Cardiovascular Physiology

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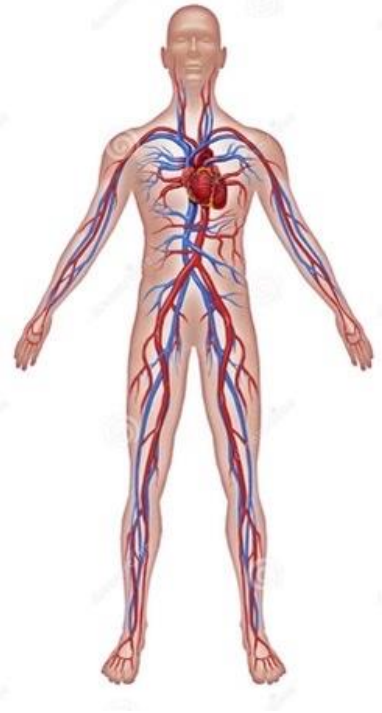
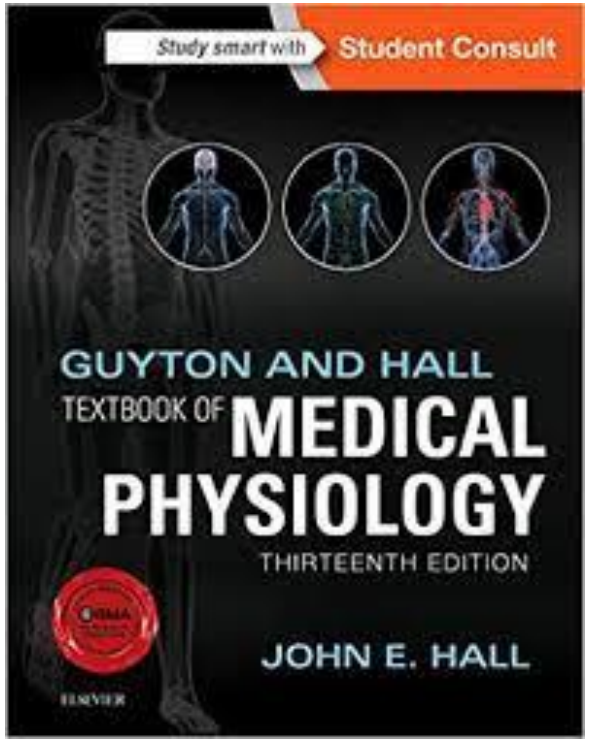
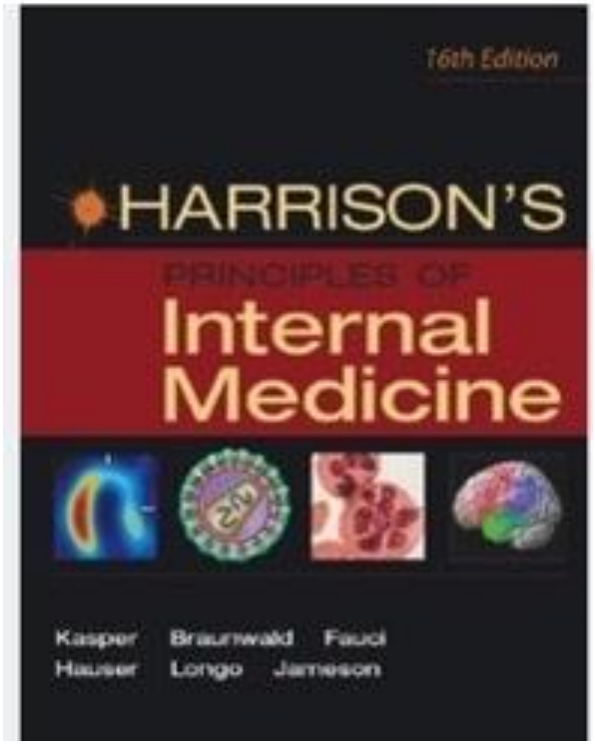


