Clinical characteristics comparision of the types of paroxysmal supraventricular tachycardia attack between young and elderly patients

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Abstract: This study is carried out to describe types of clinical characteristic of paroxysmal supraventricular tachycardia attack (PSVT) between young and elderly patients who underwent cardiac electrophysiology test. This is a cross sectional descriptiveand prospective study. 182 patients who were diagnosed with PSVT attack underwent cardiac electrophysiological test at Vietnam Heart Institute during 01/2014-05/2017. The patients were divided into two groups: Group I (n=93) is the young patients (< 60 years of age) and Group II (n=89) is a elderly patients (≥ 60 years of age).: Group I (young patients) accounted for 51.1% and Group II (elderly patients) made up 48.9%. vThe rate of PVST attack in female was 70.0% while that in male was 29.1% (P>0.05); the mean age of elderly patients was higher than younger patients (p < 0.0001). The PVST attacks have moredate positive correlation with structure (R = 0.355) and hypertension (R = 0.314), there are differences between both groups in the structure and hypertension. The structure and hypertension rates of patients in elderly petients group were higher than those in young patients group (p < 0.0001), there is a strongly postive correlation between the structure and hypertension patients (R = 0.966, p < 0.0001). Characteristics of PVST attack are 68.3% of atrioventricular nodal reentrant (AVNRT) and 29.6% of atrioventricular reciprocating tachycardia (AVRT) attacks; The AVNRT and AVRT attack rates in female were 74.8% and 61.8% respectively, whereas the AVNRT and AVRT attack rates in male were 25.2% and 28.2% respectively (p > 0.05). PVST attacks were more common in female patients than in male patients. the likelihood of having AVNRT was higher compared to AVRT attacks, and the mean age of AVNRT and AVRT attack in the elderly patients was higher than that in young patients.

Keywords:aging, clinical characteristics, PVST, young patients, elderly patients.

1. INTRODUCTION

Paroxysmal supraventricular tachycardia (PSVT) attack is an abnormality of rapid heart rhythm, which has an elctropathologic substrate on above the atrioventricular bundle, it's quite common in clinical practice, type of arrhythmias often appears suddenly and can be self-extinguished. PSVT hasfrequency of about 0.23-3.0% [1], [2]. In the United States, according to data from the MESA study showed that the prevalence is 2.25 per 1.000 persons,

the incidence of new case is 35 out of 100,000 persons each year, and about 89,000 new cases each year [2]. In Vietnam, there are no comprehensive statistics on morbidity. The PSVT attack can occur in patients of any ages.It's causing many uncomfortable symptoms such as palpitations, pulsation in the neck, fatigue, light headedness, sweating, tightness, chest pains, shortness of breath, dizziness and even syncope, ect. in some cases, the PSVT attacks prolonged for many hours, or many days causing hemodynamic disorders, or heart failure, increase the risk of falls (especially in the elderly) [2], [3]. PSVT attack is one of the rhythmias causing patiets to have to go to the hospital, or emergency department. Therefore, the treatments is very necessary to prevent further complications of this arrhythmias, and the ablation by intervention is very good solution [2], [3].

The PSVT includes the most common is atrioventricular nodal reentrant (AVNRT), quite common is atrioventricular reciprocating tachycardia (AVRT) with Orthodontic AVRT attack is more common than Antidromic AVRT. Where AVNRT and AVRT are two types of rhythms depending on the AV node (the AV node is part or whole of the loop (of the ring on the back). This is meaningful treatment because then the drugs affecting the AV node will be able to cut off the attack [2], [3].

For decades, there have been many methods of treatments for PSVT attack that have been applied and also have been certainly effective. The treatment methods for cutting off paraxysmal supraventricular tachycardia attack such as the flute therapy for vaginal nerve, drug therapy, drug, electric shock, pacemaker frequency, etc. to the prevention of recurrent attacks with drugs. Many treatment rhythm drugs were born, developed and now scientists are continuing to research and develop new antiarrhythmic drugs that are more effective [4], [5]. However, these are only temporary treatments that do not completely resolve the origin of the rhythm. Nowadays, the method of electrocardiography and radiotherapy of arrhythmia with radiofrequency wave energy is considered to be the most effective and most thorough treatment. Most of the PSVT attack can be completely eliminated [2], [5], [6]. Althoughselecting specific treatments for this arrhythmias depends on the types of PSVT attacks, it is very important to identify rapid onset ventricular tachycardia because it will allow the doctor to select the appropriate treatment and treatment strategies. Prophylaxis is appropriate for each nature of the attack.

