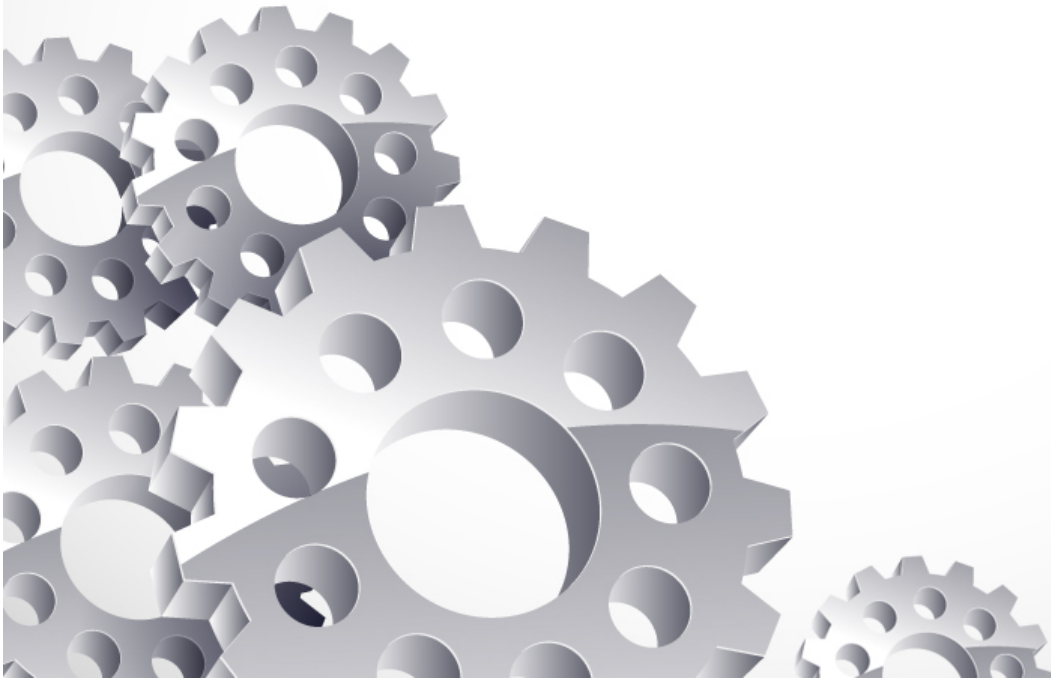


Tachydysrhythmias

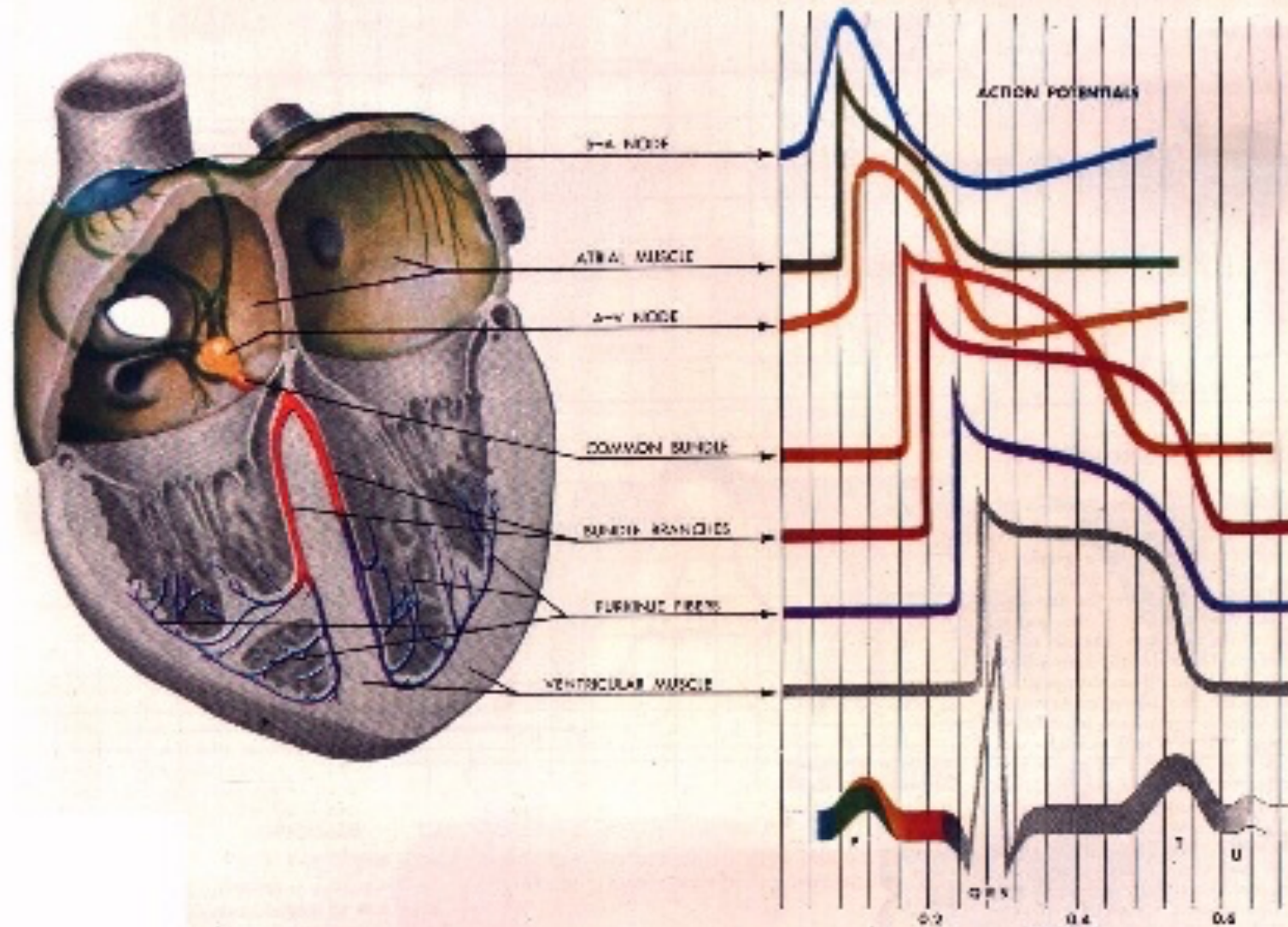
H.Shaker M.D
Faculty of E.D



Normal cardiac conduction system



- S.A node (rate, blood supply)
- Atrial conduction tract (ant, middle, post)
- A.V node (blood supply, rate)
- HIS bundle
- RBB
- LBB (LASF, LPIF) blood supply

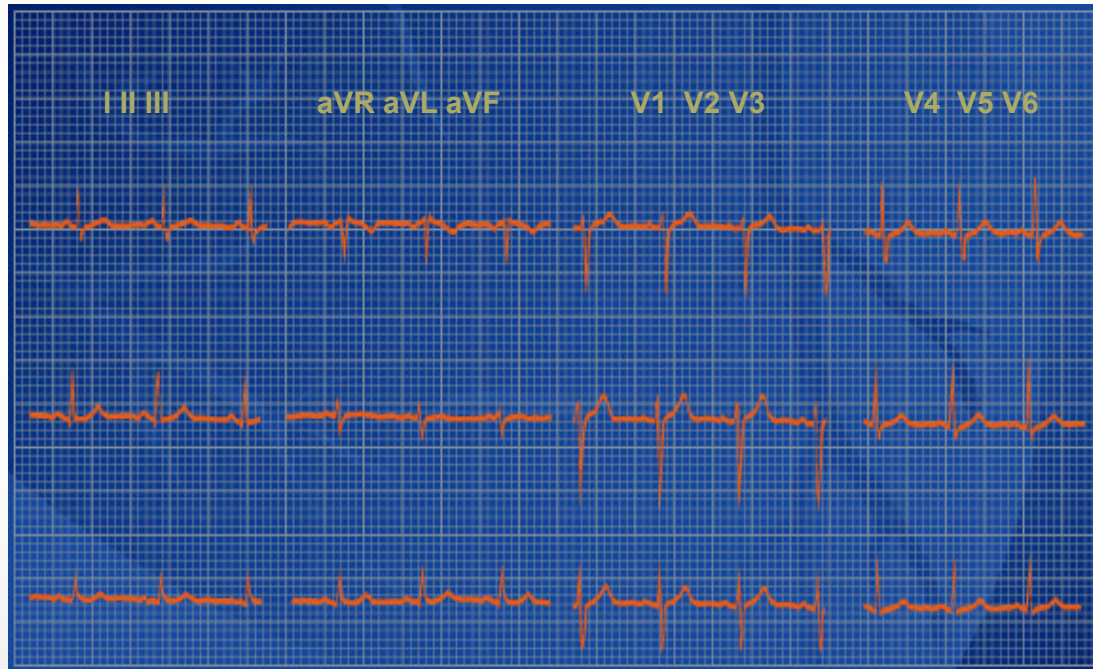


Normal Electrocardiogram

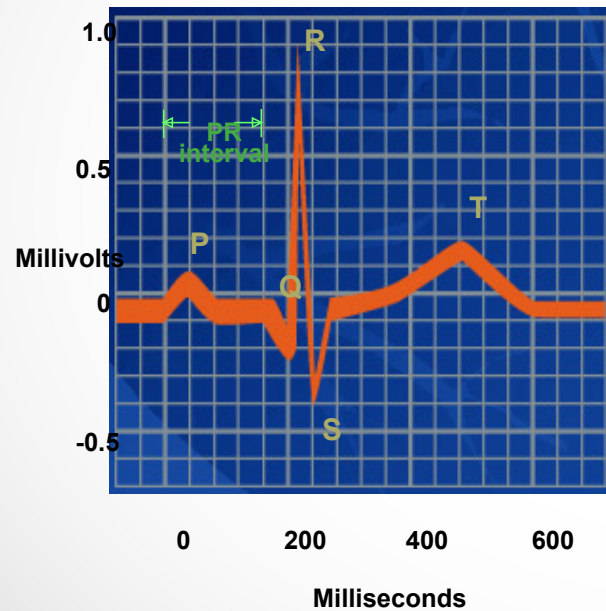


- P wave
- P-R interval
- QRS wave
- ST segment
- QT interval
- T wave
- U wave

The 10 rules for a normal ECG

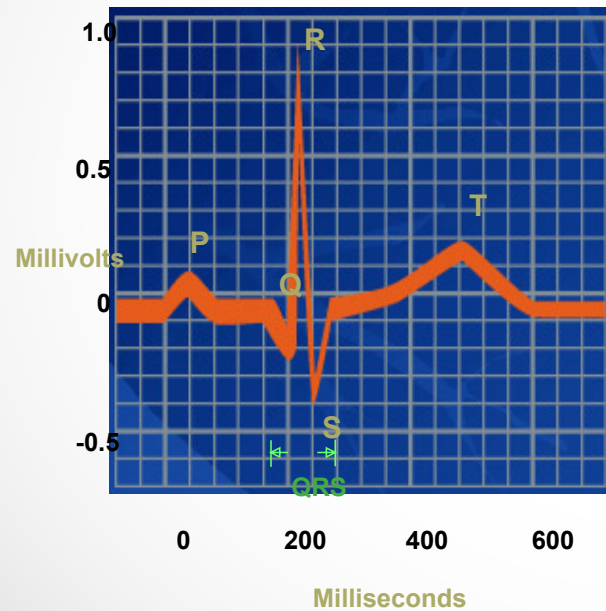


Rule 1



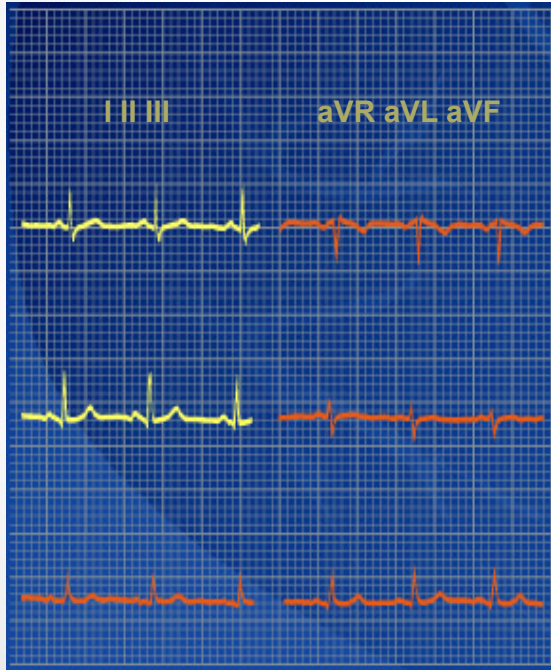
PR interval should be 120 to 200 milliseconds or 3 to 5 little squares

