Cardiac arrhythmias and interpretation

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Introduction

Two main components of the heart:

The electrical system

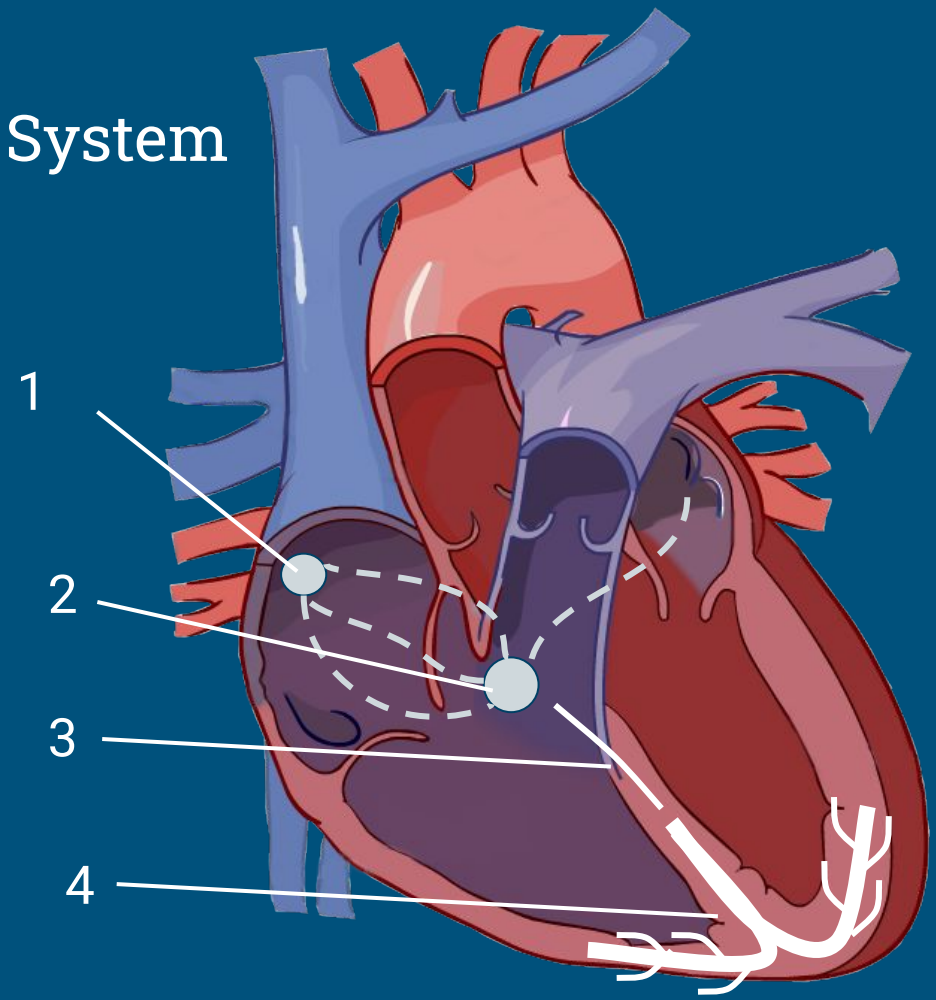
The electrical system (the cardiac pacemaker cells) is responsible for generating the impulse that signals the heart muscle to contract.

