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ASSESSMENT OF MYOCARDIAL VELOCITIES IN DIFFERENT DEGREES OF CORONARY ARTERY DISEASE BY TISSUE DOPPLER ECHOCARDIOGRAPHY

By

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ABSTRACT

Background: Tissue Doppler Imaging (TDI) is a rapid inexpensive and noninvasive method for the assessment of both the systolic and the diastolic cardiac function, and it has proved to be a useful prognostic tool both in the general population and among persons with known cardiovascular diseases**.**

Objective: To determine how myocardial velocity assessed by pulsed TDI is affected by different degrees of CAD in patients with symptomatic CAD and preserved LV ejection fraction.

Patients and methods: A case-control study that included 40 patients with suspected CAD admitted at Bab El- Sha'aria University Hospital, between July 2012 and January 2013, for coronary angiography. The selected patients were divided into two groups: Group I (control group): Ten patients with normal coronary angiography or with insignificant lesions (less than 70%) in the coronary arteries by coronary angiography. Group II (Patient group) Thirty patients with significant stenosis (more than 70%) in the coronary arteries by coronary angiography. The second group was further subdivided into three subgroups: Group A : patients with single vessel disease (SVD), Group B : patients with two vessel disease (TVD), and Group C : patients with multi vessel disease (MVD). For all patients, the data collected were full history taking and thorough clinical examination , twelve leads resting ECG, conventional echocardiography and pulsed tissue Doppler imaging and coronary angiography.

Results: There was no statistically significant difference between the two groups as regard demographic characteristics including age, gender, cardiovascular risk factors including DM, hypertension, dyslipidemia, smoking and BMI. There was statistically significant difference between the two groups as regard Sm velocity, Ea velocity and E/Ea velocity ratio. There was no statistically significant difference between the two groups as regard DT, E velocity, A velocity, E/A velocity ratio, Aa velocity, Ea/Aa velocity ratio, IVCT, IVRT, ET and MPI .

There was no statistically significant difference between the control and subgroups A, B, and C as regard demographic characteristics including age and gender but there was statistically significant difference between the three subgroups as regard BMI (Kg/m2) . There was no statistically significant difference between the three subgroups as regard diabetes mellitus, hypertension, and smoking and echocardiographic data including Sm, Ea, Aa, E, A velocities, E/Ea and E/A velocity ratios, DT, IVCT, IVRT, ET, MPI and EF.

There was no statistically significant difference between the control group and the subgroups A,B and C as regard demographic characteristics including age and gender, cardiovascular risk factors including DM, hypertension, smoking and BMI and E-velocity, A- velocity, Aa velocity, E/A ratio , Ea/Aa -velocity ratio, DT, IVRT, IVCT, ET and MPI. There was no significant difference between the control group and subgroup

A, but significant with subgroup B and very significant with subgroup C as regard Sm velocity. There was statistically no significant difference between the control group and subgroup A, but very significant with subgroup B and significant with subgroup C as regard Ea-velocity. As regard E/Ea velocity, there was no statistically significant difference between the control group and subgroups A and C but significant with subgroup B.

Conclusion : Tissue Doppler imaging revealed both systolic and diastolic dysfunction in patients with coronary artery disease even when ejection fraction was preserved and the nature of the dysfunction depended on the severity of CAD.

Key word: CAD, Coronary angiography, Echocardiography, Tissue Doppler imaging velocities.