Rule 2



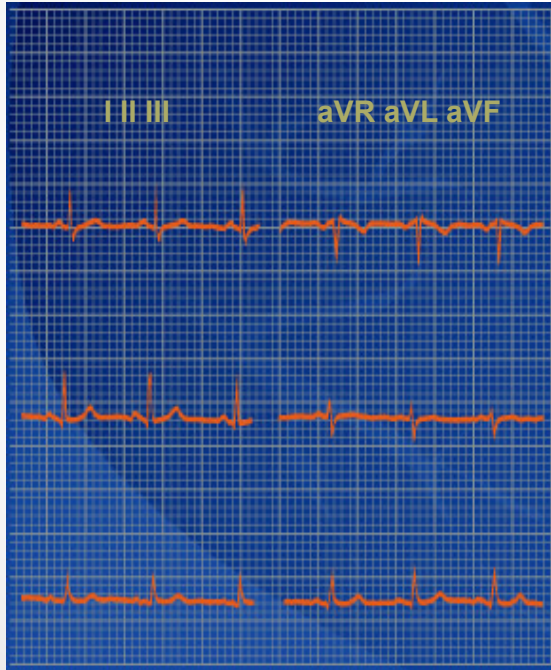
The width of the QRS complex should not exceed 110 ms, less than 3 little squares

Rule 3



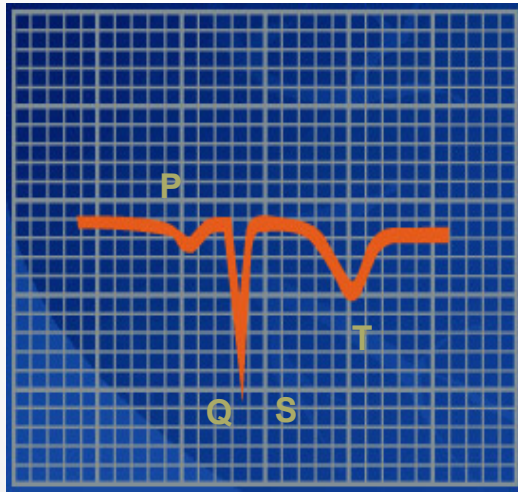
The QRS complex should be dominantly upright in leads I and II

Rule 4



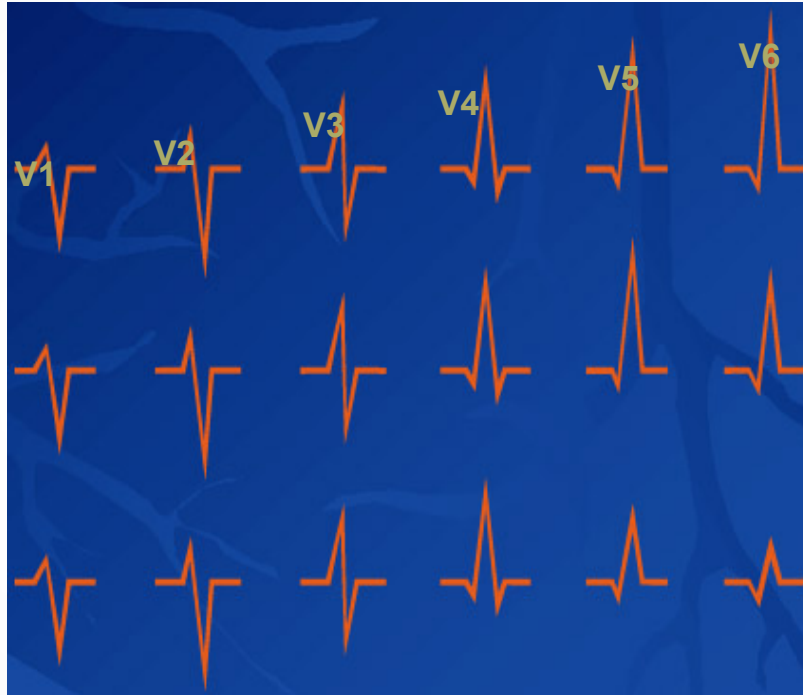
QRS and T waves tend to have the same general direction in the limb leads

Rule 5



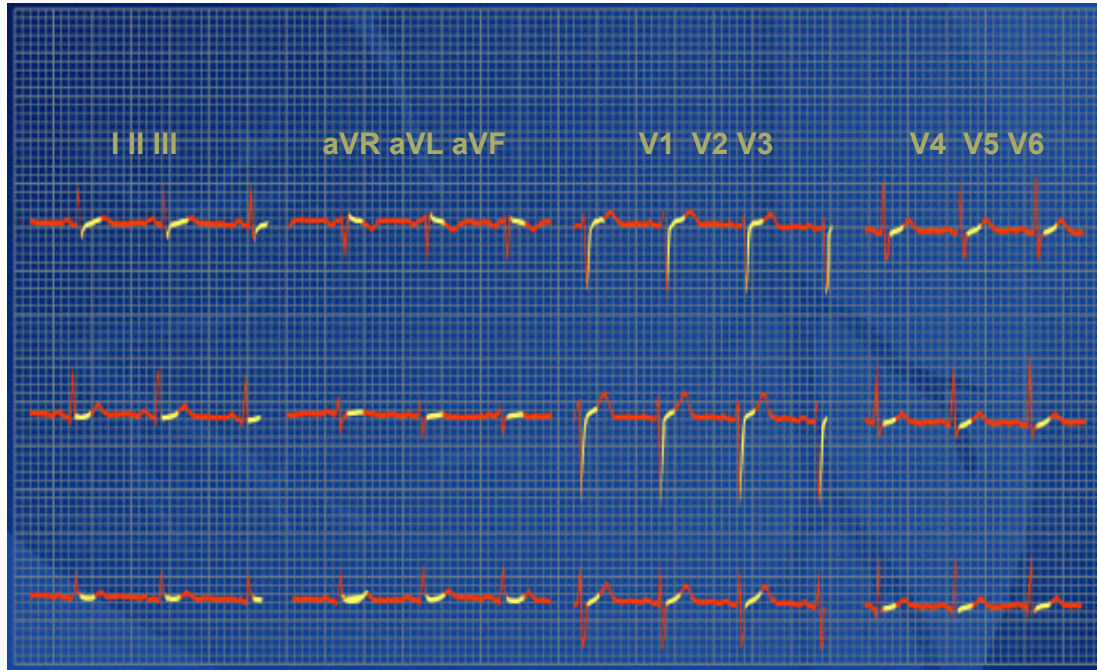
All waves are negative in lead aVR

Rule 6



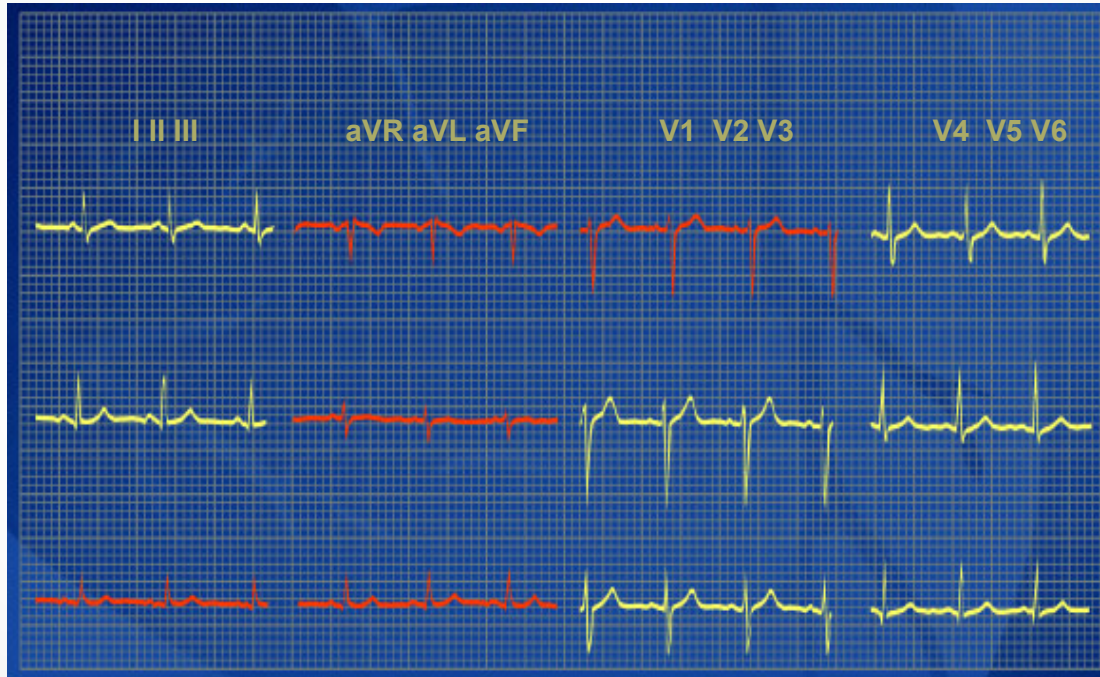
The R wave in the precordial leads must grow from V1 to at least V4

Rule 7



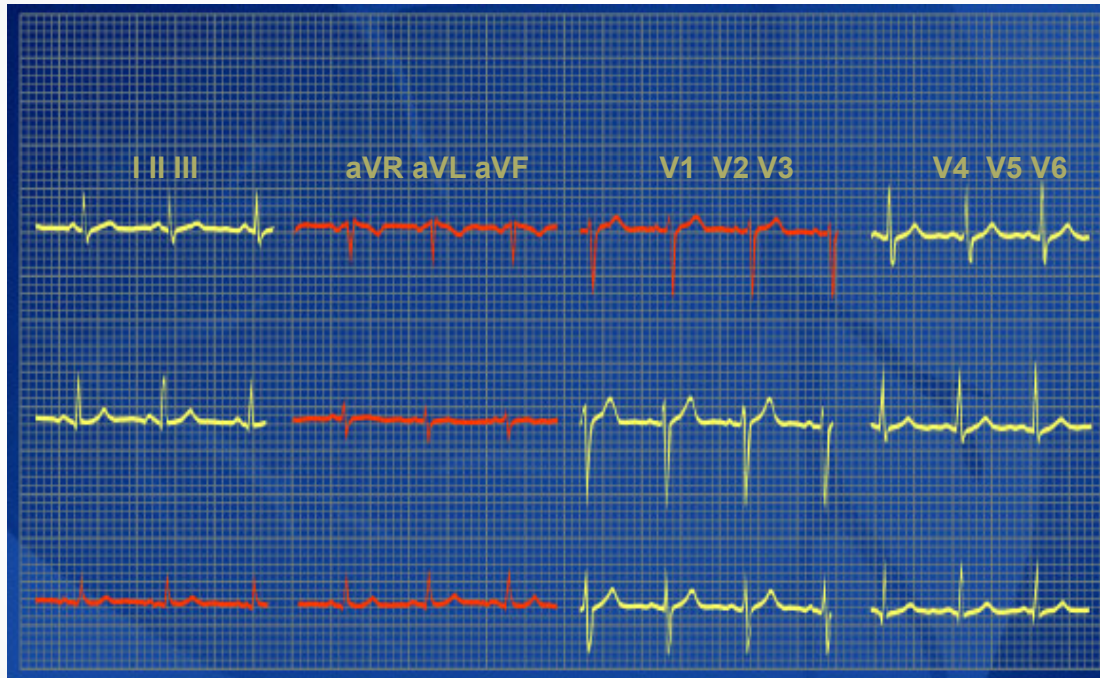
The ST segment should start isoelectric except in V1 and V2 where it may be elevated

