

RFCA 적응증

Korea University Cardiovascular Center

Hong Euy Lim, M.D., Ph.D. / Young-Hoon Kim, M.D., Ph.D.

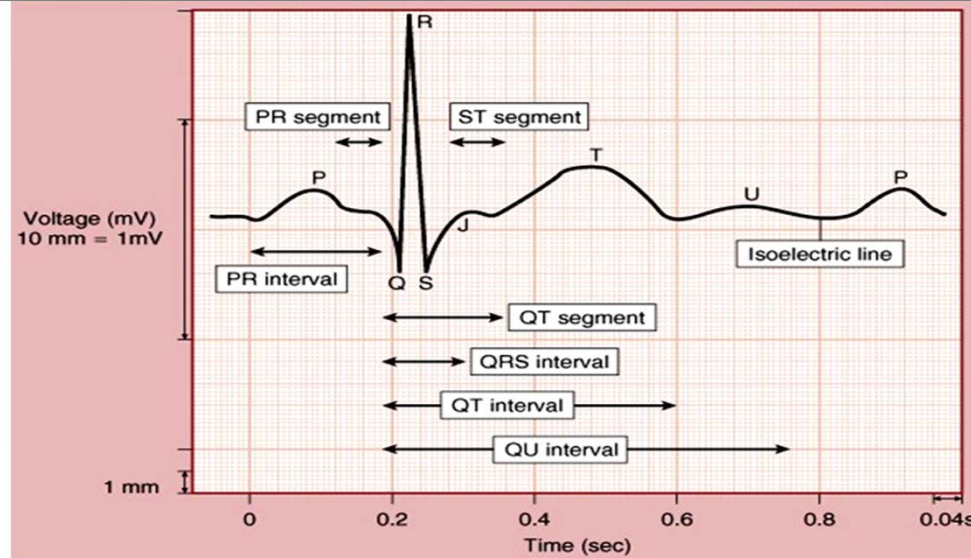
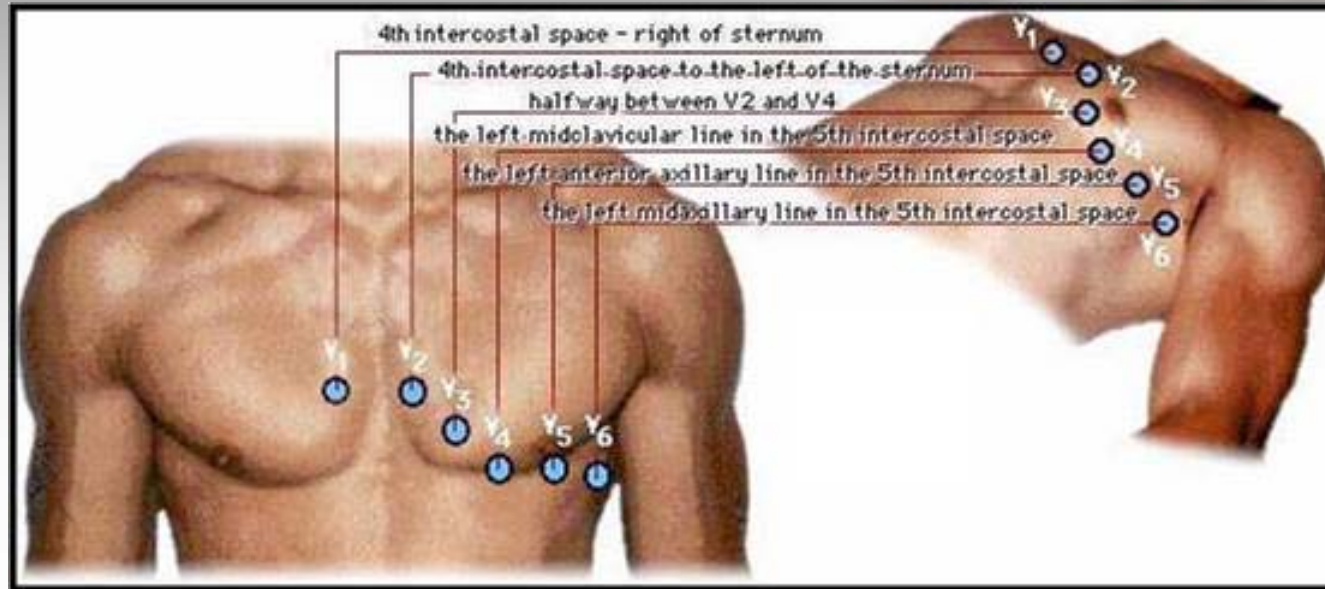
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- 전기생리학 검사란?
- 전극도자 절제술이란?
- 전극도자 절제술의 적응증

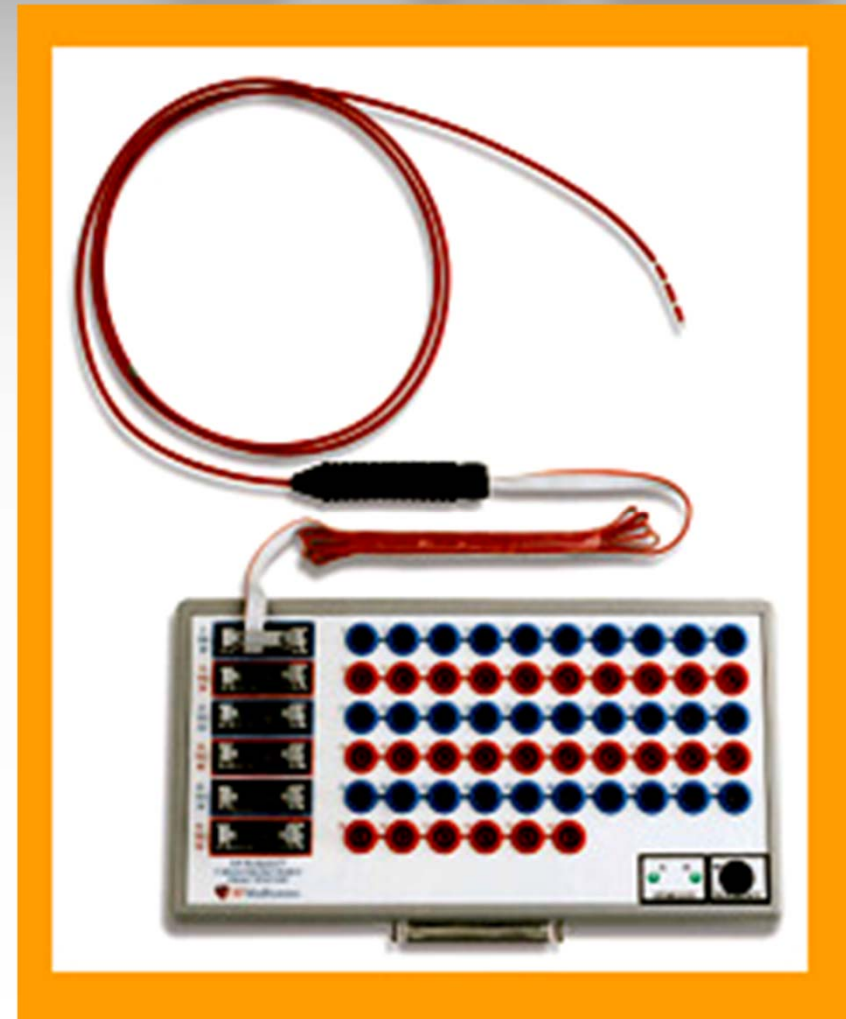
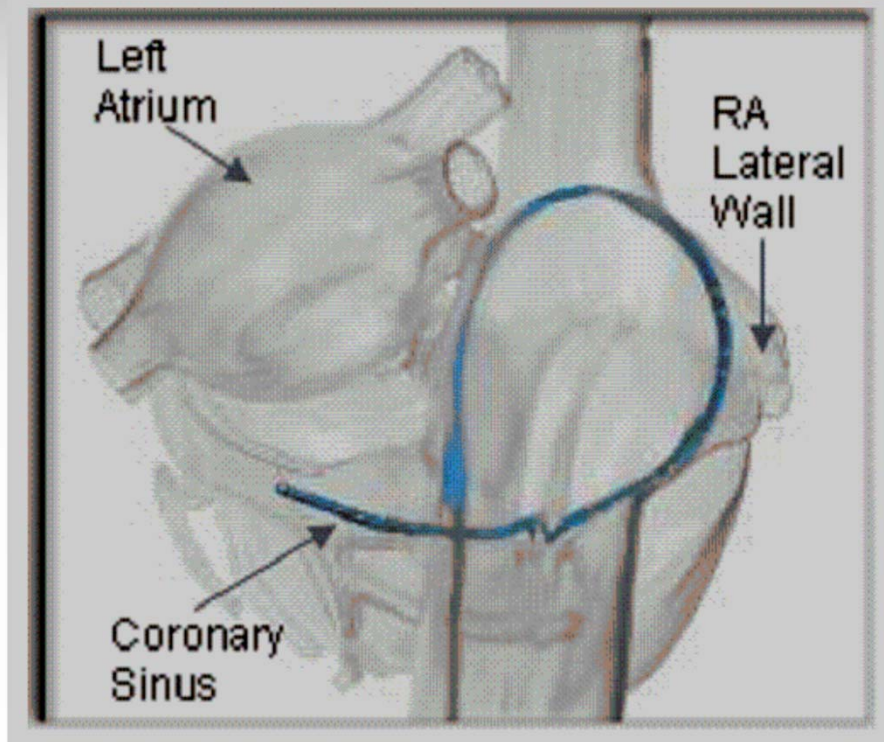
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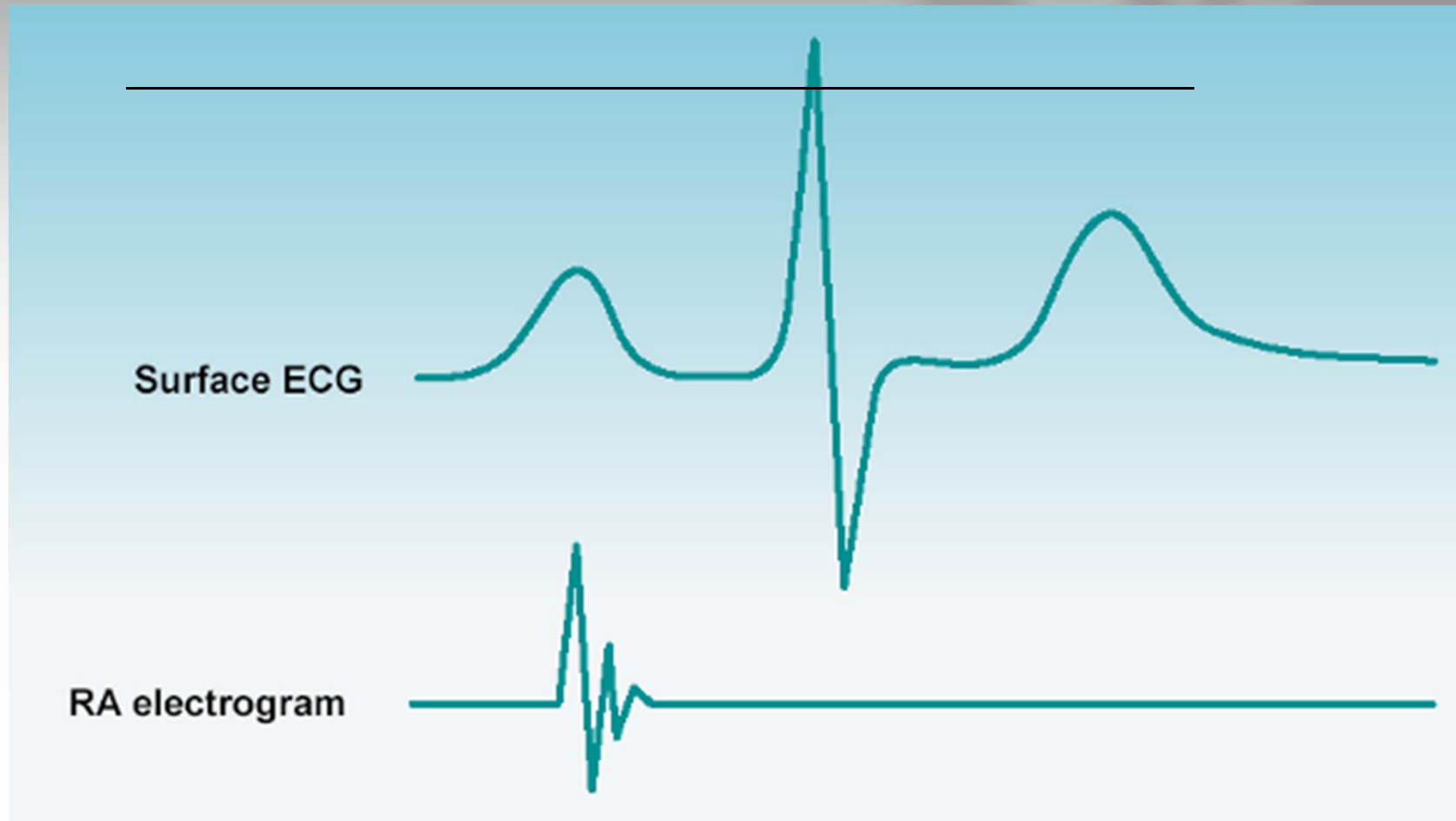
심전도



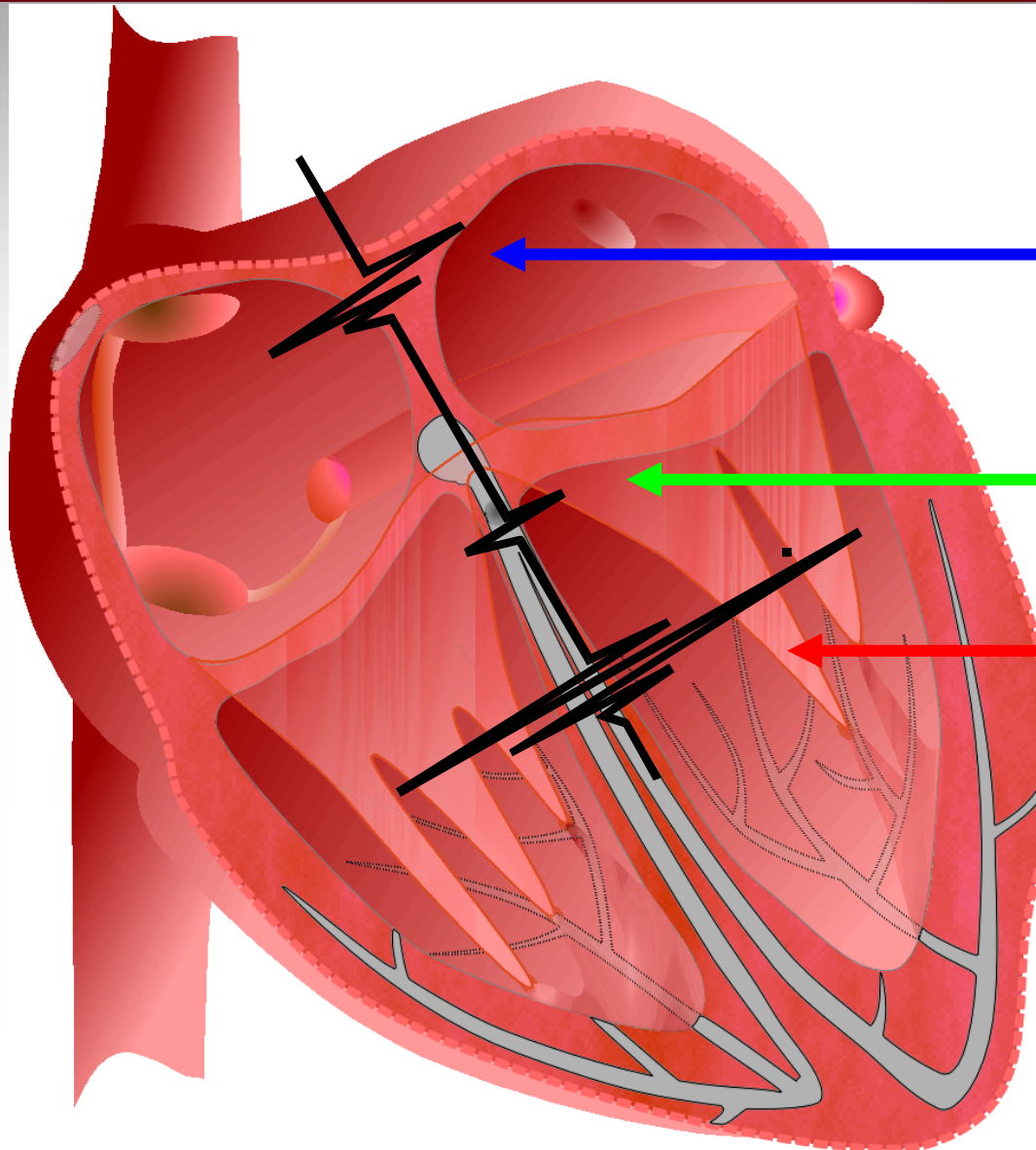
전기생리학 검사



Intracardiac Electrogram



Intracardiac ECG



A-Wave = HRA

His potential = His

V Wave = CS (LBB)
& RVa (RBB)

