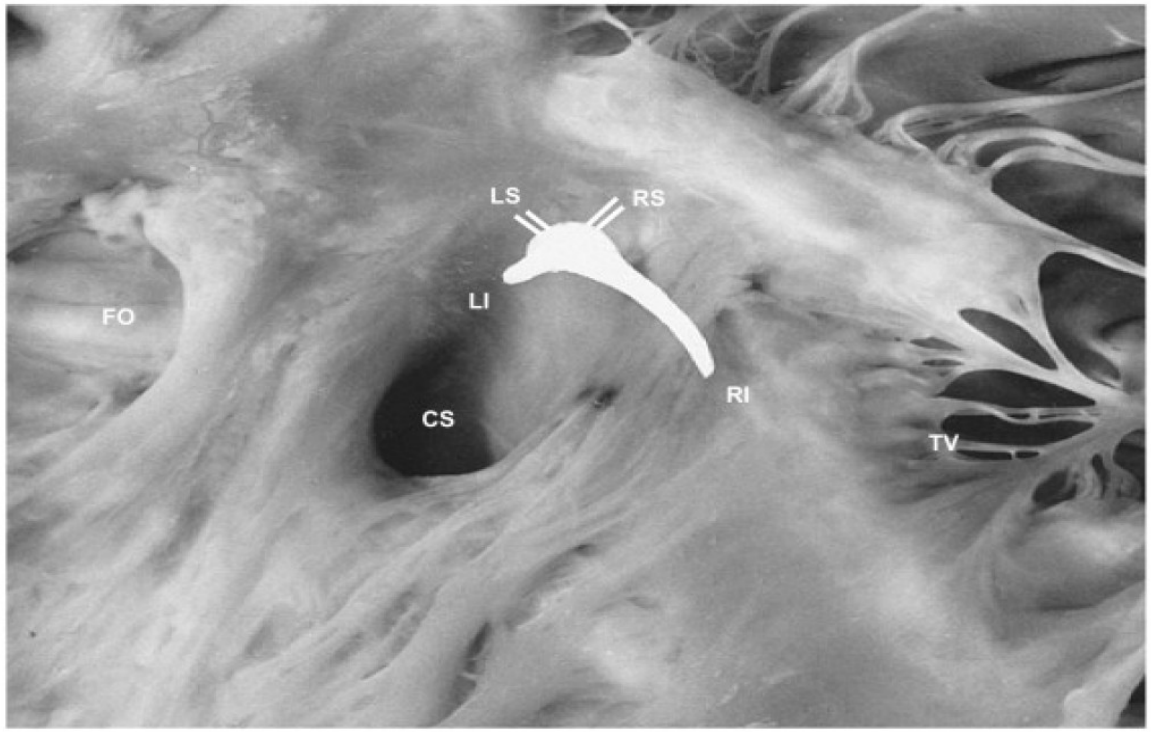




Netter, F. Clinical Symposia. Novartis Pharmaceuticals Corporation, Summit, NJ, 1997.

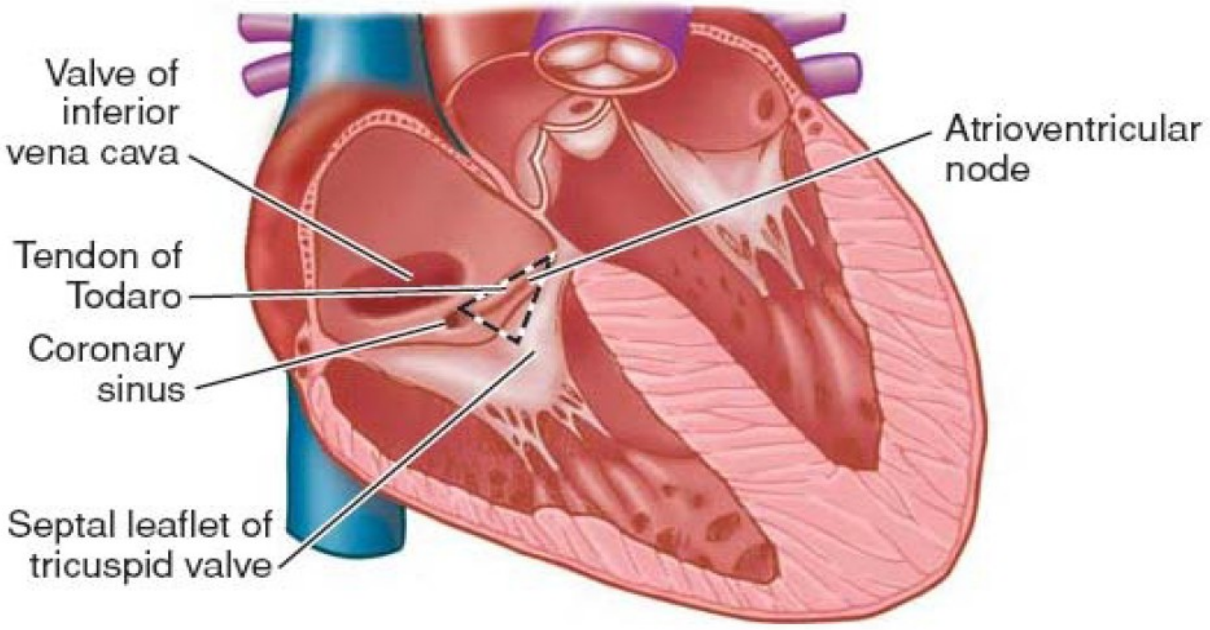
AVNRT circuit based on intraoperative ice mapping

