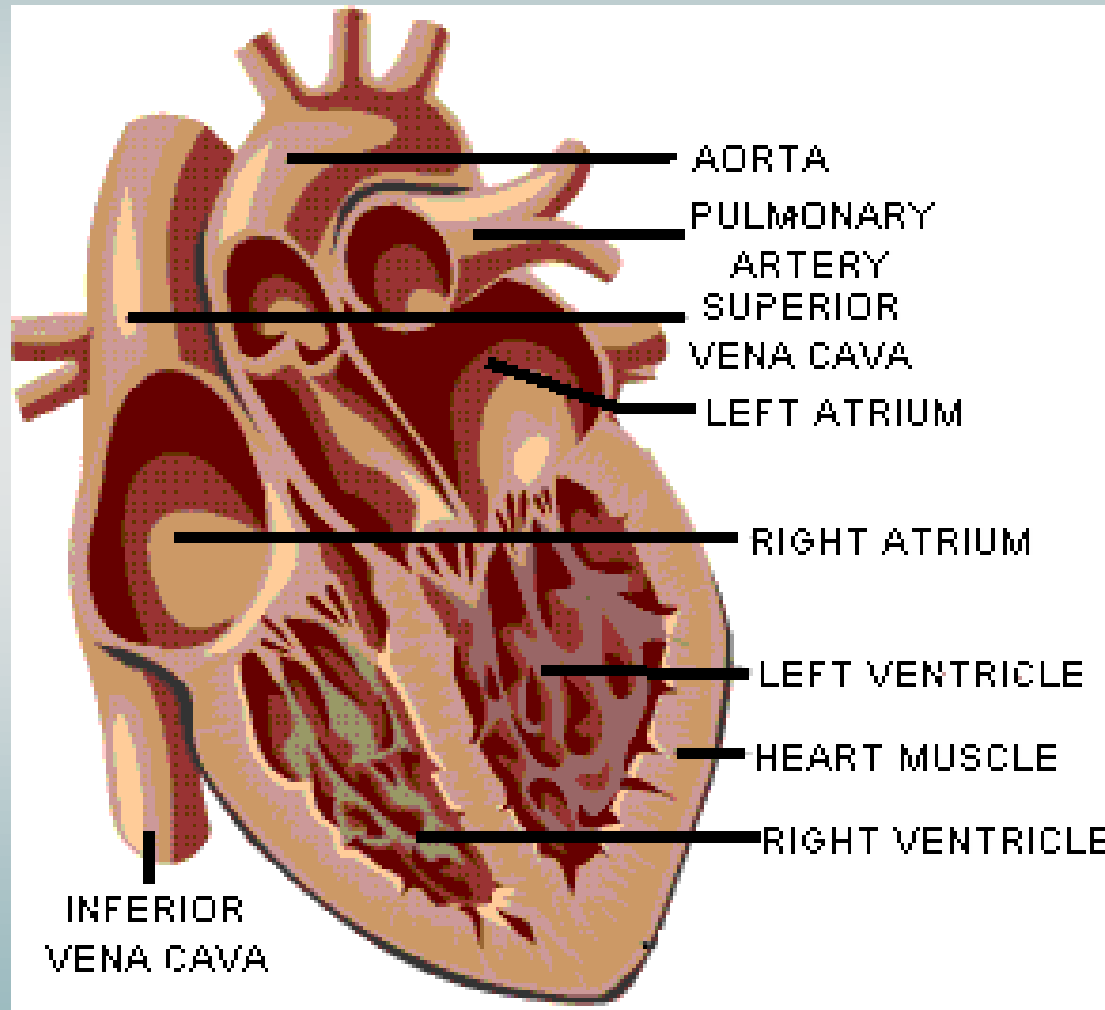


TACHYARRHYTHMIAS

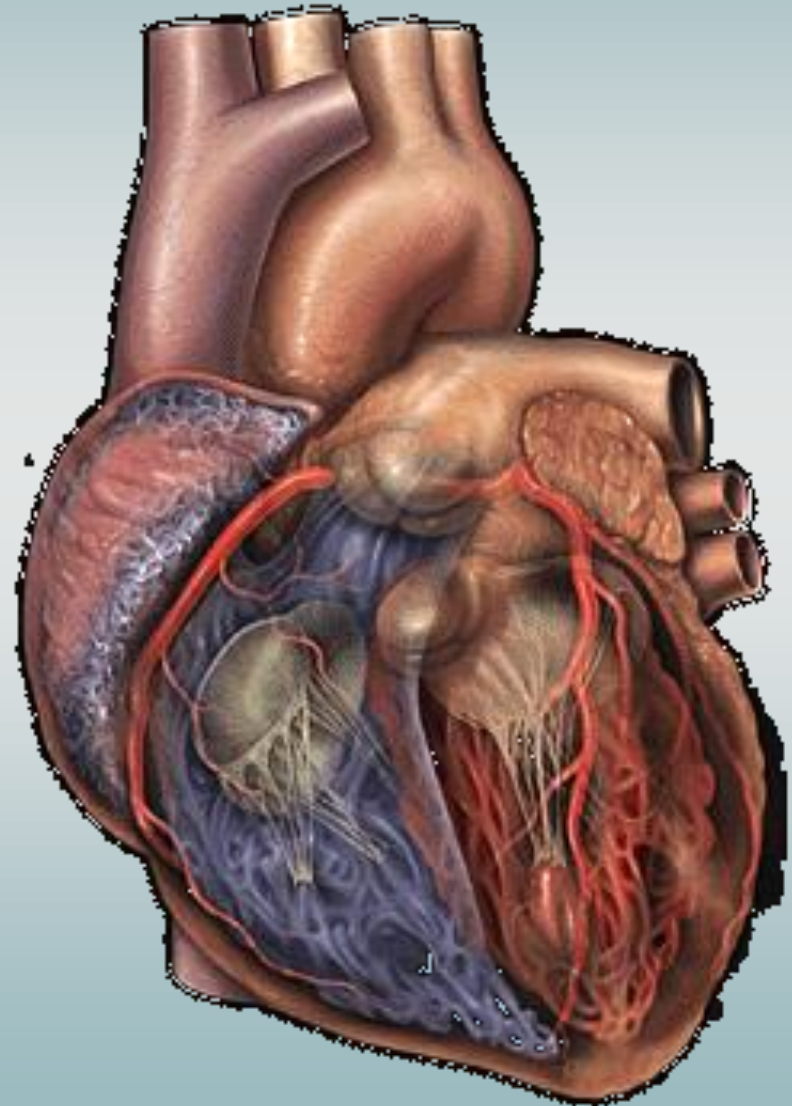
SupraVentricular Tachycardia

- Atrial Extra Systole
- Sinus Tachycardia
- Focal A. Tachycardia
- AVRT
- AVNRT
- Atrial Flutter
- Atrial Fibrillation

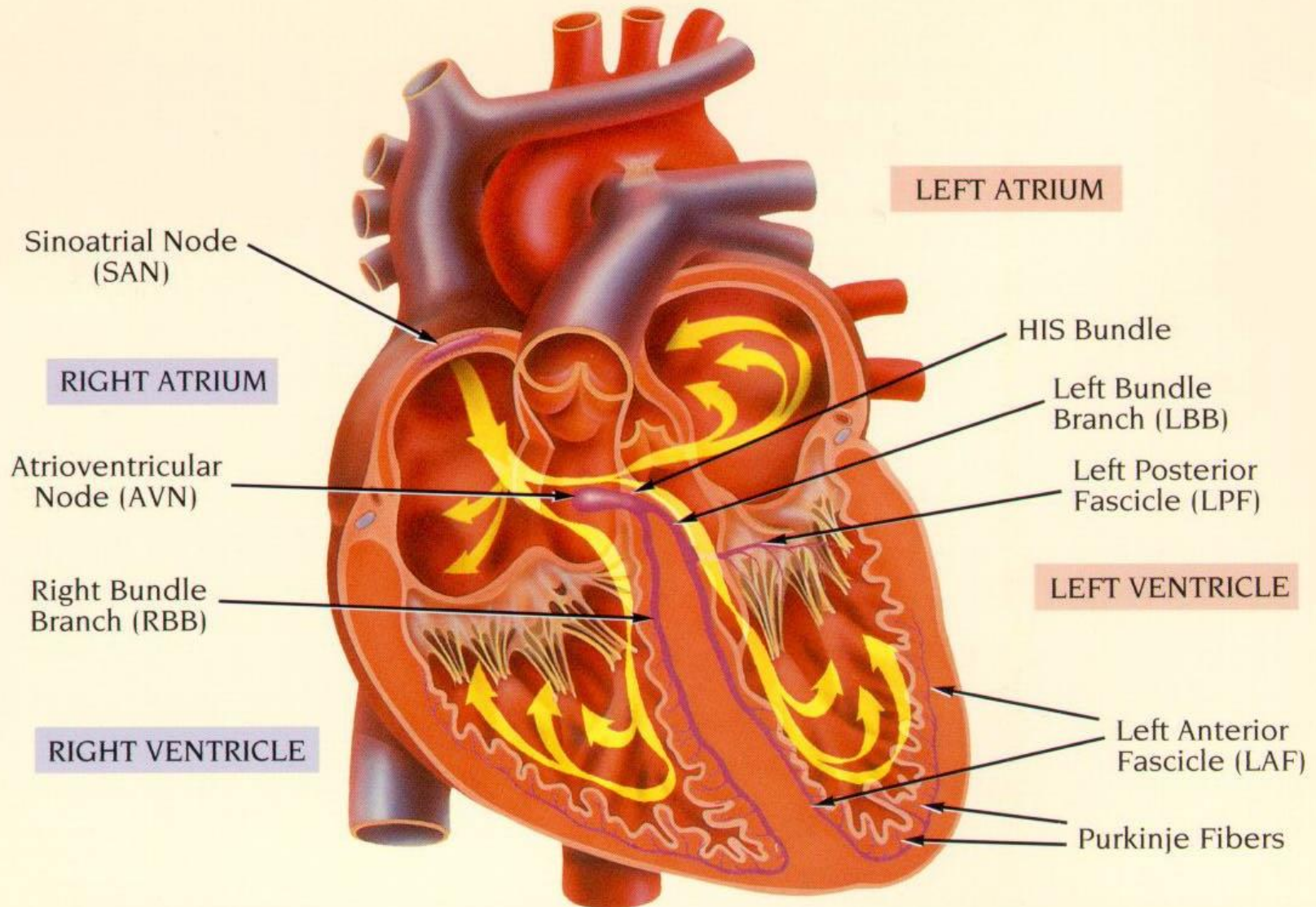


Ventricular Tachycardia

- Ventricular Extra systole
- VT (reentry)
- Ventricular Flutter
- Ventricular Fibrillation



The Conduction System

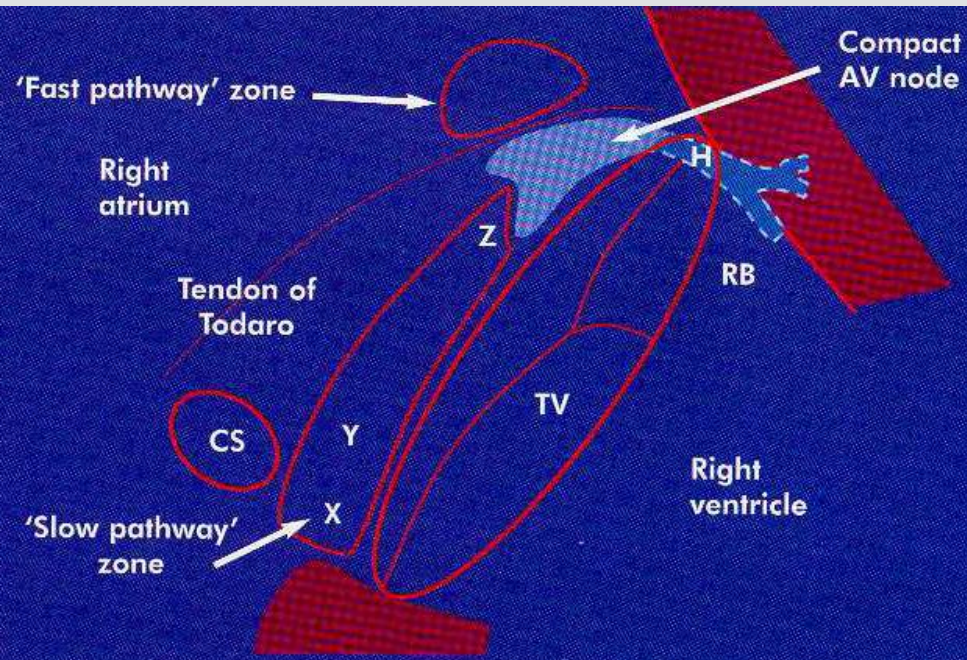




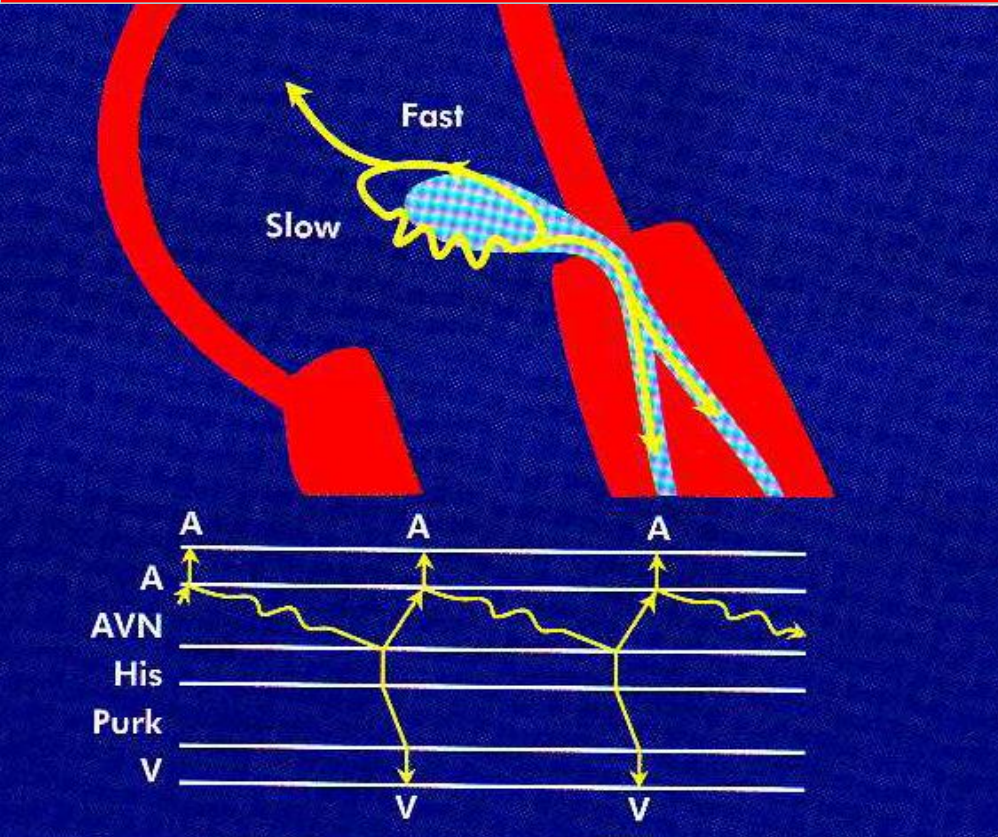
ARRHYTHMIAS

AVNRT

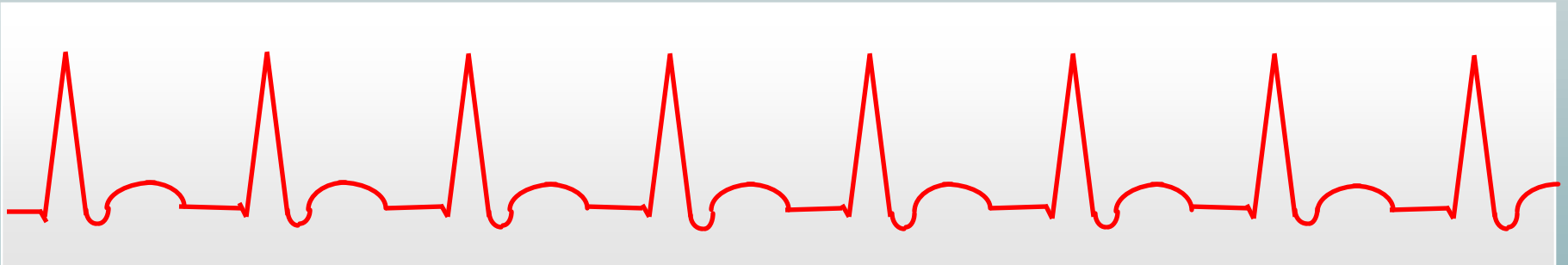
Diagram of Atrio-Ventricular (AV) Nodal Reentry



