Common Arrhythmia in Elderly

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Overview

- Cardiac rhythm in elderly : Causes
  - Degenerative changes
  - Consequences of
    - Cardiovascular problems
      - CAD, Hypertensive heart, etc.
    - Other medical problems
      - CKD, thyroid dysfunction, COPD, anemia, elecrolyte disturbances, etc.
    - Medications
      - Antihypertensvie drugs, bronchodilators, etc.

Overview

- Cardiac rhythm in elderly : Impact
  - Significant cause of fall
  - Physical disablity
  - Frequent hospital admission
  - Aggravation of preexisting cardiovascular problems

Common arrhythmia in Elderly

- Bradyarrhythmia
  - Sick sinus syndrome
  - Disturbances of atrioventricular conduction (AV block)
- Tachyarrhythmia
  - Atrial tachyarrhythmia
    - Atrial fibrillation, atrial flutter, atrial tachycardia
  - Ventricular tachyarrhythmia
    - Ventricular tachycardia
- Tachy-bradyarrhythmia
- Ectopic beat
  - Premature atrial contraction (PAC)
  - Premature ventrucular contraction (PVC)

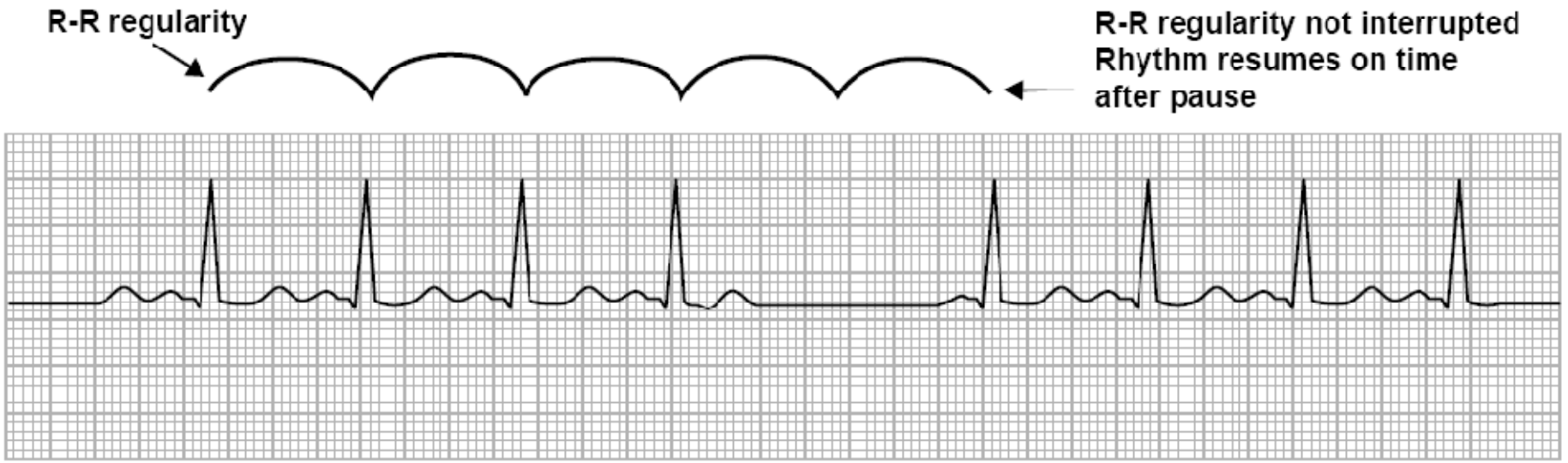
Sick Sinus Syndrome (SSS)

- Sick sinus syndrome or Sinus node dysfuntion
  - Disorders of impulse formation and conduction involving sinus node and/or peri-sinus node tissue
- Clinical manifestation
  - Sinus bradycardia +/- chronotropic incompetence
  - Sinus pause/ sinus arrest
    - Escape Juntional rhythm, escape ventricular rhythm or asystole (ventricular standstill)
  - Sinus exit block
  - Tachy-brady syndrome

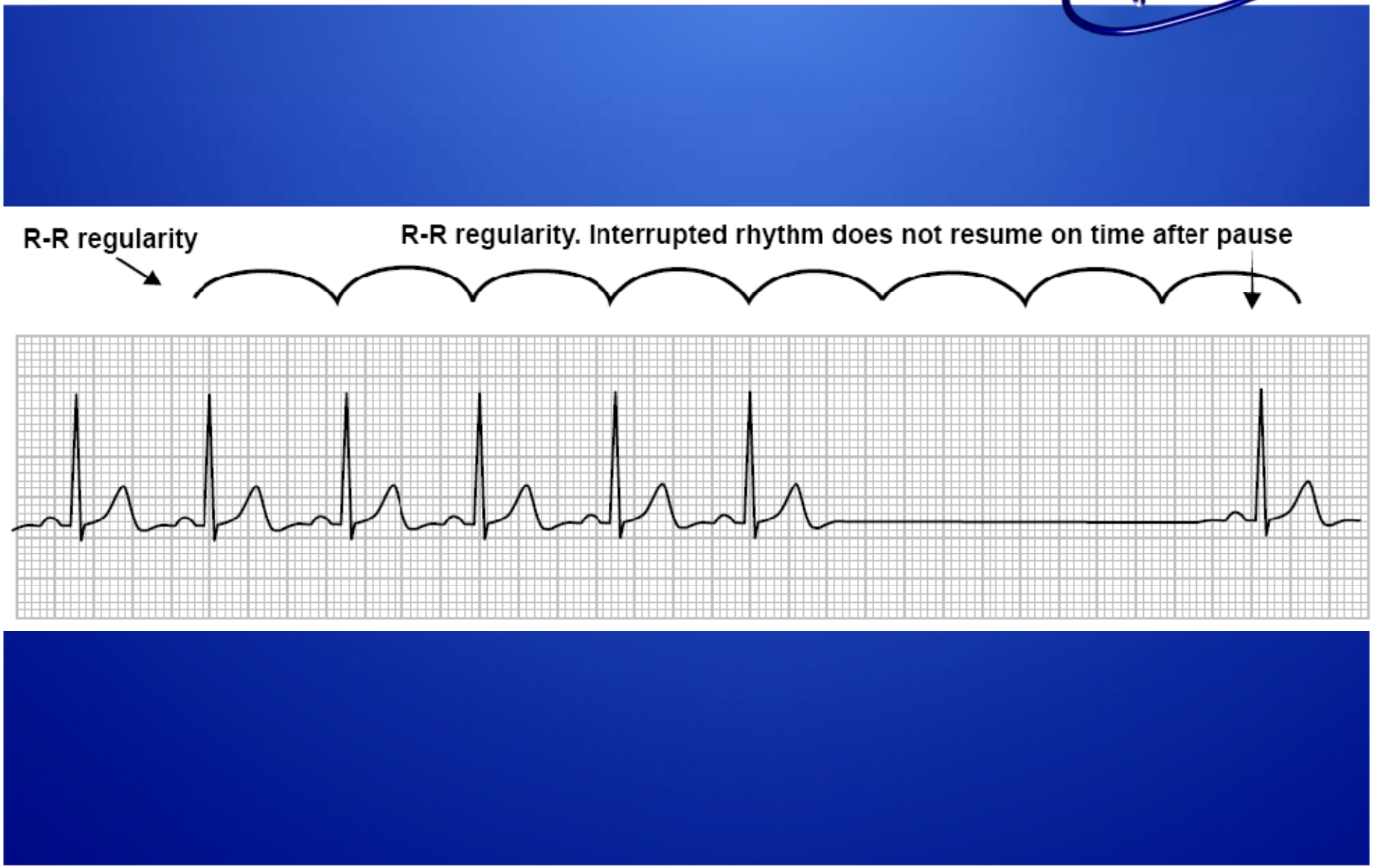
SSS - Causes

- Primary cause
  - Degenerative change
- Secondary causes or aggravating factors
  - Medical problems
    - Hypotjyroidism, infiltrative diseases (Amyloidosis, etc), inflammatory disorder (pericarditis, connective tissue disorder), Coronary arteru disease, malignancy, kidney and liver dysfunction
  - Medication
    - B-blockers, calcium blockers, digitalis, antiarrhythmic drugs (e.g. amiodarone, etc), antidepressant, lithium