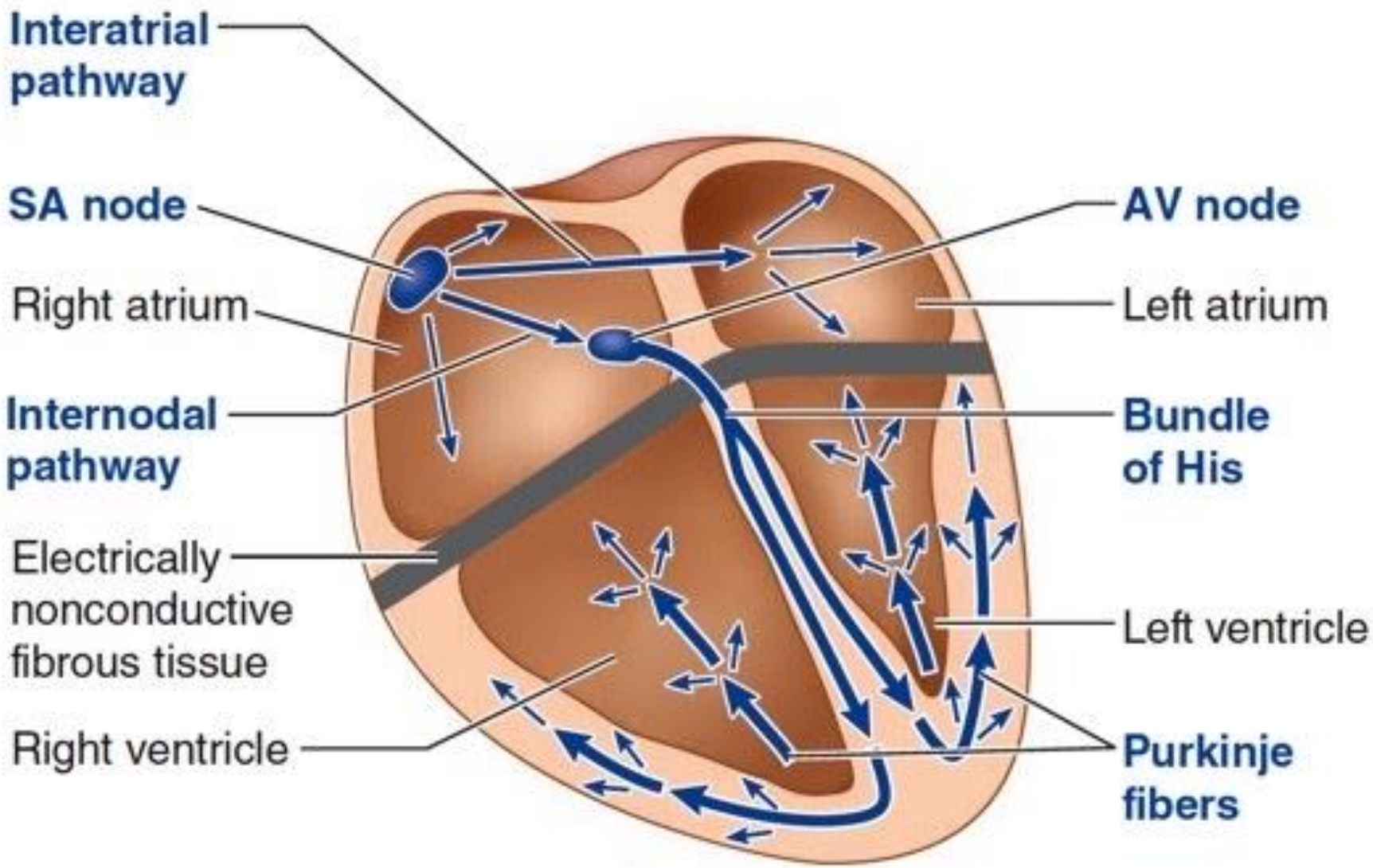
References





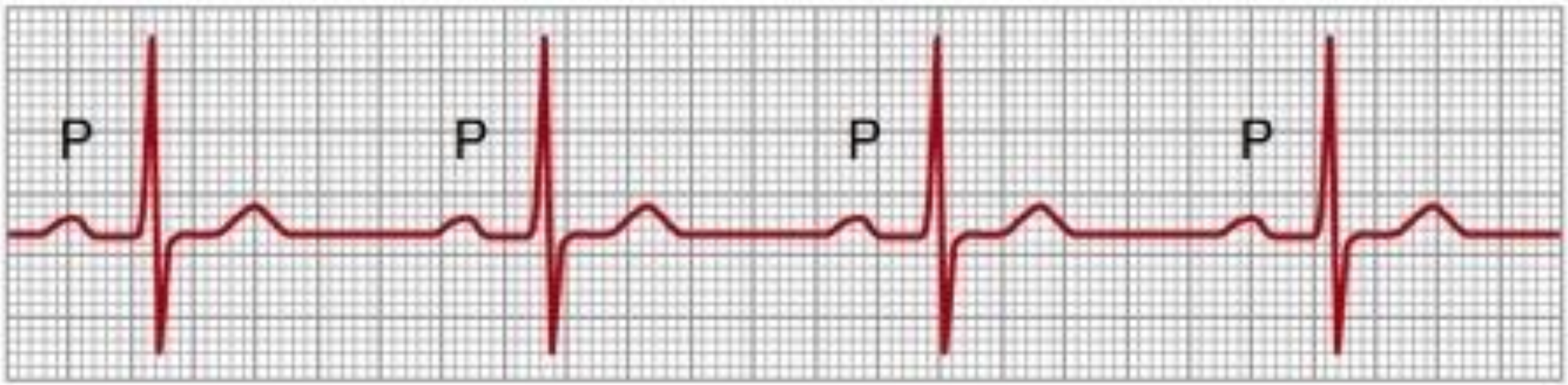
Ecgpedia.org

Cardiac Arrhythmias 2


Interatrial pathway
SA node
Right atrium
Internodal pathway
Electrically nonconductive fibrous tissue
Right ventricle
AV node
Left atrium
Bundle of His
Left ventricle
Purkinje fibers

First degree AV block

- Incomplete heart block.
- Prolonged P-R interval : > 0.20 s.