In the world there have been many studies on the characteristics of the PSVT attack [2], [5], [6]. However, very few authors mentioned in details the characteristics of the PSVT attack of young and elderly people, ages relationship between aging and cardiovascular system [7-12]. Therefore, we conducted this study to explore the "characteristics of the paraxysmal supraventricular tachycardia attack between young and elderly patients" and "to findout some disorders of heart rhythm in young people and the elderly with characteristics of the paraxysmal supraventricular tachycardia attack through electrophysiological probe ".

2. MATERIALS AND METHODS

Study design: Cross-sectional descriptive study, prospective study

Participantss: 182 patients who were diagnosed with characteristics of the paraxysmal supraventricular tachycardia attack should be diagnosed and treated with RF at the Heart Institute, Bach Mai Hospital, Vietnam from 01/2014 to 05/2017. The patients were divided into two groups: Group I were young patients (patients under 60 years of age) & Group II were elderly patients (patients ≥ 60 years of age) [13], [14], [15].

Describes the cross-sectional descriptive study, proceeding in sequence analysis. Study at the Vietnam Bach Mai Hospital's Heart Institute,. The research was conducted on on patients who meet the selection criteria during January 2014 - May 2017.

Sample Size: Following formula can be used for calculation of sample size for comparison between two

groups. The PSVT attack can occurat any ages; Therefore, both AVNRT and AVRT are selected[16], [17].

$$\text{Sample size} = \frac{2 \times (Z\alpha/2 + Z_\beta)^2\, P\,(1-P)}{(p1 - p2)^2}$$

$Z_{\alpha/2} = Z_{0.05/2} = 1.96$ (From Z table) at error of 5% $Z_\beta = Z_{0.20} = 0.842$ (From Z table) at 80% power.

p1-p2: Difference in proportion of events in two groups = (0.6 - 0.3)= 0.3 [18]

P = PSVT type prevalence = [Prevalence in the case of AVNRT group (p1) + Prevalence in the case of

AVRT group (p2)]/2 = (0.6+0.3)/2 = 0.45

We selected p1 = 0.6 and p2 = 0.3 [18]

Calculator for the samples size = 43, the mean that researcher needs 43 patients per group. And then, the sampe size for the two groups are 86 patients.

We selected 182 patients to be sure there are enough samples for control*Stasistical Analysis:* Data is processed on a computer with IBM SPSS 21.0 software. Use T-test to compare 2 mean values, when squared compare 2 percentage. The p-value of 0.05 was considered statistically significant [17].

The correlation coefficient (R) show the strength and direction of a relationship between two variables ranging the between -1 and +1 and belonging to values R as follow:

Values R = 0: No linear relationship;

Values R = -1 or +1 : Perfect negative/positive linear relationship;

Values R = (-0.3: 0) or (0: 0.3): Weak negative/positive linear relationship; Values R = (-0.7: -0.3] or [0.3: 0.7): Moredate negative/positive linear relationship;

Values R = (-1:-0.7] or [0.7:1): Strong negative/positive linear relationship [17], [19].

2.2. Criteria for diagnosis of paraxysmal supraventricular tachycardia attack

Paroxysmal supraventricular tachycardia (PSVT) attack is episodes of fast heart rate, start attack in a part of the heart above the ventricle.

The electrocardiogram pattern which demostrates the Heart rate of regular ranges are higher than 140 to 250 beats per minute, the narrow QRS complex (< 120 milliseconds), regular, hidden or inverted P waves (behind the QRS complex) [20], [22].

