

‘it’s the Rhythm of my show’ Quick update rhythm analysis

Ian Naldrett – Associate lecturer UWL, Associate
Director of nursing north Middlesex university hospital
BACCN Chair elect



6 Steps to Rhythm strip success

- 1 Electrical Activity
- 2 QRS Rhythm
- 3 QRS Rate
- 4 QRS Duration
- 5 Atrial Activity
- 6 Atrio-ventricular relationship

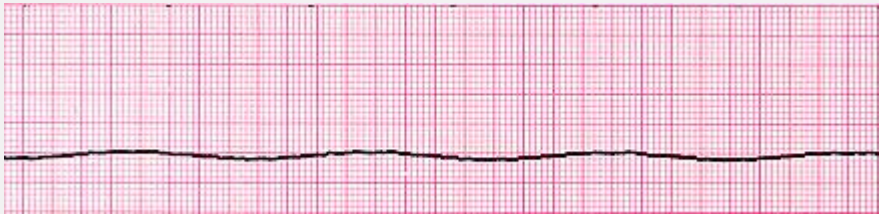


Resuscitation council UK (2020) Advanced Life
Support London:RCUK



Electrical Activity ?

- Firstly – Check the patient ABCDE
Check leads are attached
Check gain and ECG size
Asystole is rarely a straight line



QRS Rhythm

2

- Is the QRS regular or irregular (Map out R waves)
- Is there any cyclical pattern emerging
- Are there any pauses – remember pauses of over 3 seconds represents a risk of Asystole



What rate is running at?

3

- Rate= 300/ divided the number of large square in between two R

QRS complex represents depolarisation of ventricles

Normal – 60-100

Bradycardia - <60

Tachycardia - >100



Calculating QRS rate

- **To calculate a regular rhythm:** to go by R interval. If it is 1 big box (0.2 secs) then the rate is $60/0.2 = 300$ bpm. The rest of the sequence would be as follows.
 - 1 big box = 300 beats/min (duration = 0.2 sec)
 - 2 big boxes = 150 beats/min (duration = 0.4 sec)
 - 3 big boxes = 100 beats/min (duration = 0.6 sec)
 - 4 big boxes = 75 beats/min (duration = 0.8 sec)
 - 5 big boxes = 60 beats/min (duration = 1.0 sec)
- **To calculate an irregular rhythm:** Count the number of QRS Complexes on one ECG strip (10 sec) and then multiply by 6



Another way to calculate the rate

- Count 30 big squares on the Rhythm strip, now count how many R you have within that window and multiply by 10 = rate



QRS Duration

- Is the QRS Wide or Narrow ?
- Normally the QRS is less than 0.12 seconds or 3 small squares – Narrow complex
- Abnormal QRS longer than 0.12 sec is Broad complex



QRS and Conduction pathway

- Narrow complex QRS follow the specialised conduction pathways of the heart
- Broad Complex QRS is where the impulse is from ectopic focus or fails to take the normal route.



Conduction pathways

Standard pathway – (SA node - AV node – Bundle of His – Left/Right Bundle Branches and Perkinje Fibres.)