- It is a delay of conduction from the atria to the ventricles but not actual blockage of conduction.


P
P
P
P

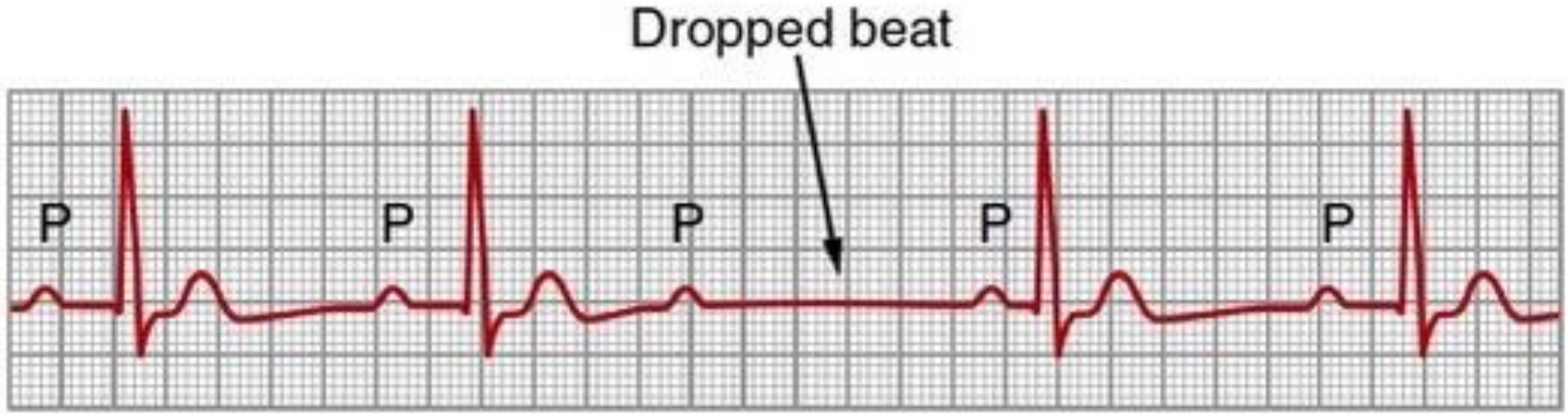
Second degree AV block

- When some atrial impulses fail to conduct to the ventricles, that is called dropped beats (P wave but no QRS-T).

- There are 2 types of second degree AV block.: Mobitz type I and Mobitz type II.

