D.PHARM • FIRST YEAR

औषधीय रसायन विज्ञान

अध्याय 7

# हृदयवाहिका तंत्र पर कार्य करने वाली औषधियाँ

हिंदी अध्याय नोट्स



DIPLOMA IN PHARMACY

# ANTI-ARRHYTHMIC DRUGS

## DEFINITION

Anti-arrhythmic drugs impulse formation, conduction या refractoriness बदलकर abnormal heart rhythms को suppress या prevent करते हैं।

Arrhythmias abnormal automaticity, triggered activity, re-entry circuits या conduction block से हो सकती हैं।

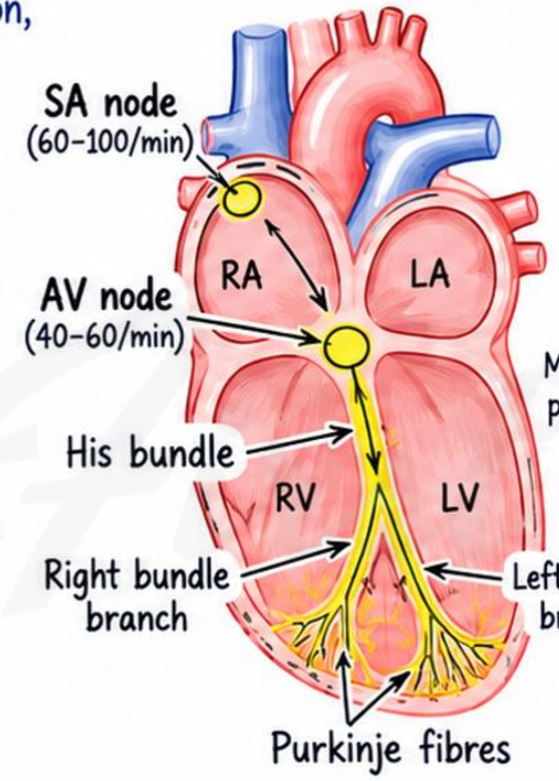
## CARDIAC ELECTRICAL BASIS

Fast-response ventricular action potential:

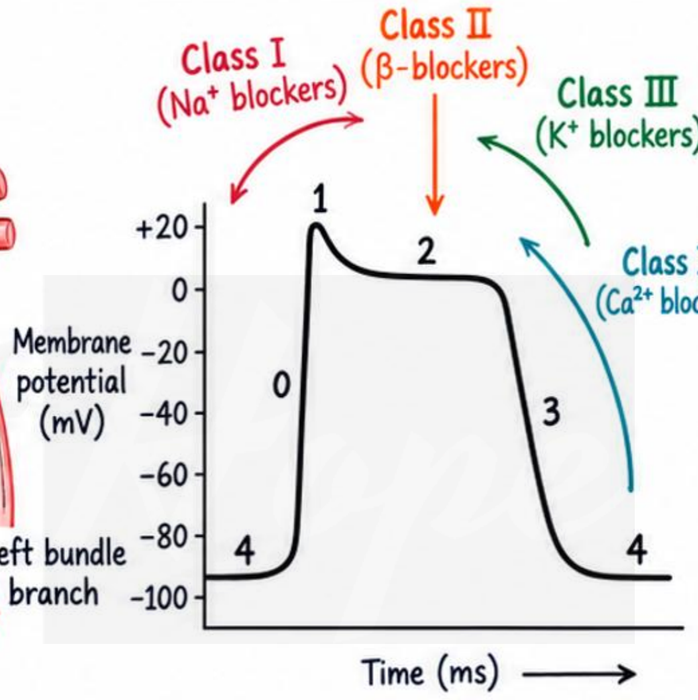
- Phase 0 → rapid $Na^+$ influx और depolarisation।
- Phase 1 → brief $K^+$ efflux।
- Phase 2 → $Ca^{2+}$ influx को $K^+$ efflux balance करता हैं; plateau।
- Phase 3 → $K^+$ efflux और repolariisation।
- Phase 4 → ion gradients और $Na^+/K^+$-ATPase resting potential maintain करते हैं।

