Gender Differences of Pulsed and Tissue Doppler Indices of Left Ventricular Diastolic Function in Type II Diabetic Patients

Thesis

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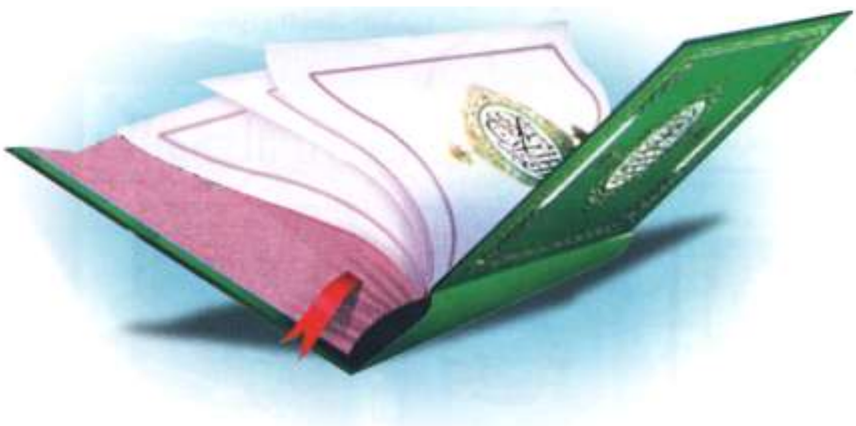
بسم الله الرحمن الرحيم

" رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ
وَعَلَى وَالِدَيَّ وَأَنْ أَعْمَلَ صَالِحًا تَرْضَاهُ وَأَدْخِلْنِي
بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ "

صدق الله العظيم

سورة النمل الآية (١٩)



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List of Contents

List of Abbreviations

Abbr.	Title
ADA	: American diabetic association
Ar velocity	: Atrial reversal velocity
ATP	: Adenosine triphosphate
CAD	: Coronary artery disease
CHARM PRESERVED	candesartan in heart failure preserved trial
CMR	: Cardiac magnetic imaging
CVD	: Cardiovascular disease
CWD	: Continuous wave Doppler
DBP	: Diastolic blood pressure
DD	: Diastolic dysfunction
DHF	: Diastolic heart failure
DHF	: Diastolic heart failure
DM	: Diabetes mellitus
DT	: Deceleration time
DTI	: Tissue Doppler image
ECG	: Electrocardiogram
ED	: Diastolic elastance
EDD	: End diastolic diameter
ESC	: European society of cardiology
ESD	: End systolic diameter
ESH	: European society of hypertension
HF	: Heart failure
HFNEF	: Heart failure normal ejection fraction
HR	: Heart rate
BP	: Blood pressure
LAD	: Left atrial dimension
HBA1c	: glycosylated hemoglobin

ICTP	: Carboxy terminal telopeptide collagen
IVRT	: Isovolumetric Relaxation Time
LV	: Left Ventricular
LVEDP	: Left ventricular end diastolic pressure
LV	: Left ventricle
LVEF	: Left ventricular ejection fraction
MMPs	: Matrix metalloproteinase
NIDDM	: Non insulin dependence diabetes mellitus
PIIINP	: Serum aminoterminal peptide
PNF	: Pseudonormal left ventricular filling
PVAT	: Perivascular Adipose Tissue
PWD	: Pulsed wave Doppler
RAAS	: Renin angiotensin aldosterone system
ROS	: Reactive Oxygen Species
SBP	: Systolic blood pressure
SD	: Standard deviation
SERCA	: Sarcoplasmic reticulum–calcium ATPase
SPSS	: Statistical package of special science
SR	: Sarcoplasmic reticulum
SV	: Stroke volume
T2DM	: Type 2 diabetes mellitus
TD	: Tissue Doppler
TTE	: Transthoracic echocardiography
TVI	: Tissue velocity image
VP	: Propagation velocity
WHO	: World health organization