Type I Second Degree AV Block

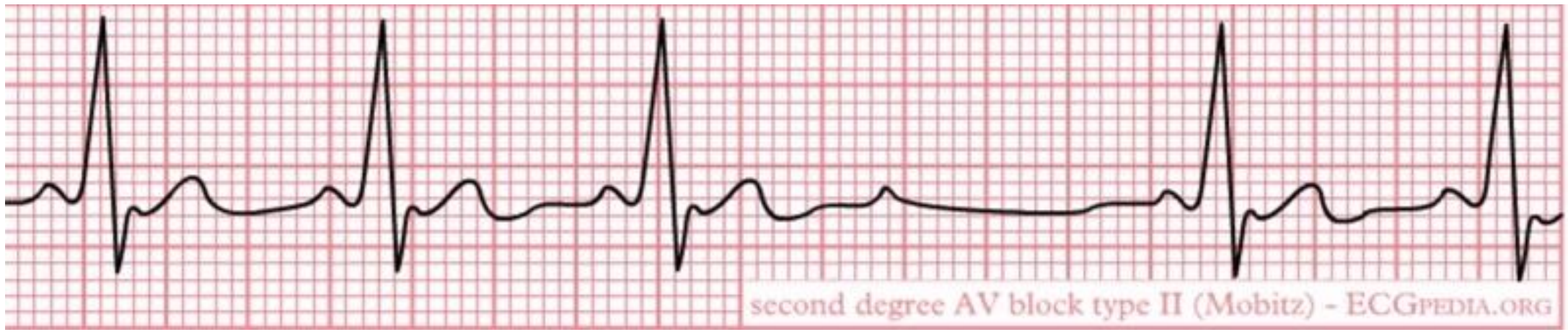
- Mobitz type I (also known as Wenckebach periodicity).
- Progressive prolongation of the P-R interval until a ventricular beat is dropped and is then followed by resetting of the P-R interval and repeating of the abnormal cycle.
- In most cases, this type of block is benign, and no specific treatment is needed.


Dropped beat
P
P
P
P
P

Type II Second Degree AV Block

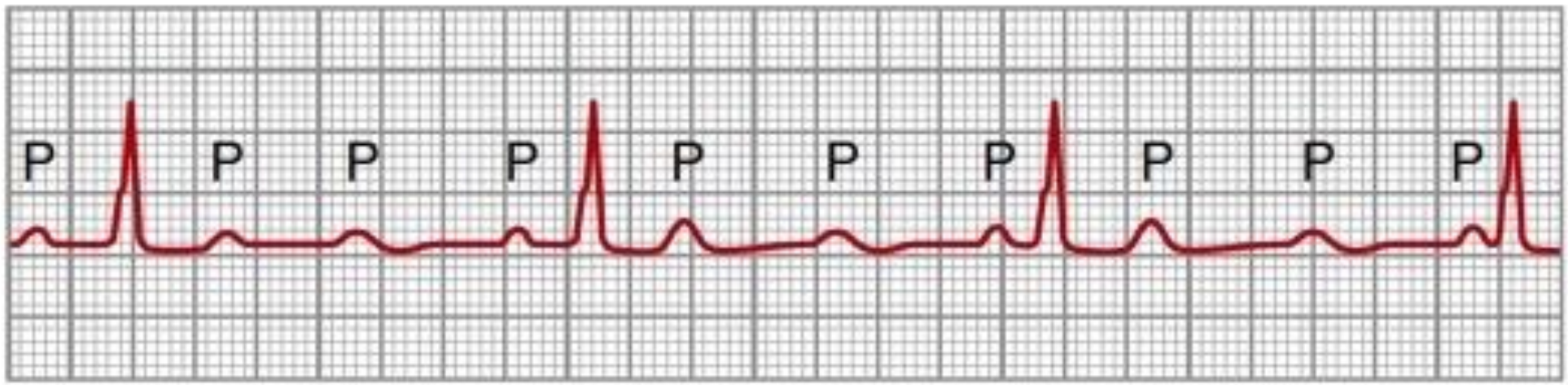
- In contrast to type I block, with type II block the P-R interval does not change before the dropped beat; it remains fixed, then the drop happens suddenly.

- It is generally caused by an abnormality of the bundle of His–Purkinje system and may require implantation of a pacemaker to prevent progression to complete heart block and cardiac arrest.


second degree AV block type II (Mobitz) - ECGPEDIA.ORG

Third Degree Block

- Complete AV block.
- P wave is dissociated from QRS complex.
- the ventricles may escape from control by the atria and start beating at their own rate, controlled most often by signals generated distal to the A-V node or A-V bundle where the block occurs.