Rule 8



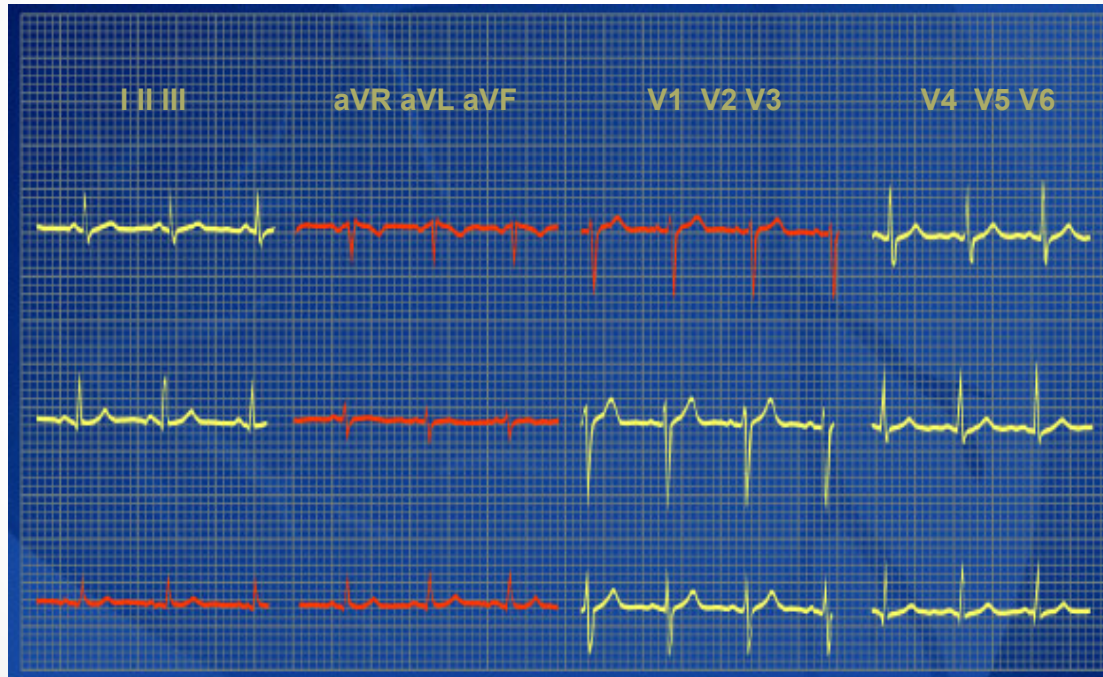
The P waves should be upright in I, II, and V2 to V6

Rule 9



There should be no Q wave or only a small q less than 0.04 seconds in width in I, II, V2 to V6

Rule 10



**The T wave must be upright in I, II, V2
to V6**

Tachyarrhythmia



- Narrow Complex Tachycardia (SVT)
regular vs irregular
- Wide Complex Tachycardia
VT vs SVT with Abberency

SVT

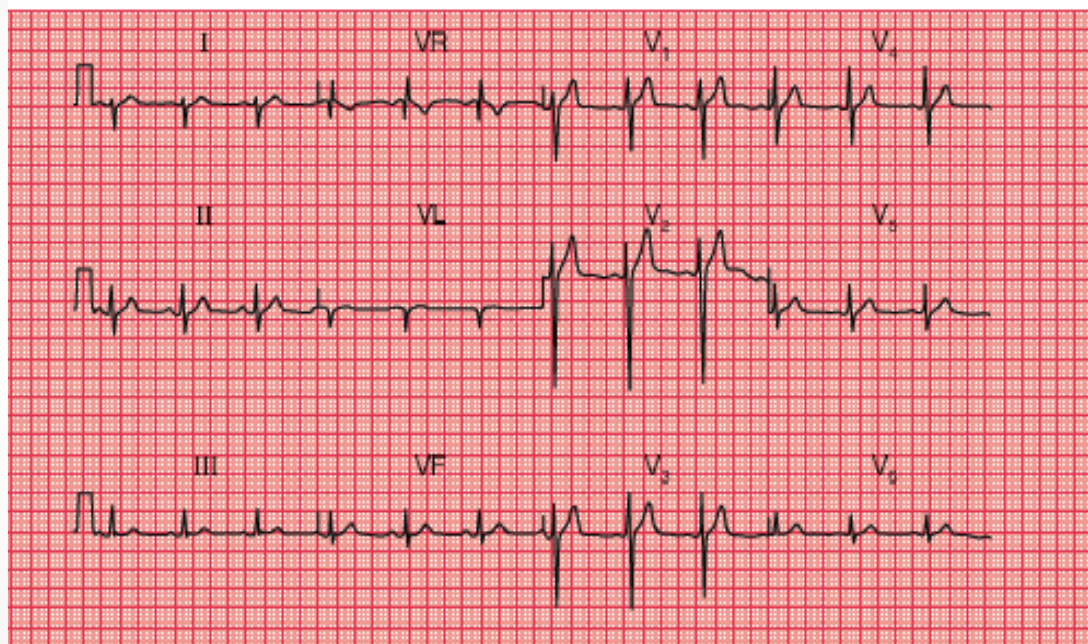


Regular Atrial

- **Sinus tachycardia**
- **Atrial tachycardia**
- **Atrial flutter**
- **Inappropriate sinus tachycardia**
- **Sinus node reentrant tachycardia**

Irregular Atrial

- **Atrial fibrillation**
- **Atrial flutter (variable block)**
- **Multifocal atrial tachycardia**



Mechanism of tachyarrhythmia

- Increased of Automaticity
- Rentry



Reentry



AV Nodal Re-entry Tachycardia (AVNRT)



- This is the commonest cause of palpitations in patients with structurally normal hearts
- AVNRT is typically paroxysmal and may occur spontaneously or upon provocation with exertion, caffeine, alcohol, beta-agonists (salbutamol) or sympathomimetics (amphetamines)
- It is more common in women than men (~ 75% of cases occurring in women) and may occur in young and healthy patients as well as those suffering chronic heart disease
- Patients will typically complain of the sudden onset of rapid, regular palpitations. Other associated symptoms may include:
 - Presyncope or syncope due to a transient fall in blood pressure
 - Chest pain, especially in the context of underlying coronary artery disease
 - Dyspnoea
 - Anxiety
 - Rarely, polyuria due to elevated atrial pressures causing release of atrial natriuretic peptide
- The tachycardia typically ranges between 140-280 bpm and is regular in nature. It may self-resolve or continue indefinitely until medical treatment is sought
- The condition is generally well tolerated and is rarely life threatening in patients with pre-existing heart disease

PSVT (AVNRT)





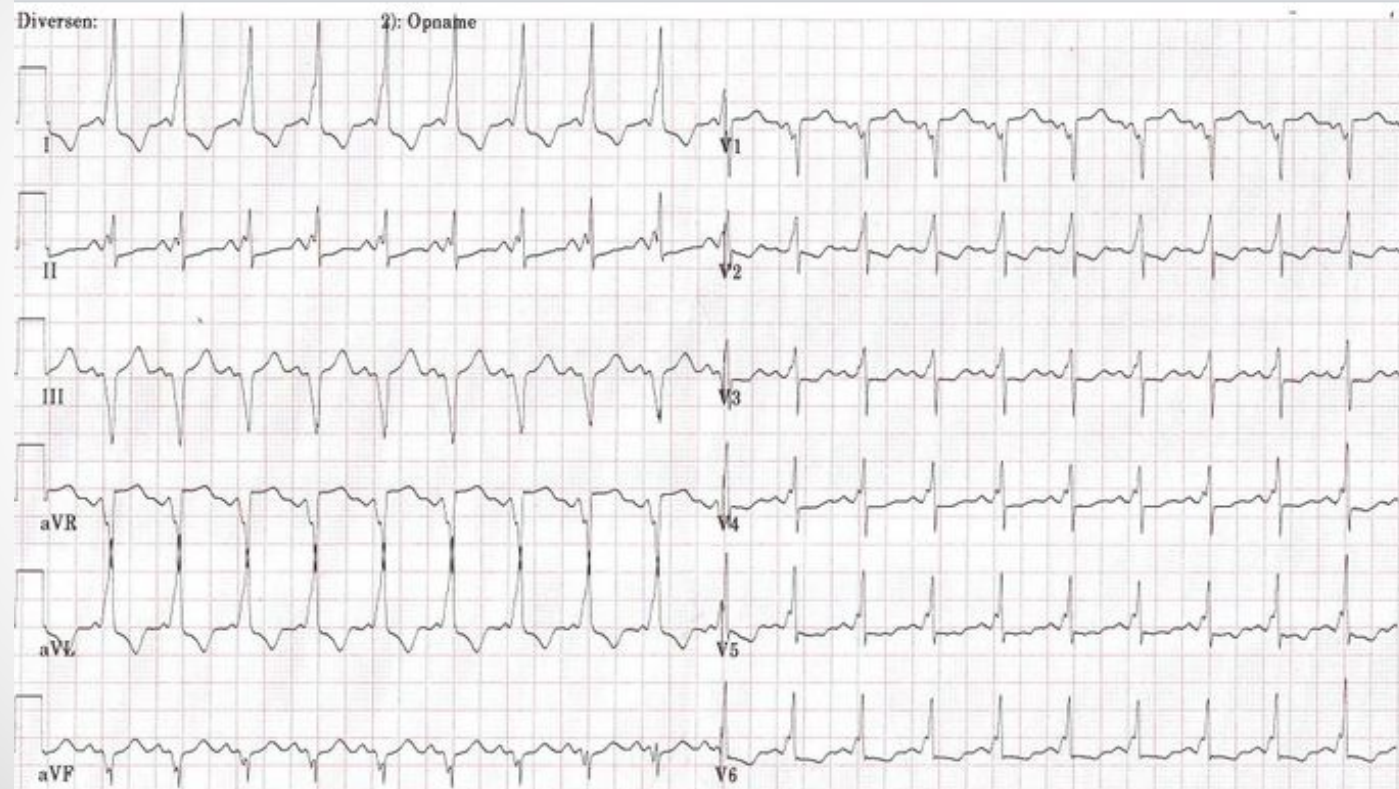
Wolff-Parkinson-White (WPW) Syndrome



ECG features of WPW in sinus rhythm



- **PR interval < 120ms**
- **Delta wave: slurring slow rise of initial portion of the QRS**
- **QRS prolongation > 110ms**
- **Discordant ST-segment and T-wave changes (i.e. in the opposite direction to the major component of the QRS complex)**
- **Pseudo-infarction pattern in up to 70% of patients — due to negatively deflected delta waves in inferior/anterior leads (“pseudo-Q waves”), or prominent R waves in V1-3 (mimicking posterior infarction)**











AVRT (orthodromic)



AVRT (antidromic)



Management of AVNRT and AVRT



- May respond to vagal maneuvers with reversion to sinus rhythm.
- The mainstay of treatment is adenosine
- Other agents which may be used include calcium-channel blockers, beta-blockers and amiodarone
- DC cardioversion is rarely required
- Catheter ablation may be considered in recurrent episodes not amenable to medical treatment.

