

# Efficacy and Adverse Effects of Adenosine in Patients of Supraventricular Tachycardia

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**Background:** Adenosine administered intravenously terminates supraventricular tachycardia (SVT) involving the AV node as part of the reentrant circuit. This study was designed to determine the safety and efficacy of intravenous adenosine in terminating acute episodes of paroxysmal supraventricular tachycardia. **Methods and results:** A randomized trial to evaluate the dose response in patients receiving Adenosine in the Emergency Department of Punjab Institute of Cardiology Lahore was carried out from March 2003 to August 2003. A total of 100 patients with a tachycardia electrocardiographically consistent with paroxysmal supraventricular tachycardia were entered in to the protocol. The patients received sequential bolus doses of 6, 12 and 18 mgs of Adenosine to terminate SVT with a two minute interval between the injections. Clinical variables and the time interval from the initiation of treatment to the termination of the supraventricular tachycardia were noted and any adverse clinical effects if observed were also recorded. There was a female preponderance of 63% in the study group of total 100 cases. The types of arrhythmias observed among the patients under study included AVNRT (81%), AVRT (12%) and atrial tachycardia (07%). The response to Adenosine therapy revealed (92.5%) in patients of AVNRT, (75%) in patients of AVRT and (42%) in patients of atrial tachycardia. The analysis of adverse effects revealed Facial flushing in (26%) patients, while dyspnoea, chest pressure, Bronchospasm and other rhythm disturbances were present in other patients. (30%) patients had no side effects. **Conclusions:** Adenosine is a safe, effective and rapidly acting drug for terminating SVT and it is associated with very limited number of adverse effects if they occur at all.

**Key Words:** Adenosine, Supraventricular Tachycardia.

Adenosine is an endogenous purine nucleoside with potent atrioventricular (AV) nodal blocking activity.<sup>1</sup> It is found naturally in all cells of the body and acts by interrupting the reentry pathways through the AV node and restores the normal Sinus Rhythm in cases of Supraventricular Tachycardia<sup>2</sup>. SVT is classified on the basis of path that the electrical signal takes from the atria. One type is AVNRT (AV nodal reentrant Tachycardia) where electrical impulse travels in a circle through extra fibres in and around the AV node. Another type is AVRT i.e. AV reentrant Tachycardia. Another variety of Atrial tachycardia develops when localized regions in the atria develop the ability to fire rapidly on their own<sup>3</sup>.

Supraventricular arrhythmias occur in all age groups and may be associated with minimal symptoms i.e. palpitations or may present with syncope reentrant SVT involving the AV node comprising either AVNRT or AVRT readily responds to a variety of pharmacological agents. Adenosine has been widely and effectively used for the acute management of patients with SVT. The advantages of adenosine include its rapid and prompt onset of action i.e. 10-25 seconds when given via a peripheral vein, short half life (less than 10 seconds) and a high degree of efficacy and safety with minimal severity of adverse effects such as facial flushing, chest tightness, dyspnoea and transient sinus arrest and or AV block<sup>4</sup>.

Adenosine is preferred over all other drugs used for the treatment of SVT on account of its safety and efficacy. Previous studies done in this regard have concentrated on the efficacy of Adenosine therapy in SVT but this study evaluates all the cases under consideration with special

reference to its adverse effects besides its efficacy and usefulness in patients of SVT.

## Material and methods:

This study was conducted at Emergency Department of Punjab Institute of Cardiology from March 2003 to August 2003 on one hundred 100 patients of supraventricular Tachycardia including 37 Male and 63 Female patients ranging from 18-75 years of age with a mean age of 46.65 years.

All patients with supraventricular tachycardia including AVNRT (Atrioventricular Nodal Reentry Tachycardia), AVRT (Atrioventricular Reentry Tachycardia and Atrial Tachycardias) were included in the trial while patients of SVT other than those cited above i.e. cases of Pre-excitation syndromes, conduction defects, COPD, Bronchial Asthma and Acute Coronary Syndromes were all excluded from the study. All the cases under study were admitted to the emergency department of PIC Lahore on establishment of ECG diagnosis and were subjected to continuous ECG monitoring before, during and after treatment with Adenosine. Patients were investigated thoroughly and X-ray chest PA View, Echocardiography (where necessary), serum electrolytes, thyroid profile and cardiac enzymes or Troponin-T were done in the patients admitted for the management of SVT.

Adenosine injections were given by intravenous route in the form of a rapid I/V bolus followed by a 0.9% saline flush with varying doses ranging from 6mg to 18mg depending upon the response of the patient to therapy. An interval of two minutes was given between two

consecutive injections of Adenosine. Response to therapy was meticulously monitored and those patients not reverting to Normal Sinus Rhythm with Adenosine were segregated while all patients (responders and non responders) were evaluated for the occurrence of adverse effects of Adenosine including facial flushing, dyspnoea, chest pressure, bronchospasm and other rhythm disturbances. Those patients who did not experience any adverse effects were specifically noted.

