Impact of Pre-Hypertension on Left Atrial Size and Function

Thesis
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of master degree in Cardiology

Presented By
Mahmoud Ibrahem Mohammad Sakr
M.B.B.CH.

Under supervision of
Prof. Dr. Khaled Abdelatef El-Meniawy
Professor of Cardiology
Faculty of medicine – Ain Shams University

DR .Inas Ibrahim Eweda
Assistant Professor of Cardiology
Faculty of medicine - AinShamsUniversity

Faculty of medicine
Ain Sham University

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List of abbreviation

JNC7	The seventh report of the joint national committee
TROPHY	Trial of preventing hypertension
BP	Blood pressure
DBP	Diastolic blood pressure
SBP	Systolic blood pressure
ESH/ESC	The European society of hypertension and the European society of cardiology
NHANES	National health and nutrition examination survey
CVD	Cardio vascular disease
DASH	The dietary approaches to stop hypertension
LA	Left atrium
LV	Left ventricular
RV	Right ventricle
LAV	Left atrial volume
LVDP	Left ventricular end-diastolic pressure
AF	Atrial fibrillation
LVV	Left ventricular volume
LAD	Left atrial dimensions
BSA	Body surface area
CHF	Congestive heart failure
HR	Heart rate
2D	Two-dimensional

3D	Three-dimensional
CT	Computerized tomography
MRI	Magnetic resonance image
CHD	Coronary heart disease
ECG	Electro cargio grame
ASE	American Society of Echocardiography
Volmax	Maximal LA volume
Volp	Pre-atrial contraction volume
Volmin	Minimal LA volume
PLAX	Parasternal long-axis
LAT	Lateral
SI	Supero-inferior
RT3DE	Real-time three-dimensional echocardiography
LAEF	Left atrium ejection fraction
ROI	Region of interest
PALS	peak atrial longitudinal strain
PACS	peak atrial contraction strain
CSI	Contraction strain index
TPLS	Time to peak longitudinal strain
A4C	Apical four-chamber
A2C	Apical two-chamber

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Protocol

Introduction

The Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7) defines hypertension as blood pressure >140/90 mmHg (Chobanian et al., 2003).

Persons with blood pressure above optimal levels, but not clinical hypertension (systolic blood pressure of 120-139 mm Hg or diastolic blood pressure of 80-89 mm Hg), are defined as having “pre-hypertension”(Chobanian et al., 2003).

Persons with pre-hypertension have a greater risk of developing hypertension than do those with lower blood pressure levels (Greenlund et al., 2004).

Hypertension affects nearly 26 per cent of the adult population worldwide (Kearney et al., 2005).

Evidence about pharmacological treatment of pre-hypertension is not available (Mancia et al., 2007).

Left atrial (LA) enlargement occurs in patients with moderate and severe hypertension (HT). (Matsuda et al., 1996).

HT results in left ventricular (LV) hypertrophy and reduced LV diastolic function. It has been established that LA volume is a sensitive marker for the severity of diastolic dysfunction. (Tsang et al., 2002)

Even mild hypertension seems to be associated with a reduction in early diastolic filling. This results in augmented late left ventricular diastolic filling due to active atrial contraction and may be the mechanism for the increase in left atrial size. (Suzanne et al., 2009).

Left atrial (LA) volume has recently been identified as a potential biomarker for cardiac and cerebrovascular disease. (Dominic et al., 2008).

The rationale for this new term was to bring to the attention of doctors and public health the need for more strenuous efforts at prevention of hypertension.

Aim of the work

The aim of the study is to evaluate the left atrial volume, function and diastolic dysfunction of left ventricle in pre-hypertensive patients.

Study population

Inclusion criteria:

- The study will include 50 pre-hypertensive volunteers and 50 normal controls, their ages range from 18 to 50 years. Males and females will be included.

Exclusion criteria:

The following patients will be excluded:

- Patients with previously documented higher BP levels than 140/90 mmHg.
- Patients on antihypertensive therapy regardless the cause.
- Diabetic patients.
- Coronary artery disease patients.
- Valvular heart disease patients.
- History of atrial or ventricular arrhythmias.
- Previous cardiac surgery or implanted devices.

Methods

The study population will be consisted of volunteers from hospital staff and the community. A detailed history will be obtained with thorough clinical examination. BP for all population will be recorded twice in the seated position 10 minutes after arrival.

- Echocardiograms will be performed according to established clinical practice using 2 commercially available instruments (Aloka prosound 4000 and Semiens sonoline G60S), using harmonic MHz variable frequency phased-array transducers.
- LA diameter by M-mode will be measured in the parasternal long-axis view. LV wall thickness will be measured by M-mode.
- Relative wall thickness will be measured as 2 x posterior wall thickness in diastole divided by LV diastolic dimension.
- LV end-diastolic and end-systolic volumes were determined from the apical 4- and 2-chamber views using the biplane method of discs.
- We will measure the following LA volumes:

(1) LA vol_{max} (LA volume in ventricular systole just before mitral valve opening)

(2) LA vol_{p} (LA volume before active atrial contraction volume at P-wave onset on ECG).

(3) LA Vol_{min} (minimal LA volume after mitral valve closure.

All volumes were calculated from the apical 4- and 2-chamber zoomed views using the biplane method of discs.

- The following LA emptying parameters will be derived:

1) LA passive emptying volume.
2) LA passive emptying fraction.
3) LA active emptying volume.
4) LA active emptying fraction.
5) LA total emptying fraction.

- Using pulsed Doppler mitral inflow will be obtained. Peak A-wave velocity, its velocity time integral and atrial fraction will be measured as an average of 3 beats.
- LV diastolic function will be determined using standard echocardiographic parameters including peak E velocity, peak A velocity, E/A ratio, and the deceleration time.

Diastolic filling were categorized as normal, impaired relaxation, pseudo normal, and restrictive patterns.

Statistics:

All the results will be subjected to adequate statistical analysis by standard methods.

Introduction

The Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7) defines hypertension as blood pressure ≥140/90 mmHg ***(Chobanian et al .,2003).***

The definitions of hypertension and pre-hypertension, which were well-defined in JNC 7 has not been addressed in JNC 8, similar treatment goals have been defined for all hypertensive population and no distinction between uncomplicated hypertension and hypertension with comorbid conditions like diabetes or chronic kidney disease (CKD) has been made, another difference was the choice of initial drug in patients without compelling indications. In contrast to JNC 7 where thiazides were recommended to be the initial choice in patients without compelling indications, no such recommendation has been made in JNC 8 ***(James et al .,2014).***

Persons with blood pressure above optimal levels, but not reaching the value of clinical hypertension (systolic blood pressure of 120-139 mm Hg or diastolic blood pressure of 80-89 mm Hg), are defined as having "pre-hypertension**"** ***(Chobanian et al .,2003)***.