Non standard pathway



Motorway

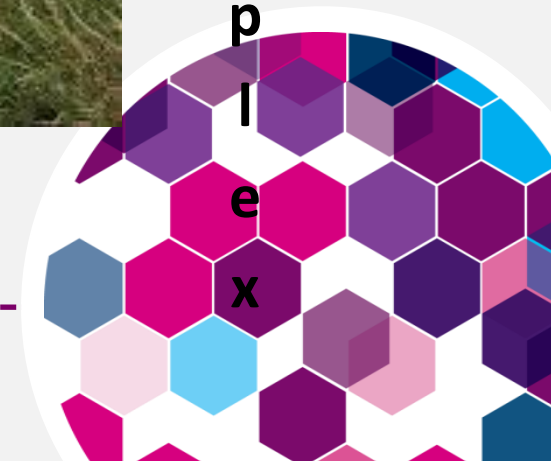


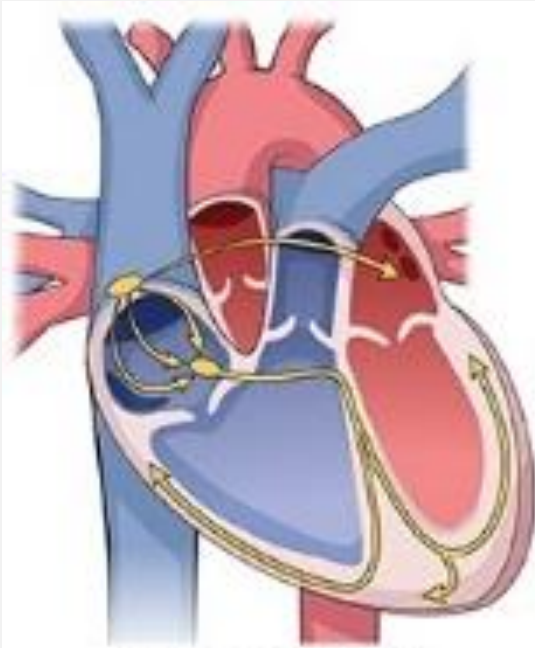
Country Road

Vs

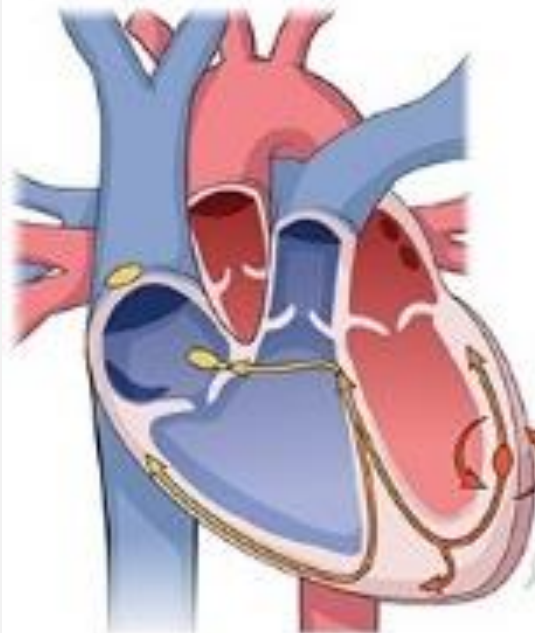
N
a
r
r
o
w
c
o
m
p
l
e
x

B
r
o
a
d
c
o
m
p
l
e
x

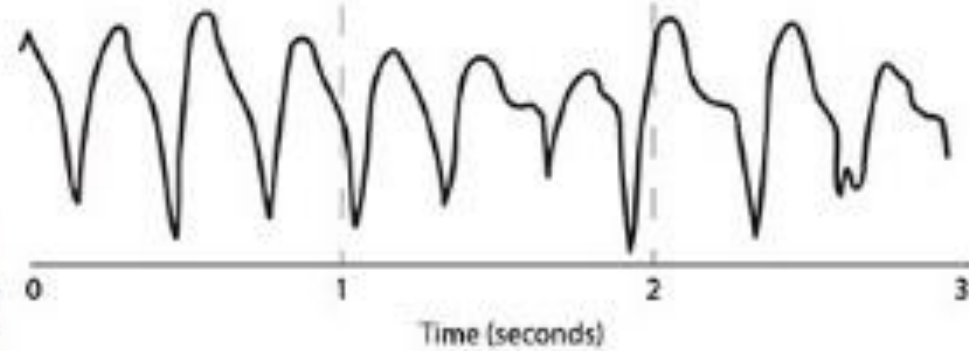




Normal heart rhythm



Ventricular tachycardia



Atrial Activity

5

- Are there P waves present ?
- Do they look normal or abnormal ?
- Are they the same shape ?
- Irregular or regular
- Atrial Flutter waves – Saw tooth, around 300 per minute.