P
P
P
P
P
P
P
P
P
P

Stokes Adam’s Syndrome

- Each time AV conduction ceases, the ventricles often do not start their own beating until after a delay of 5 to 30 seconds.

- This delay results from the phenomenon called overdrive suppression.

Stokes Adam’s Syndrome

- Overdrive suppression means that ventricular excitability is at first suppressed because the ventricles have been driven by the atria at a rate greater than their natural rate of rhythm.

- However, after a few seconds, some part of the Purkinje system beyond the block, usually in the distal part of the AV node beyond the blocked point in the node, or in the AV bundle, begins discharging rhythmically at a rate of 15 to 40 times/min, acting as the pacemaker of the ventricles.

Stokes Adam’s Syndrome

- Because the brain cannot remain active for more than 4 to 7 seconds without blood supply, most people faint a few seconds after complete block occurs because the heart does not pump any blood for 5 to 30 seconds, until the ventricles “escape.”

- After escape, however, the slowly beating ventricles (less than 40 beats/min) usually pump enough blood to allow rapid recovery from the faint and then to sustain the person.

- Pacemaker implantation.

Wolff-Parkinson-White Syndrome

- Ventricular preexcitation associated with AV bypass tracts.
- Atrial-like muscle strands may occur almost anywhere around the AV rings.
- Paroxysmal tachycardia.
- Associated with congenital abnormalities.
- May develop A fib with rapid ventricular response.

Ventricular tachycardia (VT)

- Heart rate >100, wide QRS, may see changes in QRS morphology.

- Sustained ventricular contractions >30 s

Premature ventricular contraction (PVC)

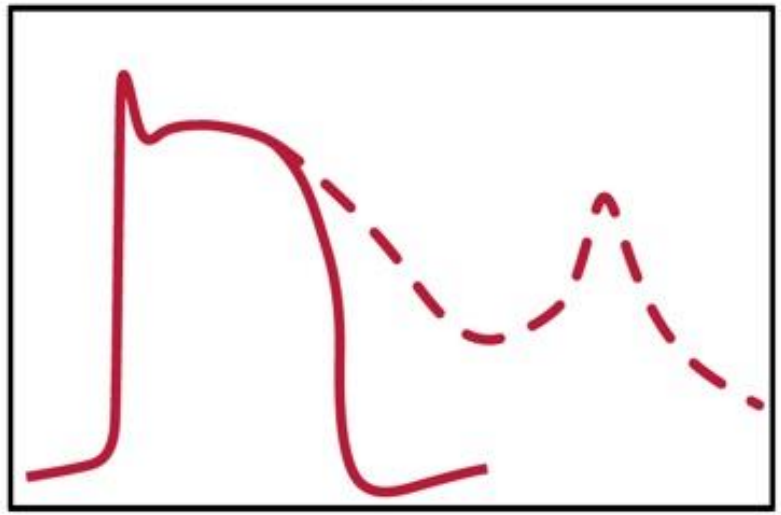
- Very common.
- Series of PVCs alternating with normal contractions in a pattern.
- Usually benign induced by lack of sleep, smoking, caffeine, emotional stress. So if there is no structural abnormality no need to treat.