INTRODUCTION

Despite a decline in mortality attributed to coronary artery disease (CAD), the burden of CAD remains high and is the leading cause of heart failure. This emphasizes the need for early detection of CAD in order to prevent heart failure and further reduce mortality due to CAD ***(Rosmond et al., 2008)***. Previous studies have demonstrated that TDI detects impaired diastolic and systolic function in ischemic myocardial regions. Hence, it has been proposed that TDI could be a useful diagnostic test in patients with suspected chronic CAD ***(Jarcia-Fernandez et al., 1999)***. Chronic CAD is a progressive disease with great variation in severity and if TDI is going to be a useful diagnostic test, it is necessary to clarify how the cardiac function is affected by different degrees of CAD (***Bolognesi et al., 2009***). TDI data display myocardial velocities throughout the cardiac cycle. The Doppler signals of the myocardium are of low intensity and high amplitude compared to that of red blood cells, which are of high velocity and low amplitude. Spectral pulsed wave Doppler (PW) provides better temporal and velocity resolution compared to the color method ***(Waggoner and Bierig , 2007).*** A number of parameters from TDI have been proposed to be useful in various cardiac diseases. In systole, potentially important prognosticators of TDI include peak systolic velocity in ejection period measured at mitral annulus (Sa) or at myocardial segments (Sm) as well as systolic dyssynchrony assessment. In diastole, potentially important prognosticators include peak myocardial early diastolic velocity measured at the mitral annulus (Ea) or myocardial segments (Em) as well as measurement of transmitral to TDI early diastolic velocity ratio (E/Ea) ***(Ding et al., 2010).*** These myocardial velocity measurements with TDI have been shown to be useful in various diseases including heart failure (HF), hypertension, and acute myocardial infarction (MI), and in patients undergoing stress echocardiography for suspected coronary heart disease (***Yu et al., 2003***). Previous investigators have shown that the ratio of early diastolic mitral inflow (E) to early diastolic mitral annular tissue velocity (Ea) has a good correlation with left ventricular filling pressure (***Sohin et al., 20013***). We hypothesized that myocardial velocities assessed by TDI may be affected by different degrees of CAD even with preserved LV systolic function. The study aimed to determine how myocardial

velocity assessed by pulsed TDI is affected by different degrees of CAD in patients with symptomatic CAD and preserved LV ejection fraction.

PATIENTS AND METHODS

The present study included 40 patients with CAD, admitted at Bab El Sha·aria University Hospital, between July 2012 and January 2013 for coronary angiography according to AHA/ACC guidelines for diagnosis of CAD.

Inclusion criteria: Sinus rhythm, patient with symptomatic CAD, age > 20 years. Exclusion criteria: Patients with left ventricular ejection fraction (LVEF) < 50%, patients with prior myocardial infarction, patients with congestive heart failure, patients with valvular heart disease and patients with intra ventricular conduction disturbances and arrhythmias. The selected patients were divided into two groups: Group I (control group); ten patients with normal coronary angiography or with insignificant lesions (less than 70%) in the coronary arteries by coronary angiography. Group II (patient group); thirty patients with significant stenosis (more than 70%) in the coronary arteries by coronary angiography. The subjects of group II were further subdivided into three subgroups:_Group A; patients with single vessel disease (SVD), Group B; patients with two vessel disease (TVD), and Group C; patients with multi vessel disease (MVD). All patients were subjected for the following***:***

1. Informed consent about the type of the study.
2. Full history taking and thorough clinical examination, and risk factors of CAD were established.
3. Twelve leads resting ECG.
4. Conventional echocardiography and pulsed tissue Doppler imaging: All patients were examined with conventional two-dimensional echocardiography and pulsed TDI by Philips Sonos. Pulsed wave Doppler at the apical position was used to record mitral inflow between the tips of the mitral leaflets. Peak velocity of early (E) and atrial (A) diastolic filling and deceleration time of the E-wave (DT) were measured, and the E/A-ratio was calculated. LVEF was determined by conventional two-dimensional echocardiography (***Manouras et al., 2009).*** Pulsed TDI loops were obtained in the apical four, two-chamber and apical long-axis view at the highest possible frame rate. Measurements were made for peak systolic (Sa), peak early diastolic (Ea), and late peak diastolic myocardial velocities (Aa), and the Ea/Aa ratio at the six mitral annular sites dividing the left ventricle into six segments of interest; the septal, lateral, inferior, anterior, posterior, and anteroseptal myocardial walls. Global longitudinal performance of the left ventricle was assessed by averaging the velocities from the six segments of patients and control group and comparing the velocities from the six segment of patient with the control group (***Olsen et al., 2009***). For every patient, we measured (IVRT, IVCT& ET) and from it we calculated

myocardial performance index (TIE index).

