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Comparison between Antecubital Vein and External Jugular Vein Effectiveness as Routes of Administration of Adenosine in Patients Referred to a Hospital in Tehran

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In patients with paroxysmal supraventricular tachycardia (PSVT), adenosine is administered through a peripheral vein by which the initial dose of 6mg of adenosine is effective in up to only 58% patients and many need a second dose of 12 mg. The aim of this study is to compare the effectiveness of antecubital vein with external jugular vein as routes of administration of adenosine. We conducted this randomized controlled trial at the Emergency Department of a university hospital, Tehran, Iran between 2009 and 2012. Forty-sixPatients were randomized to receive adenosinefrom either the route of antecubital vein (n=25) or external jugular vein(n=21). In the antecubital vein group, 14 (56%) patients were treated successfully with the first dose of adenosine which was significantly lower than 20 (95%) patients in the external jugular vein group (p=0.003). we suggest that the external jugular vein route of administration of adenosine is a safe, dose saving and cost effective approach in treating patients with PSVT.

Key words: Antecubital vein, Jugular vein, Adenosie, Tehran Hospital.

Paroxysmal supraventricular tachycardia (PSVT)is considered as a fast heartrate and regular rhythm with an incidence of 35 per 100,000 person-years, and prevalence of 2.29 per 1,000 persons[1, 2]. The first treatment goal for PSVT is its cessation[3]. Urgent management of hemodynamically stable patients with PSVT isdivided into nonpharmacologic and pharmacologic methods[4]. Nonpharmacologic management including maneuvers that increase vagal tone to decrease heart rate is the first step with the success rate of 20%. If it fails, the next step is pharmacologic management with intravenous adenosine, verapamil or beta blockers[5]. Adenosine is an endogenous nucleoside and atrioventricular nodal blocking drug with a very short half-life of 10 seconds[6]. It is highly effective for the termination of nodal-dependent PSVT and is the first-line drug for diagnosing or treating patients with supraventricular arrhythmias since the 1980s[7-10]. The first dose of adenosine is 6 mg, which is administered intravenously in a peripheral vein as a rapid bolus followed by a 20 mL fluid flush. Patients with no response to the initial dose of 6 mg receive a second dose of 12 mg after one to

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two minutes. A third dose of 12 mg is administered if thesecond dose does not work[11,12]. Intravenous adenosine should be administered through a large veinbecausethe high amount of a doseis inactivated before reaching the heart if it is administered in asmall peripheral vein[13]. Although the overall cessation rate with peripheral vein infusion of adenosine is about 90% the initial dose of 6mg of adenosine is effective in up to only 58% patients and many need a second dose of 12 mg for cessation of PSVT[14]. In addition to that, adenosine is a costly drug comparing to the other antiarrhythmic drugs. Its costs 60 times the cost of verapamil in 1993 and it has been reported that 6 mg of adenosine costs $12.50 in August 2006 compared to $1.00 for verapamil(15). We conduct this study to find the safety and effectiveness of extra jugular vein route of administration for adenosine and compare the doses of adenosine needed for treatment of PSVT in this method with the current method of antecubital vein route of administration.

Patients and Methods

This was a randomized, controlled trial conducted at the Emergency Department (ED) of a university hospital, Tehran, Iranbetween 2009 and 2012. The trial was approved by the appropriate institutional ethics review committees, and informed consent form were given to the patients containing a complete description of the research project, research objectives, benefits and possible side effects for the methods.Patients with the complaints of palpitation, fatigue, lightheadedness, feeble or brief respiration, and chest pain,who came to the ED, underwent immediate ECG testing. Patients with the ECG Criteria of sinus tachycardia with 150 -250 beats per minutes, no P wave and narrow QRS (<0.12ms) regardless of having history of PSVT whichwas or was not treated by adenosine were enrolled to the study. Patients were excluded if they were not hemodynamically stable at the time of coming to ED, experienced Ventricular Tachycardiaafter using adenosine in treatment of previous PSVTs, were not compliant with jugular vein puncture, or if there were difficultiesfor jugular vein puncture due to tissue destruction for example burn in the neck area.

Randomization was stratified by each center and was accomplished through Simple Randomization method using table of random numbers. Patients were randomized to receive adenosine from eitherthe route of antecubitalvein or external jugular vein. Firstly, adenosine 6 mg was administered and patients were monitored with ECG. If the heart rate was not terminated, the second dose of 12 mg of adenosine was administered and if this attempt failed so, the third dose was administered. Demographic data, responseor non-response to treatment with first doseof adenosine, and total dose of adenosine needed for treatment of PSVT in each patient were recorded.Statistical analyses were performed by using IBM SPSS 20 for windows. Two sample T-test and Fisher exact test were used tocompare quantitative and qualitative variables,retrospectively between two different study groups. The difference between groups was considered significant when P value is < 0.05.

