

# MEDICAL THERAPY FOR VENTRICULAR TACHYCARDIA

DR BOMA OYAN

# VENTRICULAR TACHYCARDIA

- ▶ VT refers to a rhythm >120bpm arising distal to the bundle of His
- ▶ Classified as
  - ▶ sustained or non sustained
  - ▶ Monomorphic or polymorphic
- ▶ **AETIOLOGY**
  - ▶ Structural heart disease (myocardial damage/scar) \*IHD, CMP, ARVC
  - ▶ Inherited channelopathies (long QT, Brugada,
  - ▶ Normal heart VT

## TRIGGERS

- ▶ Electrolyte deficiencies (K, Ca, Mg), inc K
- ▶ Illicit drugs cocaine, methamphetamines
- ▶ Drugs that prolong QT interval
- ▶ Drugs that slow conduction velocity (halothane)
- ▶ Digoxin toxicity
- ▶ Other arrhythmias eg AF
- ▶ Exercise

## CLINICAL FEATURES

- ▶ The underlying disorder eg MI
- ▶ Asymptomatic
- ▶ Syncope, palpitations, dyspnoea, chest pain, anxiety
- ▶ Tachypnoea, tachycardia, hypotension, reduced LOC,
- ▶ Raised JVP, cannon waves, variation in intensity of S1
- ▶ Sudden death

## DIAGNOSIS

- ▶ ECG: rhythm strip, 12 lead
- ▶ Electrolytes: K, Ca, Mg, Phosphate
- ▶ Toxicology for therapeutic (digoxin) or recreational (cocaine, methadone)
- ▶ Troponin I, T
- ▶ Echo, coronary angiography
- ▶ Electrophysiologic study (EPS): electrode catheters in the ventricles
- ▶ Other ECG: May include 24hour Holter, loop recorders, exercise/pharmacologic stress tests

# MANAGEMENT

## DETERMINE STABILITY OF THE PATIENT

Sustained VT can lead to haemodynamic collapse, so there is need for urgent conversion to SR

- ▶ AIM OF TREATMENT
  - ▶ RESTORE SINUS RHYTHM
  - ▶ PREVENT REOCCURENCE
  
- ▶ STRATEGY FOR CONVERSION TO SINUS RHYTHM DEPENDS ON THE HAEMODYNAMIC STATUS
  - ▶ UNSTABLE
  - ▶ STABLE
  
- ▶ Treat underlying cause, precipitating factor (MI, HF, electrolytes)

# RESTORE SINUS RHYTHM

- ▶ HAEMODYNAMICALLY UNSTABLE : Urgent conversion to SR
  - ▶ Direct current cardioversion (DCC)
- ▶ HAEMODYNAMICALLY STABLE
  - ▶ IV Amiodarone
  - ▶ IV Lidocaine
  - ▶ IV Procainamide
  - ▶ IV Sotalol
  - ▶ IV Magnesium sulphate (torsade de pointes)
  - ▶ DCC if medical therapy fails to convert to SR
- ▶ Pulseless VT: Defibrillation, ACLS protocol

## CHOICE OF MEDICATION DEPENDS ON

- MORPHOLOGY (Monomorphic or polymorphic)
- LEFT VENTRICULAR FUNCTION (normal or abnormal)

### ▶ **MONOMORPHIC, NORMAL LV FUNCTION**

- ▶ IV Procainamide, Amiodarone, Sotalol

### ▶ **MONOMORPHIC, IMPAIRED LV FUNCTION**

- ▶ IV Amiodarone, Lidocaine

### ▶ **POLYMORPHIC VT**

- ▶ IV Procainamide, Amiodarone, Sotalol with normal LV function
- ▶ IV Amiodarone, Lidocaine with impaired LV function
- ▶ Prolonged QT with tdp: IV Magnesium sulphate, Isoproterenol, Phenytoin, Lidocaine.  
\*(Amiodarone and Procainamide are contraindicated because of their QT prolonging effects)

## ▶ IV AMIODARONE

- ▶ Drug of choice for acute VT refractory to cardioversion shock
- ▶ 150mg over 10mins. Repeat once if needed after 10mins. Then if needed, 1mg/min IV infusion for 6hours (ie 360mg); 0.5mg/min IV infusion for 8 hours (ie 540mg). Maintenance is 0.5mg/min to a max of 720mg/24hours until SR is restored.
- ▶ SE include hypotension and bradycardia. Others- hepatic, thyroid, lung toxicity (alveolitis), phototoxicity, skin discoloration, corneal deposits, peripheral neuropathy

## ▶ IV LIDOCAINE

- ▶ Useful in patients with ongoing myocardial ischaemia, however assoc with increased mortality.
- ▶ Dose: 1-1.5mg/kg slow IV bolus over 3mins. Repeat if needed at 0.5-0.75mg/kg over 10mins. Then 1-4mg/min continuous infusion
- ▶ Endotracheal administration is possible
- ▶ SE include negative inotropy with myocardial depression, cardiac arrest, arrhythmias

## ▶ IV PROCAINAMIDE

- ▶ Although indicated for VT, it is rarely used because of hypotension and its proarrhythmic risk
- ▶ Is contraindicated in QT prolongation and heart failure
- ▶ Dose: 100-200mg/dose slowly over 25-30mins. Repeat after 5mins, prn. Not to exceed 1gm. Maintenance is 1-4mg/min by continuous IV infusion

## ▶ IV MAGNESIUM SULPHATE

- ▶ Useful in TDP if long QT was present at baseline
- ▶ Dose: 1-2gm slow IV (diluted in 50mls D/W) over 20-60mins. Then 0.5-1g/hr IV infusion