The plumbing system

Sending the oxygenated blood through the heart to the body

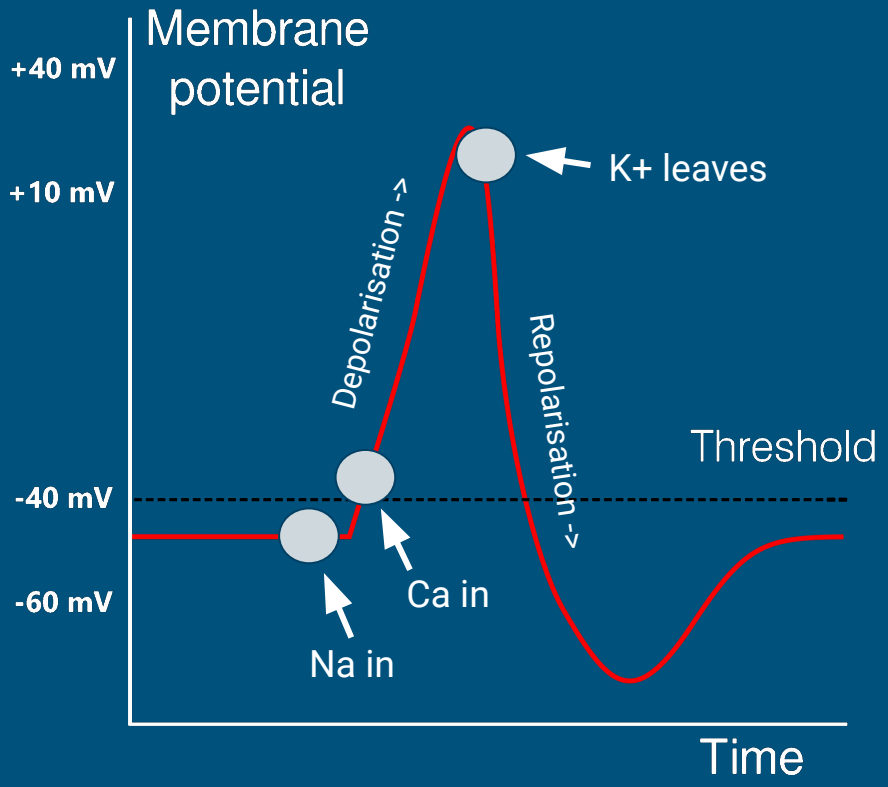
The Electrical Conduction System

1) Sino Atrial Node
2) Sino Ventricular Node
3) Bundle of His
4) Purkinje Fibers