Sinus exit block

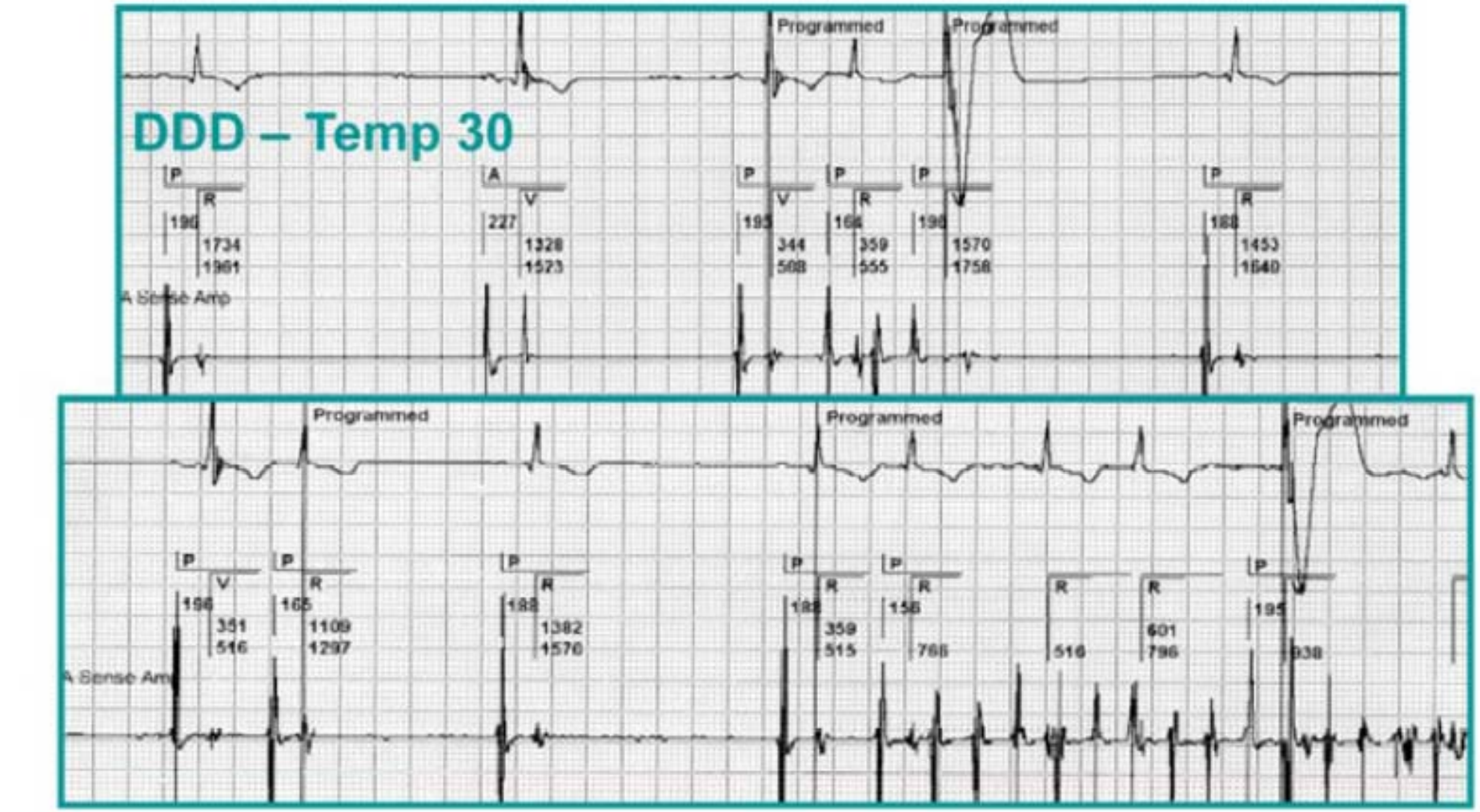


Sinus Arrest



Junctional Bradycardia

Tachy-bradyarrhythmia



Sick Sinus Syndrome

- Symptomatic sinus node dysfunction
  = Absolute indication for pacing
- AAI(R) is the pacing mode of choice
  - Dual chamber is frequently used due to high incidence of concomittent AV conduction problems (single chamber atrial pacing is not universally used)
  - If dual chamber pacer is used → should be programmed to avoid ventricular pacing
  - Single chamber VVI pacing is acceptable for extreme elderly without significant LV dysfunction

Indication for pacing in SSS

Class I	1. Proven symptomatic bradycardia, including frequent sinus pauses. In certain patients the bradycardia may be iatrogenic because of the taking of drugs that are considered irreplaceable. 2. Symptomatic chronotropic insufficiency.
Class IIa	1. Bradycardia (<40 beats/min) and presence of symptoms without a proven correlation between them. 2. Unexplained syncope in patients where severe sinus node dysfunction is revealed later, either spontaneously or during electrophysiological study.
Class IIb	Minimally symptomatic patients with slow rate (<40 beats/min) in an alert state.
Class III	Asymptomatic patients, or when symptoms are not the result of bradycardia.

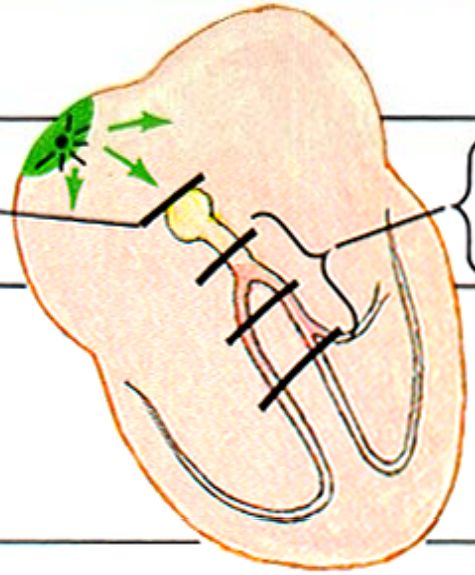
Disturbances of atrioventricular conduction

- Degree of AV conduction problem
  - 1st degree AV block
  - 2nd degree AV block
    - Mobitz I
    - Mobitz II
    - 2:1 AV block
  - 3rd degree AV block or complete heart block
- 1st degree AV block are common findings in Elderly (~8%) – usually not required treatment
- 2nd and 3rd degree AV block – not common (~1%)

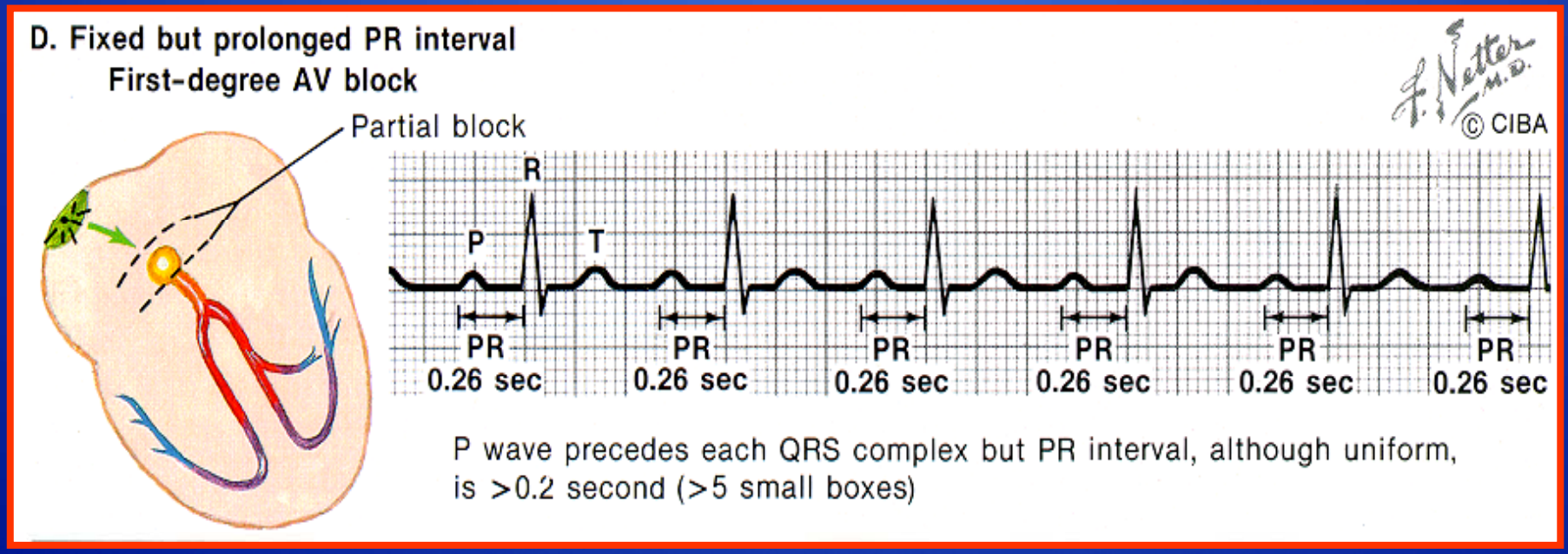
Atrioventricular block

Features of two types of atrioventricular block

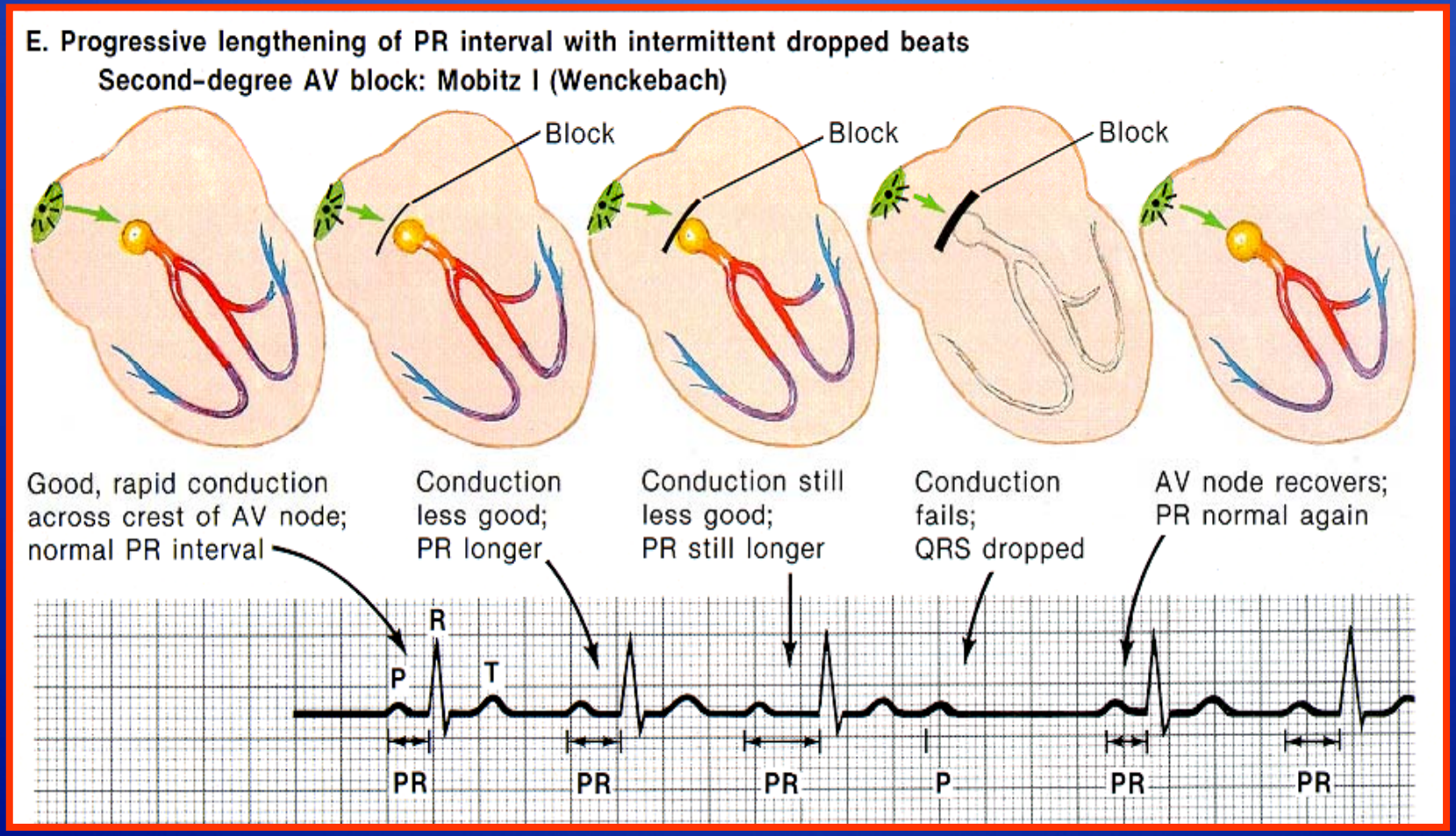
	"High"	"Low"
Site of block	Crest of AV node	Bundle of His, bilateral bundle branch, or trifascicular
Type of escape rhythm	Junctional escape rhythm Narrow QRS Adequate rate (40-55)	Ventricular escape rhythm Wide QRS Inadequate rate (20-40) Danger of asystole or ventricular tachycardia
Underlying pathology	Right coronary artery disease, diaphragmatic infarction, edema around AV node	Left anterior descending coronary artery disease, large anteroseptal infarction, or chronic degeneration of conduction system
Rhythm before complete block	Preceded by Mobitz I (Wenckebach) second-degree AV block	Preceded by Mobitz II second-degree AV block