Atrio-ventricular relationship

6

- Is it Normal?
- PR interval
- Is there a QRS for every P wave
- Is there 1:1 conduction
- What is the atrial rate



6 Steps to Rhythm strip success

- 1 Electrical Activity
- 2 QRS Rhythm
- 3 QRS Rate
- 4 QRS Duration
- 5 Atrial Activity
- 6 Atrio-ventricular relationship



Resuscitation council UK (2015) Advanced Life
Support London:RCUK



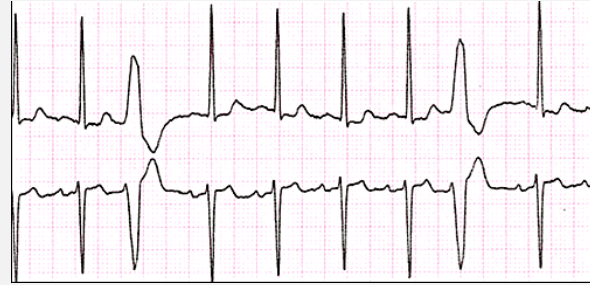
Extrasystoles/Ectopic Beats

- Atrial ectopic – R-R interval is irregular, originates in atria outside SA node premature P wave is followed by QRS
- Ventricular Ectopic (PVC)- an ectopic impulse that originates in the ventricles below the bundle of His.



Ventricular ectopic beat Types (PVC)

- Unifocal



- Multifocal



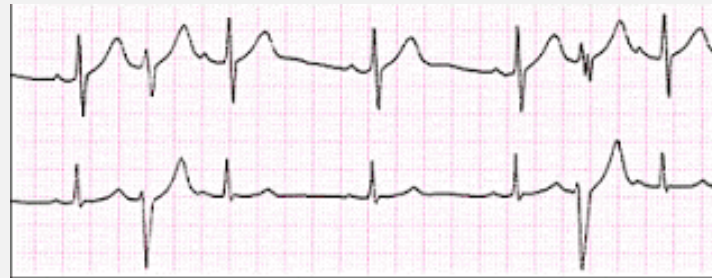
- Couplets – 2 PVC



- Salvo – 3 PVC +

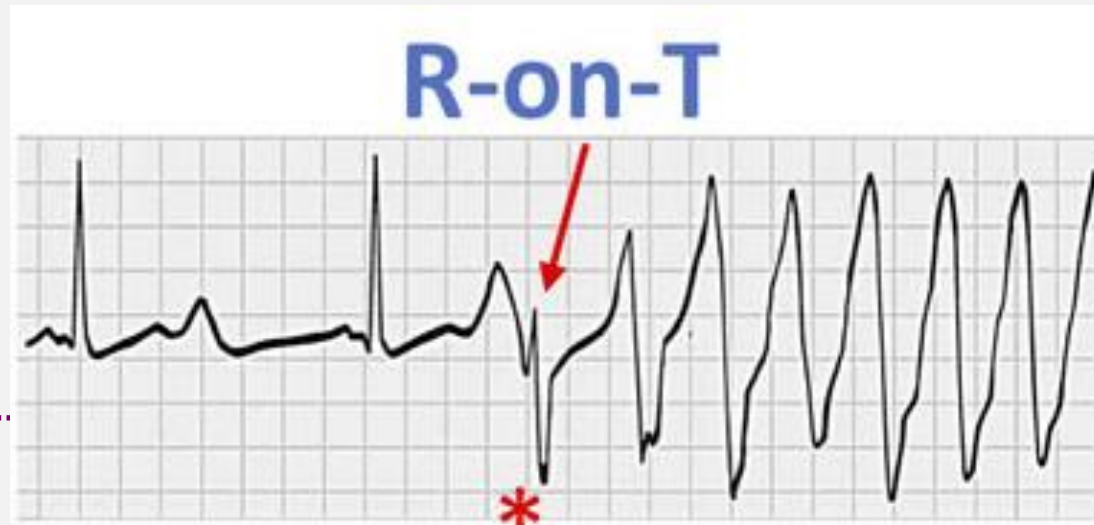


- Interpolated –
Pause or no Pause



Variants of Ventricular ectopic

- R on T phenomenon – this is when a ventricular ectopic complex occurs on or near the Peak or a previous wave. This is a vulnerable period during ventricular repolarisation – this pre-disposes the patient to VF/VT