List of Tables

List of Figures

Abstract

Background: Diabetes mellitus characterized by hyperglycemia associated with disturbances of carbohydrate, protein and fat metabolism. With absolute or relative deficiencies in insulin secretion and/ or insulin action. The disease causes significant organ dysfunction with acute and long term complications that results in diabetes related morbidity and mortality. **Aim of the Work:** To assess gender differences of left ventricular diastolic function by pulsed and tissue Doppler echocardiographic indices in patients with type II diabetes mellitus. **Patients sand Methods:** This study was conducted in the Cardiology Department (Faculty of Medicine, Ain-Shams University), it was an observational case control study started from December 2015 to July 2016. Patients with type 2 DM were age and sex matched with healthy volunteers as control. The study included 100 patients (40 males and 60 females) with type II Diabetes Mellitus, in addition to 50 (17 males and 33 females). Age and gender matched healthy volunteers as control. **Results:** The study showed that there is a highly statistically significant difference between study and control groups as regard E/é septal and E/ é lateral with (P=0.002) and (P=0.003) respectively. **Conclusion:** The study shows there are statistically significant differences of left ventricular diastolic function by pulsed-wave and tissue Doppler echocardiographic indices according to E/E` septal and lateral in patients with type II diabetes mellitus in comparison to non-diabetics. There are insignificant statistical differences in diastolic functions between diabetic males and females. This study might provide important view about differences in left ventricular diastolic dysfunction in diabetic patients free from hypertension and ischemic heart disease. **Recommendations:** Diabetic patients should be evaluated for subclinical diastolic dysfunction by Doppler studies as well as good control of diabetes for deceleration of the development of clinical cardiomyopathy, and decreased morbidity and mortality.

Key words: Diabetes mellitus, Cardiology, insulin secretion, carbohydrate, diastolic heart failure

Introduction

Diabetes mellitus (DM) may be considered as one of the challenges even in the highly developed medical field of the 21st century. It is becoming an epidemic health threat ***(Ren and Sowers, 2013).*** It affects 350 million people around the world, and the World health organization (WHO) has projected that diabetes deaths will be doubled between 2005 and 2030 ***(Battiprolu et al., 2013).***

Diabetes mellitus characterized by hyperglycemia associated with disturbances of carbohydrate, protein and fat metabolism. With absolute or relative deficiencies in insulin secretion and/ or insulin action ***(Ojji, 2011).*** The disease causes significant organ dysfunction with acute and long term complications that results in diabetes related morbidity and mortality ***(Pappachan et al., 2013).***

Cardiovascular diseases has been singled out as a major cause of death in patients with DM as diabetes increases the risk of developing heart disease by several folds. Heart involvement in diabetes goes beyond the damage to coronary arteries due to the progress of atherosclerotic process. Diabetes and its pathophysiological consequences are able to induce direct alterations and abnormalities in the cardiac muscle functions ***(Ciccone et al., 2014).***

Diabetes may affect the heart in three ways: (a) coronary artery disease due to accelerated atherosclerosis; (b) cardiac autonomic neuropathy; and (c) diabetic cardiomyopathy. Several studies have suggested that diabetes may be associated with left ventricular (LV) structural and functional abnormalities in addition to, and independent of atherosclerosis ***(Ojji, 2011).***

The high morbidity and mortality for diabetic cardiomyopathy warrant aggressive clinical management. In addition, the increasing detection of this added cardiac insult is supported by data from epidemiological, molecular as well as diagnostic studies. It is worth to be mentioned that there is increasing evidence of diabetics with abnormalities of left ventricular function in the absence of clinical heart disease and this is what called as diabetic cardiomyopathy ***(Medicine update, 2010).***

More recent data have also demonstrated an independent association between diastolic function and DM type 2 where insulin resistance can be one of the important patho-physiological links involved in this association ***(Horwich and Fonarow, 2010).*** Several studies have suggested that left ventricular dysfunction is one of the earliest signs of myocardial involvement in type 2 diabetes mellitus (T2DM) ***(Zabalgoitia et al., 2001).***

Echocardiography plays a central role in the evaluation of diastolic function, and conventional pulsed-wave (PW) Doppler is usually performed to obtain mitral inflow velocities to assess left ventricular filling. Doppler pattern of impaired left ventricular relaxation, characterized by decreased early and increased late diastolic flow, is an early sign of diastolic dysfunction ***(Nagueh et al., 2009).***

Compared with epidemiological studies on cardiovascular disease (CVD), less attention is given to examining whether disparities in CVD risk management create gender differences among an already high-risk population like those with diabetes. Although differences exist between men and women with T2DM regarding CVD occurrence, gender differences in composite control of cardiovascular risk factors are less understood ***(Joni et al., 2014).***