AV-Nodal Reentrant Tachycardia



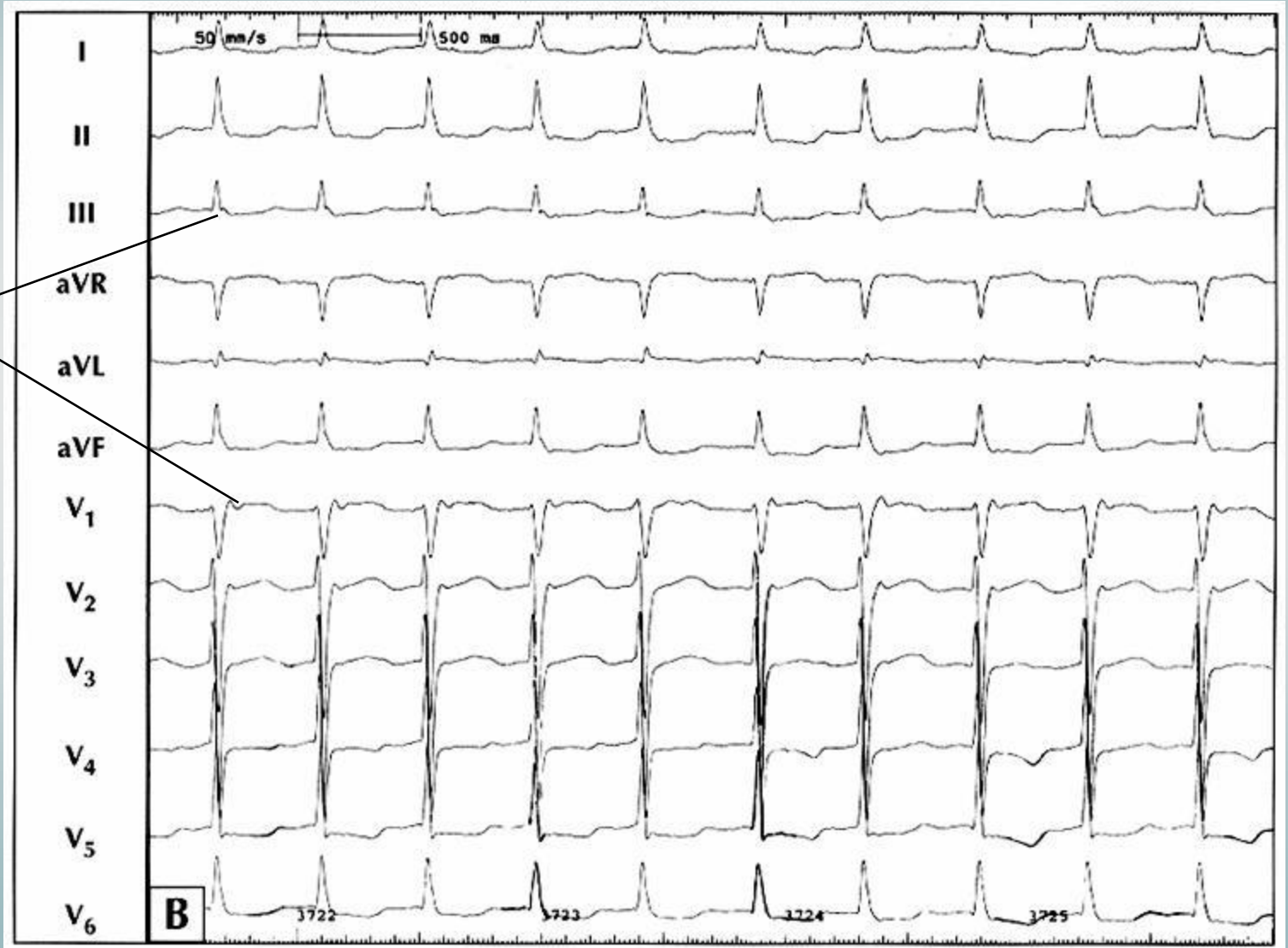
- Regular
- Narrow QRS
- “No” P-waves



AVNRT ECG

HR=150

atrial
activation
over the
retrograde
fast
pathway



AV-Nodal Reentrant Tachycardia

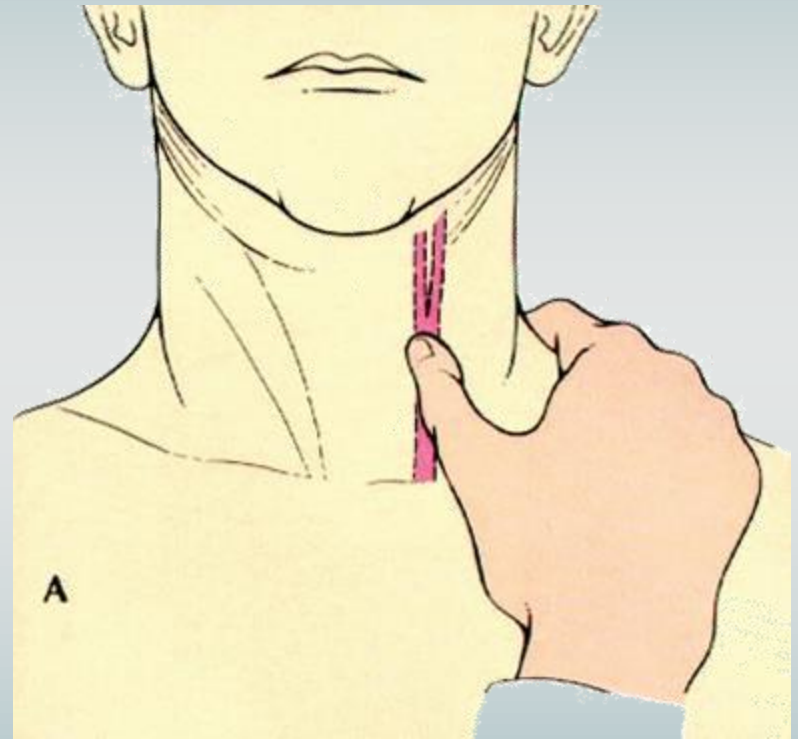
Clinical Aspects

- Palpitations
- Tachycardia of sudden onset and end
- “Heart beats to the neck”
- Rarely cause of syncope
- Typically 4 - 10 episodes per year
- Duration: minutes to hours

AV-Nodal Reentrant Tachycardia Therapy

- Acute treatment:
 - Vagal maneuvers
 - Adenosine
 - Verapamil

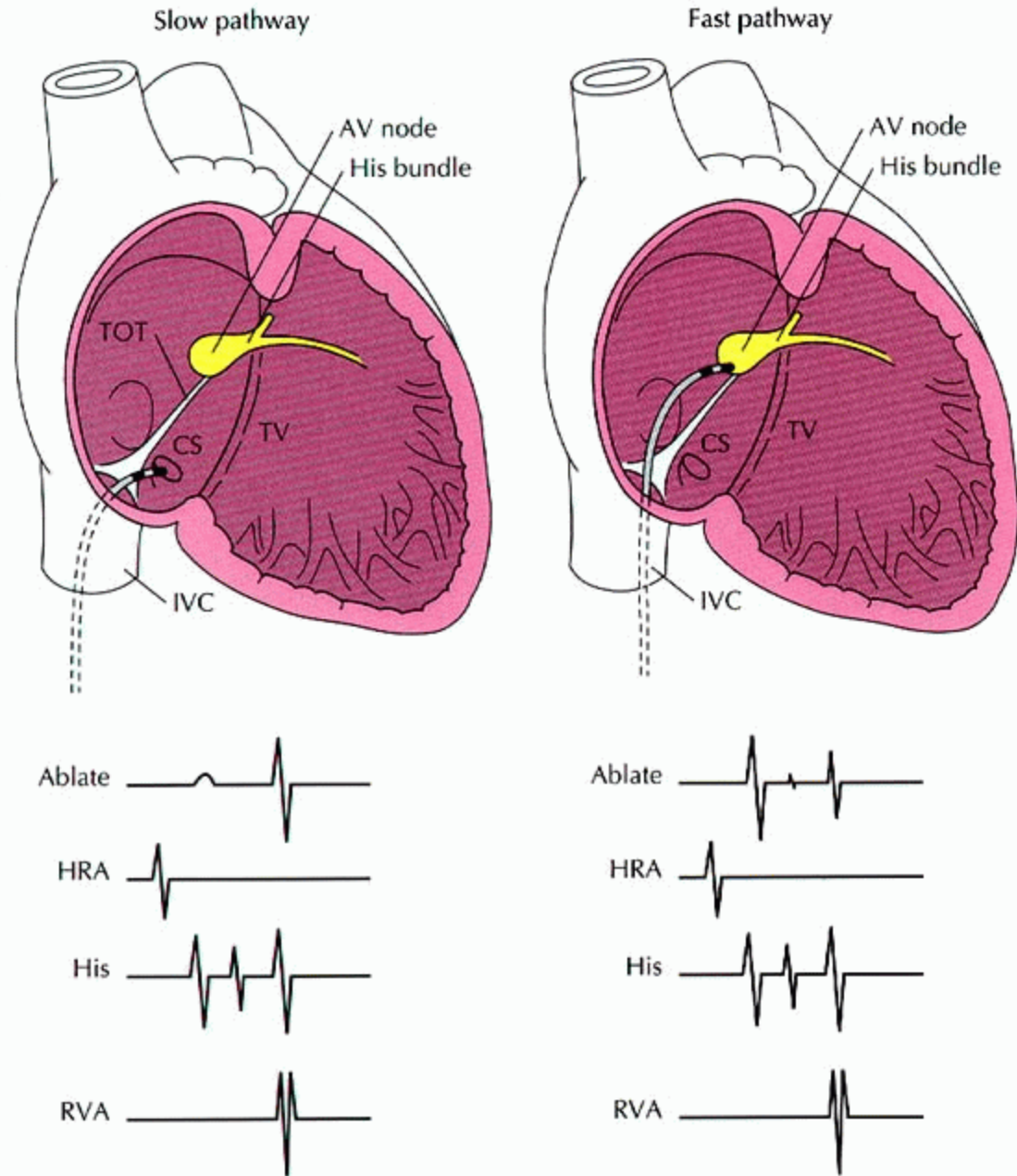
- Chronic treatment
 - catheter ablation
 - (Verapamil, β -blockers)



AV Nodal Modification

Slow pathway fibers travel from the region of the coronary sinus or toward the more anterior and superior AV node.

Fast pathway fibers are closer to the His bundle.

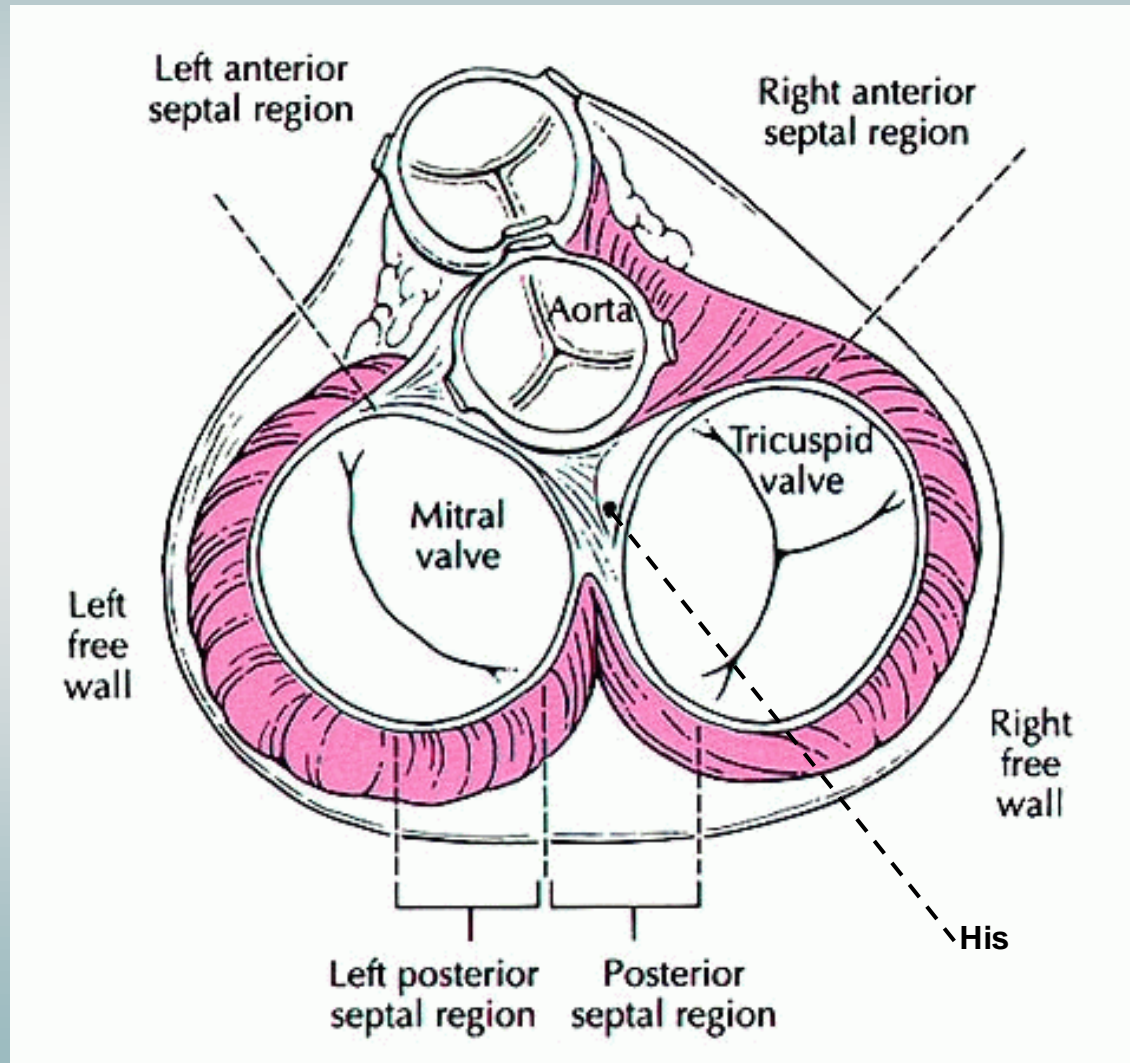


ARRHYTHMIAS

Accessory
pathway

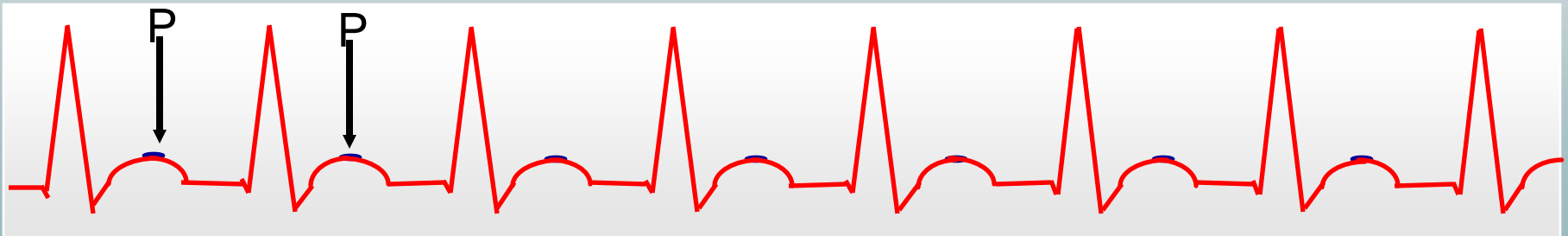
A 3D anatomical model of the heart's electrical system, showing the atria and ventricles with various colored regions representing different conduction pathways. The text 'Accessory pathway' is overlaid on the model.

AV Anatomy



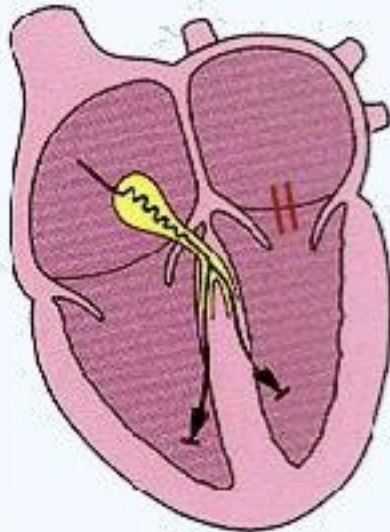
AV-Reentrant Tachycardia

- Regular
- Narrow QRS
- $PR > RP$



ECG of Accessory Pathway

Concealed

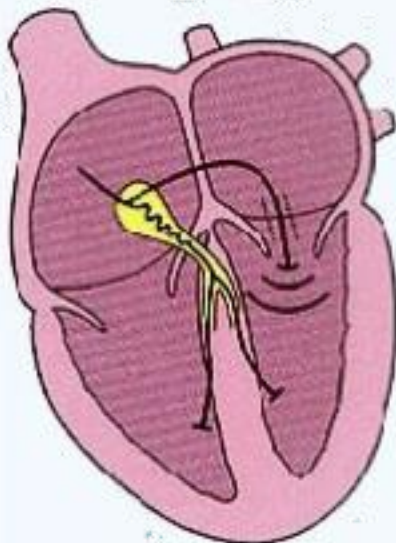


Concealed
AV connection
(no antegrade
conduction)



Ventricles activated
by normal H-P system
(QRS narrow)

Delta Wave

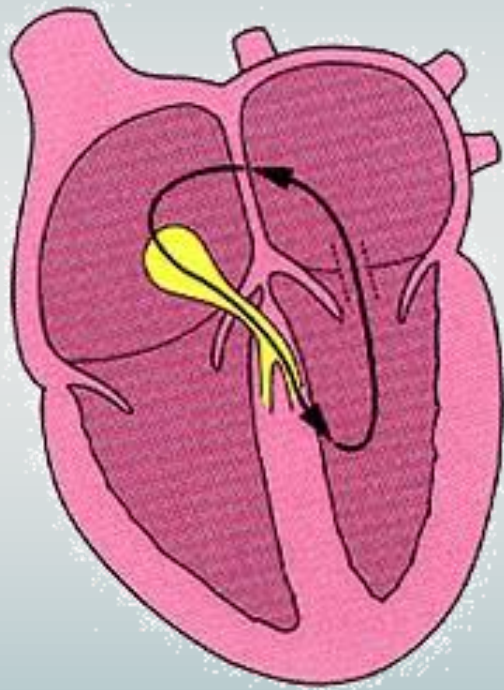


More
pre-excited.