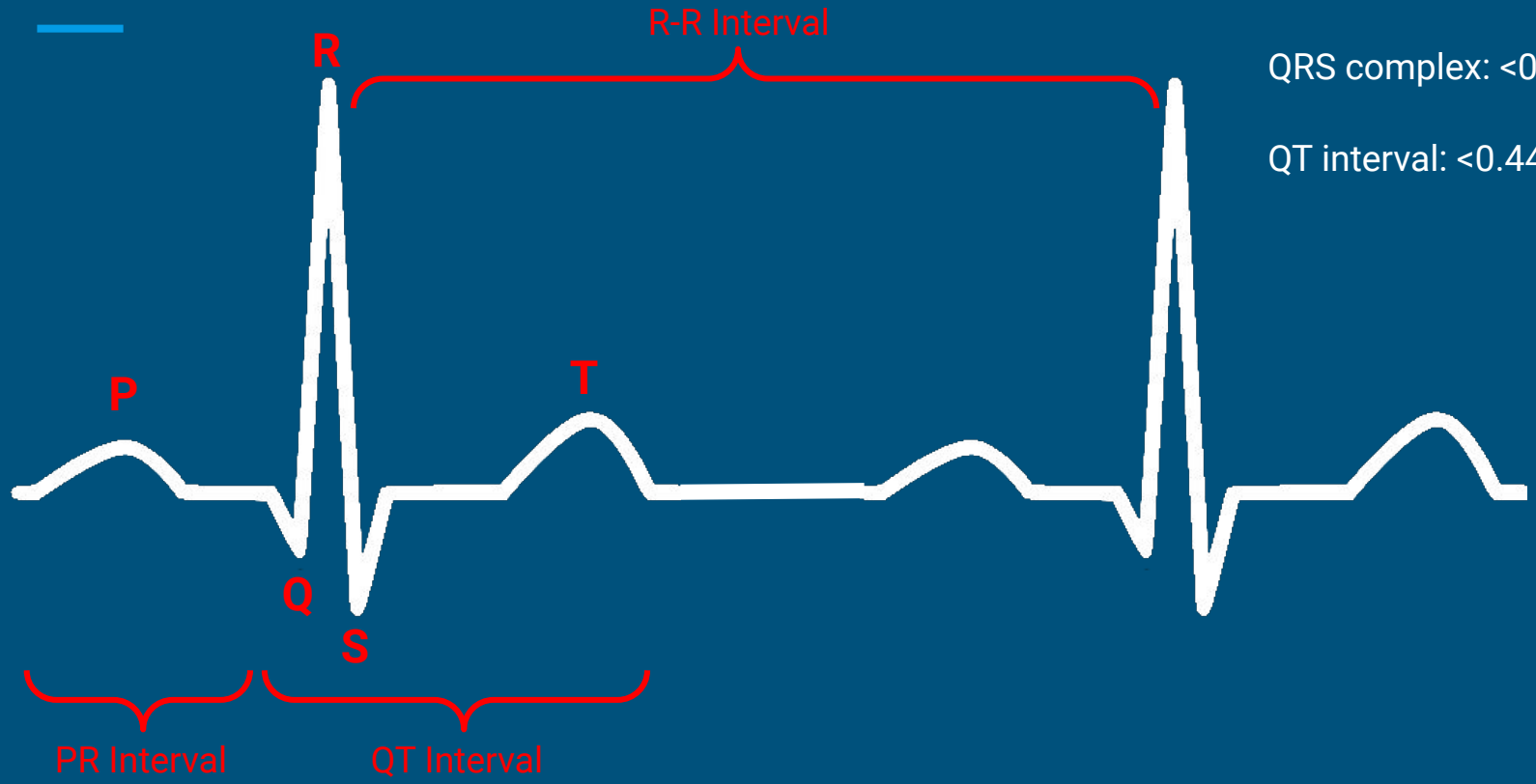


Action and Resting Potential

1) Sodium slowly starts to enter the cell
2) Calcium enters at the threshold
3) Potassium leaves the cell at the peak
4) This then causes the cell to repolarise



