Class IV Antiarrhythmics (Ca2+ Channel Blockers)

Class IV antiarrhythmics are Ca^{2+} channel blockers and are a unique class of drug, as they can be cardioselective or vasoselective, giving them a wide array of use. Cardioselective drugs, such as verapamil and diltiazem, inhibit transport of Ca^{2+} across the cell membrane during cardiac depolarization by blocking Ca^{2+} channels, decreasing SA node discharge. This decreases conduction speed through the AV node, leading to an increased PR interval and ERP. This mechanism allows class IV antiarrhythmics to treat reentrant supraventricular tachycardias, as well as protect the ventricles from arrhythmias in atrial flutter and fibrillation. They can also be used against angina and hypertension, mostly due to their effects on smooth muscle relaxation. Vasoselective drugs block Ca^{2+} channels in smooth muscle and decrease vasoconstriction and spasm. Nimodipine is indicated to treat subarachnoid hemorrhage due to its vasoselective properties.

These drugs have numerous cardiovascular side effects and can lead to sinus node depression, AV block and CHF in patients. Impaired Ca^{2+} transport leads to decreased gastrin signaling and decreased gut motility, causing constipation in patients.

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Indications

SVT

Super-V-Tac

Class IV antiarrhythmics are indicated to treat supraventricular tachycardia (SVT), particularly those due to AV nodal reentry. These drugs can also be used for atrial flutter and fibrillation.

Subarachnoid Hemorrhage

Submarine-arachnid with Hemorrhage-hammer

Nimodipine is a calcium channel blocking drug which is indicated during subarachnoid hemorrhage. This drug has higher effects on vascular smooth muscle than on cardiac conduction and contractility.

Mechanism of Action

Decrease Conduction Velocity

Down-arrow Conductor-snail

Ca^{2+} channels are especially concentrated in the sinoatrial and atrio-ventricular nodes, and these agents block Ca^{2+} channels, thus they can be used to decrease impulse conduction and velocity through the AV node.

It should be noted that Ca^{2+} channels are located in smooth muscle as well, and use of Ca^{2+} channels helps treat hypertension and vasospasm.

Increase PR Interval and ERP

Up-arrow PRada-purse and Ear-P

These drugs work to decrease conduction through the heart's AV node. This slowed cardiac conduction leads to an increase in PR and ERP.

Drugs

Verapamil

V-rapper

Verapamil is a cardioselective Ca^{2+} channel blocker, and has higher activity on slowing AV conduction than it does on vasodilation. It is indicated for use in arrhythmia prevention, hypertension, angina and cluster headaches (cerebral vasospasm).

Diltiazem

Dill-tazer

Diltiazem is a cardioselective Ca^{2+} channel blocker which has actions similar to verapamil. It is used for SVT, angina, atrial flutter and fibrillation, as well as hypertension.

Nimodipine

Knee-moped

Nimodipine is a vasoselective Ca^{2+} channel blocker, and is used to treat subarachnoid hemorrhage.

Side Effects

Cardiovascular

Heart-with-vessels

There are numerous cardiovascular side effects implicated with Ca^{2+} channel blocker use. These include CHF, AV block, and sinus node depression.

Constipation

Corked Con-toilet

Constipation is seen in this class of drugs, especially verapamil, as Ca^{2+} is a 2nd messenger for Gastrin, which is important for gastric motility. As Ca^{2+} is blocked, GI motility becomes impaired.