



Adenosine – Summary.

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Introduction

Adenosine is an anti-arrhythmic drug commonly used in intensive care units, high care units, and emergency departments in the management of tachycardia, and it is available in some emergency centres in Mzantsi Afrika. Adenosine is approved by the South African Health Products Regulatory Authority (SAHPRA). Adenosine is recommended by the South African Medicines Formulary (SAMF), the Standard Treatment Guidelines and Essential Medicines List for South Africa, and by numerous emergency medicine courses presented in Mzantsi Afrika. Adenosine is produced endogenously and may be administered intravenously for its anti-arrhythmic effects. There are four classes of antiarrhythmic drugs (class I, II, III, and IV); however, adenosine does not fit into a single class of antiarrhythmic drugs, and it is therefore categorized as a miscellaneous anti-arrhythmic drug. Due to its dual electrophysiologic effects on the heart, which enhance potassium efflux and inhibit calcium influx, adenosine results in the cardiac action potential reaching the resting membrane potential (hyperpolarization) in a shorter duration, which then results in a shorter cardiac action potential and stabilization of the cardiac membrane. As a result of its cardiac membrane stabilizing ability, adenosine has an established record of being used to treat supraventricular tachycardias.

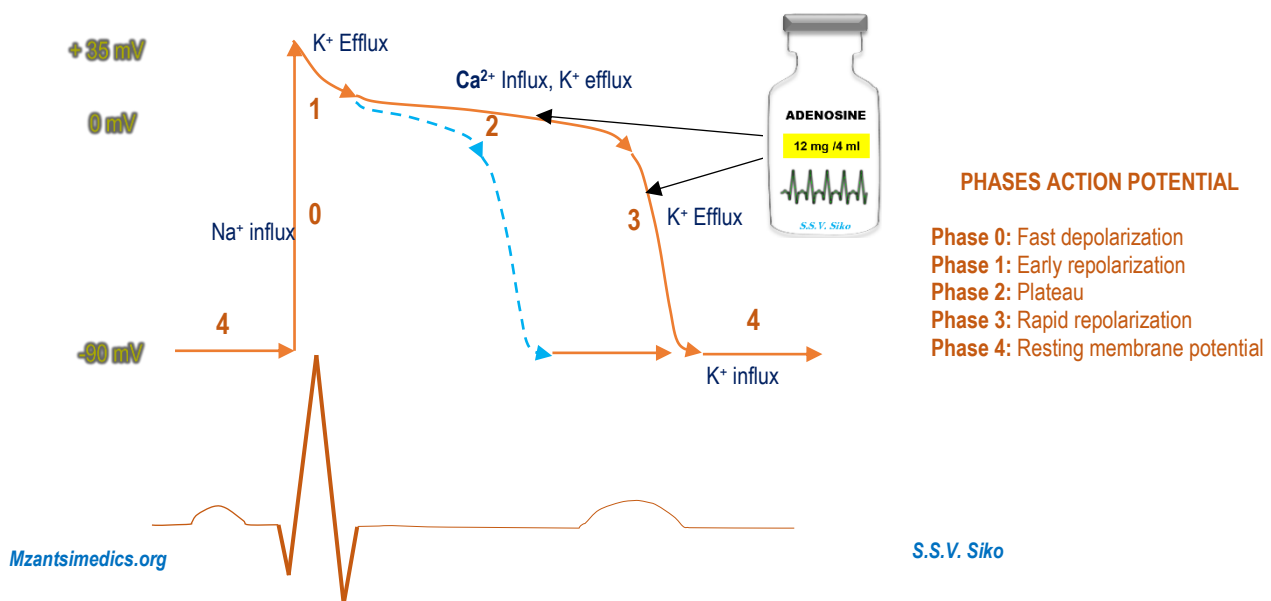


Diagram 1: Effects of adenosine on the cardiac action potential (blue arrows). Adenosine enhances K efflux in the SA and AV nodes and also inhibits calcium influx in the AV node. Due to the effects of adenosine, the cardiac action potential is shorter, and the cardiac membrane is stabilized.

Scope

This summary will cover the following items:

- Drug class
- Mechanism of action.
- Indications
- Contraindications
- Side effects
- Pharmacokinetics

Drug class of adenosine.

Adenosine is a miscellaneous anti-arrhythmic agent. [1] See the table below for other classes of antiarrhythmic agents.



ANTI-ARRHYTHMIC	EXAMPLES
Class I	I-A: Procainamide, Quinidine  I-B: lignocaine I-C: Flecainide, propafenone
Class II	Propranolol Metoprolol
Class III	 Amiodarone Sotalol
Class IV	Diltiazem Verapamil
Miscellaneous	 Digoxin  Adenosine  Magnesium sulphate

Table 1: Classes of antiarrhythmic agents.

Mechanism of action of adenosine [2, 3]

Adenosine causes two electrophysiologic effects on the heart. The first effect is the enhancement of potassium efflux during repolarization in the atrium, sinus and AV nodes. Secondly adenosine inhibits the voltage gated calcium influx channels in the AV node. These effects result in the cardiac action potential reaching the resting membrane potential (hyperpolarization) in a shorter duration, which then results in a shorter cardiac action potential and stabilization of the cardiac membrane.