II
III

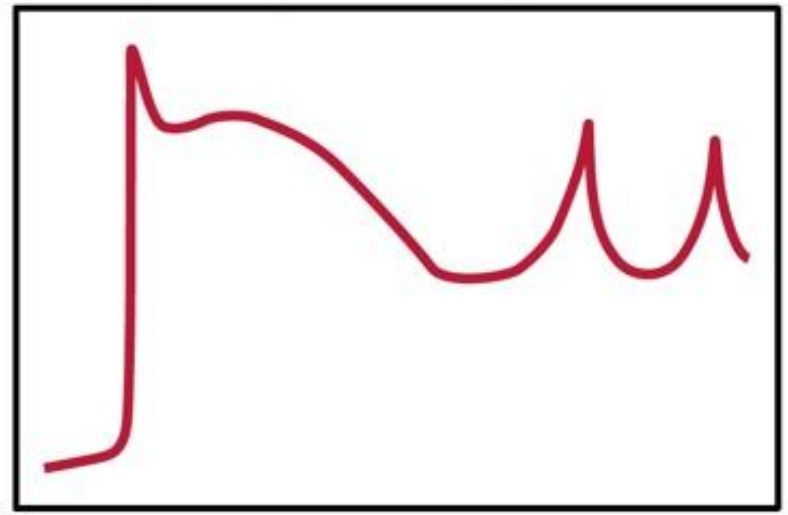
Torsades de pointes

- VT with polymorphic QRS complexes that change in amplitude and cycle length, giving the appearance of oscillation around a baseline.
- associated with QT prolongation, which may be congenital or induced by medications.
- ECG: polymorphic VT preceded by prolonged QT.
- May develop VF