Variants of Ventricular ectopic

- Bigeminy – Unifocal Ectopic beat alternates with a normal heart beat in a repeating pattern, every other beat is ectopic.
- Trigeminy - Unifocal Ectopic beat alternates with 2 normal heart beats in a repeating pattern, every 2 beats is ectopic.



Common Rhythms - Sinus Rhythm

- This rhythm follows the correct conduction pathway, there are P waves present in a 1:1 conduction to a narrow QRS complex. The PR interval is normal and there is no Ectopic activity

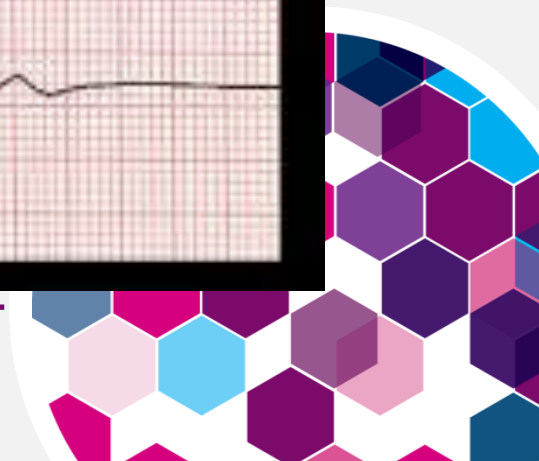


Sinus Bradycardia

- A Sinus rhythm that's slower than 60 beats per minute.

Causes – Fitness, Vagal stimulation, Noradrenaline (Reflex Bradycardia),

Drugs - Dexmedetomidine/Clonidine, Digoxin, Amiodarone.



Sinus Tachycardia

- A sinus rhythm that's faster than 100 beats per minute.

Causes – Hypovolaemia, Sepsis, Haemorrhage, Hyperthermia,

Drugs - Atropine, Adrenaline, Dobutamine, Dopamine etc.

Treatment can include – Fluid resuscitation, Blood transfusion (if haemorrhage) Titration of chronotropy



Atrial Fibrillation

- A supraventricular arrhythmia characterized by multiple atrial ectopic foci, uncoordinated atrial contraction and an irregular ventricular rate.
- Characteristics – No P waves, irregular wavy baseline, narrow complex QRS unless damaged AV conduction system



Atrial Fibrillation 2

- Causes of Atrial Fibrillation –
High blood pressure, MI, Coronary artery disease, Abnormal heart valves, post cardiac surgery,, hyperthyroidism,
- Possible contributory factors –
Hypovolaemia, ETOH(Alcohol).



Atrial Fibrillation 3

Treatments for Atrial Fibrillation –

Direct Current Cardio Version (DCCV)

Drug therapy – Flecanide, Amiodarone, Digoxin

Anticoagulation

ECHO – Identify causes and rule out Atrial Thrombus.

