AVNRT Vs AVRT incidence in ZUH electrophysiology lab

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ABSTRACT

Background: *New data about the incidence of AVNRT vs AVRT are scarce. We studied the incidence of symptomatic AVNRT vs AVRT in ZUH EP lab.*

Objective: *To study the incidence of AVNRT vs AVRT in ZUH EP lab.*

Methods: *We studied 50 patients with a documented tachycardia causing symptomatic palpitation. Whom presented to ZUH EP lab for EPS and possibly tachycardia ablation (AVNRT and AVRT cases). Clinical data are collected from each patient including age, gender, CVD and type of tachycardia presented.*

Results: *31(62%) patients had AVNRT with female performance with average age of 37 ± 9 was years. And 19(38%) patients had AVRT with no gender predominance and an average age of 24 ± 7 years. Only 8% of patients had associated CVD, while 20% of patient had HPN and only 10% had diabetes.*

Conclusion: *In the selected group of patients AVNRT had a higher incidence with female predominance and more common in the age group between 20-64y. The majority of patient had no co-morbidities.*

Keywords: *Supra-ventricular tachycardia; Atrio-ventricular Re-entry tachycardia; AV Re-entry tachycardia; incidence.*

I. Introduction

Supra-Ventricular Tachycardia (SVT) is defined as tachyarrhythmias that necessitate atrial and/or atrioventricular (AV) nodal tissue in order to initiate and maintain. Commonly narrow complexed and possess a regular, rapid rhythm. (1)

All ages are at risk of having SVT which cause a significant morbidity. Most patient are healthy except for the tachycardia and don`t have structural heart disease (2). Patients' symptom varies from minor palpitation to hemodynamic instability specially in patients with co-morbidities. (3)

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The need to study the incidence of AVNRT and AVRT comes from the fact that both of these tachycardias have a great implication on the quality of patients' lives. plus, some of treatment refractory cases has been linked to tachycardia induced cardiomyopathy.

Our aim is to determine the incidence of AVNRT vs AVRT in ZUH EP lab and collecting the demographic data of each. This might help us understanding the epidemiology of these conditions and affects future studies.

II. Method

In our study we included all patient who underwent ablation for AVNRT or AVRT at Cardiology department in Zagazig University Hospital during the period from January 2019 to September 2019. The study was approved by institutional review board (IRB) at Zagazig University Hospital. A thorough data collection regarding age, gender, symptoms analysis and presence of co-morbidity (HPN, diabetes, CVD). 19 male and 31female were included, their age ranged from 17 years to 55 years. They all admitted to our cath-lab for Electro-physiological study and possibly ablation of the tachycardia. 2 ECGs were obtained for each patient; one with the evidence of tachycardia attack and one showing sinus rhythm with detection of any pre-excitation (Delta wave) if present. An ECG machine Fukuda VX8100 Digital 3 Channel was used. Each patient was subjected to Echocardiographic examination to exclude any structural heart disease (any valvular affection, ventricular myopathy) with the standard views taken with a machine like the GE Vivid E9.

Intracardiac bipolar electrograms along with the 12-leadsurface ECG were recorded and stored digitally on a computerized multichannel system using a Biosense-Webster mapping system and a Micropace III pacing system in Zagazig Electro-physiology Cath-Lab.

The intracardiac tracings of the 50 patients were studied.

First, we tested for AVN duality through the presence of a jump with or without an echo beat by an AES or atrial pacing.

After tachycardia induction, we observed features like: atrial activation sequence and the VA interval. Reaching the final diagnosis weather, it`s AVRT or AVNRT by (4):

Typical AVNRT has the VA interval <70ms plus one or more of these features found:

a-Presence of anterograde functional dual AV nodal pathways.

b-concentric atrial activation sequence during SVT like that during RV pacing.

c-An AV response after entrainment with RVP and cPPI>115ms and ΔVA >85ms.

while, Orthodromic re-entrant tachycardia has the VA interval >70ms with one or more of the following:

a-Eccentric atrial activation sequence.

b-An 'AV' response after entrainment with a cPPI< 115ms and ΔVA < 85ms.

During tachycardia, the Tachycardia cycle length plus the VA time was calculated and documented. In each subject, we performed RV pacing 10-40ms faster than the tachycardia in attempt for entrainment. Once the tachycardia entrainment was achieved, the SA time was calculated. Analyzing the beginning of the entrainment, after a fixed QRS complex was observed on surface ECG (either fixed fusion or pure pacing) then the number of beats until the achievement of atrial perpetuation were counted. After entrainment termination, the PPI was calculated.

Statistical analysis

Data collected throughout; age, gender, co-morbidities, ECG features and EPS measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data, qualitative represent as number and percentage, quantitative continues group represent by mean ± SD. Differences between quantitative independent groups by t test. P value was set at <0.05 for significant results &<0.001 for high significant result. (5)

III.   Results

Epidemiological data

A total of 50 patient were diagnosed with SVT, 31(62%) with AVNRT and the remaining 19(38%) with AVRT.