SA और AV nodal Phase 0 mainly $Ca^{2+}$ influx पर depend करता हैं।

### Cardiac Conduction System




### Ventricular Action Potential




## USES

Atrial fibrillation या flutter; supraventricular tachycardia; selected ventricular tachyarrhythmias; premature atrial या ventricular beats।

## VAUGHAN WILLIAMS CLASSIFICATION

**Class I:** $Na^+$-channel blockers।

- IA → Quinidine, Procainamide: conduction slow और repolarisation prolong।
- IB → Lidocaine, Phenytoin: repolarisation shorten या minimally change।
- IC → Lorcainide: marked conduction slowing।

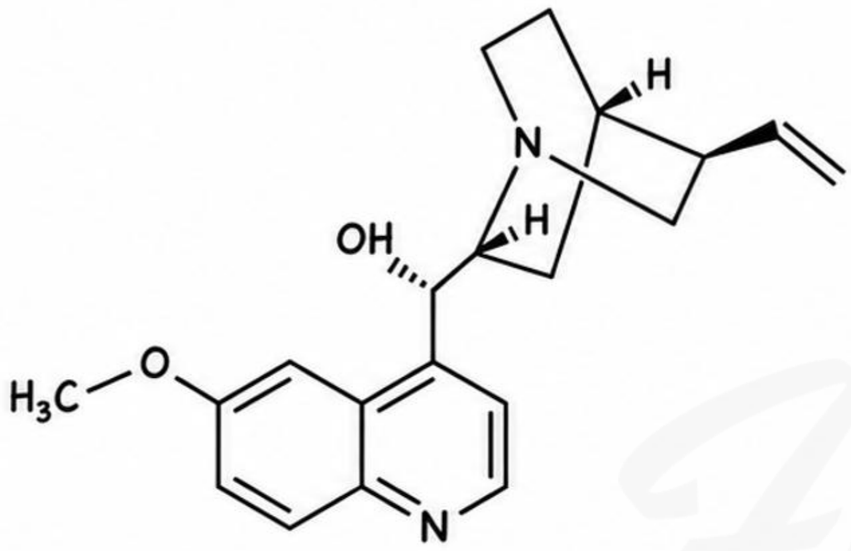
**Class II:** β-blockers → Propranolol; Sotalol में भी β-blocking action।