Atrial Tachycardia

- Focal AT (100 - 250)
- MAT (100 - 250)
- Atrial Flutter (250 - 350)
- AF (350 - 600)



FAT



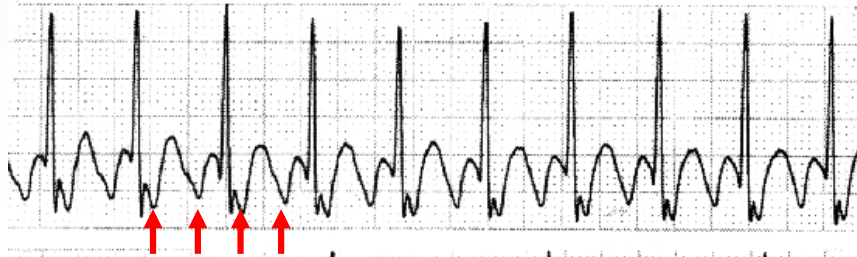
MAT



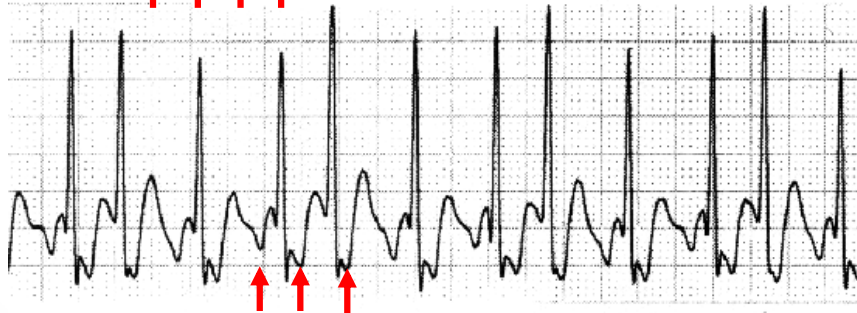
Atrial Flutter

V. rate
140-160
beats/min

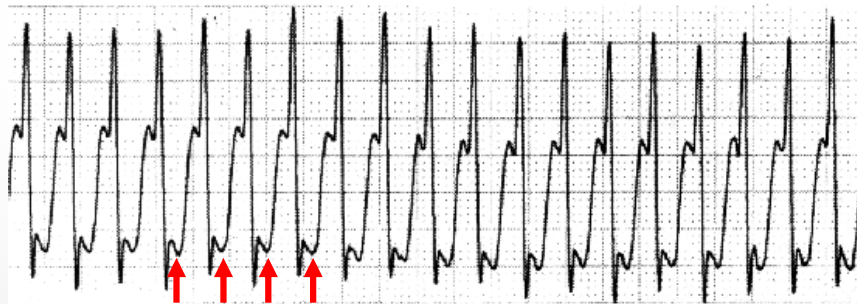
2:1
Conduction
(common)

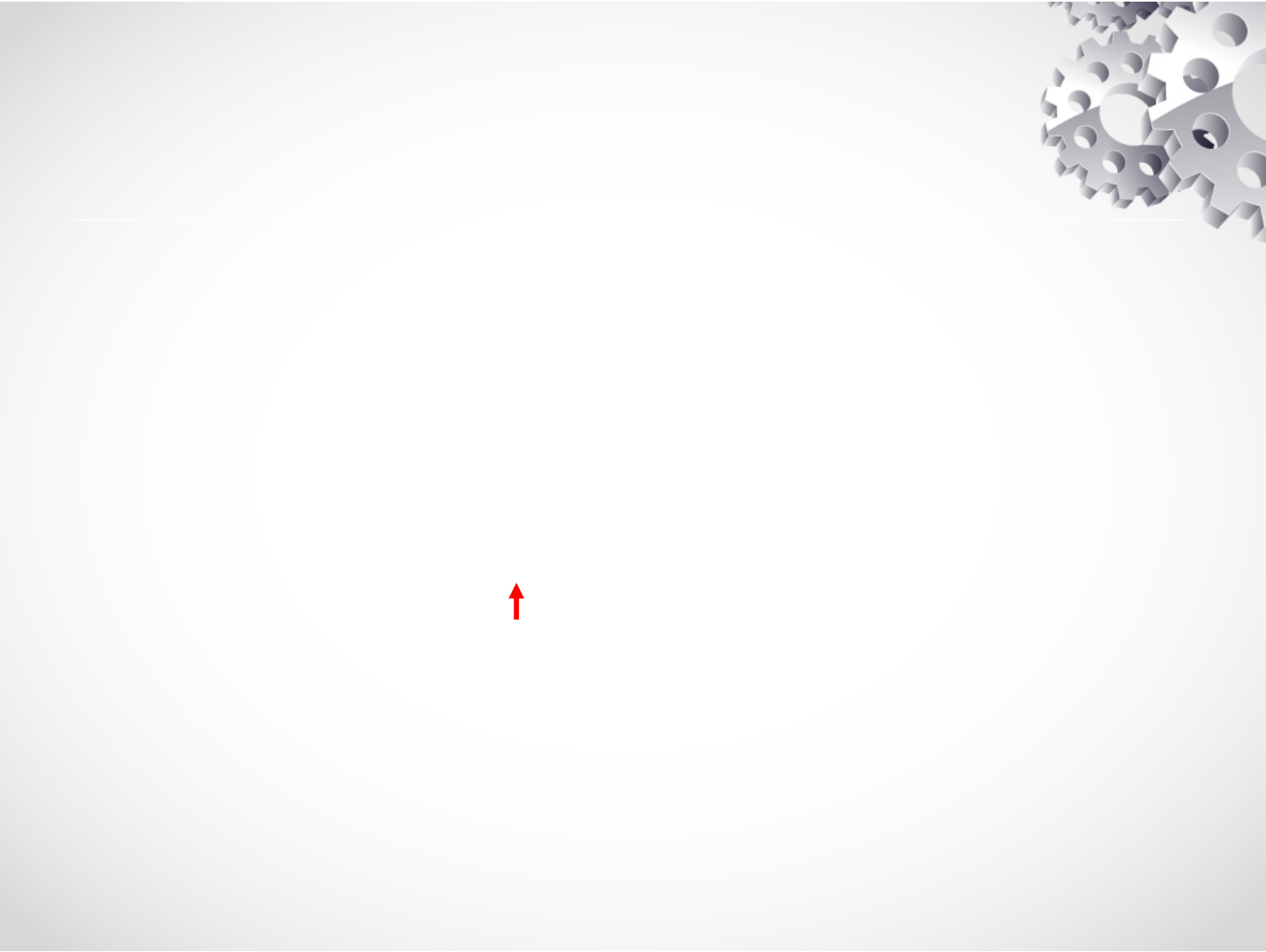


2:1 & 3:2
Conduction



1:1
Conduction
(rare but
dangerous)

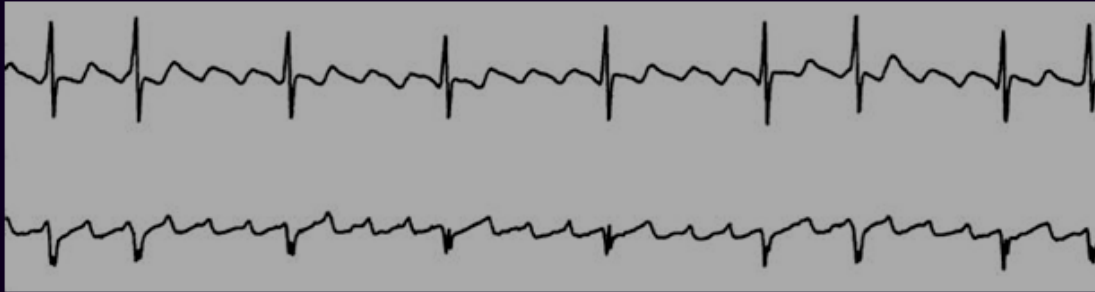




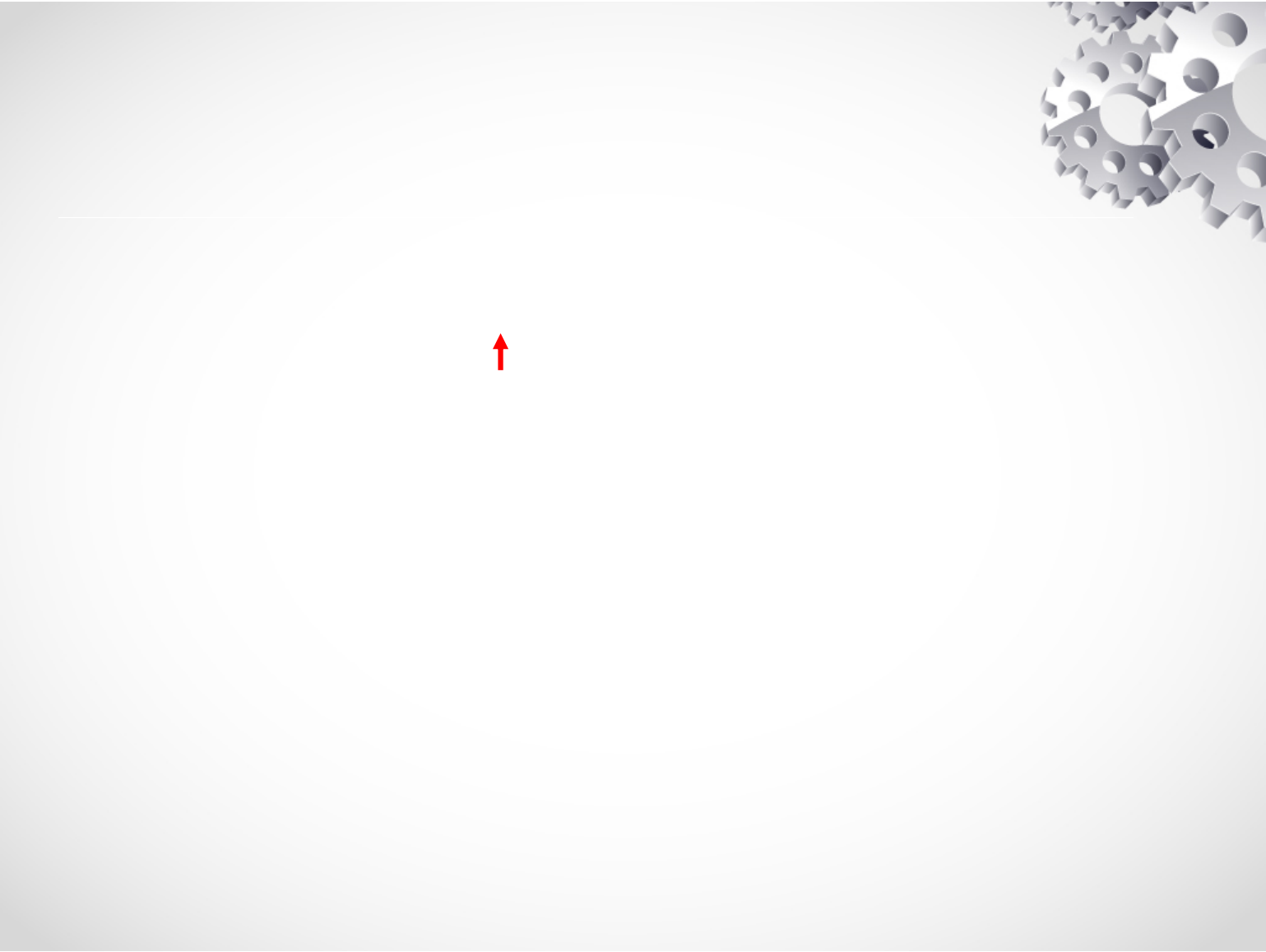
Atrial Flutter 2 to 1



**Same patient after adenosine,
showing prominent flutter waves.**









Atrial flutter with 4:1 block

Atrial Fibrillation



- Irregularly irregular rhythm
- No P waves
- Absence of an isoelectric baseline
- Variable ventricular rate
- QRS complexes usually $< 130\text{ms}$, unless pre-existing bundle branch block, accessory pathway, or rate-related aberrant conduction
- Fibrillatory waves may be present and can be either fine (amplitude $< 0.5\text{mm}$) or coarse (amplitude $> 0.5\text{mm}$)
- Fibrillatory waves may mimic P waves leading to misdiagnosis



AF w/RVR



Management of Atrial Fibrillation



- Diagnosis of atrial fibrillation
- Assessment of duration
- Assessment for anticoagulation
- Rate or rhythm control
- Treatment of underlying / associated diseases

ECG features of Atrial Fibrillation in WPW:

- Rate > 200 bpm
- Irregular rhythm
- Wide QRS complexes due to abnormal ventricular depolarisation via accessory pathway
- QRS complexes change in shape and morphology
- Axis remains stable, unlikely polymorphic VT