5. Coronary angiography: Selective coronary angiography by standard Judkin, s technique was performed for all subjects with the femoral approach and patients who found to have significant coronary stenosis were subdivided into three groups according to the vessels affected: Group A; patients with significant one-vessel disease, patients with significant left anterior descending artery (LAD) stenosis or right coronary artery (RCA) stenosis or left circumflex artery stenosis (LCX). Group B; patients with significant two-vessel disease, patients with significant LAD and circumflex artery (Cx) stenosis or significant left main artery stenosis or significant LAD and RCA stenosis, and group C; patients with significant three-vessel disease (***Soren et al., 2010***).

Statistical analysis: Data were coded and entered using the statistical registered version of the Graph Pad InStat Version 3.00 Created For win 98. Two types of statistics were done:

1. Descriptive statistics: mean(x)±standard deviation (SD) for quantitative (Continuous) variables and number and percentage for qualitative (categorical) variables.
2. Analytic statistics: Paired t-test, unpaired t-test. P value < 0.05 was considered statistically significant.

RESULTS

Demographic characteristics and risk factors for CAD in the control and patient groups (Table 1).

Group I: Mean age ± SD was (50.2 ± 6.89) years. Gender : Four patients (40%) were males and six patients (60%) were females. Mean BMI ± SD was 20.8 ± 1.476 kg/m^2. Risk Factors: Two patients (20%) were diabetic and eight patients (80%) were non diabetic. One patient (10%) was hypertensive and nine patients (90 %) were non hypertensive. Three patients ware dyslipidemic and seven patient ware non dyslipidemic. Three patients (30 %) were smokers and seven patients (70 %) were non smokers. ***Group II:*** Mean age ± SD was 45.7±7.475 years. Gender : Nineteen patients (63.33%) were males and eleven patients (36.67%) were females. Mean BMI ± SD was 20.6671.295 kg/m^2. Risk Factors: Twelve patients (40 %) were diabetic and eighteen patients (60%) were non diabetic. Eighteen patients (60%) were hypertensive and twelve patients (40%) were non hypertensive. Thirteen patients were dyslipidemic and seventeen patients ware non dyslipidemic. Fifteen patient (50%) were smokers and fifteen patients (50%) were non smokers. There was no statistically significant difference between the two groups as regard demographic characteristics including age, gender, cardiovascular risk factors including DM, hypertension, dyslipidemia, smoking and BMI.

Table (1): Comparison between the two main groups according to patient´s demographic characteristics and risk factors.

Groups / Variables	Group I	Group II	P-value	Significance
Age (mean±SD)	50.2±6.89	45.7±7.47	0.1014	Insignificant
BMI (mean±SD)	20.8±1.476	20.667±1.295	0.787	Insignificant
Dyslipidemia	3(7.5%) dyslipidemic, and 7(17.5%) non dyslipidemic	13(32.5%)dyslipidemic, and 17(42.5%) non dyslipidemic	0.236	Insignificant
Gender	4(10%) are males, and 6(14%) are females	19(63.33%) males, and 11(36.67%) females	0.198	Insignificant
Diabetes mellitus	2(5%) diabetics and 8(80%) non-diabetics	12(30%) diabetics and 18(45%) non-diabetics	0.236	Insignificant
Hypertension	1(2.5%) hypertensive and 9(22.5%) non-hypertensive	18(45%) hypertensive, and 12 (30%) non-hypertensive	0.0004	Significant
Smoking	3(9%) smokers, and 7(16%) non-smokers	15(43%) smokers and 15(32%) non-smokers	0.265	Insignificant

There was a statistically significant difference between the two groups as regard Sm velocity, Ea velocity and E/Ea velocity ratio. There was no statistically significant difference between the two groups as regard DT, E velocity, A velocity, E/A velocity ratio, Aa velocity, Ea/Aa velocity ratio, IVCT, IVRT, ET, MPI (Table 2).

Table (2): Comparison between the two main groups according to echocardiographic data (Mean ± SD).