Keim et al Circ 1992

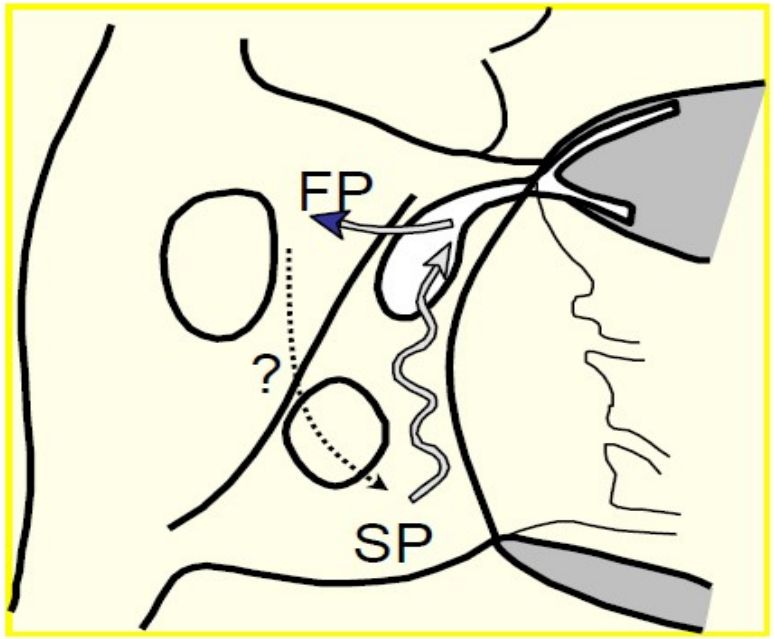


Katritsis & Becker, Heart Rhythm 07

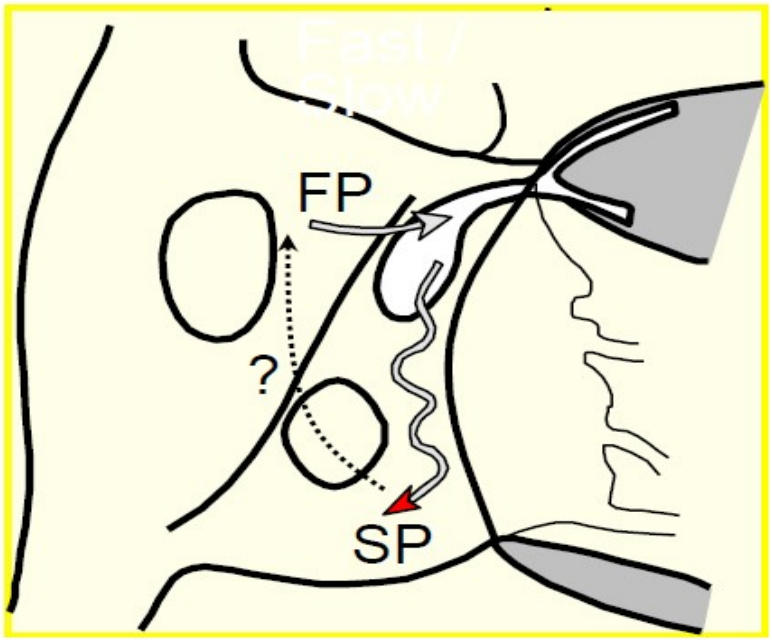
Triangle of Koch

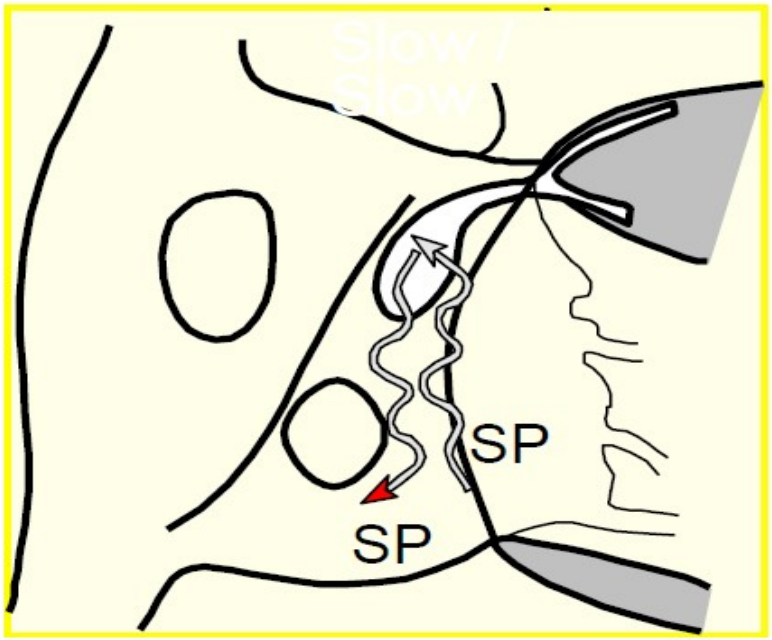


Typical Slow / Fast



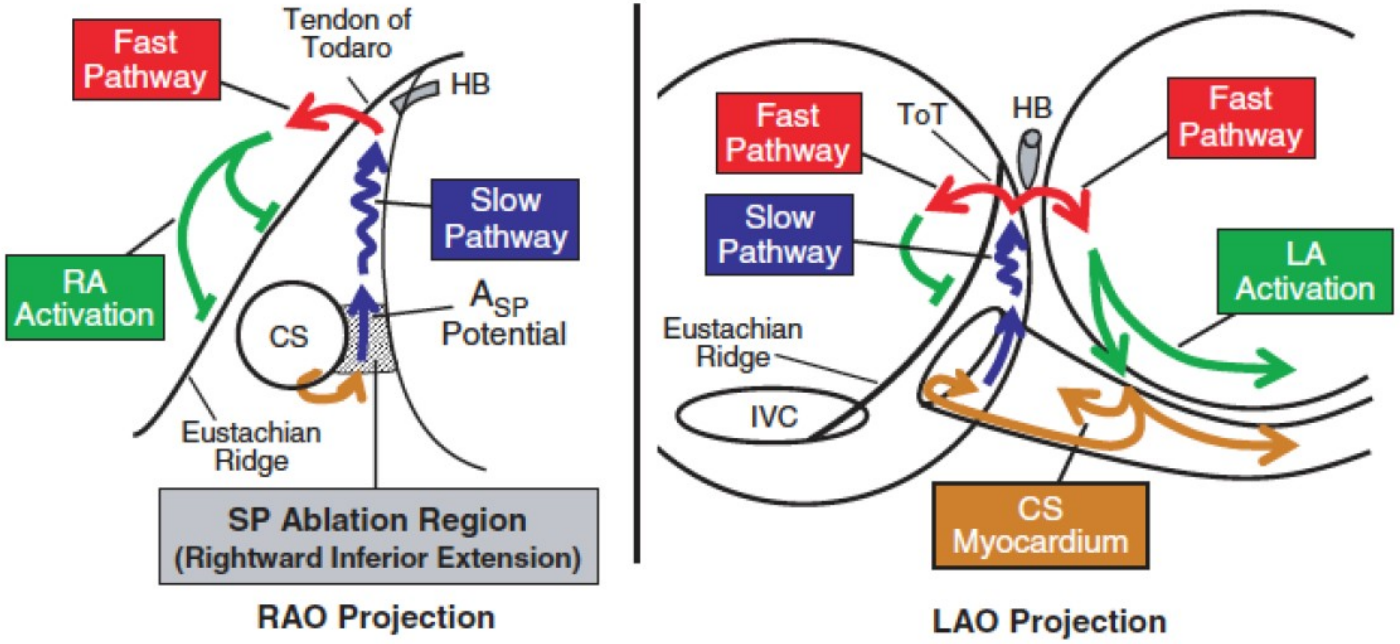
Atypical





Typical Slow/Fast AVNRT Circuit

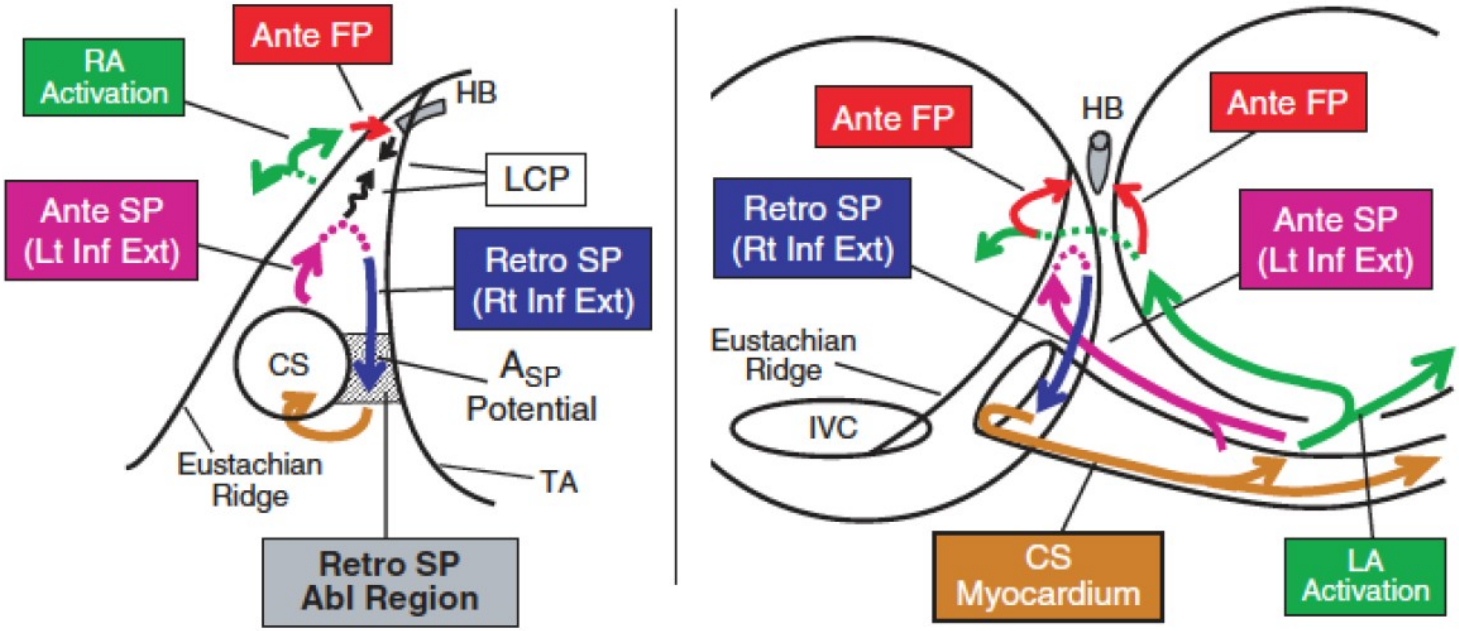