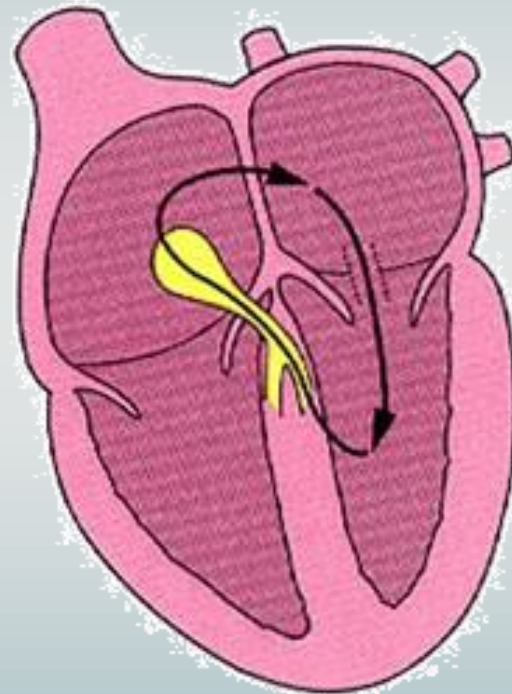


More of ventricle
activated via the
AV connection
(QRS even wider)

Tachycardia circuits utilizing an accessory pathway



A Orthodromic tachycardia

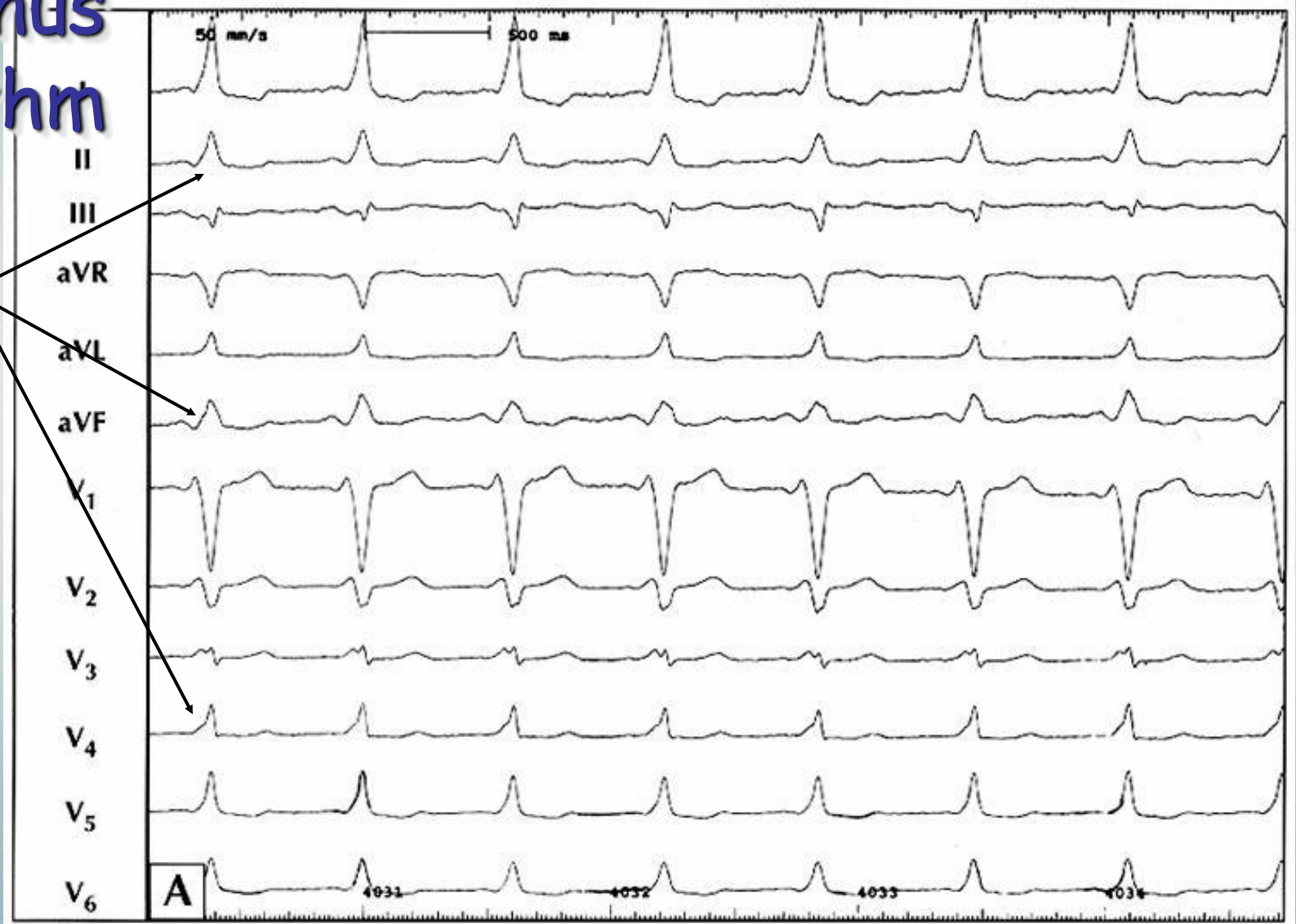


B Antidromic tachycardia

ECG - Right Accessory Pathway

in sinus rhythm

Delta Wave



IC - Right Accessory Pathway



Short AV interval => near the accessory pathway

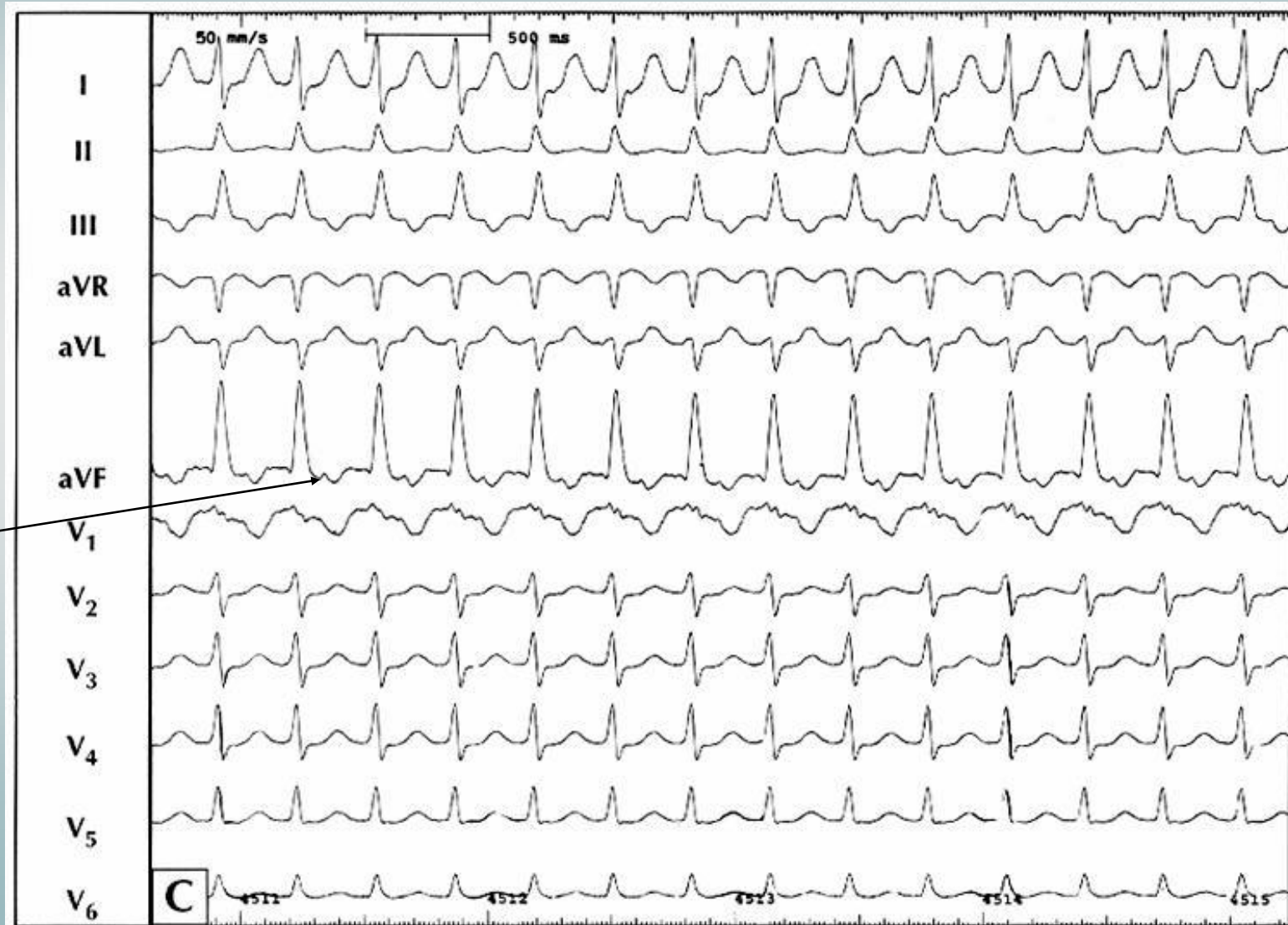
Initiation of Ventricular Activation

ECG - Orthodromic Tachycardia

Retrograde
conduction
over the AP

CL = 235 ms

P wave
PR > RP

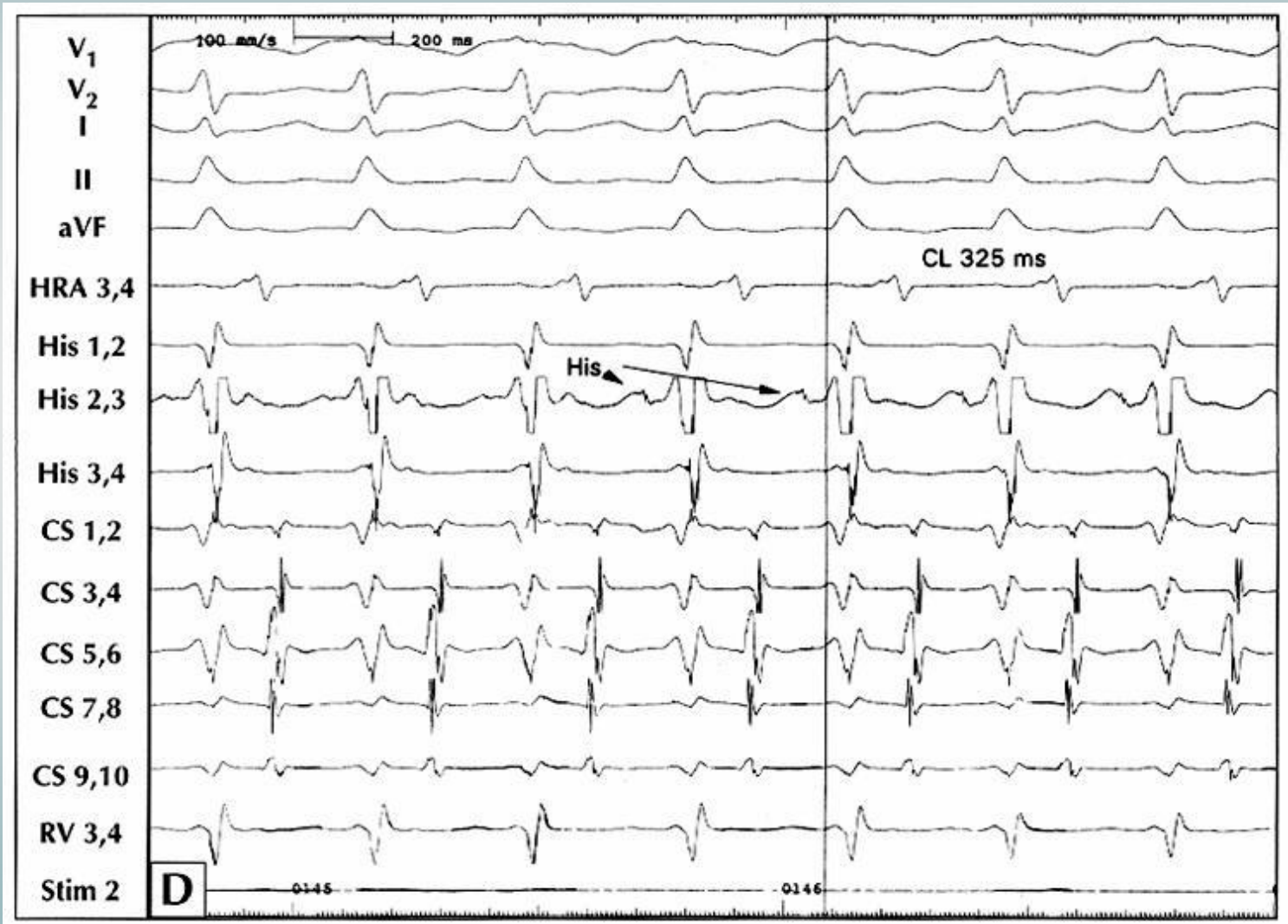


IC - Orthodromic Tachycardia

Retrograde
conduction
over the AP

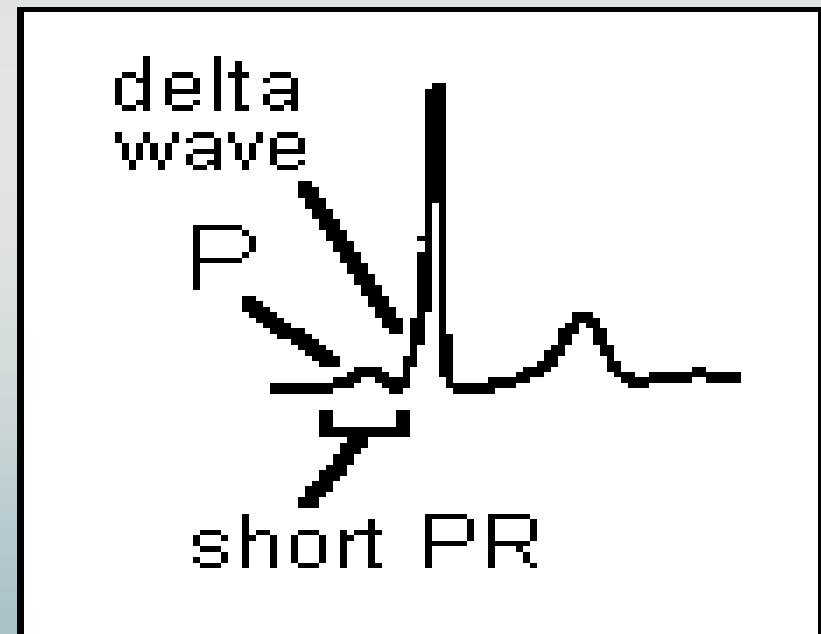
Normal HV

HRA activation
before LA (CS)
=> right AP.



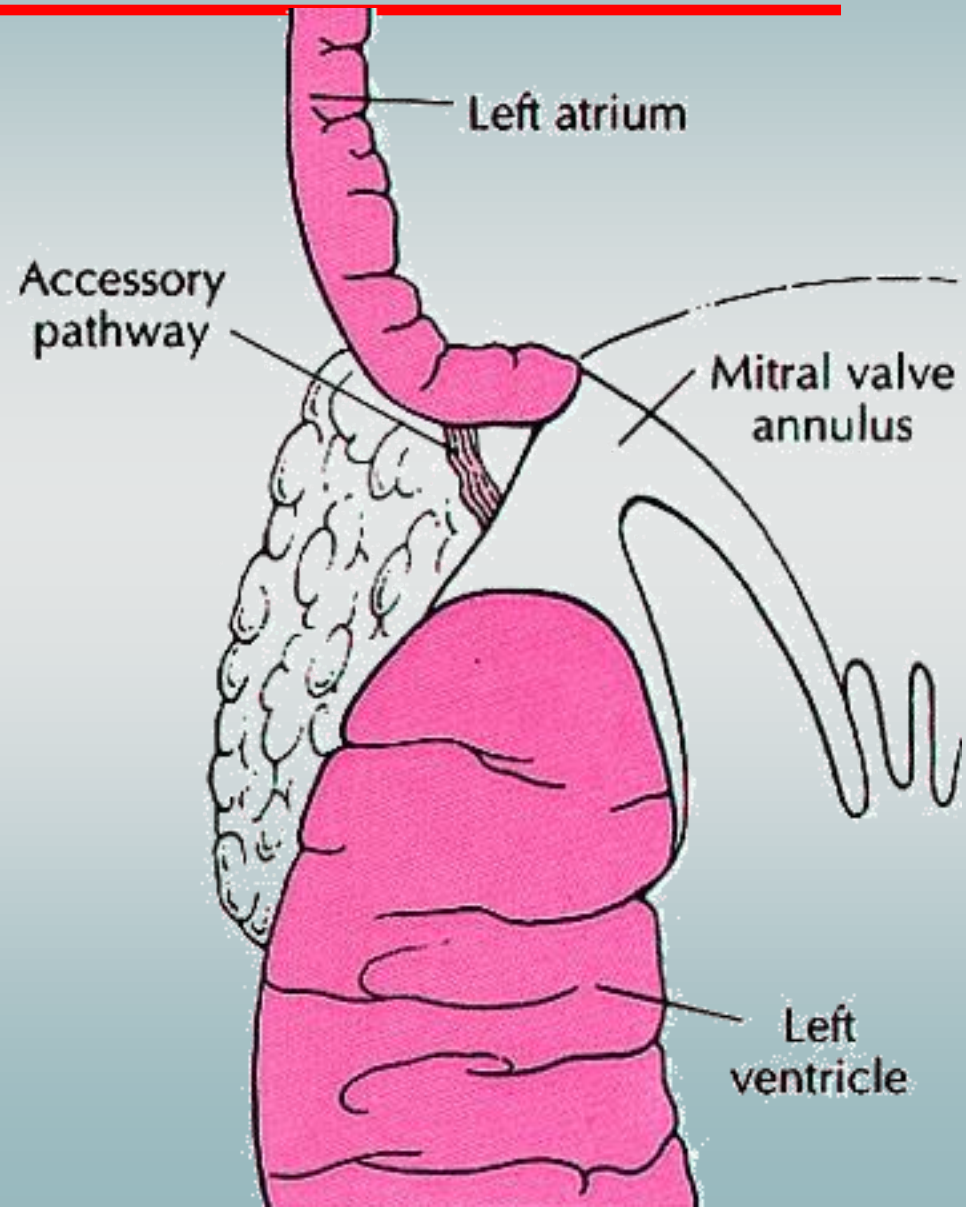
Wolf-Parkinson-White syndrome

- 1930 - WPW syndrome was defined as a combination of: BBB, short PR, Tachycardia. (without proving the mechanism)
- Short PR interval, less than (120 ms) (in SR)
- Slurred upstroke to the QRS indicating pre-excitation (delta wave)
- Broad QRS



Left Accessory Pathway

- The left atrium,
- The Mitral valve annulus,
- The left ventricle,
- The accessory pathway with para-annular attachment onto the left atrium.