All the cases under study were discharged from the hospital after post-treatment stay in emergency ward for a duration ranging from 2-6 hours and were advised to attend Out Patient Department of PIC for follow up and for further evaluation and work up for the underlying aetiology leading to these episodes of SVT.

### Results:

The 100 patients of supraventricular tachycardia included in this trial were between 18-75 years of age with a mean age of 46.5 years including 37 male and 63 female patients coming from all parts of the country and belonging to all the social and ethnic classes of the society (Table 1).

The mode of presentation of all the patients to the emergency department of Punjab Institute of Cardiology was variable with palpitation as a common factor in all the cases under study. 12% patients presented with complaint of chest pain while 10% cases had cold sweats. 6% cases had pre-syncope and 4% had syncope on presentation to the emergency room with SVT (Table 2).

Female preponderance was observed with 63% female patients under trial. Six patients had thyroid disease (thyrotoxicosis), Two cases suffered from congenital heart disease while four patients were pregnant.

Data collected from all the cases of SVT under study revealed variable patterns of arrhythmia/SVT. 81% cases had AVNRT, 12% AVRT and 07% had atrial tachycardia.(Table 3).

Response of the patients to adenosine therapy also varied with nature of arrhythmia. 87% patients responded to adenosine therapy and reverted to normal sinus rhythm in varying proportions. 75/81 (92.5%) were cases of AVNRT, 9/12(75%) of AVRT and 3/7 (42%) of atrial tachycardia responded to Adenosine therapy and reverted to normal sinus rhythm.(Table 4).

Table 1. Demographic profile of cases under study (n=100)

Age	Male	Female
18-75 Years range	37	63
46.65 Year mean		

Table 2. Clinical presentation of cases under study

Symptoms	%age
Palpitations	100
Chest pain	12
Cold sweats	10
Syncope	06
Presyncope	04

Table 3. Types of arrhythmias in patients under study (n=100)

Arrhythmias	%age
AVNRT	81
AVRT	12
Atrial Tachycardia	07

Table 4. Response of adenosine therapy in patients treated (n=87/100=87%)

Responders	%age
AVNRT	75/81(92.5%)
AVRT	09/12(75%)
Atrial Tachycardia	03/7(42%)

### Discussion:

Supraventricular arrhythmias are a common rhythm disturbance which is often repetitive, occasionally persistent and rarely life threatening. SVT that is persistent for weeks to months may lead to Tachycardia mediated Cardiomyopathy<sup>5</sup>.

Prompt diagnosis and early treatment is essential to prevent long term cardiovascular morbidity and mortality in such cases.

Adenosine is an effective and safe drug for the management of supraventricular tachycardia. Adenosine acts by diminishing conduction at the AV node and blocks reentry circuits and does not cause much hypotension. The average active life of less than 10 seconds is the unique quality of Adenosine. It is the chosen drug for the treatment of supraventricular Tachycardia by AHA (American Heart Association) especially for the initial treatment of supraventricular tachycardia<sup>6</sup>.

Since the conventional protocol for the management of SVT is to initiate certain vagal manoeuvres which augment the sympathetic tone and slow the conduction through the AV- Node. Carotid Sinus massage is the most commonly used method for this purpose. It is recommended for 5-10 seconds only on one side of the neck. This manoeuvre was done in all the cases under study before embarking on pharmacological treatment with adenosine<sup>6</sup>.

Our main aim in this trial was to evaluate the efficacy of Adenosine especially with reference to its adverse effects. Previous studies conducted in this context give a comparative analysis of other drugs used for the treatment of SVT. Drugs which have been used for the acute termination of SVT include adenosine and verapamil. In patients with hypotension, myocardial infarction or Pre excitation syndromes Adenosine should be given but for chronic cases of SVT oral therapy with Calcium channel blockers and Beta blockers are preferred drugs<sup>7</sup>.

In our study only Adenosine was given to the patients under trial and no comparative analysis was done with other drugs i.e. verapamil etc.

Adenosine has been effectively and safely used in patients of supraventricular tachycardia during Pregnancy and their treatment with Adenosine was successful without any haemodynamic compromise<sup>8</sup>. The results of our study

also endorse and approve the efficacy and safety of adenosine during pregnancy.

**Conclusion:**

Adenosine terminates supraventricular tachycardia effectively, rapidly and safely. Supraventricular tachycardia terminated in 87% cases in our study with Adenosine therapy with minimal adverse effects. Asystole, Spontaneous atrial fibrillation or Ventricular arrhythmias were not noted in our study. Adenosine is therefore safe and is recommended for the treatment of patients of Supraventricular tachycardia on account of its prompt mode of action i.e. within seconds, safety during pregnancy and minimal adverse effects.

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