Groups / Variables	Group I	Group II	P- value	Significance
Sm-velocity	11.294±3.149	7.693±1.932	0.0001	Significant
DT	181.60±36.25	192±47.957	0.5150	Insignificant
E-velocity	67.430±17.819	72.150±23.148	0.5691	Insignificant
A-velocity	60.400±17.011	60.040±39.964	0.9782	Insignificant
E/A velocity ratio	1.168±0.2941	1.148±0.8258	0.9424	Insignificant
Ea velocity	9.783±0.8151	7.894±1.977	0.0059	Significant
Aa velocity	10.811±2.094	9.752±1.815	0.1323	Insignificant
E/Ea velocity ratio	6.926±1.810	9.634±3.790	0.0368	Significant
Ea/Aa velocity ratio	0.903±0.252	0.907±0.296	0.973	Insignificant
IVCT	61.666±14.559	57.350±11.810	0.9444	Insignificant
IVRT	70.768±15.124	74.633±17.490	0.5363	Insignificant
ET	275.27±42.506	278.47±30.703	0.3307	Insignificant
MPI	0.5460±0.1819	0.4877±0.1236	0.2589	Insignificant

Demographic characteristics and risk factors for CAD (Table 3)

Subgroup A: Mean age ± SD was 53.178± 7.655 years. Sex: Four patients (10 %) were males and seven patients (17.5%) were females. Mean BMI ± SD was 20.455±.0688 kg?m². Risk Factors: Two patients (5 %) were diabetics and nine patients (22.5 %) were non diabetics. Six patients (15 %) were hypertensive and five patients (12.5 %) were non hypertensive. Four patients (10%) were smokers and seven patients (17.5%) were non smokers.

Subgroup B: Mean age ± SD was 45.615±9.188 years. Sex: Seven patients (17.5%) were males and six patients (15%) were females. Mean BMI ± SD was 20.308±1.182 kg?m². Risk Factors: Seven patients (17.5 %) were diabetics and six patients (15 %) were non diabetics. Seven patients (17.5%) were hypertensive and six patients (15 %) were non hypertensive. Seven patients (17.5%) were smokers and six patients (15%) were non smokers.

Subgroup C: Mean age ± SD was 52.866 ±6.927 years. Sex: One male patient (2.5%) and five patients (12.5 %) were females. Mean BMI ± SD was 21.833±1.835 kg?m². Risk Factors: Three patients (7.5%) were diabetics and three patients (7.5%) were non diabetics. Five patients (17.5%) were hypertensive and one non hypertensive patient (10.29 %). Four patient (10%) were smokers and two patients (5%) were non smokers .

Table (3): Comparison between the three subgroups according to patient´s demographic characteristics and risk factors.

Groups / Variables	Group A	Group B	Group C	P- value	Significance
Age	53.178±7.655	45.615±9.18	52.866±6.927	0.8820	Insignificant
BMI (kg/m^2**)**	20.45±0.68	20.30±1.18	21.83±1.83	0.0398	Significant
Gender	4 (17%) males and 7 (29%) females	7 (29%) males, and 6(25%) females	1 (6%) males and 5 (29%) females	A vs B 0.3706 A vs C 0.4128 B vs C 0.177	Insignificant
Diabetes mellitus	2 (8%) diabetics, and 9(38%) non-diabetics	7(29%) diabetics, and 6 (25%) non-diabetics	3(18%) diabetics, and 3(18%) non-diabetics	A vs B 0.444 A vs C 0.6000 B vs C 0.8760	Insignificant
Hypertension	6 (25%) hypertensive, and 5 (21%) non-hypertensive	7(29%) hypertensive, and 6(25%) non-hypertensive	1(6%) hypertensive, and 5 (29%) non-hypertensive	A vs B 0.9727 A vs C 0.3165 B vs C 0.4672	Insignificant
Smoking	4(17%) smokers, and 7(29%) non-smokers	7(29%)smokers, and 6(25%) non-smokers	4(24%) smokers, and 2(12%) non-smokers	A vs B 0.6561 A vs C 0.4916 B vs C 0.9790	Insignificant

There was no statistically significant difference between the three subgroups as regard demographic characteristics including age and gender, diabetes mellitus, hypertension, and smoking . There was statistically significant difference between the three subgroups as regard BMI (Kg/m2). There was no statistically quite significant difference between the three subgroups as regard ***echocardiographic data*** including Sm, Ea, Aa, E, A velocities, E/Ea and E/A velocity ratios, DT, IVCT, IVRT, ET, MPI and EF (Table 4).