NICE Guidelines 2014 – Management of Acute Atrial Fibrillation

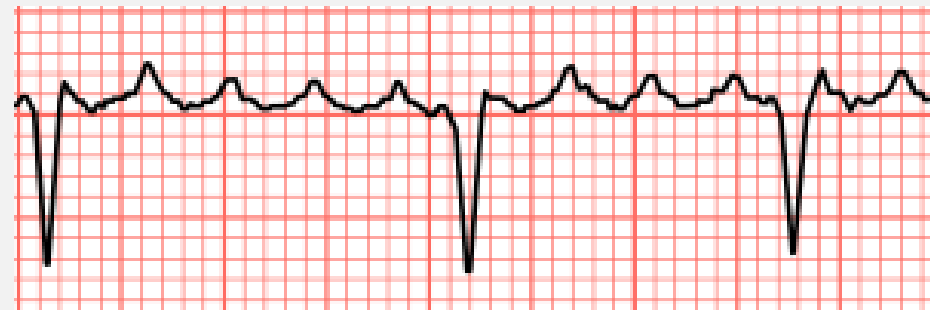


Atrial Flutter

- A supraventricular arrhythmia characterised by saw tooth flutter P waves

Atrial activity is then filtered through the AV node and a block develops leading to a ratio effect, 1:2, 1:4 etc.

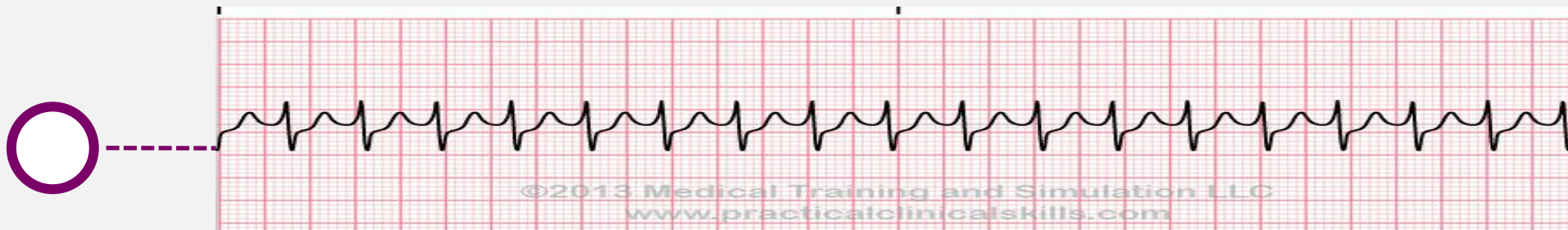
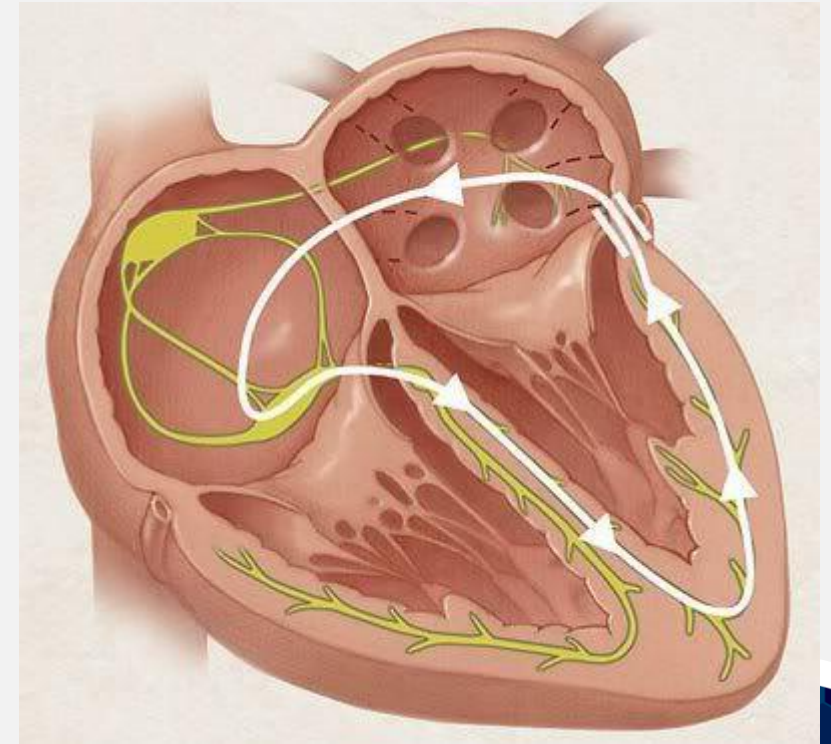
Treatment – DCCV +/- Antiarrhythmic



Supraventricular Tachycardia – PSVT

- SVT is a tachyarrhythmia originating above the bundle of his. Can be the result of a re-entry pathway.

