Pattern of Tachyarrhythmias in Sulaimani Teaching Hospital, Cardiac Center/Coronary Care Unit

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Abstract

Background and objectives: Cardiac tachyarrhythmias are recurrent/chronic and mostly life-threatening conditions. Diagnosis and treatment of this condition is depending on its patterns and associated comorbidities. This study aimed to assess the pattern of tachyarrhythmia, identify the risk factors and determine the outcome of the management strategy**Methods:** A prospective observational study was carried out at cardiac center in Sulaimani Teaching Hospital from Januarys 2017 to December 2017.A total of sixty three patients, aged between (20–90) years old, who presented to emergency department with tachyarrhythmia were recruited to this study **Results:** The mean± SD of patients' age was 61.1 ± 16.6 years with a male: female ratio of (1.2). Atrial fibrillation was the commonest type of tachyarrhythmia (61.9%) followed by supraventricular tachycardia (25.4%) and Ventricular tachyarrhythmia (12.7%). Atrial fibrillation was more common in ages above 65 years (36.5%), and 19.1% of supraventricular tachycardia was present among females. Moreover, 14.3% of heart failure and 15.9% of ischemic heart disease were commonly associated with atrial fibrillation. In addition, 38.1% of atrial fibrillation was responded to rate control medications but most of ventricular arrhythmia (4.8%) received a combination of rate and rhythm control drugs. Higher rate of hemodynamic instability (12.7%) was recorded in patients with atrial fibrillation.

Conclusions: Atrial fibrillation, supraventricular tachycardia and ventricular arrhythmia were the commonest types of tachyarrhythmia. Moreover, aging, male gender, heart failure, and ischemic heart disease were significantly associated with atrial fibrillation. In addition, rate control drugs were used for most of patients.

Keywords: Tachyarrhythmia; Atrial fibrillation; Coronary care unit.

Introduction

Cardiac tachyarrhythmia is recurrent or chronic and mostly life-threatening condition[1]. This condition is significantly associated with increased risks of cardiovascular complications, sudden death, decreased quality of life, disabilities and high mortality rate[2]. It is more heterogeneous disease and has large burden in term of mortality and morbidity. For instance, atrial fibrillation (AF) and supraventricular tachycardia (SVT) are two main common tachyarrhythmia conditions; the first one affects 2.3 million people in the United States, but the latter affects two to three per 1000 persons in general population[2,3]. In addition, AF was accounted for 2.69 odd of stroke death, 2.76 cardiovascular deaths and 1.88 of all cause deaths2. Moreover, another study has shown that ventricular tachycardia (VT) was the reason of death in 30% of acute myocardial infarction (MI)[4].

Socio-demographic features such as gender, age, and occupation has been considered as risk factors for tachyarrhythmia. Some studies showed that AF is associated with a 1.5 fold increase in risk of death in men and a 1.9 fold increase risk of death in women5. Atrial arrhythmias, AF, paroxysmal SVT, and ventricular arrhythmias are increasing with age. Furthermore, the risk of AF is increased to 10 folds in ages over 60 years, and the risk of paroxysmal SVT is increased one to two fold(s) in age over 65 years old6. Therefore, taking the accounts of the demographic risk factors in relation with the pattern of tachyarrhythmia may help in early diagnosis of the conditions.

Tachycardia is defined as a heart rate (HR) of above 100 beats per minute (bpm), although symptomatic or hemodynamically relevant emergencies usually occur only when the HR is 150 bpm or higher[7]. Moreover, cardiac

arrhythmias result from abnormalities of electrical impulse generation, conduction, or both[8].

Tachyarrhythmia can be classified according to the differences in the mechanism of its occurrence. It includes automaticity—spontaneous depolarization of atrial, junctional, or ventricular pace makers, re-entry circus propagation of a depolarizing wave front, and triggered arrhythmias initiated after depolarization[9,10]. Therefore, different clinical tachyarrhythmia patterns have been diagnosed and classified, and the commonest patterns are; AF, atrial flutter, SVT, VT, and ventricular fibrillation (VF). In this regard and conventionally in the literature, SVT has been used to describe all kinds of tachycardia apart from VT and AF[11].