Table (4): Comparison between the three subgroups according to echocardiographic data (Mean±SD).

Groups / Variables	Group A	Group B	Group C	P- value
Sm-velocity	8.763±2.502	7.105±0.9229	7.005±1.759	0.0641
Ea velocity	8.541±1.879	7.596±1.717	7.352±2.651	0.3958
Aa velocity	10.575±1.795	9.167±1.865	9.512±1.365	0.1567
E-velocity	72.8±19.183	71.6±26.826	69.3±17.338	0.9547
A-velocity	74.200±17.542	72.377±43.170	73.783±10.412	0.9890
E/Ea velocity ratio	8.963±3.208	9.870±4.024	10.352±4.704	0.7503
E/A velocity ratio	1.045±0.4330	1.367±1.220	0.9600±0.2750	0.5477
DT- velocity	198.96±33.470	195.45±59.567	173.67±39.883	0.5483
IVCT	72.621±23.685	78.218±15.030	77.305±13.513	0.7491
IVRT	54.015±11.347	60.653±12.779	56.307±10.268	0.3936
ET	274.00±39.778	276.92±20.210	269.19±46.654	0.9003
MPI	0.4855±0.1733	0.5008±0.0997	0.4633±0.0997	0.8361
EF	76.27±7.6	76.07±5.37	60.5±5.95	0.0729

There was no statistically significant difference between Group I and the three subgroups of group II as regard demographic characteristics including age, gender, cardiovascular risk factors including DM, hypertension, smoking and BMI (Table 5) .

Table (5): Group I (control group) and the three subgroups (A,B,C) of group II according to patient´s demographic characteristics and risk factors (Mean ± SD).

Subgroups / Variables	I vs A		I vs B		I vs C	
	I	A	I	B	I	C
Age	51.200 ±7.554	55.455 ± 6.121	51.200 ±7.554	54.615± 9.188	51.200 ±7.554	52.867± 6.595
P-Value	0.1706(NS)		0.3518(NS)		0.5467 (NS)	
BMI	20.800±1.476	20.455±0.687	20.800±1.476	20.308±1.182	20.800±1.476	21.833±1.835
P-Value	0.4932 (NS)		0.2352 (NS)		0.3839 (NS)	
Gender	4 (19%) males 6 (29%) females	4 (19%) males 7(33%) females	4 (19%) males 6(26%) females	7(30%) males 6 (26%) females	4 (19%) males 6(26%) females	1(6%) males 5(31%) females
P-Value	1.000(NS)		0.5879(NS)		0.6802(NS)	
DM	2 (10%) diabetic 8 (38%) non-diabetics	2 (10%) diabetic 9 (43%) non-diabetics	2 (9%) diabetic 8 (35%) non-diabetics	7 (30%) diabetic 6 (26%) non-diabetics	2(13%) diabetic 8(50%) non-diabetics	3(19%) diabetic 3(19%) non-diabetics
P-Value	0.2995(NS)		0.1968(NS)		1.0000 (NS)	
HTN	1(5%) HTN 9 (43%) Non-HTN	6(29%) HTN 5 (24%) Non-HTN	1(4%) HTN 9(39%) Non-HTN	7(30%) HTN 6(26%) Non-HTN	9(24%) HTN 13(35%)Non-HTN	8(22%) HTN 7(19%) Non-HTN
P-Value	0.635(NS)		0.5164 (NS)		0.0743(NS)	
Smoking	3(14%) Smokers 7(33%) Non-smokers	4(19%) Smokers 7(33%) Non-smokers	3(13%) Smokers 7(30%) Non-smokers	7(30%) Smokers 6(26%) Non-smokers	1(6%) Smokers 9(56%) Non-smokers	5(31%) Smokers 1(6%) Non-smokers
P-Value	1.000(NS)		0.4015(NS)		0.0076(NS)	

There was no significant difference between Group I and subgroup A, but significant with subgroup B and subgroup C as regard Sm velocity. There was statistically no significant difference between Group I and subgroup A, but significant with subgroup B and subgroup C as regard Ea-velocity. As regard E/Ea velocity, there was no statistically significant difference between group 1 and subgroups A and C, but significant with subgroup B. There was no statistically significant difference between Group I and the three subgroups as regard E-velocity, A- velocity, Aa velocity, E/A ratio , Ea/Aa -velocity ratio, DT, IVRT, IVCT, ET and MPI (Table 6).