Wide Complex Tachycardia

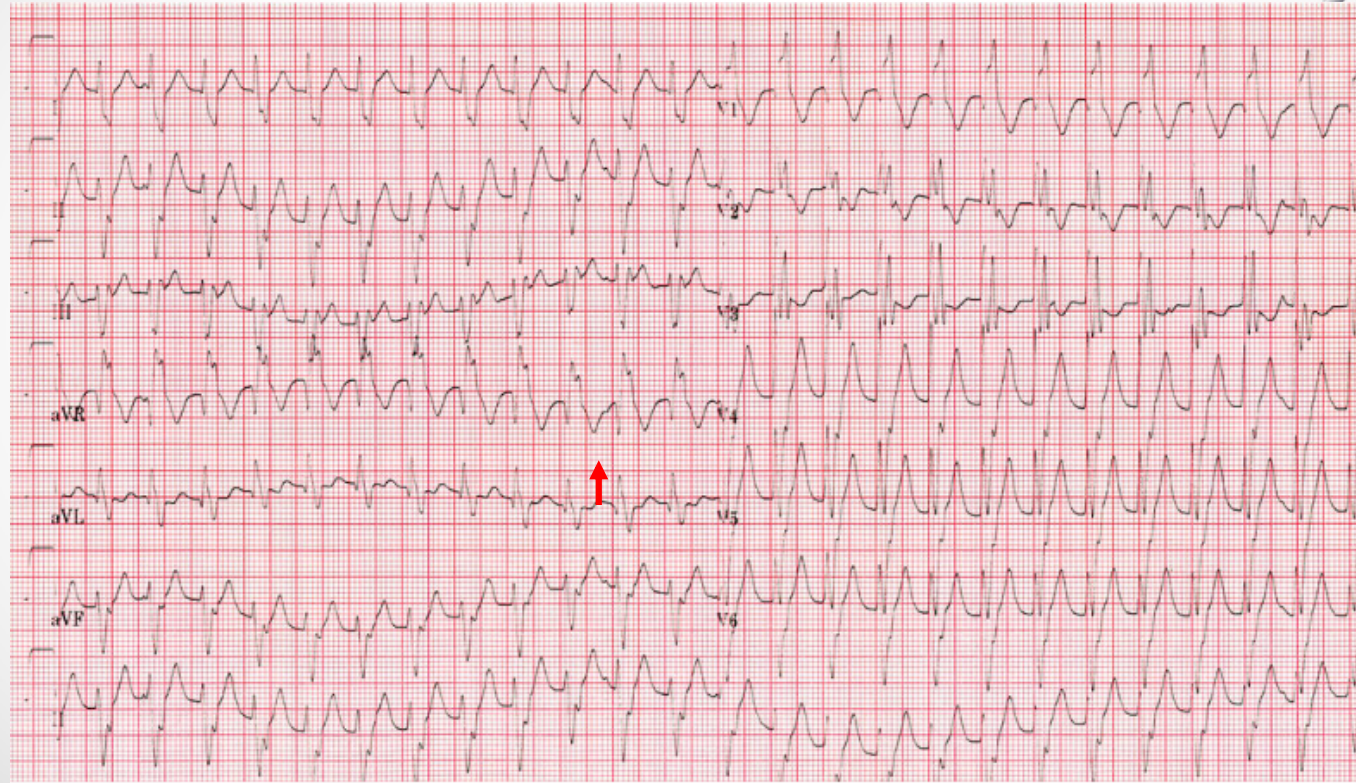


- Ventricular Tachycardia (VT)
- Wide complex SVT (abberency)
- wide complex SVT(antidromic)
- Accelerated idioventricular rhythm
- Ventricular Fibrillation (VF)

Ventricular Tachycardia

- monomorphic VT
- polymorphic VT





Electrocardiographic features that increase the likelihood of VT include

- Absence of typical RBBB or LBBB morphology
- Extreme axis deviation (“northwest axis”): QRS positive in aVR and negative in I and aVF
- Very broad complexes > 160ms
- AV dissociation:
- P and QRS complexes at different rates
- P waves are often superimposed on QRS complexes and may be difficult to discern
- Capture beats: Occur when the sinoatrial node transiently “captures” the ventricles in the midst of AV dissociation, producing a QRS complex of normal duration
- Fusion beats: Occur when a sinus and ventricular beat coincide to produce a hybrid complex (see Dressler beat)



- **Positive concordance throughout the precordial leads**
- **Negative concordance throughout the precordial leads**
- **RSR' complexes with a taller left rabbit ear**
- **Brugada sign: Distance from onset of R wave to nadir of S wave is $> 100\text{ms}$ in leads V1-6 (discussed further below)**
- **Josephson sign: Notching/slurring near the nadir of the S wave**