Regarding the age and gender distribution of each group, table (1) shows that AVNRT patient were mostly females (70%) in the age group of 20-64y. While the AVRT group were mostly males (63%) below the age of 19y.

The AVNRT group had mean age was 37 ± 9 years. While, the AVRT group had 19 patients and their mean age was 24 ± 7 years. So, the AVRT patients were evidently younger than those with AVNRT. The AVNRT group had 22 females (70%) while, AVRT group had 7 females (36%) with significant female predominance in AVNRT group in comparison to male predominance in AVRT Patients.

Table 1

Demographic Data

	AVNRT group				AVRT group			
Age	Males	Females	Total		Males	Females	Total	
	No.	No.	No.	%	No.	No.	No.	%
<19y	4	1	5	10%	6	4	10	20%
20-64	2	17	19	37%	5	3	8	16%

>64	3	3	6	12%	1	0	1	2%
Total	9	12	31	62%	12	7	19	38%

Note: Comparison between AVNRT cases and AVRT cases regarding age and gender distribution.

Electrophysiological data

Comparing the tachycardia cycle length (TCL) between the two group, the AVNRT group had mean TCL of 360.81± 42.624ms. While, the AVRT group had mean TCL of 331.84 ±49.531ms. There was a statically difference between the two group as the tachycardia cycle length was greater in case of AVNRT than that of AVRT (P 0.033).

Regarding the VA time in the AVNRT group, it had the mean of 37.84 ± 14.00ms. In comparison to the mean VA in the AVRT group of 92.37 ± 35.56ms. There was statically difference between the two group as the VA was greater in case of AVRT than that of AVNRT (P 0.000). All these data are shown in table (2).

Regarding the Delta VA time, in the AVRT group it had the mean of 51.11 ±19.872ms, while in the AVNRT group it had the mean of 111.39± 21.416ms. So, there is a statically difference between the two group as the Delta VA time was greater in case of AVNRT than that of AVRT. (P 0.000)

Comparing the cPPI, its mean in AVRT group was 77.63 ±24.116ms, but in AVNRT group it was 178.58 ± 34.178ms. So, there is a statically difference between the two group as the cPPI was greater in case of AVNRT than that of AVRT. (P 0.000)

In the AVRT group 13 (68%) had left lateral accessory pathway, 2 (10%) had left posterior pathway, 6 (31%) had septal pathway, 5 (26%) right free-wall pathway.

Table 2

Variables between AVRT and AVNRT group collected during EPS.

Variables	Mean ± SD		P
	AVRT	AVNRT	
VA time	92.37 ± 36.567	37.84 ± 14.005	0.000*
TCL	331.84 ±49.531	360.81± 42.624	0.033
Delta VA	51.11 ±19.872	111.39± 21.416	0.000
cPPI	77.63 ±24.116	178.58 ± 34.17	0.000

AVRT= atrio-ventricular reentrant tachycardia. AVNRT= Atrio-ventricular Reentrant tachycardia.

TCL= tachycardia cycle length. cPPI= corrected post-pacing interval.

Clinical data

All 50 patient were diagnosed with SVT in ZUH ER then referred to ZUH EP lab for EPS and ablation. Comparing their symptom, 39(78%) patients complained of palpitation, 8(16%) patients of diazines and 3(6%) with witnessed syncopal attacks.

29 (58%) patients had prior history suggestive of previous attacks of SVT and 4 (8%) patients were already taking antiarrhythmic drugs to prevent the tachycardia. The remaining 21 (42%) patients were diagnosed for the first time.

10 (20%) patients have hypertension and taking antihypertensive medication. While, 5 (10%) patients have diabetes. Only 4 (8%) had CVD disease documented with echo. AVNRT group included one male of 62y who had degenerative heart disease with moderate aortic stenosis, another female with coronary artery disease with prior stenting and the last one with rheumatic heart disease with mild mitral stenosis. The AVRT group had one patient with mitral valve prolapse and moderate mitral resurge.

Table 1Demographic Data

	AVNRT group				AVRT group			
Age	*Males*	*Females*	*Total*		*Males*	*Females*	*Total*	
	No.	*No.*	*No.*	*%*	*No.*	*No.*	*No.*	*%*
<19y	*4*	*1*	*5*	*10%*	*6*	*4*	*10*	*20%*
20-64	*2*	*17*	*19*	*37%*	*5*	*3*	*8*	*16%*
>64	*3*	*3*	*6*	*12%*	*1*	*0*	*1*	*2%*
Total	*9*	*12*	*31*	*62%*	*12*	*7*	*19*	*38%*

Note: Comparison between AVNRT cases and AVRT cases regarding age and gender distribution.

Table 2Variables between AVRT and AVNRT group collected during EPS.