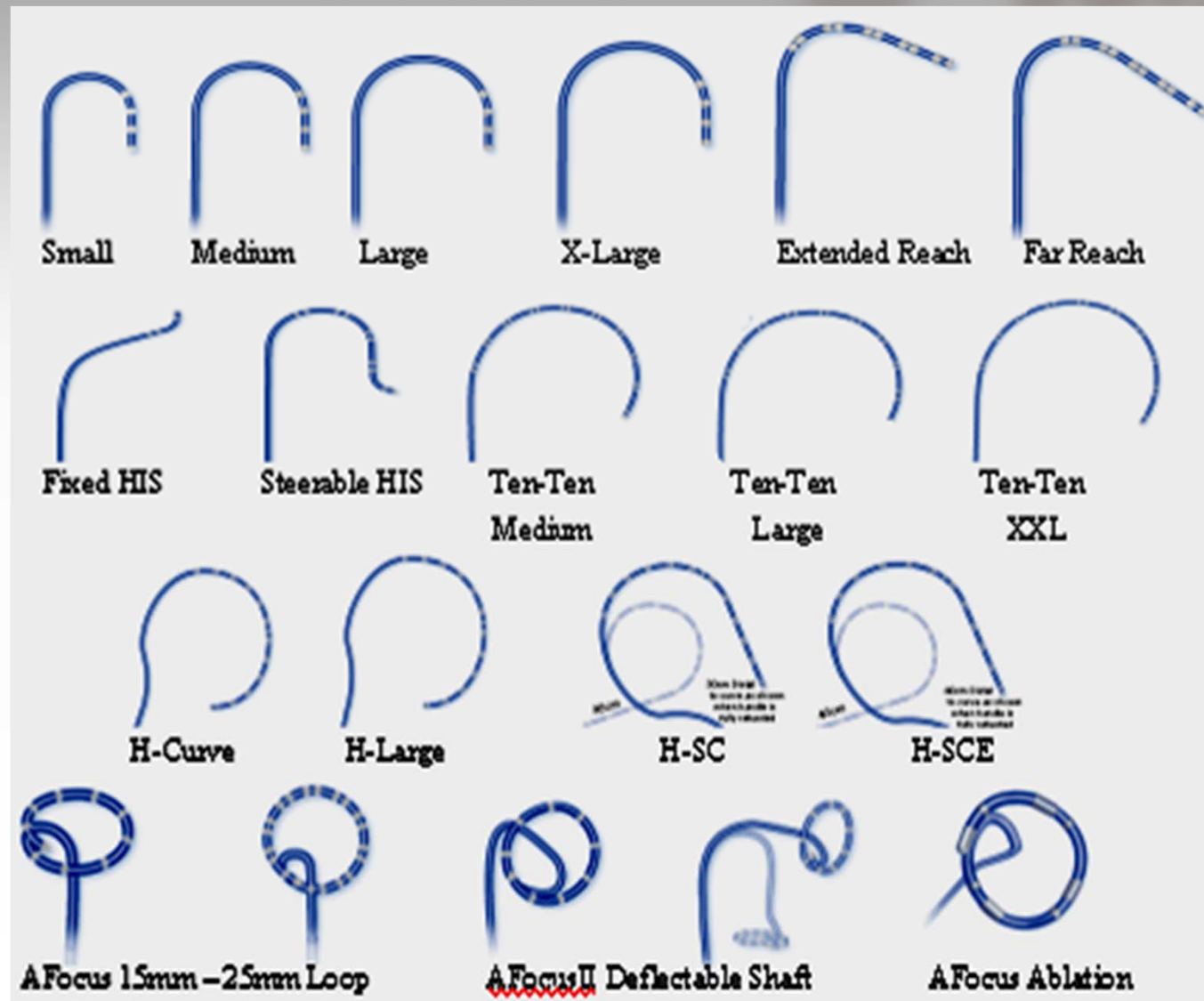
Pacing and Recording

Pacing

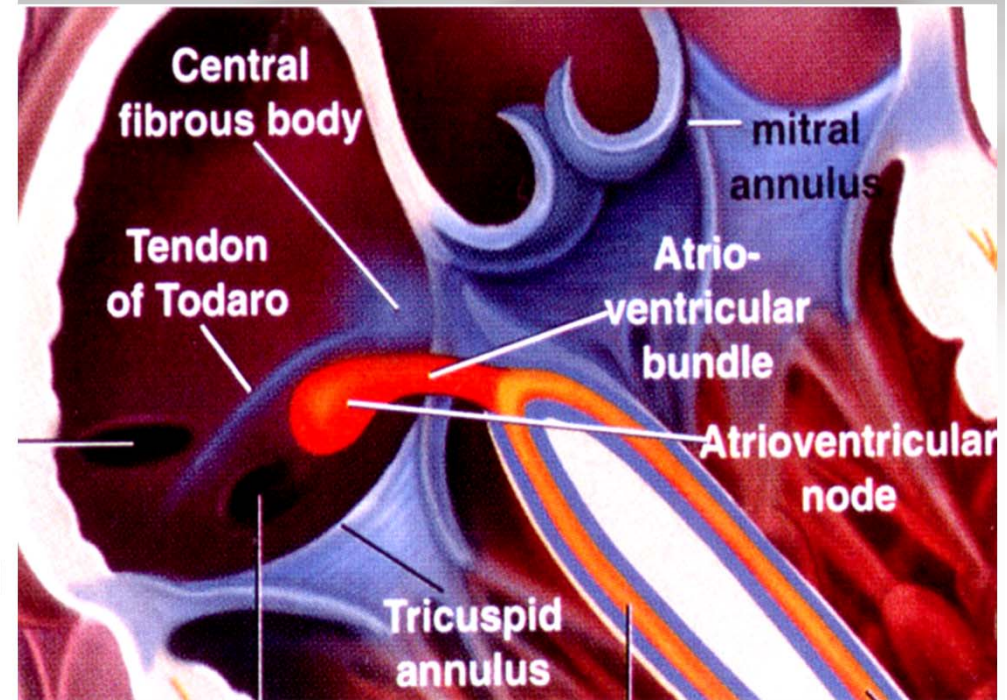
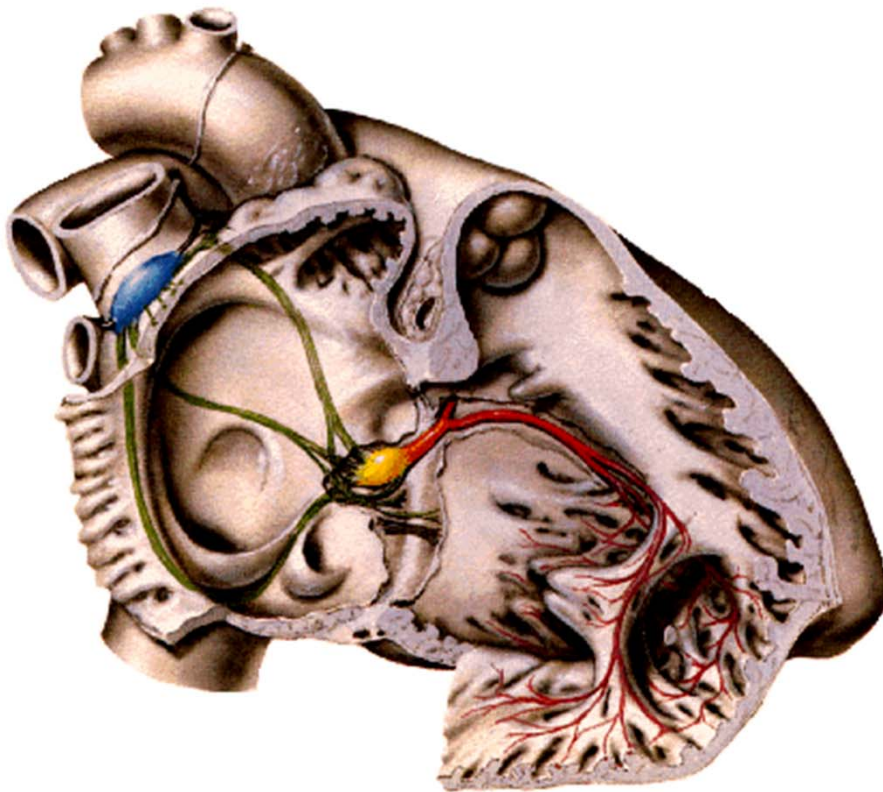
Recording



Types of Catheters

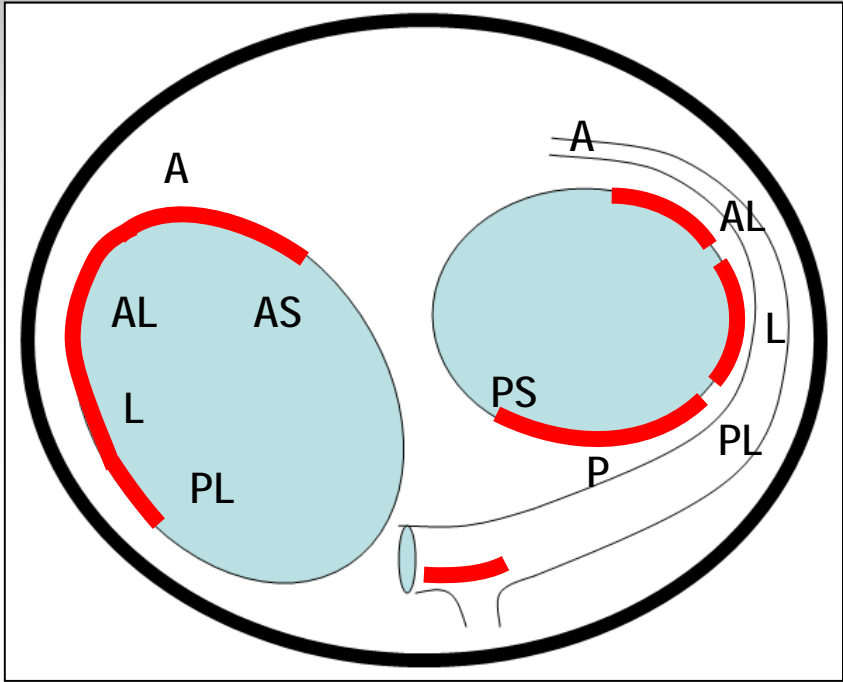


Conducting System

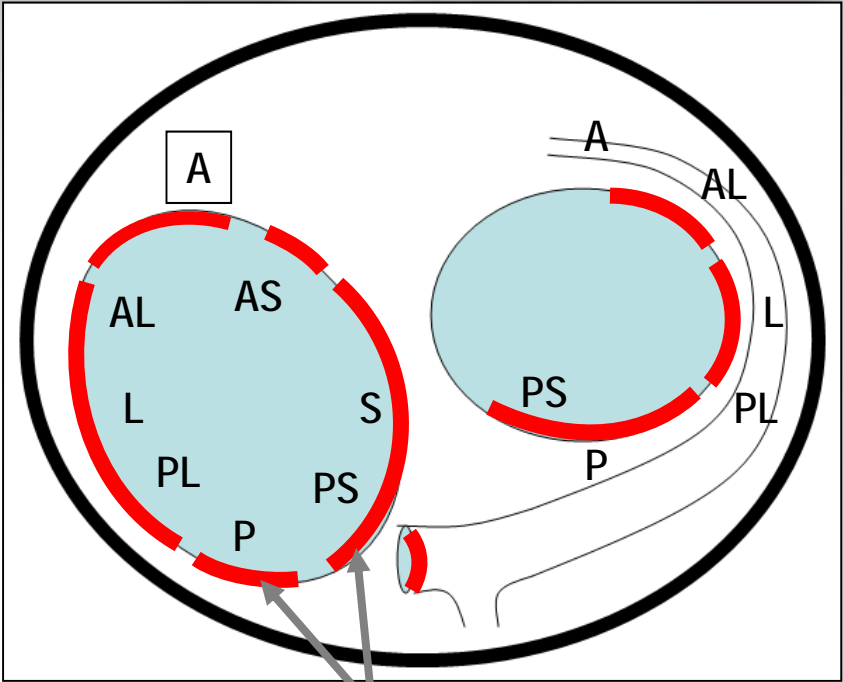


Location of Bypass Tract

Below the Valve and Inside the CS



Above the Valve

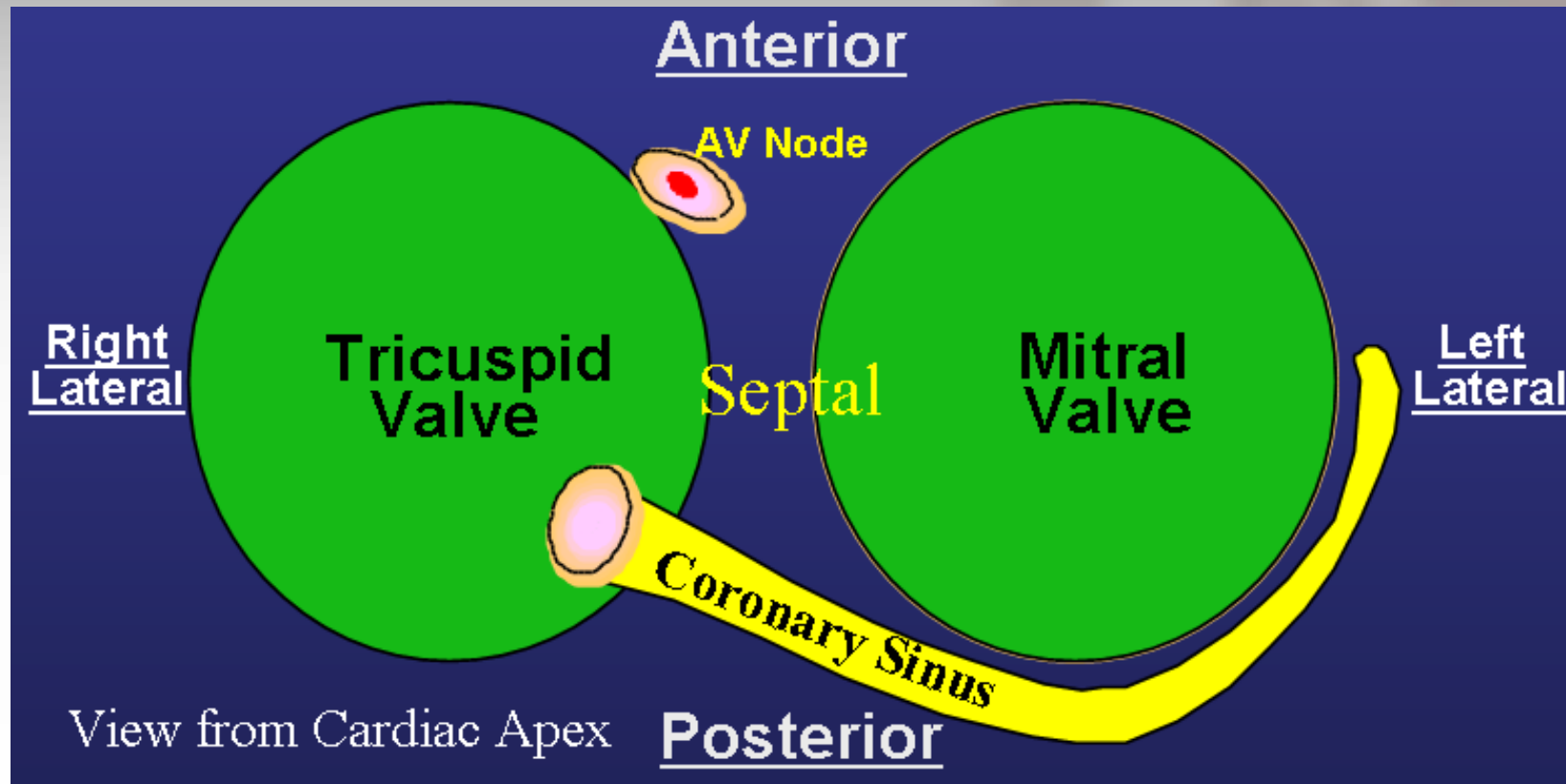


- A: Anterior
- AL: Anterolateral
- L: Lateral
- PL: Posterolateral
- P: Posterior
- PS: Posteroseptal
- S: Septal
- AS: Anteroseptal

