

# Adenosine

## Newborn Use Only

2017

<b>Alert</b>	Adenosine is used for pharmacological conversion of supraventricular tachycardia (SVT) to sinus rhythm. It is not a maintenance antiarrhythmic agent. Infants with SVT associated with serious cardiovascular compromise such as severe hypotension and decompensated heart failure should be converted with synchronised electrical cardioversion rather than adenosine.
<b>Indication</b>	Pharmacological conversion of supraventricular tachycardia. [1, 2]
<b>Action</b>	Endogenous purine analogue with rapid onset antiarrhythmic action resulting in transient AV nodal block. It has a short half-life (1–10 seconds). [3]
<b>Drug Type</b>	Antiarrhythmic
<b>Trade Name</b>	Adenocor, Aspen Adenosine
<b>Presentation</b>	6 mg/2 mL injection
<b>Dosage / Interval</b>	Dose range 0.1 to 0.3 mg/kg The initial recommended dose is 0.1 mg/kg but if AV block is not achieved within 2 minutes, further doses should be increased by 0.1 mg/kg aliquots to a maximum of 0.3 mg/kg.
<b>Maximum daily dose</b>	The first dose should not exceed 6 mg and the second dose 12 mg. [1] If multiple doses are required within 24 hours, consult cardiologist to discuss further management.
<b>Route</b>	Intravenous Successful intraosseous administration has been reported.
<b>Preparation/Dilution</b>	Draw up 1 mL (3 mg) and add 9 mL sodium chloride 0.9% to make a final volume of 10mL with a concentration of 0.3 mg/mL.
<b>Administration</b>	Intravenous, as proximally as possible, as a rapid IV bolus followed by a rapid flush of sodium chloride 0.9%. Use of filter may slow down infusion.
<b>Monitoring</b>	Adenosine should be used only where cardiac monitoring and cardiorespiratory resuscitation equipment is available for immediate use if necessary.
<b>Contraindications</b>	Known hypersensitivity to adenosine; sick sinus syndrome, second or third degree AV block (except in patients with a functioning artificial pacemaker); long QT syndrome; severe hypotension; decompensated states of heart failure. Atrial fibrillation or flutter but can be useful to unmask atrial flutter.
<b>Precautions</b>	Patients who develop high level atrioventricular block or returned to sinus rhythm at a particular dose should not be given further dosage increments. Solution must be clear at time of administration.
<b>Drug Interactions</b>	Dipyridamole was shown to produce a fourfold increase in adenosine activity. Dipyridamole should be discontinued 24 hours beforehand or the dose of adenosine should be significantly reduced. Adenosine may interact with drugs that tend to impair cardiac conduction. Aminophylline, theophylline and caffeine are competitive adenosine antagonists and should be avoided for 24 hours prior to the administration of adenosine. Adenosine has been effectively administered in the presence of other cardioactive drugs, such as digitalis, quinidine, beta-adrenergic blocking agents, calcium channel blocking agents and angiotensin converting enzyme inhibitors, without any change in the adverse reaction profile.
<b>Adverse Reactions</b>	Very rare reactions (mostly reported in adults): atrial fibrillation; ventricular excitability including ventricular fibrillation and torsades de pointes; severe bradycardia not corrected by atropine and possibly requiring temporary pacing. Hypotension has been reported.
<b>Compatibility</b>	Fluids: Glucose 5%, Hartmann's, sodium chloride 0.9%  Y-site: Abciximab.
<b>Incompatibility</b>	Fluids and Y-site: No information.
<b>Stability</b>	Discard remainder after use.
<b>Storage</b>	Store below 25°C. Protect from light. Do not refrigerate – crystallisation will occur.
<b>Special Comments</b>	Treatment of any prolonged adverse effects should be individualised and be directed toward the specific symptoms.

<b>Evidence summary</b>	<p><b>ARC 2010 treatment recommendations for supraventricular tachycardia:</b> If haemodynamically stable (adequate perfusion and blood pressure), initial treatment of SVT for infants and young children should be application to the face of a plastic bag filled with iced-water (or unilateral carotid sinus massage in older infants) [LOE IV; GOR B]. If drug therapy required, adenosine is the drug of choice. It has a very short half-life and must be given as a rapid intravenous or intraosseous bolus and flushed with 0.9% sodium chloride into the circulation. A dose in the range of 0.1 to 0.3 mg/kg converts most cases to sinus rhythm [LOE IV; GOR B]. The initial recommended dose is 0.1 mg/kg but if this is ineffective, the dose should be increased to 0.2 mg/kg. The first dose should not exceed 6 mg and the second dose 12 mg. [1]</p> <p><b>Adenosine versus intravenous calcium channel antagonists for tachycardia:</b> There are no randomised controlled trials (RCTs) in infants or newborns.[1, 2] In RCTs in adults, time to reversion was slower for verapamil than adenosine. Minor adverse events such as nausea, chest tightness, shortness of breath and headache were reported in patients treated with adenosine with 10.8 % of patients reporting at least one of these events, compared with 0.6% of those treated with verapamil (OR 0.15, 95% CI 0.09 to 0.26, P&lt;0.001). There was no significant difference in the rate of major adverse events between the two groups, although hypotension was reported exclusively in the verapamil treatment group (3/166 patients treated with verapamil, 0/171 treated with adenosine).[4]</p> <p><b>Pharmacokinetics:</b> Adenosine is an endogenous purine analogue with rapid onset and the short half-life (1–10 sec). Adenosine exerts its antiarrhythmic actions by activation of A<sub>1</sub> adenosine receptors located in the sinoatrial and atrioventricular nodes, as well as in activated ventricular myocardium.[3]</p> <p><b>Safety:</b> A few cases of adenosine-induced tachyarrhythmia e.g. torsades de pointes, have occurred.[1]</p>
<b>References</b>	<ol style="list-style-type: none"> <li>1. Australian Resuscitation C, New Zealand Resuscitation C. Management of specific dysrhythmias in paediatric advanced life support. ARC and NZRC Guideline 2010. Emergency medicine Australasia : EMA. 2011;23:409-11.</li> <li>2. de Caen AR, Kleinman ME, Chameides L, Atkins DL, Berg RA, Berg MD, Bhanji F, Biarent D, Bingham R, Coovadia AH, Hazinski MF, Hickey RW, Nadkarni VM, Reis AG, Rodriguez-Nunez A, Tibballs J, Zaritsky AL, Zideman D, Paediatric B, Advanced Life Support Chapter C. Part 10: Paediatric basic and advanced life support: 2010 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Resuscitation. 2010;81 Suppl 1:e213-59.</li> <li>3. Szentmiklosi AJ, Galajda Z, Cseppento A, Gesztelyi R, Susan Z, Hegyi B, Nanasi PP. The Janus face of adenosine: antiarrhythmic and proarrhythmic actions. Current pharmaceutical design. 2015;21:965-76.</li> <li>4. Holdgate A, Foo A. Adenosine versus intravenous calcium channel antagonists for the treatment of supraventricular tachycardia in adults. The Cochrane database of systematic reviews. 2006:CD005154.</li> <li>5. Australian Injectable Drugs Handbook, 6th Edition, Society of Hospital Pharmacists of Australia 2014.</li> </ol>

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