Right Inferior Extension



Nakagawa, H. et al. Circulation 2007;116:2465-2478

Fast/Slow AVNRT

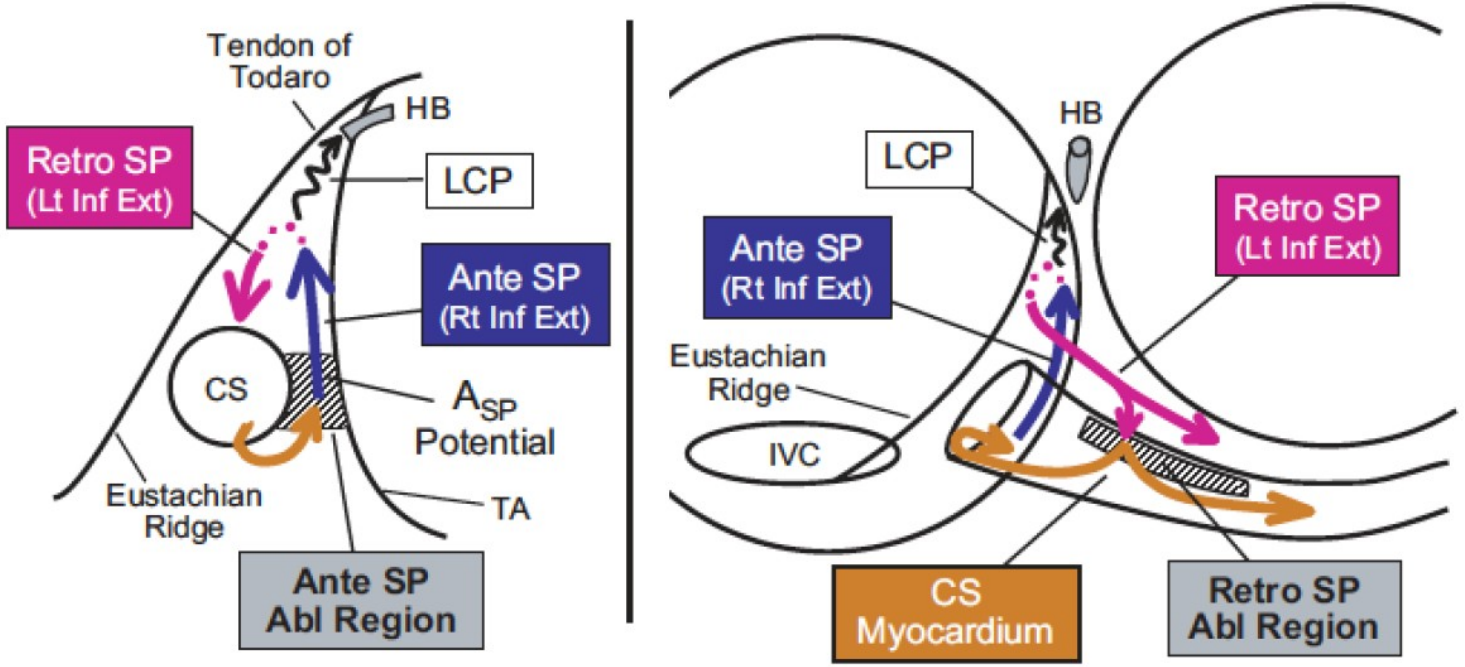
Right and Left Inferior Extensions Counterclockwise



Nakagawa, H. et al. Circulation 2007;116:2465-2478

Slow/Slow AVNRT

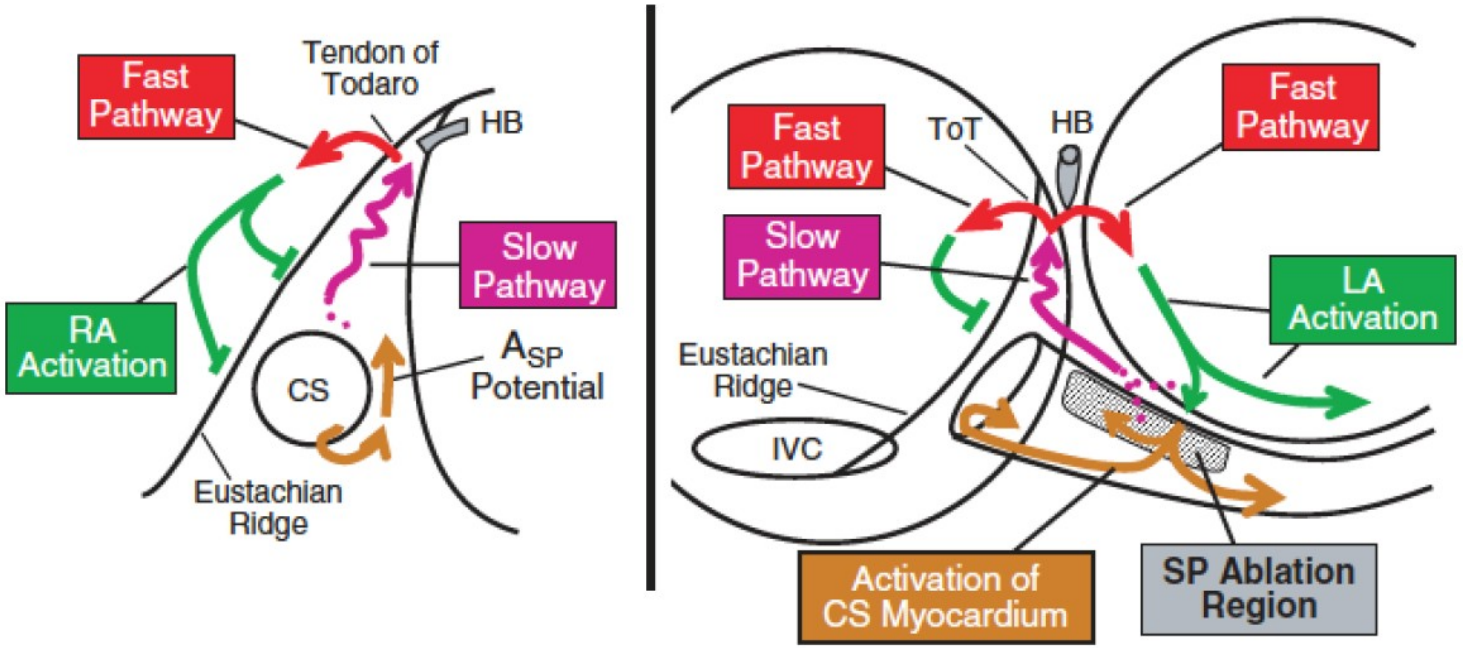
Right and Left Inferior Extensions Clockwise



