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A Comparative Efficacy and Safetystudy of Adenosine and Verapamil for the Immediate Treatment of Stable Narrow Complex Supraventricular Tachycardiaat Chitwan Medical College, Nepal.

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ABSTRACT

Background

People with supraventricular tachycardia (SVT) frequently are symptomatic with palpitation and present to the emergency department for treatment. Acute management of supraventricular tachycardia includes controlling the rate and preventing hemodynamic collapse.Adenosine or calcium channel antagonists are administered to terminate stable narrow complex SVT.

Objectives: To compare the efficacy and safety of adenosine with that of verapamil in the treatment of stable narrow complex supraventricular tachycardia (SVT) who presented at Chitwan Medical College.

Methods: Comparison was made between 28 SVT patients receiving Adenosine and another 30 SVT patients receiving Verapamil. In Adenosine group, initially 6mg bolus was administered. If fails, a further 12mg bolus dose was administered which again if fails, shifted to Verapamil group. On the other hand, In Verapamil group, initially 5mg bolus slowly administered over 2 minutes.Iffails, another dose of 5mg verapamil repeated after 5 minutes which if fails again, shifted to adenosine group.

Results: Of 28 patients in Adenosine group, 24 (93.1%) patients were cardioverted to sinus rhythm with 6 mg and 3(5.2%) patients converted to sinus rhythm with an additional 12 mg of adenosine whereas in Verapamil group, 30 (100%) patients were converted to sinus rhythm with 5 mg bolus dose. Total efficacy of adenosine and verapamil was 98.3% and 100% respectively. One patient (3.6%) in adenosine group developed cardiac arrest otherwise uneventful in both the group.

Conclusion: This study documents that both Verapamil and adenosine are non-inferior in convertingstable narrow complex supraventricular tachycardia to Sinus Rhythm and is also safe.

Key Words: Adenosine,Comparison, Efficacy, Safety,.Supraventricular Tachycardia (SVT),Verapamil

I. INTRODUCTION

Supraventricular tachycardia is a common abnormal rhythm of the heart that results in a very rapid heartbeat.Patients with supraventricular tachycardia frequently present to the Emergency Departmentwith distressingsymptoms of palpitations, light-headedness and chest pain.[1]Some patients can have angina, hypotension and intenseanxiety. Occasionally, it may also cause confusion or loss of consciousness.Most supraventricular tachycardia are benign and self-terminated.For some patients, rest, reassurance and sedation may be all that are required to abort an attack of SVT. [2] Serious hemodynamic instability occurs in a small minority and requires immediate electrical cardioversion.[3,4]The criteria for defining instability are chest pain, systolicblood pressure less than 90mmHg, confusion or signs of cardiac failure.

Vagal maneuvers such as carotid sinus massage and valsalva serve as the first line of therapy in younger individual but when these maneuver fails,

pharmacological treatment is required. The two most commonly used drugs are adenosine and verapamil, both are known to be effective but both have a different efficacy and significant side-effect profile.[5]Adenosine is a safe, effective and rapidly acting drug in terminating supraventricular tachycardia.[6] Adenosine is associated with transient side effects such as facial flushing, chest discomfort in 15.26%, breathlessness in 3.42% and dizziness in 8.04% of subjects.[2] Intravenous verapamil is associated with hypotension in 9.1% of subjects.[7]Verapamil is more effective than adenosine in conversion of SVT to sinus rhythm as shown from previous literature. [6]

II. METHODS

This is a prospective observational hospital based study carried out in the department of cardiology at Chitwan Medical College, Bharatpur, Chitwan after approval from institutional ethical committee. Informed consent was taken from each participated patient.Total number of 58 patients were included in this study presenting at CMCTH with the diagnosis of narrow complex SVT from October 1, 2018 to September 31, 2020. Comparison was made between 28 SVT patients receiving Adenosine and another 30 SVT patients receiving Verapamil. Patients with hemodynamicallyunstable and wide complex supraventricular tachycardia were excluded.The rationale of this study is to compare both drugs, adenosine and verapamil in terms of efficacy.