**Positive concordance in VT: Leads V1-6 show
entirely positive (R) complexes, with no rS
complexes seen**



**Negative concordance in VT: Leads V1-6
show entirely negative (QS) complexes, with
no rS complexes seen**

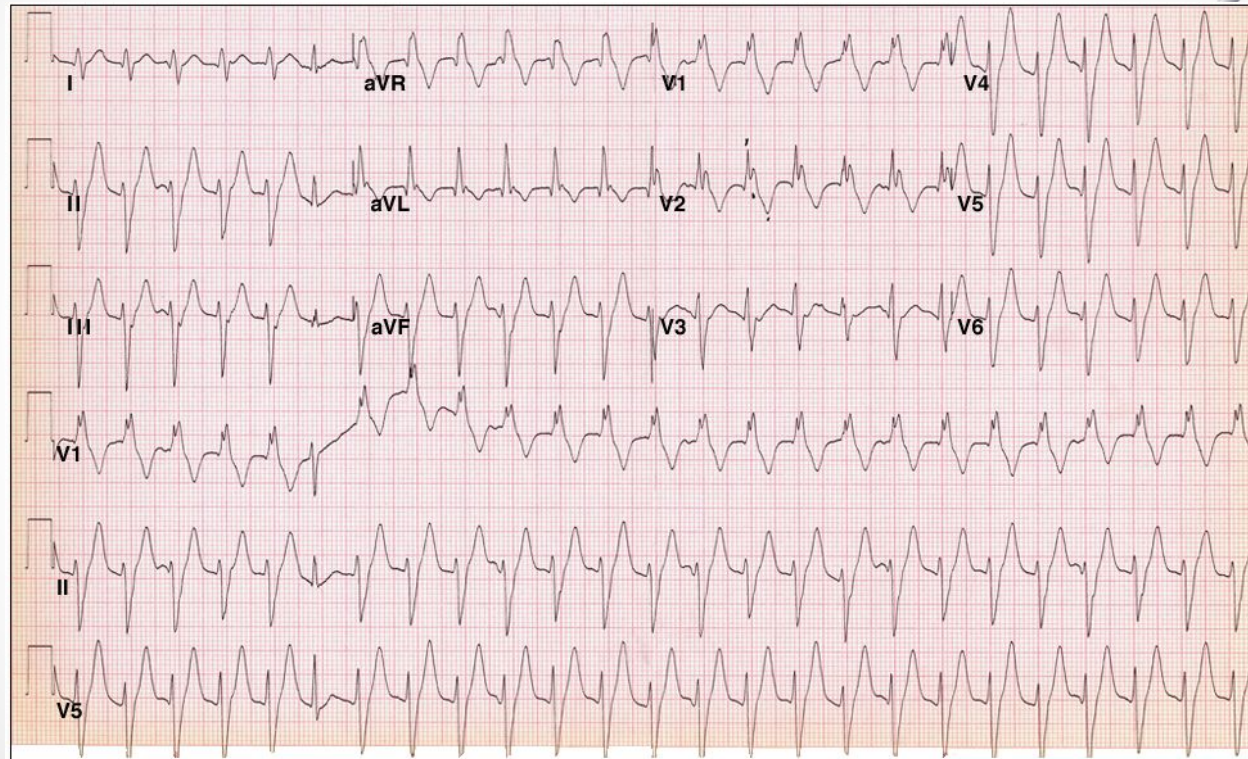


Taller left rabbit ear in V1
Rabbit ear sign



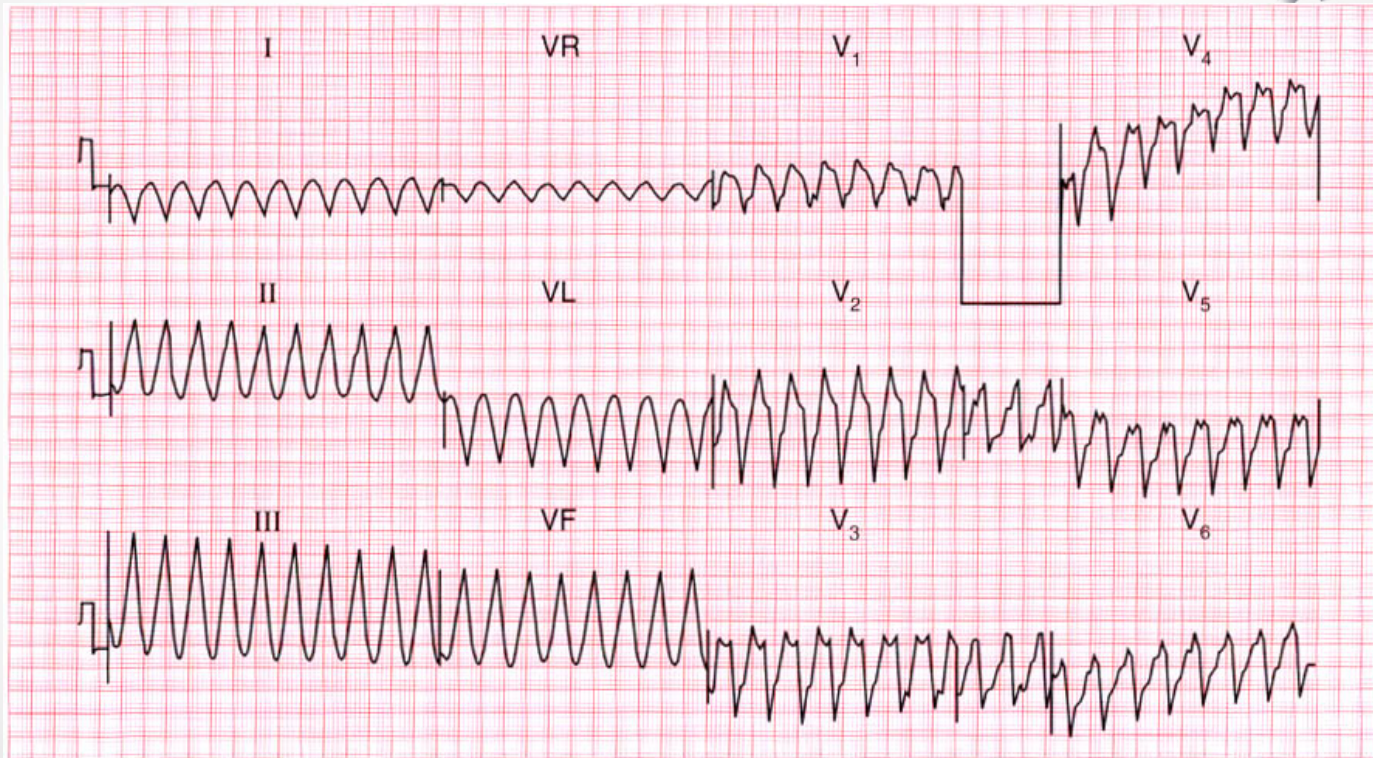


Capture beats, or Dressler beats

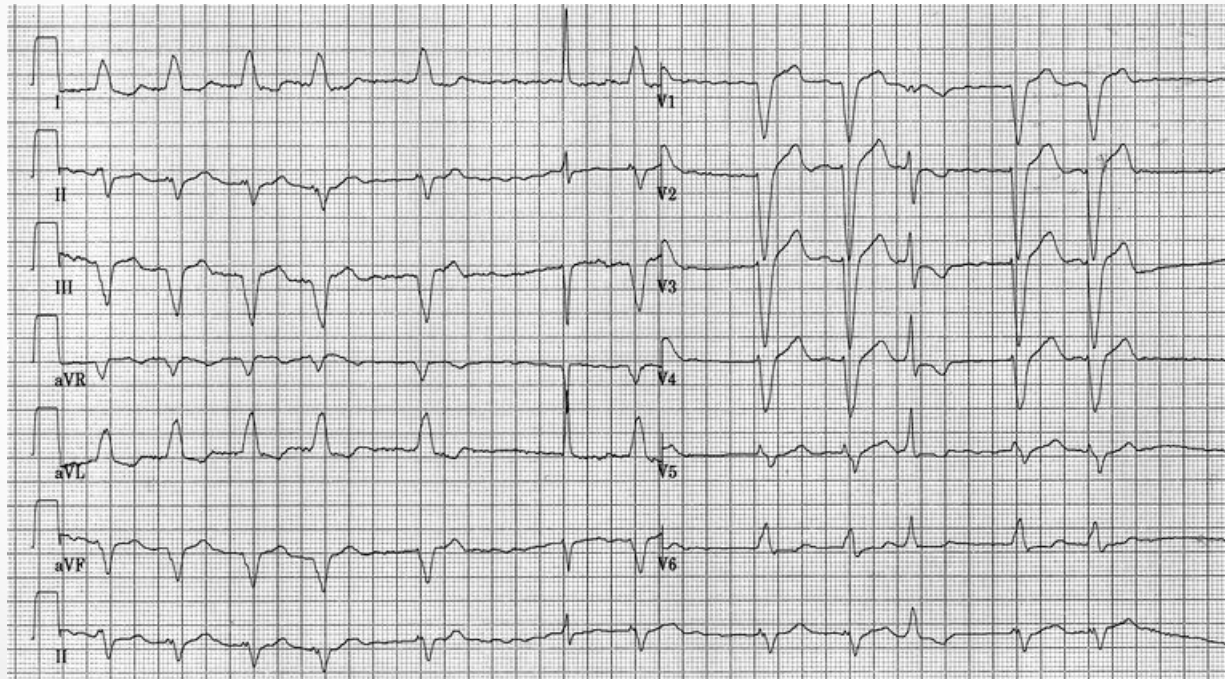




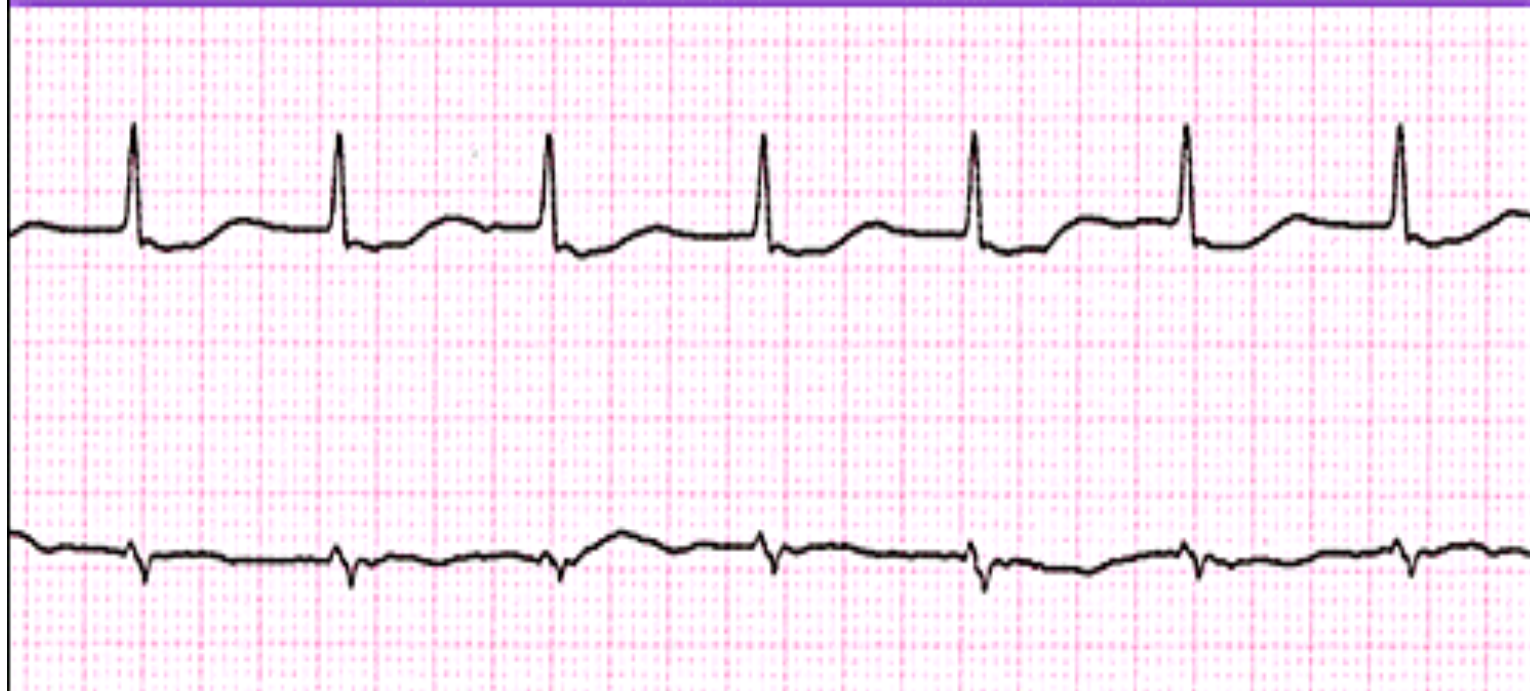
This ECG was recorded in a coronary care unit from a patient admitted 2 h previously with an acute anterior myocardial infarction. The patient was cold and clammy, and confused, and his blood pressure was unrecordable. What do you do ?



Rate dependant left bundle branch aberration

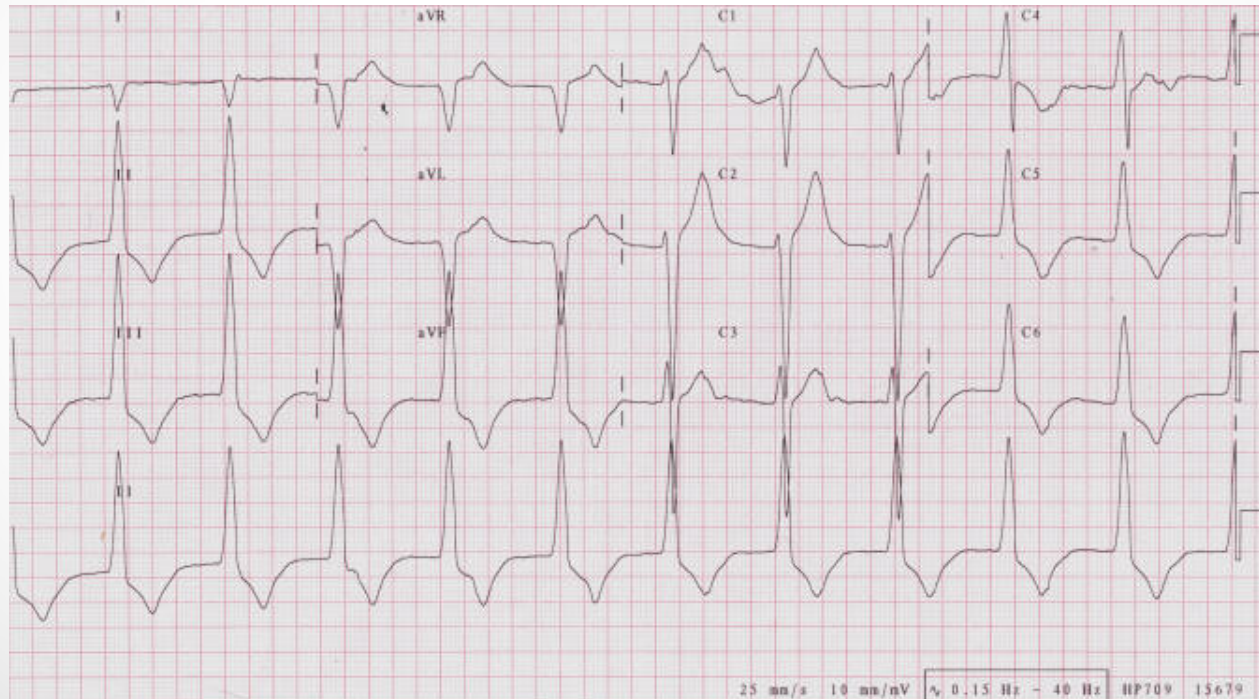


Accelerated Junctional Rhythm

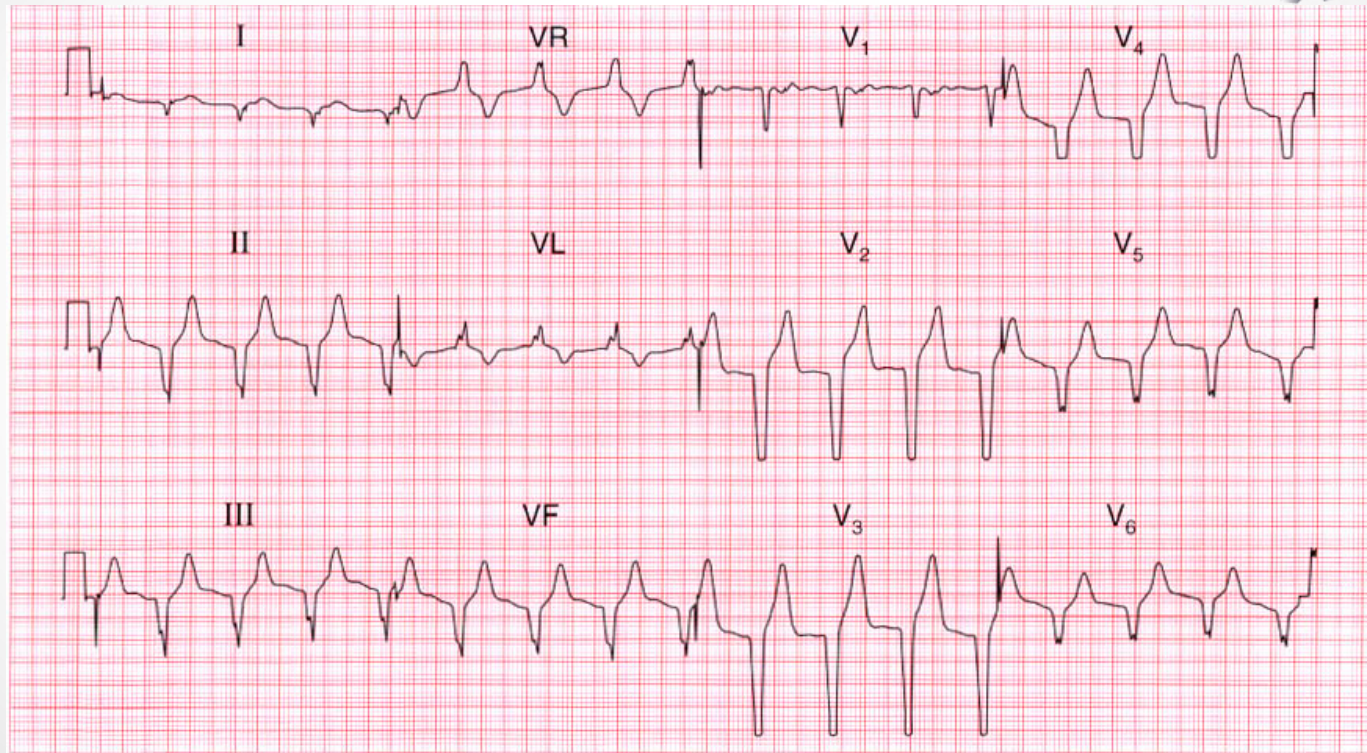


Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
60-100 bpm	Regular	Inverted, absent or after QRS	<.12	<.12