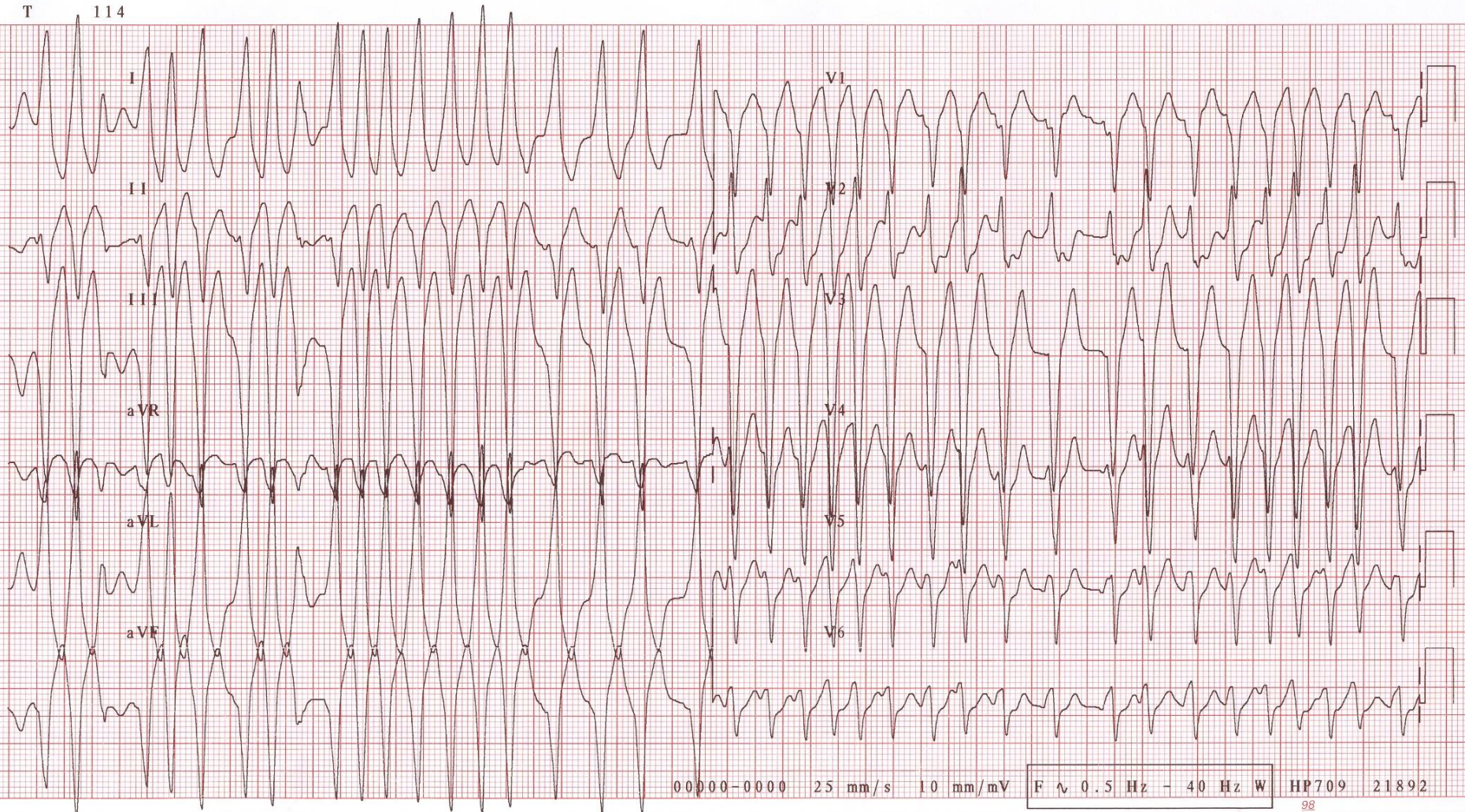
AV-Reentrant Tachycardia

Clinical Aspects

- Palpitations
- Tachycardia of sudden onset and end
- May cause syncope (overt pathways)
 - risk of sudden death
- Typically 4 - 10 episodes per year
- Duration: minutes to hours

Częst 196
PR 0
QRS cz 146
QT 365
QTp 659

---Os---
P
QRS -42
T 114



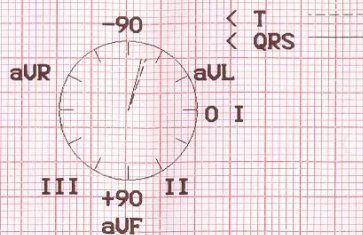
Pierwsza pomoc

HR 238 BPM

Uogad

Wyniki Pomiarów:

| | | | |
|-----------|---|------------|--------|
| QRS | : | 80 | ms |
| QT/QTcB | : | 190 / 393 | ms |
| PR | : | (80) | ms |
| P | : | (76) | ms |
| RR/PP | : | 234 / 230 | ms |
| P/QRS/T | : | / -75/ -70 | stopni |
| QTD/QTcBD | : | 42 / 87 | ms |
| Sokolow | : | mU | |
| NK | : | 17 | |



Interpretacja:

probably acute MI (anterior)
 left anterior hemiblock
 ventricular couplet
 atrial fibrillation
 sinoatrial arrest
 tachycardia
 left axis deviation
 ST-segment elevation (inferior)

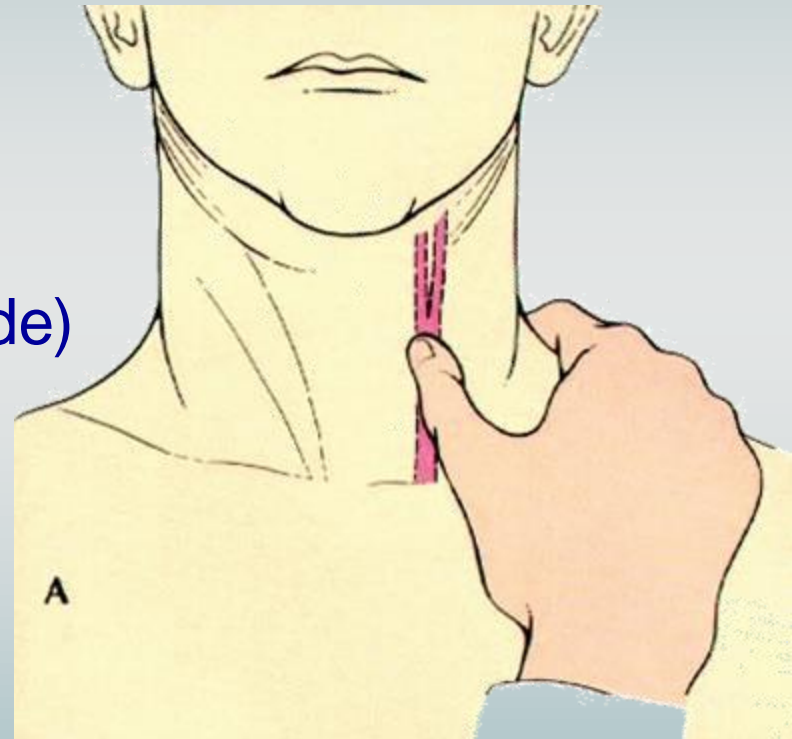
Report niez zaakceptowany.



AV-Reentrant Tachycardia

Therapy

- Acute treatment:
 - Vagal manoeuvres
 - Adenosine
 - class Ic-drugs (e.g. flecainide)
- Chronic treatment
 - catheter ablation
 - (class Ic-drugs)
 - ~~Verapamil and digoxin-!!!~~

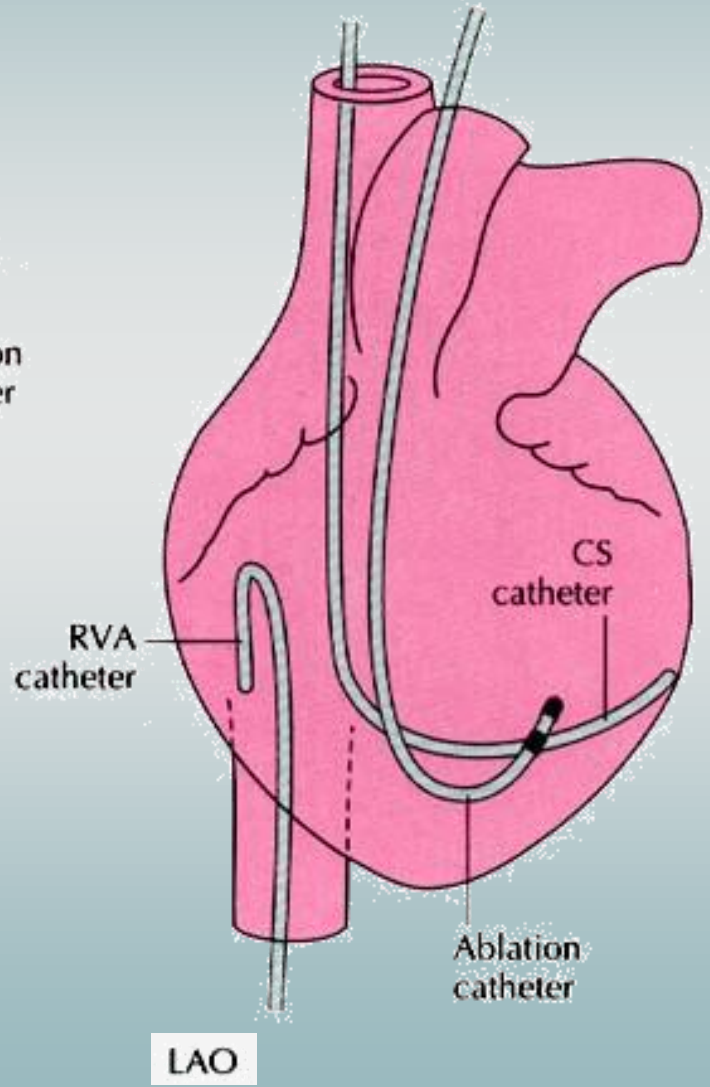
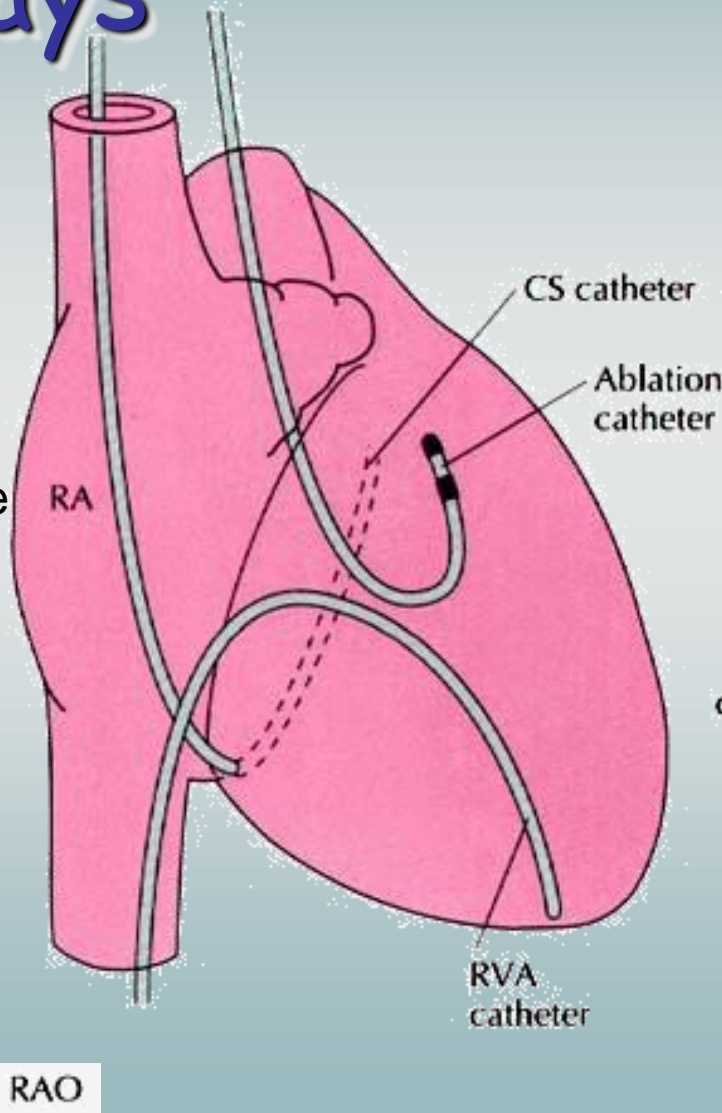


Ablation of left Accessory Pathways

Retrograde aortic approach

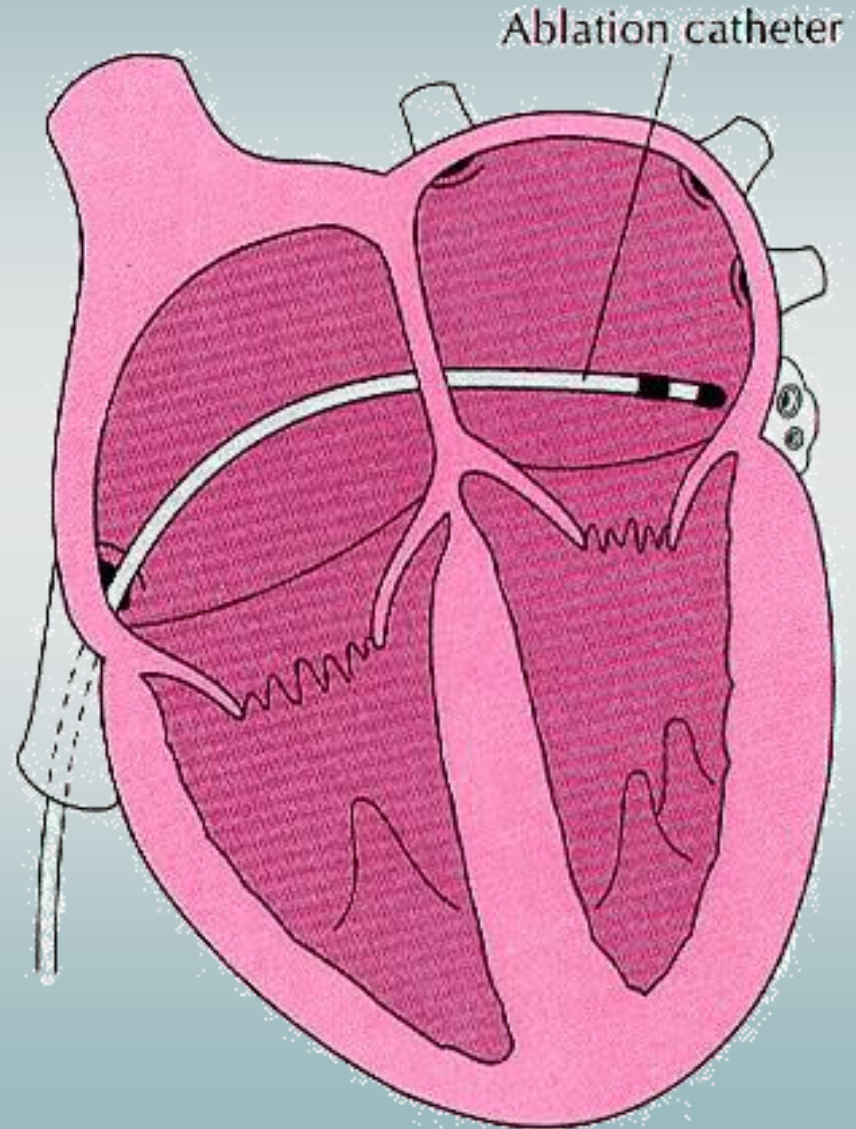
Tip is placed
1. underside of the mitral annulus
2. top of the mitral valve on the atrial portion of the atrioventricular groove.

IC - fusion of atrial and ventricular ECGs with an AP potential



Ablation of left Accessory Pathways

Trans-septal approach



O, S
2004-12-01 09:56:08 (Speed: 25 mm/s)
47508/04

I Katedra i Klinika Kardiologii AM w Warszawie



ARRHYTHMIAS

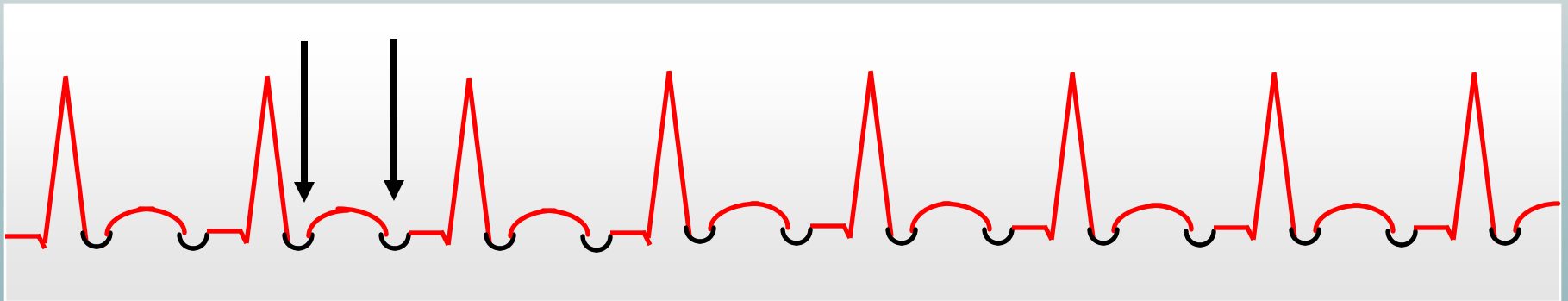
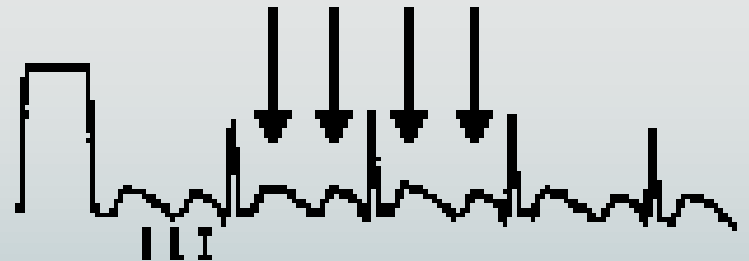
Atrial

Flutter

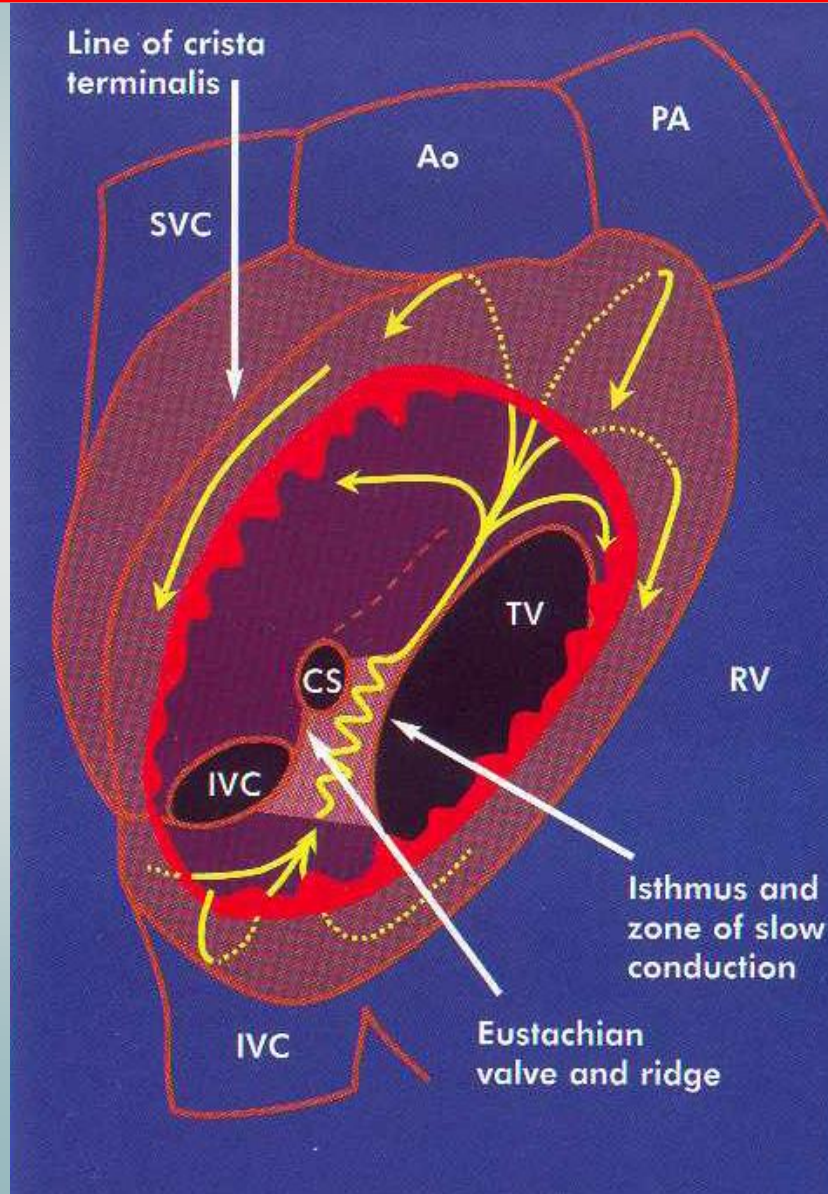


Typical Atrial Flutter

- atrial CL 200 - 250 ms
- often 2:1 conduction
 - ventricular rate 150
- narrow QRS or BBB



Atrial Flutter



K , K
2005-01-20 14:41:31(Speed: 25 mm/s)
3628/05

I Katedra i Klinika Kardiologii AM w Warszawie



14:41:31 14:51:00 14:51:02 14:51:04 14:51:06 14:51:08

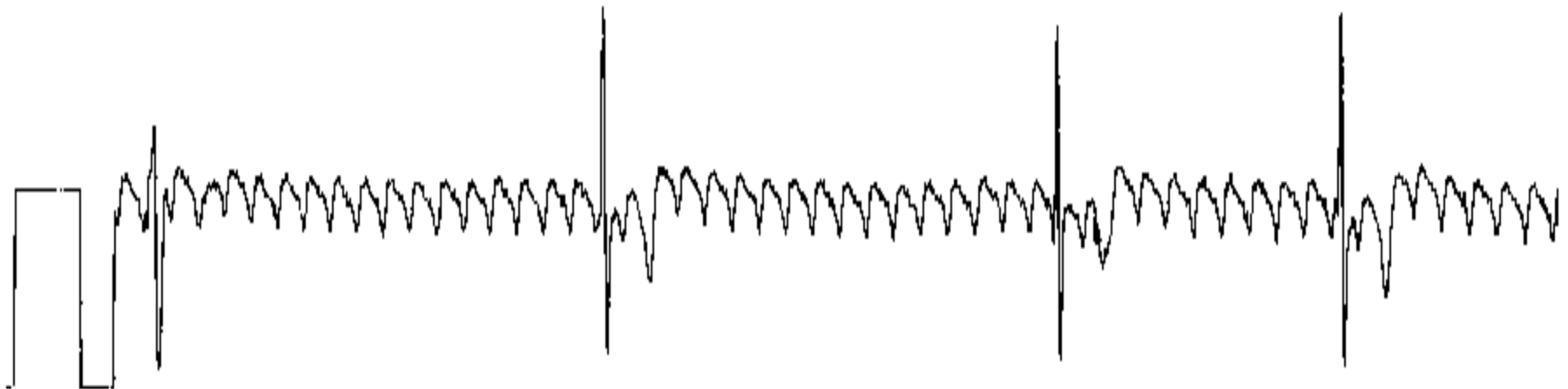
Atrial Flutter - 2:1 AV *conduction*

- The sawtooth can usually be seen in the leads II, III and aVF if one looks closely. Sometimes in V1.
- Suspect 2:1 flutter when you see a rate of about 150 bpm.