2.2.1. Criteria for the AVNRT

AVNRT: Retry caused by nodal pathways or tracts. There are two types as typical (Slow-fast) and atypical (Fast-Slow) [6-7], [21-25]. a/ Typical AVNRT

-      Dual A-V nodal physiology

-      Retrograde AV conduction is through the fast way, the retrograde atrial activation sequence during tachycardia in concentric

-      VA interval during the tachycardia < 60 ms at His potential recording site and < 90 ms at high right atrium

-      PV stimulation during tachycardia should not preexcite the atrium when delivered at a time when His bundle is refractory b/ Atypical AVNRT

-      A retrograde dual AV conduction in some patients

-      Tachycardia induction depends on a critical A-V or His-atrial natural during retrograde slow pathway conduction

-      Retrograde atrial activation sequence during tachycardia is concentric

-      A-V natural during tachycardia < 60 mg at His potential site and > 90 ms at high right atrium

-      PV stimulation during tachycardia should not reset the atrium when delivered at a time that His bundle is refractory.

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2.2.2. Criteria for the AVRT

AVRT: Reentry caused by accessory pathways have two types which are orthodromic AVRT and antidromic AVRT attacks [6-7], [21-25].

a.   Orthdromic AVRT: RP interval < PR interval or RP interval > PR interval with a slowly conducting accessory pathway; retrograde P waves (leads DI, DII, DIII, aVF, V1); delta wave seen with normal sinus rhythm, not with tachycardia.

b.   Antidromic AVRT: Short RP interval < 100 msec; regular, wide QRS complex ≥120 msec; delta waves seen with normal sinus rhythm and tachycardia; concealed accessory pathways do not show delta waves.

3. RESULTS

3.1. Clinical characteristics:

182 patients who were diagnosed with paraxysmal supraventricular tachycardia attackunderwent electrocardiography and radiofrequency radiofrequency ablation tests, and were divided into two groups: Group I (younger group) and Group II (elderly group).

The mean of age is 53.1 ± 16.1 years [18: 78], they have 53 male of 182 patients (29.1%) and 129 female of 182 patients (70.9%) with p = 0.344 (>0.05).

Results showed that group I (n=93) had 51.1% and mean age of 40.5 ± 12.6 years old [18:59], and group II (n = 89) had 48.9% and mead age of 66.3 ± 5.2 years old [60:78] (p <0.0001). Group I had 30 males (32.3%) and 63 females (67.7%) with p> 0.05, group II had 25 males (25.8%) and 66 females (74.2%) with p> 0.05.

The most common symptom waspalpitationsfound in 179/182 (98.4%), chest pain was found in 74/182 (40.7%), shortness of breath was found in 31/182 (17.0%), dizziness was found in 38/182 (20.9%), and 5/182 patiens (2.7%) had fainting and syncope (all syncope patients were met in young group); Many patients have these symptoms combined.
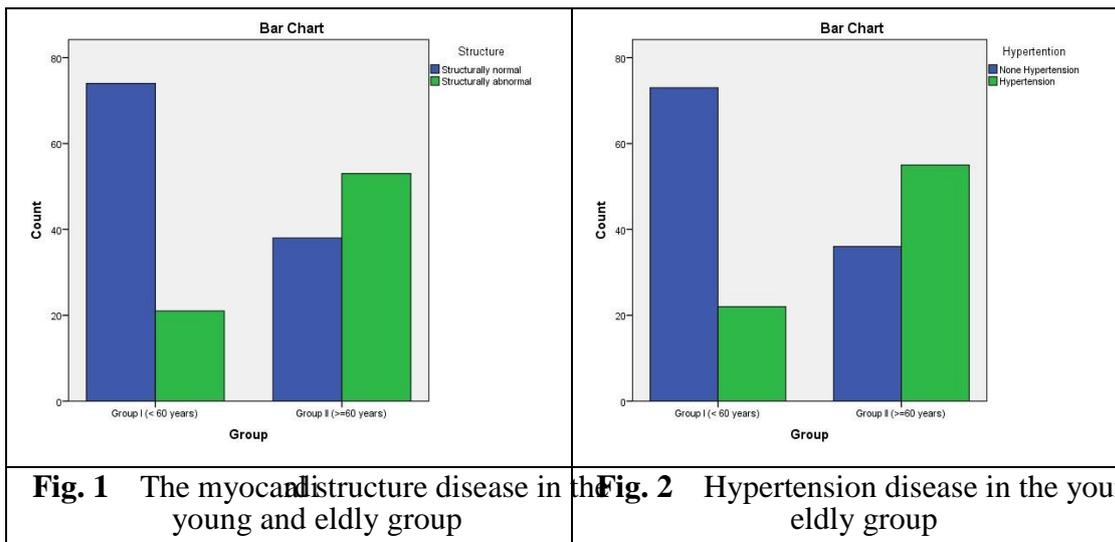
| Fig. 1 | The myocard structure disease in the young and eldly group | Fig. 2 | Hypertension disease in the young and eldly group |

