

Detection of Ventricular tachyarrhythmia in early five years of Diabetes Mellitus Using Holter Monitoring

Hussein A. Naser*

الخلاصة

أجريت الدراسة على 60 مريضاً مصاباً بداء السكري وبمدة مرض لا تزيد عن خمس سنوات في مركز النجف لأمراض السكري والغدد الصماء في مستشفى مدينة الصدر الطبية في مدينة النجف والفترة من آذار 2010 إلى آذار 2012 وكانت أعمار المرضى 29 سنة – 70 سنة ووزن المرضى على 30 ذكر و30 أنثى وكما أجري فحص 60 شخصاً لمجموعة مقارنة مرضى السكر أجريت لجميع الأشخاص المشمولين بالبحث فحص ضربات القلب والتخطيط بالهولتر ولمدة 24 ساعة تمت دراسة تسارع ضربات القلب، الضربات البطينية الشاردة، التسارع البطيني الغير مستمر وجدان هنالك زيادة وذات مصداقية إحصائية في عدد ضربات البطينية الهاجرة وفي الإناث بشكل خاص .

Abstract

The study was carried in Al Najaf Diabetic Centre in Sadar Teaching Hospital in Najaf . from March 2010 to March 2012 .

Aim of the study is to understand the associated ventricular tachyarrhythmias as they important risk factors and can related to sudden death in diabetic patients . we studied 60 patients in early 5 years of disease with other 60 normal persons of same age using Holter Monitor for 24 hours ECG monitor. The results showed occurrence of more ventricular premature contractions in diabetic patients compare to the normal persons and more in female patients .

Key Words: Ventricular arrhythmia, Diabetes, Holter

Introduction

Patients with diabetes mellitus are at in risk of dying from cardiovascular disease ¹, the reason for which is not completely understood .Excess cardiovascular risk in this population persists even after normalization for other conventional risk factors (hypertension, dyslipidemia, physical inactivity, smoking) suggesting that there are other incompletely understood mechanisms which increase cardiovascular risk in diabetic patients³. Ventricular instability might be an important additional mechanism. It has been proposed that hyperglycemia may produce ventricular instability by increased sympathetic activity, increased cytosolic calcium content in myocyte or both⁶ .

Insulin stimulates sympathetic activity and diabetes is known to be associated with impaired parasympathetic cardiac content .This is reflected in a reduced ability to regulate heart rate variability . Recent studies shows diabetes-induced remodeling of potassium channels also holds true for large mammals, which share a far greater similarity of ventricular repolarization to human.

*Consultant physician ,College of Medicine, Kufa University

In dogs, for instance, diabetes-induced repolarization abnormalities were associated with prominent down regulation of Ito. In addition, a decrease in density of the slow component of delayed rectifier were observed. Functional down regulation of potassium channel subunits and currents can be regarded as long-QT syndrome whereby the reduced⁷.

Repolarization reserve increases the predisposition to early after depolarization, triggered arrhythmia, and goal processes contributing to electrical instability in the diabetic heart⁸. The independent role of diabetes mellitus in enhancing risk of sudden death has been investigated in a small number of studies, however, all have constantly identified diabetes as a strong predictor of sudden cardiac death. An analysis was performed among >6000 middle-aged healthy male Parisian civil servants who were enrolled in the Paris prospective Study and followed for over 23 years. There were a total of 120 sudden cardiac cases and separately, there occurred 192 non-sudden death that were related to acute myocardial infarction¹¹. In multivariate analysis, diabetes independently conferred a significant risk for sudden cardiac death (relative risk 2.2) controlling for all other variables (age, body mass index, tobacco history, systolic pressure, cholesterol and triglyceride levels)¹⁰.

