

Antiarrhythmic drugs

Blocks Na⁺ channels ← class 1

Class 2 ^β blockers

A
 ↑ APD & dissociate from the channel with intermediate kinetics.

- * **Quinidine**: slower the rapid
- Inhibits Na⁺ channels → depolarization
- Slows upstroke & conduction
- ↑ APD & QRS duration
- ↑ Automaticity → inhibits arrhythmias
- Produces bidirectional block → prevents reentry arrhythmias.

Uses:

In patients with normal hearts but have atrial or ventricular arrhythmias.

Side effects:

- Cinchonism (headache, dizziness & tinnitus)
- Allergy, thrombocytopenia, hypotension
- ↑ serum digoxin levels & ↑ warfarin effects.
- Sudden death

* Disopyramide

* Procainamide:

- Has short t_{1/2}
- When it's acetylated → NAPA (K⁺ channel blocker)

↓ Automaticity (↓ phase 4 spontaneous depolarization & ↑ threshold)

↓ Membrane responsiveness (V_{max}) →

- ↓ conduction velocity
- ↑ APD & refractory period
- ↳ blocks K⁺ efflux

Uses

Atrial & ventricular arrhythmias (acute MI)

Adverse effects

- Lupus erythematosus like syndrome.
- Torsade de pointes, hypotension

B
 ↓ APD & dissociate from the channel with rapid kinetic

- * **Lidocaine (Lignocaine, Xylcaine)**:
- Ineffective orally
- More effective with ↑ K⁺ supplementation
- Not effective in atrial arrhythmias

Uses

- Acts selectively in ischemic ventricular tissue to promote conduction & block reentry
- In MI patients to prevent ventricular arrhythmias.

Side effects

- CNS effects
- Hypotension due to depression of the myocardium
- Least cardiotoxic of the class

* Tocainide:

- Oral analog of lidocaine
- CNS, GI & blood dyscrasia

* Mexiletine:

- Oral analog of lidocaine
- Neurologic side effects

* Phenytoin:

- Antiepileptic

Useful in

- Digitalis induced arrhythmias.
- Arrhythmias after congenital heart surgery.
- Congenital prolonged QT interval.

C
 - Minimal effects on the APD
 - Dissociate from the channel with slow kinetics.

- * **Flecainide**:
- Blocks Na⁺ & K⁺ channels
- Negative inotropic effect.
- ↓ conduction velocity

(shallow phase 0 slope)

Uses

- In supraventricular tachycardia with normal heart
- In resistant, life-threatening ventricular arrhythmias.

Toxicity

- Ventricular arrhythmias & sudden death
- Blurred vision & CNS side effects

- Proarrhythmic in MI patients

* Propafenone:

- Has Na⁺, Ca⁺⁺ & beta blocking activity.
- No effect on QT interval

Uses

Supraventricular arrhythmias

Side effects

- Metallic taste
- Constipation
- Arrhythmias

corneal deposits, Lung fibrosis

* Propranolol:

- β blocking, membrane stabilization, intrinsic sympathomimetic activities & antiarrhythmic activity.
- Blocks effects of catecholamines on: automaticity, A-V conduction & refractory period.
- Quinidine-like effects on membranes
- ↓ conduction velocity

Uses

- ↓ Mortality after MI by reducing arrhythmias & reducing myocardial oxygen requirements
- Paroxysmal atrial tachycardia.
- Arrhythmias associated with hydrocarbon anesthetics.

- Arrhythmias resulting from L-dopa or tricyclic antidepressants
- Pheochromocytoma

Adverse effects

- Negative inotropic / Bronchospasm (so it's contraindicated in patients with asthma or COPD)

- depression & nightmares / A-V block
- ↑ sensitivity to β-agonists on withdrawal
- * **Acetabulol** & **Metoprolol**: β1 selective drugs
- * **Esmolol**: short acting, Used in: intraoperative & acute arrhythmias

* **Carvedilol**: α & β blocker

* **Sotalol**: non-selective β blocker, has an effect on K⁺ channel, prolong AP

Class 3 → blocks K⁺ channels

- * **Amiodarone**: ↑ APD, blocks K⁺, Na⁺ & Ca⁺⁺ channels, blocks α & β receptors
- its effect is due to alteration of lipid membrane
- ↓ HR & AV conduction / Peripheral vasodilator
- ↑ QT but low incidence of TdP
- Has slow kinetics, Used for: life threatening atrial & ventricular arrhythmias.

Toxicity: skin (blue man syndrome) / CNS / GI / liver / thyroid / ↑ digoxin & anticoagulants

Antiarrhythmic drugs

Class 1 ✓ Class 2 ✓

Class 3 ✓

- * Amiodarone ✓
- * Sotalol:
 - B-blocker but has class 3 actions
 - For atrial & ventricular arrhythmias
 - Causes bradycardia, HF & ↑ QT
- * Dofetilide
- * Ibutilide:
 - Blocks I_{Kr} → slows depolarization
 - Activation of slow inward sodium current → AP prolongation
 - Used for atrial flutter & atrial fibrillation (used IV)
 - Adverse effect: torsade de pointes

Blocks Ca⁺⁺ channels ← Class 4

- * Verapamil & Diltiazem:
 - Block activated & inactivated L-type Ca⁺⁺ channels
 - Vasodilators
 - Have negative inotropic effects
 - Effects are more marked in tissues that fire frequently, less completely depolarized at rest & those dependant on Ca⁺⁺ (SA & AV nodes)
 - Used in: Paroxysmal supraventricular tachycardia
 - Adverse effects:
 - Severe AV block
 - ↑ Digoxin levels
 - Constipation, gastric discomfort, vertigo, headache, nervousness, pruritis.

Magnesium:

- Works on Na⁺/K⁺ ATPase, Na⁺, K⁺ & Ca⁺⁺ channels
- Effective IV in refractory digitalis induced ventricular arrhythmias only in hypomagnesemic patients.
- Effective in TdP patients even if serum Mg⁺⁺ is normal

Potassium salts

- For digitalis induced arrhythmias with hypokalemia
- Depress ectopic pacemakers & slow conduction

Digitalis

- Sensitizes baroreflexes to increase vagal tone & depress sympathetic activity to heart

Digoxin

- Direct actions (inhibits Na⁺/K⁺ ATPase)
- Sensitizes baroreflexes → Vagotonic effects
- ↑ A-V refractory period → ↓ ventricular rate

Uses

- Atrial fibrillation & flutter
- Heart failure

Adverse actions

- Arrhythmias (PVC, AV conduction block)
- Blurred vision
- Nausea

Adenosine

- T_{1/2}: 10 seconds
- Stimulate purinergic P₁ receptors
- Acts on A₁ receptor to inhibit adenylate cyclase: ↓ CAMP
- ↓ AV conduction
- ↓ Phase 4 depolarization in SA node
- Activates K⁺ currents & hyperpolarizes nodes
- Inhibits Ca⁺⁺ current
- No effect on ventricles
- In hypoxia: ↓ ATP, ↑ adenosine

Uses

Paroxysmal supraventricular tachycardia (PSVT)

Adverse effects

- Bronchoconstriction
- Symptoms of angina
- Hypotension, facial flushing, headache, nausea, paresthesia
- Chest tightness

* Theophylline & caffeine:

Adenosine receptor blockers

Atropine: for sinus bradycardia

Isoprenaline for heart block

Magnesium chloride

For digoxin toxicity / ventricular fibrillation

Adrenaline epinephrine:

For cardiac arrest

Calcium chloride

For ventricular tachycardia due to hyperkalemia