Nakagawa, H. et al. Circulation 2007;116:2465-2478

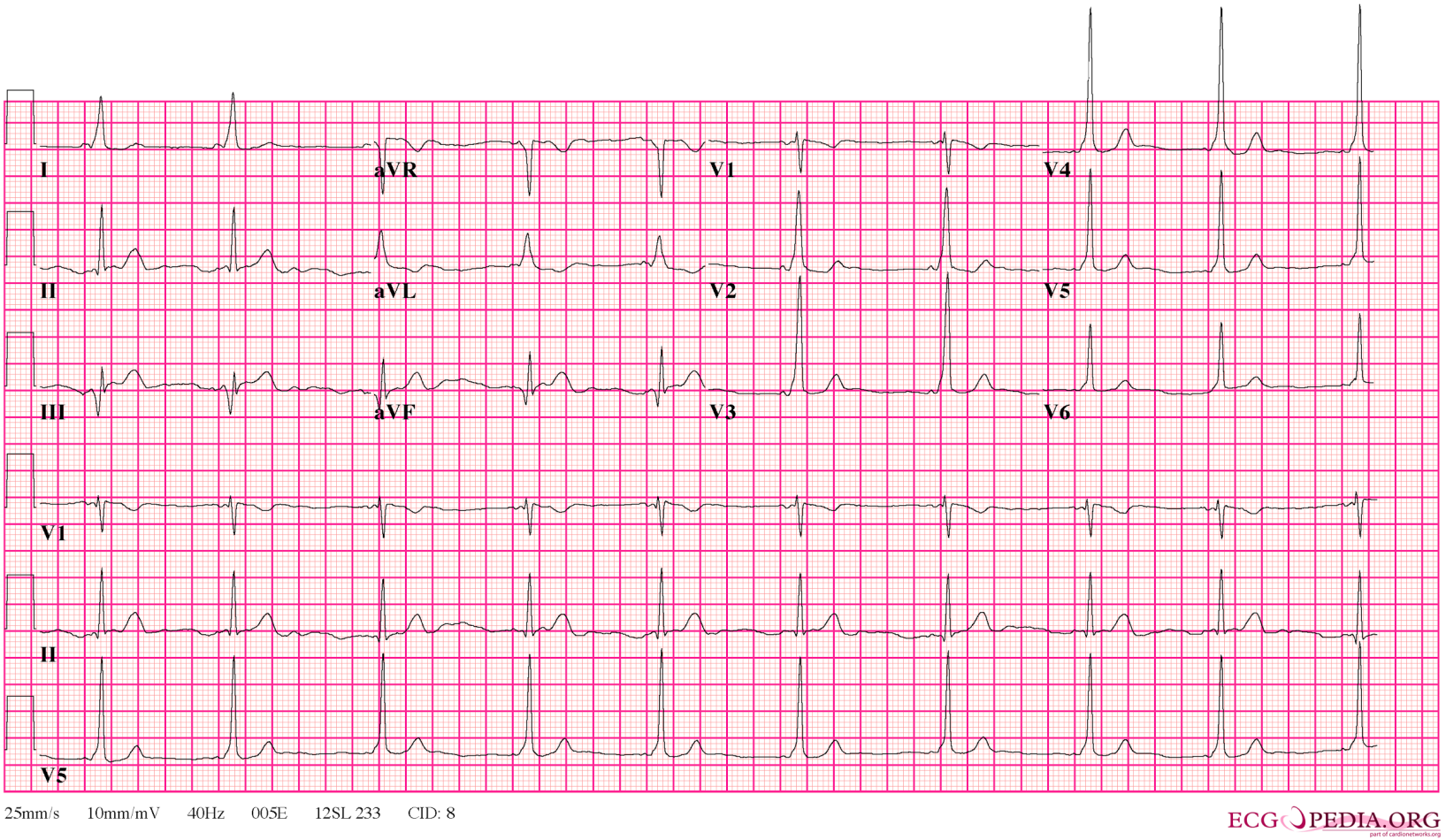
Slow/Fast AVNRT

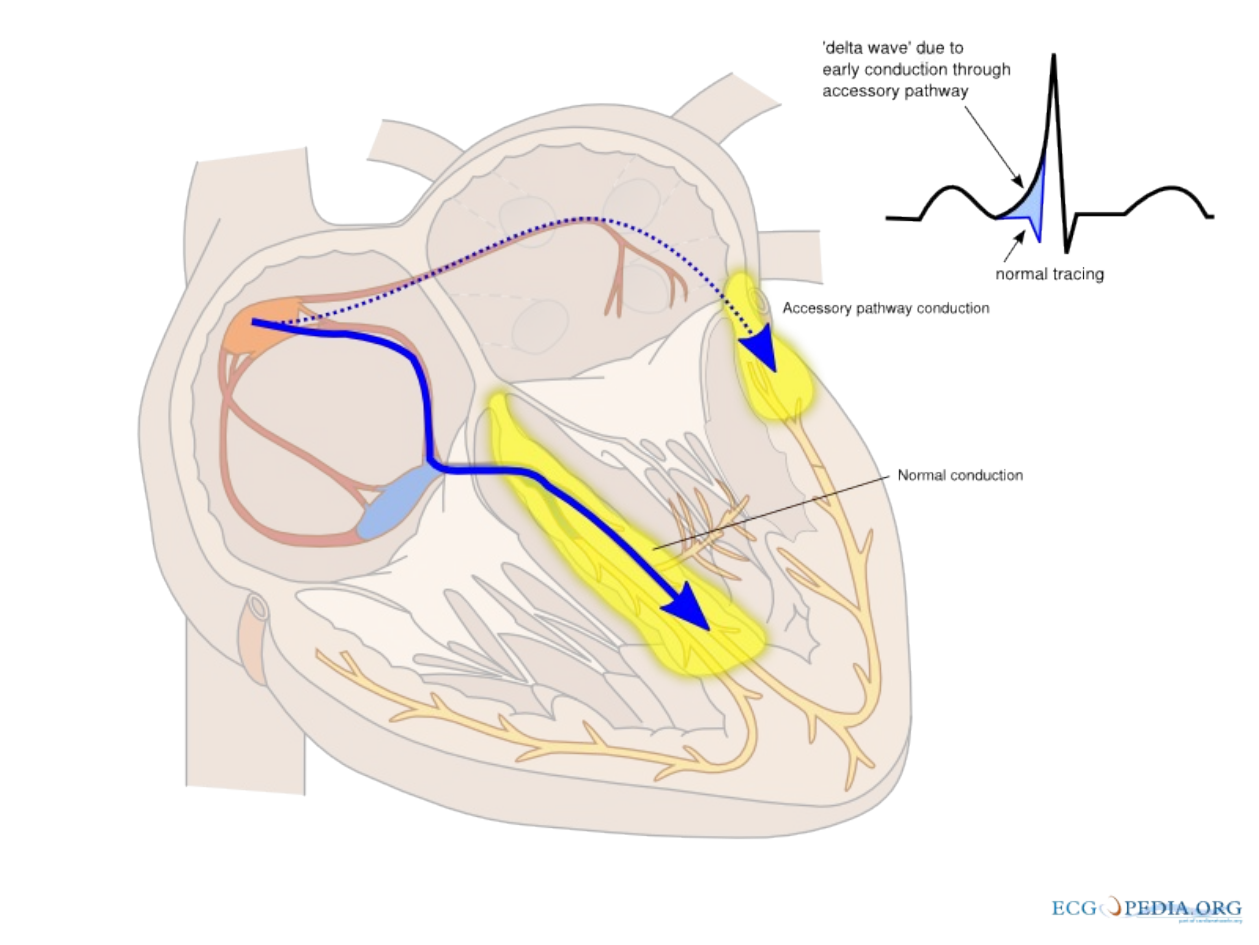
Left Inferior Extension

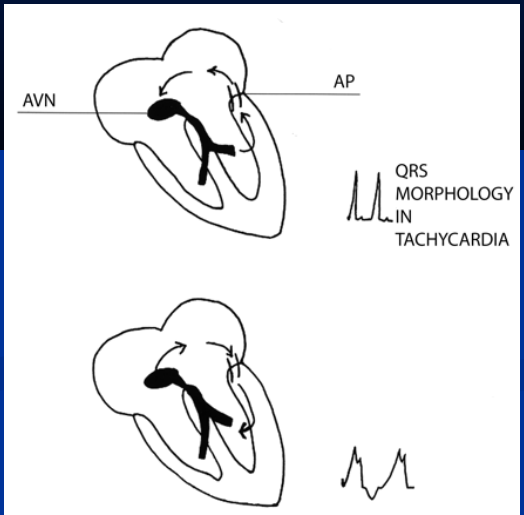


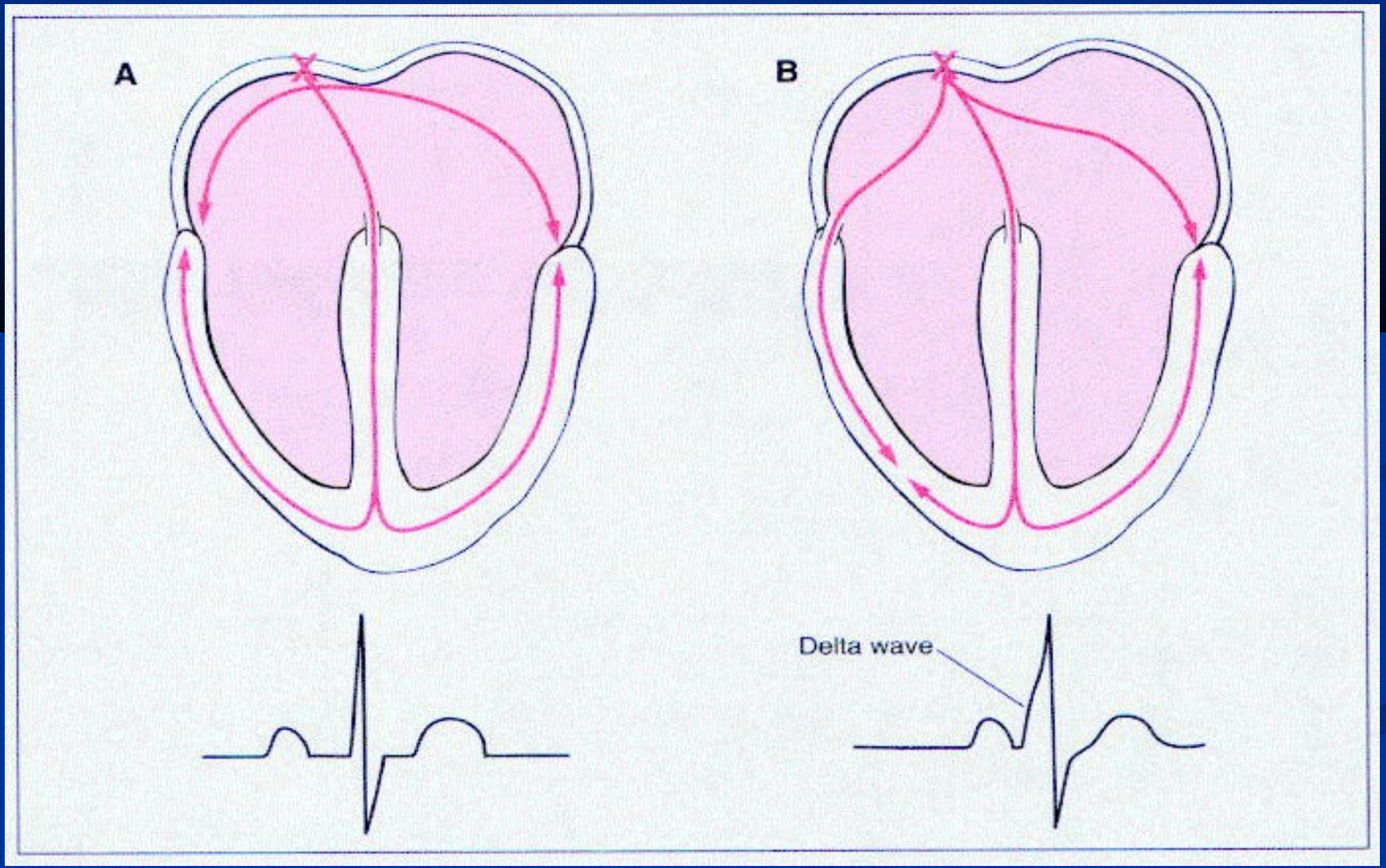
Nakagawa, H. et al. Circulation 2007;116:2465-2478