There are 110 out of 182 patients (60.4%) with structurally normal of heart system. The structurally abnormal disease was found in 72 out of 186 patients (39.6%); Among 182 patients, there are66 patients with hypertension (36.3%), 5 patients withdiabetes, two patients with only diabets (1.1%), three patients with Coronary artery disease (1.6%), two patients with mitral valve disease (1.1%), one patient with aortic valve disease (0.54%), and one patient with hypertrophic cardiomyopathy (0.54%). The distribution of the hypertension, only diabetets, coronary artery, mitral valve, aortic vale disease in each group is 20/66 (30.3%), 0%, 0%, 1/2 (50%), and 0%; and 46/66 (69.7%), 2/2 (100%), 3/3 (100%), ½ (50%), 1/1 (100%) respectively. Besides, there are 4 patients with Chronic obstructive pulmonary disease (COPD), of which 2 patients were found in Group I and 2 patients in Group II.

The comparison between the two age groups and PSVT attacks has no difference with p = 0.211 (> 0.05). Comparison rate calculator between the two groups and other types of PSVT attacks (AVNRT, AVRT attack) showed that no difference between the types of PSVT attacks and aging with p > 0.05 (p = 0.211, and p = 0.211 respectively).

The calculation rate for the structurally abnormal disease was 72/182 (39.6%) and the young and eldly group had 21/93 (22.6%) and 51/89 (57.3%) respectively; There is a significant difference between the structurally abnormal and two groups (p < 0.0001), and there is moredate correlation between the abnormally normal disease and aging with R = 0.355 (Correlation is significant at the 0.01).

The calculation for the hypertension disease was 66/182 (36.3%), in which goup I and group II had 20/93 (21.5%) and 46/89 (51.7%) respectively; There is a highly significant difference between the hypertension and two groups (p < 0.0001), and there is moredate correlation between the hypertension disease and aging with R = 0.314 (Correlation is significant at the 0.01).

Besides, there is strongly positive correlation between the structure and hypertension withR = 0.966, p < 0.0001 (Correlation is significant at the 0.01)

3.2. Characteristics of type of paraxysmal supraventricular tachycardia attack pacing

Table 1: Types of paraxysmal supraventricular tachycardia attack

Type attack			Group II (n=89)		Aging (n=182)	
	N	%	N	%	n	%
AVNRT (n=127)	61	48.0%	66	52.0%	127	68,3
R, P	R = -0.093, P = 0.211				R= -0.144, P = 0.052	
AVRT (n=55)	32	58.2%	23	41.8%	55	29,6
R, P	R = 0.093, P = 0.211				R= 0.144, P = 0.052	
Total	93	100%	89	100%	182	100%

Group Group I (n=93)

Table 1: Group I and Group II were the most common in AVNRT attack with 61/93 (65.6%) and 66/89 (74.2%) with p > 0.05 respectively; while AVRT attack in these two groups was less frequentaccounting for 34.4% (32/93 cases)   and 25.8% (23/89 cases) respectively with p > 0.05The distribution of the PSVT attack pacing between group I and II was not significantly different (p> 0.05). There is a relationship between AVNRT/AVRT attack and aging, but with weak negative/positive correlation (R= - 0.144, and R = 0.144); Moreover the difference between AVNRT/AVRT attack and aging was not significant (p > 0.05).