Typical Atrial Flutter

- A characteristic 'sawtooth' or 'picket-fence' waveform of an intra-atrial re-entry circuit usually at about 300 bpm.
- This patient was taking rather too much digoxin and has a very slow ventricular response.



Atrial Flutter

Clinical Aspects

- Palpitations
- Tachycardia (2:1 conduction)
- Dyspnoea
- Angina pectoris
- Rarely asymptomatic
- Symptoms related to severity of underlying heart disease

Atrial Flutter

Therapy

- Electrical cardioversion
- Catheter ablation
- Antiarrhythmic drugs
 - risk of 1:1 conduction
- Amiodarone, sotalol, flecainide

ARRHYTHMIAS

Atypical

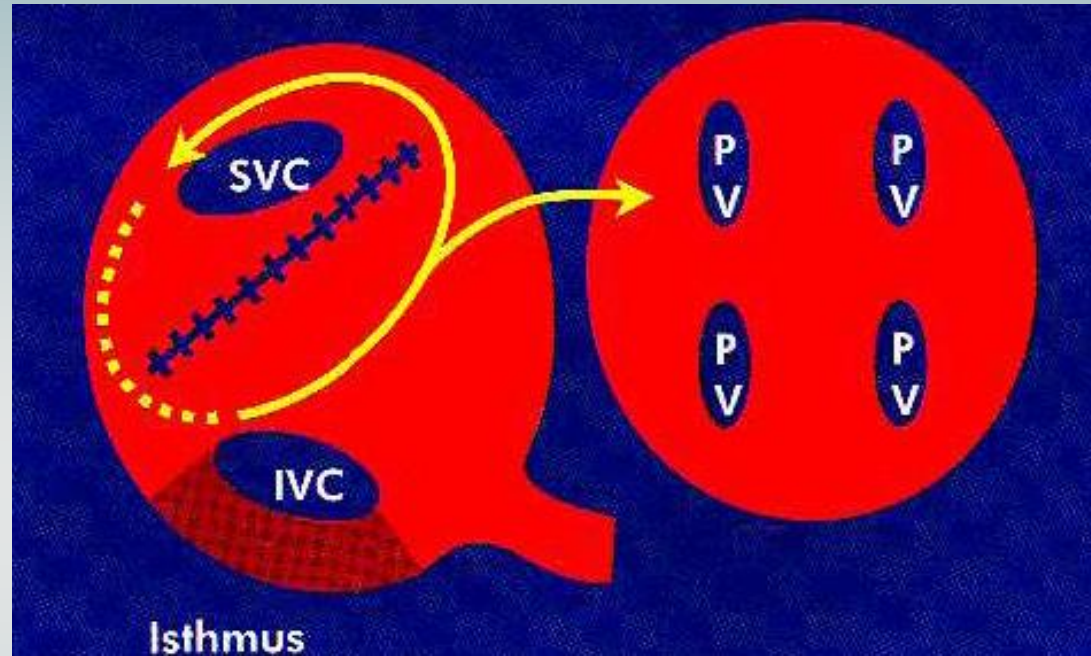
Flutter



Mechanism of operation

- Reentry
- After atrial surgical intervention
- May involve reentry around the scar or use the usual isthmus region
- May be caused by the slow pathway within the scar, but circulate around an anatomical landmark (i.e. TCA)
- May sometimes be confused with Flutter

Atypical AFI



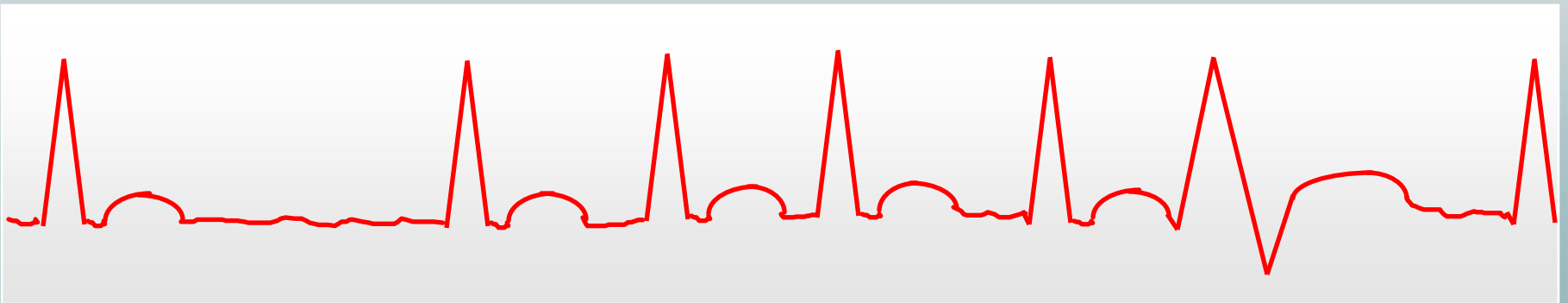
ARRHYTHMIAS



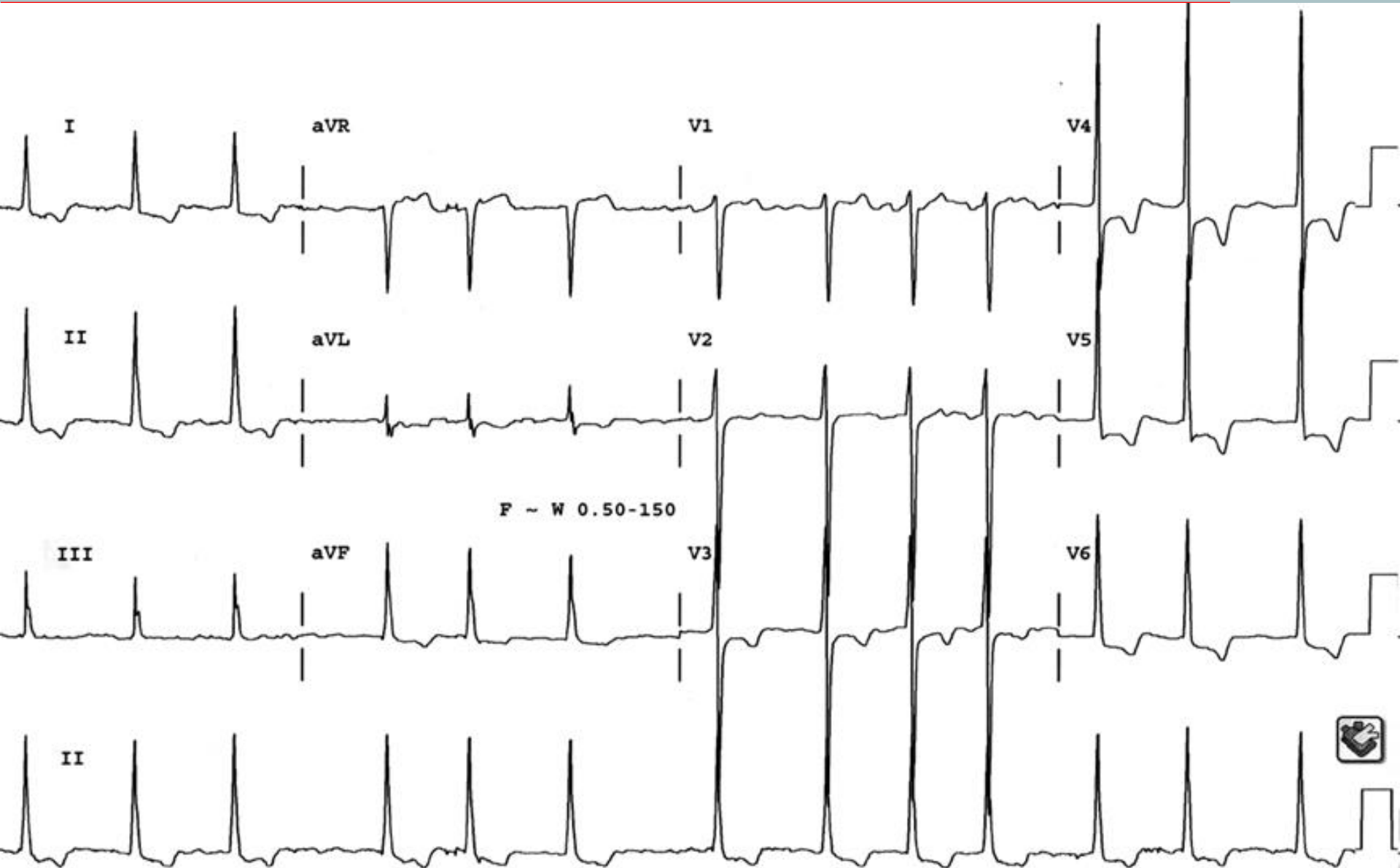
Fibrillation

Atrial Fibrillation

- No P-waves
- Variable RR-intervals
- Narrow QRS or BBB



Atrial Fibrillation



Atrial Fibrillation +LBBB



Atrial Fibrillation

Background and Aetiology

- Most frequent supraventricular tachycardia
- Age-dependent increase
 - 1% of total population
 - 3-4% > 60 years.
 - 7% > 70 years.
- Often related to cardiovascular diseases
 - hypertension
 - organic heart disease

Atrial Fibrillation

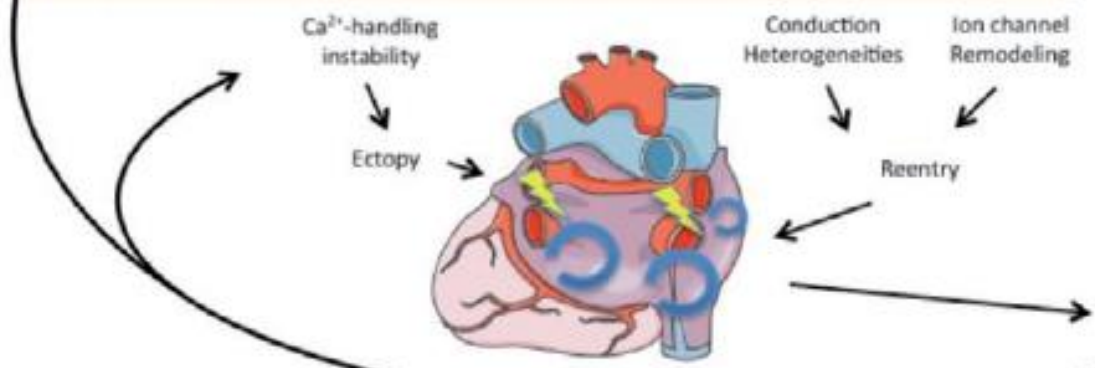
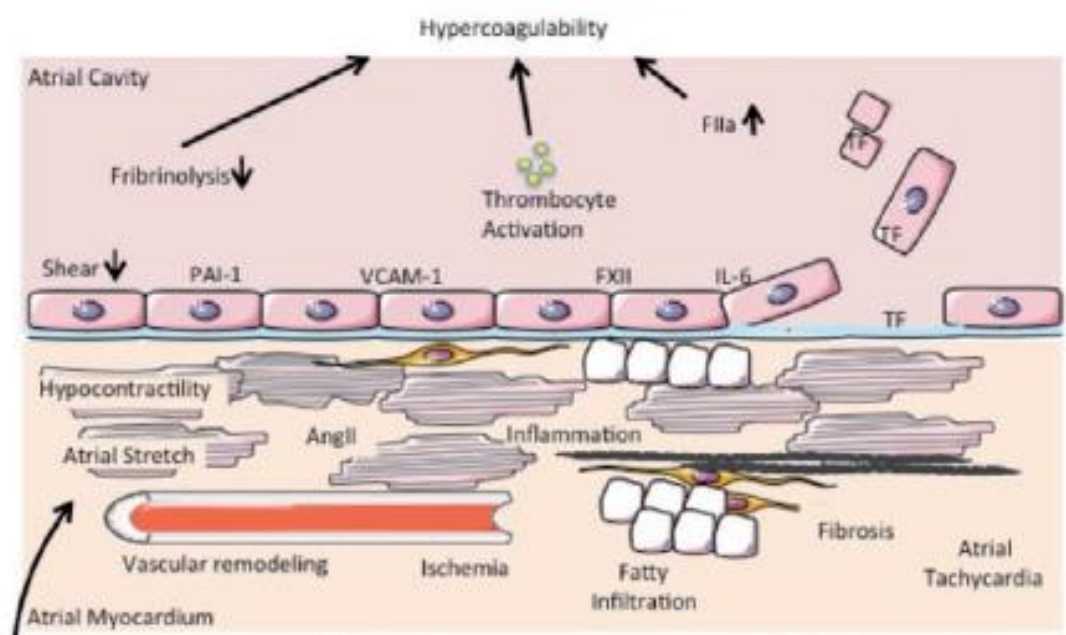
Clinical Aspects

- Paroxysmal, permanent, persistent, long standing AF
- Absolute arrhythmia
- Bradycardia or tachycardia
- Palpitations
- Dyspnoea and/or angina
- Very rarely syncope
- Frequently asymptomatic
- Significant risk of thromboembolic complications



Stroke

- Diabetes
- Heart failure
- Obesity
- Coronary artery disease
- Hypertension
- Ageing
- Genetic predisposition



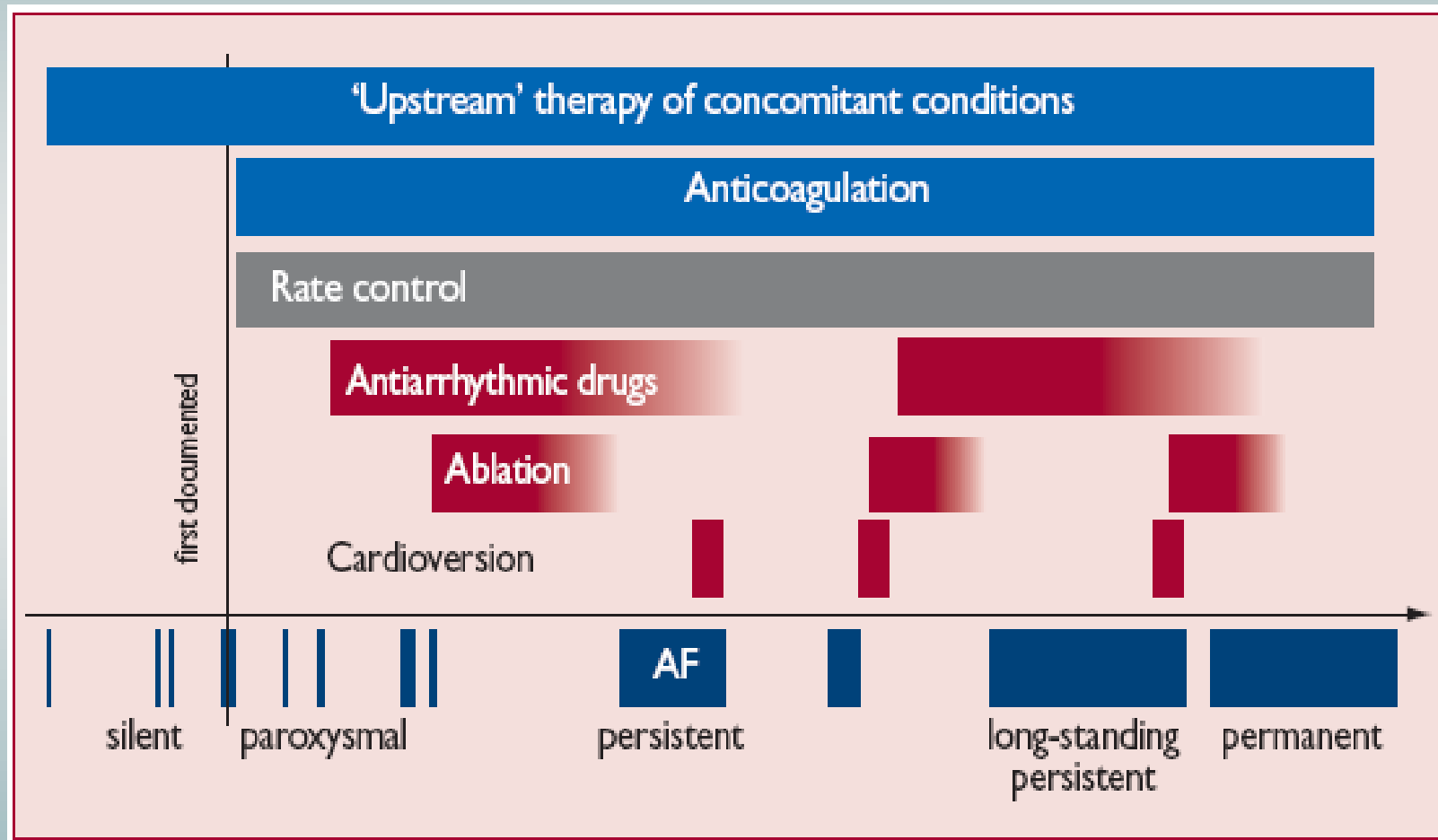
Atrial fibrillation

AngII = angiotensin II; TF = tissue factor; FXII = factor XII; IL-6 = interleukin 6; PAI-1 = plasminogen activator inhibitor 1; VCAM-1 = vascular cell adhesion molecule 1.