First-degree AV block

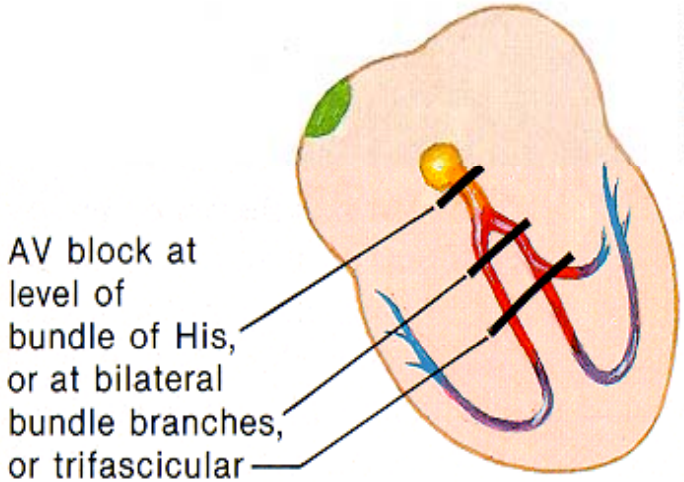


Second-degree AV block : Mobitz I



Second-degree AV block : Mobitz II

F. Sudden dropped QRS without prior PR lengthening
Second-degree AV block: Mobitz II (non-Wenckebach)

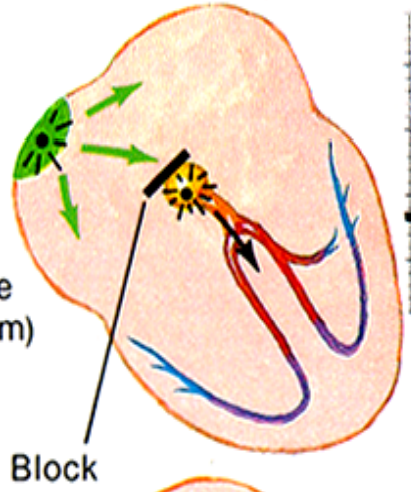


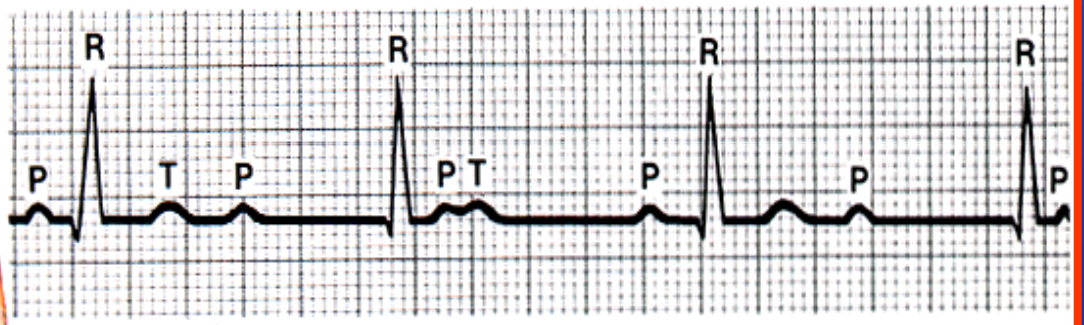
Third-degree AV block

G. No relationship between P waves and QRS complexes: QRS rate *slower* than P rate

Third-degree (complete) AV block

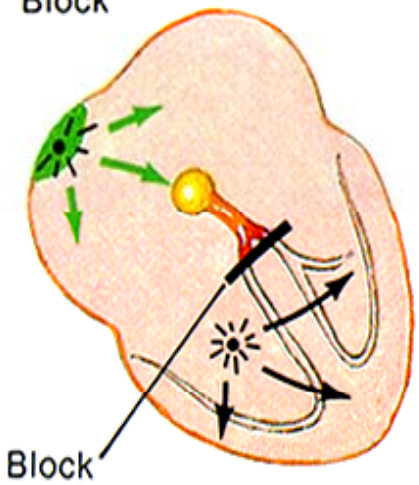
1. Impulses originate at both SA node (P waves) and below site of block in AV node (junctional rhythm) conducting to ventricles

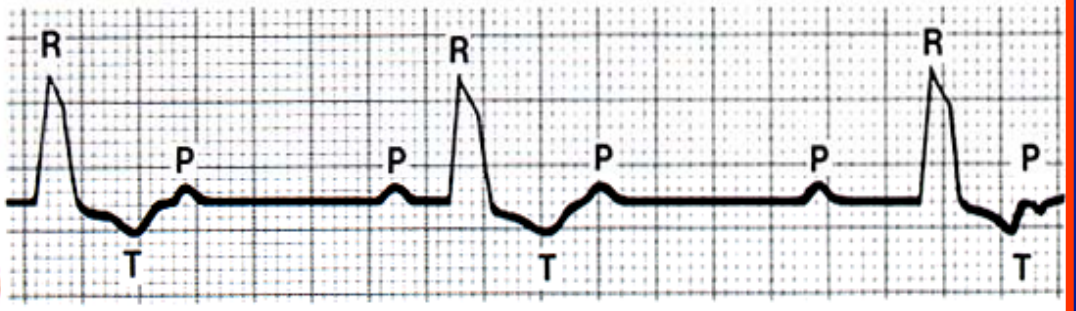




Atria and ventricles depolarize independently. QRS complexes less frequent; regular at 40 to 55/minute but normal in shape

2. Impulses originate at SA node (P waves) and also below site of block in ventricles (idioventricular rhythm)





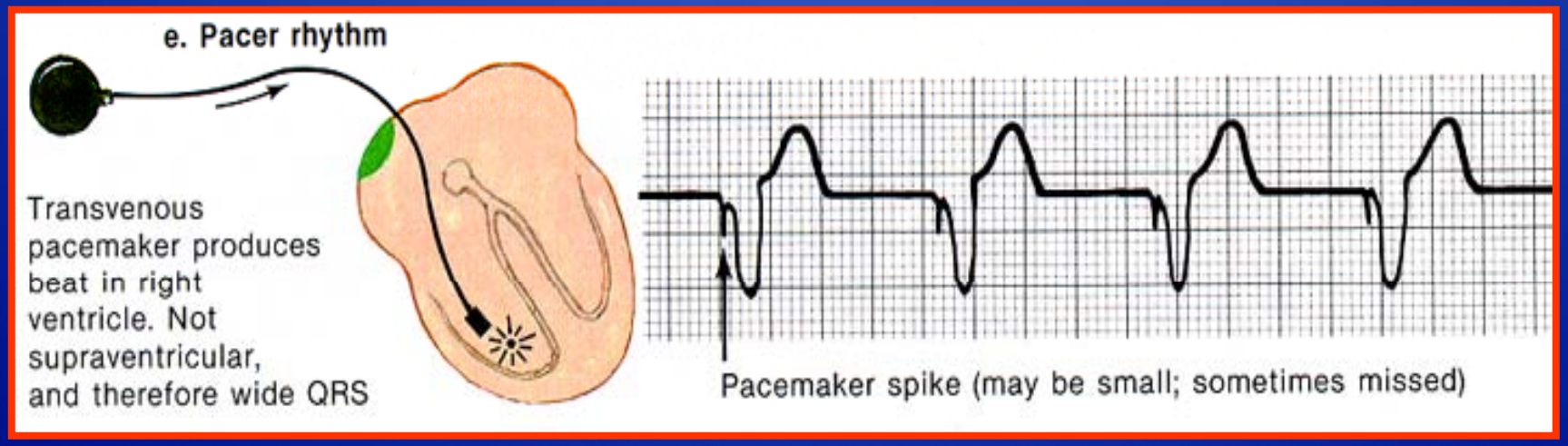
Atria and ventricles depolarize independently. QRS complexes less frequent; regular at 20 to 40/minute but wide and abnormal in shape

Indication for pacing in AV block

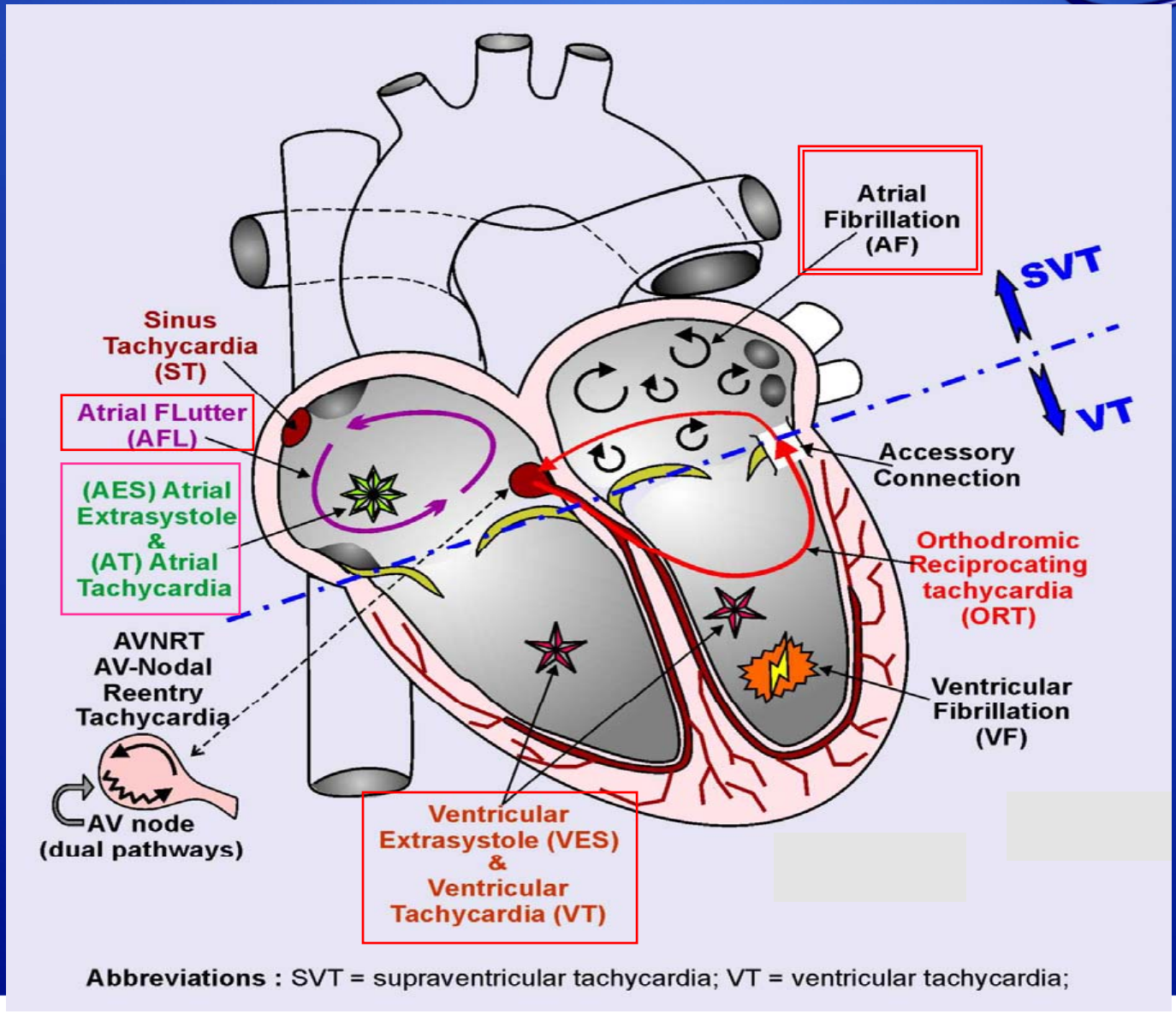
Asymptomatic	Indication
1st degree	Pacing not indicated
2nd degree	Pacing not indicated in type I with narrow QRS Electrophysiological study in type I with wide QRS Pacing in type II
3rd degree	Pacing
Symptomatic	Pacing regardless of type

