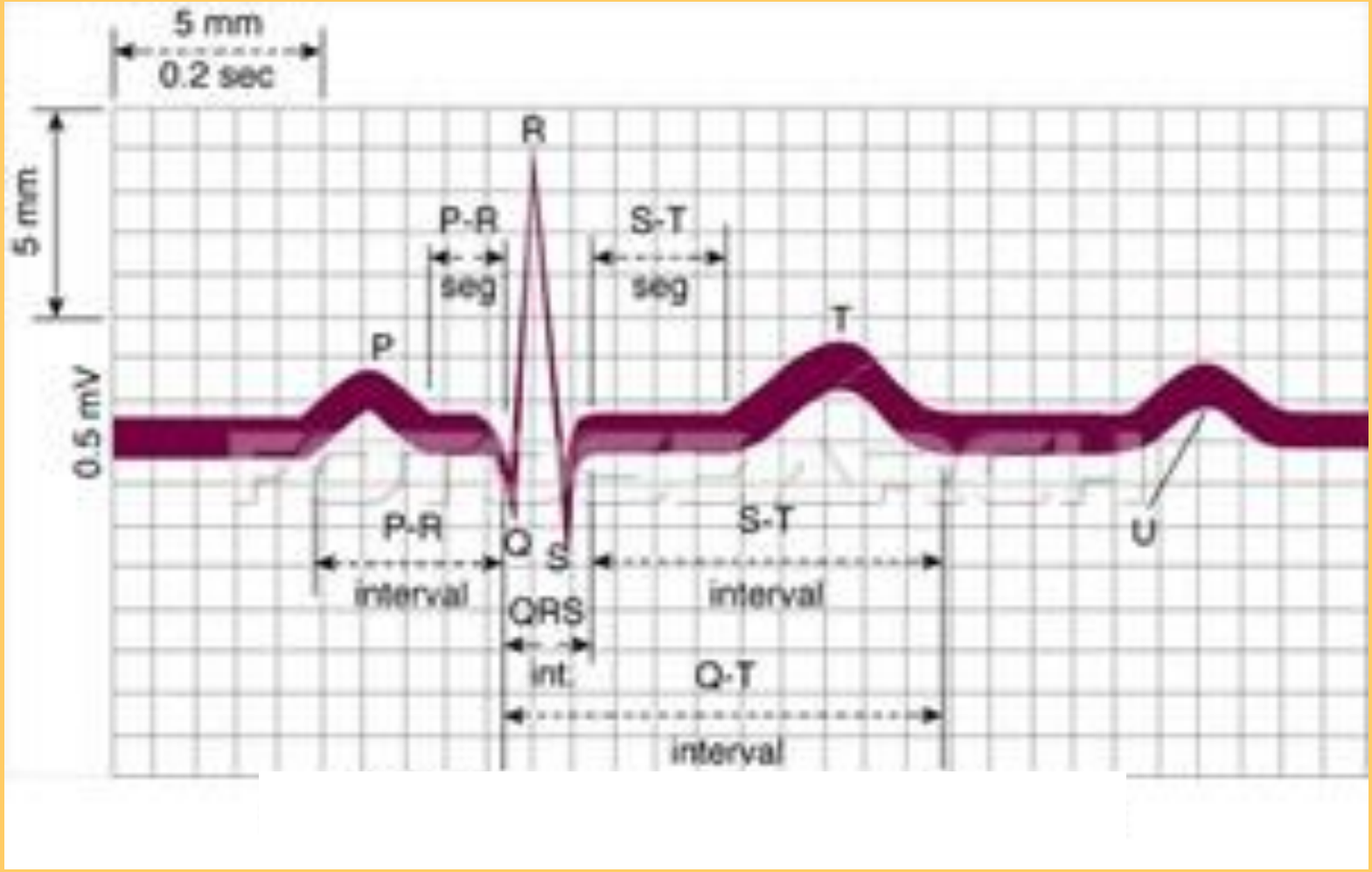
MANAGEMENT OF CARDIAC ARRHYTHMIAS

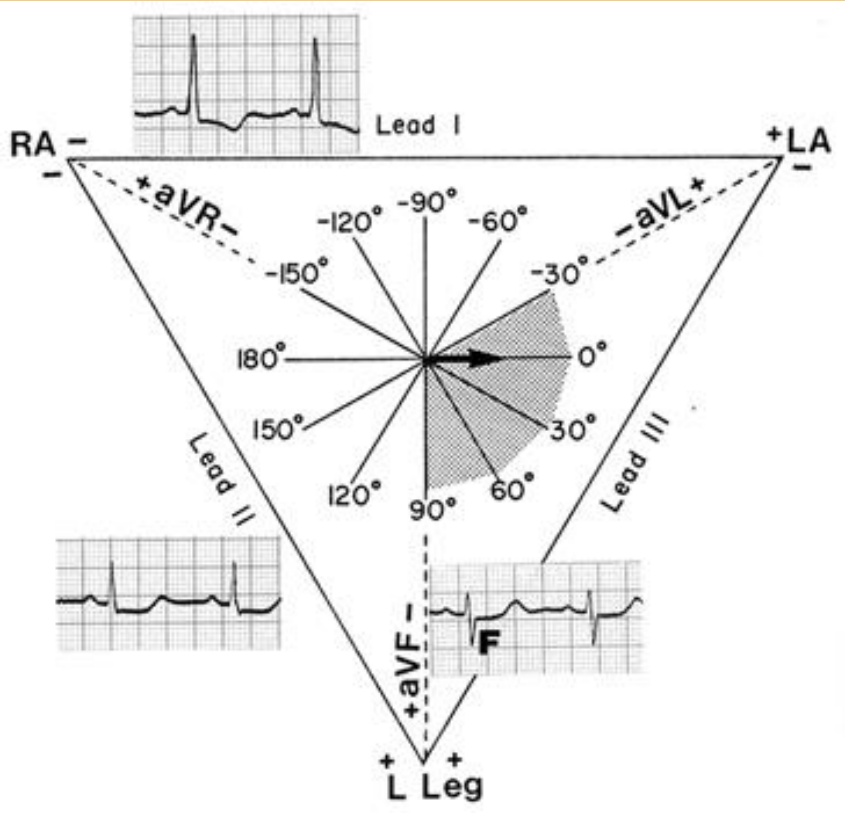
Prof. Arjuna de Silva

MBBS,MD,MRCP(UK),MSc(Oxon),FRCP,FCCP, AGAF,FNASSL

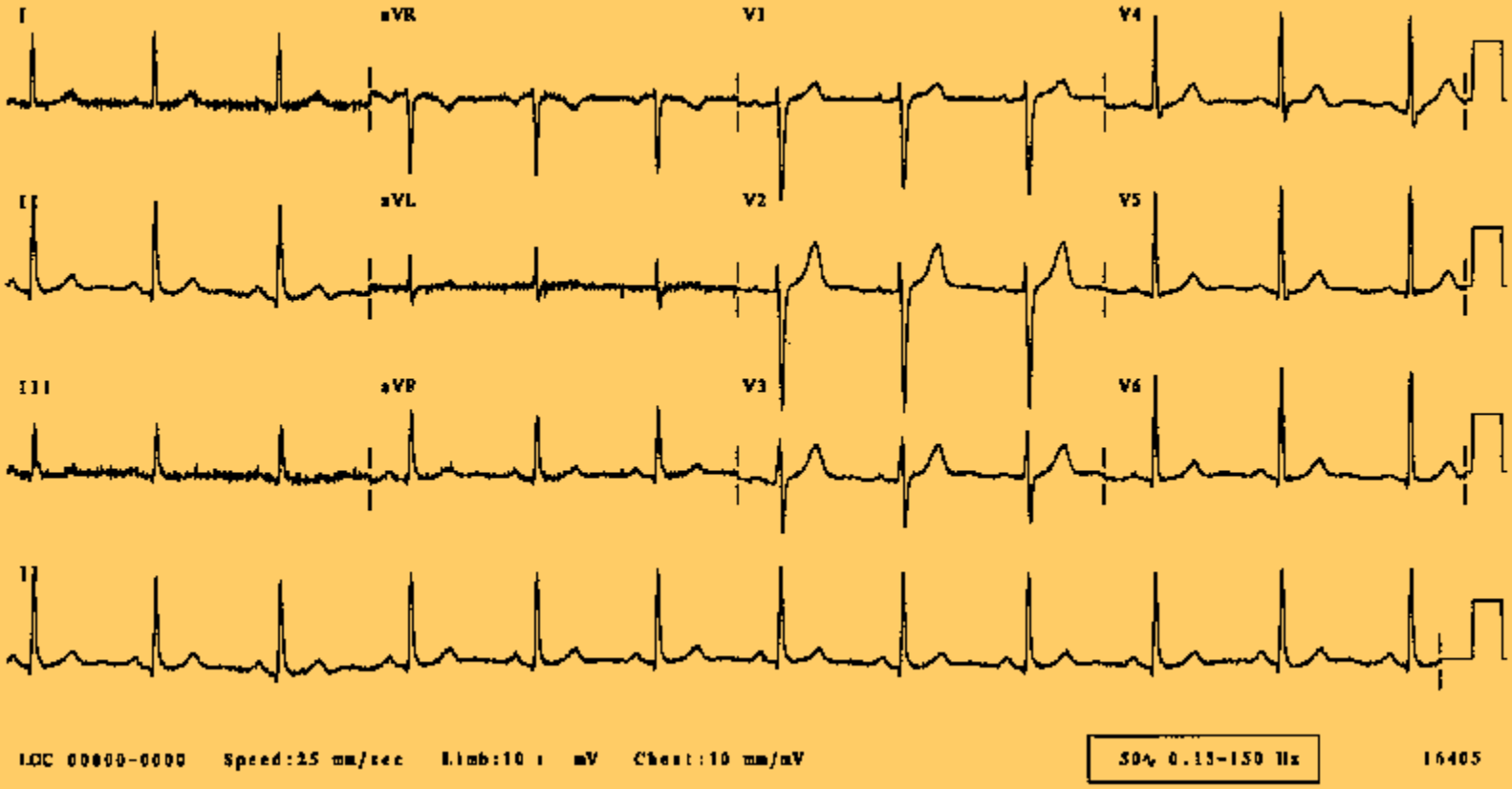
Normal ECG


5 mm
0.2 sec
5 mm
0.5 mV
R
P-R
seg
S-T
seg
P
T
U
P-R
interval
Q
S
QRS
int.
S-T
interval
Q-T
interval

Normal ECG (continued)



Normal


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
LOC 00000-0000
Speed:25 mm/sec
Limb:10 mV
Chest:10 mm/mV
50% 0.15-150 Hz
16405

Normal sinus rhythm

- each P wave is followed by a QRS
- P waves normal for the subject
- P wave rate 60 - 100 bpm with <10% variation
  - rate <60 = sinus bradycardia
  - rate >100 = sinus tachycardia
  - variation >10% = sinus arrhythmia

Normal P waves

- height < 2.5 mm in lead II
- width < 0.11 s in lead II
  - for abnormal P waves see right atrial hypertrophy, left atrial hypertrophy, atrial premature beat, hyperkalaemia

Normal PR interval

- 0.12 to 0.20 s (3 - 5 small squares)
  - for short PR segment consider Wolff-Parkinson-White syndrome or Lown-Ganong-Levine syndrome (other causes - Duchenne muscular dystrophy, type II glycogen storage disease (Pompe's), HOCM)
- for long PR interval see first degree heart block and 'trifasicular' block

Normal QRS complex

- < 0.12 s duration (3 small squares)