Diagnosis and treatment of these conditions depends on the tachyarrhythmia patterns and associated comorbidities. Patterns of tachyarrhythmia could be diagnosed at the beginning of its presentation based on clinical features and 12 leads electrocardiography (ECG). Therefore, tachyarrhythmia first was classified into hemodynamically stable and unstable, later into regular wide and narrow QRSs, followed by regular and irregular QRS complexes[12]. The modes of its treatment in the acute situations mostly rely on whether the patient is hemodynamically stable or unstable. Hemodynamically unstable tachycardia with shock, alteration of consciousness, or pulmonary edema (PE) should be treated as soon as possible with cardioversion and/or defibrillation. In contrast, hemodynamically stable tachyarrhythmia is treated with medications and 12 leads ECG monitoring should be put in place to know the tachyarrhythmia pattern as a base for its specific treatment[7]. Therefore, clinical features and the pattern of tachyarrhythmia have crucial role in its treatment.

The severity and outcome in such cases are deter¬mined by number of factors such as underlying etiology and adverse features that may accompany with arrhythmia. Therefore, the aim of this study was to assess the pattern of tachyarrhythmia, identify the risk factors and determine the outcome of its management strategies.

Patients and methods

A cross-sectional observational study was carried out on 63 patients at cardiac center/coronary care unit (CCU) in Sulaimani Teaching Hospital from Januarys 2017 to December 2017 after obtaining scientific committee approval from Kurdistan Board for Medical Specialties (KBMS). The patients were aged 16-years old and above who presented with tachyarrhythmia. Informed written consent was taken from all participants or their companion. Moreover, all the participants were assessed, diagnosed and managed according to local administrative usual care. The inclusion criteria included an age of 16-year-old and above in patients who presented with tachyarrhythmia and admitted to the cardiac center/CCU, and any patients who refused to participate were excluded.

Demographic features, past medical history (comorbidity, medical and drug histories), clinical feature(s), treatment, and complications as well as pattern of tachyarrhythmia were collected.

Comorbidities were classified into five main groups; heart failure (HF), ischemic heart disease (IHD), arrhythmia, other chronic diseases and no history of chronic disease. In this regard, priority has been given to the first three comorbidities; patients who had HF and IHD were considered as HF, and patients who had IHD and arrhythmia were considered as IHD.

Descriptive analysis was performed for all the variables. To find the association of independent variables with the outcome i.e. pattern of tachyarrhythmia, all independent variables were tabulated with tachyarrhythmia. Inferential statistic was conduct to find out the associations between the variables. Furthermore, IBM SPSS Statistics version 22 software was used for the analysis of the data and a p-value of ≤0.05 was considered as statistically significant.

Results

The mean ± SD (Standard Deviation) of age of the patients were 61.1 ± 16.6 years (ranged from 20-90 years). Although the AF and SVT were higher in unemployed patients but it was of no statistical significance, Table 1.

Table (1): The association of socio-demographic features of the patients with arrhythmia patterns.

Socio-demographic features		Arrhythmia patterns			Total (%)	p-value
		AF (%)	SVT (%)	VT and VF (%)		
Age groups (year)	20-40	2 (3.2)	4 (6.3)	0 (0)	6 (9.5)	0.003
	41-65	14 (22.2)	11 (17.5)	5 (7.9)	30 (47.6)	
	>65	23 (36.5)	1 (1.6)	3 (4.8)	27 (42.9)	
	Total	39 (61.9)	16 (25.4)	8 (12.7)	63 (100)	
Gender (M:F ratio = 1.2)	Male	23 (36.5)	4 (6.3)	7 (11.1)	34 (54)	0.009
	Female	16 (25.4)	12 (19.1)	1 (1.6)	29 (46)	
Occupation	Unemployed	27 (42.9)	9 (14.3)	2 (3.2)	38 (60.3)	0.062
	Employed	12 (19.1)	7 (11.1)	6 (9.5)	25 (39.7)	
Residency	Inside city	28 (44.4)	12 (19.1)	6 (9.5)	46 (73)	0.009
	Outside city	11 (17.5)	4 (6.4)	2 (3.2)	17 (27)	

Table (2): The association of medical background of participants with arrhythmia patterns.