Intervention: In Adenosine group, initially 6 mg bolus was givenand if it fails to cardiovert within 2 minutes of the administration, a next dose 12 mg bolus was administered. If supraventricular tachycardia persisted then the patient were shifted to Verapamil group. On the other hand in Verapamil group, patients were given intravenous verapamil 5 mg bolus over a period of two minutes and if SVT persisted even after 5 minutes of first dose of Verapamil, another additional 5mg Verapamil was administered. If second dose of verapamil fails to cardiovert then the patients were shifted to adenosine group. Heart rate and blood pressure was continuously monitored during drug infusion and for up to 30minutespost-conversion.

Outcome Parameters The primary outcome measures was chemical cardioversion into Sinus rhythm.

Statistical analysis: Collected information was transferred to SPSS version 17.0 computer software program and analyzed accordingly. Continuous or interval-related variables are expressed as mean+SD. Comparison of continuous variables between two groups were done using the Student's t-test. P value ≤0.05 was considered to indicate a statistically significantly similar in efficacy.

III. RESULTS:

Our patient age ranged from 7 to 91 years with mean age of 48.9± 18.23 in adenosine group whereas in verapamil group, age ranged from 19 to 87 years with mean age of 51.7±17.77. Adenosine group comprise of 16 (57.1%) female and 12 (42.9%) male whereas Verapamil group consists of 21 (70%) female and 9 (30%) male. A total of 58 patients with stable narrow complex SVT were analyzed. Of these, of 28 in Adenosine group, 24 (93.1%) patients were cardioverted to sinus rhythm with 6 mg bolus and 3(5.2%) patients converted to sinus rhythm with an additional 12 mg bolus of adenosine. 1(1.7%) patient did not get cardioverted with adenosine. So, 5mg verapamil was needed to convert into sinus rhythm. Therefore, total efficacy of adenosine was 98.3%. In Verapamil group, 30 (100%) patients were converted to sinus rhythm with 5 mg bolus dose and none of the patient needs an additional 5 mg dose of verapamil. Total efficacy of verapamil was 100%. Test of proportion was applied and it was found that there was statistically no significant difference in efficacy of verapamil (p value =0.000) in comparison to adenosine (p value 0.036). The mean dose of the adenosine used was 7.71 mg and verapamil was 5mg. Overall, efficacy of verapamil (100%) wasgreater than adenosine (98.3%). In adenosine group, hypertensive, diabetic, hyperthyroidism and daily alcohol intake was noted in 4 (14.3%) cases, 2 (7.1%) cases, 1(3.6%) cases and 1 (3.6%) cases respectively whereas in verapamil group only hypertensive and diabetic were noted which is 2 (6.7%) cases and 1 (3.2%) cases respectively. One patient (3.6%) in adenosine group developed cardiac arrest with the introduction of 6mg bolus adenosine but able to make him survive with injection atropine 0.6mg and cardiopulmonary resuscitation (CPR) for about 1 minute otherwise uneventful in both the group which accounts for 96.4% inadenosine group and 100% in verapamil group.No mortality happened in both the groups. Test of proportionwas applied and it was found that there was statisticallysignificantly similarin efficacy of verapamil (p value=0.036) compared to adenosine (p value=0.000).

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Table 1: Efficacy of Adenosine versus Verapamil

Drug name	Dose	Successful Cardioversion	Unsuccessful Cardioversion	Efficacy	p Value
Adenosine (n=28)	6mg	24 (93.1.3%)	4(6.9%)	27 (98.3%)	0.036
	12mg	3 (5.2%)	1 (1.7%)		
Verapamil (n=30)	5mg	30 (100%)	0 (0%)	30 (100%)	0.000
	10mg				