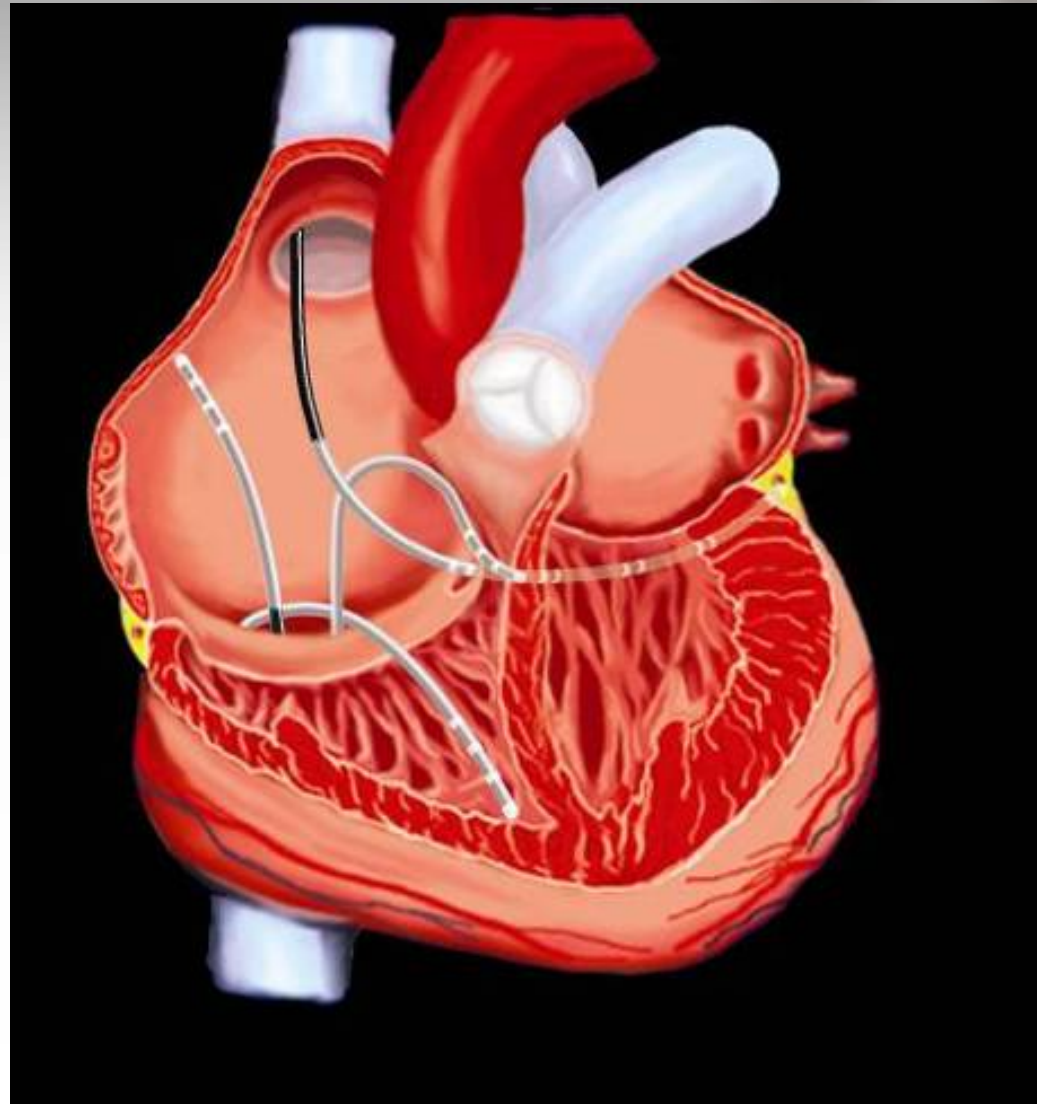
AVNRT
Flutter
P & PS WPW

LAO View

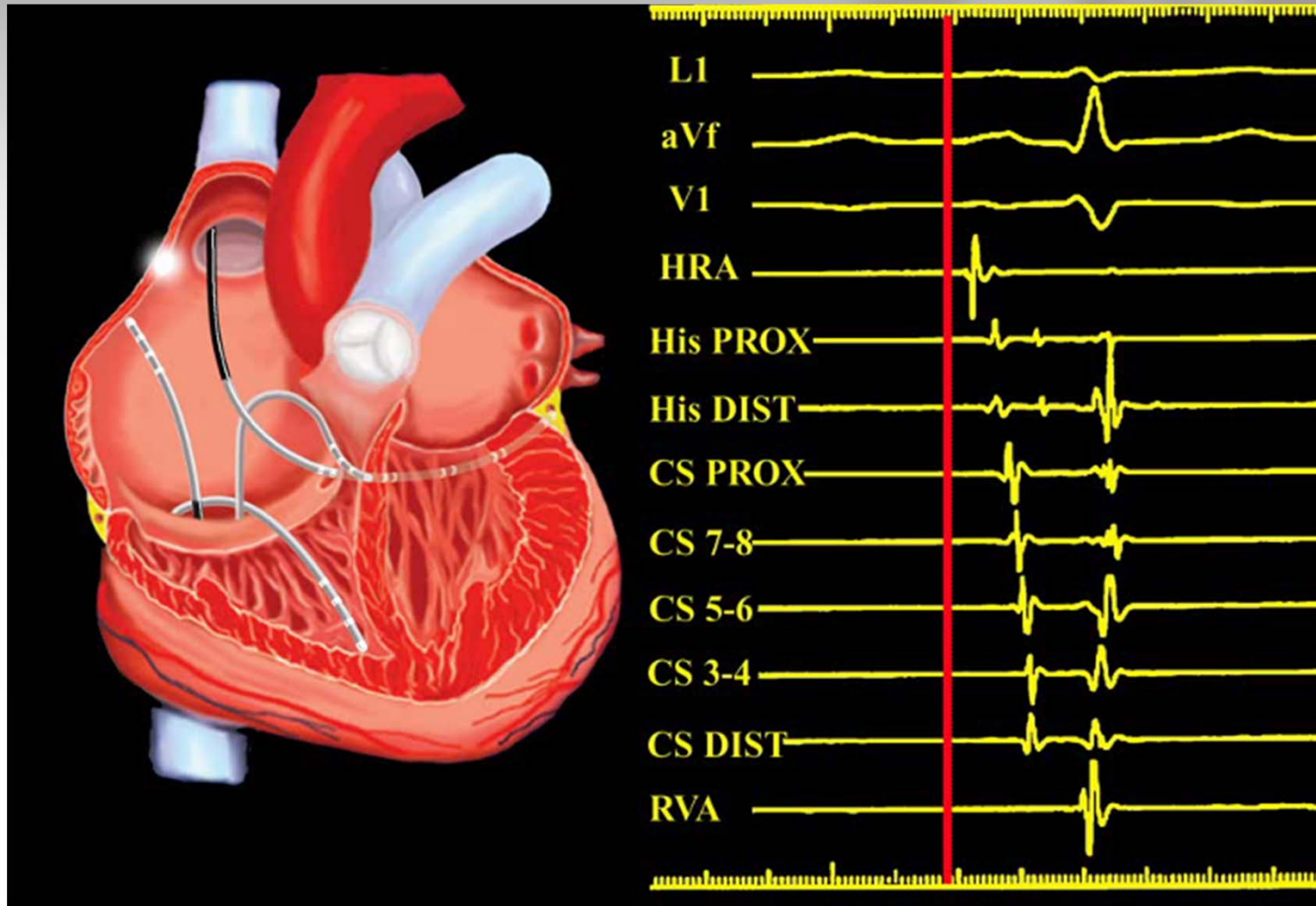
Common Location of Catheters



Catheter Position



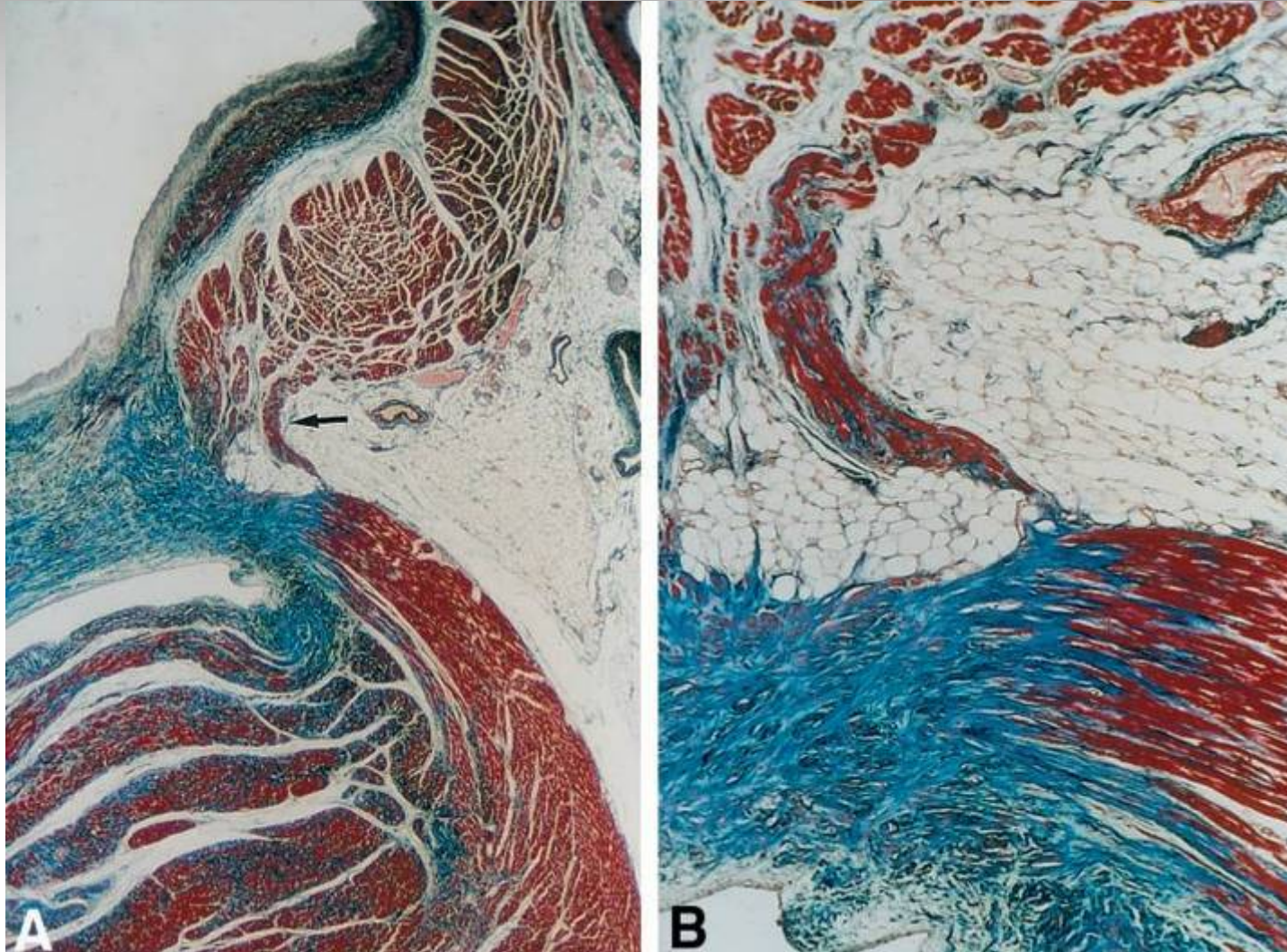
Intracardiac ECG



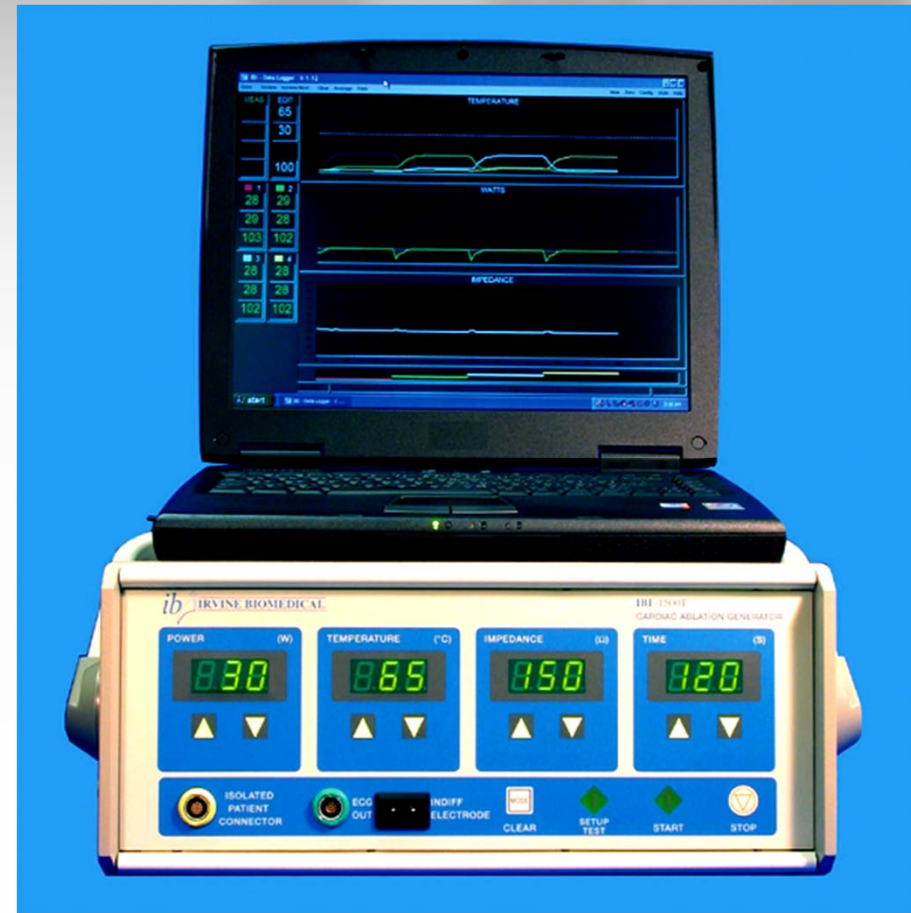
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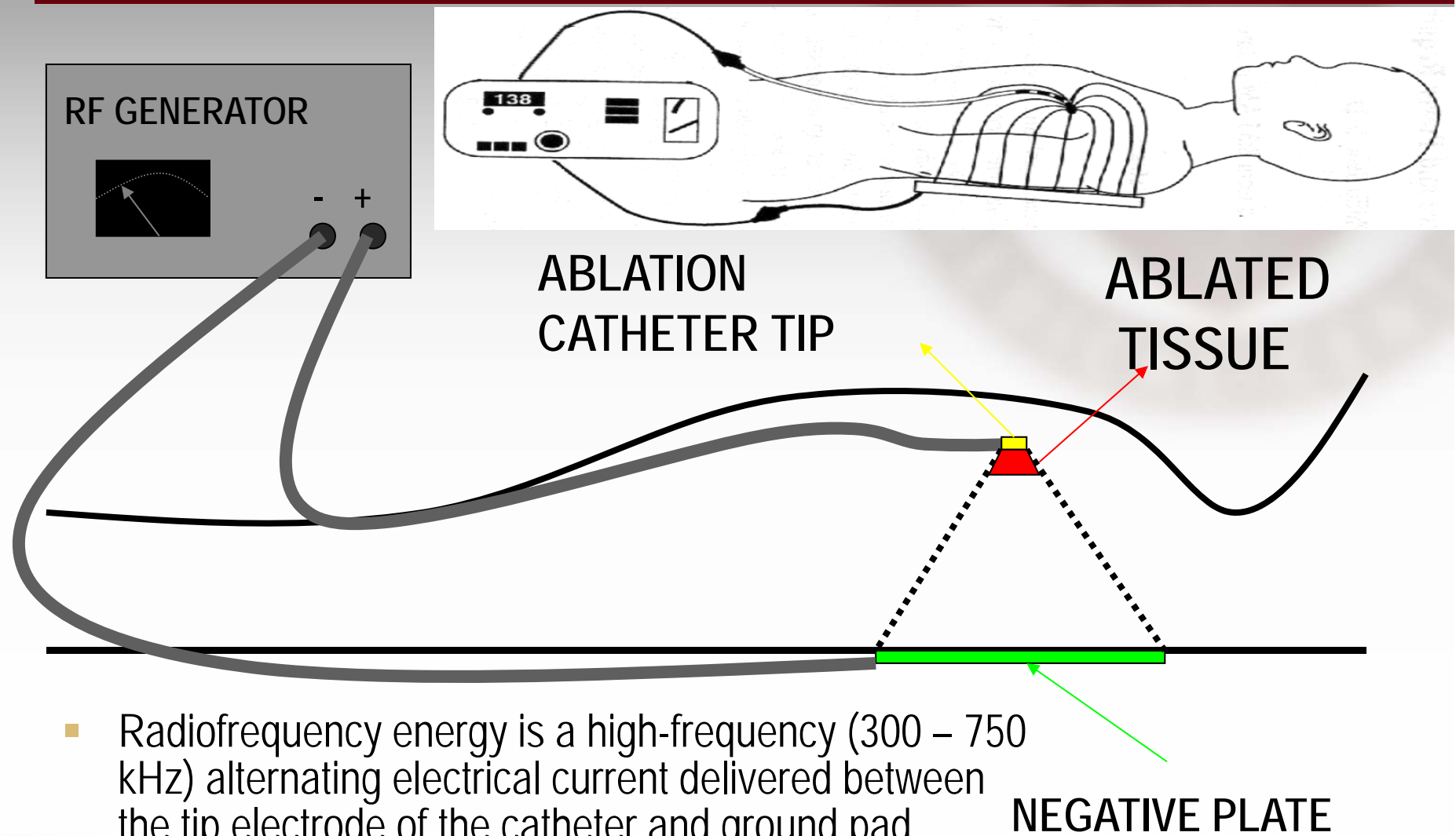
Bypass Tract



Catheter Ablation



Radiofrequency Ablation



- Radiofrequency energy is a high-frequency (300 – 750 kHz) alternating electrical current delivered between the tip electrode of the catheter and ground pad located on the patient's skin.

Ablation Catheters



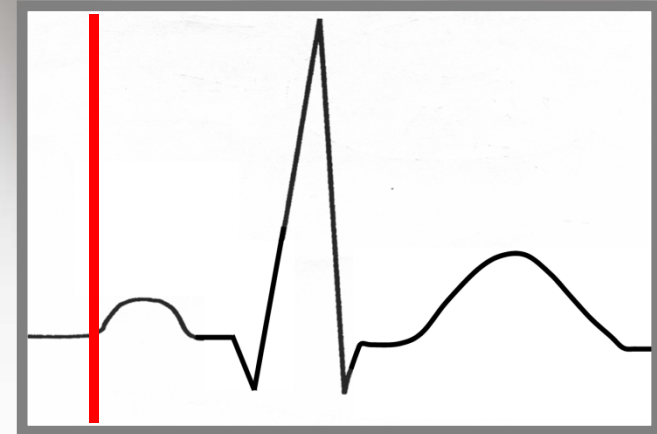
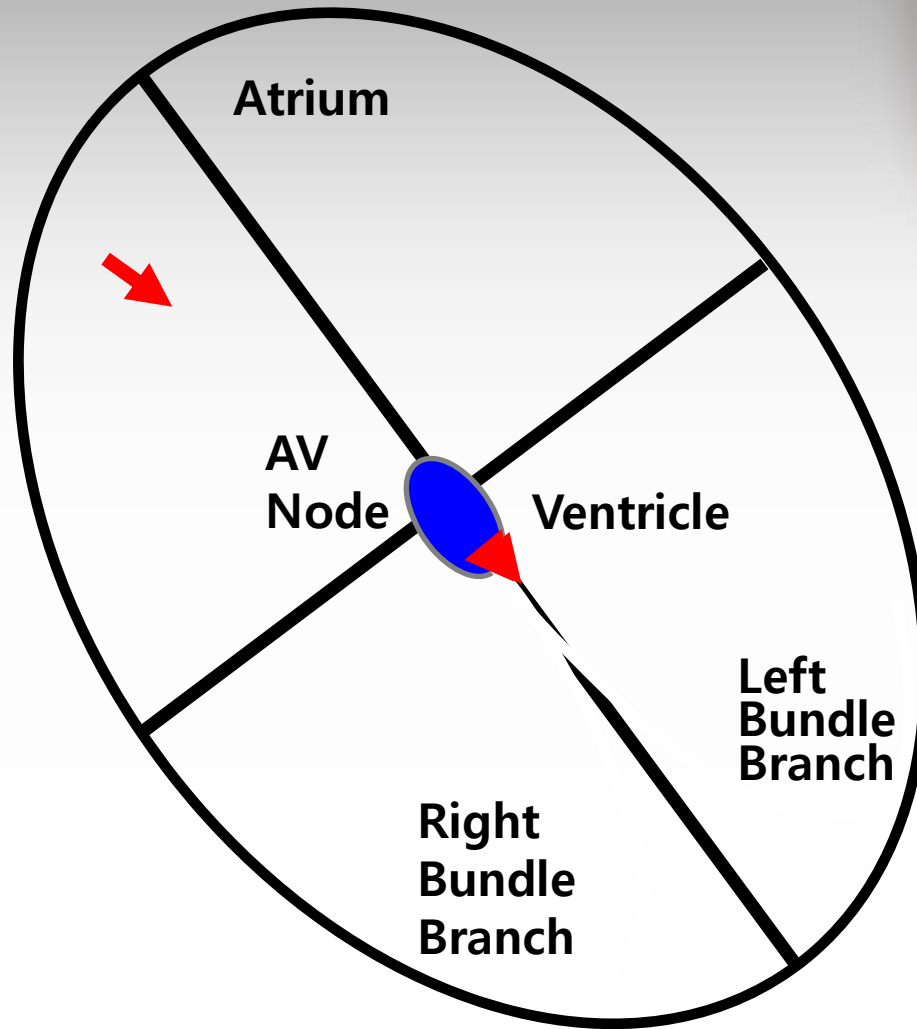
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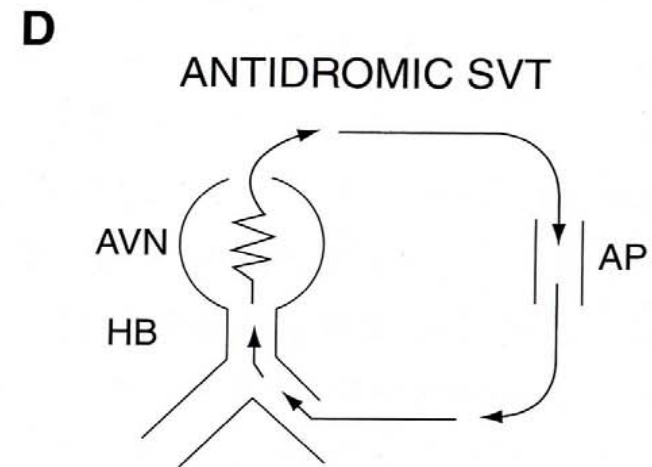
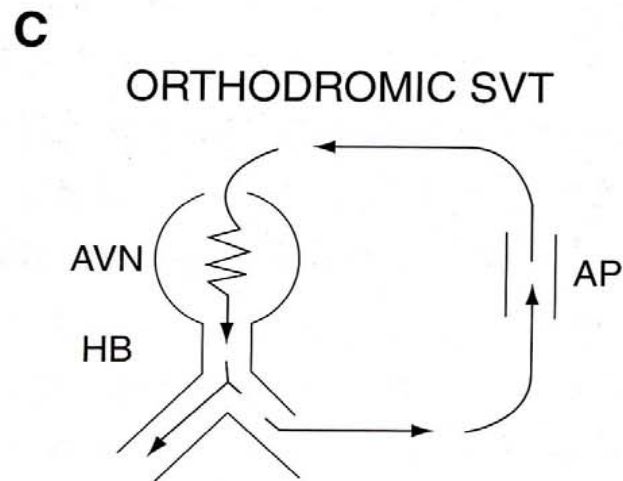
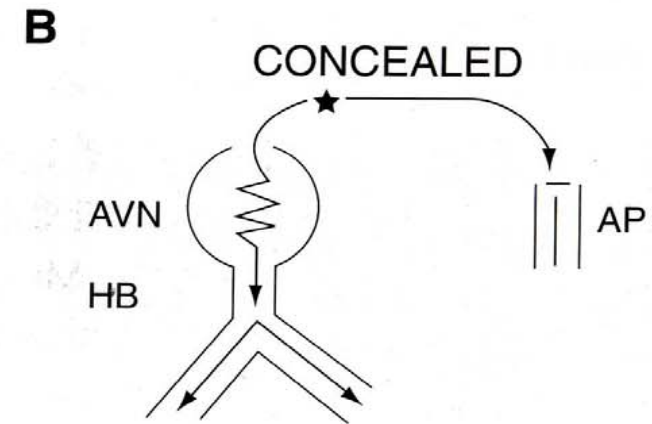
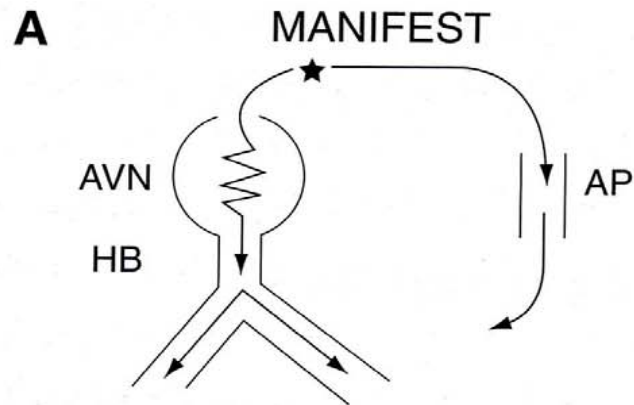
Bypass Tract