Table (6): Group I (control group) and the three subgroups (A,B&C) according to patient´s echocardiographic data (Mean ± SD)

Groups / Variables	I vs A		I vs B		I vs C		P- value	Significance
	I	A	I	B	I	C		
Sm-velocity	11.294 ± 3.149	8.763 ± 2.502	11.294 ± 3.149	7.105 ± 0.9229	11.294 ± 3.149	7.005 ± 1.759	0.0545 0.0089 0.0002	Insignificant Significant Significant
Ea velocity	9.783 ± 0.8151	8.514 ± 1.879	9.783 ± 0.8151	7.596 ± 1.717	9.783 ± 0.8151	7.352 ± 2.651	0.698 0.0157 0.0013	Insignificant Significant Insignificant
Aa velocity	10.811 ± 2.094	10.575± 10.795	10.811 ± 2.094	9.176± 1.865	10.811 ± 2.094	9.95± 1.508	0.7844 0.060 0.2127	Insignificant Insignificant Insignificant
E-velocity	67.430± 17.891	72.800± 19.183	67.430± 17.891	71.233± 27.985	67.430± 17.891	69.300± 17.338	0.5163 0.7149 0.7353	Insignificant Insignificant Insignificant
A-velocity	60.400± 17.011	74.200± 17.542	60.400± 17.011	72.377± 43.170	60.400± 17.011	73.783± 10.412	0.0835 0.4182 0.1058	Insignificant Insignificant Insignificant
E/Ea velocity ratio	6.926± 1.810	9.085± 3.088	6.926± 1.810	9.870± 4.024	6.926± 1.810	10.352± 4.704	0.0659 0.0339 0.0546	Insignificant Significant Insignificant
E/A velocity ratio	1.168± 0.2941	1.054± 0.4330	1.168± 0.2941	1.367± 1.220	1.168± 0.2941	0.9600± 0.2750	0.4922 0.1828 0.2610	Insignificant Insignificant Insignificant
Ea/Aa – velocity	0.903± 0.2532	1.003± 0.3718	0.903± 0.2532	0.8554± 0.2585	0.903± 0.2532	0.8417± 0.1822	0.4859 0.6632 0.1521	Insignificant Insignificant Insignificant
DT- velocity	181.60± 36.025	199.18± 36.641	181.60± 36.025	195.54± 59.567	181.60± 36.025	173.67± 39.883	0.2821 0.5215 0.6878	Insignificant Insignificant Insignificant
IVCT	61.666± 14.559	54.015± 11.347	61.666± 14.559	60.653± 12.779	61.666± 14.559	56.307± 10.268	0.1928 0.8609 0.444	Insignificant Insignificant Insignificant
IVRT	70.768± 15.124	72.621± 23.685	70.768± 15.124	78.218± 15.030	70.768± 15.124	77.305± 13.513	0.8351 0.2531 0.3996	Insignificant Insignificant Insignificant
ET	275.27± 42.506	274± 39.778	275.27± 42.506	276.92± 42.506	275.27± 20.210	290.02± 33.350	0.3307 0.3059 0.2181	Insignificant Insignificant Insignificant
MPI	0.5460± 0.1819	0.4855± 0.1733	0.5460± 0.1819	0.5008± 0.0997	0.5460± 0.1819	0.4633± 0.0595	0.444 0.4541 0.3044	Insignificant Insignificant Insignificant