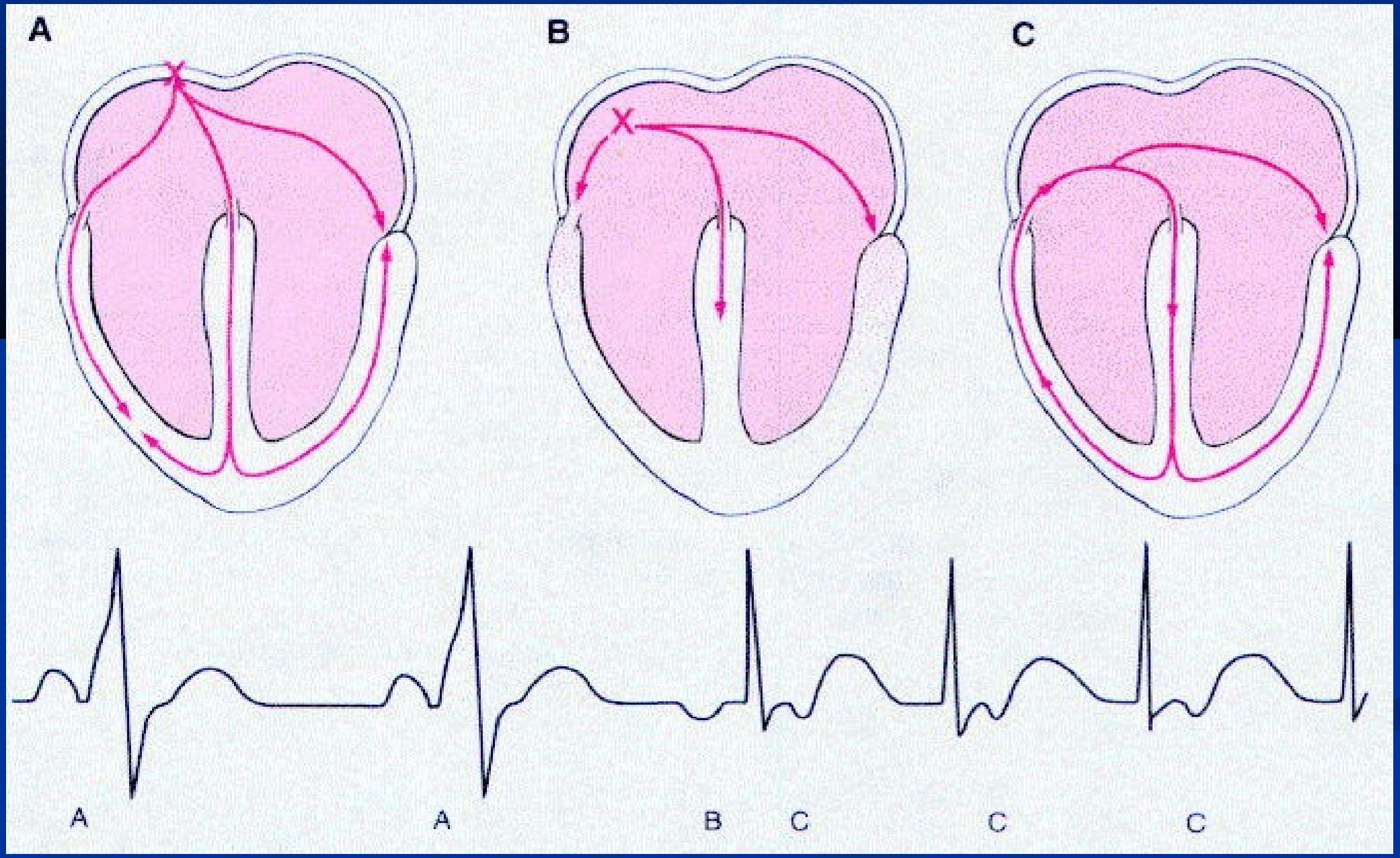
AVRT

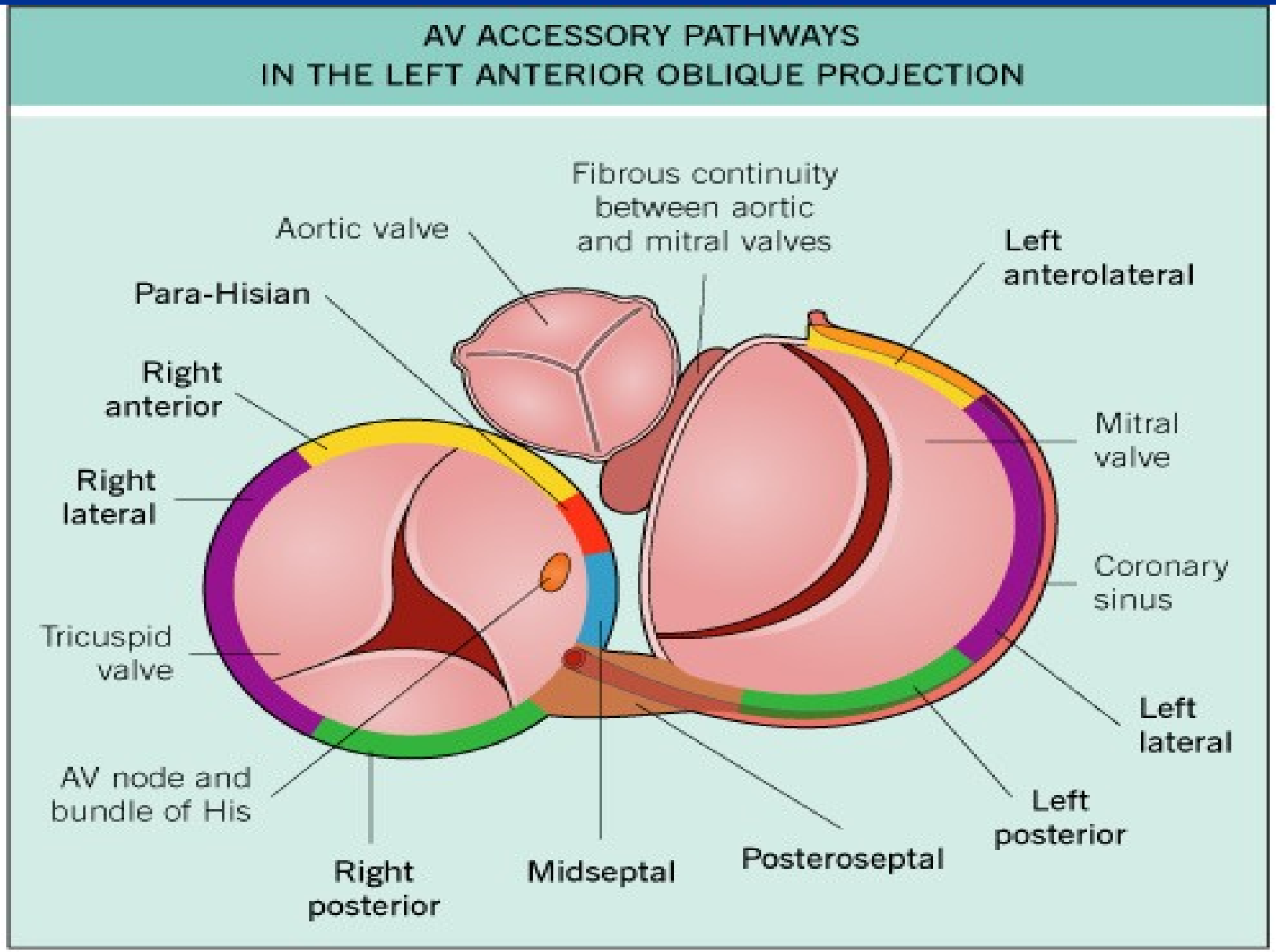

I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
V1
II
V5
25mm/s 10mm/mV 40Hz 005E 12SL 233 CID: 8
ECGPEDIA.ORG
part of cardionetworks.org