**Class III:** $K^+$-channel blockers → Amiodarone, Sotalol; repolarisation और refractory period prolong।

**Class IV:** non-dihydropyridine $Ca^{2+}$-channel blockers → Verapamil, Diltiazem; AV-nodal conduction slow।

Other useful agents में Adenosine, Digoxin और Magnesium sulfate शामिल हैं।

# QUINIDINE SULFATE



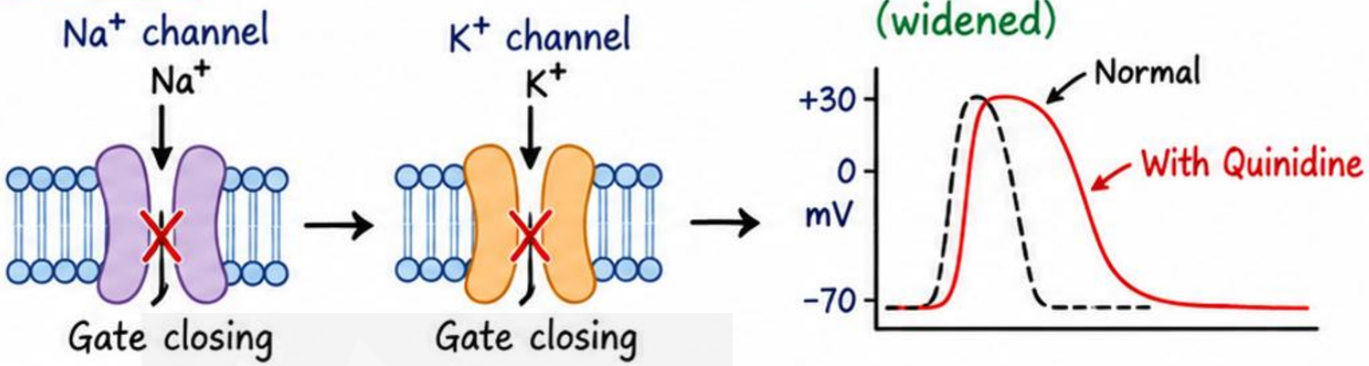

## CLASS

- Class IA anti-arrhythmic; Quinine का stereoisomer।

## CHEMICAL IDENTITY

- Quinidine: (S)-[(2R,4S,5R)-5-ethenyl-1-azabicyclo[2.2.2]octan-2-yl]-(6-methoxyquinolin-4-yl)methanol।
- Medicinal products में commonly Quinidine sulfate, अक्सर dihydrate के रूप में use होता है।

## MECHANISM







## USES

- Selected atrial या ventricular arrhythmias में, जब specialist benefit को risk से अधिक माने।
- Historical antimalarial use है, लेकिन सामान्यतः safer या preferred regimens चुने जाते है।

## STABILITY & STORAGE

- Controlled room temperature पर tightly closed रखें; light और moisture से protect करें।

## FORMS

- Immediate-release और extended-release oral tablets या capsules; strength salt और product के अनुसार बदलती है।

## IMPORTANT EFFECTS

- QT prolongation मे torsades de pointes हो सकता है।
- Cinchonism में tinnitus, headache, dizziness या visual disturbance हो सकते हैं।
- Pro-arrhythmic और other adverse effects के कारण Quinidine अब infrequently use होता है।

# PROCAINAMIDE HYDROCHLORIDE

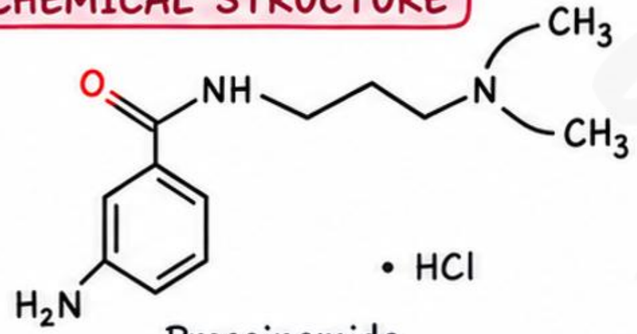
## CLASS

- Class IA anti-arrhythmic; $Na^+$-channel blocker, साथ में $K^+$-channel-blocking action।

## CHEMICAL NAME

- 4-amino-N-[2-(diethylamino)ethyl] benzamide; commonly Procainamide hydrochloride के रूप में supplied।

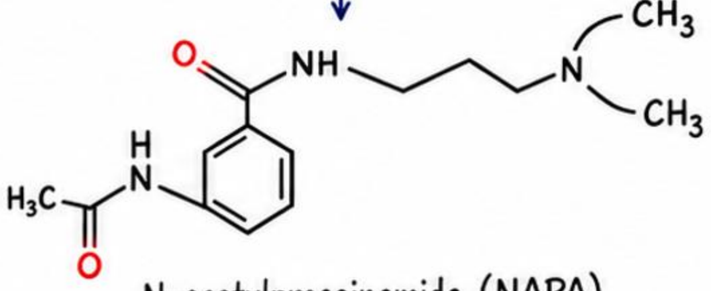
## CHEMICAL STRUCTURE




Procainamide
(Free base)