The US Nurses Study and the Physician Health Study as well retrospective clinical database analysis from a health cooperative in Seattle have reported similar finding. A universal finding among diabetes is a high prevalence of abnormal prolongation of corrected QT (QTc) interval from the ECG⁷. Earlier clinical studies of diabetes have also reported a good correlation between prolonged QTc interval and overall cardiac mortality. A Holter Monitor is a continuous tape recording of a patient ECG for 24 hours. Since it can be worn during the patient regular daily activities, it helps the physician to correlate the symptoms of dizziness, palpitation or blackouts.

Since the recording covers 24 hours on a continuous basis, Holter Monitoring is much more likely to detect an abnormal heart rhythm when compare to the ordinary ECG which last less than a minute. Evaluation of a patient presented with tachyarrhythmias starts with a resting ECG, however, symptoms of palpitation often are episodic and recording the heart rhythm during symptoms with an ambulatory recording device is usually needed

Patients and Methods

The study involved 120 persons, 60 diabetic patients (all had their files in Hakeem Diabetic Centre of Sadar Teaching Hospital in Najaf City), 60 non diabetic persons as control group.

Diabetic patients had less than 5 years disease duration, age (29-70) years with mean (44.3). 73% of diabetic patients used sulfonylurea (Glibeclamide). 30 Male, 30 Female.

The same number and sex distribution in the control.

Exclusion criteria include the following :-

1. Ischemic heart disease
2. Blood Pressure more 130/80
3. Abnormal level of K, Na, Ca and Mg
4. Clinical and Laboratory evidence of autonomic neuropathy
5. Abnormal Blood Urea or Serum Creatinine

Holter Monitoring

All persons in the study had an initial resting ECG and then 24 Holter Monitor recording type SCHILLER MT-101 .

The concern was with Ventricular premature contractions (VPC) which characterized by premature and bizarrely shaped QRS complexes ,wider width than 120 msec on the width of ECG. They are not preceded by a P wave and T wave is usually large and its direction is opposite the major deflection of QRS. Non sustained VT defined as 3 or more consecutive beats arising below the atrioventricular node with a rate > 120 beat/min and lasting less than 30 s. We also recorded the all tachycardia events . All these parameters were studied in both Diabetic patients group and the Control group.

The Tachycardia (TC) events were also recorded .

Statistical methods–data are expressed as mean- standard deviation. Comparisms of the variable data were considered using paired students t-test. Statistical analysis was performed with SPSS 18 for Windows (SPSS Corporation, Chicago) .

P value <0.05 regards significant .

Results

The results were showed on different tables and compared different parameter variants of ventricular tachycardia (VPC), non-sustained VT(NSVT). The occurrence of Tachycardia(TC)attacks also recorded.

In table 1shows the distribution of diabetic patients group and control group by gender and age

Table 1

Group	Sex	Number	Mean
Control	Female	30	46.7
	Male	30	43.2
Diabetic	Female	30	45.2
	Male	30	42.8

In table 2 shows in control group ,for males the mean of TC,PVC and Non sustained VT was (62.5 , 34and4.)

While that of females(49.5 , 2.2 and16.1)respectively

In diabetic group and for males, the mean of TC,PVC and Non sustained VT was (43.4 , 72.0 , and32.0) while that of females was (42.9 , 130.5 and48.0) respectively

Table2

Group	Sex	Parameter	Mean	Std	Std E
Control	Male	TC	62.55	78.696	17.59
		VPC	34.0	48.776	10.906
		NS VT	4.0	4.588	1.025
	Females	TC	49.5	33.664	7.527
		VPC	3.2	5.379	1.202
		NS VT	16.1	35.704	7.983
Diabetic	Males	TC	43.4	43.483	9.723
		VPC	72.0	109.7077	24.531
		NS VT	32.0	115.292	25.70
	Females	TC	42.9	62.954	14.077
		VPC	130.5	192.857	43.124
		NS VT	48.0	59.132	13.222

In studying the parameters TC, VPC and non-sustained VT and make a comparism between diabetic group and a control group and in different gender with aid of t-test