Atrial Fibrillation

| AF pattern | Definition |
|-----------------------------|---|
| First diagnosed AF | AF that has not been diagnosed before, irrespective of the duration of the arrhythmia or the presence and severity of AF-related symptoms. |
| Paroxysmal AF | Self-terminating, in most cases within 48 hours. Some AF paroxysms may continue for up to 7 days. ^a AF episodes that are cardioverted within 7 days should be considered paroxysmal. ^a |
| Persistent AF | AF that lasts longer than 7 days, including episodes that are terminated by cardioversion, either with drugs or by direct current cardioversion, after 7 days or more. |
| Long-standing persistent AF | Continuous AF lasting for ≥ 1 year when it is decided to adopt a rhythm control strategy. |
| Permanent AF | AF that is accepted by the patient (and physician). Hence, rhythm control interventions are, by definition, not pursued in patients with permanent AF. Should a rhythm control strategy be adopted, the arrhythmia would be re-classified as 'long-standing persistent AF'. |

AF - 'natural' time course



EHRA score of AF-related symptoms

| Modified EHRA score | Symptoms | Description |
|---------------------|-----------|---|
| 1 | None | AF does not cause any symptoms |
| 2a | Mild | Normal daily activity not affected by symptoms related to AF ^a |
| 2b | Moderate | Normal daily activity not affected by symptoms related to AF, but patient troubled by symptoms ^a |
| 3 | Severe | Normal daily activity affected by symptoms related to AF |
| 4 | Disabling | Normal daily activity discontinued |

Atrial Fibrillation

Therapy

- Rate control
- Rhythm control
- Prevention of thromboembolism

CHADS2-VASC

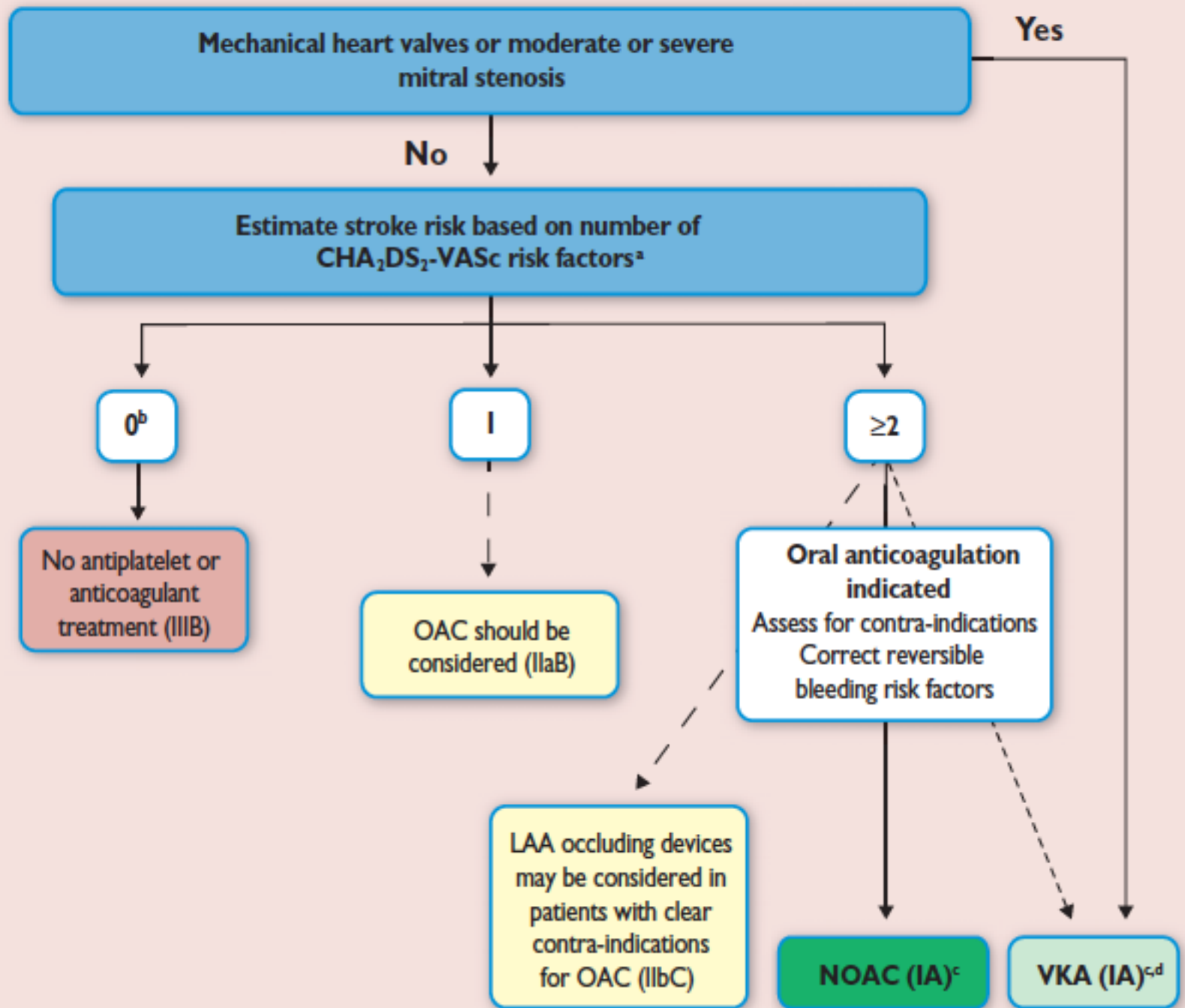
(a) Risk factors for stroke and thrombo-embolism in non-valvular AF

| 'Major' risk factors | 'Clinically relevant non-major' risk factors |
|---|--|
| Previous stroke, TIA, or systemic embolism Age ≥ 75 years | Heart failure or moderate to severe LV systolic dysfunction (e.g. LV EF $\leq 40\%$) Hypertension - Diabetes mellitus Female sex - Age 65–74 years Vascular disease ^a |

(b) Risk factor-based approach expressed as a point based scoring system, with the acronym CHA₂DS₂-VASC

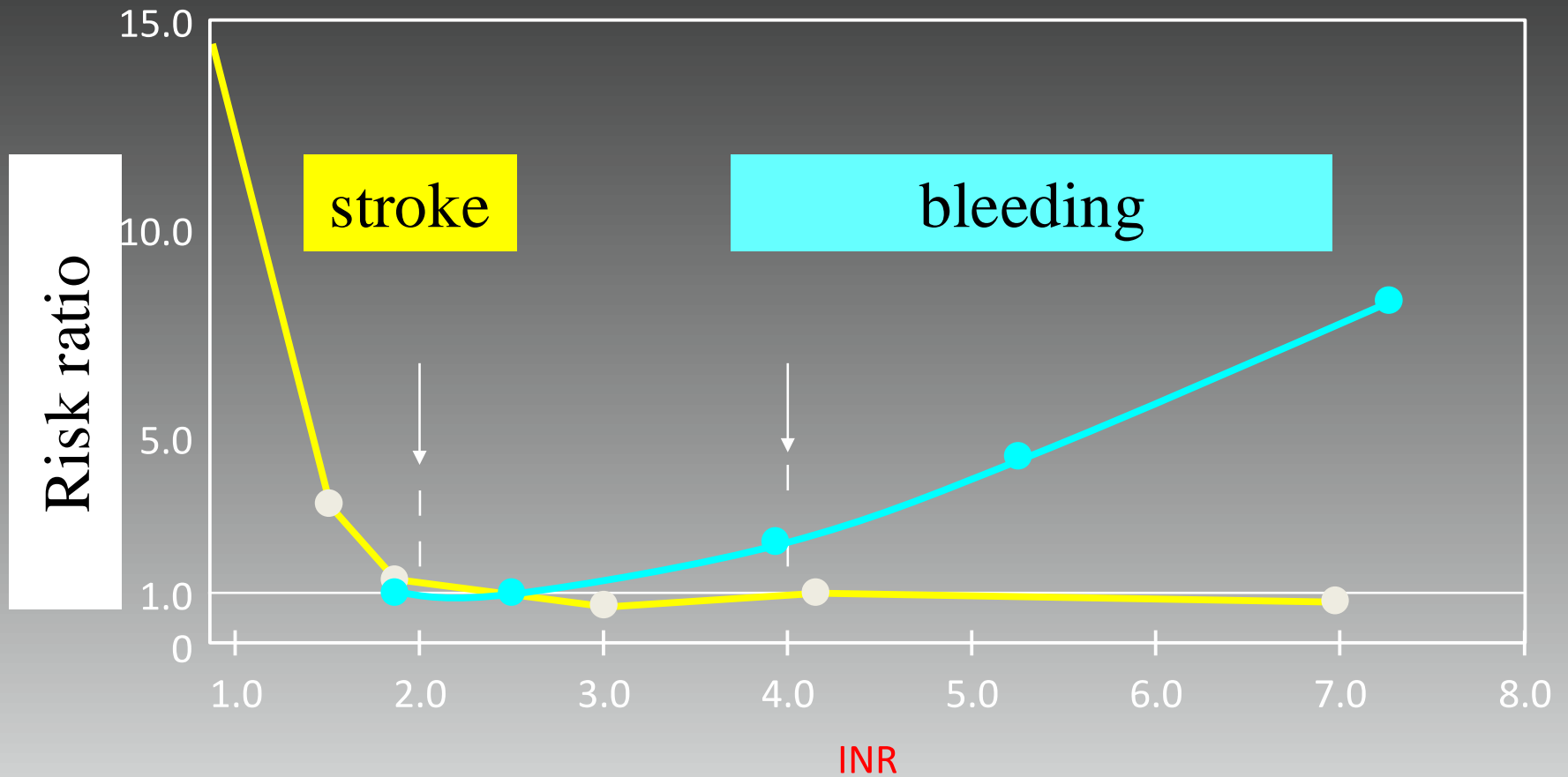
(Note: maximum score is 9 since age may contribute 0, 1, or 2 points)

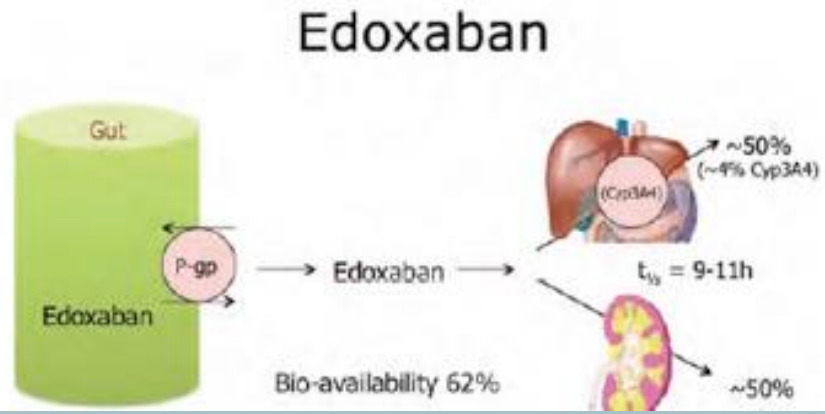
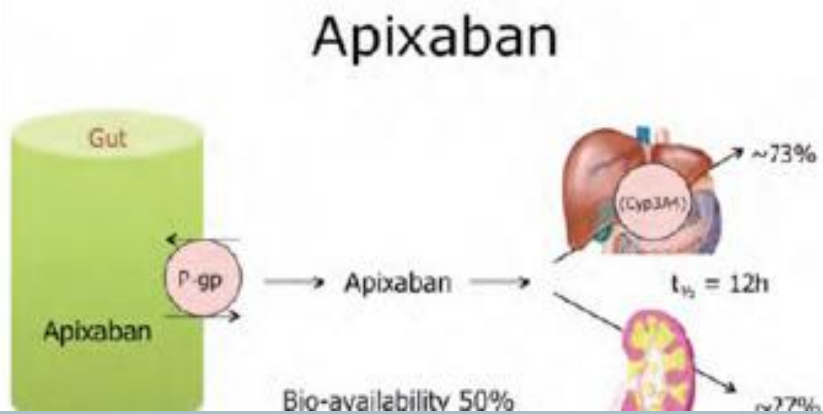
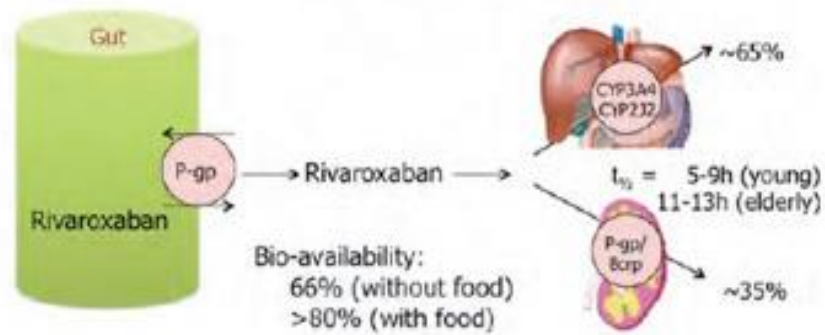
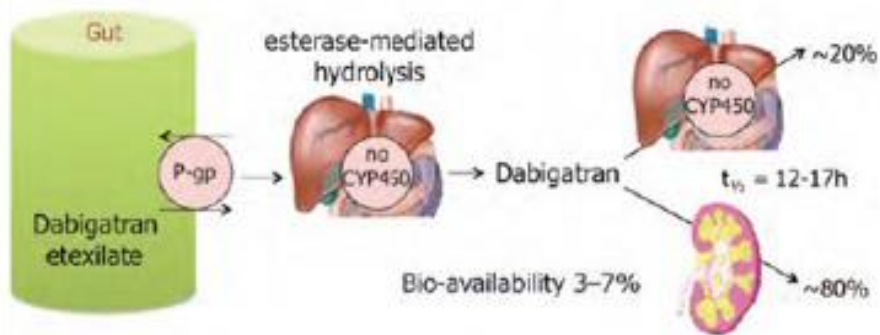
| Risk factor | Score |
|---|----------|
| Congestive heart failure/LV dysfunction | 1 |
| Hypertension | 1 |
| Age ≥ 75 | 2 |
| Diabetes mellitus | 1 |
| Stroke/TIA/thrombo-embolism | 2 |
| Vascular disease ^a | 1 |
| Age 65–74 | 1 |
| Sex category (i.e. female sex) | 1 |
| Maximum score | 9 |



