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LEFT VENTRICULAR FUNCTION IN VARICOSE VEINS

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Abstract : Left ventricular function (LVF) was evaluated noninvasively by recording systolic time intervals (STIs) in 25 patients suffering from varicose veins (VV) of lower limbs and compared with 25 age - sex matched controls. STI was measured from simultaneous recordings of electrocardiogram (ECG), carotid arterial pulse (CAP) and phonocardiogram (PCG). The left ventricular ejection time (LVET) was significantly shortened with marked increase in pre-ejection period (PEP) and increase in PEP/LVET ratio ($P<0.001$) without any variation in electromechanical systols (QS_2) in VV patients compared to controls. These changes in STI suggest contractility of heart is adversely affected in VV patients.

Key words : varicose vein systolic time interval contractility of heart

INTRODUCTION

Varicosity of veins in lower extremities is a common venous disorder. Moderate varicosity persisting over years may cause cardiovascular symptoms (1). The present study was planned to evaluate the left ventricular function (LVF) by measuring systolic time intervals (STIs) noninvasively in varicose veins (VV) patients.

METHODS

Present study was conducted in 25 patients of either sex suffering from lower limbs varicose veins of 3–9 years duration in the age group of 25–45 years (mean 36±5.59) and was compared with age, sex matched 25 control subjects. Chronic varicosity was clinically diagnosed and confirmed by ambulatory venous pressure recording (2). None of the patient had present or past history suggestive of deep vein thrombosis, cardiac disease, diabetes, hypertension, chronic anaemia or collagen disorders.

Recording of systolic time intervals

Simultaneous recordings of electrocardiogram (ECG), carotid arterial pulse (CAP) and phonocardiogram (PCG) were made using a four channel polygraph (polyrite INCO). Study was performed with

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subjects in the left lateral decubitus position. The following systolic time intervals were computed (Fig. 1).

Electromechanical systole (QS_2) was measured from the onset of QRS deflection of ECG to the first high frequency vibration of the aortic component of the second heart sound.

Left ventricular ejection time (LVET) was measured from the point of onset of sudden upstroke of the CAP tracing to the trough of the incisura.

- Pre-ejection period (PEP) was obtained by subtracting LVET from QS_2.
- Ratio of PEP/LVET was also calculated.

The recordings were taken at a paper speed of 50 mm/sec. Only clearly defined tracings were analysed. Measurements were made on 10 cycles and the averages calculated. The results were expressed in milliseconds. The heart rate (HR) was determined from the ECG by measuring R–R interval.

Statistical analysis was done by using student's t-test. The correlation coefficient (r) between each value and HR was determined and regression equations worked out. These regression equations were used to correct the values of STI to zero heart rate (as described by Richterich) (3).

RESULTS

In patients with VV there was no appreciable change in heart rate and blood pressure (Table I and II). Regression equations (Table I) and rate corrected STI (designated with the subscript I) are given in Table III. There was significant reduction in LVET ($P<0.001$) and marked lengthening of PEP and PEP/LVET ratio ($P<0.001$) in VV patients compared to normals. However QS_2 showed no significant change between the two groups.

TABLE I: Heart rate and blood pressure in controls and varicose veins.

Parameter	*Control*	*Varicose veins*	*p value*
Heart rate (beats/min)	75.40±12.80	72.40±13.91	NS
Blood pressure systolic (mm of Hg)	115.63±12.17	110.51±11.23	NS
Diastolic (mm of Hg)	72.72±6.75	74.46±9.21	NS

TABLE II: Regression data of systolic time intervals (STIs) in controls and varicose veins.

STI	*Controls*	*Varicose veins*
QS_2	QS_2+1.39×HR	QS_2+1.17×HR
LVET	LVET+0.90×HR	LVET+0.7×HR
PEP	PEP+0.48×HR	PEP+0.43×HR

TABLE III: Heart rate and rate corrected STIs in controls and varicose veins.