Figure 1: Efficacy of Adenosine versus Verapamil

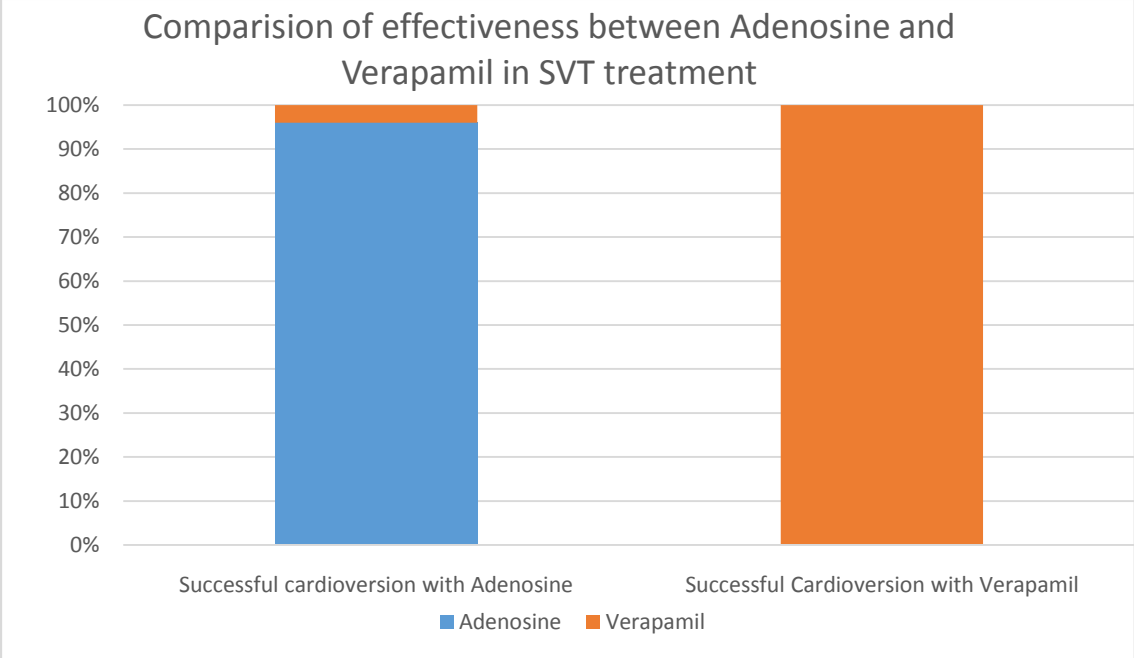

Table 2: Demographics of SVT patients:

Feature	Adenosine group	Verapamil group
Hypertension	4 (14.3%)	2 (6.7%)
Diabetes	2 (7.1%)	1 (3.2%)
Hyperthyroidism	1 (3.6%)	
Daily alcohol intake	1 (3.6%)	
ECHO Findings		
Normal	16 (57.1%)	19 (63.3%)
Grade I LVDD	11 (39.3%)	11 (36.7%)
RHD: Post MVR	1 (3.6%)	

Table 3: Comparison of safety outcome in Adenosine and Verapamil group

Feature	Safety in adenosine group	Safety in verapamil group
Cardiac arrest	1 (3.6%)	0%
Uneventful	27 (96.4%)	100%
Mortality	0	0

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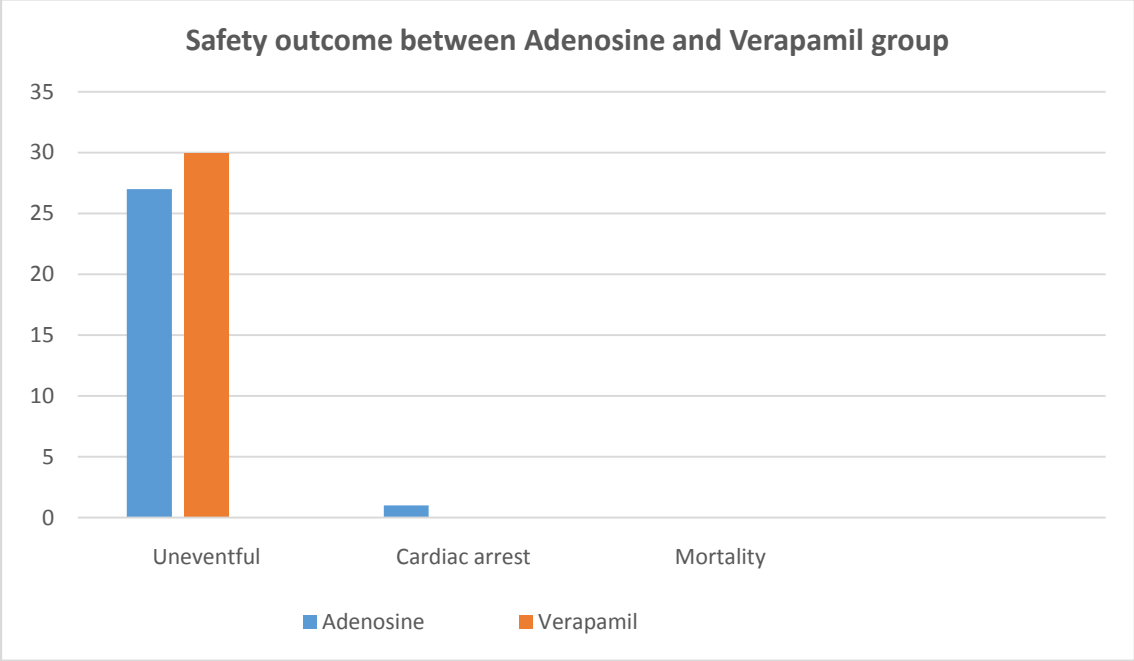
Figure 2: Safety outcome between Adenosine and Verapamil