Arrhythmia	Recommendation	Class	Evidence
WPW syndrome (pre-excitation and symptomatic arrhythmias), well tolerated	Catheter ablation	I	B
	Flecainide, propafenone	II a	C
	Sotalol, amiodarone, beta blockers	II a	C
	Verapamil, diltiazem, digoxin	III	C
WPW syndrome (with AF and rapid-conduction or poorly tolerated AVRT)	Catheter ablation	I	B
AVRT, poorly tolerated (no pre-excitation)	Catheter ablation	I	B
	Flecainide, propafenone	II a	C
	Sotalol, amiodarone	II a	C
	Beta blockers	II b	C
	Verapamil, diltiazem, digoxin	III	C
Single or infrequent AVRT episode(s) (no Pre-excitation)	None	I	C
	Vagal maneuvers	I	B
	“pill-in-the-pocket” _____		
	Verapamil, diltiazem, beta blockers	I	B
	Catheter ablation	II a	B
	Sotalol, amiodarone	II b	B
	Flecainide, propafenone	II b	C
	Digoxin	III	C
Pre-excitation, asymptomatic	None	I	C
	Catheter ablation	II a	B

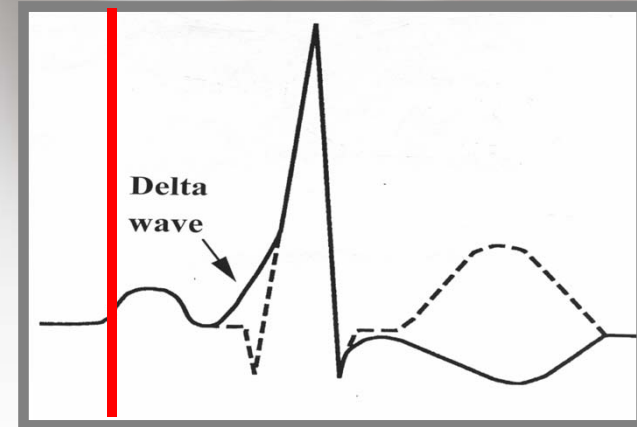
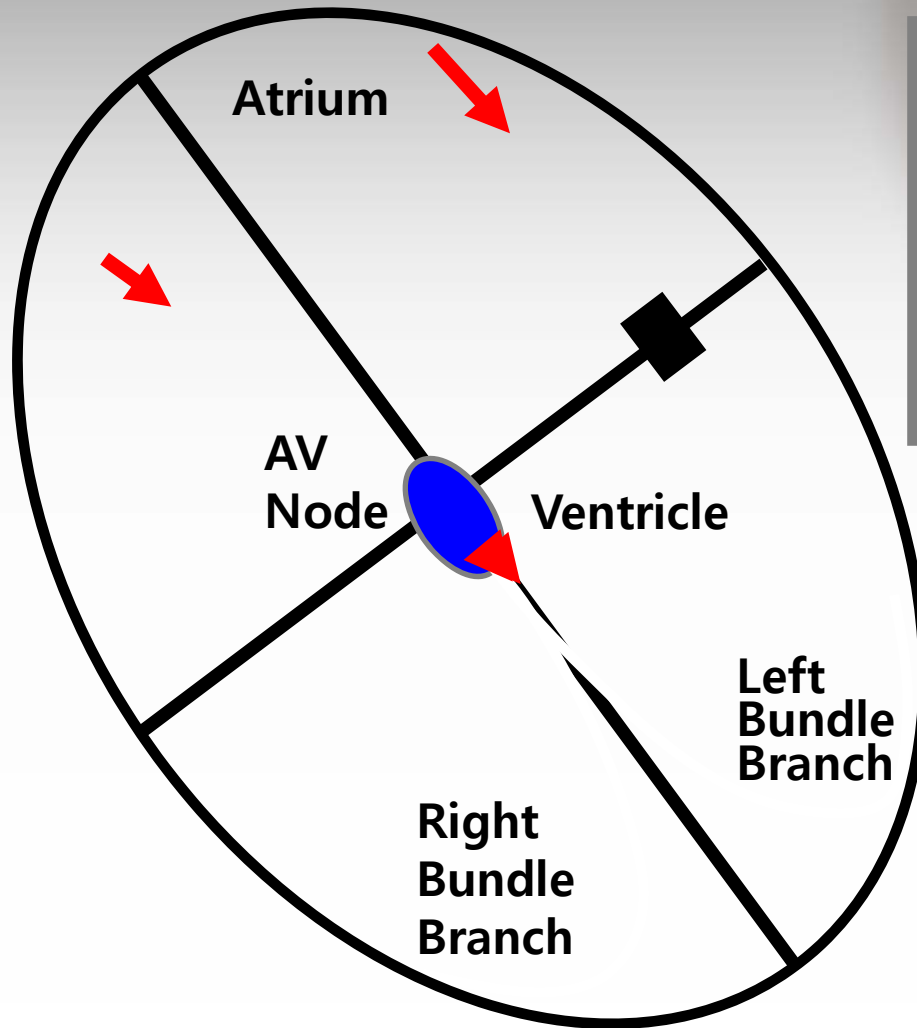
Sinus Rhythm



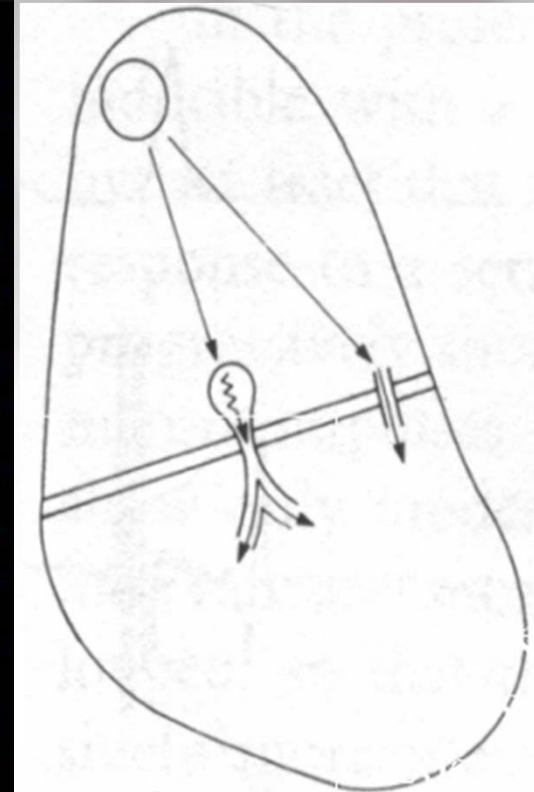
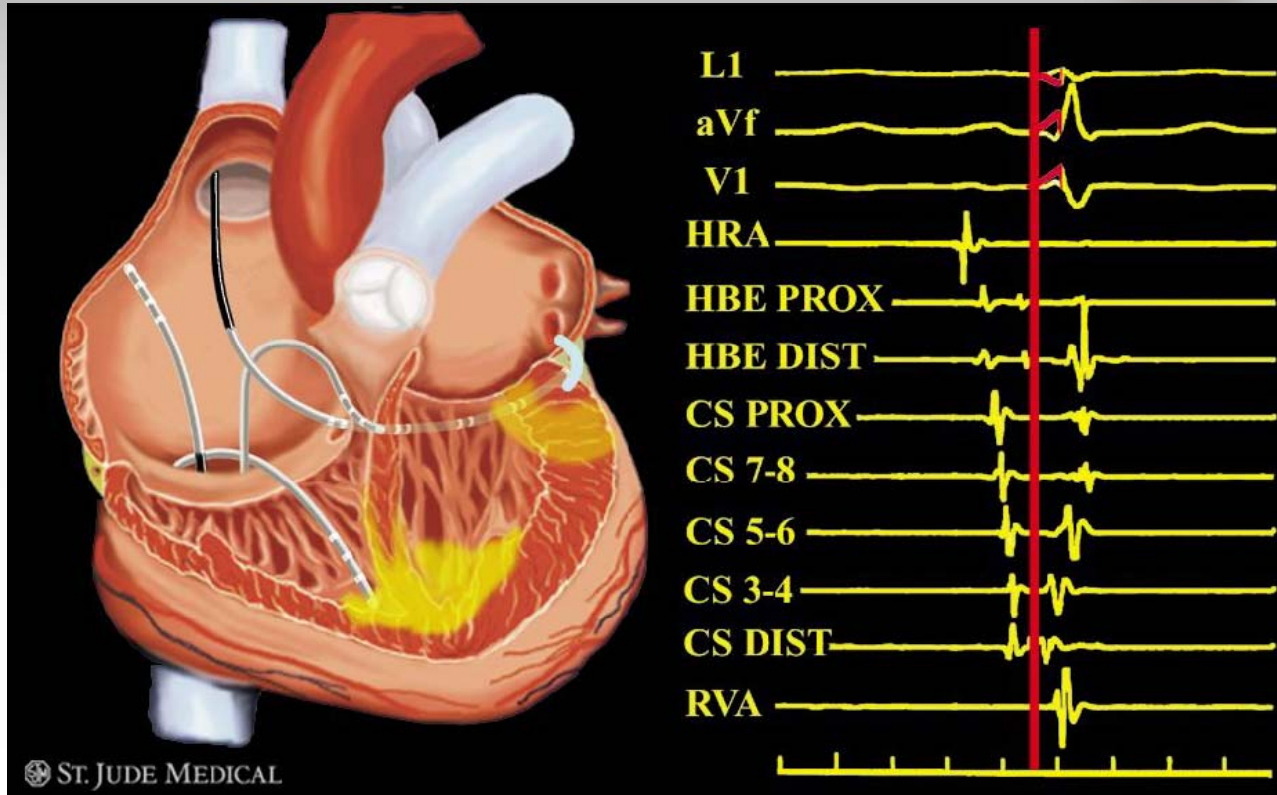
AVRT