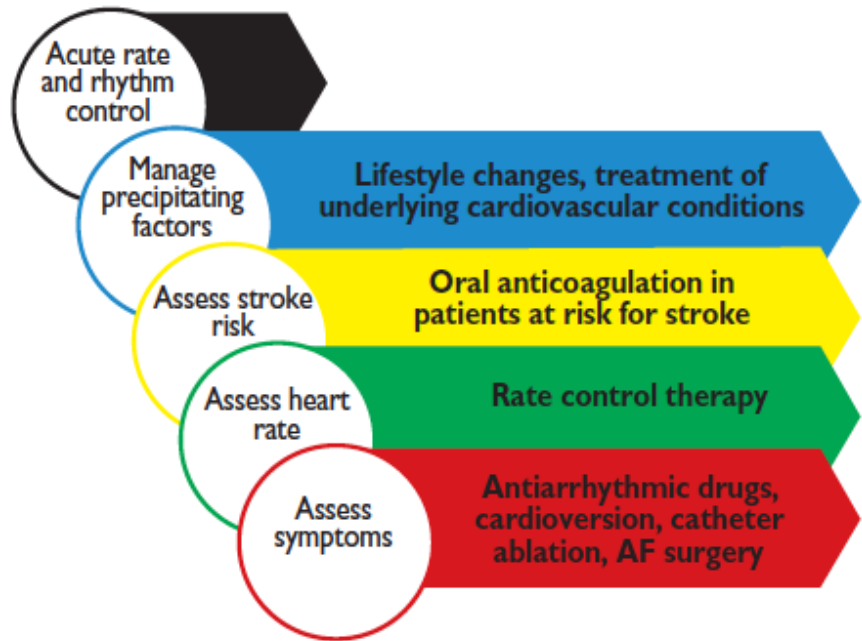
INR range

Safety and efficacy of VKA





Treatment

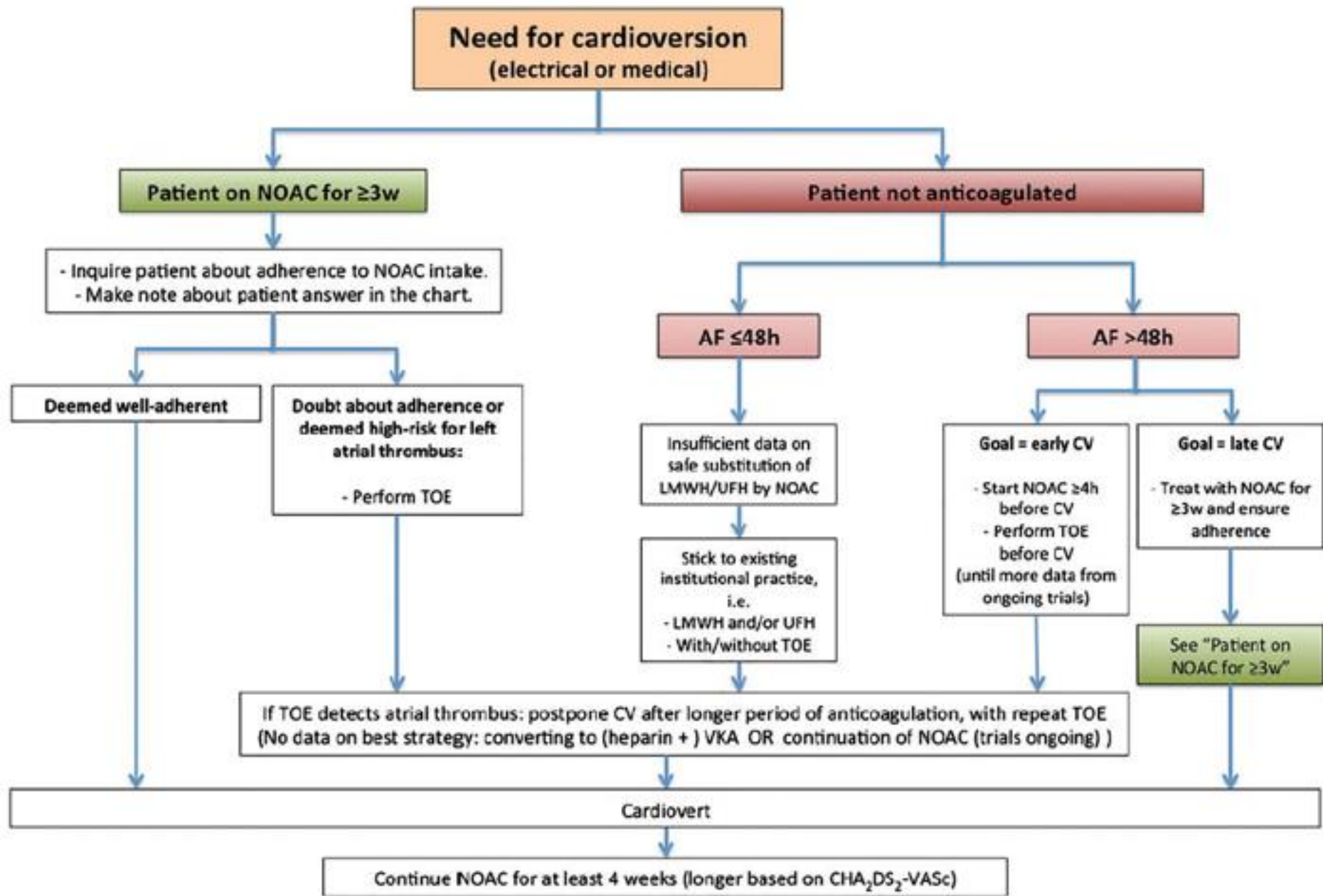


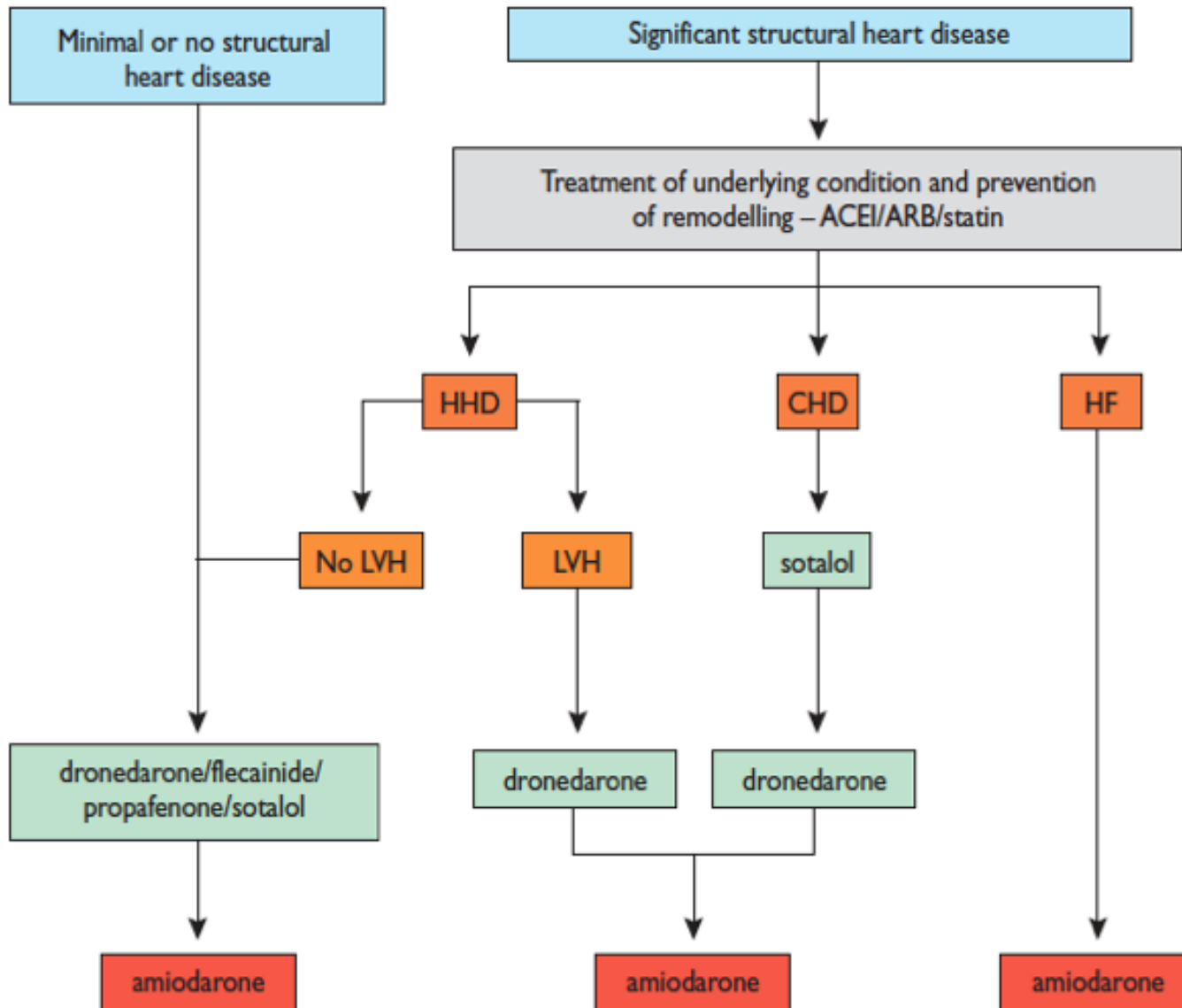
Desired outcome

- Haemodynamic stability
- Cardiovascular risk reduction
- Stroke prevention
- Symptom improvement, preservation of LV function
- Symptom improvement

Patient benefit

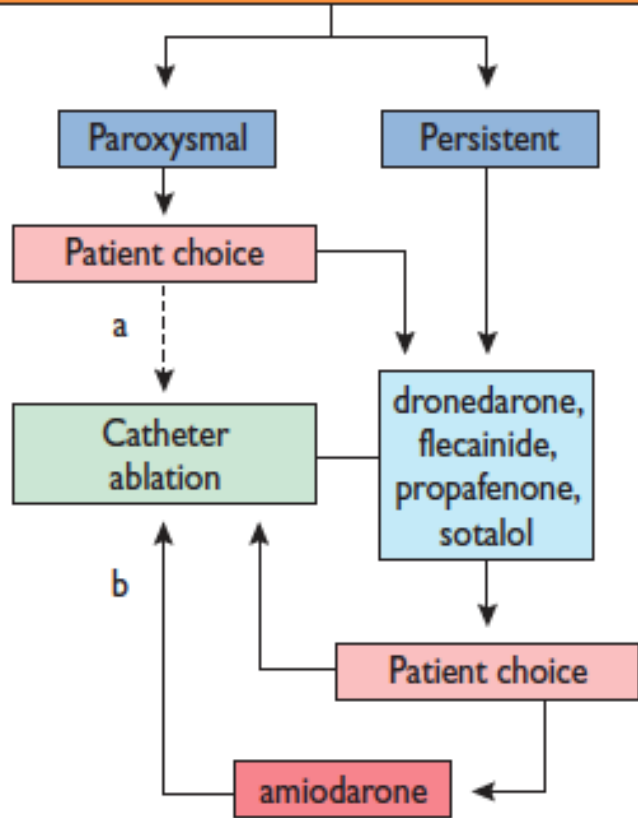




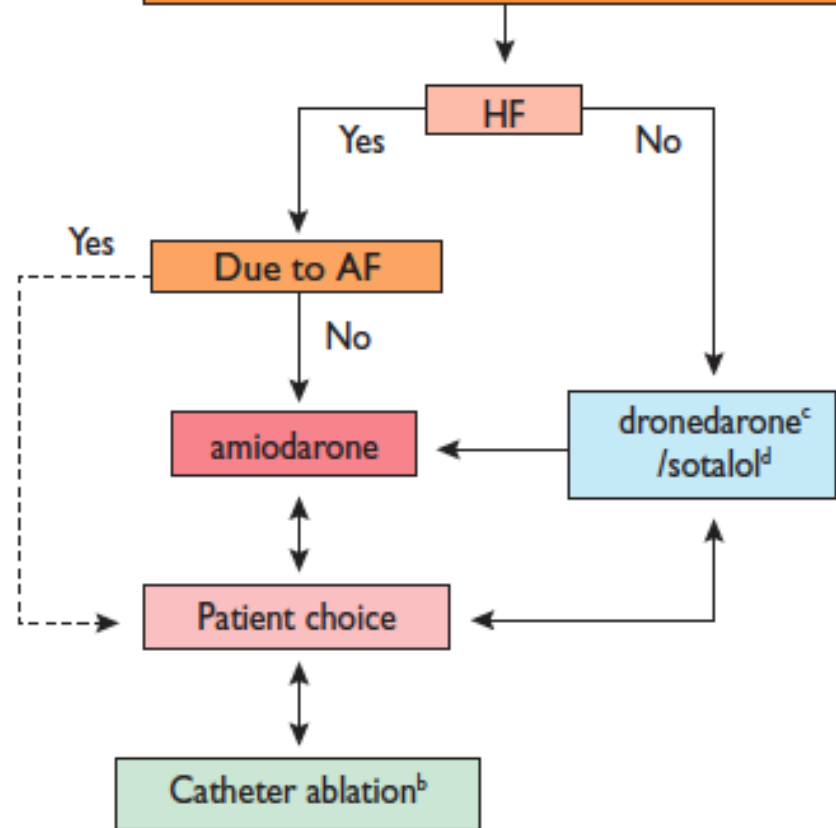


ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin-receptor blocker; HHD = hypertensive heart disease; CHD = coronary heart disease; HF = heart failure; LVH = left ventricular hypertrophy, NYHA = New York Heart Association. Antiarrhythmic agents are listed in alphabetical order within each treatment box.

No or minimal structural heart disease

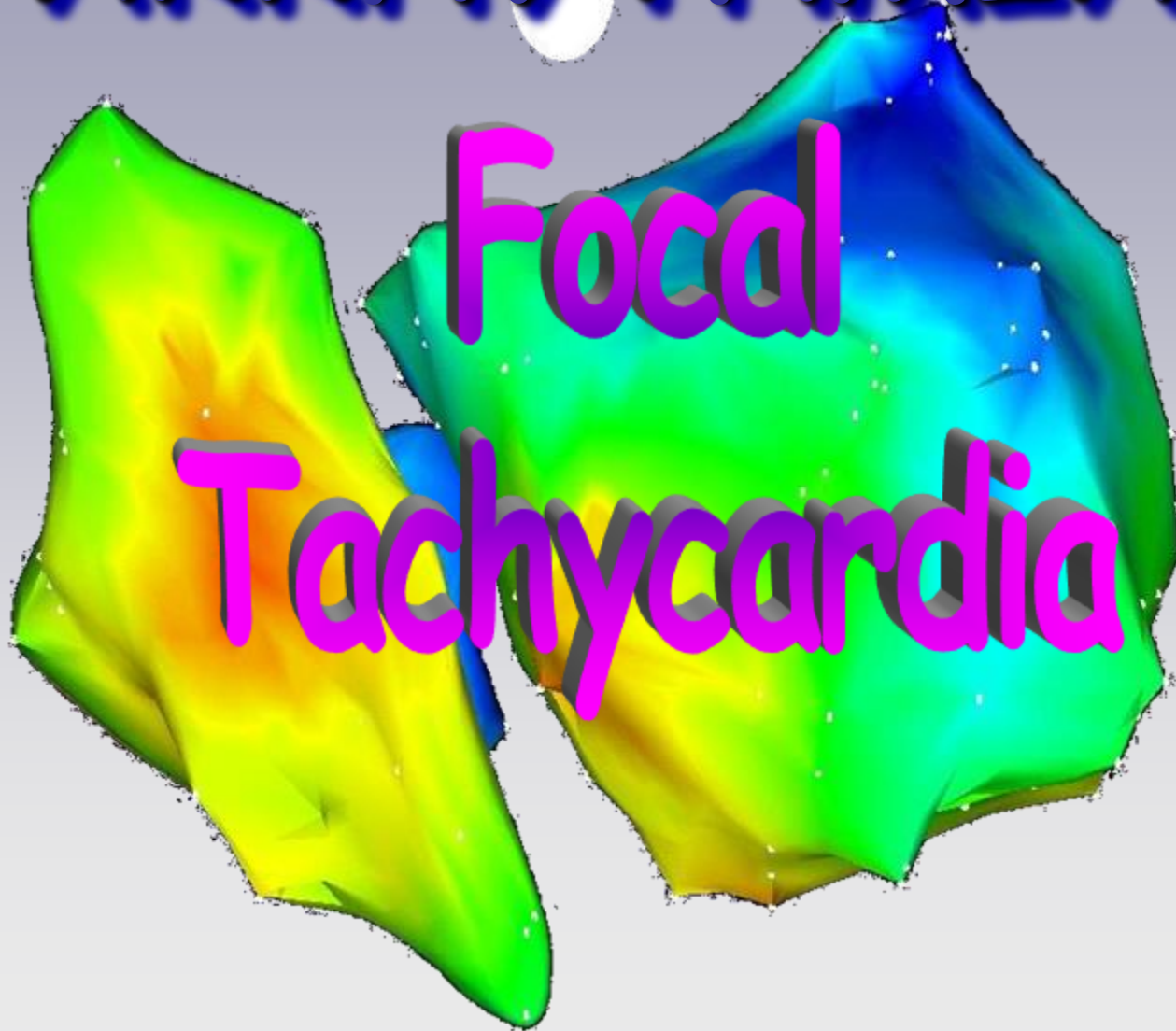


Relevant structural heart disease



AF = atrial fibrillation; HF = heart failure. ^aUsually pulmonary vein isolation is appropriate. ^bMore extensive left atrial ablation may be needed. ^cCaution with coronary heart disease. ^dNot recommended with left ventricular hypertrophy. Heart failure due to AF = tachycardiomyopathy.