The Cardiac Cycle

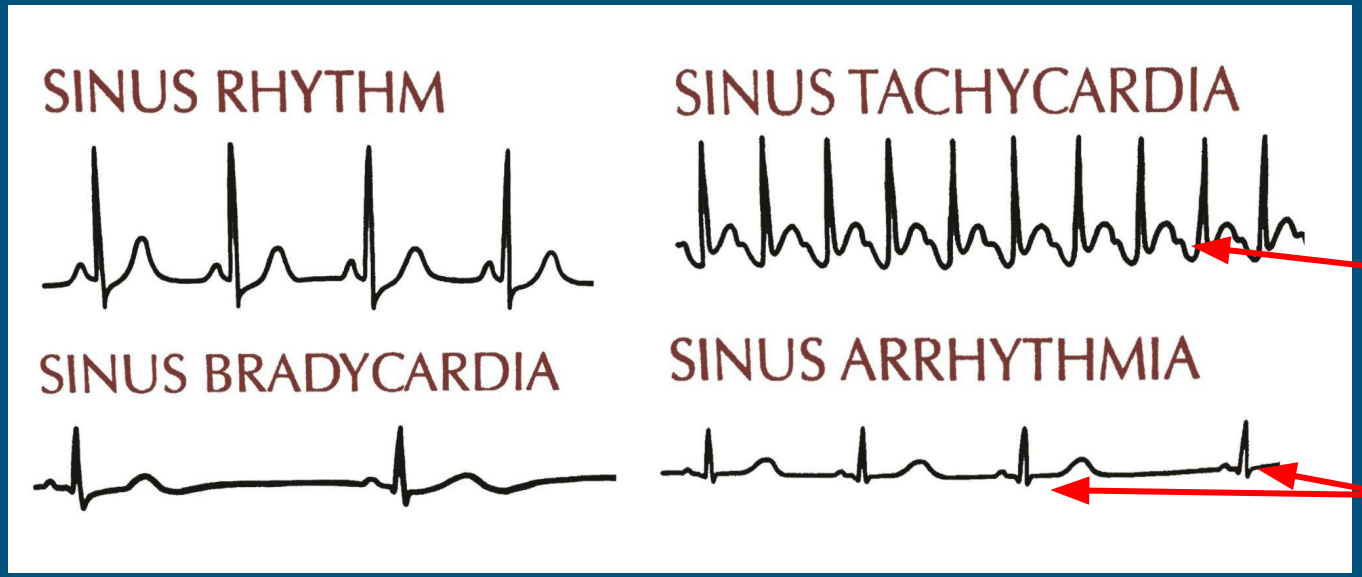


PR interval: 0.12-0.20 secs

QRS complex: <0.12 secs

QT interval: <0.440-0.460 secs

Rhythms and Arrhythmias of a Sinus Origin

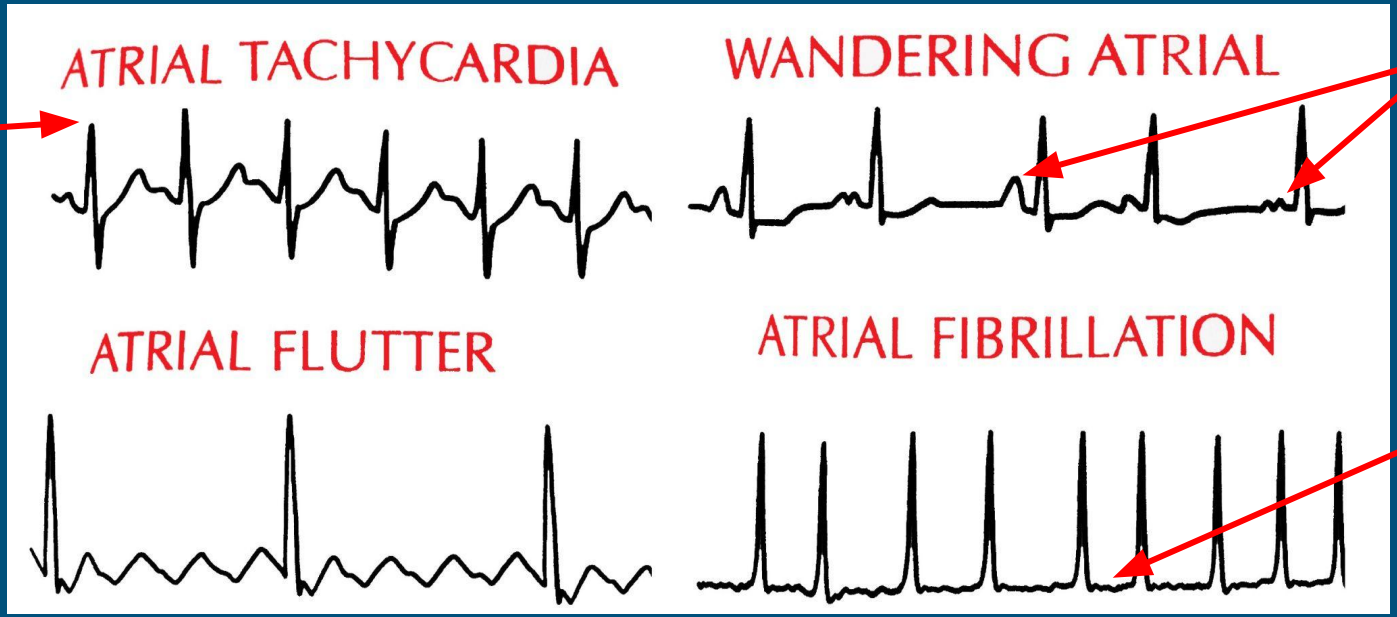


P wave buried in the T wave

P wave followed by QRS at irregular intervals

Arrhythmias of Atrial Origin

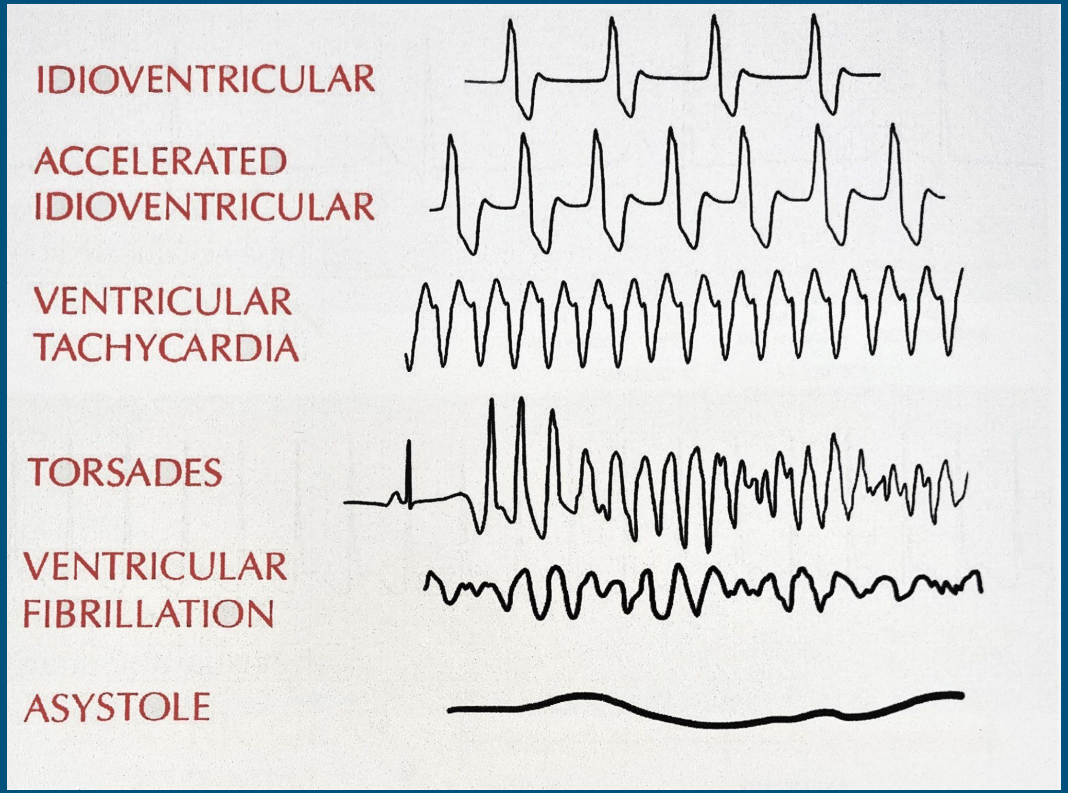