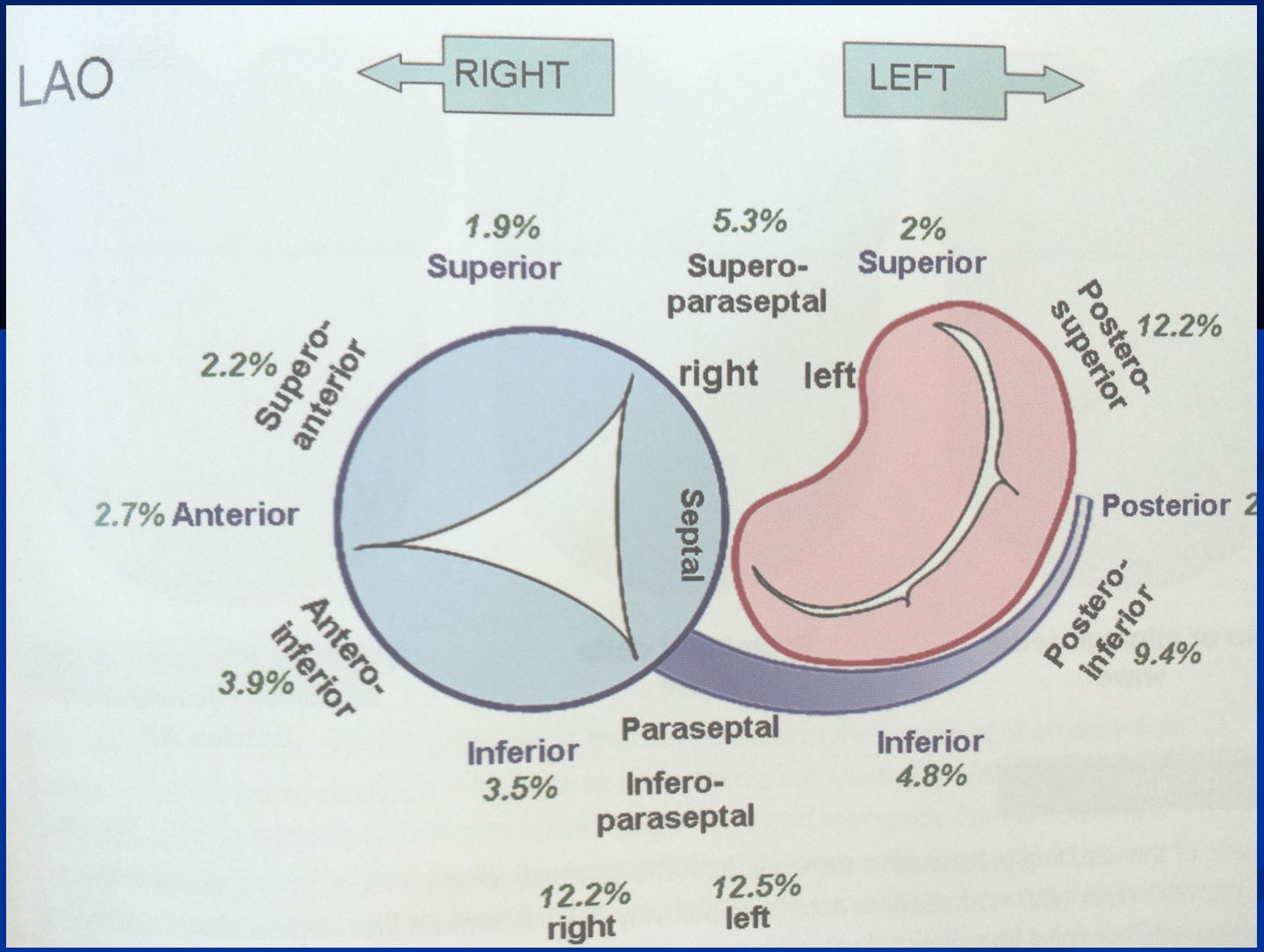

'delta wave' due to
early conduction through
accessory pathway
normal tracing
Accessory pathway conduction
Normal conduction
ECGPEDIA.ORG