  - for abnormally wide QRS consider right or left bundle branch block, ventricular rhythm, hyperkalaemia, etc.
- no pathological Q waves
- no evidence of left or right ventricular hypertrophy

Normal QT interval

- Calculate the corrected QT interval (QTc) by dividing the QT interval by the square root of the preceeding R - R interval. Normal = 0.42 s.
- Causes of long QT interval
  - myocardial infarction, myocarditis, diffuse myocardial disease
  - hypocalcaemia, hypothyrodism
  - subarachnoid haemorrhage, intracerebral haemorrhage
  - drugs (e.g. sotalol, amiodarone)
  - hereditary -Romano Ward

Normal ST segment

– no elevation or depression
  - causes of elevation include acute MI (e.g. anterior, inferior), left bundle branch block, normal variants (e.g. athletic heart, Edeiken pattern, high-take off), acute pericarditis
  - causes of depression include myocardial ischaemia, digoxin effect, ventricular hypertrophy, acute posterior MI, pulmonary embolus, left bundle branch block

Normal T wave

- causes of tall T waves include hyperkalaemia, hyperacute myocardial infarction and left bundle branch block
- causes of small, flattened or inverted T waves are numerous and include ischaemia, age, race, hyperventilation, anxiety, drinking iced water, LVH, drugs (e.g. digoxin), pericarditis, PE, intraventricular conduction delay (e.g. RBBB)and electrolyte disturbance.