DISCUSSION

Tissue Doppler imaging (TDI) is used clinically to evaluate quantitatively myocardial motion velocity, and several studies have reported the clinical importance of TDI by comparing systolic and diastolic parameters determined by conventional methods with values obtained with TDI ***(Garcia et al.,1998).*** Previous studies have demonstrated that TDI detects impaired diastolic and systolic function in ischemic myocardial regions. Hence, it has been proposed that TDI could be a useful diagnostic test in patients with suspected chronic CAD ***(Jarcia-Fernandez et al., 1999).*** Chronic CAD is a progressive disease with great variation in severity and if TDI is going to be a useful diagnostic test, it is necessary to clarify how the cardiac function is affected by different degrees of CAD ***(Bolognesi et al., 2009).*** The aim of this study was to determine that the myocardial velocities assessed by pulsed TDI is affected by different degrees of CAD in patients with symptomatic CAD and preserved LV ejection fraction. There was statistically significant difference between the CAD patients (Group 2) and the control group (group 1) as regard Sm, Ea and E/Ea. When we compared the control group with the three patient subgroups, we found that, as regard Ea velocity, there was no significant difference between the control group and group (A), but significant with group (B) and group (C). As regard E/Ea velocity, there was no statistically significant difference between control group (group 1) and group (A and C) but significant with group (B). As regard Sm velocity, there was no statistically significant difference between control group (group 1) and group (A) but significant with group (B) and group (C). However, there were no statistically significant differences between the three subgroups as regard Sa, Ea and E/Ea . Hence, the findings of this study supported the previous reports which suggested that tissue Doppler velocities (Ea and Sa) decrease with increase number of coronary arteries with significant stenosis. The finding of the study done by ***Soren et al.(2010***) was similar to our study except that late diastolic tissue Doppler velocity (Aa) velocity: Our study demonstrated that there was no significant changes between patient and control groups and between the three subgroups. This result was supported by the study done by ***Divid et al. (2009)*** which demonstrates that ischemia may affect mainly the diastolic active process without affecting the passive phase (atrial contraction). Therefore, during ischemia, there is a decrease in early diastolic velocity (E wave) without any change in late velocity (A wave) resulting in an inverted E/A ratio. The alteration of LV global diastolic filling depends on the magnitude and extension of regional diastolic dysfunction caused by myocardial ischemia. The study by ***Jarcia-Fernandez et al. (1999)*** is similar to our study except that IVRT was not significantly affected as we measured it globally not regionally. In the study ***by Bolognesi et al. (2009)***, the extent of the percentage of left ventricular longitudinal shortening and the systolic peak velocity at echo-tissue Doppler were significantly higher in the control patients than in patients with CAD. Left ventricular end-diastolic pressure was higher in patient with CAD. Hence, the findings of this study support the result of our study that

tissue Doppler velocities (Ea & Sa) decreased in patients with CAD. As regard myocardial performance index (TIE Index), our study demonstrates no significant difference between patient and control group as regard TIE Index. In the study by ***Sohin et al.(2013***) concluded that although the normal EF, MPI value impaired in proportion to the severity of CAD in patients with stable CAD. Findings of this study was not the same of our study which may be due to low number of our study. In the present study, there was no statistically significant difference between the two groups as regard BMI, sex, smoking, prevalence of DM, and there was statistically significant difference between the two groups as regard HTN. This was probably due to personal variation.

This study has some limitations which should be addressed in further studies. Regional wall motion abnormalities may be due to other condition other than ischemia such as age, diabetes, intra ventricular conduction delay and fibrosis. The presence of coronary artery lesion assessed by CA is not necessary associated with ischemia sample. On the other hand, ischemia may present in the control without significant stenosis due to microvascular ischemia, and the region of ischemia supplied by stenotic arteries may be supplied by collateral arteries.

CONCLUSION

Tissue Doppler imaging revealed both systolic and diastolic dysfunction in patients with coronary artery disease even when ejection fraction was preserved and the nature of the dysfunction depend on the severity of CAD.

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خلفية البحث: يعتبر مرض قصور الشرايين التاجية السبب الأول للوفيات. كما يعد مرض تصلب الشرايين السبب الأساسي لقصور الشرايين التاجية للقلب.

الهدف من البحث: كان الهدف من هذه الدراسة هو تقييم الأنماط المختلفة لسرعات عضلة القلب بواسطة الدوبلر النسيجي ومقارنتها بدرجة إصابة الشرايين التاجية بتضيقات الشريان التاجي .