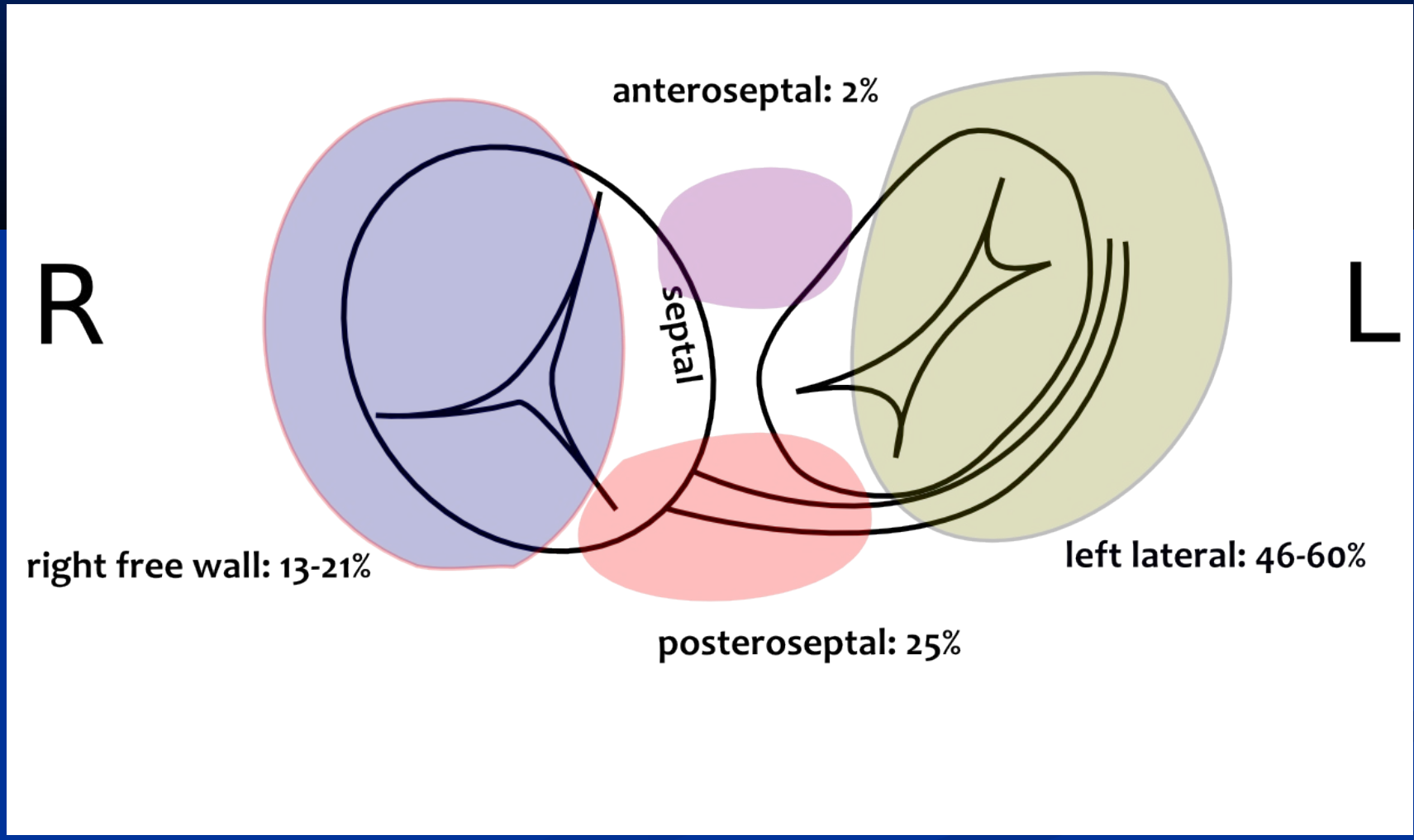

AVN
AP
QRS
MORPHOLOGY
IN
TACHYCARDIA

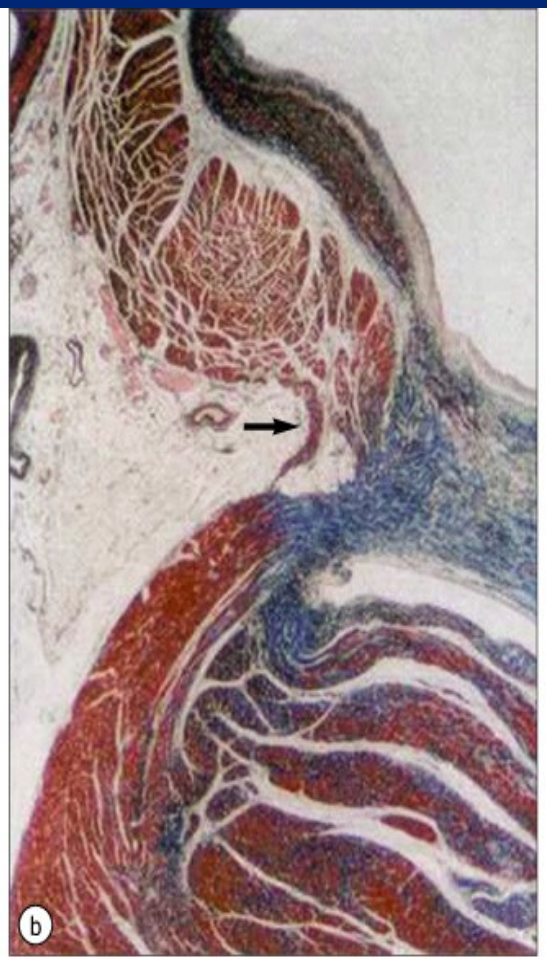

A
B
Delta wave

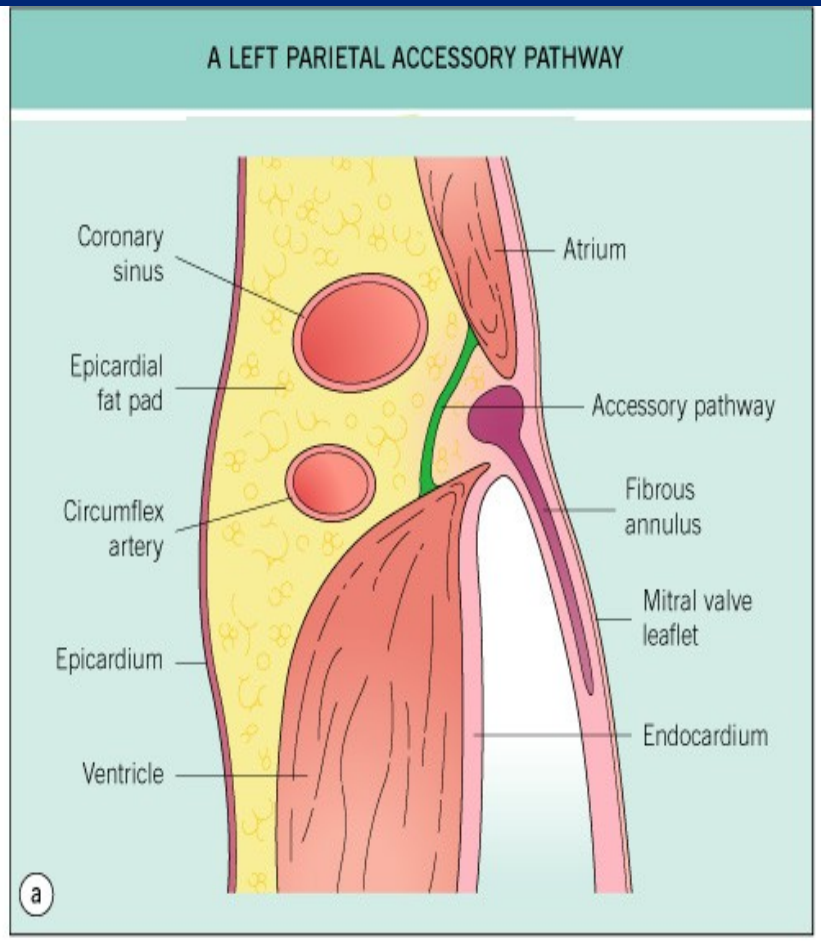

A
B
C
A
A
B
C
C
C




LAO
RIGHT
LEFT
1.9%
Superior
5.3%
Supero-
paraseptal
2%
Superior
Postero-
superior
12.2%
2.2%
Supero-
anterior
right
left
2.7% Anterior
Septal
Posterior 2
Antero-
inferior
3.9%
Postero-
inferior
9.4%
Paraseptal
Inferior
3.5%
Infero-
paraseptal
Inferior
4.8%
12.2%
right
12.5%
left


anteroseptal: 2%
R
L
septal
right free wall: 13-21%
left lateral: 46-60%
posteroseptal: 25%





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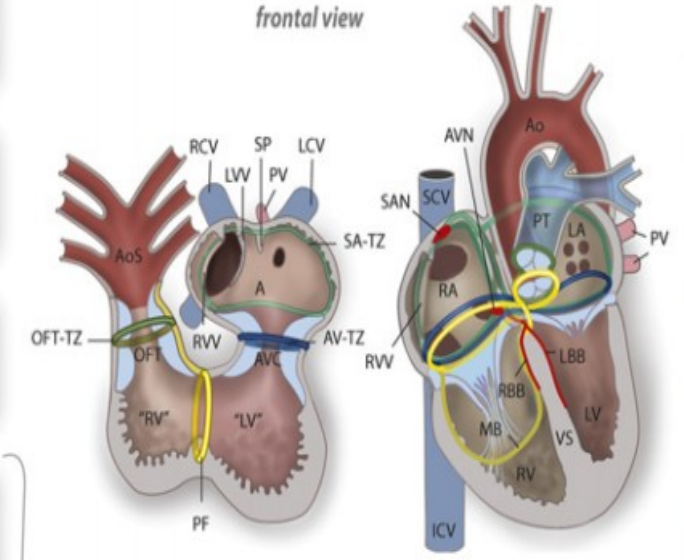
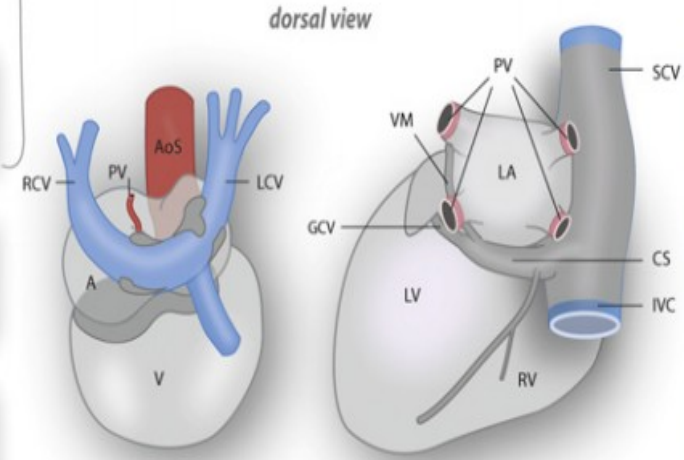
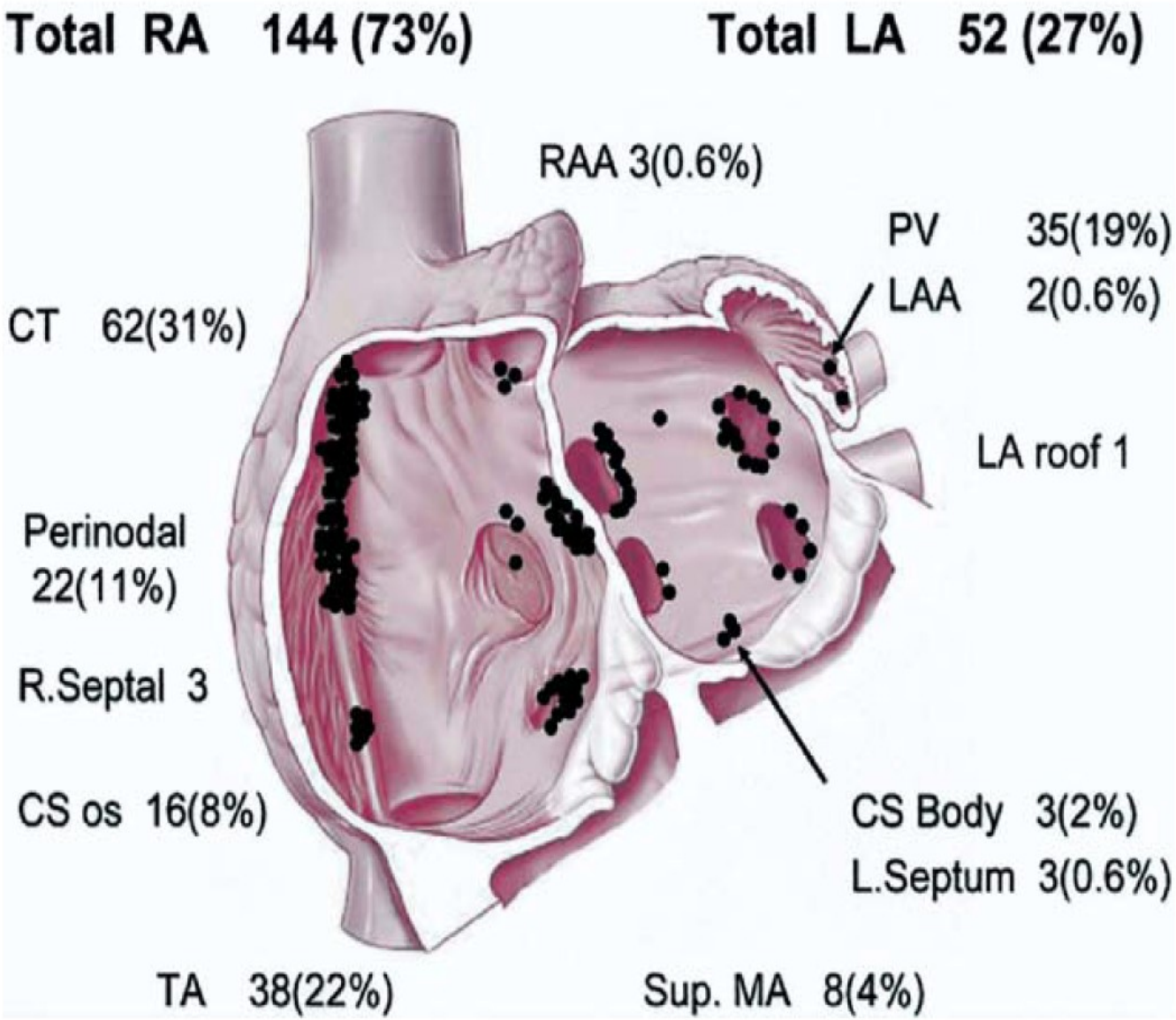
Bedankt voor de aandacht