Classification of arrhythmias

- Tachyarrhythmia
  HR>100
- Bradyarrhythmia
  HR<60
  HR<50

Broad complex (QRS) arrhythmias.
Narrow complex (QRS) arrhythmias

Classification

- Supraventricular arrhythmias
- Ventricular arrhythmias

Broad complex (QRS) arrhythmias

Broad regular

VT

SVT

WPW

Broad irregular

VF

Symptoms

- Asymptomatic (when no cardiac lesion)
- Palpitation (tachyarrhythmia)
- Ischemic chest pain
- Symptoms of cardiac failure
- Disturbed consciousness

Management

- Correct diagnosis with ECG
- Clinical assessment for haemodynamical stability

Signs of haemodyanamical instability

Presence of SBP<90 or

Inadequate peripheral circulation

Pulmonary oedema

Management of unstable patient with tachyarrhythmia

- Cardioversion with 100 J (Synchronize)

Management of stable patient with tachyarrhythmia

- lidocaine 50-100mg iv within 2mins

fail

Shock

fail or recure

Lidocaine infusion 8ml/min in 1st h

4 ml/min in 2nd h

2ml/min in 3rd h

OR

Start amidarone infusion

Amidarone

- Iv 150mg over 10 minutes
- Iv 300mg over 6 hours
- Iv 900mg over 18 hours
- Then switch to oral

Supraventrycular arrhythmias

- Atrioventricular nodal re-entrant tachy cardia (AVNRT)
- Atrioventricular reciprocating tachycardia(AVRT)
- Atrial fibrillation
- Atrial flutter
- Atrial tachycardia

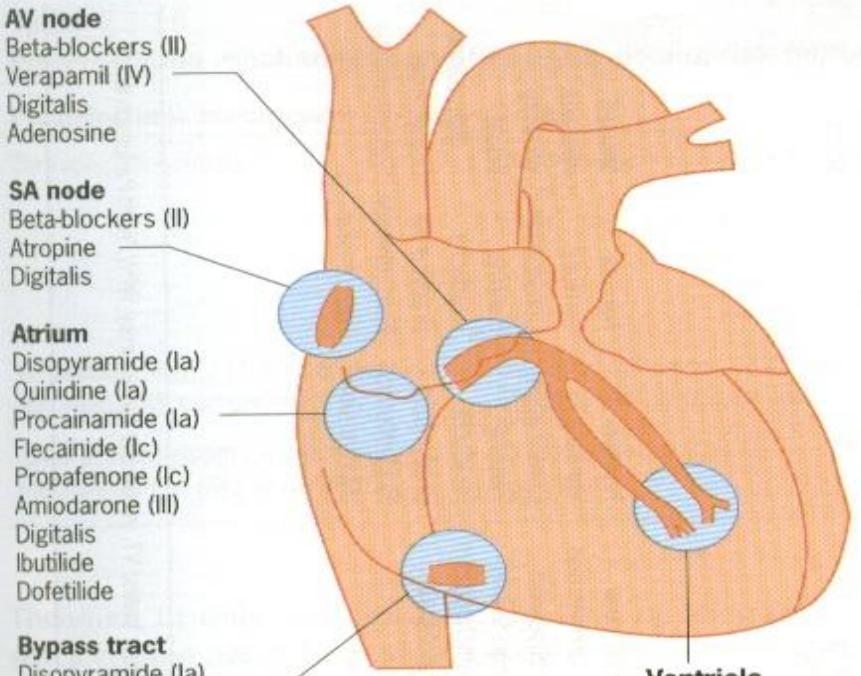


Fig. 13.46 **Drugs that affect various parts of the heart.**
The Vaughan Williams' class is given in parentheses.

Atrial fibrillation

- Identify and treat the cause
  - IHD
  - Hypertension
  - Valvular heart disease
  - Heart failure
  - Pulmonary infection or embolism
  - metabolic abnormalities
  - toxins

Treatment of recent onset (within 48 hr) poorly tolerated(unstable) AF

- Direct current cardioversion
- Heparinization followed by warfarin
  (for at least 1 month)

Treatment of recent onset (within 48 h) well tolerated(stable) AF

- IV bolus of amiodorone 300mg followed by an infusion of 900mg over 24 hours.

if fails

cardioversion

Heparinization followed by warfarin (at least for 1 month)

Treatment of well tolerated(stable) AF of long or unknown duration

- Significant thromboembolic risk associated with cardioversion
- Heparinization followed by warfarin
- Atenolol 5mg by slow iv infusion followed by oral atenolol(5-10mg)
- If coexistent ventrycular dysfunction , digoxin(0.125-0.5mg) DOC.
- Cardioversion should be considered after l month’s anticoagulation.