Treatment – Vagal manoeuvres, DCCV, Calcium channel blockers



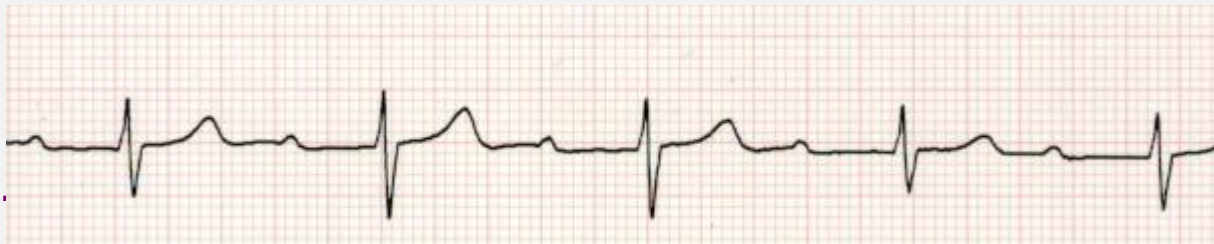
1st Degree Heart block

- A rhythm that appears to be Sinus rhythm with a prolonged PR interval

Causes – AV nodal disease, increased vagal tone (athletes) Hypokalemia, Lyme disease.

Drugs – Cardiac glycosides, Beta blockers.

Treatment not usually necessary.



2nd Degree AV Block Mobitz Type 1 Wenckebach

- A rhythm with progressive lengthening of the PR interval until a blocked P wave occurs. Cyclical in nature, set number of P waves and QRS complexes.

Causes – AV node disorder

Treatment – Not usually required

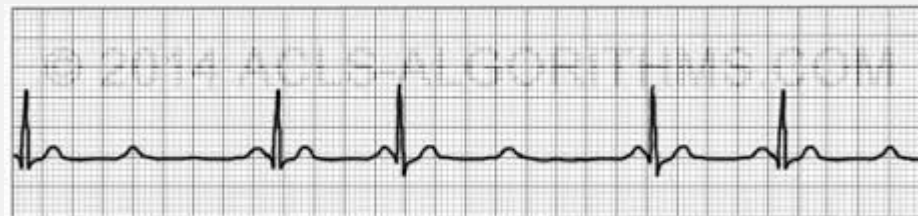


2nd Degree AV Block Mobitz Type II

- Similar to Type I – difference being no prolongation in PR interval and random missed beats not being conducted

Causes – Purkinje Fibre or Bundle of His disease

Treatment – Significant risk of deterioration to 3rd degree AV block with no escape rhythm – leading to Cardiac Arrest. Treated with implantable Pacemaker



3rd Degree AV Block – Complete Heart block

- Characterised by Complete Disassociation between P waves and QRS complex – no conduction between Atria or Ventricles. Escape rhythm potentially keeps patient alive – but is unreliable and may cease at any time.
- **This is a medical emergency**



P Wave Asystole

- 3rd Degree AV block can degrade to P wave asystole also known as ventricular standstill.

This is where no conduction is happening between Atria and ventricles and there is no ventricular escape rhythm.