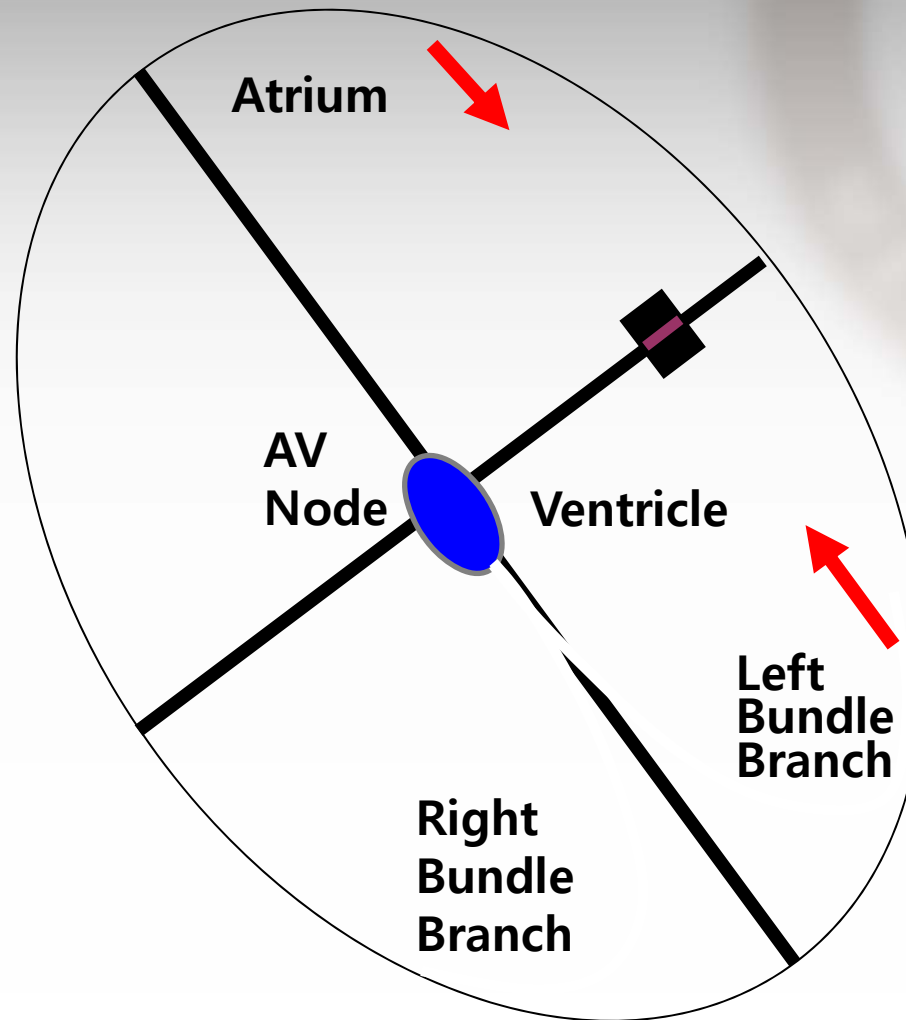
Delta Wave



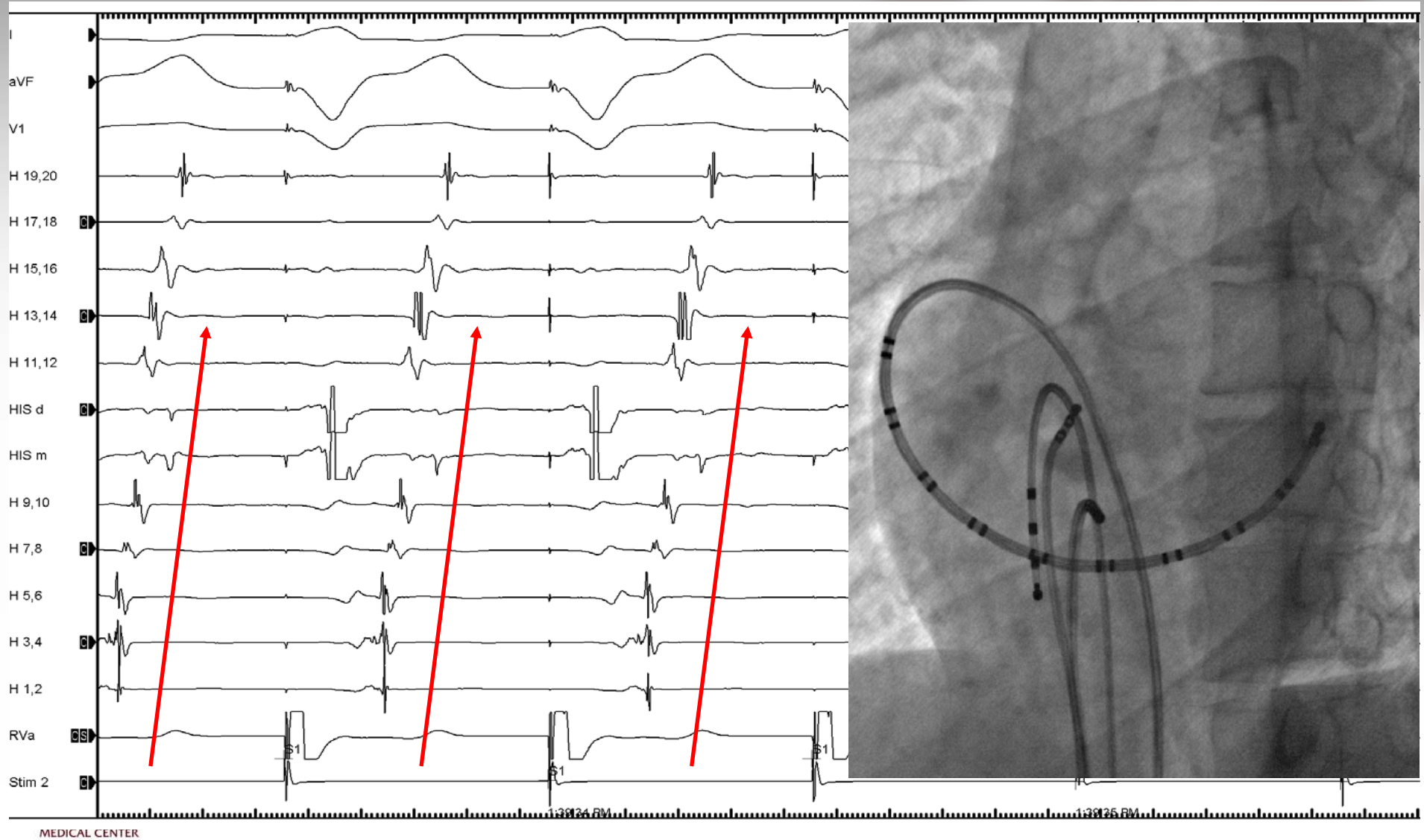
Pre-excitation



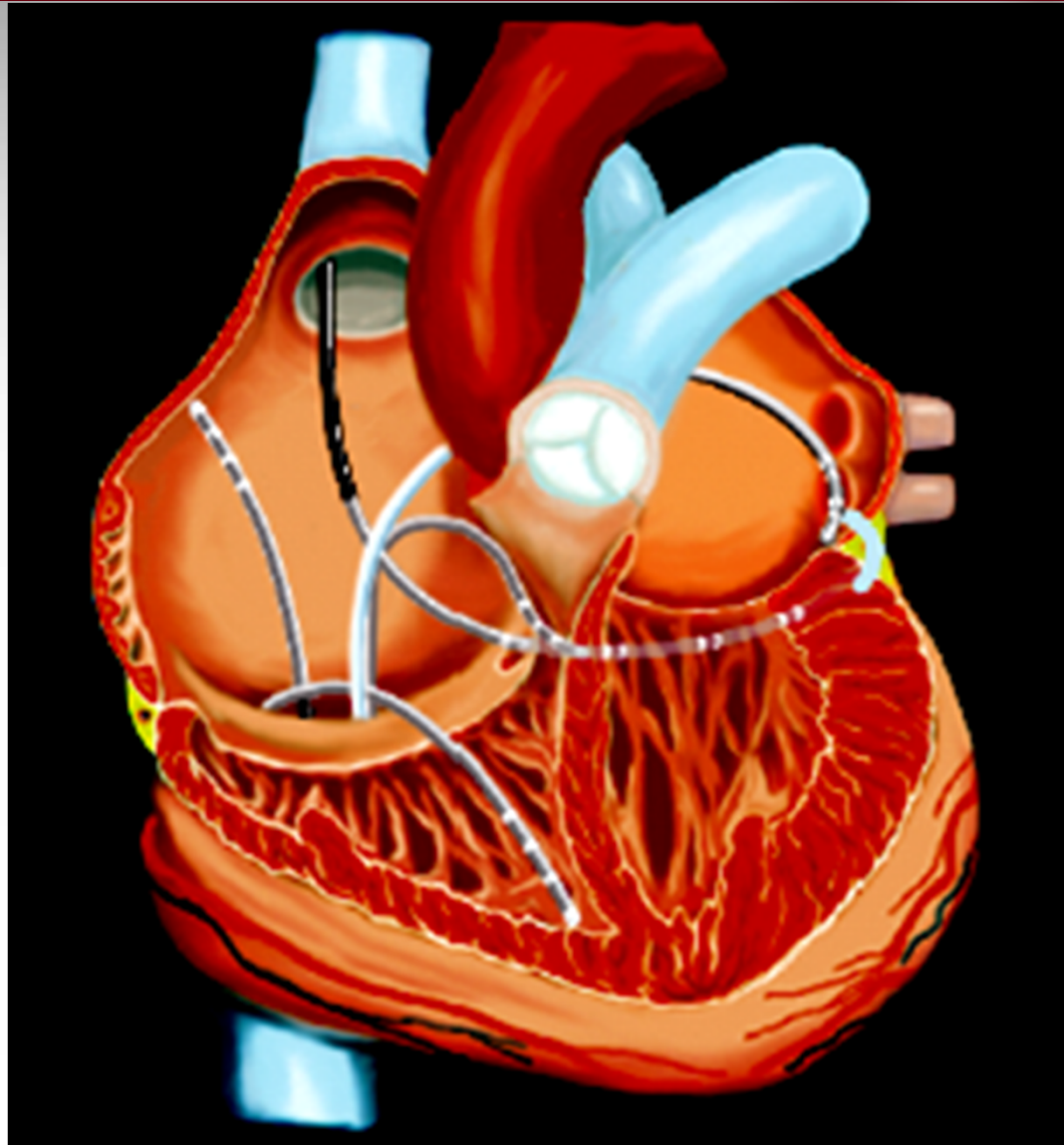
Concealed Bypass Tract



V Pacing



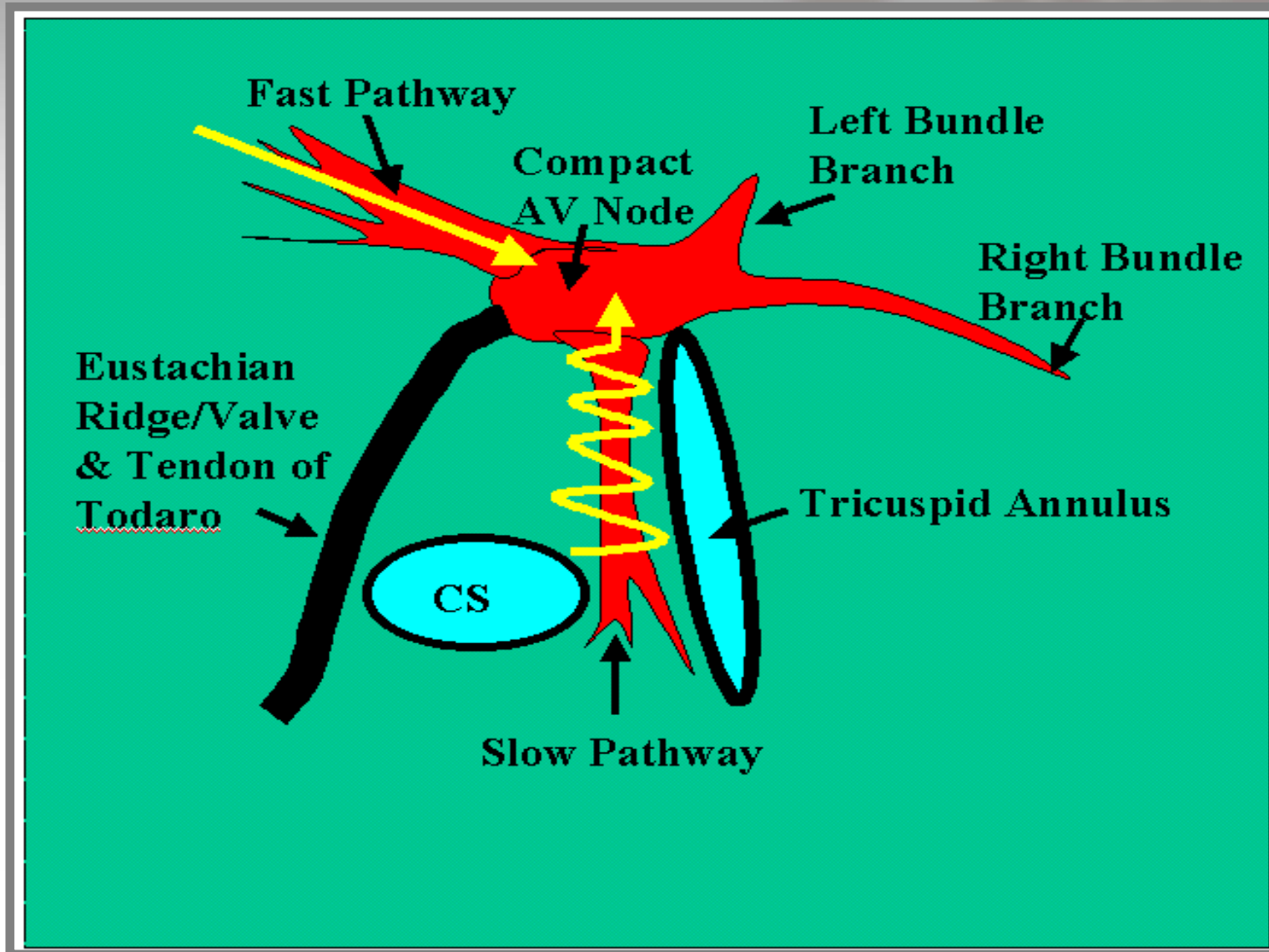
Position of Ablation Catheter



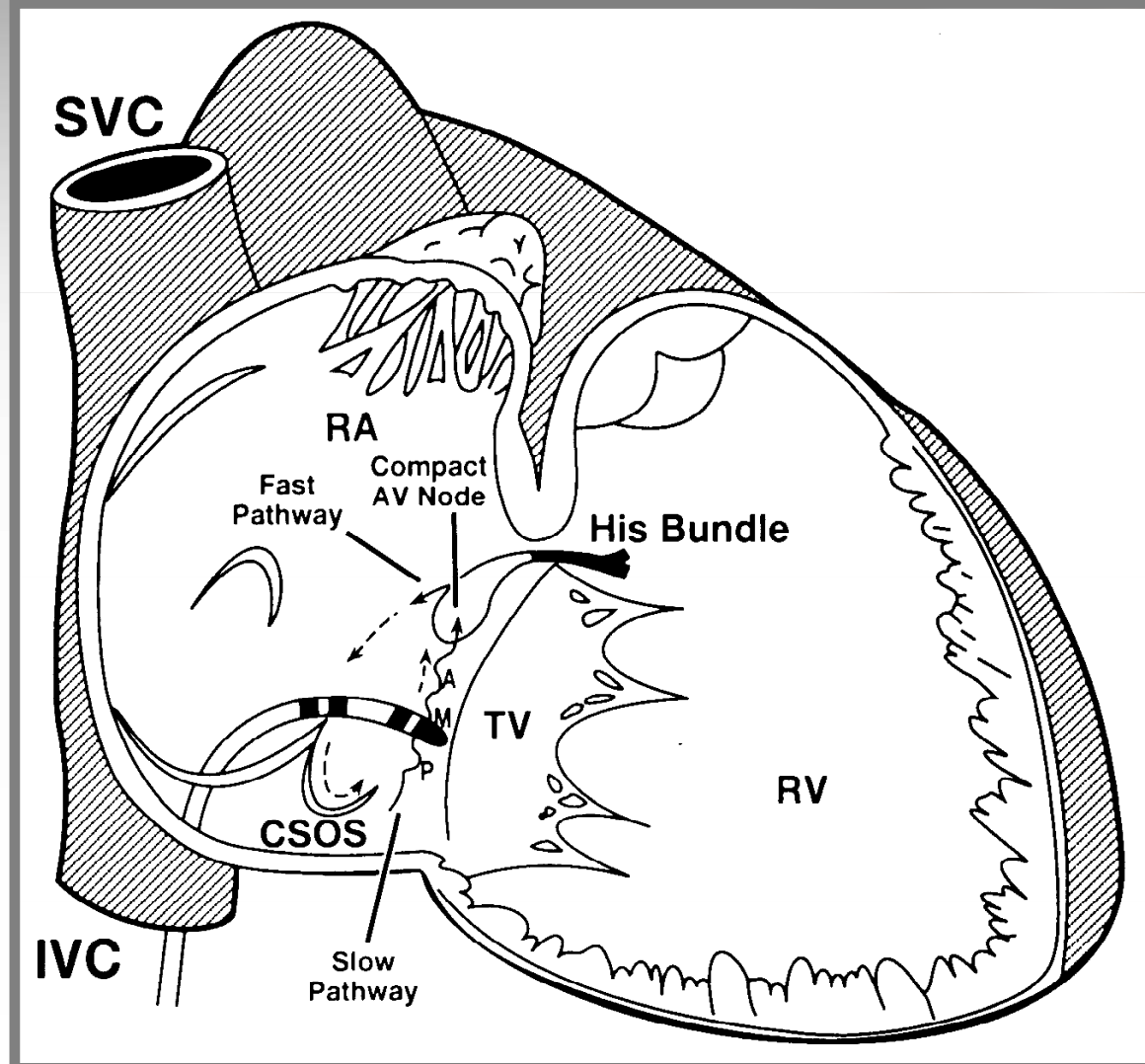
AVNRT

Clinical Presentation	Recommendation	Class	Level of Evidence
Poorly tolerated AVNRT with hemodynamic intolerance	Catheter ablation	I	B
	Verapamil, diltiazem, beta blockers, sotalol, amiodarone	II a	C
	Flecainide,* propafenone*	II a	C
Recurrent symptomatic AVNRT	Catheter ablation	I	B
	Verapamil	I	B
	Diltiazem, beta blockers	I	C
	Digoxin†	II b	C
Recurrent AVNRT unresponsive to beta blockade or calcium-channel blocker and patient not desiring RF ablation	Flecainide,* propafenone,* sotalol	II a	B
	Amiodarone	II b	C
AVNRT with infrequent or single episode in patients who desire complete control of arrhythmia	Catheter ablation	I	B
Documented PSVT with only dual AV-nodal pathways or single echo beats demonstrated during electrophysiological study and no other identified cause of arrhythmia	Verapamil, diltiazem. Beta blockers, flecainide,* Propafenone*	I	C
	Catheter ablation‡	I	B
Infrequent, well-tolerated AVNRT	No therapy	I	C
	Vagal maneuvers	I	B
	Pill-in-the-pocket	I	B
	Verapamil, diltiazem, beta blockers	I	B
	Catheter ablation	I	B

Slow Pathway in Triangle of Koch



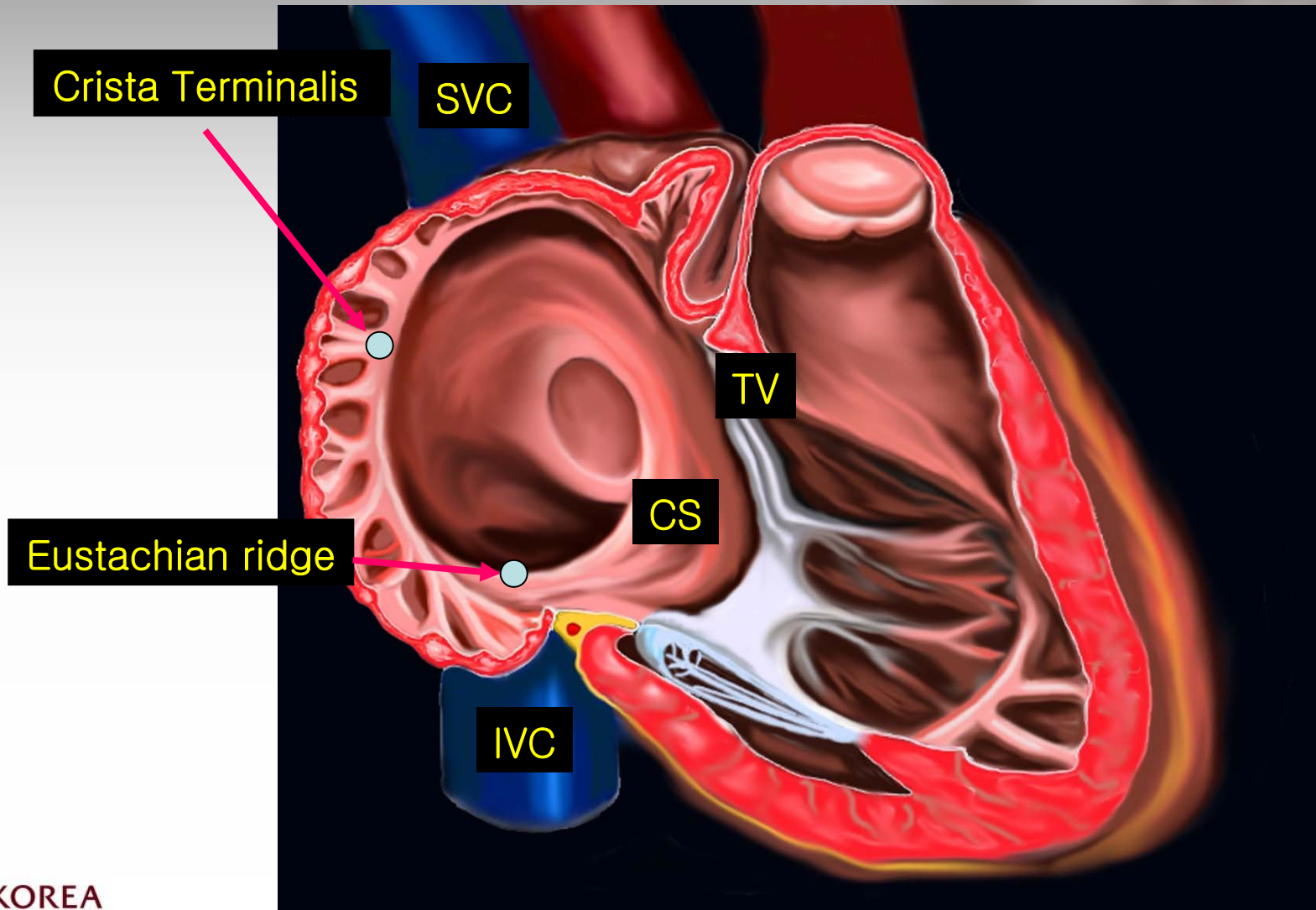
Position of Ablation Catheter



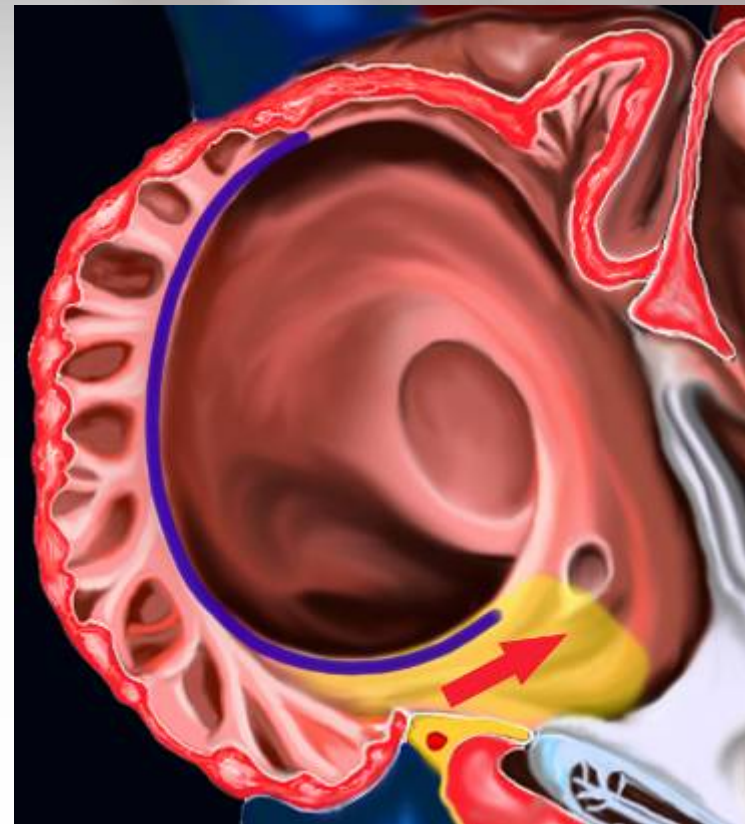
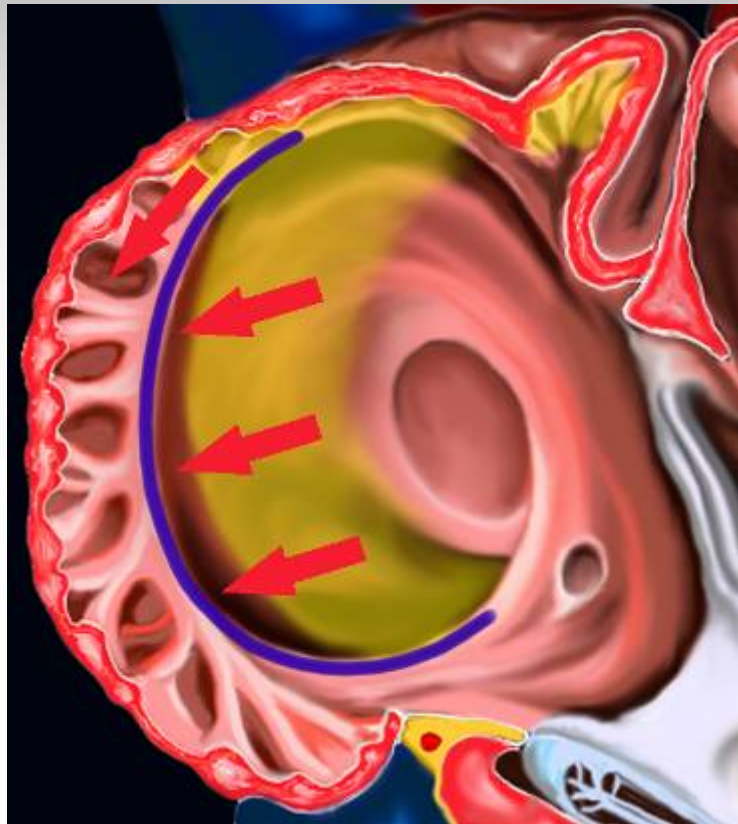
Atrial Flutter

Clinical Status/ Proposed therapy	Recommendation	Class	Evidence
First episode and Well-tolerated atrial flutter	Cardioversion alone	I	B
	Catheter ablation*	II a	B
Recurrent and well- tolerated atrial flutter	Catheter ablation*	I	B
	Dofetilide	II a	C
	Amiodarone, sotalol, flecainide.†† quinidine, †† propafenone, ††		
	Procainamide, †† disopyramide ††	II b	C
Poorly tolerated atrial flutter	Catheter ablation*	I	B
Atrial flutter appearing after use of class Ic agents or amiodarone for treatment of AF	Catheter ablation*	I	B
	Stop current drug and use another	II a	C
Symptomatic non-CTI- dependent flutter after failed antiarrhythmic drug therapy	Catheter ablation	II a	B