Atrial flutter

- If unstable cardiovert
- If stable Adenosine iv

Treatment of chronic arrhythmias

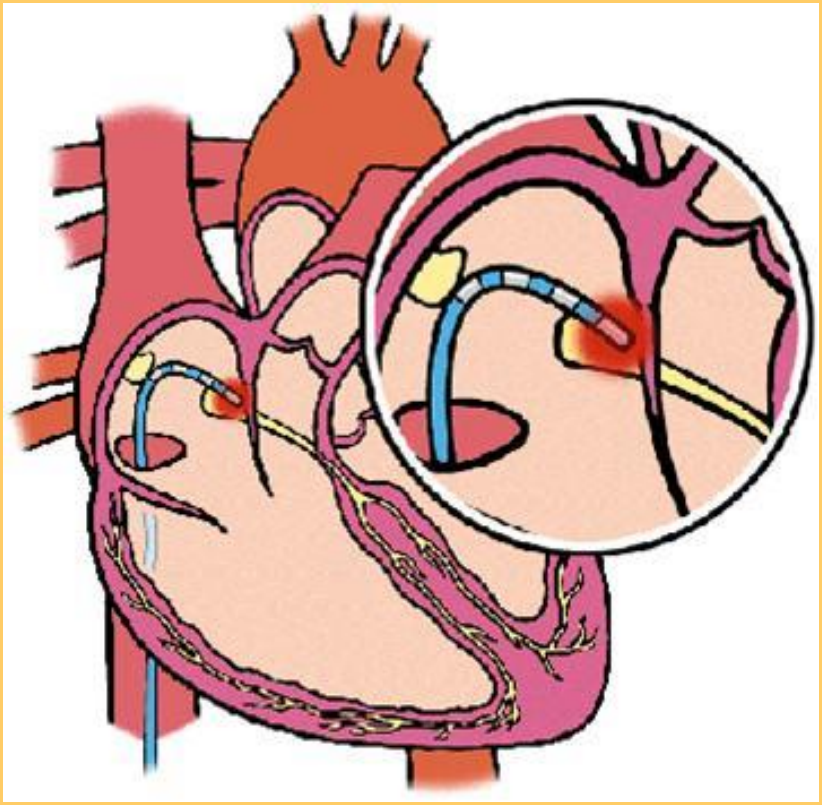
- Drugs
- RF ablation
- Implanted devices

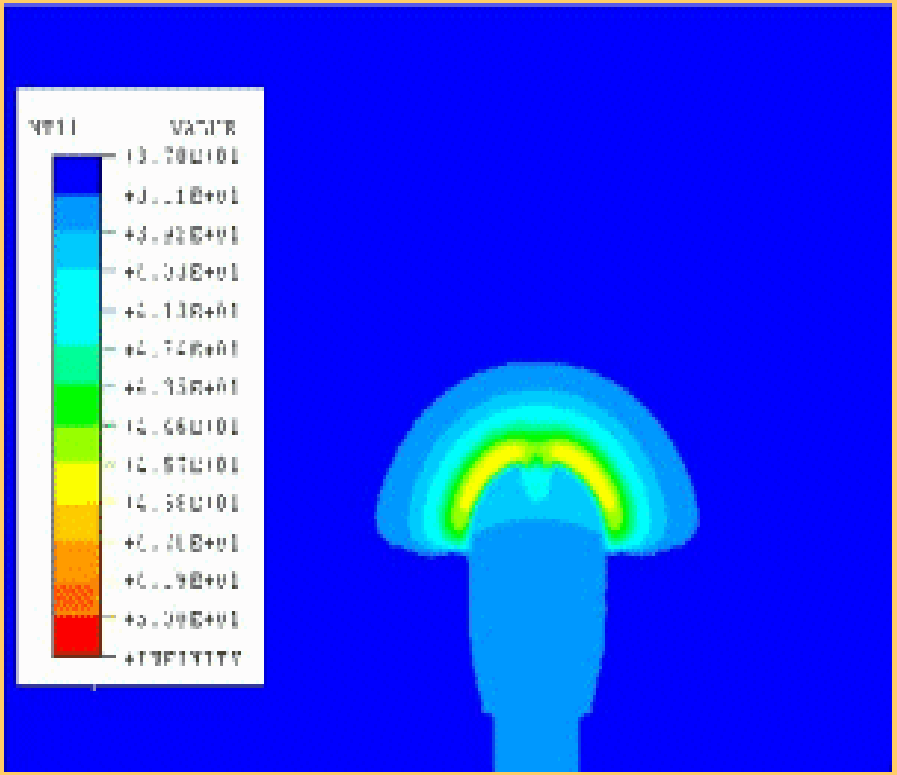
Atrial tachycardia

- If haemodynamically unstable – cardiovert
- If haemodynamically stable

  Adenosine iv

Radiofrequency ablation (RF)