Variables	Mean ± SD		P
	AVRT	AVNRT	
VA time	92.37 ± 36.567	37.84 ± 14.005	0.000*
TCL	331.84 ±49.531	360.81± 42.624	0.033

Delta VA	51.11 ±19.872	111.39± 21.416	0.000
cPPI	77.63 ±24.116	178.58 ± 34.17	0.000

AVRT= atrio-ventricular reentrant tachycardia. AVNRT= Atrio-ventricular Reentrant tachycardia.

TCL= tachycardia cycle length. cPPI= corrected post-pacing interval.

IV. Discussion

Surprisingly up to date there has been few studies reviewing the difference between AVNRT and AVRT rates at tertiary centers. In the period between January 2019 and September 2019, 50 cases were admitted to ZUH for EPS and ablation if possible. 62% of them had AVNRT in comparison to 38% cases of AVRT. These data agree with ***Porter et al***, that AVRNT is more common than AVRT in general population. ***Porter et al***, also said that AVNRT is more common in female which what our study concluded. (6) ***Ting et al,*** said that "With overall incidence, atrioventricular reentrant tachycardia (AVRT) is more common compared with atrioventricular nodal reentrant tachycardia (AVNRT) (AVRT VS AVNRT: 58.7% vs 41.3%)". (7) In another study by ***Katritsis et al,*** on 1754 patients underwent catheter ablation, atrioventricular nodal reentrant tachycardia (AVNRT) was the major etiology accounting for 56%, atrioventricular reentrant tachycardia (AVRT) accounted for 27% of cases. (4) In ***SCHEINMAN*** and ***HUANG*** study that included 3357 patients from 68 different centers were subjected to catheter ablation of SVT. 646 (19%) patients had AVNRT and 654 (19.5%) had AVRT. (8) In ***Deneke et al,*** study out of 230 patients 177 (77%) had AVNRT and 53 (23%) had AVRT. (9)

The age and gender distribution of each group showed that AVNRT cases were mostly female with the average age of 40±5y. On the other hand, the AVRT were mostly young males with age average of 25±3y. These findings adopt the same conclusion of ***Ting et al***, as he said that "*Compared to women, men with paroxysmal supraventricular tachycardia have a higher incidence of atrioventricular accessory pathways, a lower prevalence of atrioventricular nodal reentrant tachycardia. The average age of onset with different types of PSVT varies; it is also affected by gender. The average onset age of AVNRT group, whether in men or women are significantly greater than AVRT group (p < 0.001). The average onset age of dominant pathway-mediated AVRT occurs younger than the occult accessory pathway-mediated group*". (7)

In another study by ***Liuba et al,*** a 2:1 predominance of women was concluded. The mechanism behind the female predominance in AVNRT is still under investigation. (10) Experimental studies propose that sex hormones may impact the electrophysiologic proprieties of the AV node. (11) In clinical practice, this effect is supported by the relation between tachycardia occurrence and the phase of the menstrual cycle in women. ***Rosano et al,*** concluded that the tachycardia episodes were coincident with high progesterone levels as the frequency of tachycardia was heightened in the luteal phase of the menstrual cycle. (12) Also, ***Deneke et al,*** came across the conclusion that the AVNRT group were mostly female (66 to 34%), whom were younger than males. In the AVRT group, males and females were equal in number. And females with AVRT were older. (9)

We found that associated CVD presented in only 8% of patients. Hypertension diagnosed in 20% in comparison to 10% were diabetics. **Rosengren et al,** found that the three most presented comorbidities were CHD, hypertension and heart failure. (13) **Orejarena et al,** said that "*CVD was present in 20 (61%) of the 33 incident patients, occurring in 90% of males and 48% of females (p = 0.0495). Hypertension was present in 15 patients, coronary artery disease in 7, congestive heart failure in 6, atrial fibrillation in 6*". And that" *Thirteen (39%) of patients with newly diagnosed PSVT had no CVD and were labeled as having "lone PSVT."* (14)

V.   Study limitation

This study should also be conducted as a general population-based study, or as a multi-centers scale study. Only troubled patient with the symptom are referred for tertiary centers by their physician. Also, a considerable number of patients will refuse the invasive treatment. Not all health care provider follows the ESC guidelines 2019, that advocate ablation as a permanent treatment for AVNRT and AVRT. (15)

VI.   Conclusion

In ZUH EP lab AVNRT cases were nearly double the cases of AVRT. AVNRT patient were mostly old females, while AVRT patients were mostly young males and this might be linked to the hormonal influence on the electrophysiological character of the conductive system. Associated CVD presented in minority of patients much like hypertension and diabetes.

Abbreviation

AVRT	Atrioventricular reentrant tachycardia
AVNRT	Atrioventricular nodal reentrant tachycardia
ECG	Electrocardiogram
PCL	Pacing cycle length
PPI	Post-pacing interval
SVT	Supraventricular tachycardia
TCL	Tachycardia cycle length

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