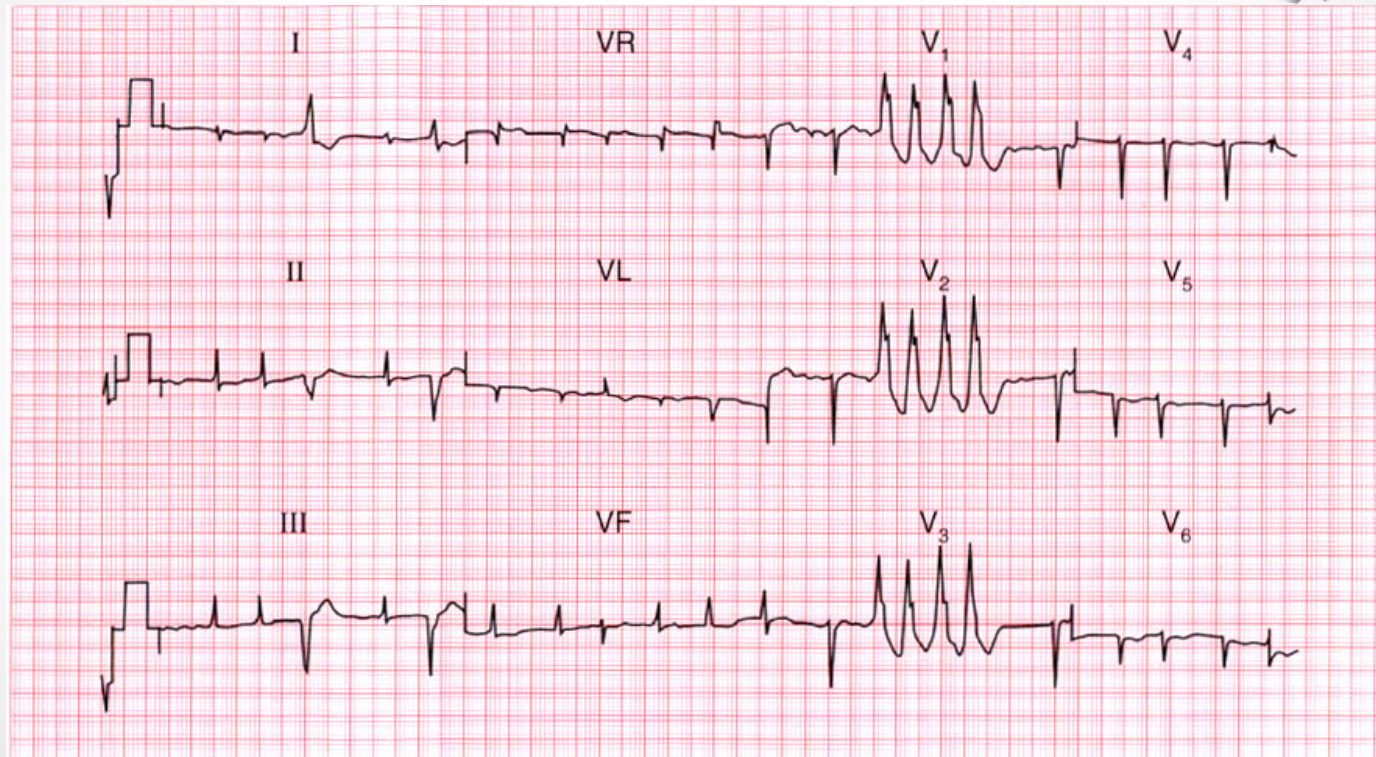
Accelerated idioventricular rhythm



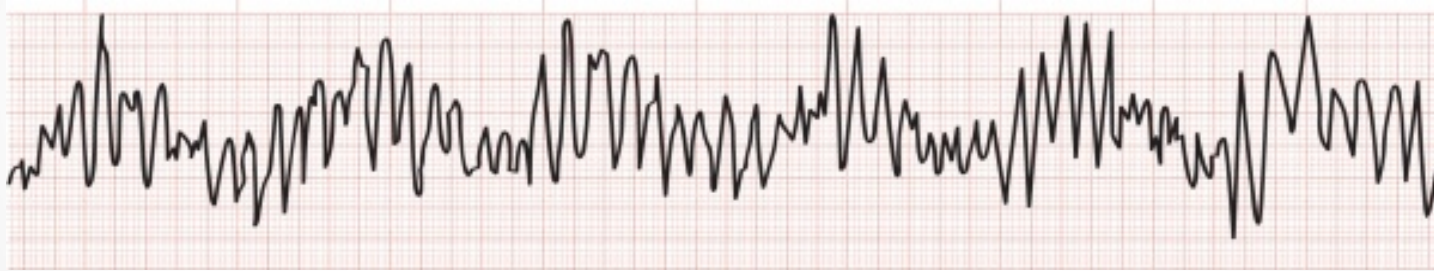
This ECG was recorded from a 45-year-old man, who had been admitted to a coronary care unit with a myocardial infarction and who was recovering well. What is the rhythm, and what would you do?



A 60-year-old man who was being treated in hospital complained of palpitations, and this ECG was recorded. What do you think the underlying disease was, and what were the palpitations due to?

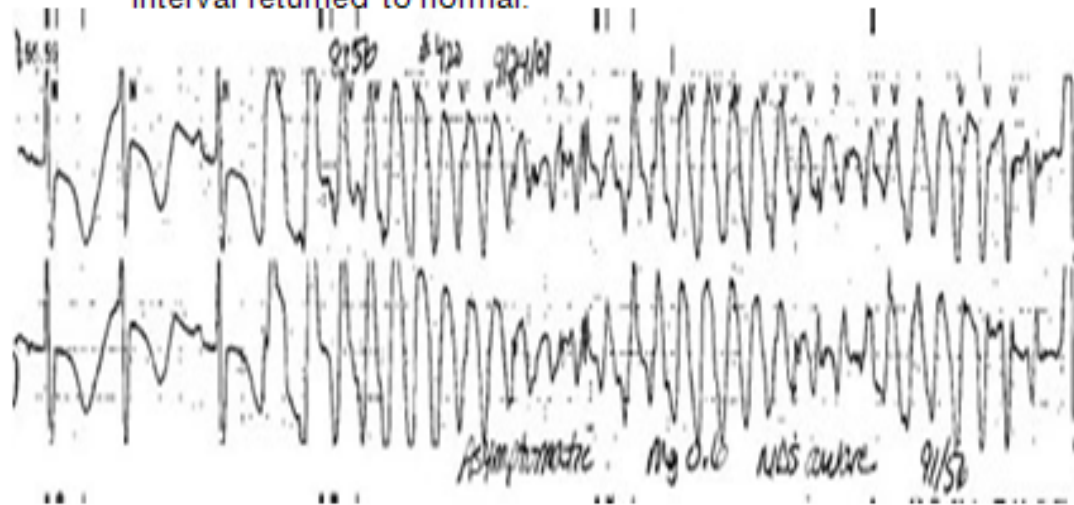


polymorphic VT (Torsade)

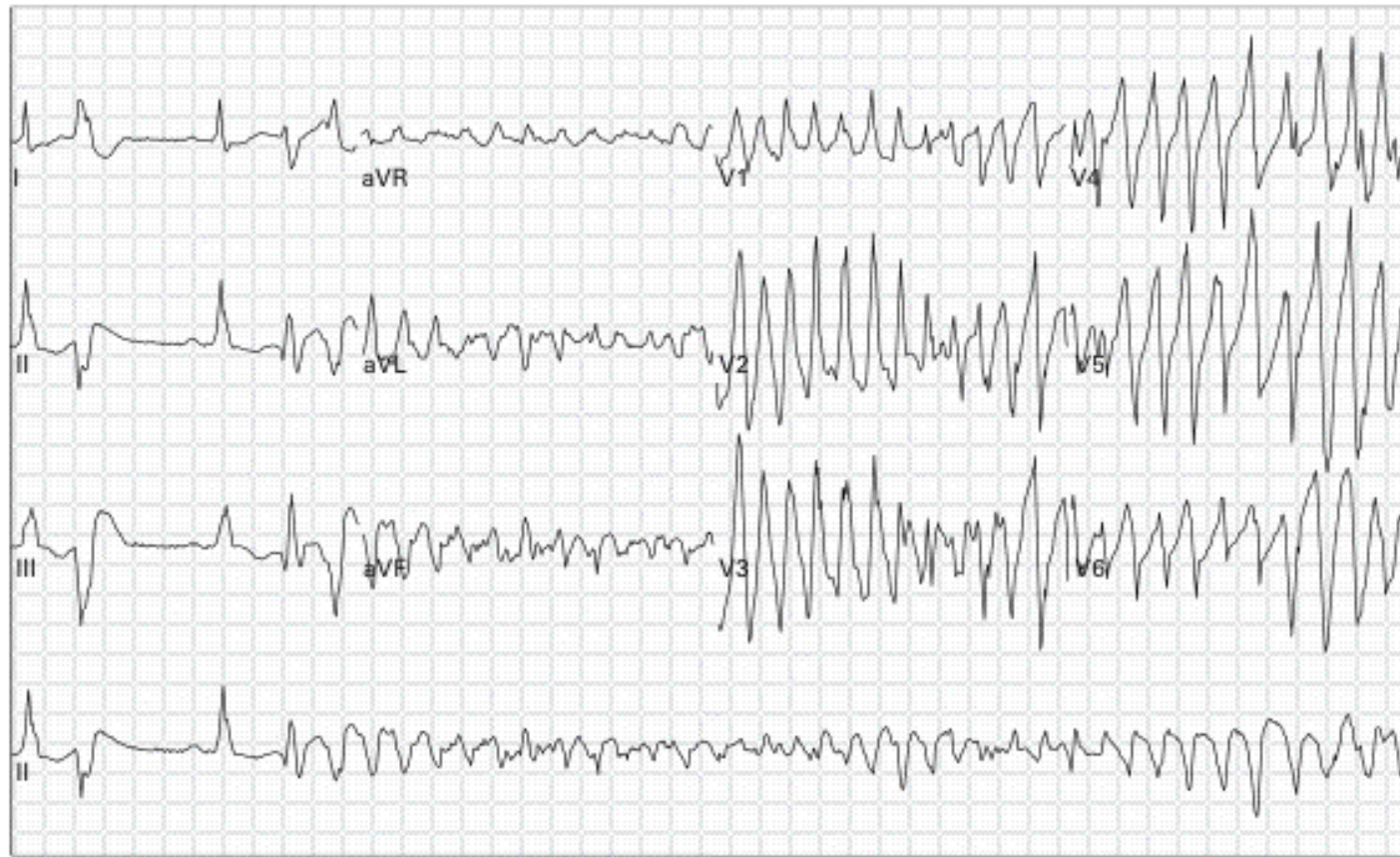


ECG

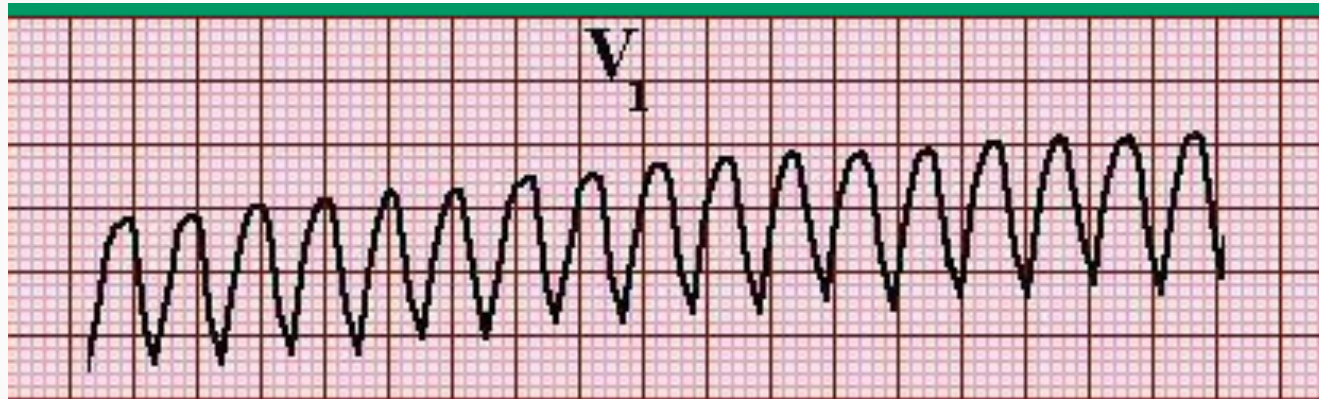
- This shows an example of recurrent nonsustained torsade de pointes that occurred several hours after the ECG was performed. With discontinuation of the erythromycin and aggressive repletion of the magnesium and potassium, no further torsade de pointes occurred and the patient's QT interval returned to normal.