Table 2: Gender distribution in all types of paraxysmal supraventricular tachycardia attack pacing

Group	Group I		Group II		Total (n=182)	

Type attack	Male	Female	Male	Female	Male	Female
	18 (29.5%)	43 (70.5%)	14 (21.2%)	52 (78.8%)	32 (25.2%)	95 (74.8%)
AVNRT (n=127) 0.077	R = 0.081, P = 0.439		R = 0.179, P = 0.093		R = 0.131, P =	
	12 (37.5%)	20 (62.5%)	9 (39.1%)	14 (60.9%)	21 (38.2%)	34 (61.8%)
AVRT (n=55) 0.077	R = - 0.081, P = 0.439		R = - 0.179, P = 0.093		R = - 0.131, P =	
P	>0.05		>0.05		> 0.05	

Table 2: Commparing in details on the gender in each group showed that the female in each type attack (AVNRT and AVRT) was higher than the male in the each group I (70.5% and 29.5%; 62.5% and 37.5% respectively) with very weak correlation, and Group II (78.8% and 21.2%; 61.8% and 38.2%) with weak correlation, it's no difference with P > 0.05.

Table 3: Mean age of all types of the PSVT attack pacing

Type of PSVT attack		Group I (x ± SD) N=93	Group II (x ± SD) N=89	Total (n=182)
1.	AVNRT (n=127)	N= 61	N= 66	
	Mean of age	41.5 ± 11.6	66.8 ± 5.4	
	P	P < 0.0001		P > 0.05
2.	Mean of age	N= 32	N= 23	
	AVRT (n=55)	38.6 ± 14.2	64.8 ± 4.1	
	P	P < 0.0001		
3.	Total	40.5 ± 12.6	66.3 ± 5.2	
	P	P < 0.0001		

Table 3: In both groups (I and II), years of age in patients with AVNRT was higher than AVRT attack, the difference was not statistically significant with p> 0.05. Mean age of AVNRT and AVRT attack in two groups was different with p <0.0001.

Overall, The female in AVNRT and AVRT were higher than male in both groups (The female with AVNRT and AVRT were 74.8% and 61.8%, respectively; The male with AVNRT and AVRT were 25.2% and 38.2%, respectively), the relationship between two gender's weak relationship, but it's also no difference with p > 0.05.

4. DISCUSSION

4.1. Clinical characteristics:

We selected ages for two groups asWHO and many authors in the world did [14], [2627]. Besides, some developed nations can seclect two groups of age by < 65 year and ≥ 65 year as Leonardo AO in the USA studied about PSVT attacks in the general population by two goups <65 years and ≥ 65 years [28].

The results showed that the PSVT attacts were quite common in middle-aged and elderly patients, and were also quite common with the mean age of 53.1 ± 16.1 years, which is lower than Chen SA's study [6] probably age of the Taiwanese life expectancy was higher than that ofVietnamese; although the meanage is the same, some authors such as Hiroko N (52 ± 14 years, n = 23) [21], the Japan has high life expectancy, Hiroki N only studied on type AVNRT attack and only report mean age of 23 patients with fast-slow AVNRT (range: 26 to 64 years) among 138 AVNRT patients Mean age in elderly group (66.5 ± 5.4 years) is the same as in study of Peter MK (66.4 ± 1.7 years for the patients group ≥ 60 years) [11].

Although the rate of the female was higher than male in both groups, but the difference was not statistically significant (p> 0.05). Almost authors also showed that prevalence of gender in patients with PSVT attack had no difference between males and females. The rate of gender in Muhammad A (n=200) was 53.5% males and 46.5% females (p< 0.05) [20].

The palpitation symptom wasthe most common (98.4%), the same as other authors [17], Bottoni H showed that palpitation was absolutely found(100%) [7]. However, the study showed that 5 out of 182 patients with fainting and syncope (2.7%), Bottoni H showed that syncope wasfound in AVRT and AVNRT with respective rate of 8.7% and 8.3%[7]. This

means that we must be aware of thepossible dangers of this arrhythmias because the PSVT attacks can occur in patients who are associated with a variety of complex arrhythmias or complex myocardial structure [12]. Remarkably, two patients have syncope in the young group. There are no difference in the PSVT attacks and two groups (p > 0.05). According to many studies sudden onset can occur suddenly and at any age [15], [28].