Pacing in Elderly

- Sinus node dysfunction and disturbances of AV conduction system is common in elderly
- Permanent pacing is the treatment of choice when bradycardia is accompanied with symptoms



Tachyarrhythmia



Abbreviations : SVT = supraventricular tachycardia; VT = ventricular tachycardia;

Tachyarrhythmia

- Atrial tachyarrhythmia
  - Atrial fibrillation
  - Atrial flutter
  - Atrial tachycardia
  - Paroxysmal supraventricular tachycardia
- Ventricular tachyarrhythmia
  - Ventricular tachycardia
    - Monomorphic
    - Polymorphic
  - Ventricular fibrillation

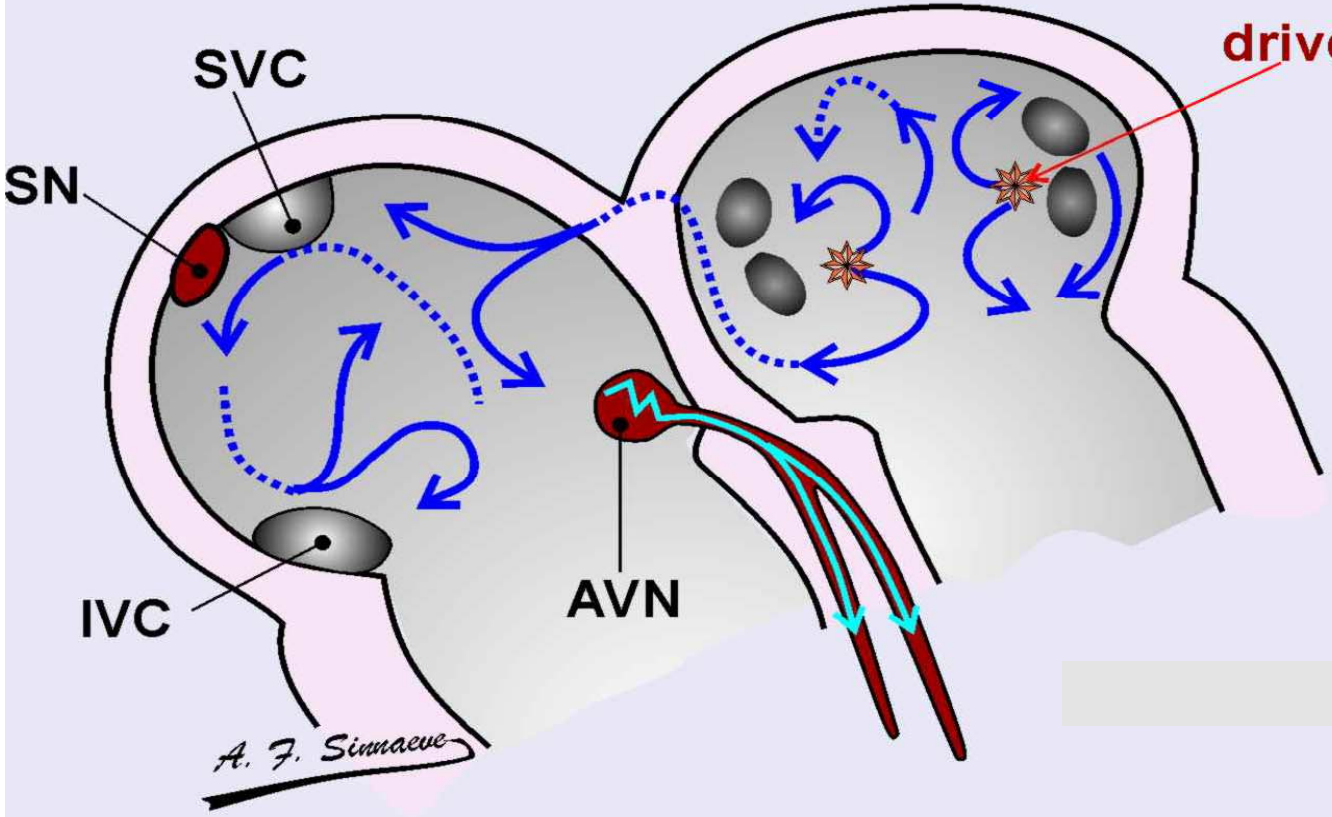

RHYTHM STRIP: II
25 mm/sec;1 cm/mV

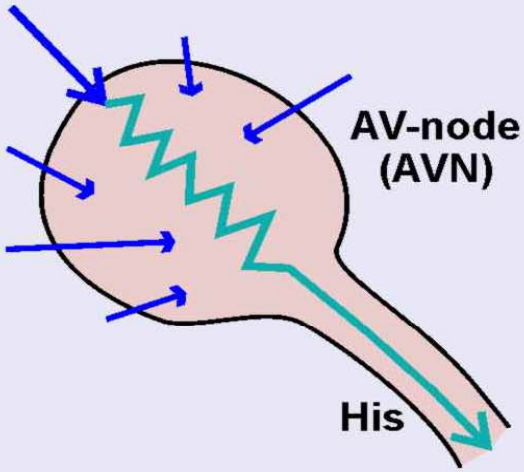
Atrial fibrillation (AF)

- Most common arrhythmia in elderly (~10% in age > 75 years)
- Impacts of AF
  - Independent risk factor for cardiac and overall mortality
  - Increased risk of heart failure and embolic events
  - Negative effect on the quality of life and mental function (Alzheimer's disease and senility are common in AF patients)

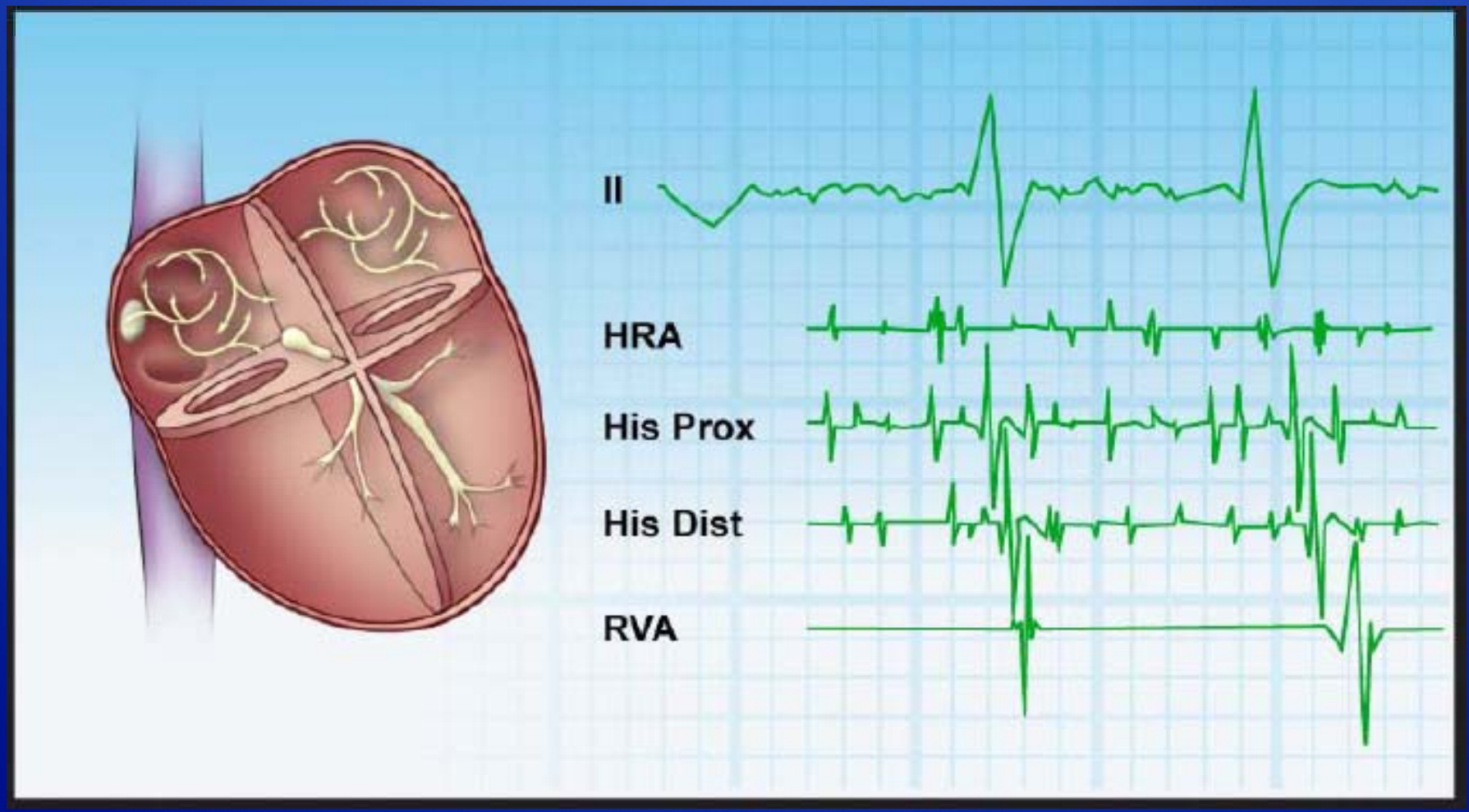
ATRIAL FIBRILLATION (AF)

The electrophysiologic basis of atrial fibrillation remains unclear. Two major hypotheses prevail : (1) multiple wavelets of depolarization propagating within the atria, dividing, coalescing and extinguishing each other as they travel in an apparently random fashion seeking tissue that is excitable and (2) a single or a small number of high-frequency sources ("motors" or "drivers") of stable micro-reentry ("mother wave") primarily located at the left atrium/pulmonary vein junction with passive fibrillatory conduction giving rise to "daughter waves".
Both mechanisms may co-exist !