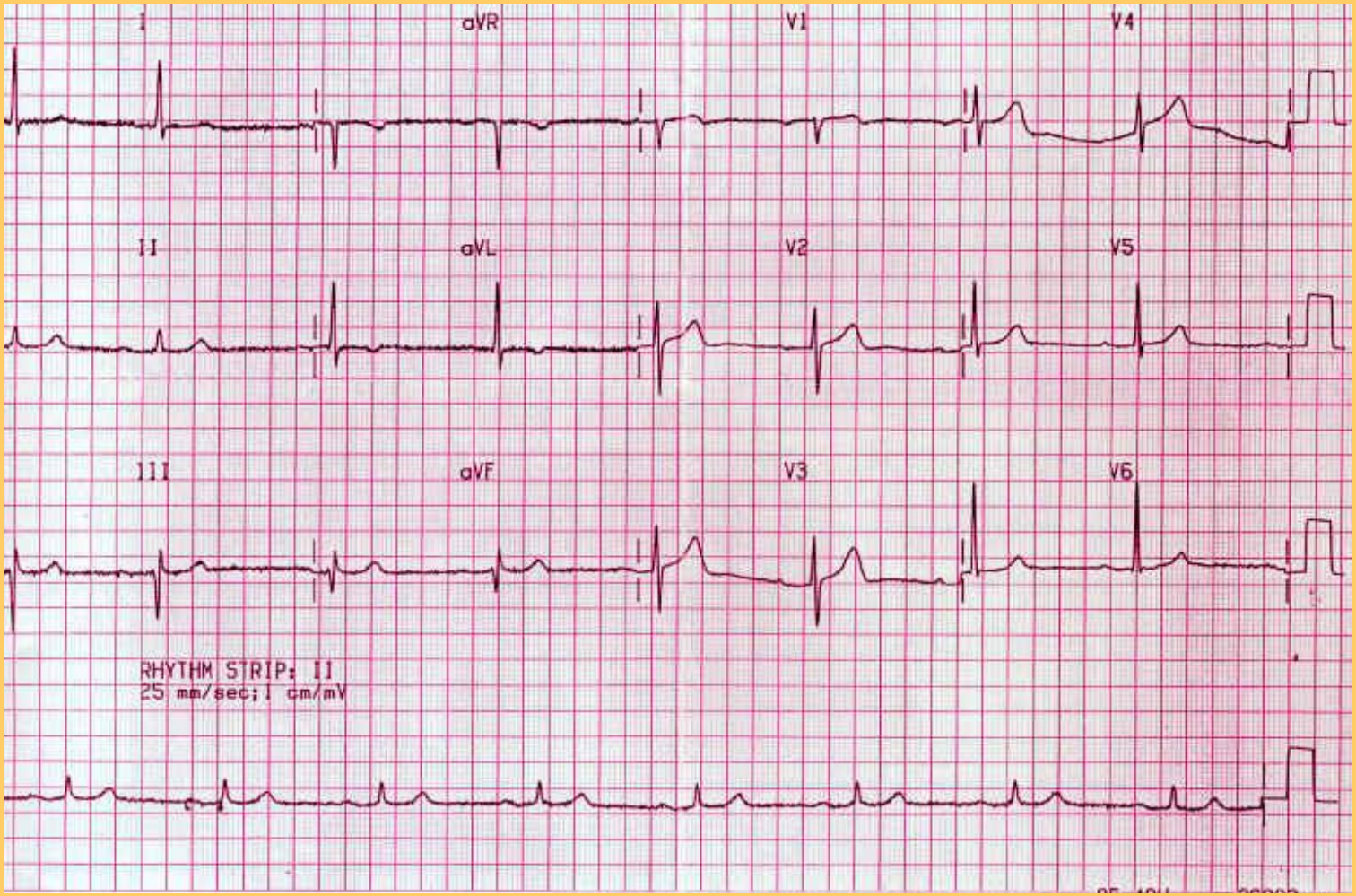




Bradyarrhythmias

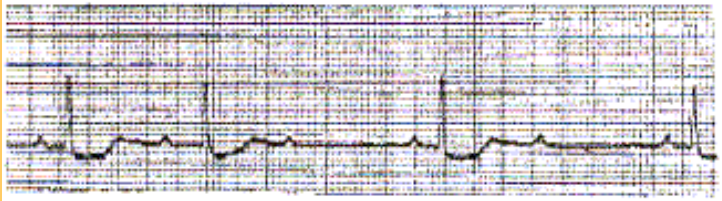
- 1st degree heart block
- 2nd degree heart block
- Complete heart block