Fetal heart		Adult heart	Abnormal development/ Arrhythmia
OFT transitional zone		RVOT/LVOT	Idiopathic ectopy/ ventricular tachycardia from RVOT
Right venous valve		Crista terminalis	Atrial flutter/ Atrial tachycardia
Primary fold continuity with AV junction		Moderator band	Mahaim tachycardia
Myocardial continuity AV canal		Annulus fibrosus	Accessory pathways: AVRT/WPW
	?	AVN compact part, transitional zone, inferior nodal extension	Congenital AV block AV nodal reentry tachycardia
Myocardium surrounding right cardinal vein		SAN Myocardial sleeve superior caval vein and coronary sinus	Sick sinus syndrome Inappropriate sinus tachycardia Atrial fibrillation/ tachycardia
Myocardium surrounding left cardinal vein		Marshall ligament/ vein Peristent left superior caval vein	Atrial fibrillation/ Atrial tachycardia
Myocardium surrounding pulmonary veins		Myocardial sleeve pulmonary veins	Atrial fibrillation/ Atrial tachycardia





M.R.M. Jongbloed et al. / Differentiation 84 (2012) 131–148


Total RA 144 (73%)
Total LA 52 (27%)
RAA 3(0.6%)
PV 35(19%)
LAA 2(0.6%)
CT 62(31%)
LA roof 1
Perinodal 22(11%)
R.Septal 3
CS os 16(8%)
CS Body 3(2%)
L.Septum 3(0.6%)
TA 38(22%)
Sup. MA 8(4%)

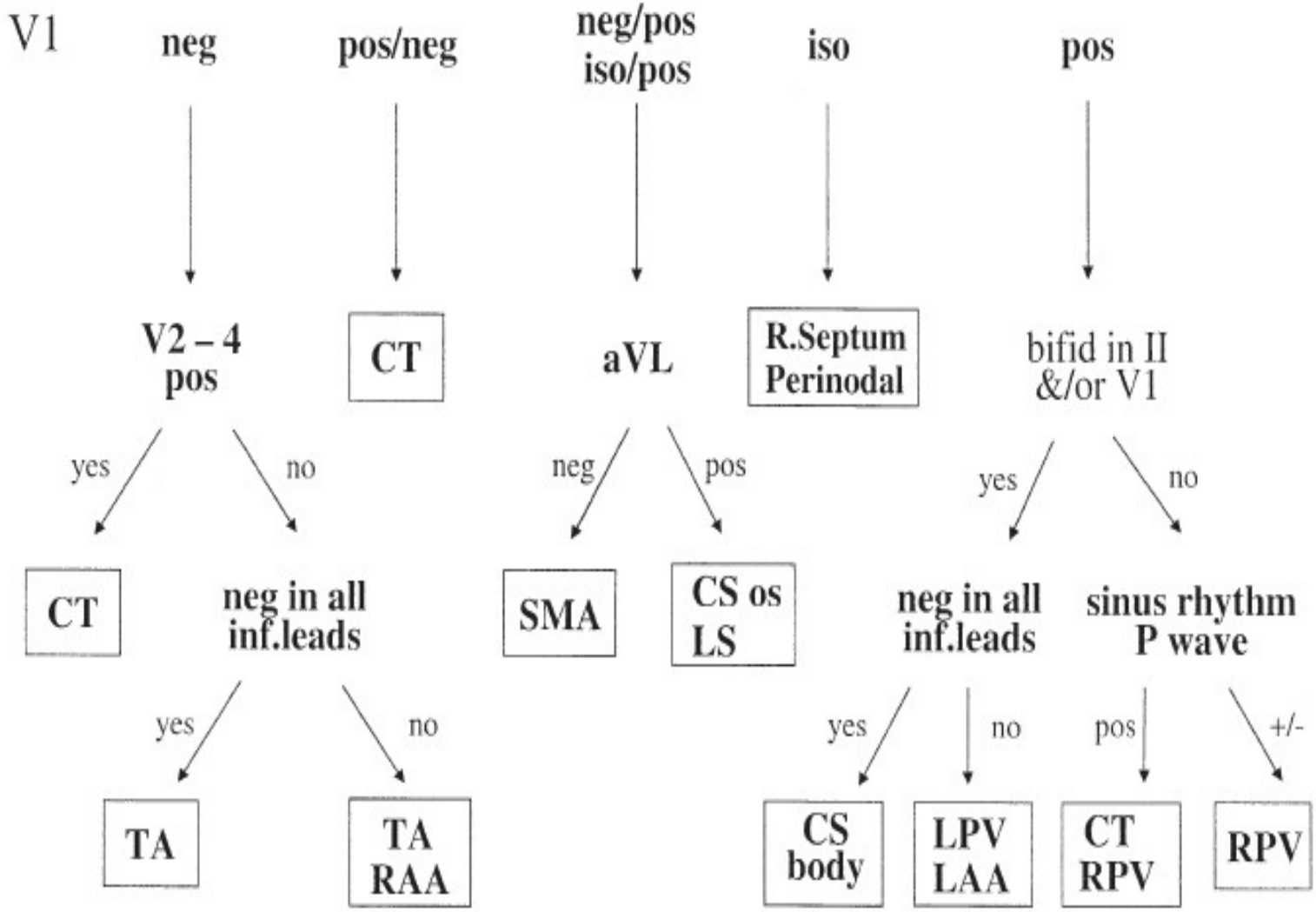


Figure 6. A P-wave algorithm constructed on the basis of findings from 130 atrial tachycardias correctly localized the focus in 93%. Abbreviation
Figure 1.

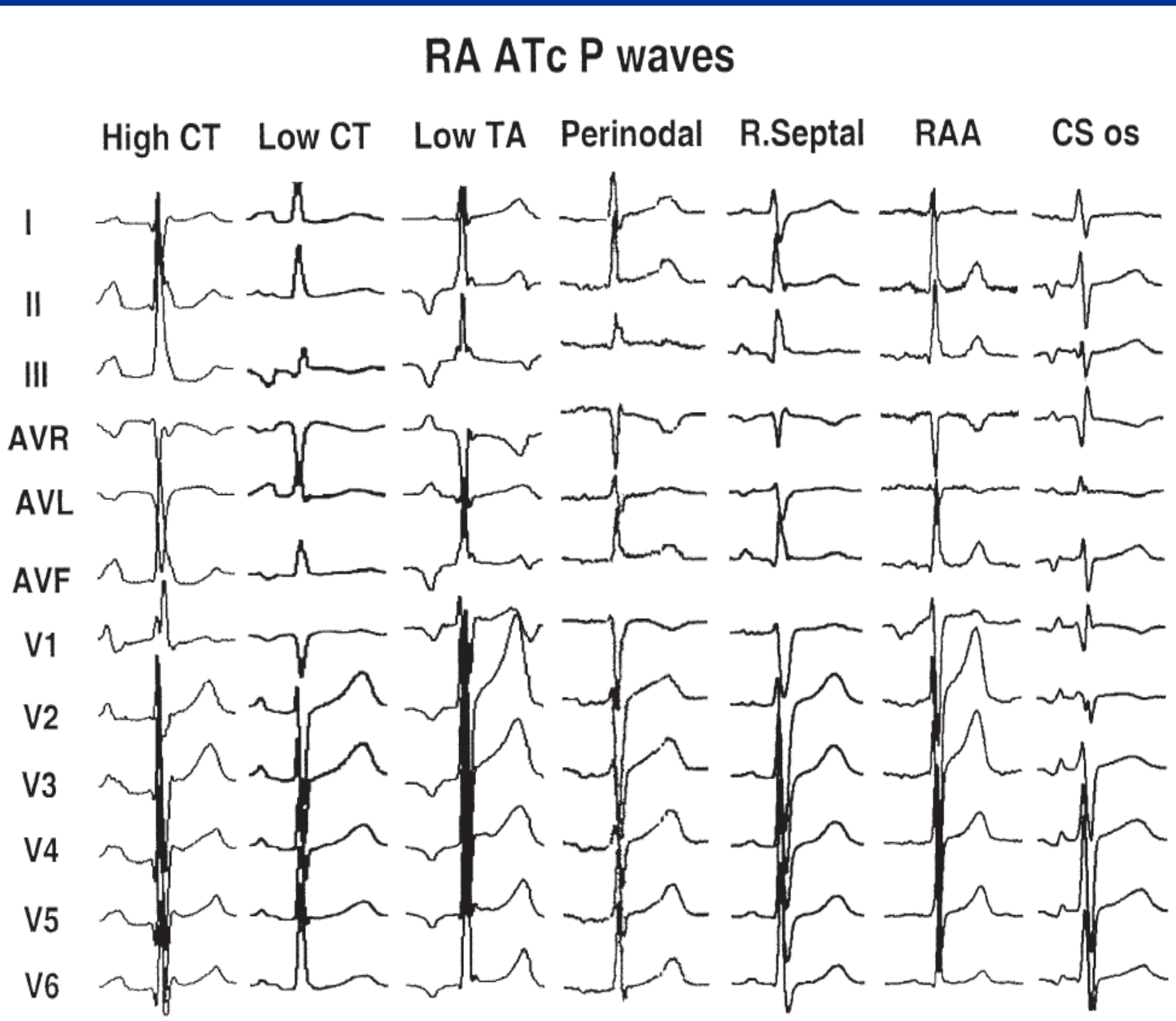


Figure 3. Representative examples of the tachycardia P-wave from right atrial sites. Abbreviations as in Figure 1.