AF :
mechanism & electrograms



Atrial fibrillation (AF)

- Management principles
  - Rate control
  - Rhythm control
  - Prevention of thromboembolism
- Goal of treatment
  - Symptom control
  - Stroke prevention
  - Reduction in hospitalization

Atrial fibrillation (AF)

- Rate control
  - Control of ventricular response during AF
  - Improve symptom and avoid tachycardia induced cardiomyopathy
  - Adequate control : HR 60-80 bpm at rest and 90 to 115 during moderate exercise
  - Drugs to control ventricular rate
    - B-blocker, calcium blocker, Digoxin

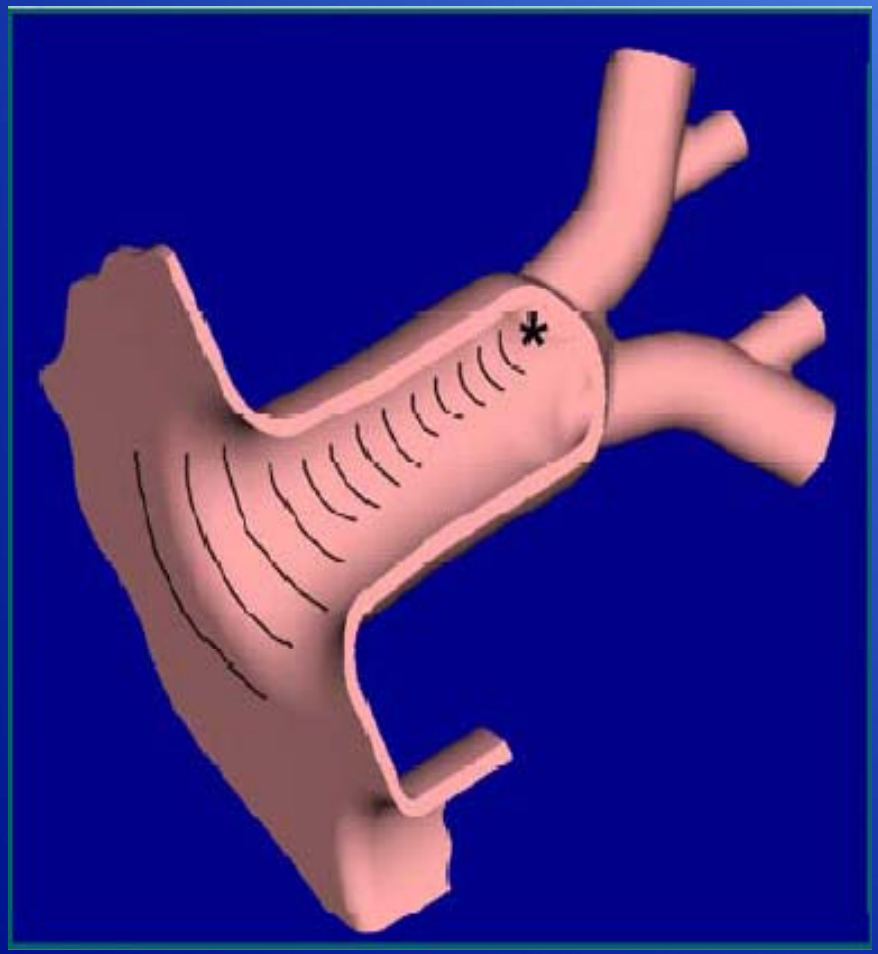
Atrial fibrillation (AF)

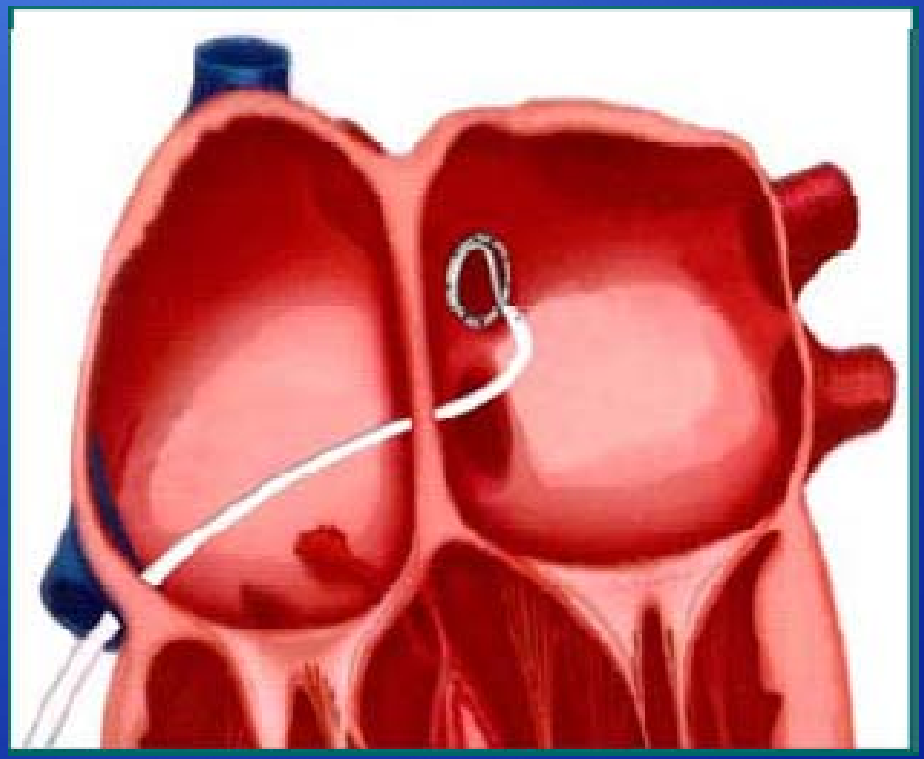
- Rhythm control
  - Restoration of sinus rhythm (cardioversion)
    - Electrical cardioversion
      - Synchronized direct current cardioversion
    - Pharmacological cardioversion
      - Many intravenous effective drugs for AF cardioversion are not available in Thailand
      - IV Amiodarone is commonly used in Thailand
  - Maintenance of sinus rhythm
    - Flecainide (Tambocor), Propafenone (Rythmonorm), Amiodarone (Cordarone), Dronedarone

Atrial fibrillation (AF)

- Catheter ablation for AF
  - Pulmonary veins are important source of triggered activity
  - PV isolation is a fundamental endpoint
  - Need transeptal puncture and relatively extensive ablation
  - Success rate : 40-90% with one procedure
  - Complication rate : 2-12%
    - Cardiac tamponade, PV stenosis, stroke, atrio-esophageal fistula, phrenic nerve injury, left atrial flutter
  - Mortality rate is < 0.1%
  - Should be considered for highly symptomatic PAF, especially those without significant structural heart

Pulmonary vein isolation





AV node ablation + PPM (Ablate & Pace)

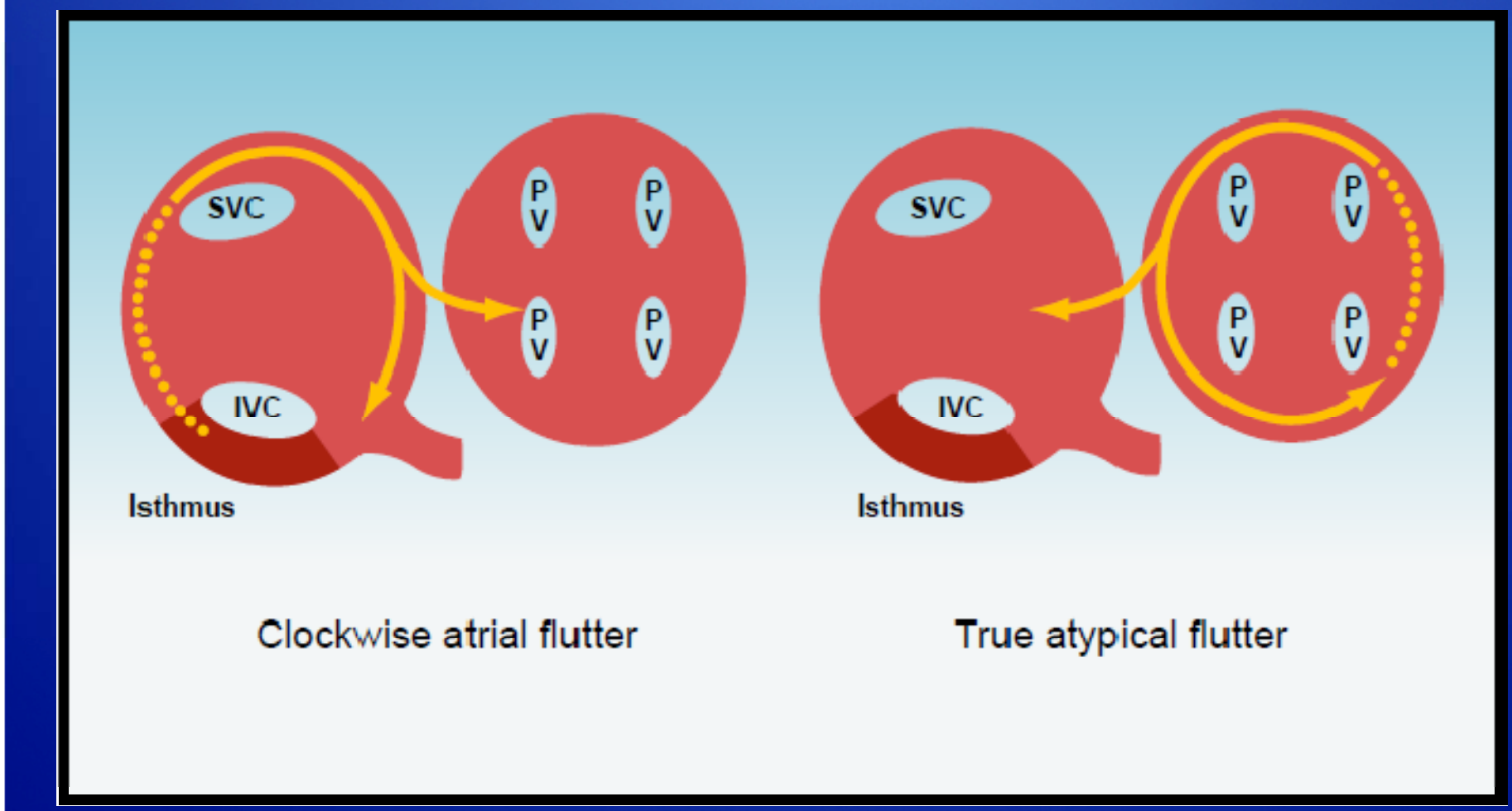
AF : Stroke prevention

$CHADS_2$ Risk Criteria	Score
Congestive Heart Failure	1
Hypertension	1
Age ≥ 75 years	1
Diabetes Mellitus	1
Stroke or TIA in the past	2