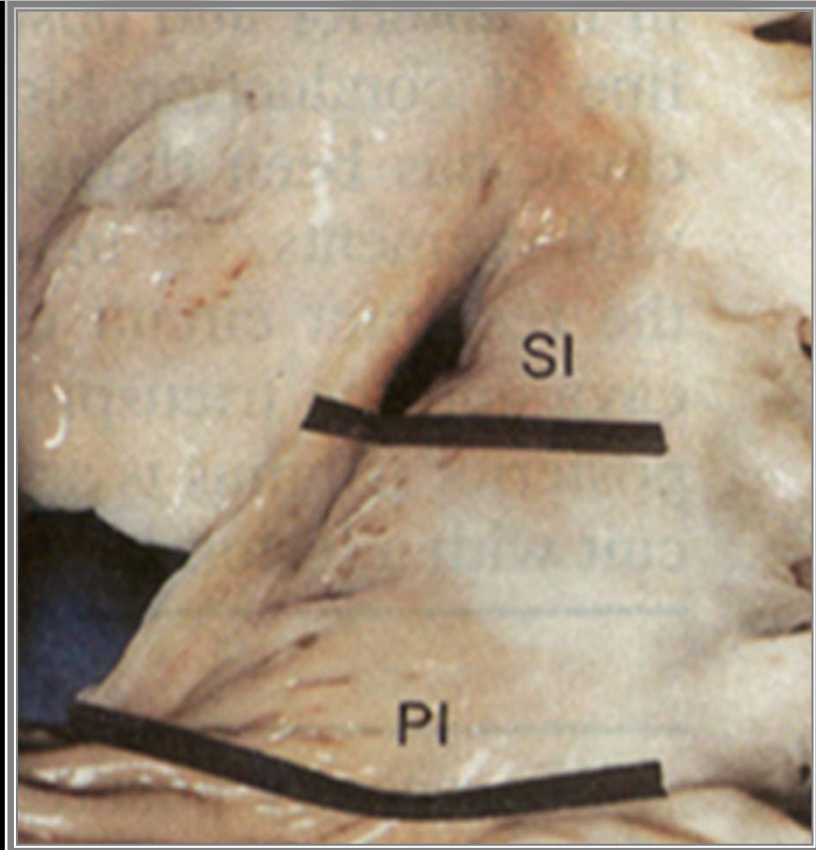
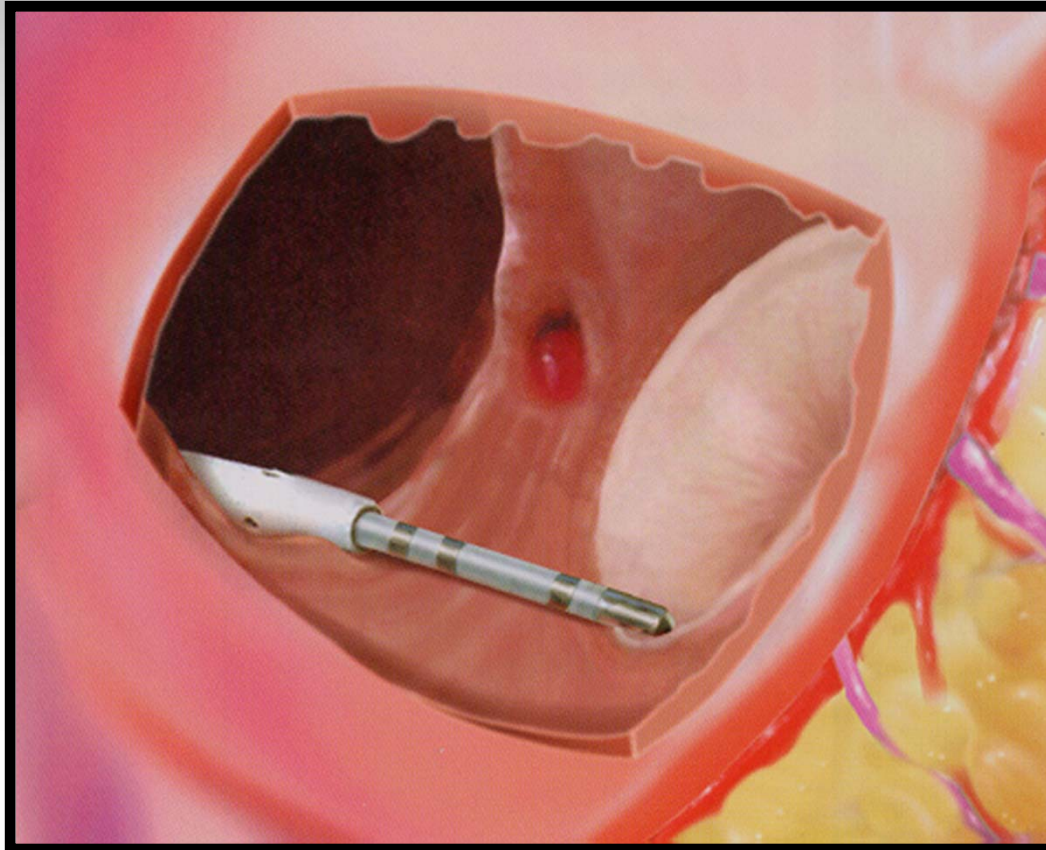
Anatomy of Right Atrium



Conduction barriers



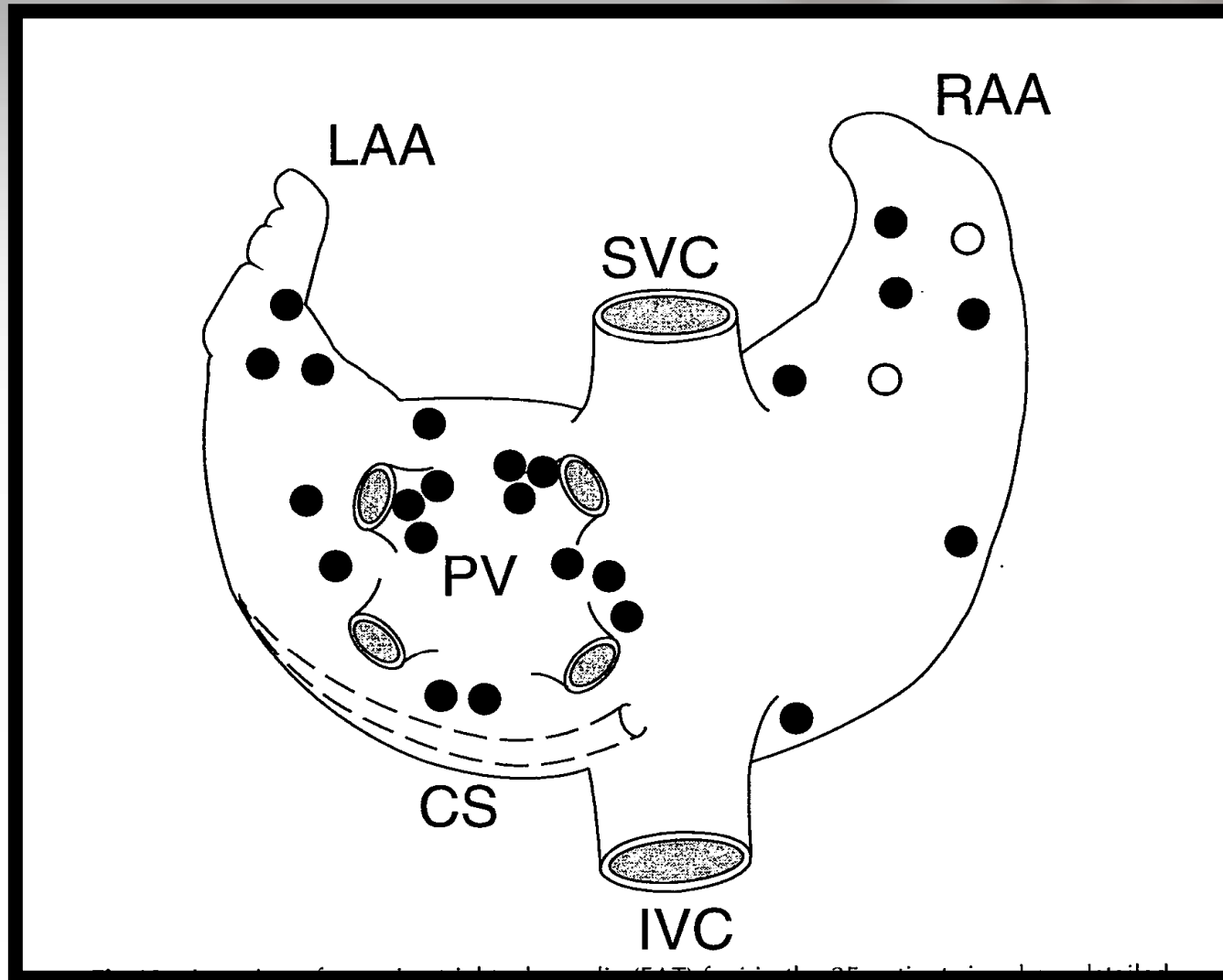
Linear Ablation on CTI



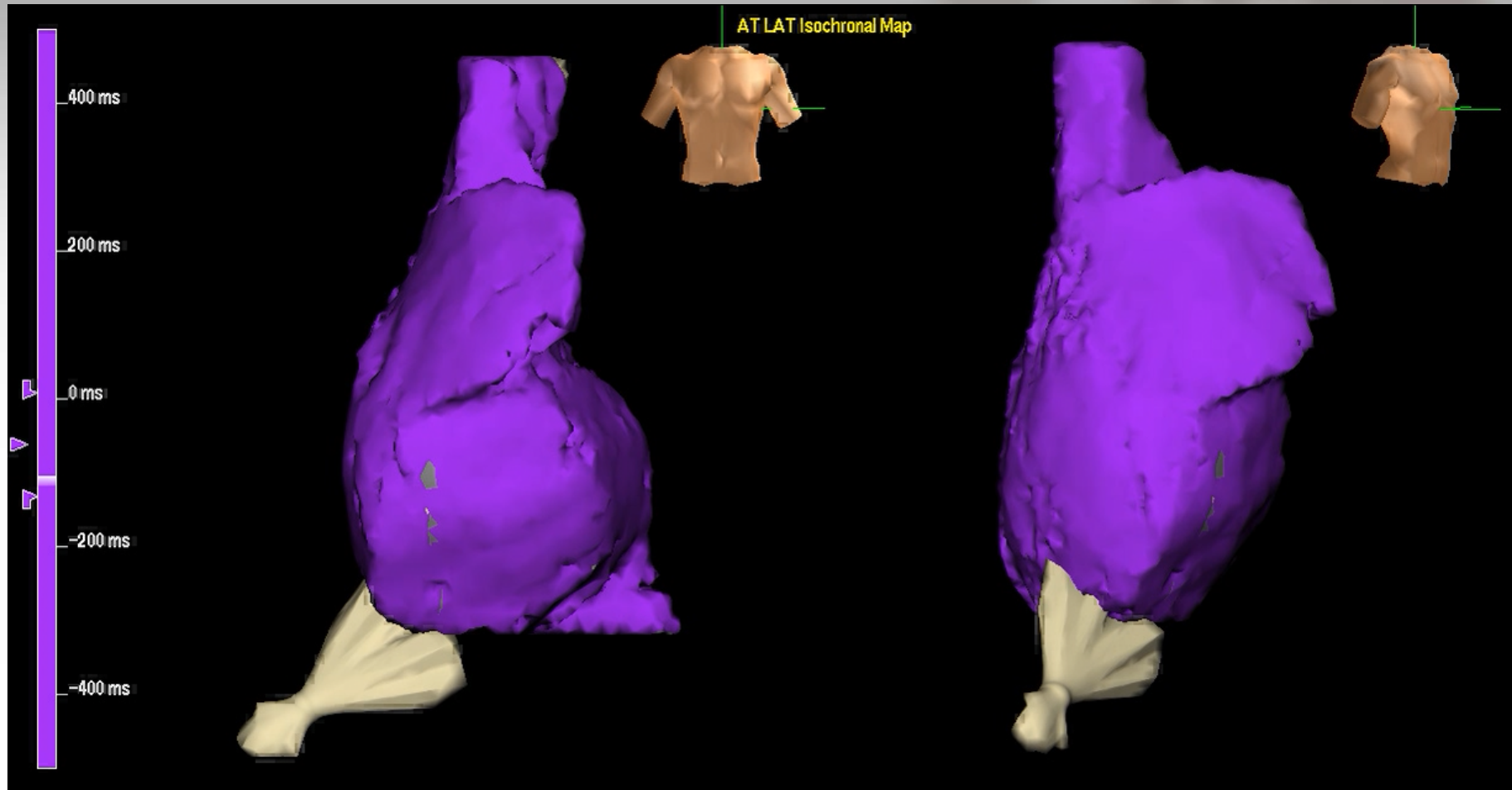
Atrial Tachycardia

Clinical situation	Recommendation	Class	Evidence
Recurrent symptomatic AT	Catheter ablation	I	B
	Beta blockers,		
	Calcium-channel blockers	I	C
	Disopyramide‡	II a	C
	Flecainide, propafenone‡	II a	C
	Sotalol, amiodarone	II a	C
Asymptomatic or symptomatic incessant ATs	Catheter ablation	I	B
Non-sustained and Asymptomatic ATs	Non therapy	I	C
	Catheter ablation	III	C

