ORIGINAL ARTICLE

COMPARING THE EFFICACY OF INTRAVENOUS ADENOSINE AND VERAPAMIL IN TERMINATION OF ACUTE PAROXYSMAL SUPRAVENTRICULAR TACHYCARDIA

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Background: Paroxysmal supraventricular tachycardia (PSVT) has always been a diagnostic and therapeutic challenge for the cardiologists. There are many modalities to treat the problem. Of the available pharmacological treatment, the role of verapamil and adenosine is under debate. This study was carried out to detect and compare the efficacy of both drugs. The objective of this study was to compare the efficacy of intravenous adenosine and verapamil in termination of PSVT. **Methods:** This experimental study was carried out in the Emergency department of Chauhdry Pervaiz Elahi Institute of Cardiology, Multan from to August 2008 to February 2010. A total of 120 patients with PSVT were divided in two groups. Patients in group A were treated with adenosine and group B patients received verapamil. **Results:** The efficacy of adenosine was proven among 56 (93%) patients, while verapamil in 43 (71%) patients. The results were statistically significant (p-value <0.05). **Conclusions:** Although, both the drugs have high efficacy, adenosine is more effective than verapamil for termination of PSVT.

Keywords: Verapamil; adenosine; Paroxysmal supraventricular tachycardia.

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INTRODUCTION

Supra ventricular tachycardia (SVT), by definition, includes all forms of tachycardia that either arises above the bifurcation of the bundle of His or that have mechanisms dependent on the bundle of His. In patients with SVT, the heart rate is at least 100 beats/min, but ventricular rates can be lower as a result of atrio ventricular (AV) block. On electrocardiography (ECG), QRS morphology is usually normal or supra ventricular; however, it may be widened or abnormal because of intrinsic conduction disturbance, myocardial disease, or rate-related bundle branch block.[1]

Paroxysmal supraventricular tachycardia is episodic, with an abrupt onset and termination.[1,2] PSVT include all tachyarrhythmia's that originate in supra ventricular tissue or incorporate supra ventricular tissue in re-entrant circuit and has sudden onset and termination. Atrio-ventricular nodal re-entrant tachycardia (AVNRT) and atrio-ventricular re-entrant tachycardia (AVRT) are two major types of PSVT; other rare types are atrial tachycardia, paroxysmal atrial flutter and paroxysmal atrial fibrillation.[3]

PSVT is the most common tachyarrhythmia with a prevalence of 2.25 per 1000 cases, often recurrent and frequent cause of visits to cardiac emergency room.[4–8] Younger female patients with SVT are more than twice as like to be male.[9] Most females with SVT present during their childbearing years (15–50 years)[10] and this has been linked to the effect of progesterone on the myocardium[11]. Women with SVT are more likely to have AVNRT than men whereas there is a male predominance in AVRT.[12]

Supra ventricular tachycardia's are often recurrent, occasionally persistent, and a frequent cause of visits to emergency rooms and primary care physicians. The common symptoms of SVT include palpitations, anxiety, and light-headedness, chest pain, pounding in the neck and chest, and dyspnea.[13]

Augmentation of vagal tone by manual carotid stimulation may restore PSVT to sinus rhythm. When simple maneuvers such as carotid stimulation fail, supra ventricular tachycardia can be treated in the Emergency department with a variety of different drugs. First line drugs for paroxysmal supra ventricular tachycardia are adenosine 6–12 (mg) and intravenous verapamil 5–15 mg.[14] Adenosine is highly effective in PSVT characterized by fast heart rates, whereas the efficacy of verapamil is increased in patients of PSVT with lower heart rates.[15]

Data from randomized trials show that supra ventricular tachycardia is terminated in 60–80% of patients treated with 6 mg of adenosine and in 90–95 percent of those treated with 12 mg. Verapamil also successfully terminates PSVT in 81.8% patients.[13] In one of the study at Punjab Institute of Cardiology, Lahore, the response to adenosine therapy revealed 92.5% in patients of AVNRT, 75% in patients of AVRT and 42% in patients of atrial tachycardia.[8] In a study a total of 206 patients with spontaneous SVT

were analyzed. Of these, half of the patients were administered calcium channel blockers and half were given adenosine. The conversion rates for the calcium channel blockers (98%) were statistically higher than the adenosine group (86.5%).[16] In a study, eight trials involving 577 patients were reviewed. Combined analysis of these trials showed no difference in the effectiveness of adenosine and verapamil in successfully treating supra ventricular tachycardia, with an overall success rate of approximately 90% for both drugs. The objective of this study was to compare the efficacy of intravenous adenosine and verapamil in termination of paroxysmal supraventricular tachycardia.

MATERIAL AND METHODS

This experimental study was carried out in the Emergency department of Chauhdry Pervaiz Elahi Institute of Cardiology, Multan from August 2008 February 2010**.** A total of 120 patients with PSVT were divided in two groups. Patients in group A were treated with adenosine and in group B, patients received verapamil. Efficacy was main outcome, which was measured by termination of PSVT. The result was compared for significance by applying chi-square test. *p*-value <0.05 was taken as significant.

RESULTS

There were total 120 patients included in the study. Out of these, 46 (38.3%) were males and 74 (61.7%) were females. All the patients were divided in two groups. In group-A, there were 24 (40%) patients who were male and 36 (60%) patients were female. In group-B, there were 22 (36.7%) patients were male and 38 (63.3%) patients were female.