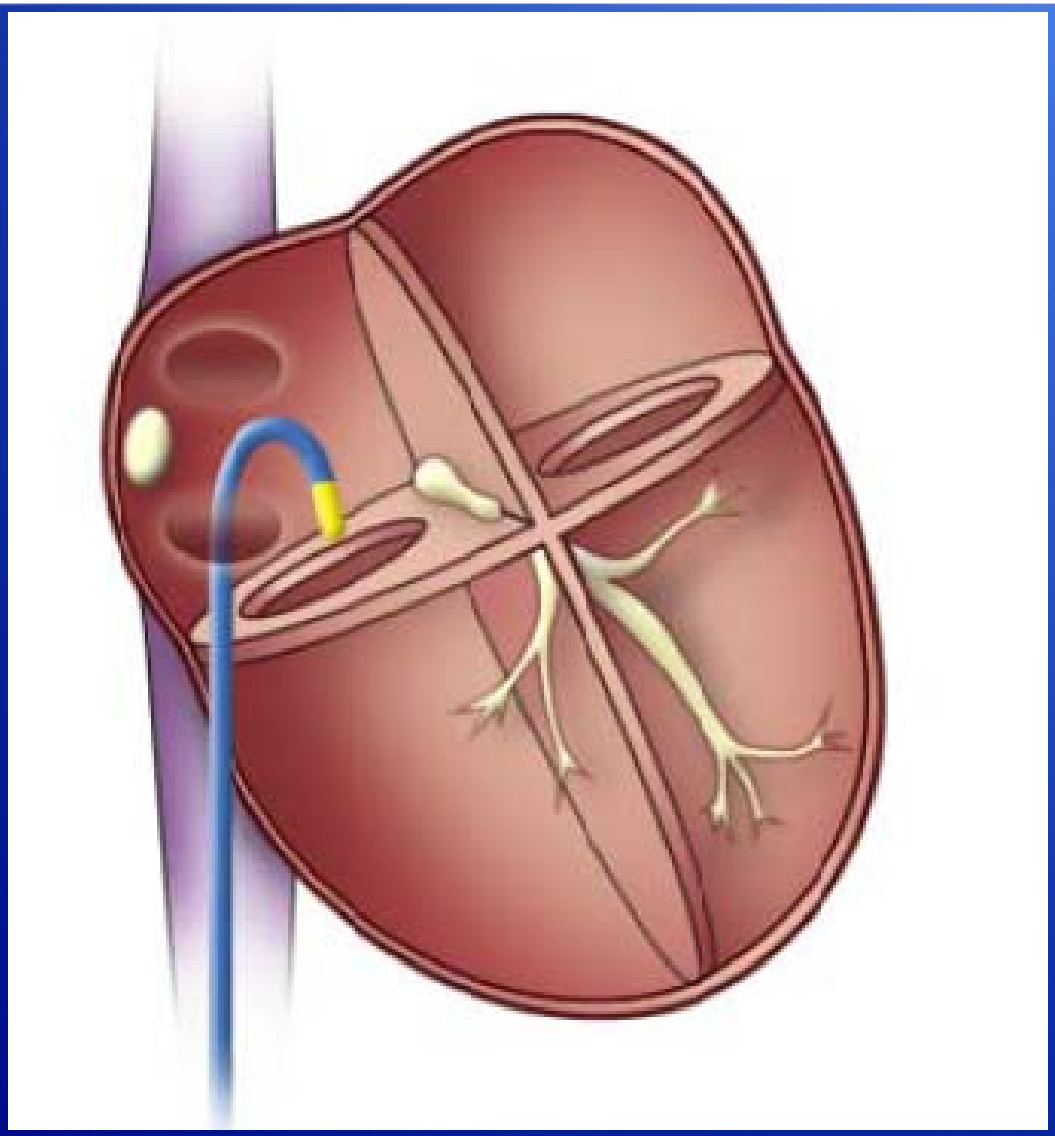
AF : Stroke prevention

$CHADS_2$ Score	Recommended Therapy
0	Aspirin (81 to 325 mg daily)
1	Aspirin (81 to 325 mg daily) or warfarin (INR 2.0 to 3.0, target 2.5)
≥ 2	Warfarin (INR 2.0 to 3.0, target 2.5)

Atrial flutter



Atrial Flutter Ablation



- Cavotricuspid linear ablation from tricuspid ring to IVC
- For Isthmus dependent flutter
- Success rate > 90%

Ventricular tachycardia

Sustained VT

Nonsustained VT

Polymorphic nonsustained VT

Ventricular tachycardias

- Very high risk of sudden cardiac death, especially when occur in patient with structural heart diseases (common in old age group)
  - LV dysfunction
  - Coronary artery disease
- Management
  - Treatment of underlying cardiac problems
  - Antiarrhythmic drugs
    - Narrow therapeutic limit
    - Proarrhythmia
    - Side effects
  - Automated implantable cardioverter defibrillator (AICD)

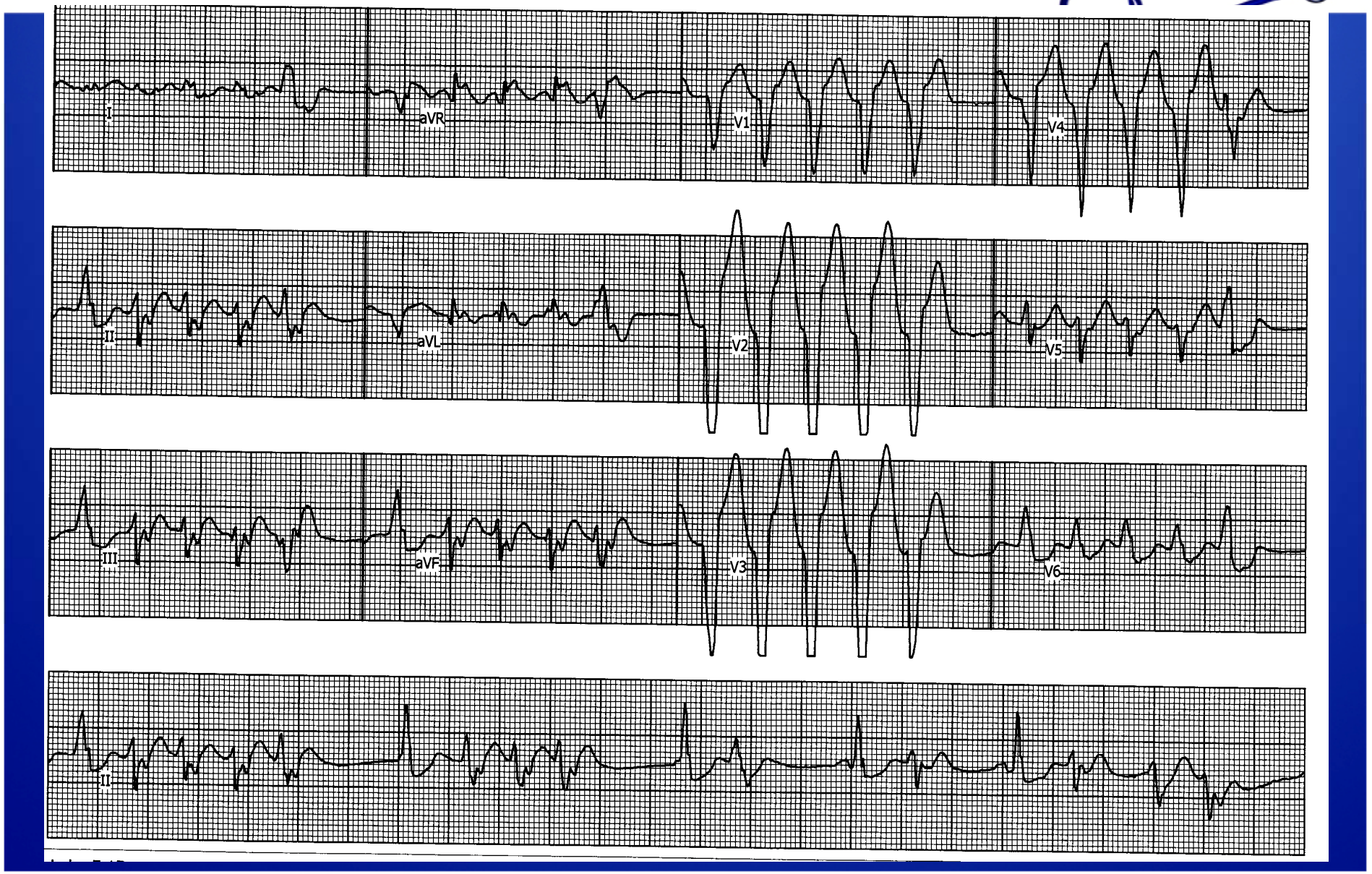
Classification of VT by Clinical Presentation

- Hemodynamically stable
  - ♥ Asymptomatic
  - ♥ Minimal symptoms, e.g., palpitations
- Hemodynamically unstable
  - ♥ Presyncope
  - ♥ Syncope
  - ♥ Sudden cardiac arrest
  - ♥ Sudden cardiac death