## METABOLISM

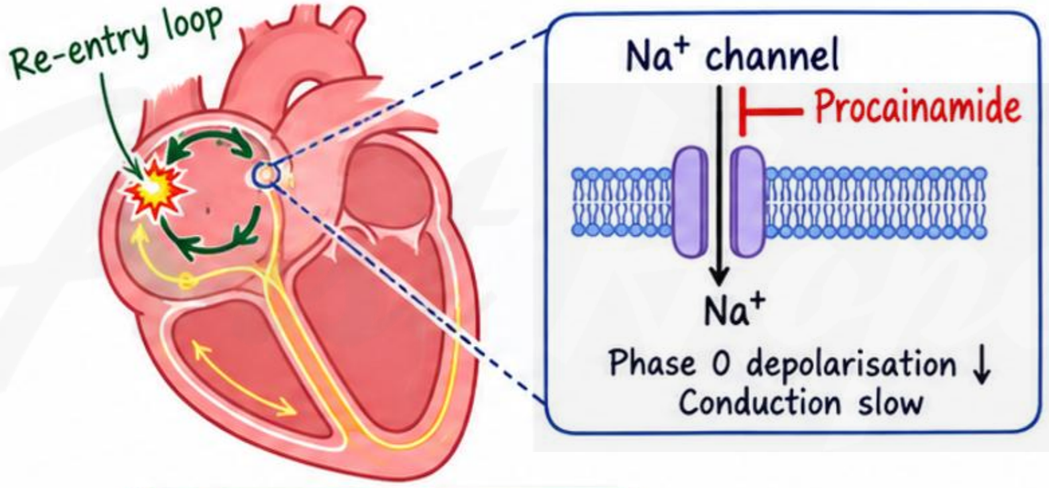
Hepatic metabolism ↓



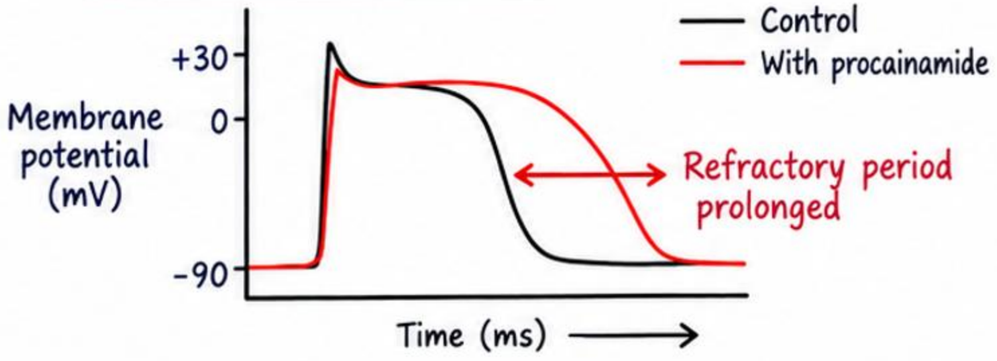

N-acetylprocainamide (NAPA)

## MECHANISM

- Phase 0 depolarisation और myocardial conduction slow करता है।
- Action-potential duration और refractory period prolong करता है।
- Hepatic metabolite N-acetylprocainamide (NAPA) में important Class III $K^+$-blocking action होता है।




### Effect on action potential




## USES

- Selected acute stable wide-complex tachycardia।
- Specialist monitoring में selected atrial arrhythmias; including pre-excited atrial fibrillation।

## STABILITY & STORAGE

- Dry form में stable, लेकिन solution में slowly hydrolyse होता है।
- Controlled room temperature पर well-closed, light-resistant container में रखें।
- Discoloured या particles वाली injection use न करें।

## FORMS

- Oral tablets और IV/IM injection; source examples: 250 mg और 500 mg tablets तथा 100 mg/mL injection।

## IMPORTANT EFFECTS

- Hypotension, QRS या QT prolongation और torsades हो सकते हैं।
- Long-term use से lupus-like syndrome हो सकता है; blood count और ECG monitoring आवश्यक हो सकती है।

# VERAPAMIL

## CLASS

- Class IV anti-arrhythmic; non-dihydropyridine L-type $Ca^{2+}$-channel blocker।