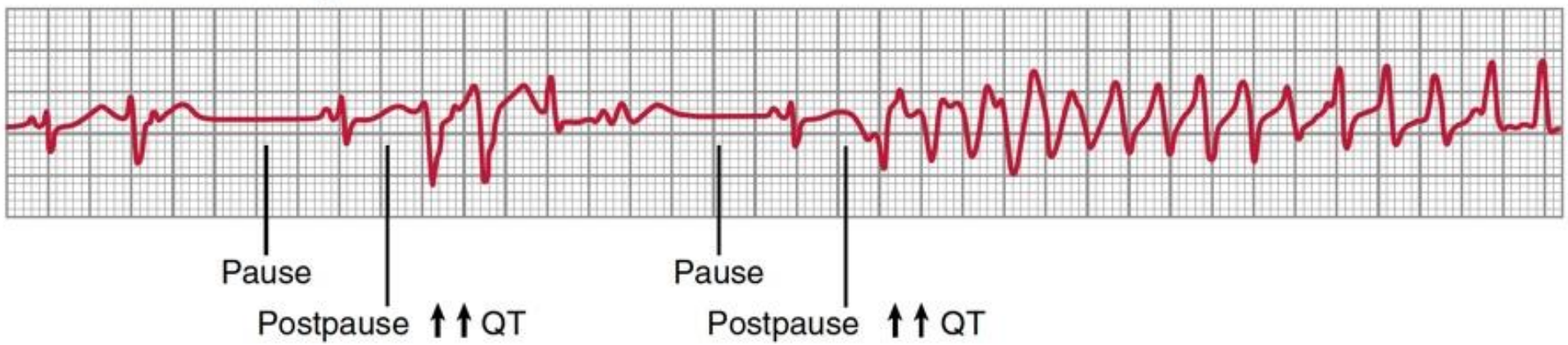
Premature depolarization



Repetitive premature depolarization



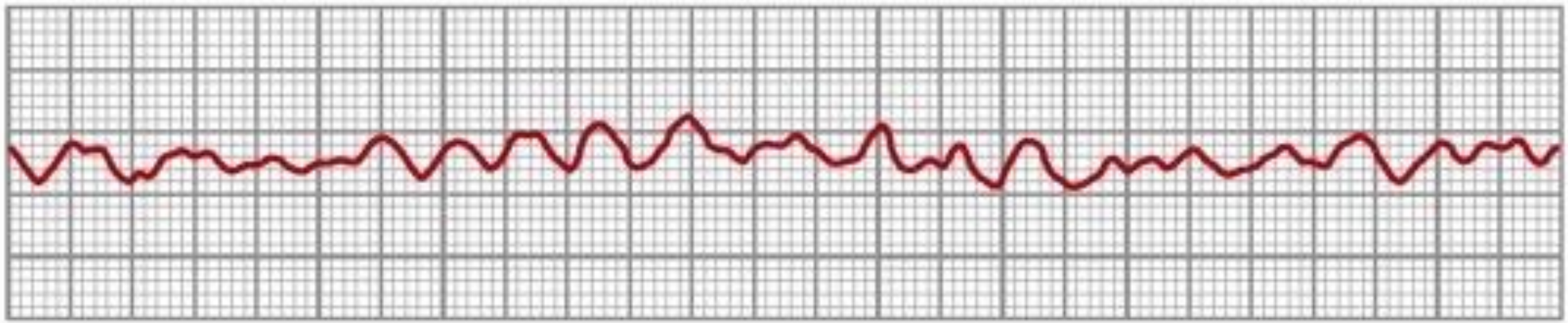
Torsades de pointes

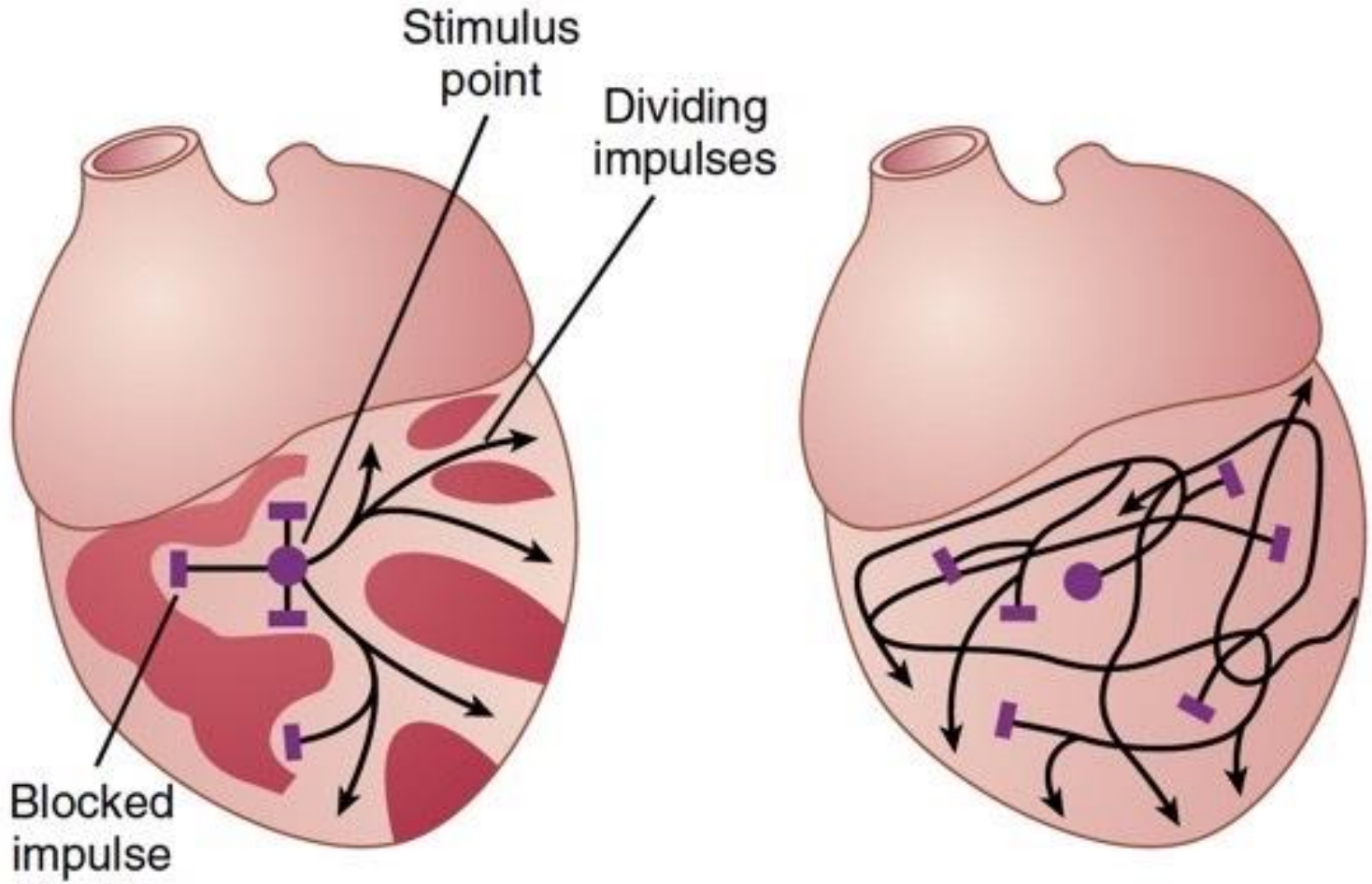


Ventricular fibrillation

- The most serious of all cardiac arrhythmias is ventricular fibrillation, which, if not stopped within 1 to 3 minutes, is almost invariably fatal.

