Determinants of early changes in left ventricular systolic function in patients with essential hypertension and normal ejection fraction.

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Objectives:

Hypertension has been associated with an early reduction in myocardial systolic function as assessed by indices of novel 2D speckle tracking (2DST) echocardiography even in the presence of normal ejection fraction (EF)

The **aim** of the study was to investigate the association of 2DSTE indices of longitudinal and rotational myocardial function with classical cardiovascular risk factors, arterial stiffness and coronary microvascular function in hypertensive patients with normal EF

Methods:

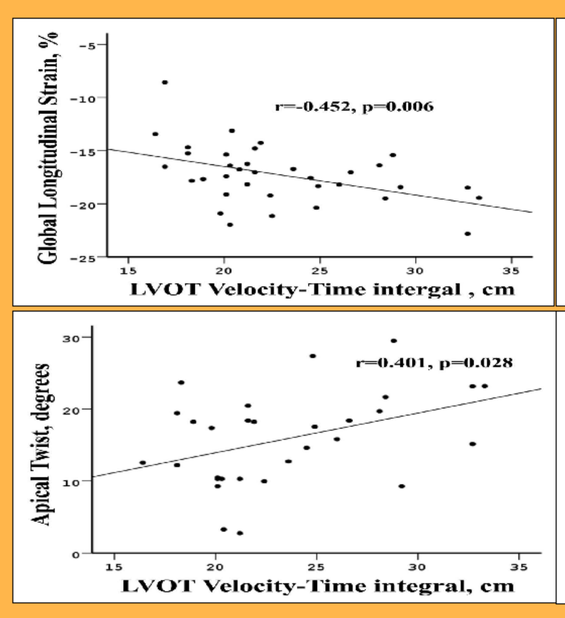
- Forty-one male patients (mean age 57±9 years) with normal EF and no left ventricular (LV) hypertrophy were enrolled
- Conventional, tissue Doppler (TD) and 2DST echocardiography were used to assess cardiac function
- Coronary flow reserve (CFR) in the left anterior descending artery using dipyridamole was assessed
- Arterial stiffness was assessed by measuring carotid femoral pulse wave velocity (PWVcf) and central augmentation index (AIx) with arterial tonometry

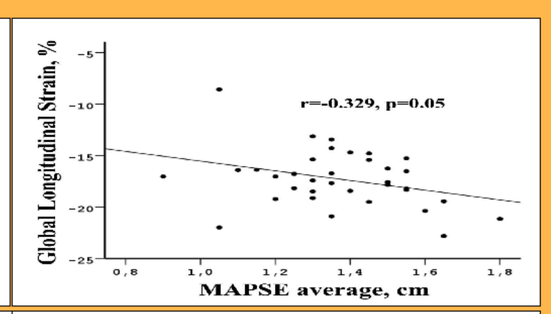
Results:

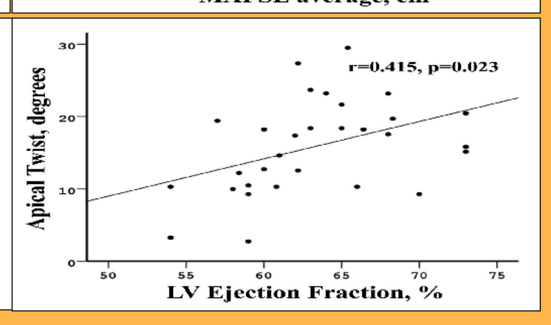
CLINICAL & LABORATORY PARAMETERS	
Age,years	57±9
BMI, kg/m^2	29.0±2.8
Heart Rate, bpm	70±10
SBP,mmHg	140±17
DBP, mmHg	86±13
cSBP, mmHg	133±10
cDBP, mm Hg	87±10
cPP, mm Hg	46±9
Smoking (%)	12 (29)
Diabetes (%)	10 (24)
Drugs (%)	
Diuretics	18 (44)
RAAS inhibitors	30 (73)
CCB	20 (49)
B-blockers	14 (31)
Statins	22 (54)
eGFR, ml/min/1.73 m^2	77.3±17.9
Hemoglobin, g/dl	15.1±1.2
Glucose, mg/dl	103 (63, 294)
Total Cholesterol, mg/dl	208±72
HDL, mg/dl	51±14
Triglycerides, mg/dl	141±66

VASCULAR MEASUREMENTS	
PWVcf, m/sec	9.1±1.9
AIx, %	23.8±8.0

ECHO CARDIOGRAPHIC MEASUREMENTS	
CFR	2.60±1.02
LAVI, ml/m^2	29±7
LVMI, gr/m^2	89±19
LVEDV, ml	82±18
LVESV, ml	30±9
EF, %	63.6±5.4
Stroke volume, ml	81±15
LVOT-VTI, cm	22.6±4.5
TAPSE, mm	24±4
MAPSE average, mm	14.0±2.3
E wave, m/s	0.68±0.14
A wave, m/s	0.76±0.16
E/A	0.93±0.25
DT,ms	213±45
IVRT, ms	85±21
A duration, ms	126±21
IVCT, ms	58±16
MPI	0.49±0.09
PASP, mmHg	23±11
TDI-MV S average, cm/s	9.3±1.7
TDI-TV S, cm/s	14.9±3.0
E/E'	7.5±2.2
GLS	-17.3±2.8
GCS	-19.0±4.3
Peak Twist	15.8±6.4







Univariate and multivariate associations				
GLS, %	**Univariate associations**		**Multivariate associations R^2 0.24, P=0.005**	
	r	**P**	**B (95% CI)**	**P**
Systolic BP, mmHg	0.500	0.003	0.079 (0.026, 0.133)	0.005
Heart rate, bpm	0.435	0.009	-	-
LV mass index, gr/m^2	0.437	0.011	-	-
Diastolic BP, mmHg	0.377	0.028	-	-
eGFR, ml/min/1.73 m^2	-0.335	0.05	-	-
APICAL TWIST, degrees	**Univariate associations**		**Multivariate associations R^2 0.05, P=0.008**	
LV mass index, gr/m^2	-0.476	0.010	-0.15 (-0.26, -0.04)	0.008

- **Global circumferential strain (GCS)** was not associated with any of the studied parameters.
- **Global longitudinal strain (GLS)**
  - in uninvariate analysis, was associated with conventional echocardiographic indices of systolic function [velocity-time-integral of LV outflow tract (r=-0.452, p=0.006) and MAPSE (r=-0.329, p=0.05)] as expected, as well as systolic (r=0.500, p=0.003) and diastolic (r=0.377, p=0.028) blood pressure, heart rate (r=0.435, p=0.009), eGFR (r=-0.335,p=0.05), and LV mass index (r=0.437, p=0.011)
  - in multivariate analysis, the sole independent predictor of GLS (R^2 0.241) was systolic blood pressure (B 0.079, p=0.005)
- **Apical twist** was associated with conventional echocardiographic indices of systolic function [LVEF (r=0.415, p=0.023), velocity-time-integral of LV outflow tract (r=0.401, p=0.028)] as expected as well as LV mass index (r=-0.476, p=0.010)
- Indices of arterial stiffness and CFR did not correlate with any novel index of systolic function: global circumferential strain or GLS or apical twist

Conclusions:

- In healthy hypertensive patients with normal EF, longitudinal and rotational myocardial function were inversely associated with systolic blood pressure and LV mass respectively, but not with indices of arterial stiffness or coronary microvascular function
- Further research is needed to assess the potential pathophysiological and prognostic role of these echocardiographic indices in patients with hypertension

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