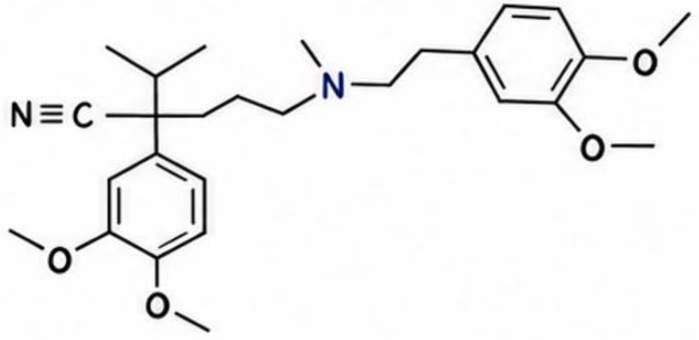
## CHEMICAL NAME

- 2-(3,4-dimethoxyphenyl)-5-[2-(3,4-dimethoxyphenyl)ethyl-methylamino]-2-propan-2-ylpentanenitrile।
- Medicinal products में commonly Verapamil hydrochloride use होता है।

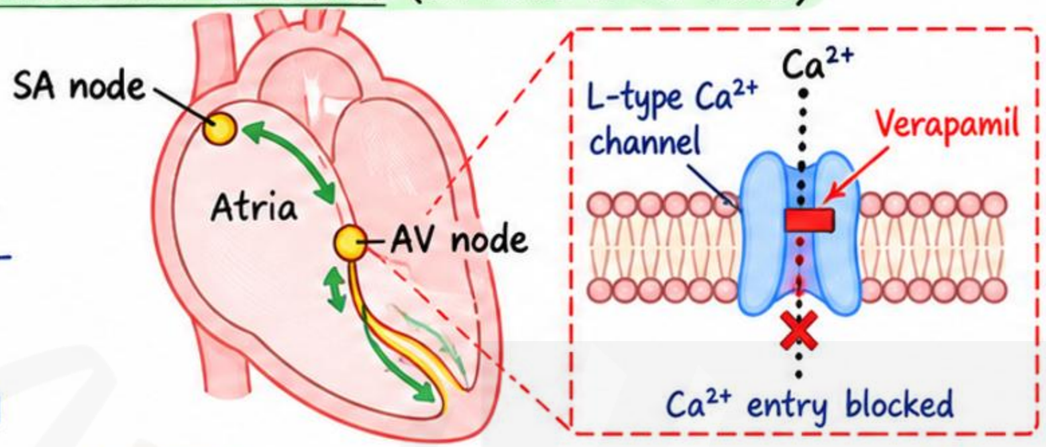
## MECHANISM

- AV node, myocardium और vascular smooth muscle में L-type $Ca^{2+}$ channels block करता है।
- AV-nodal conduction slow, AV-nodal refractoriness increase, contractility reduce और arteries dilate करता है।

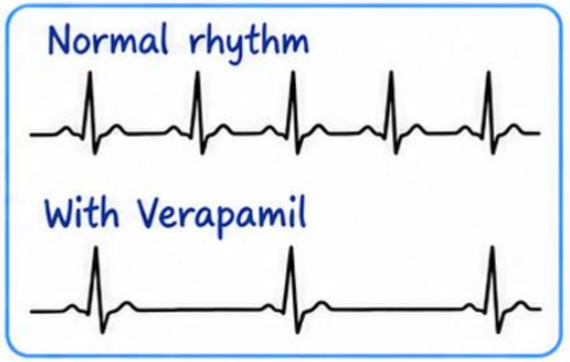
## CHEMICAL STRUCTURE (Verapamil)




## CONDUCTION PATHWAY (SA node to AV node)




## EFFECT ON ECG (Slower rhythm)




↓ Heart rate (slower rhythm)

## USES

- Paroxysmal supraventricular tachycardia।
- Selected atrial fibrillation या flutter में ventricular-rate control।
- Hypertension और angina pectoris।



Arrhythmia (SVT, AF)



Hypertension (vasodilation)



Angina pectoris (coronary use)

## STABILITY & STORAGE

- Light से protect करें; airtight container में controlled room temperature, commonly 15–30°C पर रखें।

## FORMS

- Immediate-release tablets, sustained-release tablets या capsules और IV injection।
- Source strengths: 40 mg और 80 mg tablets, 120–240 mg sustained-release forms और 2.5 mg/mL injection।

## IMPORTANT CAUTION

- Bradycardia, hypotension या AV block हो सकता है।
- Severe left-ventricular dysfunction या accessory pathway के साथ atrial fibrillation में inappropriate use avoid करें।

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