The mean age of patients in group-A was 28.90±11.04 with an age range of 17–56 years. The there were 9 (15%) patients of age less than 20 years. There were 31 (51%) patients of age range of 21–30 years, 10 (17%) patients of age range of 31–40 years, 7 (12%) patients of age range of 41–50 years. There were 3 (5%) patients of age range of >50 years. In group-B, there were 11 (18%) patients of age less than 20 years, 29 (48%) patients of age range of 21–30 years, 12 (20%) patients of age range of 31–40 years, 7 (12%) patients of age range of 41–50 years. There were 1 (2%) patients of age range of >50 years. The mean age of patients in group B was 32.38±12.07 (Table-1).

In group-A, there were 60 patients who received adenosine for the termination of PSVT. Of these 60 patients, the termination of PSVT was observed in 56 (93.3%) patients. while the remaining 4 (6.7%) patients did not show termination of PSVT. Among the 60 patients of group-B, who were treated with verapamil, there were 43 (71.6%) patients in whom PSVT was terminated, while 17 (28.4%) patients did not show termination of PSVT. (Table-2).

Table-1: Distribution of patients by age (n=120)

Age	Group-A		Group-B	
(years)	No.	%age	No.	%age
<20	09	15.0	11	18.0
21–30	31	51.0	29	48.0
31–40	10	17.0	12	20.0
41–50	07	12.0	07	12.0
>50	03	05.0	01	02.0
Mean±SD	28.90±11.04		32.38±12.07	
Range	17–56		18–55	

Table-2: Distribution of patients by termination/efficacy of PSVT (n=120)

Termination/ efficacy of PSVT)	Group-A		Group-B	
	No.	%age	No.	%age
Yes	56	15.0	43	71.6
No	4	06.7	17	28.4

DISCUSSION

Paroxysmal supraventricular tachycardia is a common abnormal rhythm of the heart resulting in a very rapid heartbeat. PSVT can sometimes be treated with simple physical maneuvers such as forced breath holding. When simple maneuvers fail, supraventricular tachycardia can be treated in the Emergency department with a variety of different drugs. The two most commonly used drug types are adenosine and calcium channel antagonists (verapamil is the most frequently used drug in this class). This study was conducted in the Emergency department of Chauhdry Pervaiz Elahi Institute of Cardiology, Multan on 120 patients. In this study, we compared the efficacy of the two drugs. We found that adenosine was effective in 93.3% patient population in terminating the PSVT, while verapamil was effective in 71.6% patient population.

In Pakistan, the studies that have compared the efficacy of the two drugs are lacking. There are few studies that have documented the efficacy of single drug separately. A study was conducted on 100 patients by Majeed *et al* to evaluate the efficacy of adenosine.[7] The response of adenosine therapy revealed 92.5% in patients of AVNRT, 75% in patients of AVRT and 42% in patients of atrial tachycardia. These results also favored the results of our study that adenosine is more efficacious in termination of PSVT. This study also analyzed the adverse effects related to adenosine and revealed that facial flushing occurred in (26%) patients, while dyspnoea chest pressure, bronchospasm and other rhythm disturbances were also present in other patients while 30% patients had no side effects. Like our study, they also concluded that adenosine is a safe, effective and rapidly acting drug for terminating SVT. Additionally, they also showed that it was associated with very limited number of adverse effects if they occur at all.

In our study, the majority of patients in both groups were of younger age, i.e., the mean age of the patients in group-A was 28.90±11.04 years and it was 32.38±12.07 years in group-B. When compared to the study by Kenneth *et al* the majority of the patients in their

study was <65 years, i.e., 77% in group-A and 87% in group-B.[17] In another study by Eric *et al* the mean age of the patients was 45%.[18] Similarly, the majority of the patients in study by Kenneth *et al*, were female, i.e., 80% in group-A and 67% in group-B. This finding is almost similar to our study which has also concluded that female population constitutes the majority of the patients, 60% in group-A and 63.3% in group-B. This suggests that PSVT is common among female population.

Garrat *et al* performed a study on 20 patients with diagnosis of PSVT to compare the efficacy of the two drugs, i.e., verapamil and adenosine.[19] Like our study, the main outcome measure was successful termination of the supraventricular tachycardia. However, the sample size was quite larger in our study, i.e., 120 patients. They noticed the termination of tachycardia in 100% patients with adenosine and 95% with verapamil ($p<0.05$).

In a reterospective clinical trial by Rankin *et al*, which was conducted on 43 patients with PSVT to compare the efficacy of the two drugs, it was noticed that PSVT was terminated in 96% patients with adenosine and 81% patients with verapamil.[20] This results of this study are also agreement of our results that adenosine is more efficacious in termination of PSVT.

Di Marco *et al* performed a clinical trial on a very large sample of 359 patients and concluded that adenosine was efficacious in termination of tachycardia in 91% patients.[21] This was a comparative study, but they compared the drug with placebo which showed efficacy in 16.1% patients. The efficacy of the adenosine was almost similar to that in our study, however this study did not compared it with verapamil. However, their sample size was larger as compared to our study. In a clinical trial by Hood *et al*, the two drugs were compared for the efficacy in terms of termination of PSVT.[20] This was a randomized double blind study performed on 25 patients. This study concluded that adenosine was effective in 100% patients and verapamil in 73%. This study also favored the results of our study that adenosine is more efficacious in termination of SVT.

The limitation of our study being that it was not blinded due to different doses and timing of drugs.

CONCLUSION

Although, both adenosine are verapamil are highly effective in termination of PSVT, adenosine has higher efficacy as compared to verapamil.

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