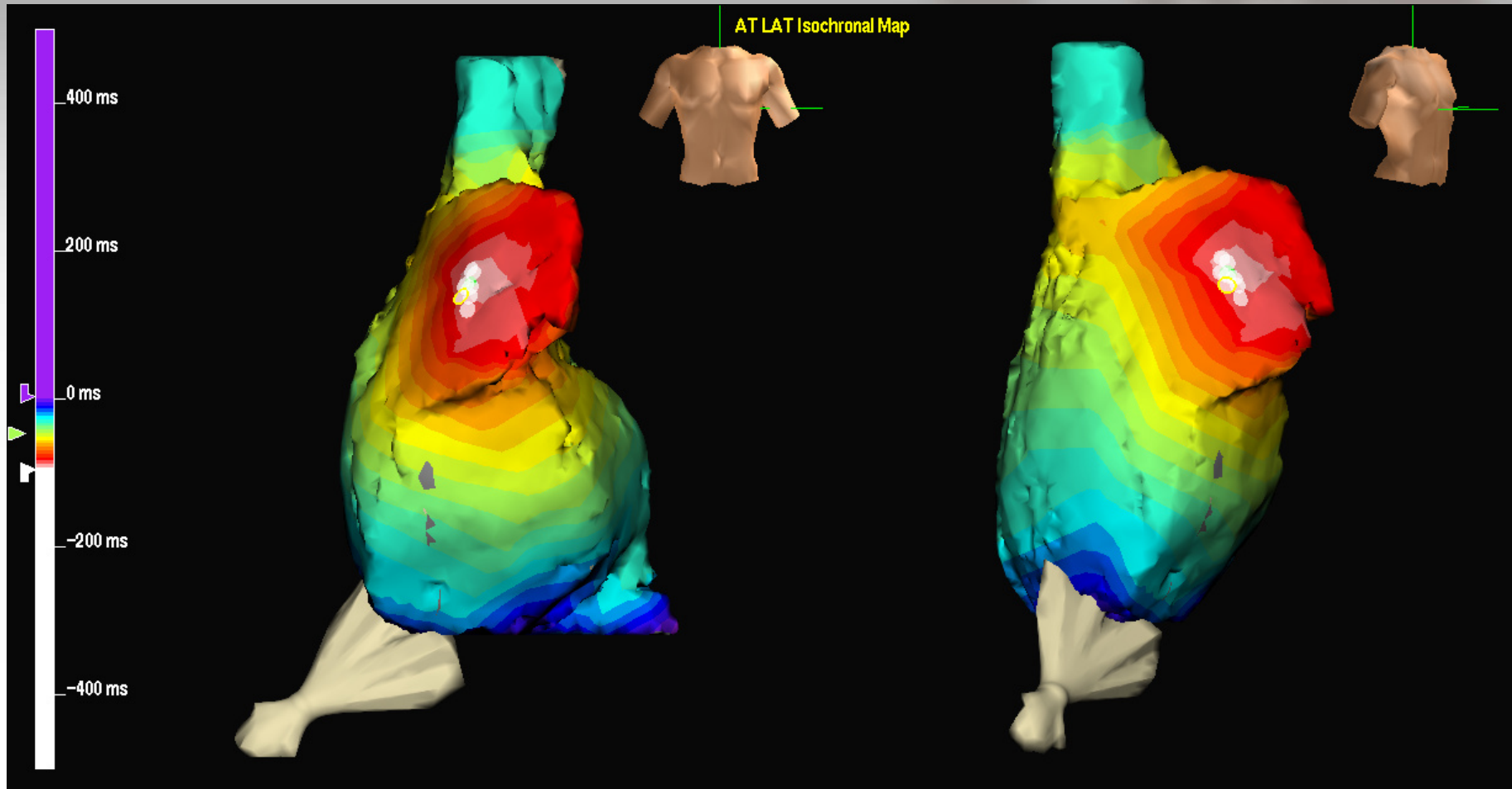
Location of Atrial Tachycardia



Activation Mapping during AT



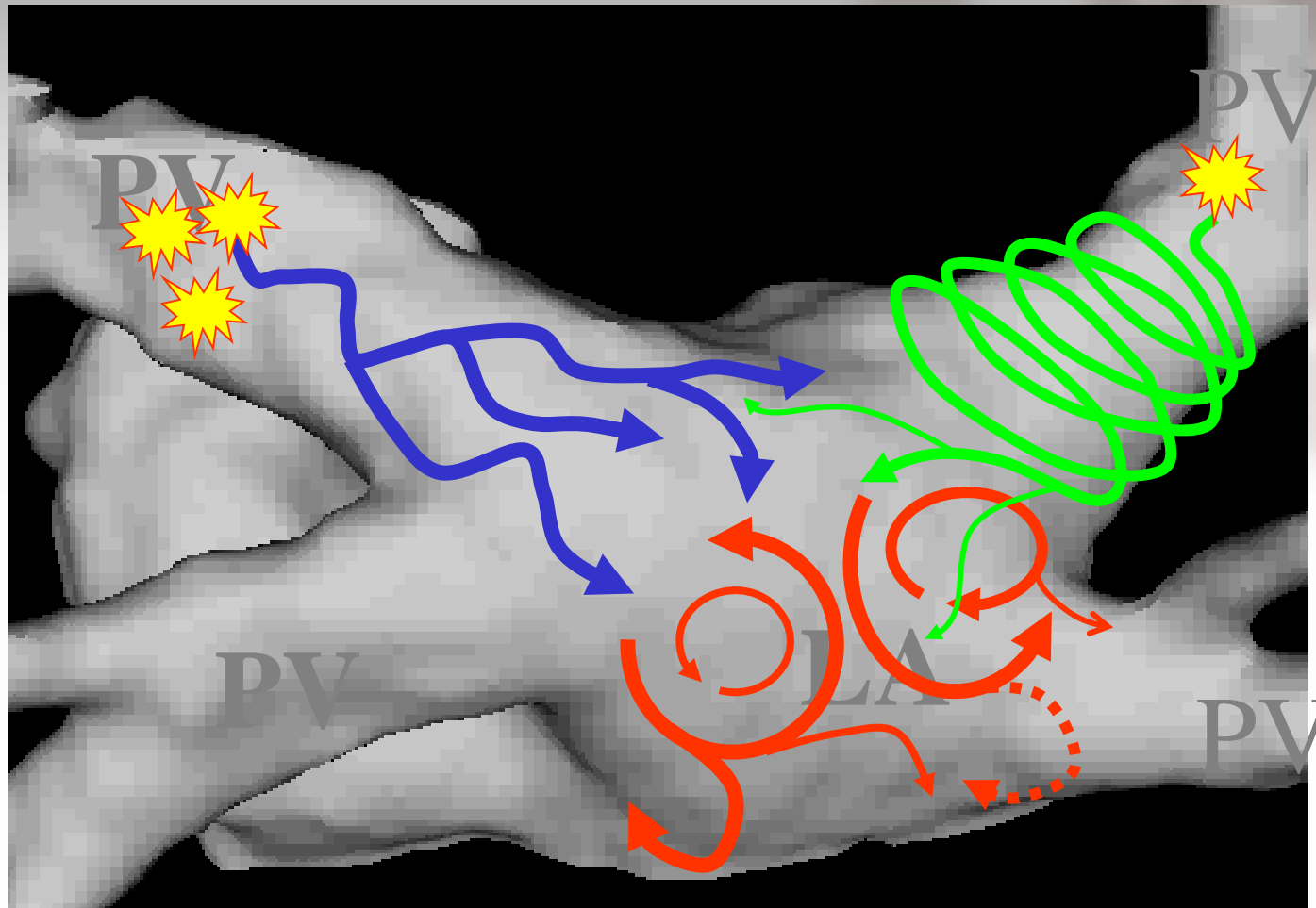
Activation Mapping during AT



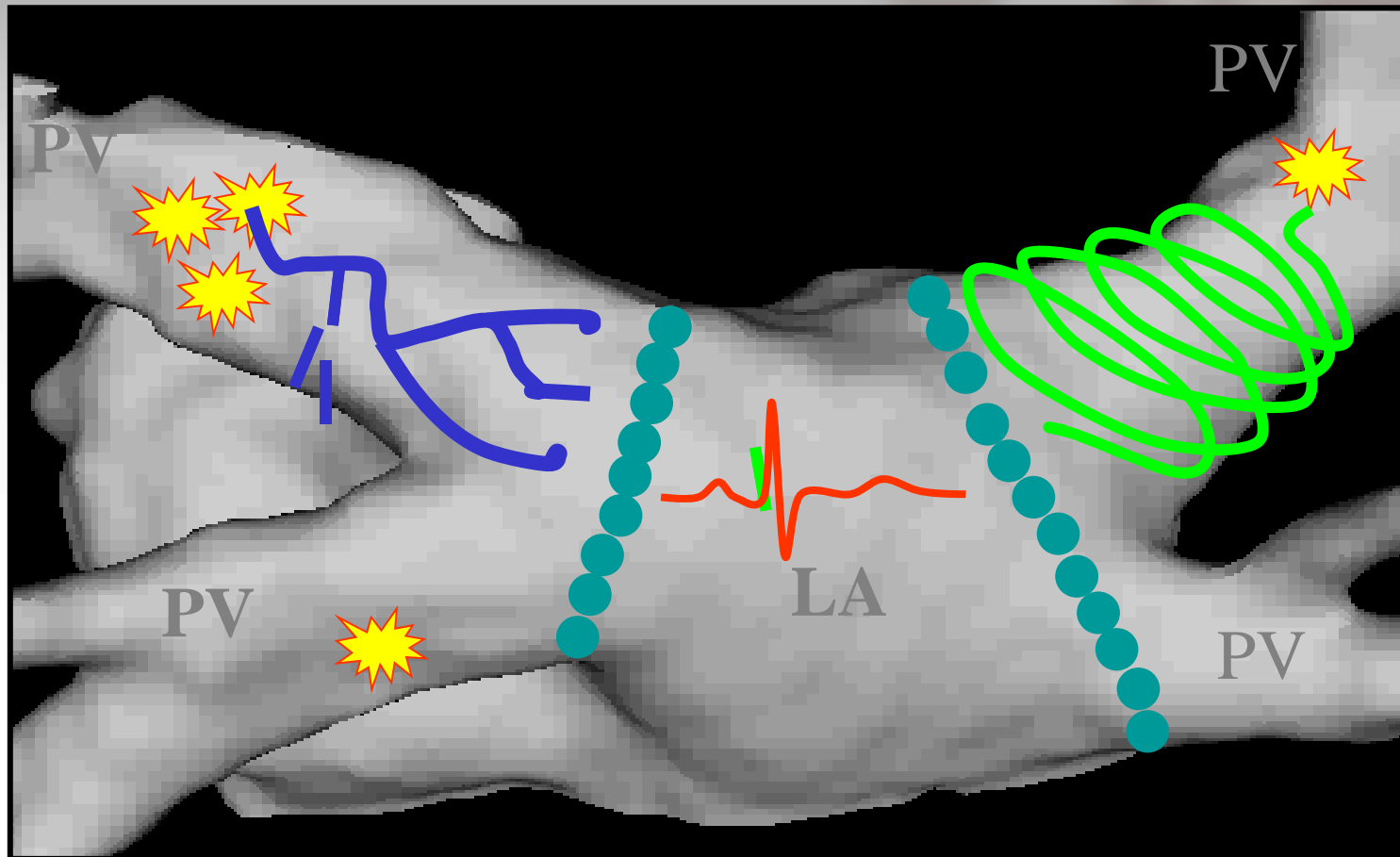
Indication for CA of AF

	CLASS	LEVEL
Symptomatic AF refractory or intolerant to at least one Class 1 or 3 anti-arrhythmic medications		
Proxysmal: Catheter ablation is recommended*	I	A
Persistent: Catheter ablation is reasonable	II a	B
Longstanding Persistent: Catheter ablation may be considered	II b	B
Symptomatic AF prior to initiation of anti-arrhythmic drug therapy with a Class 1 or 3 antiarrhythmic agent.		
Proxysmal: Catheter ablation is reasonable	II a	B
Persistent: Catheter ablation may be considered	II b	C
Longstanding Persistent: Catheter ablation may be considered	II b	C

Focal Source Hypothesis

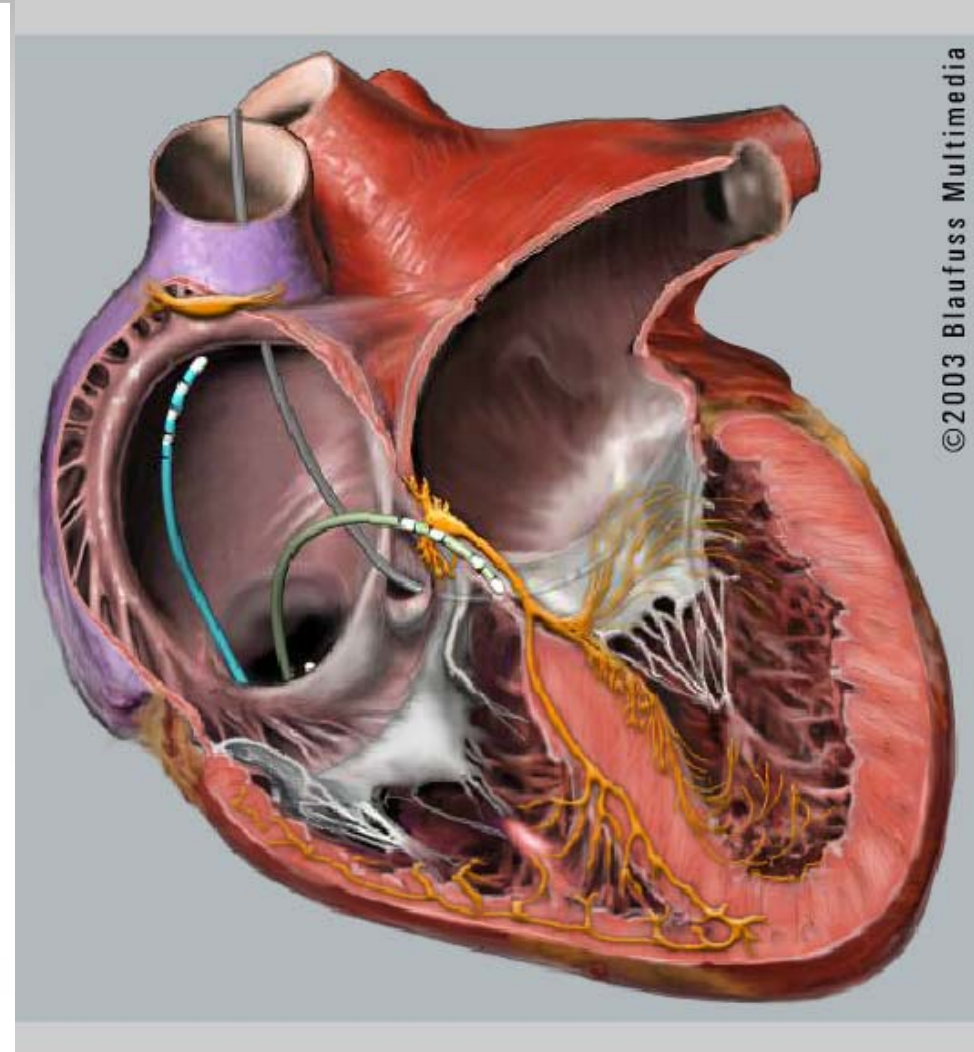
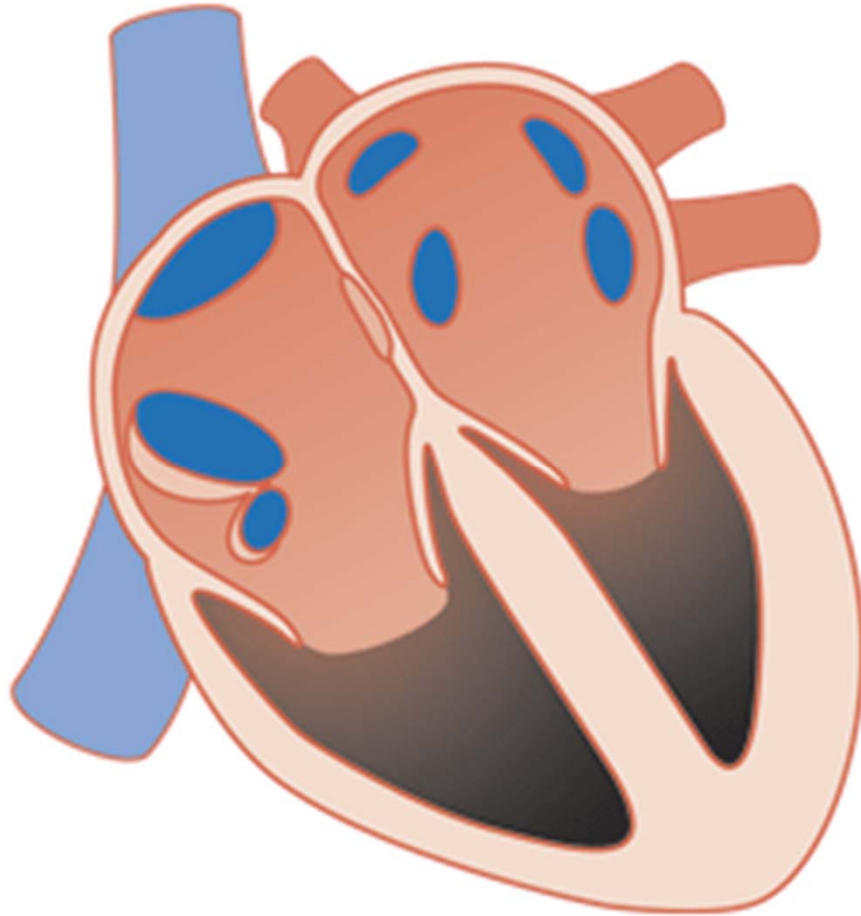


Isolation of Pulmonary Vein



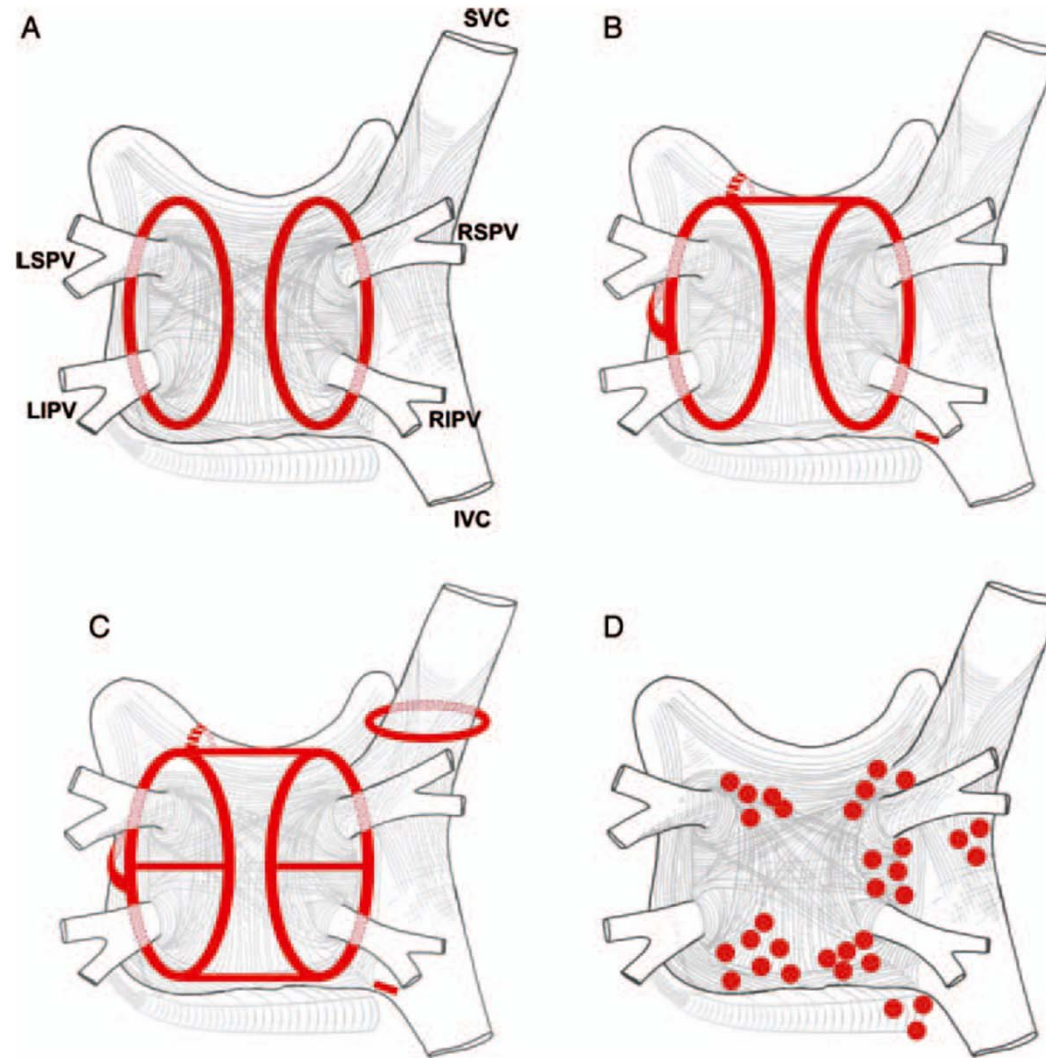
Ablate the PV antrum: PV isolation

Catheter Ablation



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Ablation Methods



VT in Structural Heart Disease

Catheter ablation of VT is recommended

1. for symptomatic sustained monomorphic VT (SMVT) including VT terminated by an ICD. That recurs despite anti-arrhythmic drug therapy or when anti-arrhythmic drugs are not tolerated or not desired²
2. for control of incessant SMVT or VT storm that is not due to a transient reversible cause:
3. for patients with frequent PVCs, NSVTs, or VT that is presumed to cause ventricular dysfunction
4. for bundle branch reentrant or interfascicular VTs
5. for recurrent sustained polymorphic VT and VF that is refractory to anti-arrhythmic therapy when there is a suspected trigger that can be targeted for ablation

Catheter ablation should be considered

1. in patients who have one or more episodes of SMVT despite therapy with one of more Class I or III anti-arrhythmic drugs:²
2. in patients with recurrent SMVT due to prior MI who have LV ejection fraction >0.30 and expectation for 1 year of survival and is an acceptable alternative to alternative to amiodarone therapy:²
3. in patients with haemodynamically tolerated SMVT due to prior MI who have reasonably preserved LV ejection fraction (>0.35) even if they have not failed anti-arrhythmic drug therapy.²

VT in Structural Normal Heart

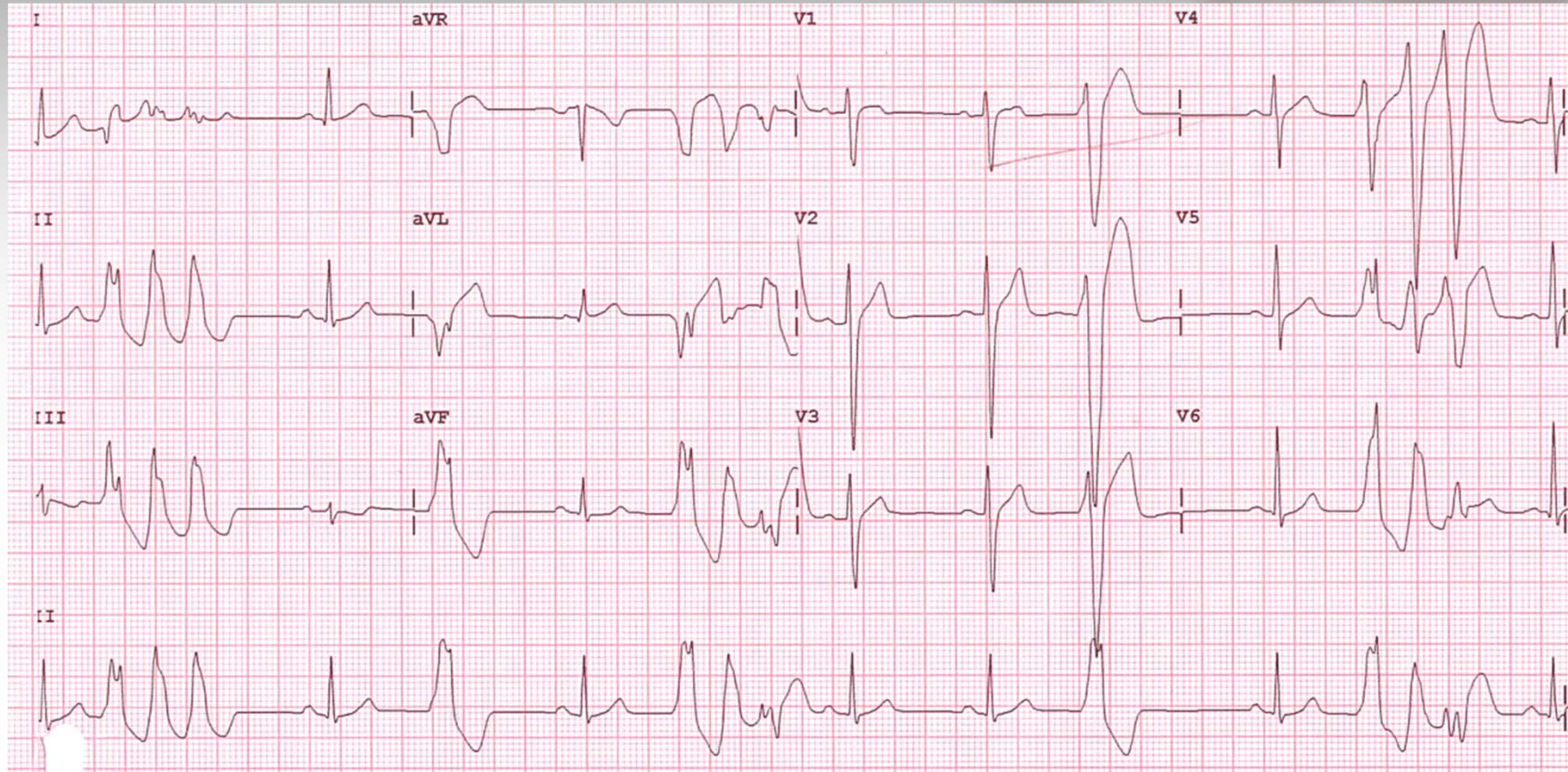
Catheter ablation of VT is recommended for patients with idiopathic VT

