ORIGINAL ARTICLE

Adenosine Versus Verapamil for the Treatment of Supra-ventricular Tachycardia: Randomized Comparative Trail

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ABSTRACT

Objective: To compare the relative effects of adenosine versus intravenous verapamil in the emergency treatment of supraventricular tachycardia (SVT), and to determine which is the most appropriate for the management of SVT.

Patients and method: We performed a prospective comparative study in 180 patients from January 11, 2010 to June 20, 2010. Comparison was made between 90 SVT patients receiving Adenosine and another 90 SVT Patients receiving Verapamil. In Adenosine group, initially 6 mg bolus was administered, and if it fails to cardiovert with in 2 minutes of the administration, a further 12 mg bolus was administered. If SVT 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 2 minutes and another 5 mg repeated after 10 minutes of the initial dose if the SVT persisted. If 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 30min post-conversion.

Results: A total of 180 patients with spontaneous stable SVT were analyzed. Of these, In Adenosine group, 54 (60%) patients were cardioverted to sinus rhythm with 6 mg bolus and 17(18.89%) patients converted to sinus rhythm with an additional 12 mg bolus of adenosine. Total efficacy of adenosine was 78.9%. In Verapamil group, 74(82.22%) patients were converted to sinus rhythm with 5 mg dose and 8(8.89%) patients converted to sinus rhythm with an additional 5 mg dose of verapamil. Total efficacy of verapamil was 91.1%. Test of proportion was applied and it was found that there was statistically significant difference in efficacy of verapamil as compared to adenosine (p value 0.02).

Conclusions: This study documents effectiveness of Verapamil over adenosine in converting stable spontaneous SVT to Sinus Rhythm**.** And thus, Verapamil is an alternative to adenosine in the emergency treatment of SVT. It is safe and affordable for healthcare systems where the availability of adenosine is limited.

Key words: Supraventricular tachycardia (SVT), adenosine, verapamil, efficacy.

INTRODUCTION

Patients with paroxysmal supraventricular tachycardia frequently present to the Emergency Department. Patients present with distressing symptoms of palpitations, light-headedness, and chest pain[1]. For some patients, rest, reassurance, and sedation may be all that are required to abort an attack[2]. Most SVT are benign and self-limited. However, some patients can have angina, hypotension, and intense anxiety. The first step in the management of SVT is to determine whether the patient is hemodynamically stable. Serious hemodynamic instability occurs in a small minority and requires immediate electrical cardioversion[3,4]. The criteria defining instability are chest pain, systolic blood 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 and when these fail, 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]. The goal of pharmacological treatment is to slow or block AV nodal conduction. There remains some controversy regarding the relative effectiveness of adenosine and verapamil for the treatment of PSVT[8].

Adenosine is a safe, effective and rapidly acting drug for terminating SVT[6]. Adenosine is accompanied by 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].

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The rationale of study is to compare both drugs in terms of efficacy. Verapamil is a cheaper drug as compared to adenosine and is more effective than adenosine in conversion of SVT to sinus rhythm as shown from previous literature[6]. Adenosine is more costly than verapamil, The average cost of converting a patient from SVT to sinus rhythm with adenosine is more than double the cost with verapamil[7]. This will help the patients as well as hospital in terms of cost benefits in the treatment of SVT.

PATIENTS AND METHODS

Study population: From 11 January 2010 to 20 June 2010, a total number of 180 patients were included in this study presenting at tertiary health care centre in emergency department with the diagnosis of SVT. Comparison was made between 90 SVT patients receiving Adenosine and another 90 SVT Patients receiving Verapamil. Patient with hemodynamic instability, impaired cerebral Perfusion, arrhythmias other than PSVT were excluded.

Intervention: In Adenosine group, initially 6 mg bolus was administered, and if it fails to cardiovert with in 2 minutes of the administration, a further 12 mg bolus was administered. If SVT 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 2 minutes and another 5 mg repeated after 10 minutes of the initial dose if the SVT persisted. If 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 30min post-conversion.