Medical background		Arrhythmia patterns			Total (%)	p-value
		AF (%)	SVT (%)	VT and VF (%)		
PMH	Hypertension and/or diabetes mellitus	6 (9.5)	3 (4.8)	4 (6.4)	13 (20.6)	0.001
	Arrhythmia	6 (9.5)	11 (17.5)	0 (0)	17 (27)	
	Heart failure	9 (14.3)	1 (1.6)	1 (1.6)	11 (17.5)	
	IHD	10 (15.9)	0 (0)	2 (3.2)	12 (19)	
	None	8 (12.7)	1 (1.6)	1 (1.6)	10 (15.9)	
Drug Hx	Medicine for other diseases	7 (11.1)	3 (4.8)	4 (6.4)	14 (22.2)	0.342
	Not used any medicine	14 (22.2)	6 (9.5)	1 (1.6)	21 (33.3)	
	Antiarrhythmic medicine	18 (28.6)	7 (11.1)	3 (4.8)	28 (44.4)	
Smoking Hx	Non-smoker	26 (41.3)	11 (17.5)	1 (1.6)	38 (60.3)	0.013
	Current smoker	3 (4.8)	4 (6.4)	3 (4.8)	10 (15.9)	
	Ex-smoker	10 (15.9)	1 (1.6)	4 (6.4)	15 (23.8)	

FH = family history; Hx = history; PMH = past medical history

Table (3): The association of clinical features of the patients with arrhythmia patterns.

Clinical feature		Arrhythmia pattern			Total (%)	p-value
		AF (%)	SVT (%)	VT and VF (%)		
SBP (mmHg)	>90	31 (49.2)	15 (23.8)	3 (4.8)	49 (77.8)	0.007
	<90	8 (12.7)	1 (1.6)	5 (7.9)	14 (22.2)	
PR (bpm)	<60	1 (1.6)	0 (0)	0 (0)	3 (4.8)	0.011
	60-100	9 (14.3)	1 (1.6)	0 (0)	10 (15.9)	
	101-119	5 (7.9)	0 (0)	0 (0)	5 (7.9)	
	120-140	11 (17.5)	2 (3.2)	0 (0)	13 (20.6)	
	>140	15 (23.8)	13 (20.6)	8 (12.7)	32 (50.8)	
Shock		8 (12.7)	1 (1.6)	5 (7.9)	14 (22.2)	0.007
CHF		4 (6.4)	0 (0)	1 (1.6)	5 (7.9)	0.388
Pulmonary edema		3 (4.8)	0 (0)	1 (1.6)	4 (6.4)	0.425
SOB		17 (27)	1 (1.6)	2 (3.2)	20 (31.8)	0.024
Altered level of consciousness		0 (0)	0 (0)	2 (3.2)	2 (3.2)	0.001
Typical ischemic chest pain		9 (14.3)	4 (6.4)	4 (6.4)	17 (27)	0.289
Acute MI		1 (1.6)	0 (0)	2 (3.2)	3 (4.8)	0.015
Palpitation		31 (49.2)	15 (23.8)	4 (6.4)	50 (79.4)	0.044
Syncopal attack		0 (0)	0 (0)	1 (1.6)	1 (1.6)	0.03

CHF = congestive heart failure; PR = pulse rate; SBP = systolic blood pressure; SOB = shortness of breath

Table (4): Managements and complications of participants according to arrhythmia patterns.

Managements and complications	Arrhythmia patterns			Total (%)
	AF (%)	SVT (%)	VT and VF (%)	
Cardioversion	0 (0)	0 (0)	1 (1.6)	1 (1.6)
Rate control drug (Beta blockers = Metoprolol)	24 (38.1)	9 (14.3)	2 (3.2)	35 (55.6)
Rhythm control drugs (antiarrhythmic = amiodarone)	6 (9.5)	1 (1.6)	1 (1.6)	8 (12.7)
Pacemaker	0 (0)	0 (0)	1 (1.6)	1 (1.6)
Combined rate and rhythm control drugs	9 (14.3)	5 (7.9)	3 (4.8)	17 (27)
Vagal maneuver	0 (0)	1 (1.6)	0 (0)	1 (1.6)
Complications	1 (1.6)[*]	1 (1.6)[**]	1 (1.6)[***]	3 (4.8)

[*] This patient was treated with combined rate and rhythm control drugs and complicated by HF
[**] This patient was treated with rate control drug and complicated by shock
[***] This patient was treated with rate control drug and complicated by ventricular fibrillation
Note: none of the patients had been deceased

Discussion

There was significant association between age and arrhythmia patterns; AF was significantly increased with advance in age, Table 1. Meanwhile, AF and VT were significantly higher in male but SVT was higher in female patients, Table 1. These findings was confirmed by previous literature in which they were 1.5 to 2 times higher in men than in women, and the cumulative lifetime risk of developing AF is one in four for both men and women[5].