- 1. for monomorphic VT that is causing severe symptoms**
- 2. for monomorphic VT when anti-arrhythmic drugs are not effective, not tolerated, or not desired**
- 3. for recurrent sustained polymorphic VT and VF (electrical storm) that is refractory to anti-arrhythmic therapy when there is a suspected trigger that can be targeted for ablation**

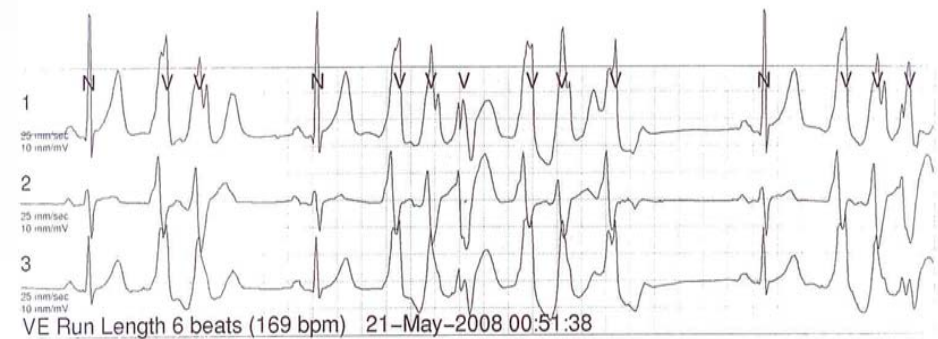
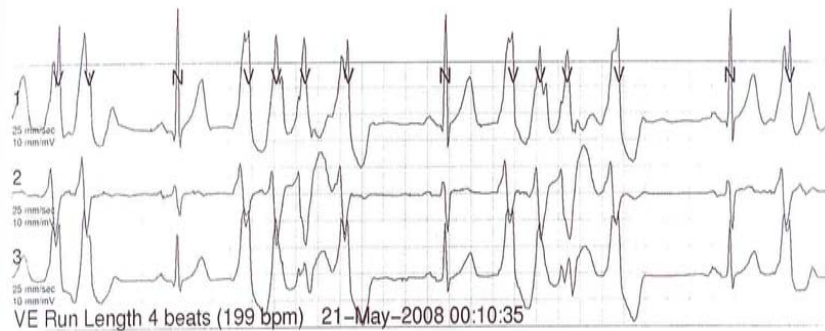
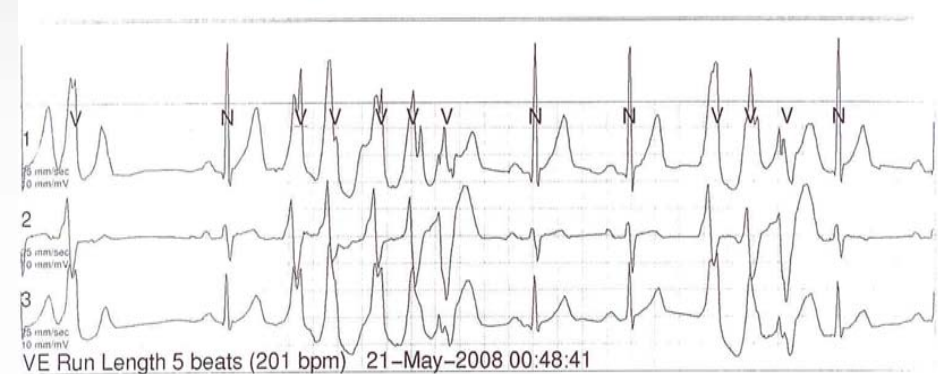
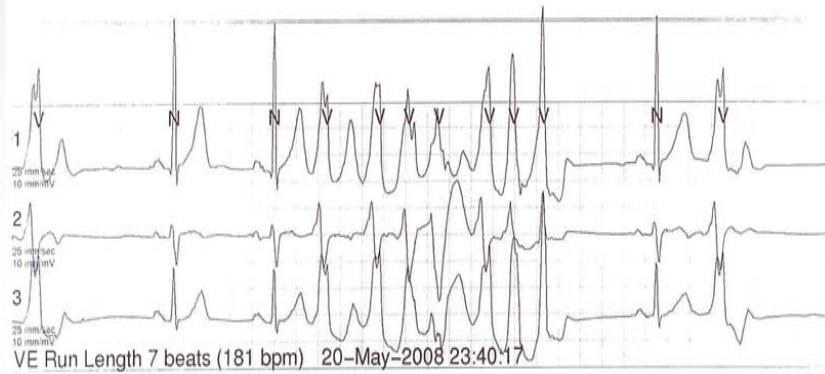
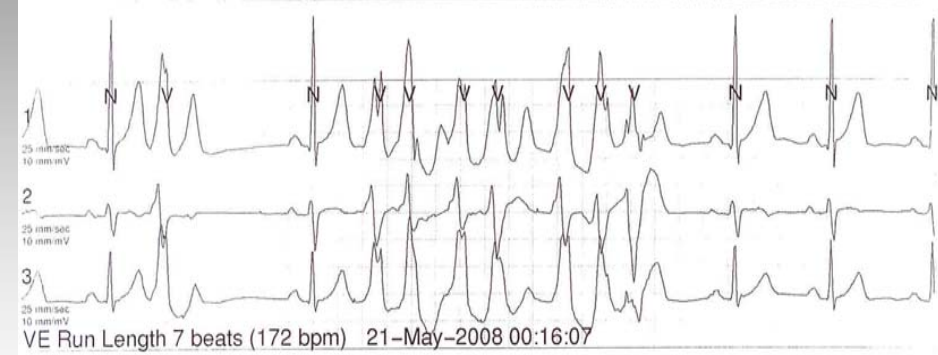
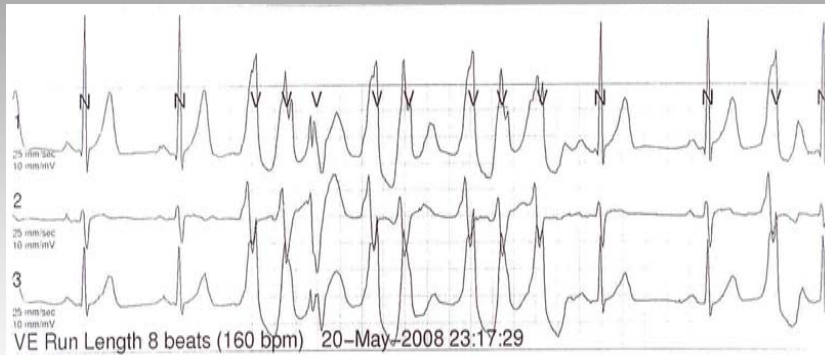
VT catheter ablation is contra-indicated

- 1. in the presence of a mobile ventricular thrombus (epicardial ablation may be considered):**
- 2. for asymptomatic PVCs and/or NSVT that are not suspected of causing or contributing to ventricular dysfunction**
- 3 for VT due to transient, reversible causes, such as acute ischaemia, hyperkalaemia, or drug-induced Torsade de pointes**

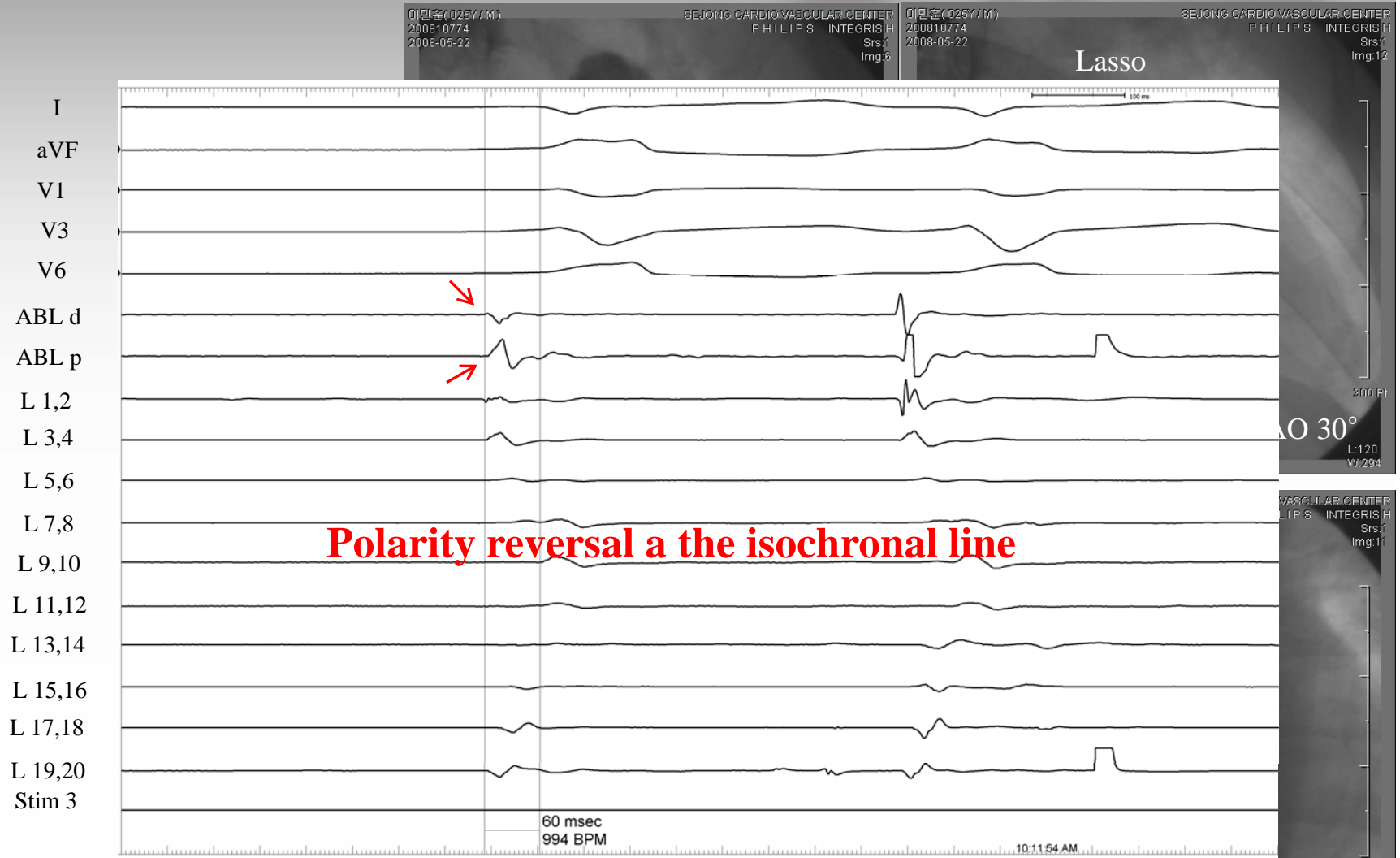
Polymorphic VT



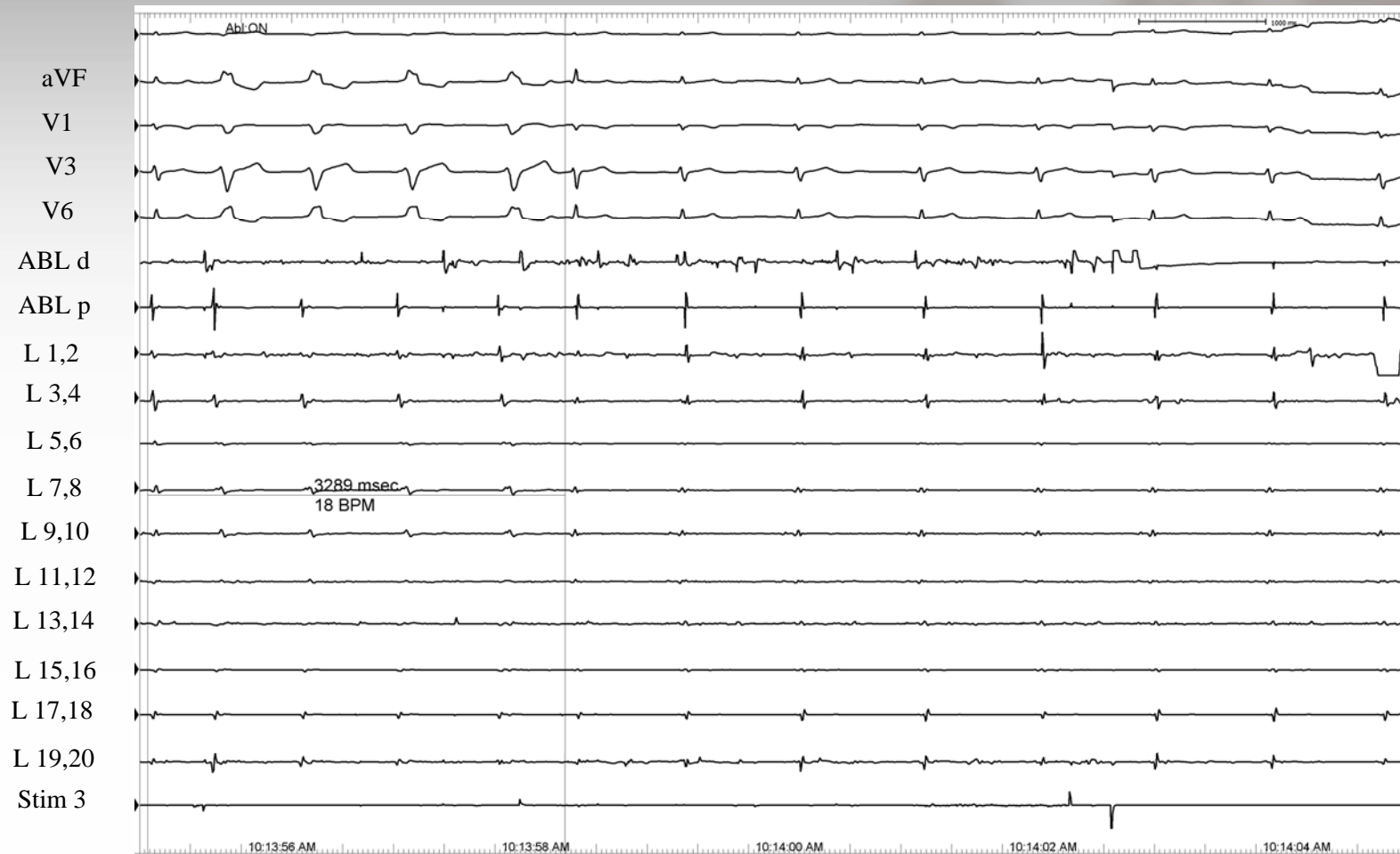
Holter



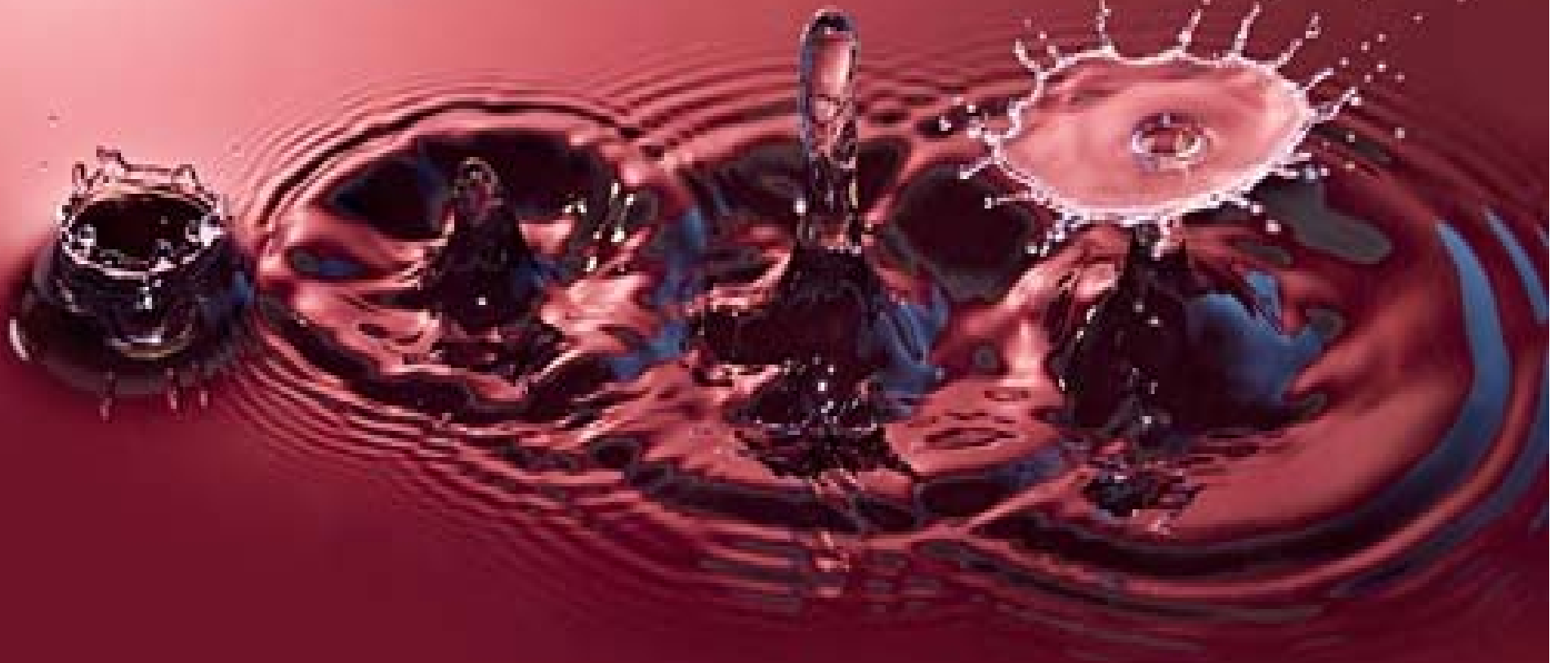
PA Origin



RFCA



Thank you for your attentions !



Korea University Cardiovascular Center