ARRHYTHMIAS

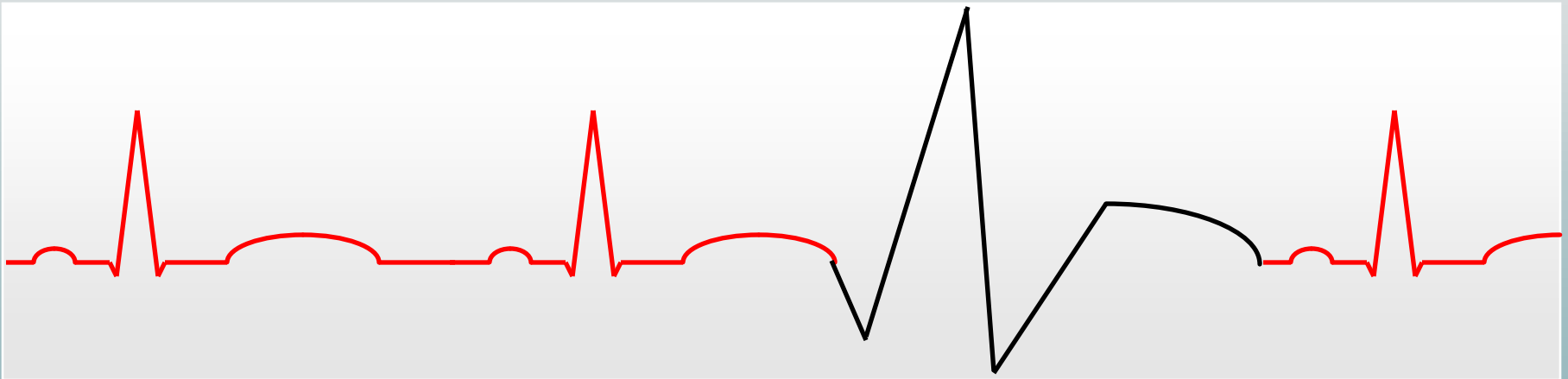


Focal

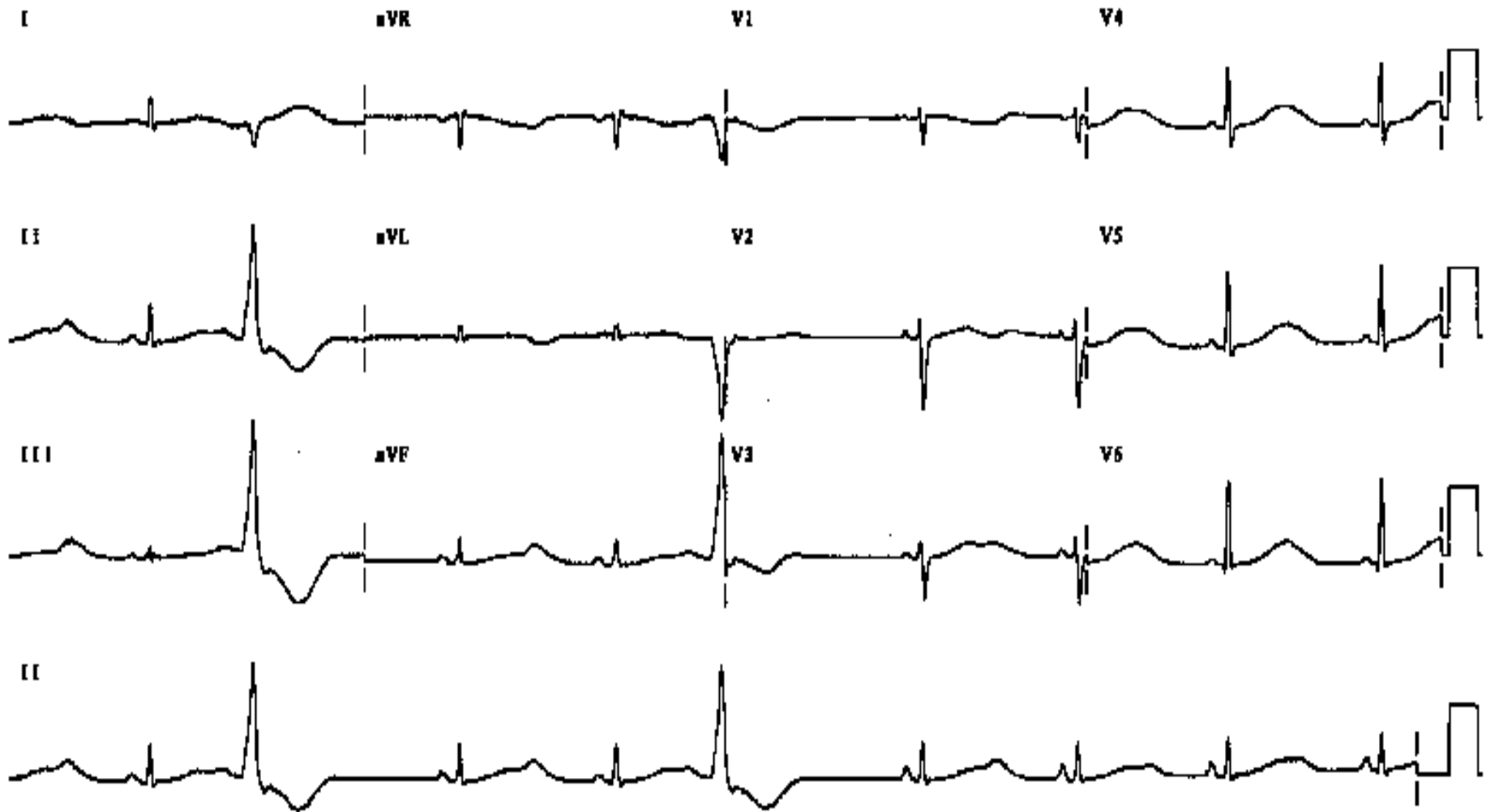
Tachycardia

Ventricular Extrasystole

- Premature
- No P wave
- Wide QRS

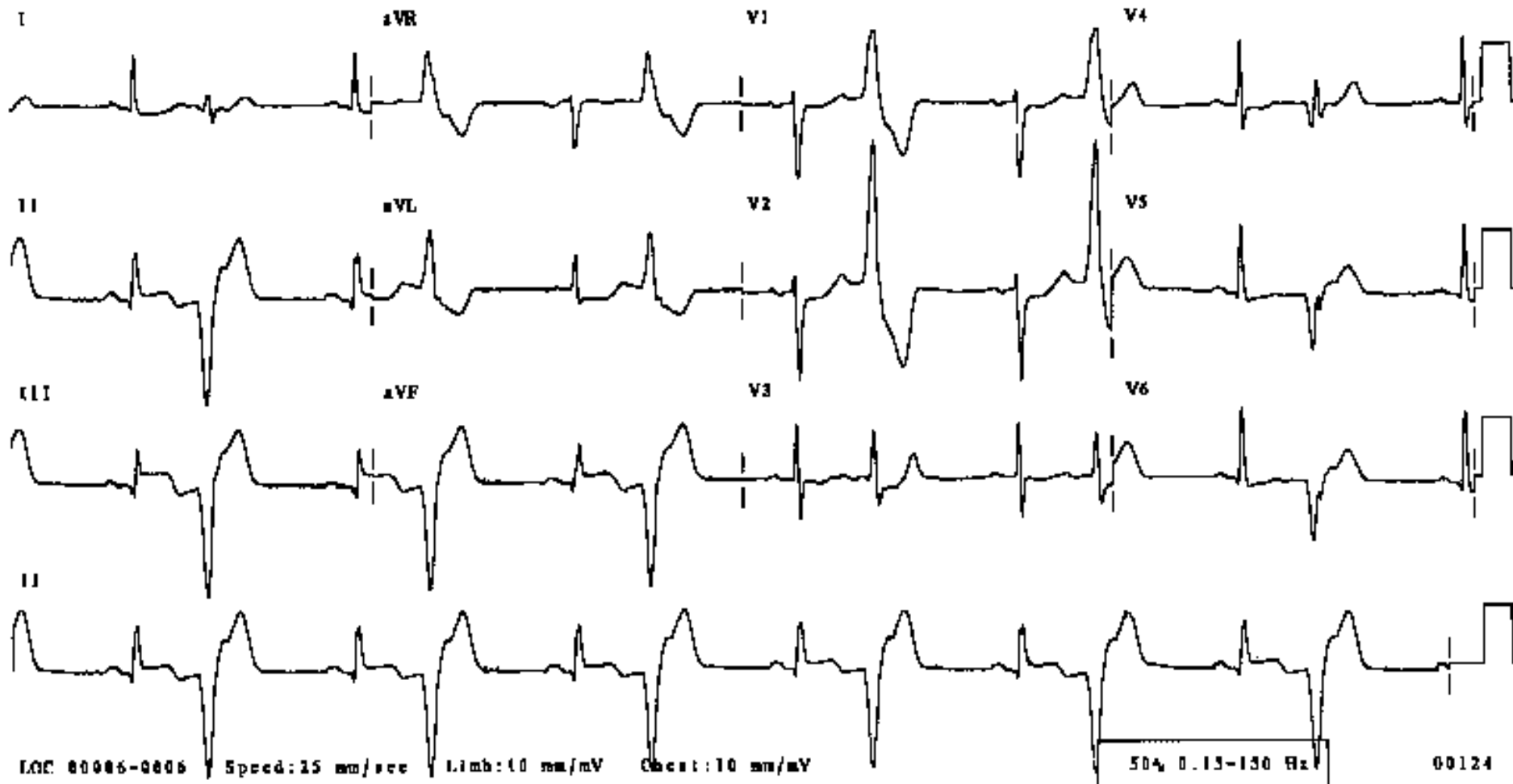


Ventricular premature beats (VPBs)



Ventricular bigeminy

A ventricular premature beat follows each normal beat



Ventricular Extrasystole

Clinical Aspects

- Often no symptoms
- Palpitations
- Symptoms depend on incidence
- May induce other arrhythmias
 - ventricular tachycardia

Ventricular Extrasystole

Therapy

- Often no therapy necessary
- Antiarrhythmic drugs
 - Cave: CAST-data
- (catheter ablation)

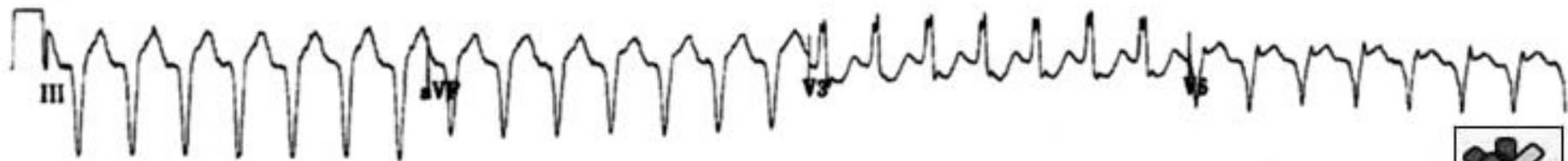
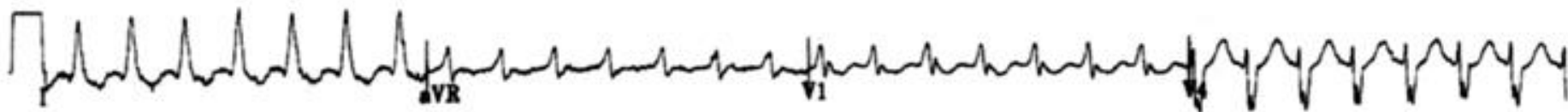
Ventricular Tachycardia

- wide QRS
- no P waves
- no typical BBB



Ventricular Tachycardia

70 yrs, previous myocardial infarction, on a beta-blocker, after a shock, sinus rhythm.



VT Overview

□ Ischemic (Post MI)

- Scar related
- Slow conduction pathways
- Re-entry mechanism

□ Idiopathic VT

- Not associated with detectable structural heart disease.
- Usually Focal mechanism
- RVOT

Ventricular Tachycardia

Clinical Aspects

- Tachycardia
- Palpitations
- Dyspnoea
- Angina pectoris
- (Pre)syncope
- Sudden death

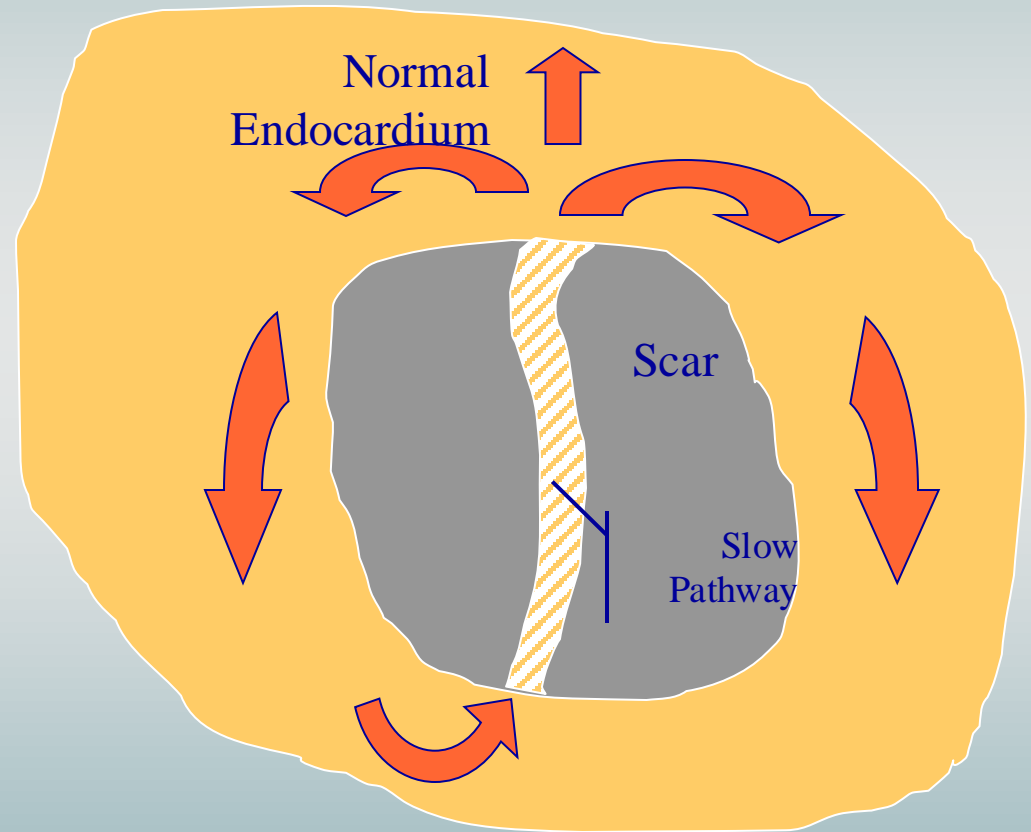
Ventricular Tachycardia

Therapy

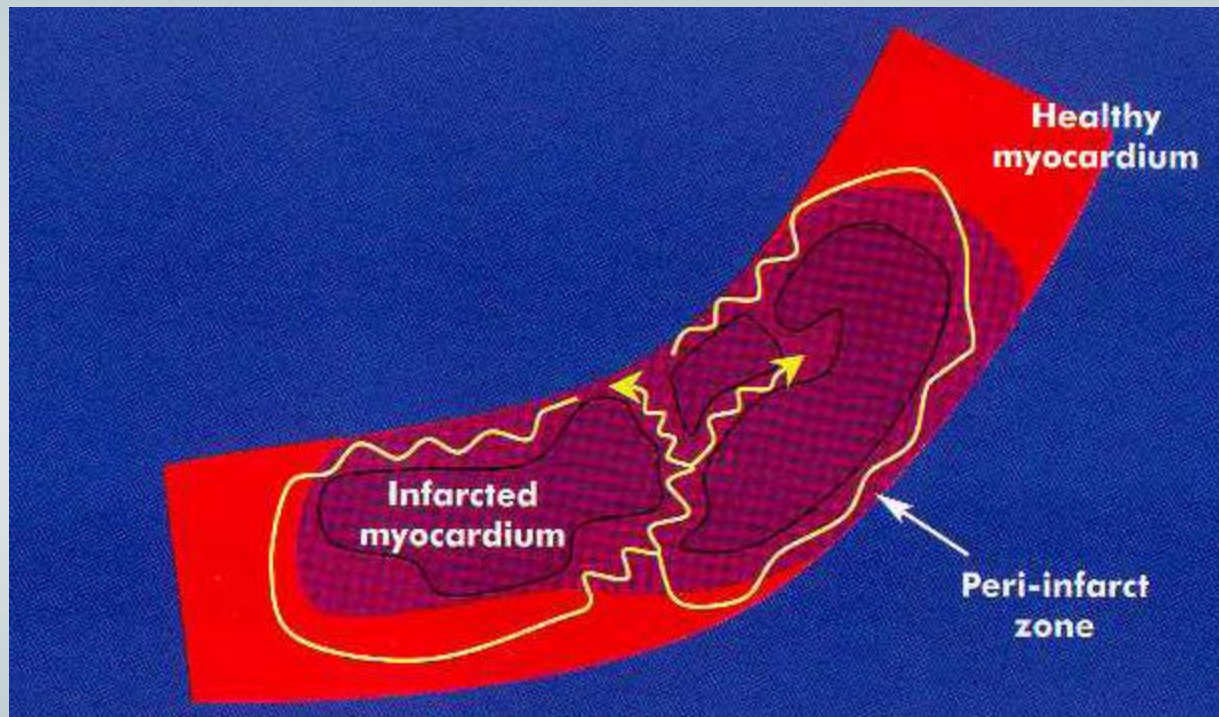
- Sustained VT “always” requires patients evaluation (and therapy)
- Antiarrhythmic drugs
- Catheter ablation
- Antitachycardia surgery
- Implantable cardioverter/defibrillator

Ischemic VT

The basic treatment approach is to block the conduction through the critical slow pathway.

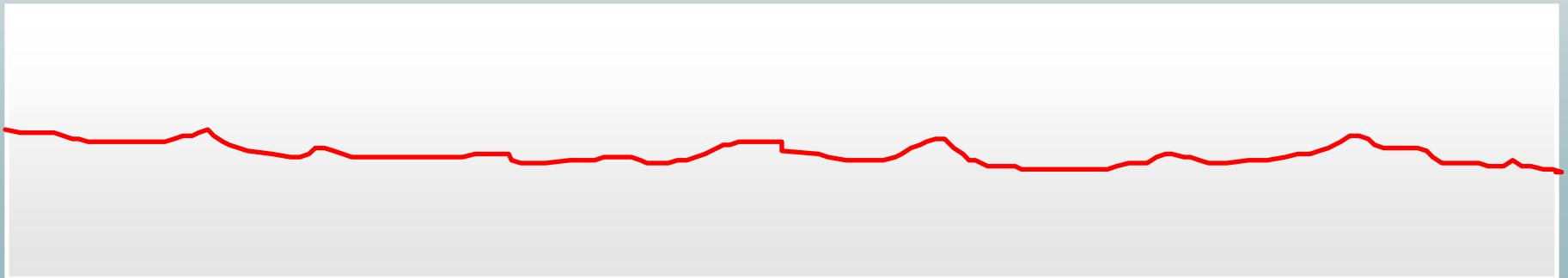


Scar related VT

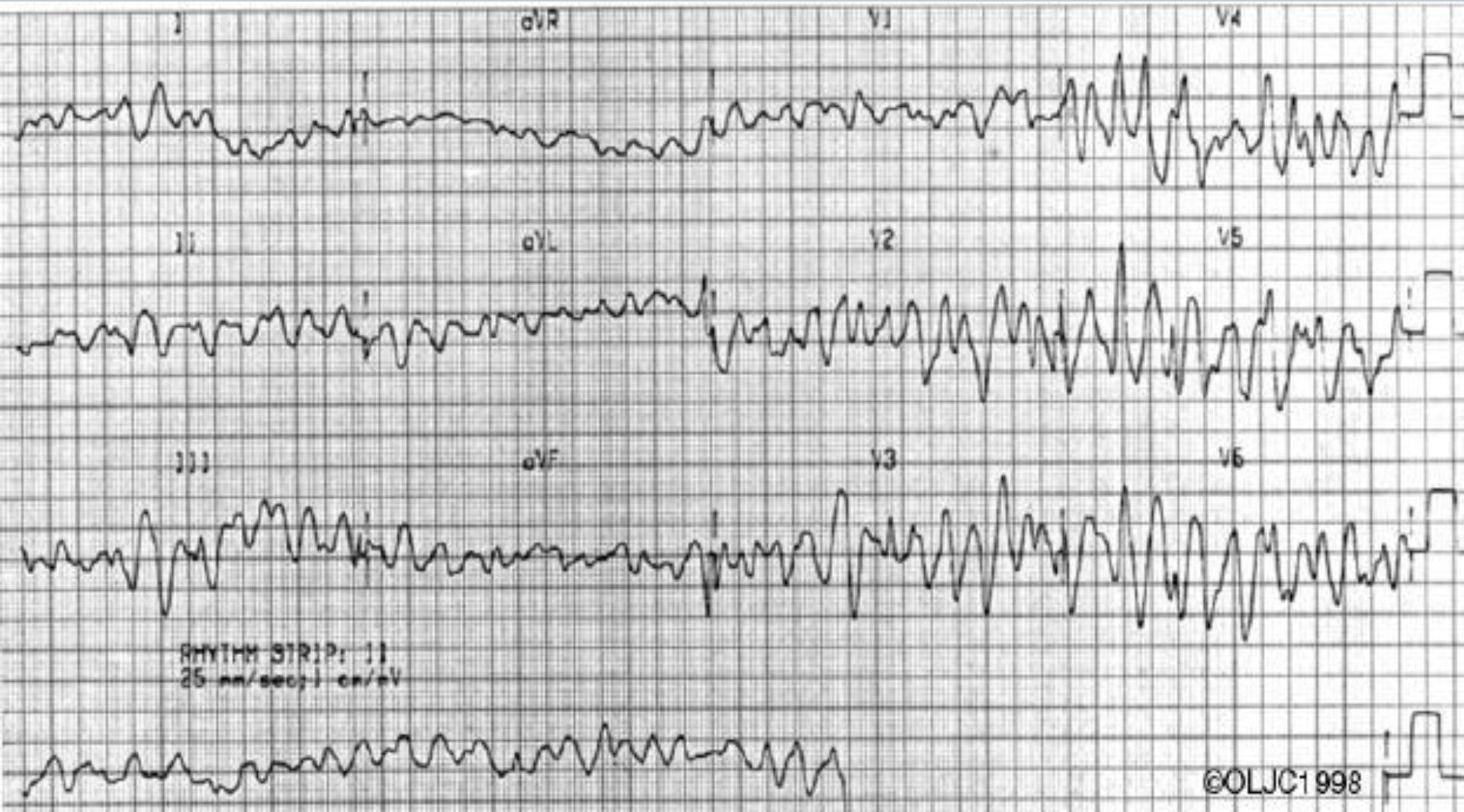


Ventricular Flutter/Fibrillation

- no QRS detectable



Ventricular Fibrillation



Ventricular Flutter/Fibrillation

Background and Aetiology

- Patients with organic heart disease
 - coronary artery disease,
 - acute MI or
 - post MI
 - cardiomyopathies
- Rarely in healthy subjects
 - idiopathic VF
- Rarely in pts. with WPW-syndrome
- Degeneration of ventricular tachycardia

Ventricular Flutter/Fibrillation

Clinical Aspects

- ❑ Syncope within seconds
- ❑ Dramatical drop of blood pressure
- ❑ Generalised ischemia
- ❑ Asystole within minutes
- ❑ Sudden cardiac death

Ventricular Flutter/Fibrillation

Therapy

- Immediate resuscitation
- Defibrillation as soon as possible
- After survival careful examination
 - Heart catheterization
 - Electrophysiologic study
- Therapy of 1st choice: ICD-implantation

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I Katedra i Klinika Kardiologii AM

PEI CardioEP

12 ekg

Ablacja EK/PL

VEBs

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