Past medical history (PMH) has crucial roles for the way of presentation, pattern, assessment and management of tachyarrhythmia. Many studies have confirmed that other cardiovascular and systemic diseases had intimate relation to tachyarrhythmia. In our study, most participants presented with cardiovascular and other comorbidities like; HF, IHD, hypertension, and diabetes mellitus; but only 15.9% had no any chronic diseases, Table 2. A similar study found 4% of cases with AF, 12% with VT and 2% of VF were contributed to acute MI[4].

In the present study, we found a statistically significant association between current comorbidity and the pattern of tachyarrhythmia; AF was associated more with HF (23.1%) and IHD (25.6%) as compared to those who did not have any chronic disease, Table 2. A study showed a 40% of patients who hospitalized for HF had history of AF, and about 20% of patients with HF experienced new onset of AF[11]. In addition, another study showed that cardiomyopathy was related to HF, and both of AF and HF were more related to each other[13]. Furthermore, HF reduces the ejection fraction, and AF has negative impacts on cardiac functions through ineffective work of the atria which ultimately leads to acceleration of the episodic onset of HF14. In the current study, both of HF and AF were shared certain criteria like age, high blood pressure, diabetes mellitus, obesity and valvular heart lesion. Additionally, both of VT and VF were significantly occurred higher in those participants who had hypertension and diabetes mellitus (6.4%) as compared to those who had no significant history of any chronic disease (1.6%), Table 2.

Tachyarrhythmia may present as acute or recurrent/chronic condition. In the current study, we found that 55.6% of patients were admitted for the first episode of tachyarrhythmia, but 44.4% of the patients had history of antiarrhythmic drug usage, Table 2. Moreover, AF and VT were significantly occurred in new episode compared to SVT which was more occurred as recurrent episodes, Table 2. Same finding was confirmed in the literature, SVT had more recurrent episodes as compared to other pattern of tachyarrhythmia[15].

The clinical presentation of arrhythmia which was shown in Table 3 illustrating that including sudden cardiac death (SCD), were found in other studies[16,17]. Additionally, we found that high SBP, high PR, and SOB were significantly higher in AF, Table 3) in which the same finding was shown in another study that, after supraventricular extra systole, AF was the next most common form of arrhythmia associated with hypertension[18]. Moreover, a study showed that palpitation is present with the most arrhythmia, sinus tachycardia, AF, premature ventricular contractions, or VT[19].

Several other findings were observed in the current study such as: shock (22.2%), altered level of consciousness (3.2%), typical ischemic chest pain (27%), acute MI (4.8%),

and syncope (1.6%) Table 3. Furthermore, a study showed that altered level of consciousness, shock and syncope were mostly related to SCD and VT[6].

In this study, most of AF and SVT had received the rate control drugs only, Table 4. A study showed that Amiodarone was the most effective antiarrhythmic drug for the treatment of both supraventricular and ventricular tachyarrhythmia[12].

Our study showed only three patients with tachyarrhythmia who developed complications; one patient of AF developed HF, one patient of SVT complicated by shock and one patient of VT complicated by VF, Table 4. Moreover, a study found that 55 out of 135 patients with AF and atrial flutter who received rate or rhythm control drugs developed complications[20]. According to another study, AF was associated with three folds increase in the risk of developing MI, and was complicated by HF[21].

In this study, three patients were managed either by vagal maneuver, cardioversion, or pacemaker separately, Table 4. This line of treatment was also mentioned in other studies in which cardioversion were the first line of treatment for hemodynamically unstable tachyarrhythmia, and vagal maneuver was more effective for patients with SVT[22]. In addition, another study showed that the treatment goal for SVT was to slow down the rate and convert it to sinus rhythm by increasing the refractoriness of or blocking the atrioventricular node and this was accomplished with vagal maneuvers, medications, or cardioversion[23].

Conclusions

Atrial fibrillation, SVT and ventricular arrhythmia were the commonest types of tachyarrhythmia. Moreover, aging, male gender, HF, and IHD were significantly associated with AF. In addition, SVT was more presented as recurrent episodes than AF and ventricular arrhythmia.

Furthermore, medications for controlling tachyarrhythmia were effective; most of patients with AF and SVT were treated with rate control drugs only, but most of patients with ventricular arrhythmia were treated by combined rate and rhythm control drugs.

The limitations of our study were small sample size, and a broad topic was used to study. Therefore, we suggest doing more researches on each type of arrhythmias separately by using a larger sample size.

Conflict of interest: Nothing to declare

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