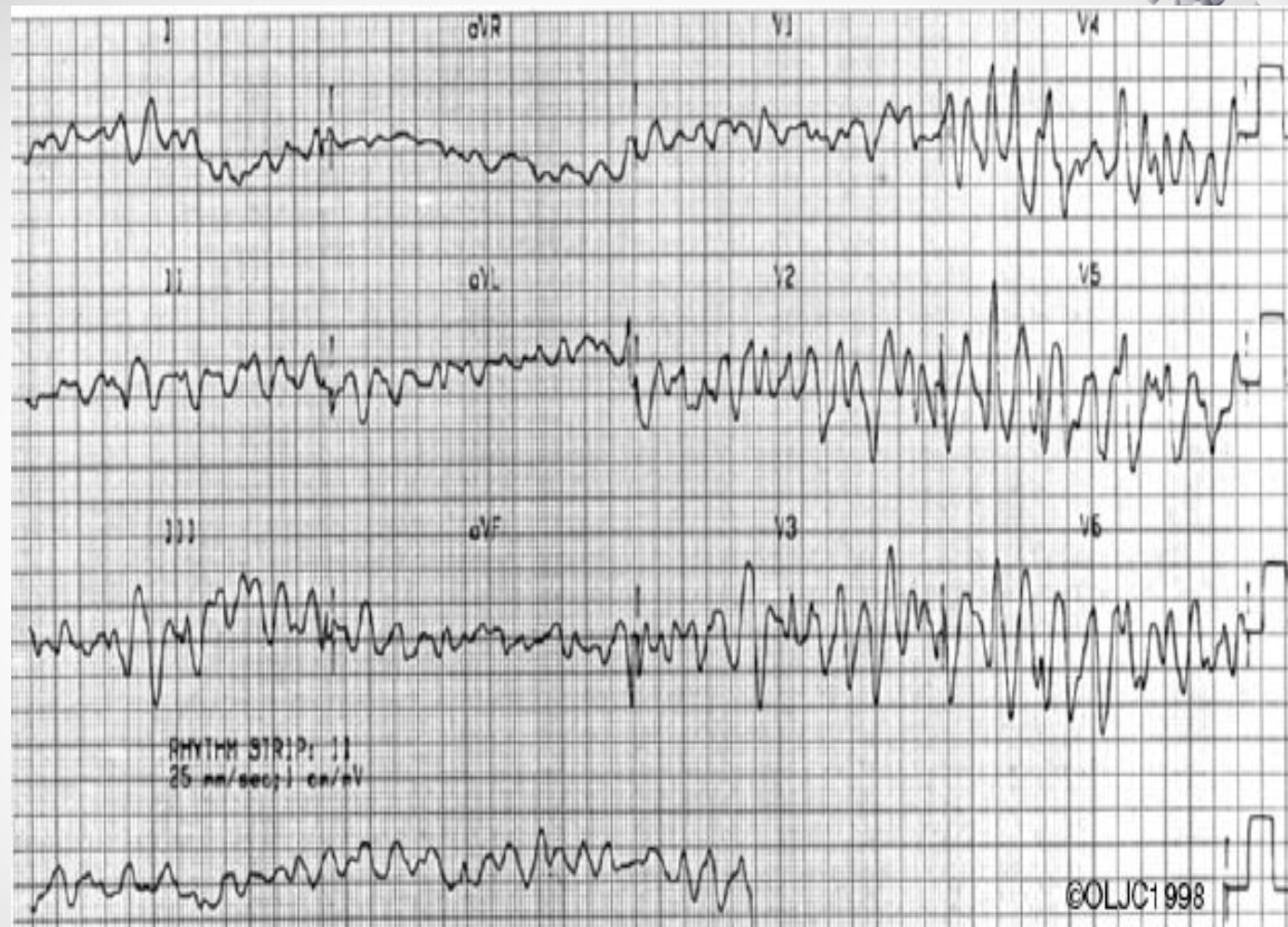


44 y M chronic alcoholic, unresponsive



Irregular WCT, varying QRS morphology (undulating) = Torsades de

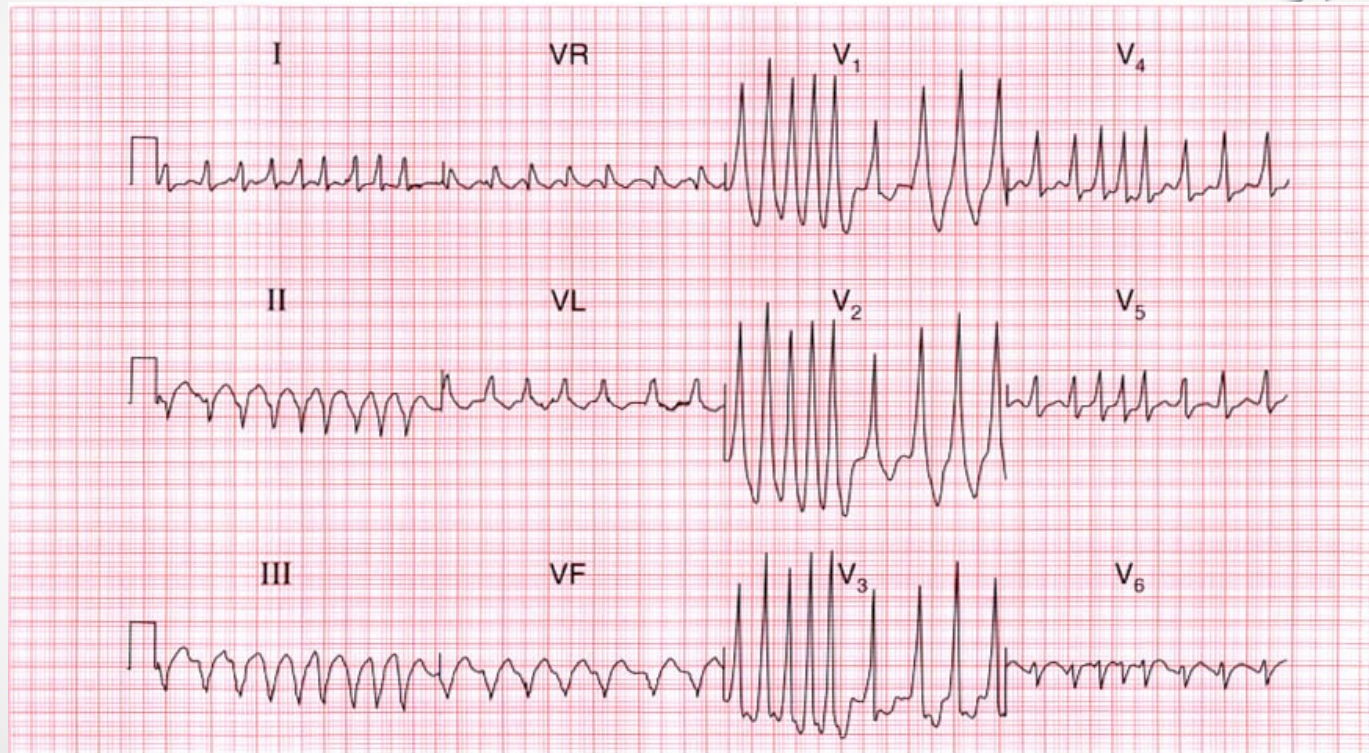




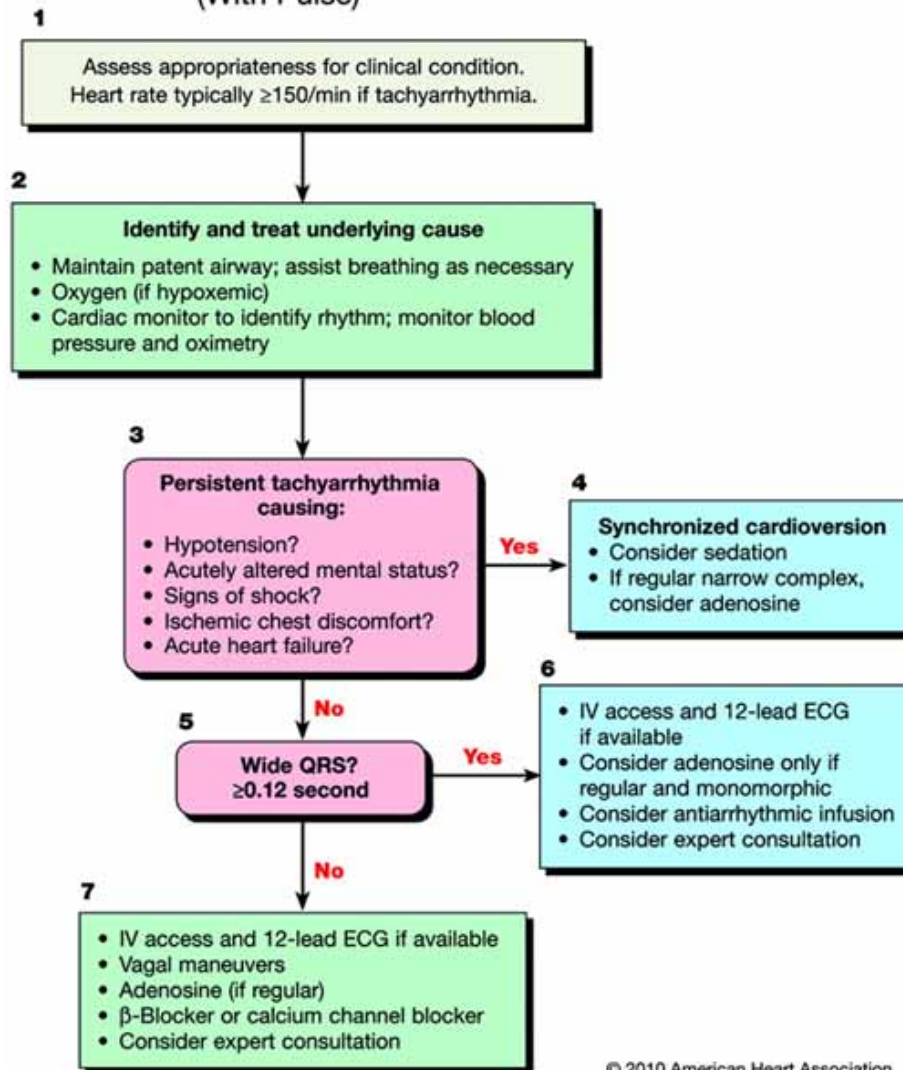
A 50-year-old man who had come to the ED department with chest pain, collapsed while his EGG was being recorded. What happened and what would you do?



A 25-year-old woman, who had had episodes of what sound like a paroxysmal tachycardia for 10 years, produced this ECG when seen during an attack. What is the rhythm, and what is the underlying problem?



Adult Tachycardia (With Pulse)



Doses/Details

Synchronized Cardioversion

Initial recommended doses:

- Narrow regular: 50-100 J
- Narrow irregular: 120-200 J biphasic or 200 J monophasic
- Wide regular: 100 J
- Wide irregular: defibrillation dose (NOT synchronized)

Adenosine IV Dose:

First dose: 6 mg rapid IV push; follow with NS flush.

Second dose: 12 mg if required.

Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia

Procainamide IV Dose:

20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases >50%, or maximum dose 17 mg/kg given.

Maintenance infusion: 1-4 mg/min.

Avoid if prolonged QT or CHF.

Amiodarone IV Dose:

First dose: 150 mg over 10 minutes.

Repeat as needed if VT recurs.

Follow by maintenance infusion of 1 mg/min for first 6 hours.

Sotalol IV Dose:

100 mg (1.5 mg/kg) over 5 minutes.

Avoid if prolonged QT.