1st degree heart block

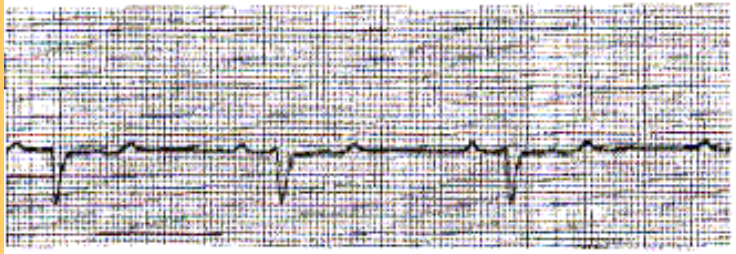


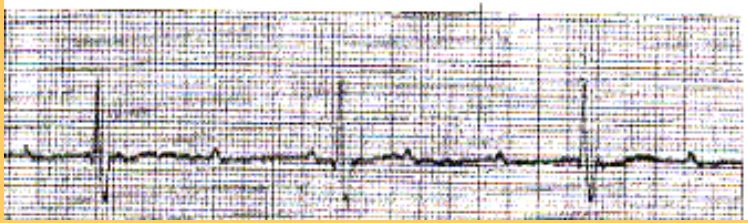
2nd degree

Wenckebach or Mobitz I

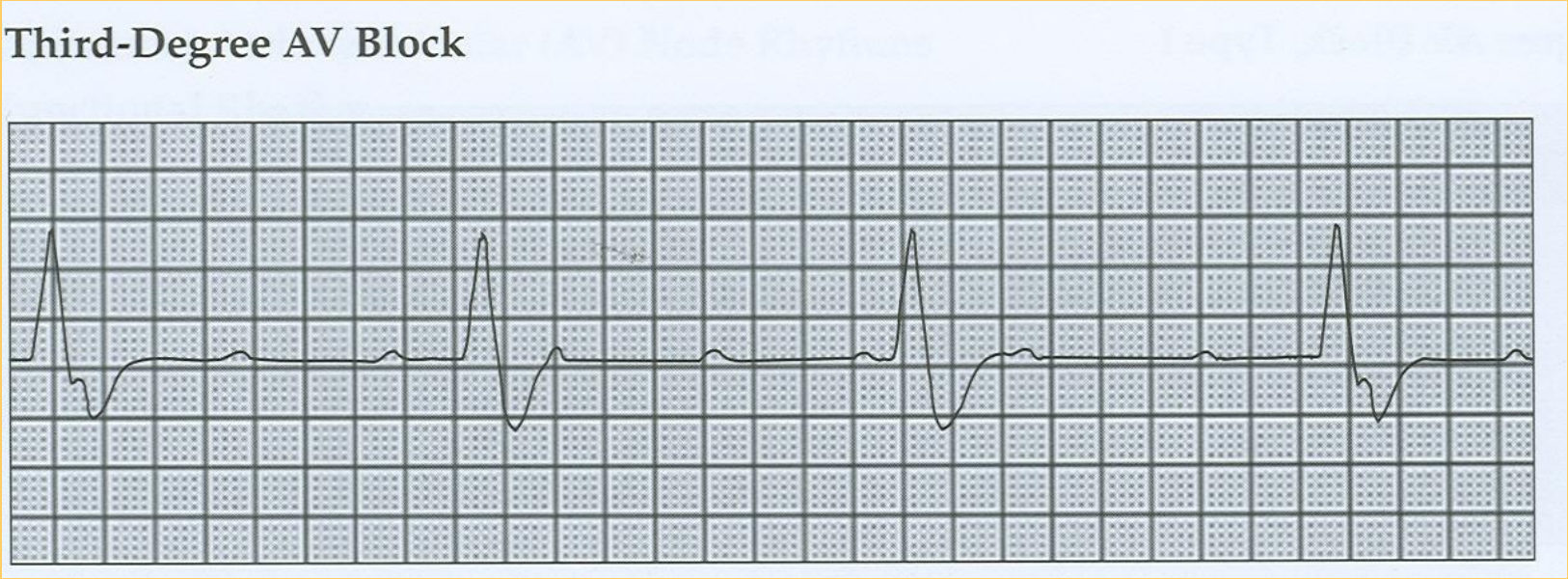


Mobitz II
Second Degree Heart Block Type II





Complete HB

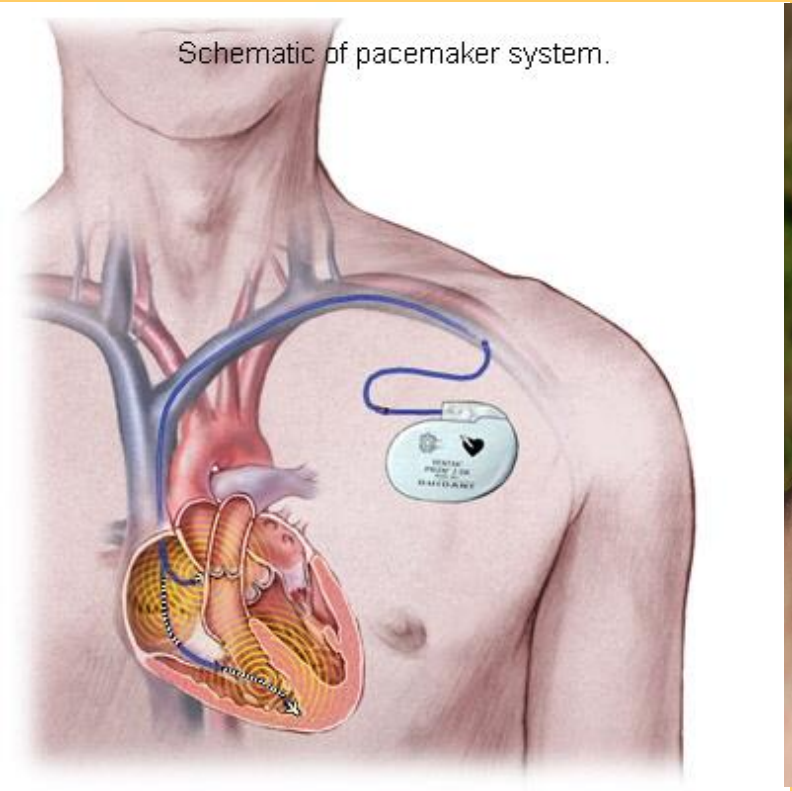


Complete heart block treatment

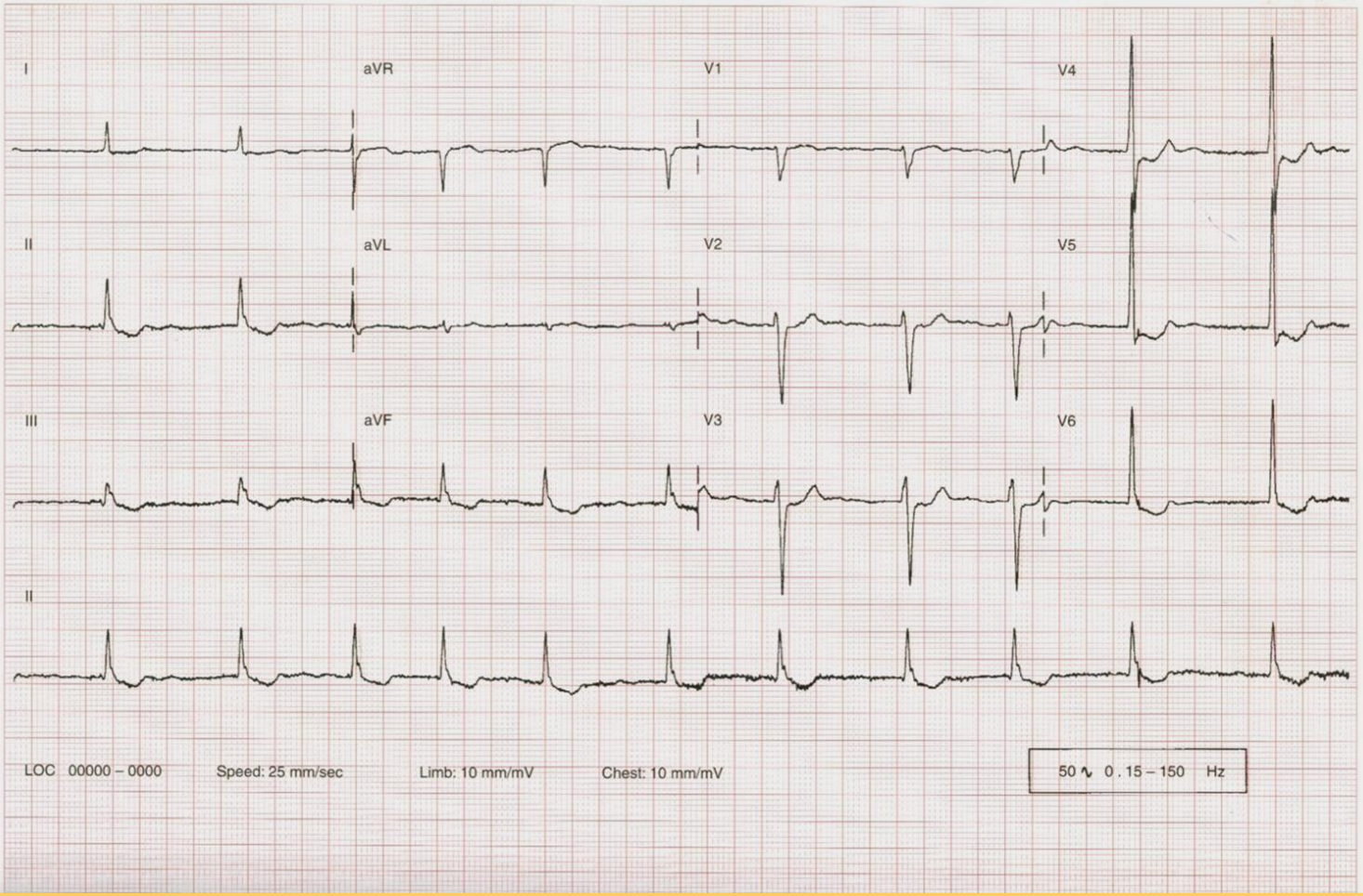
- Pacing - Temporary