المرضى و طرق البحث: أجريت هذه الدراسة بوحدة القسطرة بقسم القلب بمستشفى باب الشعرية الجامعي – جامعة الأزهر – بالقاهرة في الفترة ما بين يوليو 2012 ويناير 2013م. وقد إشتملت هذه الدراسة على أربعين مريضا من مرضى قصور الشرايين التاجية للقلب المنومين بقسم القلب بمستشفى باب الشعرية الجامعي لعمل القسطرة القلبية لهم. و قد تم تقسيمهم إلى مجموعتين طبقا لنتائج الفحص كالتالي : المجموعة الأولى : أشخاص لديهم شرايين تاجية سليمة أو تضيق بسيط (<70%). المجموعة الثانية : أشخاص يعانون من مرض الشريان التاجي (تضيق شديد ≤ 70%) وتم تقسيمهم إلى ثلاث مجموعات صغيرة على حسب عدد الشرايين التاجية الرئيسية المصابة : ***المجموعة أ***: مرضى ذو ضيق في شريان تاجي واحد . ***المجموعة ب***: مرضى ذوى ضيق في شريانين تاجيين. ***المجموعة ج*** : مرضى ذوى ضيق في ثلاث شرايين تاجية فأكثر. وقد خضع جميع المرضى إلى التالي:- أخذ التاريخ المرضى الكامل مع التركيز بشكل خاص على الجنس والعمر وعوامل الخطورة لقصور الشرايين التاجية كارتفاع ضغط الدم و مرض البول السكري والتدخين، الفحص العملي الكامل: شاملا قياس طول ووزن المريض لحساب مؤشر كتلة الجسم، تخطيط القلب الكهربائي (12 قطب) ، إجراء فحص موجات فوق صوتية قلبية مع تقنية الدوبلر النسيجي النبضي . تصوير الشرايين التاجية باستخدام القسطرة: وفى هذه الدراسة تمت المقارنة بين المجموعتين الأولى والثانية وكذلك مجموعة أ ومجموعة ب ومجموعة ج من حيث الخصائص الإكلينيكية وعوامل

الخطورة لقصور الشرايين التاجية (العمر، الجنس، ارتفاع ضغط الدم، مرض البول السكري، التدخين، ومؤشر كتلة الجسم). تقييم سرعات عضلة القلب بواسطة الدوبلر النسيجي ودرجة إصابة الشرايين التاجية بمرض إنسداد الشريان التاجي .

النتائج: وجد فروق ذات دلالة إحصائية عالية بين المجموعة الأولى والثانية فيما يتعلق بتقييم *كفاءة عضلة القلب الإنقباضية والإنبساطية بواسطة الدوبلر النسيجي.* وظهر عدم وجود *فرق ذو دلالة إحصائية بين المجموعة الأولى والثانية فيما يتعلق بالسن والجنس والبدانة ومؤشر كتلة الجسم والتدخين وداء البول السكري بينما توجد فروق ذات* دلالة إحصائية عالية بين المجموعة الأولى والثانية فيما يتعلق *بارتفاع ضغط الدم. ولم توجد فروق ذات دلالات إحصائية بين المجموعة (أ) والمجموعة(ب) والمجموعة(ج) فيما يتعلق بالجنس والعمر وإرتفاع ضغط الدم ومرض البول السكري والتدخين ومؤشر كتلة الجسم وكذلك من حيث تقييم كفاءة عضلة القلب الإنقباضية والإنبساطية بواسطة الدوبلر النسيجي. ولم توجد فروق ذات دلالات إحصائية بين المجموعة الأولى والثلاث مجموعات (أ ، ب ، ج) أما فيما يتعلق بارتفاع ضغط الدم ومرض البول السكري والعمر ومؤشر كتلة الجسم والتدخين فقد وجدت فروق ذات دلالة إحصائية عالية بين المجموعة الأولى والثلاث مجموعات (أ ، ب ، ج)* فيما يتعلق *بتقييم كفاءة عضلة القلب الإنقباضية والإنبساطية بواسطة الدوبلر النسيجي.*

الإستنتاج: إنتهت الدراسة إلى أن فحص القلب.بالموجات فوق الصوتية مع تقنية الدوبلر النسيجي في مرضى قصور الشريان التاجي يوضح وجود خلل في وظيفة عضلة القلب الإنقباضية والإنبساطية وهذا يتناسب مع شدة إصابة الشرايين التاجية.