RESULTS

From 2009 to 2012, 46 patients with the mean age of 42.4 (range 26-80) were entered to the study who were randomized either to the antecubitalvein group (n=25) with the mean age of 42.8 (range 26- 64) and to the external jugular-vein group with the mean age of 42 years (range 31-80). As shown in Table 1,there were no significant differences between two groups

Table 1. Demographic data and primary symptoms of patients

	Antecubital vein group (n=25)	External jugular vein group (n=21)	P value
Age (years)	42.8±11.8	42±12.4	0.87
*Sex*Female	48%	57%	0.57
Primary symptoms			
Palpitation	76%	80%	0.73
Chest pain	12%	14%	1.00
Respiratory distress	12%	6%	0.61

of patients regarding their demographic data and primary symptoms.

In the antecubital vein group, 14 (56%) patients were treated successfully with the first dose of adenosine which was significantly lower than 20 (95%) patients who were treated with the first dose of adenosine in external jugular vein (p=0.003). In other words, the mean of total doses of adenosine needed for treatment of PSVT in the antecubitalvein group was 12.3 mg comparing to 6.6 mg in the external jugular group (p=0.003). In the antecubital vein group, two (8%) patients needed 30 mg of adenosine for treatment of PSVT whereas no patient in the external jugular vein group needed such a high dose. The amount of doses of adenosine in each group is plotted in figure 1.

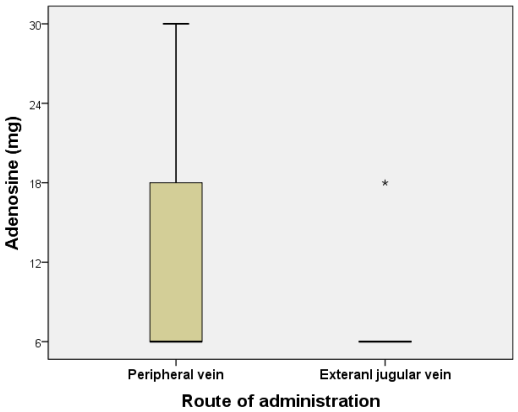

Fig. 1. Relation between route of administration and Adenosine dose

DISCUSSION

Adenosine is the first-line drug of choice in urgent pharmachologic management of PSVT[16]. It has been shown that with the current method of administration of adenosine through a large antecubital vein, 34% of patients need the second dose of 12 mg and 23% need the third dose of 12 mg to terminate the PSVT and approximately 43-70% of patients are treated successfully with the first 6 mg dose of adenosine[2, 17]. Similarly, in our study, in the group of patients given adenosine through peripheral vein, 46% needed a second dose of 12 mg of adenosine and 8% needed a third dose of 12 mg of adenosine. However, in another group of patients given adenosine through external jugular vein, only 5% needed a second dose of 12 mg of adenosine and 95% of patients were treated successfully with the first 6 mg dose of adenosine. Overall, there was no significant complication and mortality in both groups and all patients were treated successfully with adenosine however, the doses of adenosine might be different. Thus, central administration of adenosine is safe and more dose saving method compare to the current method of peripheral administration. Mcintosh et al. in 1993 compared the minimal effective dose of adenosine between central and peripheral routes of administration. In this study, after peripheral administration,PSVT was terminated in 37% of patients with 3 mg and in 33% with 6 mg compared with central administration of adenosine by which 77% of patients were treated with 3 mg and 20% with 6 mg.It was mentioned that the incidence of side effects was not differentbetween the two routes of administration so central administration of adenosine is safe requiring a lesser dose[17].In 2002 Chang et al. reported PSVT patient who was treated with just 3 mg of adenosine with central route of administration. They suggested that a lower dose of adenosine can be used with central vein administration[18]. In a case report by Tittabut et al. in 2009, two patients with PSVT were treated successfully with central administration of only 6 mg of adenosine while failed to response to peripheral adenosine. In summary, however, central vein puncture is an invasive method, we suggest that the central route of administration of adenosine is a safe, dose saving and cost effective approach in treating patients with PSVT.

CONCLUSIONS

Our studyshows thatthe external jugularvein route for a denosine infusion as first-linedrug of choicefor treatingthe sudden supraventricular tachycardia isaffordableand effective. The results of this study have also demonstrated that adenosine injection through external jugular vein route compared with antecubital vein is a much more safe and efficient.

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