This is a cardiac arrest rhythm

Treatment – CPR and Emergency Pacing



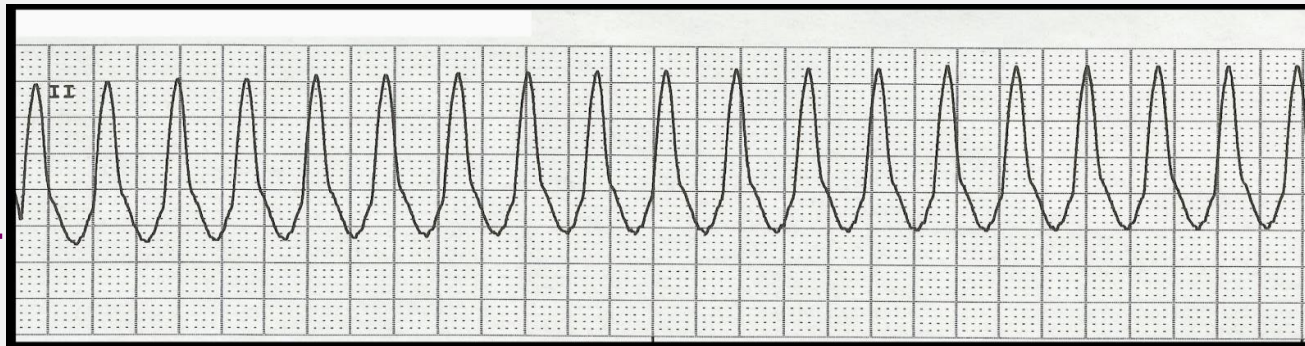
Ventricular Tachycardia – VT

- Regular Broad complex tachycardia with no visible atrial activity – ventricular origin ectopic focus

Patient may or may not have a pulse.

This is a medical emergency

Treatment – dependant on patient condition.

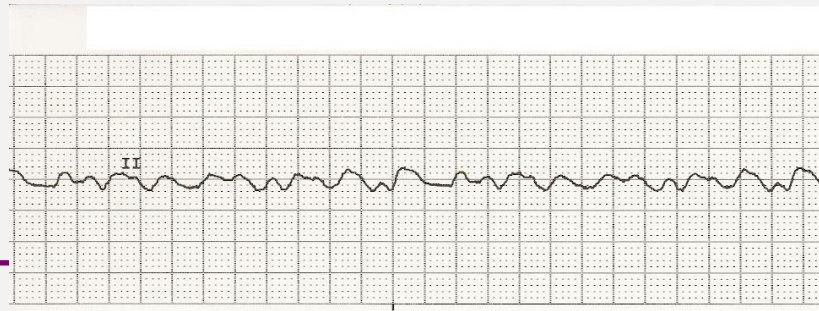
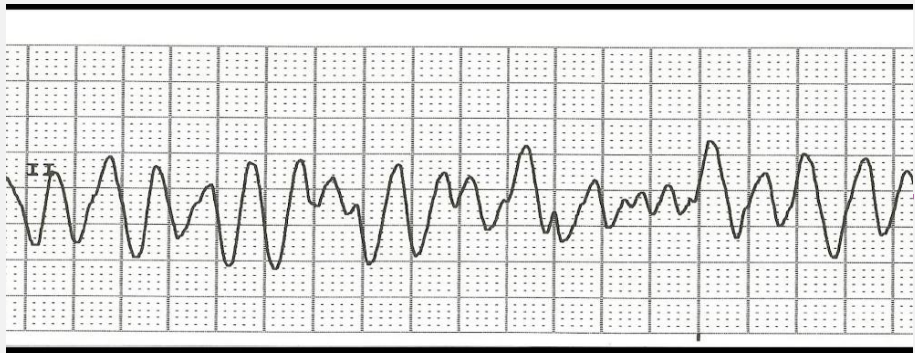


Ventricular Fibrillation – VF

- Irregular electrical activity of the ventricles, no P waves visible, often known as ‘bag of worms effect’
- Patient will have no cardiac output

This is a Cardiac arrest rhythm

Treatment – CPR and Early Defibrillation



Torsades De pointes – Polymorphic VT

- As with Ventricular tachycardia organised broad complex QRS, no P waves with an alternating big-small complex.