Classification by ECG

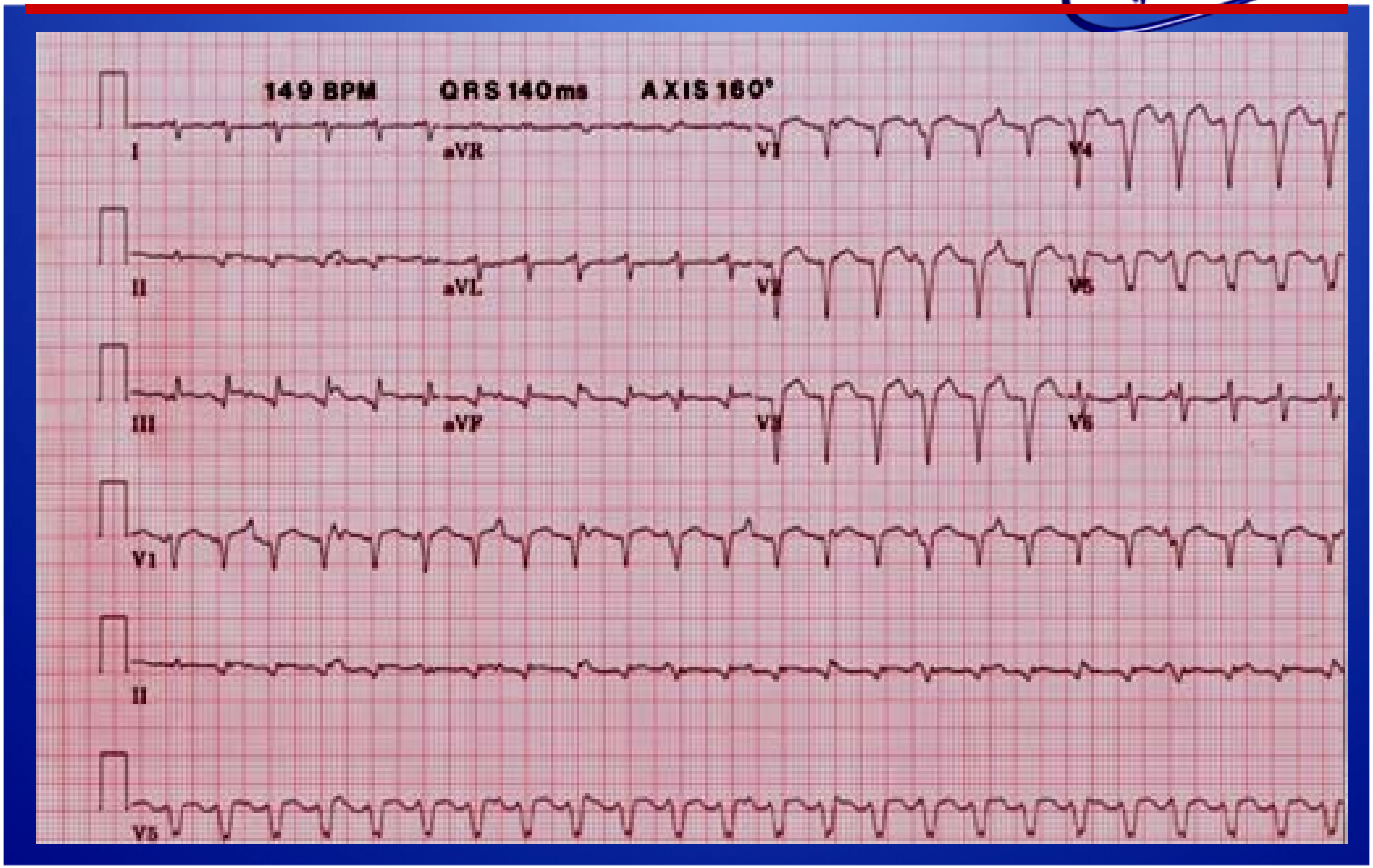
- Nonsustained ventricular tachycardia (VT)
  - ♥ Monomorphic
  - ♥ Polymorphic
- Sustained VT
  - ♥ Monomorphic
  - ♥ Polymorphic
- Bundle-branch re-entrant tachycardia
- Bidirectional VT
- Torsades de pointes
- Ventricular flutter
- Ventricular fibrillation

Nonsustained Monomorphic VT

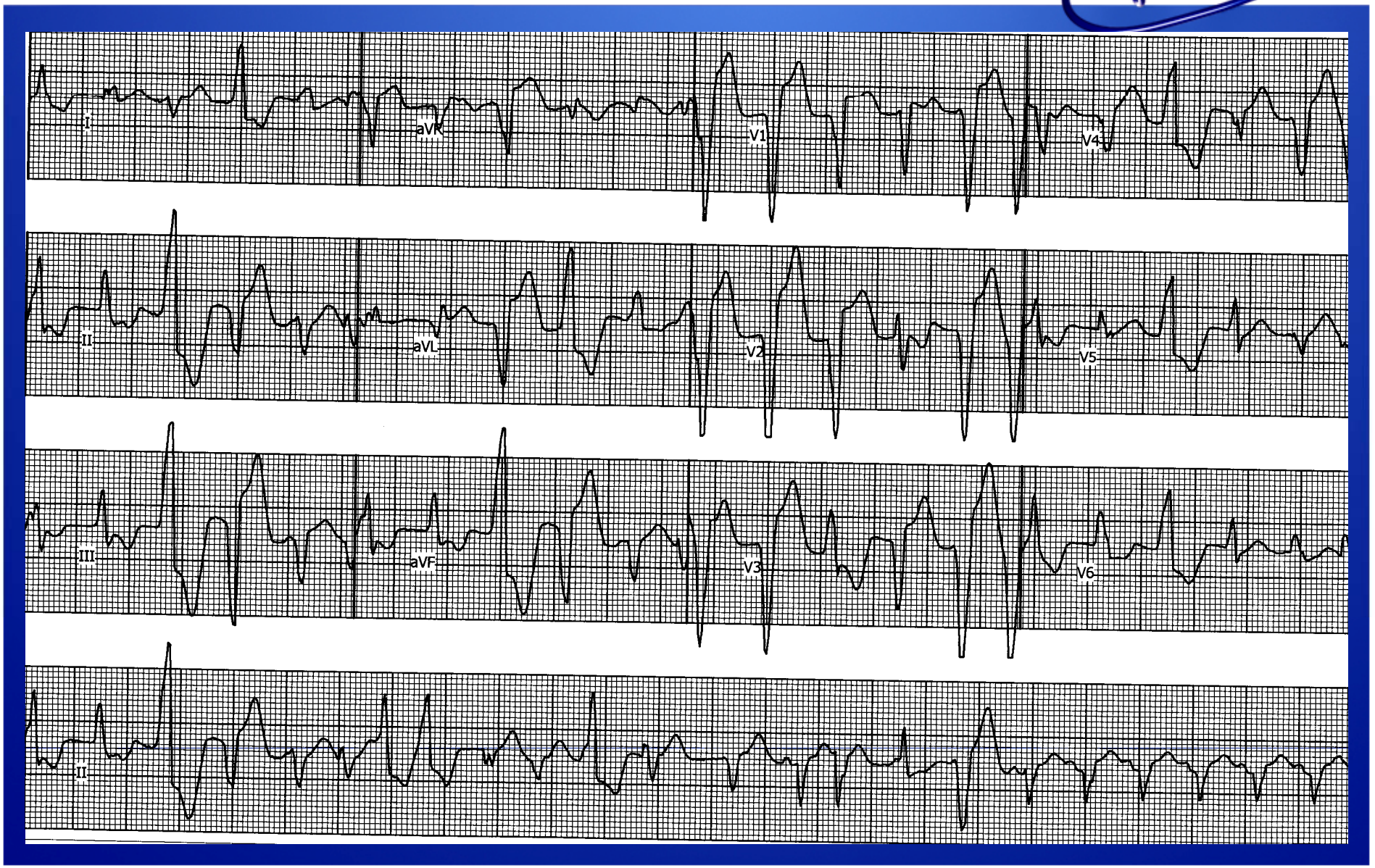


Sustained Monomorphic VT

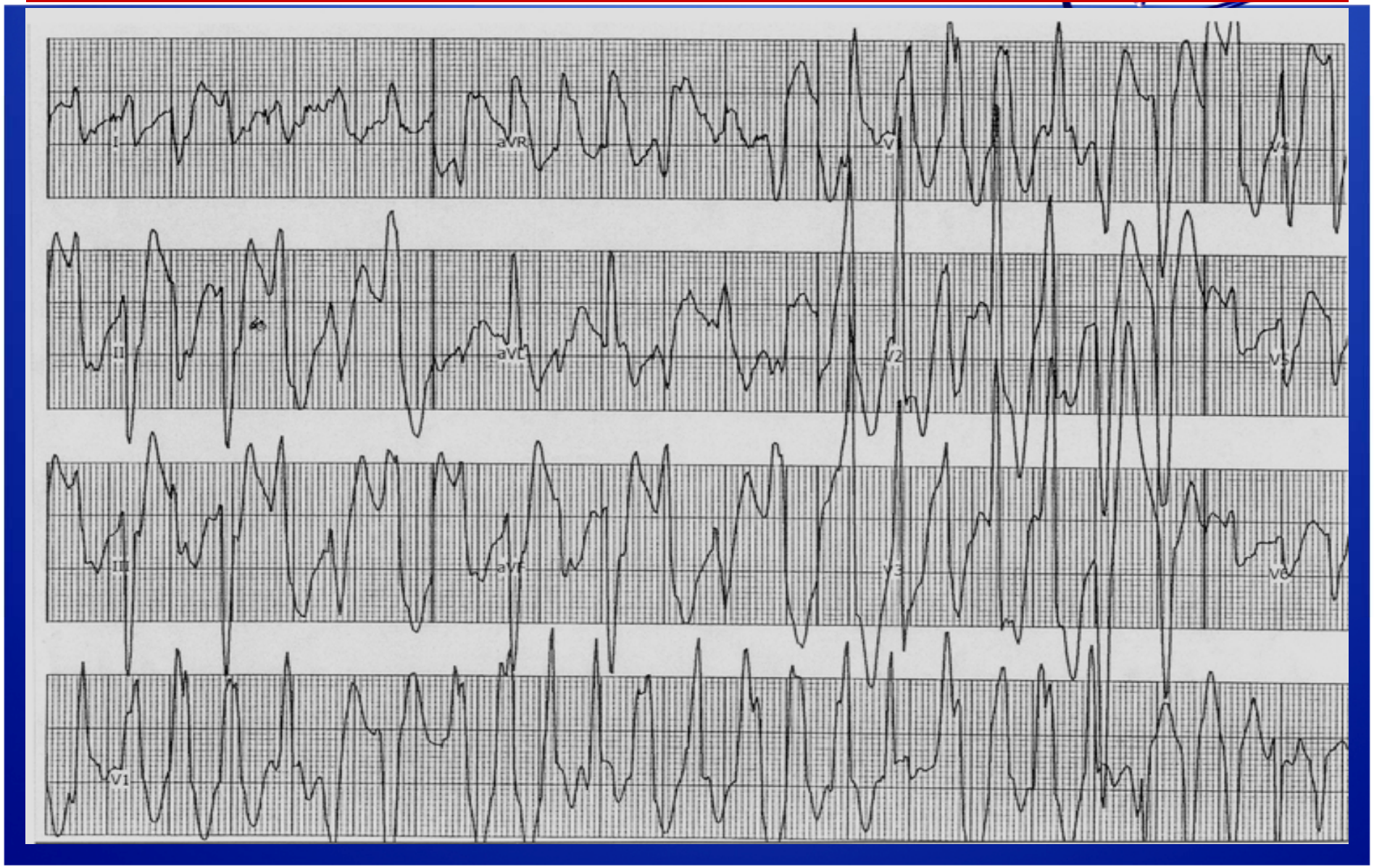
72-year-old woman with CHD



Nonsustained Polymorphic VT



Sustained Polymorphic VT



Ventricular Flutter

Spontaneous conversion to NSR (12-lead ECG)

VF with Defibrillation (12-lead ECG)

Wide QRS Irregular Tachycardia:

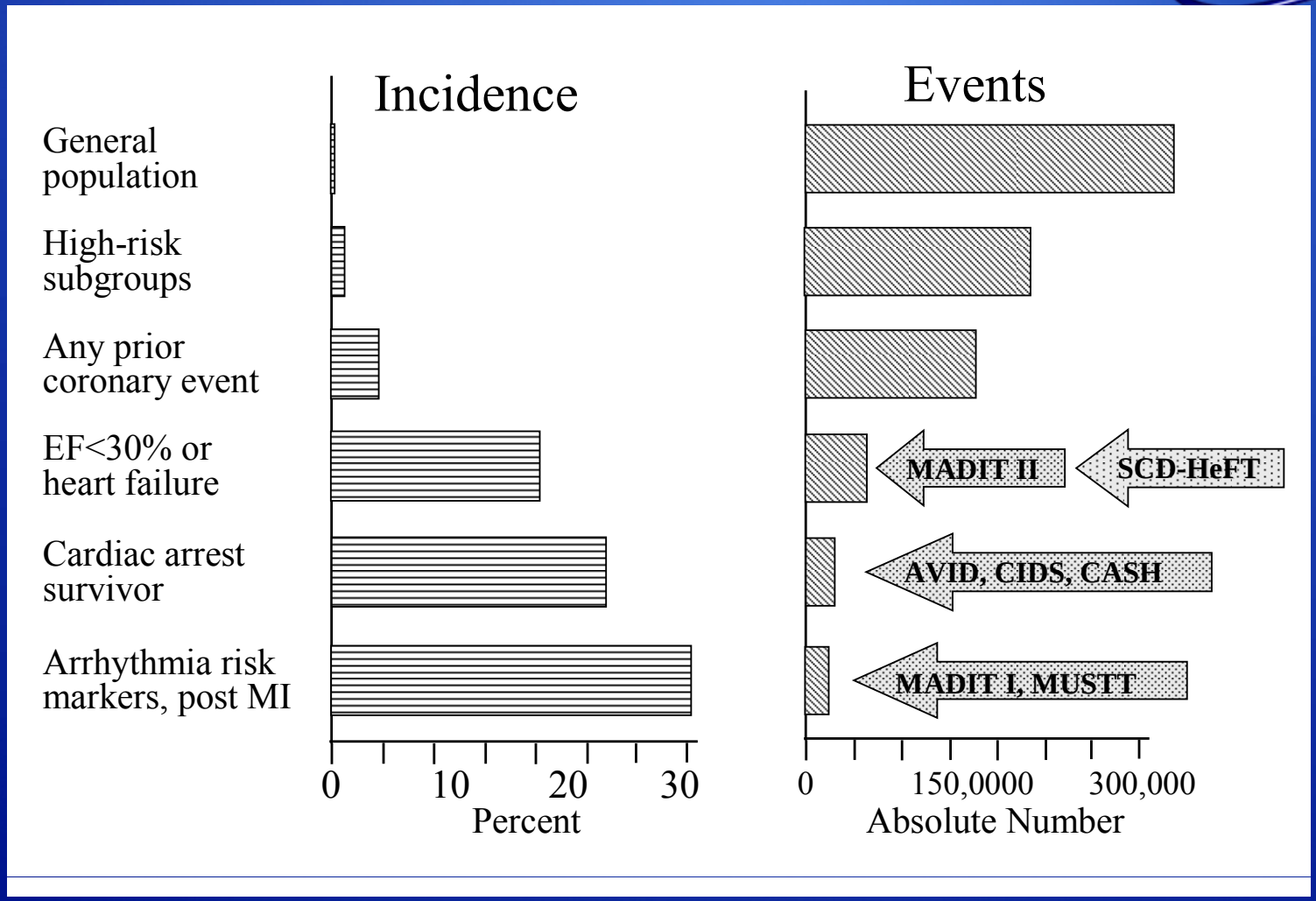
Atrial Fibrillation with antidromic conduction in patient with accessory pathway – Not VT

Classification of VT by Disease Entity

- **Coronary heart disease**
- **Cardiomyopathies** w/wo heart failure
  - Dilated cardiomyopathy
  - Hypertrophic cardiomyopathy
  - Arrhythmogenic right ventricular (RV) cardiomyopathy

- Structurally normal hearts
- Congenital heart disease
- Neurological disorders

Incidence of Sudden Cardiac Death



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Mechanisms of Sudden Cardiac Death in 157 Ambulatory Patients

- Ventricular fibrillation - 62.4%
- Bradyarrhythmias (including advanced AV block and asystole) - 16.5%
- Torsades de pointes - 12.7%
- Primary VT - 8.3%

Bayes de Luna et al. Am Heart J 1989;117:151–9.

Therapies for VA : Antiarrhythmic Drugs

- Beta Blockers
  - Effectively suppress ventricular ectopic beats & arrhythmias; reduce incidence of SCD
- Amiodarone
  - No definite survival benefit; some studies have shown reduction in SCD in patients with LV dysfunction especially when given in conjunction with BB. Has complex drug interactions and many adverse side effects (pulmonary, hepatic, thyroid, cutaneous)
- Sotalol
  - Suppresses ventricular arrhythmias; is more pro-arrhythmic than amiodarone, no survival benefit clearly shown
- Conclusions: Antiarrhythmic drugs (except for BB) should not be used as *primary* therapy of VA and the prevention of SCD

Therapies for VA : Non-antiarrhythmic Drugs

♥ Electrolytes: magnesium and potassium administration can favorably influence the electrical substrate involved in VA; are especially useful in setting of hypomagnesemia and hypokalemia

♥ ACE inhibitors, angiotensin receptor blockers and aldosterone blockers can improve the myocardial substrate through reverse remodeling and thus reduce incidence of SCD

♥ Antithrombotic and antiplatelet agents: may reduce SCD by reducing coronary thrombosis

♥ Statins: have been shown to reduce life-threatening VA in high-risk patients with electrical instability

♥ n-3 Fatty acids: have anti-arrhythmic properties, but conflicting data exist for the prevention of SCD

Ventricular arrhythmia guideline 2006

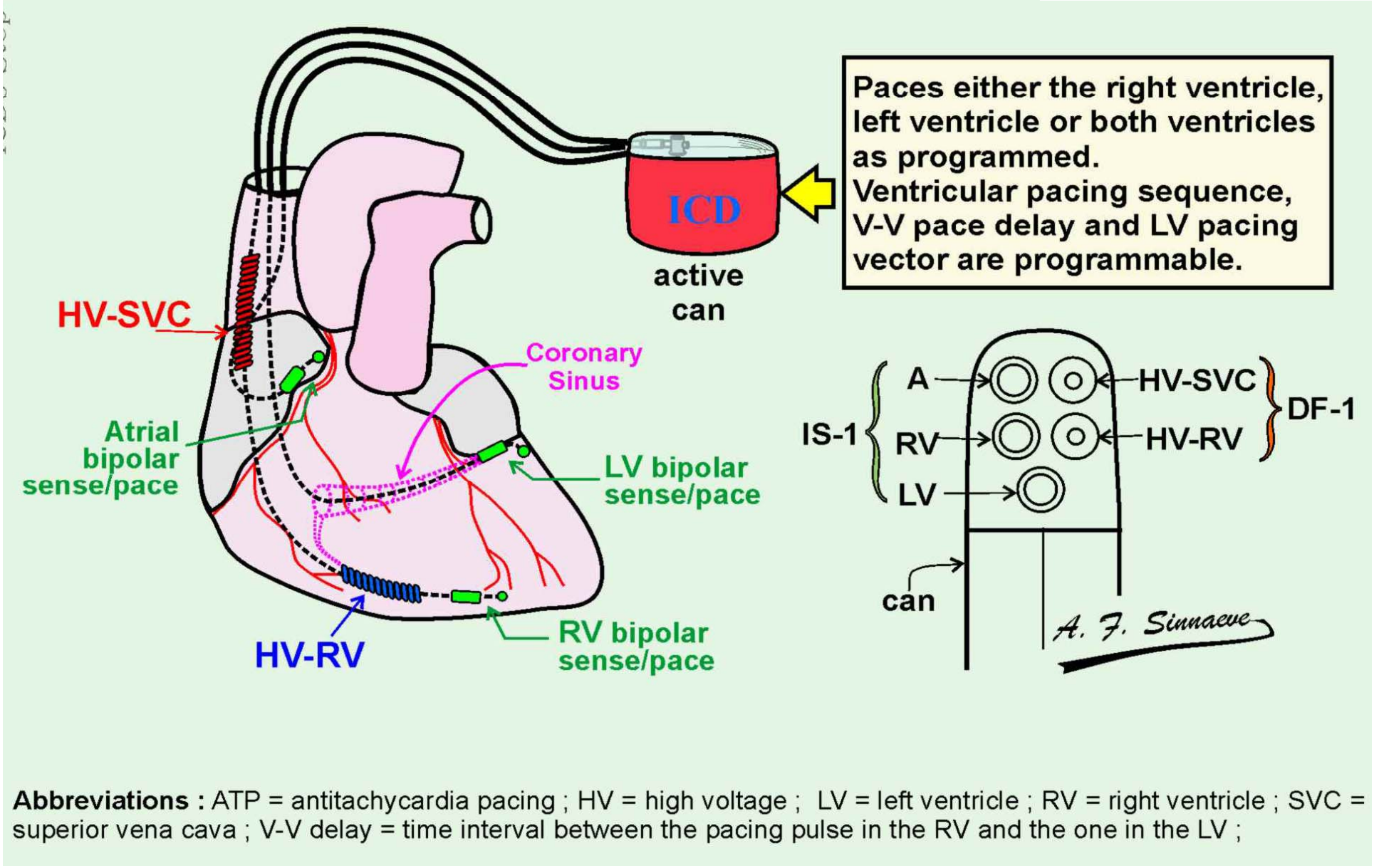
Class I

1. Elderly patients with VA should generally be treated in the same manner as younger individuals. (Level of Evidence: A)
2. The dosing and titration schedule of antiarrhythmic drugs prescribed to elderly patients should be adjusted to the altered pharmacokinetics of such patients. (Level of Evidence: C)

Class III

Elderly patients with projected life expectancy less than 1 year due to major comorbidities should not receive ICD

Biventricular AICD



Abbreviations : ATP = antitachycardia pacing ; HV = high voltage ; LV = left ventricle ; RV = right ventricle ; SVC = superior vena cava ; V-V delay = time interval between the pacing pulse in the RV and the one in the LV ;

AICD in elderly

- AICD in the patients with a history of ventricular arrhythmia or cardiac arrest (2nd prevention)
  - reduce mortality by 25-30%
  - Mean survival of more than 4 years may be expected even among octogenarians
  - age alone should not be used as a sole criterion to withhold device-based therapy.
- Important considerations in the decision to use ICD in elderly
  - Indication
  - Comorbodities, longevity and quality of life
  - Patient preferrences.

Thank you for your attention!!