There are difference between two groups and myocardial structure as well as hypertension disease with high significance (p < 0.0001). The relationship between two groups and myocardial structure as well as hypertension disease are fairly strong relationship (R = 0.355 and R = 0.314 respectively, which meansthat the aging hasfairly strong relationship with structurally abnormal and hypertension disease [12], [15], [26], [29], [30], [31]. Bottoni found the hypertension disease of AVRT and AVNRT of 8% and 31% (p< 0.01) lower than our result because Bottoni had two groups with almost young patients including AVRT and AVNRT group with 25 ± 16 and 37 ± 17 years of age repectively [7], [32], [33]. Yangni O showed that heart disease in patients of over 70 years was 35 out of 141 patients (25%)associating to the tachycardia attack [4], [34]. Especially, the structure and hypertension were very strong relationship (R = 0.966, p < 0.0001).

4.2. Characteristics of the type of paraxysmal supraventricular tachycardia attack pacing

Type of paraxysmal supraventricular tachycardia attack in both young and elderly groups were predominant AVNRT attack, accounting for 65.6% and 74.2%, respectively, whereas AVRT attack found in these two groups was less frequent, just 32/93 (34.4%) and 23/89 (25.8%), respectively. There was no difference in the type of PSVT attack pacing between group I and II (p> 0.05). **Table 6** are comparison amongs some authors in terms of the distribution of types PSVT attack pacing.

Authors	AVNRT (%)	AVRT (%)
Yangni O (n=141) [4]	7 %	2 %
Bottoni (n=94)	51.%	48.%
Joerg L (n= 395)	78.%	22.%
Our research	68.%	29.%

Table 4: Comparison with some authors on distribution for type of SVT attacks

Our results showed that rate of AVNRT attack were higher than the author's Bottoni

lower than author's Yangni O and Joerg [4], [36], the study of Yangni only focused on patients of older than 70 years [1] and Joerg L had higher mean of age [25], [37]; While AVRT attack of our research was lower than author'Bottoni [7] and higher than author's Joerg L [25], [38] and a little higher than Yangni O [4]; This probablybecauseour research was on both young and elderly people, but the rate of older patients is quite high, and most of the authors above studied on all ages. Moreover, Yangni O only focused on rather older patients (> 70 years) [4]. The higher the age had increase in female/male rate. Elderly patients had higher possibility of AVNRT attacks than younger patients, but elderly patients had lower possibility of AVRT attack than younger patients. Patients with AVNRT attack had a

higher proportion of female than male in both groups, but the difference was not statistically significant (p> 0.05).

In our study, the rate of AVNRT attack in group II was higher than the group I, this difference was not statistically significant (p> 0.05), whereas the rate of AVRT attack in group II was lower than group I, with p> 0.05 (Table 2). As the increase age of AVRT attacks is increasingly less because the pathway is tends to decrease [5], [39], [40], however, the results are not clear between two groups (p> 0.05).

Relationship between age and gender in type of PSVT attack pacing: The male/female ratio between groups I and group II were different with P> 0.05; but the male/female ratio between AVNRT and AVRT groups was different with P <0.05.

In both groups I and II, mean age of patient with AVNRT attack was significantly higher than AVRT but the difference was not statistically significant at p> 0.05. Mean age between AVNRT and AVRT was significantly different with p <0.0001.

5. CONCLUSION

The study of 182 patients with PSVT attack, Group I (young group) had 51.1% and Group II (elderly group) had 48.9%. Clinical characteristics and types of SVT attack as follow:

The PSVT attack was the most common found in female more than male (p > 0.05).

The mean age of elderly patients was higher than younger patiens (p < 0.0001).

The PVST attacks have moderate correlation with structure and hypertension, both in the structure and hypertension in eldely patients were higher than young patients (p < 0.0001).

There is the strongly positive correlation between the structure and hypertension patients (p < 0.0001).

Charactetistics of PSVT attack with type AVNRT were more than AVRT attack. The elderly group with AVNRT, AVRT attacks with higher mean age than younger groups. The AVNRT and AVRT attack in female werethan in male (p > 0.05).

The AVNRT attack wasmost commonfoud in typical AVNRT from atypical AVNRT (p < 0.0001), the elderly patietns with typical AVNRT attack was higher than typical AVNRT attack in young patients (p> 0.05).

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