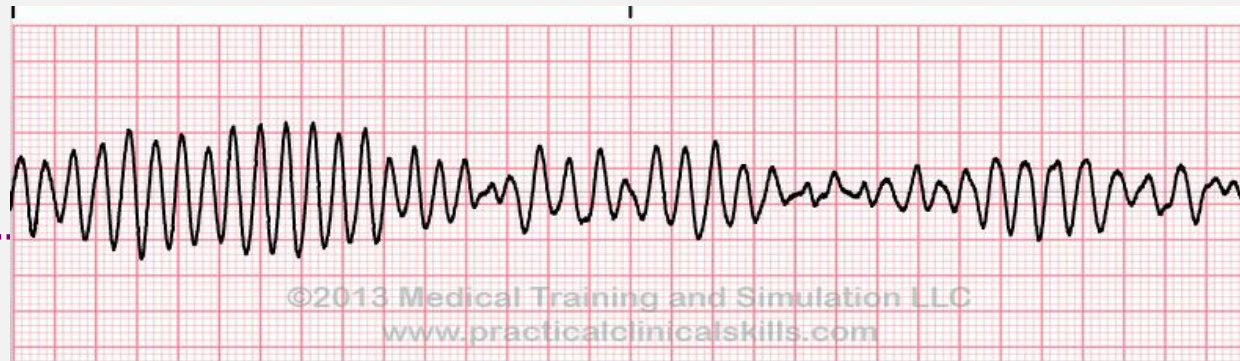
Caused by Long QT syndrome, low $MgSO_4$ and K^+

Treatment – Dependant on patient condition

(can be in cardiac arrest)

Magnesium rapid infusion +/- antiarrhythmic +/-

Defibrillation



Lets play

Can I have a volunteer



6 Steps to Rhythm strip success

- 1 Electrical Activity
- 2 QRS Rhythm
- 3 QRS Rate
- 4 QRS Duration
- 5 Atrial Activity
- 6 Atrio-ventricular relationship



Resuscitation council UK (2020) Advanced Life
Support London:RCUK



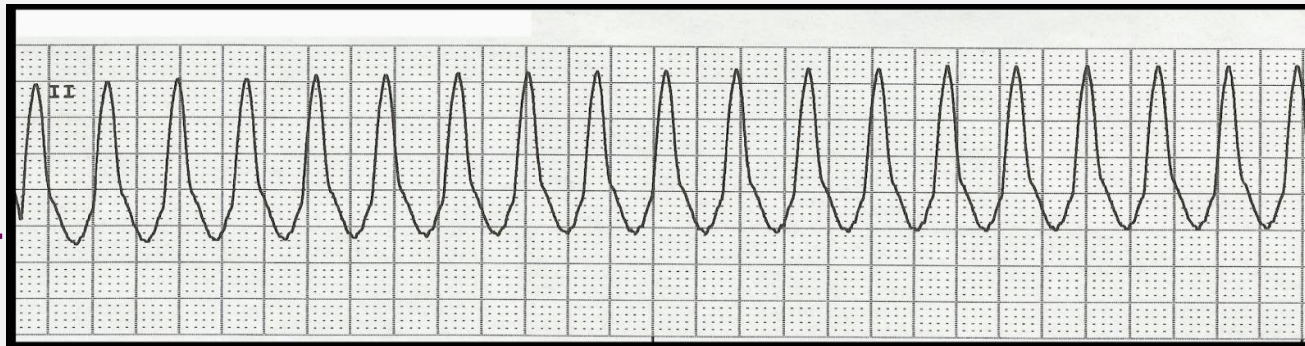
Ventricular Tachycardia – VT

- Regular Broad complex tachycardia with no visible atrial activity – ventricular origin ectopic focus

Patient may or may not have a pulse.

This is a medical emergency

Treatment – dependant on patient condition.



3rd Degree AV Block – Complete Heart block

- Characterised by Complete Disassociation between P waves and QRS complex – no conduction between Atria or Ventricles. Escape rhythm potentially keeps patient alive – but is unreliable and may cease at any time.
- **This is a medical emergency**



Sinus Bradycardia

- A Sinus rhythm that's slower than 60 beats per minute.

Causes – Fitness, Vagal stimulation, Noradrenaline (Reflex Bradycardia),

Drugs - Dexmedetomidine/Clonidine, Digoxin, Amiodarone.