Assessment: Patients were monitored for transient side effects of Adenosine such as facial flushing, chest discomfort, breathlessness and dizziness. Intravenous verapamil was monitored for episode of hypotension.

Outcome parameters: The primary outcome measure was cardio version into Sinus rhythm.

Statistical analysis: Collected information was transferred to SPSS (Statistical Package for the Social Sciences) version 16.0 computer software programme and analyzed accordingly. Continuous or interval-related variables are expressed as mean+SD. Comparison of continuous variables between groups was done using the Student's t-test. Comparison of discrete variables between groups was done using the x2 test and Fisher's exact test. An alternative test was used when the assumption for repeated measurement was not fulfilled. P≤0.05 was considered to indicate a statistically significant difference.

RESULTS

The mean age was 37.41+11.46 and 41.39+11.55 years (Adenosine versus Verapamil), respectively, in the two groups. In Adenosine group, 54 (60%) patients were converted to sinus rhythm with 6 mg bolus. 17(18.89%) patients converted to sinus rhythm with an additional 12 mg bolus of adenosine. Total efficacy of adenosine was 78.9%. The mean dose of the drug used was 10.80 mg S.D+5.91. Of the remaining 19 patients not converted with adenosine, 9 converted with 5 mg of verapamil and 10 patients converted with 10 mg of verapamil.

Table: Efficacy of Adenosine versus Verapamil

Drugs	Dose(mg)	Successful cardioversion	Unsuccessful cardioversion	Efficacy	P Value
Adenosine (n=90)	6	54(60%)	36(40%)	71 (78.9%)	0.02
	18	17(18.89%)	19(21.11%)		
Verapamil (n=90)	5	74(82.22%)	16(17.78%)	82 (91.1%)	
	10	8(8.89%)	8(8.89%)		

In verapamil group, 74(82.22%) patients were converted to sinus rhythm with 5 mg dose. 8(8.89%) patients converted to sinus rhythm with an additional 5 mg dose of verapamil. Total efficacy of verapamil was 91.1%. The mean dose of the drug used was 5.89 mg S.D+1.92. Of the remaining 8 patients not converted with verapamil, 4 converted with 6 mg of adenosine and 3 patients were converted with 18 mg of adenosine and 1 patient required direct current cardioversion.

Overall, efficacy of verapamil (91.1%) was greater than adenosine (78.9%), Test of proportion was applied and it was found that there was statistically significant difference in efficacy of verapamil as compared to adenosine (p value 0.02).

DISCUSSION

Verapamil and adenosine are the most common agents used to treat paroxysmal supraventricular tachycardia (PSVT). Most of the 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 of

verapamil 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[9,10,11,12].

A randomized, multicenter trial done in 2003 by K A Cheng and colleagues evaluated no significant difference between the two groups with respect to clinical variables. Relative drug efficacies were 86.0% (52/60) for adenosine versus 87.1% (54/62) for verapamil[13].

Ben Delaney and colleagues in 2011 searched Medline, EMBASE, CINAHL, the Cochrane database, and international clinical trial registers for randomized controlled trials comparing with verapamil, and concluded similar efficacy in treating PSVT[8].

Verapamil and adenosine are both safe and effective options for the treatment of PSVT. Although adenosine has a higher rate of minor adverse effects, verapamil 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 with awareness of the respective adverse effect profiles, and should involve informed discussion with the patient where appropriate.

There are many areas in Pakistan where intravenous calcium channel blockers, verapamil, is still being used as first line treatment of spontaneous stable SVTs as intravenous adenosine is not available because of its higher cost. In these circumstances, verapamil can be recommended to be administrated as cost effectiveness and higher efficacy especially foe developing countries like Pakistan.

CONCLUSION

This study documents effectiveness of Verapamil over adenosine in converting stable spontaneous SVT to Sinus Rhythm. Thus, In Pakistan in general, Verapamil will be safe and affordable for healthcare systems where the availability of adenosine is limited.

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