# LONG TERM TREATMENT

- ▶ After conversion to SR, patients may experience repeated episodes of recurrent VT.
- ▶ Long term management plan depends on the severity of symptoms and degree of structural heart disease
- ▶ Treat underlying cause eg heart failure, IHD
- ▶ A combination of the following is utilized for long term treatment
  - ▶ MEDICATION: anti arrhythmic drugs (prevent VT)
  - ▶ Radiofrequency ablation (destroy arrhythmogenic tissue- prevent VT)
  - ▶ Implantable cardioverter- defibrillators (abort/terminate VT)

# ANTI ARRHYTHMIC MEDICATION

- ▶ Prevention of VT is imperative in long term management
- ▶ Note that most anti arrhythmic drugs (especially Class 1) may actually cause ventricular arrhythmias and have relatively narrow therapeutic windows
- ▶ Outpatient medication choices depends on
  - ▶ Degree of ventricular dysfunction
  - ▶ Presence or absence of ICD
  - ▶ Associated medical conditions that may contribute to or exacerbate VT, co morbid diseases

## CLASS 1A

### ▶ QUINIDINE

- ▶ Rarely used due to pro arrhythmic risk.
- ▶ Specific niche for VT in Brugada syndrome
- ▶ Dose: 200-400mg tds

## CLASS 1B

### ▶ MEXILETINE

- ▶ Closest oral analogue to Lidocaine
- ▶ Used in pts who responded to IV Lidocaine in acute care
- ▶ Dose: 200-250mg tds

## CLASS 1C

### ▶ FLECAINIDE

- ▶ Assoc with increased mortality in ischaemic CMP
- ▶ Avoid in patients with structural heart disease
- ▶ Dose: 50-100mg bd

### ▶ PROPAFENONE

- ▶ Dose: 150mg tds for a week, then 300mgbd

## CLASS 2 (cardio selective)

### ▶ Useful in long term treatment of

- ▶ Normal heart VT (relieves symptoms)
- ▶ Non sustained VT (relieves symptoms)
- ▶ congenital long QT syndrome
- ▶ ARVD

### ▶ METOPROLOL

### ▶ BISOPROLOL

### ▶ ATENOLOL

## CLASS 3

- ▶ AMIODARONE
  - ▶ Used when there is LV dysfunction
  - ▶ Dose: 100-400mg dly in divided doses
- ▶ SOTALOL
  - ▶ Dose: 40-160mg bd

## CLASS 4

- ▶ VERAPAMIL
  - ▶ Used in idiopathic septal VT
  - ▶ Dose: 40-120mg tds

## ▶ AMIODARONE

- ▶ Note risk of Amiodarone induce lung, liver and thyroid injury with frequent long term monitoring
- ▶ Loading dose 800-1600mg dly for 1-3weeks until adequate response is established. Reduce to 600-800mg/day for 4weeks. Reduce to 400mg/day for maintenance
- ▶ Has a long tissue half life of 25-110days

## ▶ SOTALOL

- ▶ Monitor for bradycardia and QT prolongation as well as renal dysfunction

## ▶ FLECAINIDE

- ▶ Visual disturbances

## ▶ PROCAINAMIDE

- ▶ Joint pains, lupus like syndrome

- ▶ VERAPAMIL: Although idiopathic VT responds to Verapamil, it may cause haemodynamic collapse and death when used in patients with left ventricular dysfunction. Therefore CCB are contraindicated in any patient with wide complex tachycardia of uncertain aetiology

**END**

# REFERENCES

1. [Guideline] Russo AM et al. ACCF/HRS/AHA/ASE/HFSA/SCAI/SCCT/SCMR 2013 appropriate use criteria for implantable cardioverter defibrillators and cardiac resynchronization therapy: a report of the American College of Cardiology Foundation appropriate use criteria task force. *Journal of the American College of Cardiology*. 2013. 61(12):1318-1368
2. Macintyre CJ, Sapp JL. Catheter ablation for ventricular tachycardia in structural heart disease. *Canadian journal of Cardiology*. 2014.30(2):244-246
3. Hadid c. Sustained ventricular tachycardia in structural heart disease. *Cardiology journal*. 2015.22(1):12-24
4. Dressen WF, Ferguson JD. Ventricular arrhythmias. *Cardiol Clin*. 2018.36(1)129-139
5. Brugada P et al. A new approach to the differential diagnosis of a regular tachycardia with a wide QRS complex. *Circulation*. 1991.83(5):1649-1659
6. [Guideline] Zipes DP et al. ACC/AHA/ESC 2006 guidelines for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death. *Journal American College of Cardiology*. 2006.48(5):e247-346
7. [Guideline] Al-Khatib SM et al. 2017 AHA/ACC/HRS guideline for management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: executive summary. *Circulation*. 2017.
8. [Guideline] Epstein AE et al. practical management guide for clinicians who treat patients with Amiodarone. *American journal of Medicine*. 2016. 129(5):468-475
9. Mason JW. A comparism of seven anti arrhythmic drugs in patients with ventricular tachyarrhythmias. *Electrophysiologic study versus electrocardiographic monitoring investigators*. *N England Journal of Medicine*. 1993. 329(7):452-458
10. Mallidi J. et al. Meta analysis of catheter ablation as an adjunct to medical therapy for treatment of ventricular tachycardia in patients with structural heart disease. *Heart Rhythm*. 2011. 8(4):503-510
11. [Guideline] Priori SG et al. 2015 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death: The task force for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death of the European Society of Cardiology. *European Heart Journal*. 2015.36(41):2793-2867