  - Permanent

External pacemaker

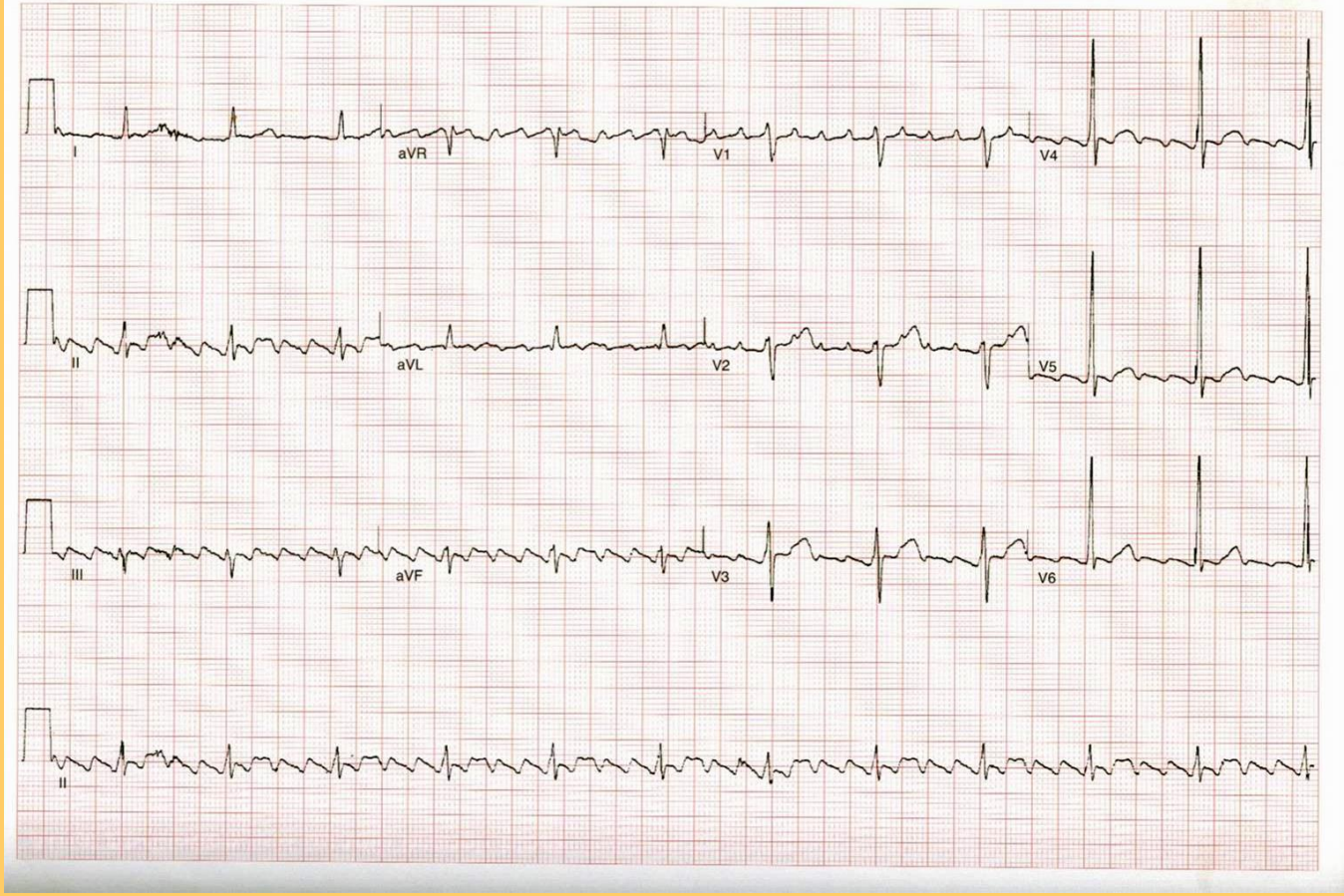
Permanent pacemaker



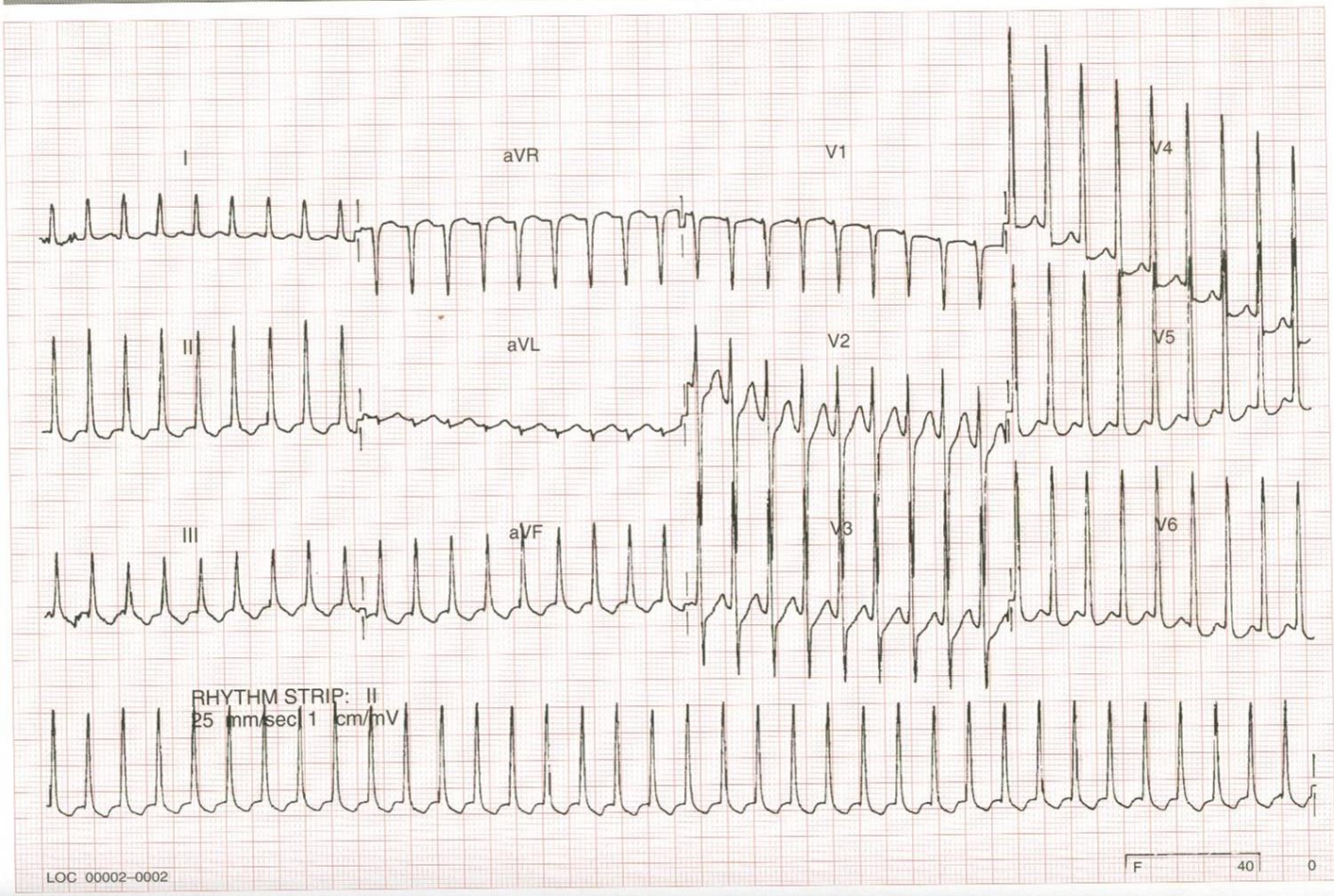
A 70-year-old lady with a stroke



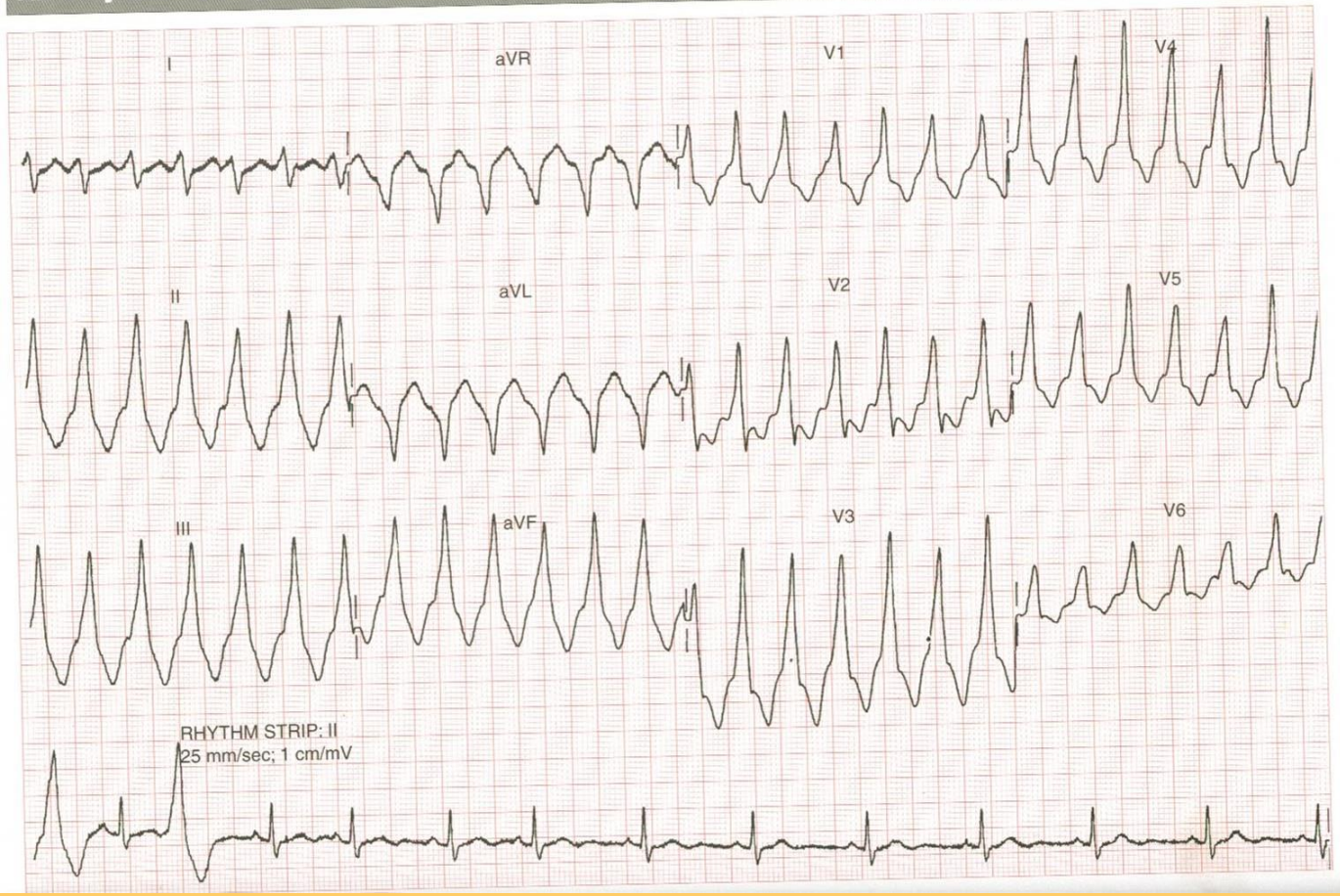
A 55-year-old man with hypertension



A 26-year-old man with palpitations



An 80-year-old lady with ischaemic heart disease



Summary

- Patients with good cardiac function often tolerate the arrhythmias.
- Patients with coexistent cardiac impairment may be severely compromised by an arrhythmia.
- Tachyarrythmias associated with major haemodynamic compromise usually require urgent cardioversion.
- Bradyarrhythmias associated with major haemodynamic compromise often require pacing.
- Patients with better tolerated arrhythmias can be treated with drug therapy.