Parameters	*Controls*	*Varicose veins*	*p value*
QS_2I (msec)	476.90±23.70	473.82±25.82	NS
LVETI (msec)	344.26±15.24	325.75±12.26	<0.001
PEPI (msec)	131.85±14.20	148.82±15.32	<0.001
PEPI/LVET ratio	0.38±0.04	0.42±0.03	<0.001

Value are mean±SD, NS-non significant, p value <0.001-Significant.

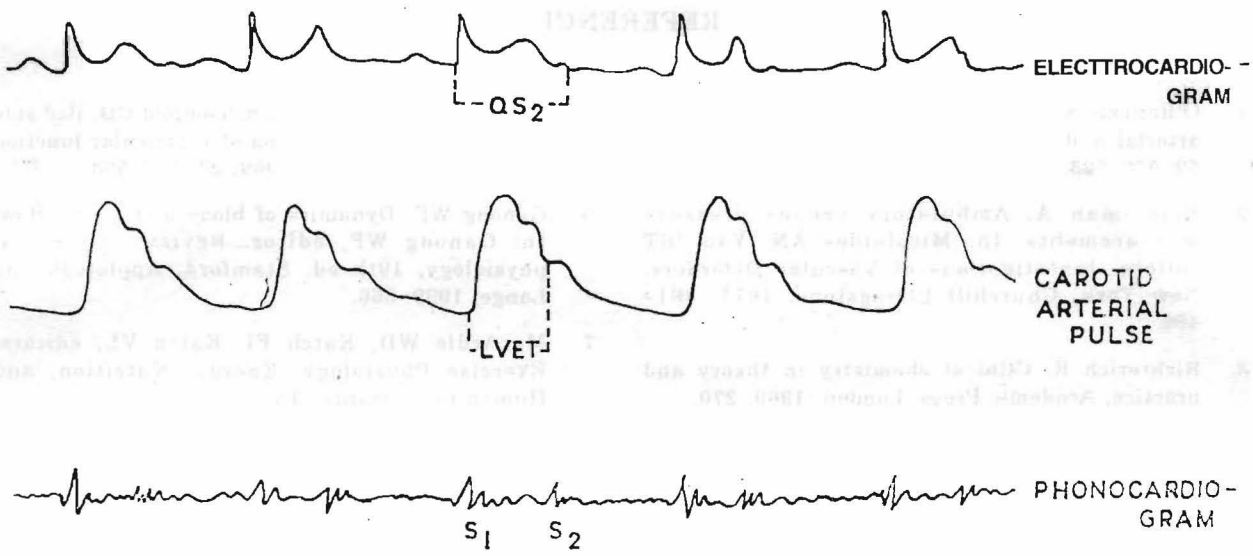

Fig. 1: Simultaneous recordings of electrocardiogram (ECG), carotid arterial pulse (CAP) and phonocardiogram (PCG) showing systolic time intervals (STIs).

DISCUSSION

Systolic time intervals are accepted as a measure of left ventricular performance. Increased ventricular filling is indicated by lengthening of LVET and shortening of PEP, while QS_2 remains unaltered (4). Shortening of PEP and decrease in PEP/LVET ratio reflect increased cardiac output and increased myocardial contractility (5). A total reverse of the above findings was seen in the current study, carried out in patients of varicose veins which revealed shortening of LVET and lengthening of PEP and PEP/LVET ratio, a pattern associated with reduced cardiac output and lowered myocardial contractility. The pooling of blood in lower extremities in these patients might have caused decreased venous return (6, 7), inadequate filling of ventricles and decreased stroke volume, thereby shortened LVET which may even clinically manifest in the form of fatigue, dyspones, dizziness, fainting and precordial distress (8), though not seen in the present study. With onset of varicosities, due to reduced venous return the body would be expected to compensate by increasing myocardial contractility. Over a period of time, however, these compensatory mechanisms would begin to fail, ending in cardiac decompensation which was not clinically apparent in this study as there was no variation in heart rate in both the groups.

In conclusion the recordings of STIs, in patients having prolonged vericosity of lower limbs, would help detecting cardiac decompensation much before it is clinically manifested.

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