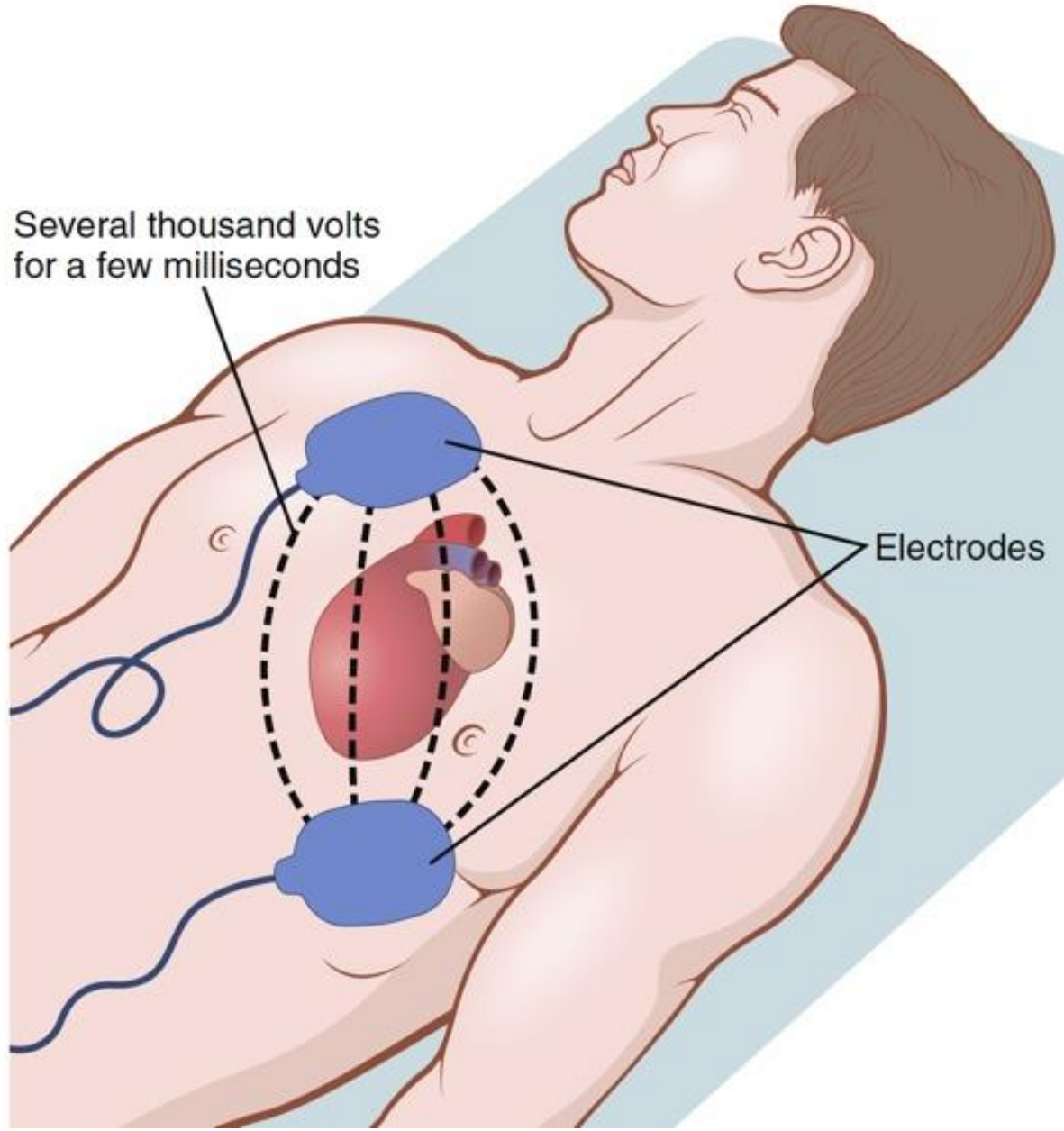
- there is never a coordinated contraction of all the ventricular muscle at once, which is required for a pumping cycle of the heart.




Stimulus point
Dividing impulses
Blocked impulse

Ventricular fibrillation

- After fibrillation begins, unconsciousness occurs within 4 to 5 seconds because of lack of blood flow to the brain, and irretrievable death of tissues begins to occur throughout the body within a few minutes.


Several thousand volts
for a few milliseconds
Electrodes

Cardiac arrest

- cessation of all electrical control signals in the heart. That is, no spontaneous rhythm remains.

Thank you