Very difficult to distinguish from Sinus tachycardia



Multiple sites in the atria discharging and effectively competing to be the natural pacemaker

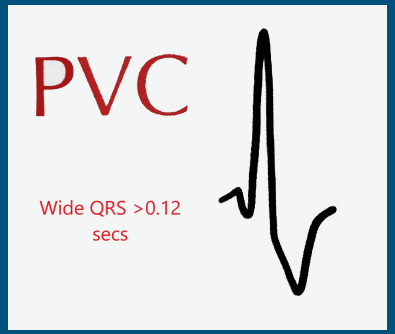
No discernable P waves, rhythm irregularly irregular

Arrhythmias of Ventricular Origin

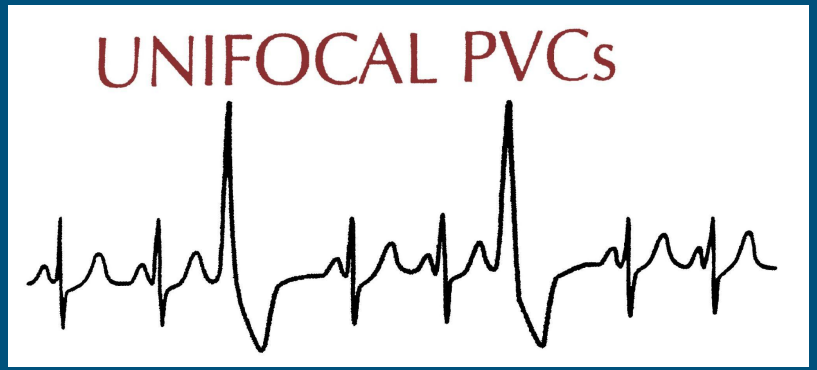


Premature Ventricular Contractions (PVC's)

- Arrives early
- Not preceded by P wave
- Early, wide and ugly!