Comparism and with P value <0.05 as a significant , the results showed only significant for diabetic group and for females and in PVC parameter while that for TC and that of non-sustained VT were not significant . All these findings were recorded in table 3

Table 3

Sex	parameter				T Value	P Value
		Mean	Std	Std.E		
Males Vs Males	TC	15.17	97	21.6	0.6	0.55
	PVC	46.5	124	28.6	-2.7	0.015
	NS VT	3.4	23	18	-1.3	0.202
Females Vs Females	TC	64	72	16.3	0.03	0.971
	PVC	114.8	196	43.3	-2.64	0.016
	NS VT	3.6	7.6	1.6	-1.8	0.084

Discussion

Heart rate is dependent on a cycle of depolarization and repolarization of the atria and ventricles that is regulated by intrinsic and extrinsic factors. Inhomogeneity.

In ventricular repolarization measured as QTd is likely to lead to arrhythmia. The role of the autonomic nervous system in the development of the inhomogeneity is still uncertain. A distinct cardiomyopathy makes diabetes an independent risk factor for heart failure.

Diabetic cardiac dysfunction is evident either as mechanical (Stevenson et al 2003) and electrical (Abo et al 1996), leading to a higher incidence of cardiac arrhythmia and sudden death (EL-ATAT et al 2004).

Diabetes (Type 1 and Type 2) is associated with ECG abnormalities. These recognized risks for lethal arrhythmia reflect abnormal repolarization and prolongation of ventricular action potential caused by attenuation of repolarization potassium currents (Shimizu et al 1998, Xu et al 2002). Earlier work provided indirect evidence suggesting that the diabetic heart may also develop abnormalities in propagation of the cardiac impulse.

It is found that conductive reserve is smaller in the diabetic heart, priming it for impaired conduction upon further challenge.

This can desynchronize contraction and contribute to arrhythmogenesis. Endothelin-1 (ET-1) is known to have a direct arrhythmogenic effect in mammalian heart. It was found that the diabetic heart seems to be more prone to ET-1 induced arrhythmia and this is probably not a result of locally high glucose concentration¹².

In diabetic patients, the corrected QT (QTc) interval is relatively long. In accordance with the concept of induced repolarization reserve, a subsequent increase in QTc interval by proarrhythmic drugs may lead to cardiac arrhythmia and sudden death¹³.

Recently it is shown that diabetic patients are at increased risk of drug-induced arrhythmias¹⁴.

In this study we tried to be out of autonomic neuropathy complication and in early diabetic disease duration with no major cardiovascular complication events, trying to see the association of arrhythmia and in special the ventricular one. The results showed that ventricular tachycardia events were more in diabetic patients group compared to those without diabetes. Many of our patients 73% used type of sulfonylurea oral hypoglycemic agents (which are mostly available) and may cause hypoglycemia events that caused tachycardia and possible ventricular one. Serious ventricular arrhythmia, that is ventricular fibrillation may occur more in diabetic patients independent of CAD or CHF¹³. This was recently introduced and makes explanation of higher risk of sudden death in diabetic patients.

Dead in bed syndrome was first described by Tat tarsal et al 1991 in that study, 20 patients with type 1 diabetes who had died suddenly in the United Kingdom in 1989 were identified. All look healthy the day before death subsequently, studies from other countries had confirmed a low but a significant incidence of dead in bed syndrome⁹.

It has always been assumed, although never proven, that dead in bed syndrome is due to cardiac arrhythmia induced by nocturnal hypoglycemia.

Recent studies have shown that hypoglycemia prolong the QT interval, which could precipitate ventricular arrhythmias.

Conclusions

1. Ventricular tachyarrhythmia occur more in diabetic Patients even in early years of disease
2. Holter monitor easy way and can detect these arrhythmia.

Recommendations

1. Concern more with arrhythmia and proof relation of hypoglycemia and ventricular arrhythmia and sudden death
2. Use Holter monitoring as one of simple test so to see early cardiac risk of diabetes.

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