Side effects of adenosine [4, 5]

Adenosine side-effects are short-lived due to its short duration of action. The following are some of the side effects of adenosine:

- Flushing
- Chest pain
- Bradycardia
- Asystole
- Bronchospasm in patients with reactive airway diseases (asthmatic patients)
- Coughing
- Joint and arm pains
- Hypotension
- Nausea
- Dizziness
- Paraesthesia

Indications for adenosine. [6, 7, 8]

- Paroxysmal re-entry supraventricular tachycardias

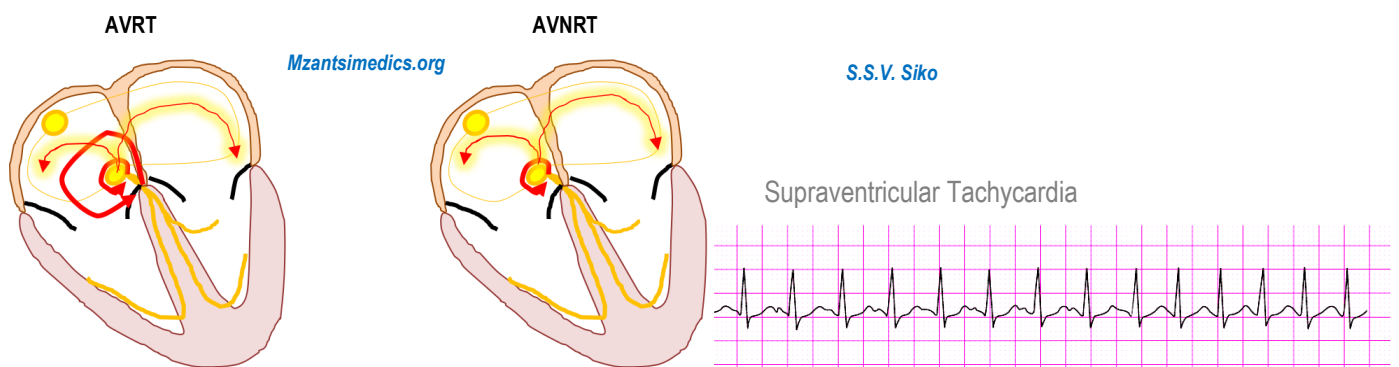


Diagram 2: showing the indication for adenosine which is paroxysmal supraventricular tachycardias. Atrioventricular Re-entry Tachycardia (AVRT), Atrioventricular Nodal Re-entry Tachycardia (AVNRT) and a rhythm strip of a supraventricular tachycardia.

Contraindications for adenosine. [9, 10]

- True hypersensitivity to adenosine
- Atrial fibrillation
- Atrial flutter
- Ventricular tachycardia
- 2nd or 3rd degree AV blocks
- Asthmatic patients

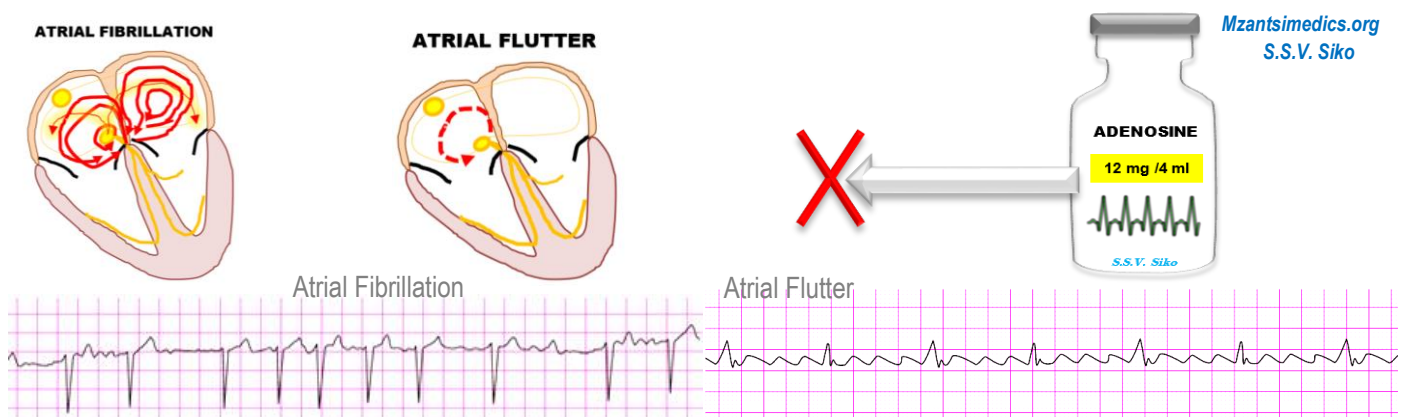


Diagram 3: Showing that Adenosine is contraindicated in Atrial fibrillation and Atrial flutter.



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Pharmacokinetics

Adenosine has very short half-life of 10 seconds. It is metabolized by erythrocytes and excreted by the kidneys as inactive metabolites.



Half-life – 10 seconds



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Diagram 4: the half-life of Adenosine.



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