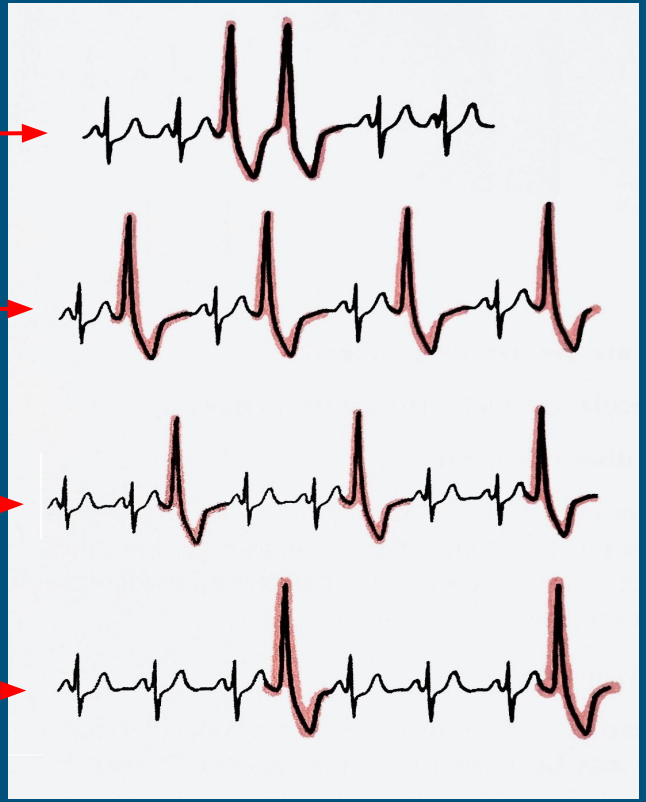


- Contractions are initiated elsewhere in the ventricles
- Uses gap junctions to travel through the cardiac contractile *and* conductive tissue.
- Thicker tissue = slower conduction



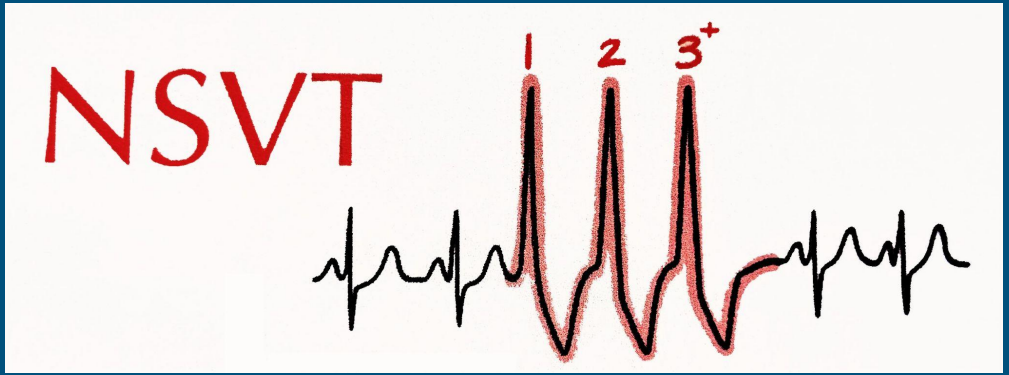
Ventricular Ectopic Groups and Patterns

- **Couplet -** two PVCs together before SR resumes
- **Bigeminy -** PVC every other SR beat
- **Trigeminy -** PVC after every second SR beat
- **Quadgeminy -** PVC after every third SR beat



Non-Sustained Ventricular Tachycardia

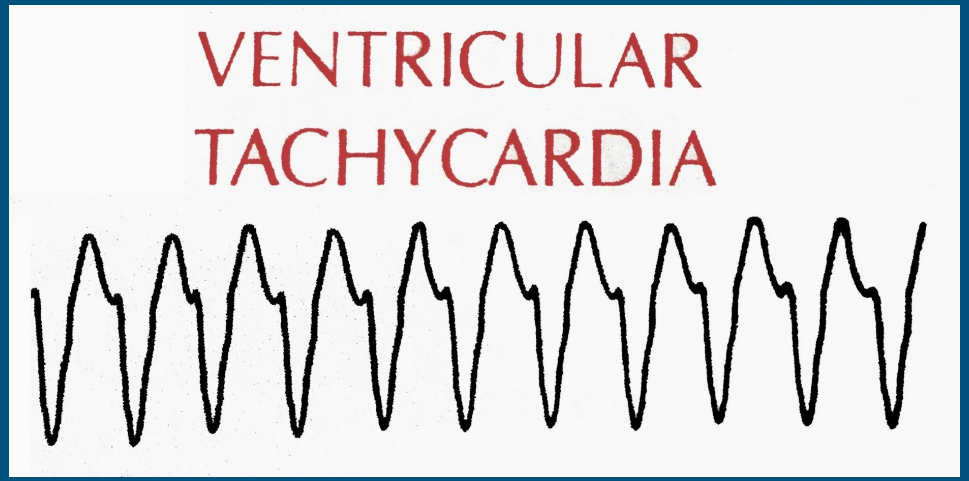
- PVC's that occur three or more in a row
- Lasting less than 30 secs in a row
- May represent ischemic changes **- unhappy heart!**



