Echocardiographically Estimated Pulmonary Capillary Wedge Pressure in Patients with Systemic Hypertension and Preserved Ejection Fraction

Thesis

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List of Abbreviations

Abbrev.	
á	Late diastolic wave by tissue Doppler
AF	Atrial fibrillation
AR	Atrial reversal flow in pulmonary veins
ASH	American Society of Hypertension
BMI	Body mass index
BSA	Body surface area
CAD	Coronary artery disease
CHF	Congestive heart failure
CMR	Cardiac magnetic resonance
CO	Cardiac output
CVD	Cardiovascular disease
D	Diastolic forward Pulmonary venous velocity
DBP	Diastolic blood pressure
DD	Diastolic dysfunction
DM	Diabetes mellitus
dP/dt	Rate of developing pressure
DT	Deceleration time
é	Early diastolic wave by tissue Doppler
E	Early mitral flow velocity
ECG	Electrocardiography
EDV	End diastolic volume
EF	Ejection fraction
HCM	Hypertrophic cardiomyopathy

List of Abbreviations (Cont.)

Abbrev.	
HFPEF	Heart failure with preserved ejection fraction
HR	Heart rate
HTN	Hypertension
IVRT	Isovolumic relaxation time
IVS	Interventricular septum
LA	Left atrium
LAD	Left atrial dimension
LAVI	Left atrial volume index
LV	Left ventricle
LVEDD	Left ventricular end diastolic dimension
LVESD	Left ventricular end systolic dimension
LVFP	Left ventricular filling pressure
LVH	Left ventricular hypertrophy
LVMI	Left ventricular mass index
LVPW	Left ventricular posterior wall
MI	Myocardial infarction
MUGA	Multi-Gated-Radionuclide Angiography
PC	Phase-contrast
PCWP	Pulmonary capillary wedge pressure
PFR	Peak filling rate
PV	Pulmonary venous
S	Systolic forward Pulmonary venous velocity

List of Abbreviations (Cont.)

Abbrev.	
SBP	Systolic blood pressure
SD	Standard deviation
SPECT	Single Photon emission computed tomography
SR	Strain rate
SRivr	Global strain rate during isovolumic relaxation
SV	Stroke volume
TDI	Tissue Doppler imaging
TEE	Transesophageal echocardiography
TPFR	Time to peak filling rate
TTE	Transthoracic echocardiography
Vp	Flow propagation velocity
WHO	World health organization
β	The exponential stiffness constant
έ	Strain
τ	Time constant of LV pressure decay

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Ahmed Abd Al Latif Gaber

Introduction

Systemic hypertension clearly increases the risk of systolic and/or diastolic heart failure ***(Gaddam et al., 2009).*** Left ventricular dysfunction: as an early measure of myocardial end organ damage, is commonly associated with hypertension and may well precede the development of left ventricular hypertrophy in hypertensive patients ***(Verma and Solomon, 2009).*** About half of the patients presenting with heart failure have a normal ejection fraction, a clinical syndrome that is commonly referred to as heart failure with preserved ejection fraction (HFPEF) or diastolic heart failure and is commonly associated with impaired LV relaxation and increased diastolic stiffness. Diastolic dysfunction and HFPEF are commonly associated with advancing age and hypertension. Hypertension control appears to be the most effective strategy in improving diastolic function and possibly for reducing the morbidity and mortality associated with HFPEF ***(Verma and Solomon, 2009).***

Doppler echocardiography is widely used for the non invasive assessment of diastolic filling of the left ventricle ***(Nishimura and Tajik, 1997).*** Analysis of the mitral inflow velocity curve has provided useful information for determination of filling pressures and prediction of prognosis in selected patients. However, mitral flow is dependant on multiple interrelated factors, including the rate and extent of ventricular relaxation, suction, atrial and ventricular compliance, mitral valve hemodynamics, and left atrial pressure ***(Nishimura and Tajik, 1997; Choong et al., 1987).*** These factors may have confounding effects on the mitral inflow ; thus, It has not be been possible to determine diastolic function from the mitral flow velocity curves in many subsets of patients ***(Yamamoto et al., 1997).***

Tissue Doppler imaging (TDI) of mitral annular motion has been proposed to correct for the influence of myocardial relaxation on trans-mitral flow. This has been shown to be an excellent predictor of diastolic filling in subsets of patients ***(Sohn et al., 1997).*** The ratio of early transmitral flow velocity (E) to early mitral annular diastolic velocity (é) was even used to estimate the pulmonary capillary wedge pressure , the correlation being validated against invasive catheter measurements ***(Ommen et al., 2000)***. In a prospective study design, we sought to evaluate the echocardiographically estimated pulmonary capillary wedge pressure (PCWP) in a series of hypertensive patients with preserved ejection fraction.

Aim of the Work

We aimed at exploring the range of the echocardiographically estimated pulmonary capillary wedge pressure in a series of hypertensive patients with preserved ejection fraction, in comparison with a normotensive group as a control.