IV. DISCUSSION

Because of adenosine's rapid onset, short half-life, and favorable safety profile, the American College of Cardiology, American Heart Association (AHA), and European Society of Cardiology recommend adenosine as the preferred agent for the pharmacologic management of paroxysmal supraventricular tachycardia.[8] The AHA Advanced Cardiac Life Support guideline recommends initially administering a 6-mg adenosine bolus over one to three seconds followed by a 20-mL saline flush.[9]If this does not convert the rhythm to sinus, a 12-mg bolus administration should follow; a second 12-mg bolus may be given if the first 12 mg adenosine is ineffective.[9]

Non-dihydropyridine calcium channel blockers should be second-line agents or used in patients with contraindications to adenosine. If the patient initially improves with adenosine therapy but if supraventricular tachycardia return back quickly, verapamil and diltiazem may be useful because of their longer half-life. Verapamil and adenosine are the most common used agents to treat stable narrow complex supraventricular tachycardia. Most previous trials comparing bolus intravenous adenosine with bolus doses of intravenous verapamil either in the electrophysiology laboratory or in the pre-hospital arena have affirmed the equivalent efficacy ofverapamil and adenosine in the initial conversion of SVT with a rate of success ranging from 59% to 100% for adenosine and from 73% to 98.8% for verapamil but a few have proven adenosine to be more effective than verapamil.[8,9,10,11]

Ben Delaney and colleagues in 2011 searched Medline, EMBASE, CINAHL, the Cochrane databaseand international clinical trial registries for randomized controlled trials comparing with verapamil and concluded similar efficacy in treating PSVT.[12]

Verapamil and adenosine are both safe and effective options for the treatment of SVT. Adenosine has a higher rate of minor adverse effects whileverapamil has a higher rate of hypotension. For institutions where verapamil and adenosine, both are available for the treatment of stable SVT, the choice between the agents should be made on a case by case basis.

V. CONCLUSION:

Verapamil and adenosine are both effective in the treatment of narrow complex supraventricular tachycardia. Verapamil was successful in all the cases but Adenosine failed to restore sinus rhythm in only one case of narrow complex SVT.This study documents,both the drugsVerapamil and adenosine are non-inferiorin converting stablenarrow complex SVT to Sinus Rhythm. One should not hesitate to treat such patient in hospital where there is facility of ECG monitoring and having resuscitation equipment. Therefore, In Developing country like Nepal, anyone drug either Adenosine or Verapamil can be used as an alternative to one another. Only thing is

that these drugs should be given while patient under continuous ECG monitoring with the instrument in ready position for resuscitation in nearby area. Otherwise both the drugs are safe for the management ofstable narrow complex SVT.

Statistically, there seems similar efficacy between Adenosine and Verapamil in the treatment of stable narrow complex SVT. The availability of both the medication are limited even in major hospital of Nepal. So, Adenosine or Verapamil, what-ever drug available in the hospital itself can be used without any hesitation to treat the stable narrow complex SVT.

VI. LIMITATION:

1. This study is limited to single center with small sample size.
2. This study excludes hemodynamically unstable narrow complex tachycardia as well as wide complex tachycardia.
3. The Long term outcomes were not evaluated.

Conflict of interest: None
Acknowledgement: None

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