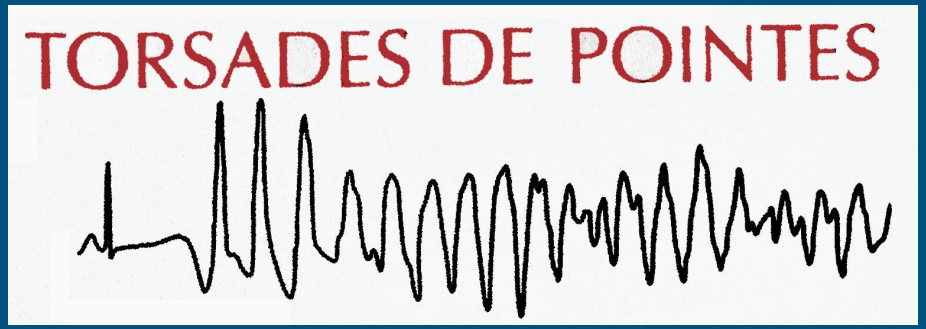
Assess the patient, take bloods and complete a 12 lead ECG

Ventricular Tachycardia

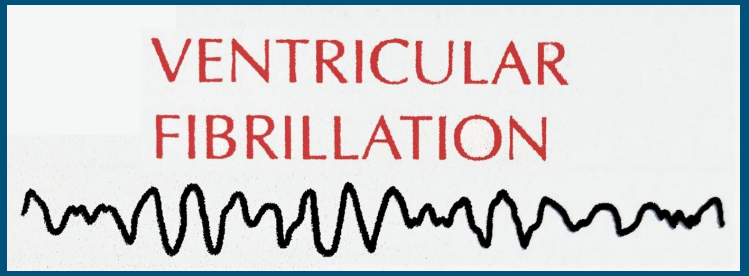
- Wide QRS
- Regular R-R interval
- No discernable P waves
- Rate > 100 bpm
- May produce a pulse (but for how long?)



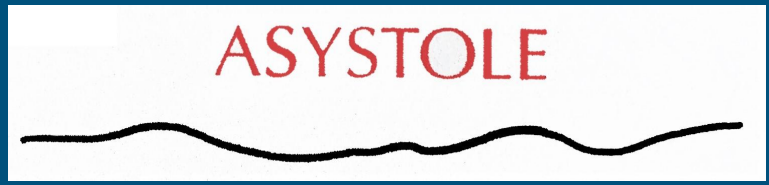
Torsades de pointes, VF and Asystole



- ‘Twisting of the points’ - bowtie appearance
- Multiple ventricular ectopic sites rotating around the axis of the heart
- Usually caused by low Mg and prolonged QT interval. Common in pregnant women.



- Chaotic rhythm, ventricles quivering.
- START CPR and SHOCK asap!



- Start CPR, administer drugs according to local ACLS guidelines
- Try to identify reversible causes

Reversible Causes - The H's and T's

Hypovolemia

Hypoxia

H+ ion (Acidosis)

Hypo/Hyperkalemia

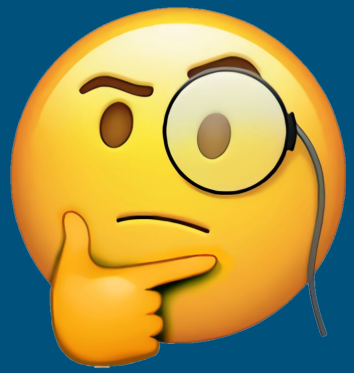
Hypothermia

Tension Pneumothorax

Tamponade

Toxins

Thrombosis



Thanks for listening!

Further information and references:

Scanlon, T. (2022) **Basic Cardiac Rhythms** - **The Visual Nurses Guide**. The Visual Nurse, Las Vegas.

Khan, G. (2015) **A new electrode placement method for obtaining 12 lead ECG's.** Open heart**.,** 2 (1) pp. 9-10.

Instagram Accounts

@thevisualnurse - provides daily quizzes on interpreting ECG rhythms

@cardiovisual - useful resource for cardiac procedures