

Diastolic function assessment in hypertensive patients

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Abstract: Systemic hypertension is linked with an increase in the risk of cardiovascular insults because to its negative effects on a variety of systems, particularly the cardiovascular system. There will be growing myocardial fibrosis before cardiac functional disturbances in a hypertensive persons become obvious. Diastolic impairment is a prominent component of this illness, and Despite the fact that its significance is becoming more widely recognized, it is still underappreciated due to its challenging diagnosis and lack of effective therapies. The study's goal is to assess diastolic function in people with managed hypertension. This study enlisted the participation of 80 young people. The patients were divided into two groups: Control group (I), n=40 (male: 24) and hypertensive group (II), n=40 (male: 24). When compared to normotensive people, we found that E/e (P value: 0.0001) and pulmonary capillary wedge pressure (P value: 0.0001) remain considerably greater. There is no difference in the ejection time of the left ventricular outflow tract between the research groups (P value: 0.6). We concluded that in managed hypertension individuals, E/e and PCWP are high, indicating impaired diastolic function.

Keywords: Diastolic function, ejection time, pulmonary capillary wedge pressure.

Abbreviation: LV: left ventricle, ET: ejection time, PCWP: pulmonary capillary wedge pressure, DT: deceleration time, MV: mitral valve, COP: cardiac out put.

Introduction

Systemic hypertension is linked with an increase in the risk of cardiovascular insults because to its negative effects on a variety of systems, particularly the cardiovascular system.⁽¹⁾ There will be growing myocardial fibrosis before cardiac functional disturbances in the heart of a hypertensive persons become apparent.⁽²⁾ Diastolic impairment is a prominent component of the illness, and despite the fact that its significance is becoming more widely recognized, it is still underappreciated due to its challenging diagnosis and lack of effective treatments.⁽³⁾ With diastolic dysfunction, there is a shift of the left ventricle filling to the diastole end, putting greater reliance on left atrial contraction. Doppler echocardiography used to detect these occurrences.⁽⁴⁾

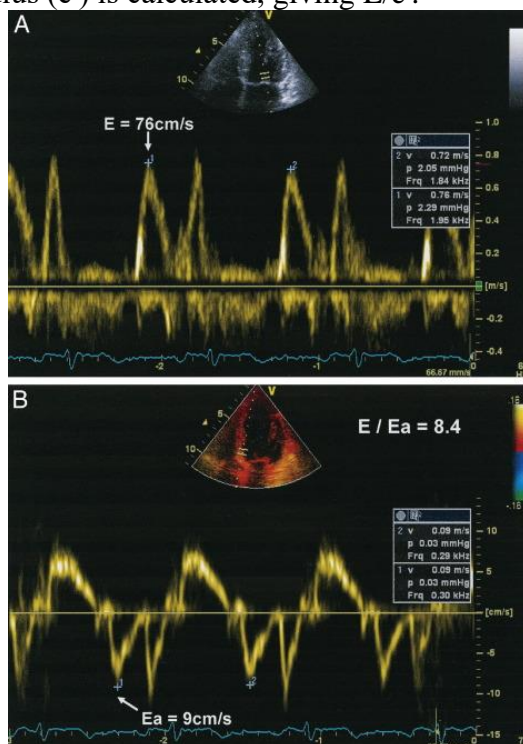
The E wave is caused by early rapid filling phase of diastole, while the A wave is caused by atrial contraction. The E wave is normally higher in Doppler than the A spike, but in case of impairment of diastole, the E spike is pulled out and appear shorter than the A spike. Patients with impaired diastole, have a longer LV ET, which is defined as the period between the aortic valve opening and closing. It has been demonstrated that in isolated diastolic dysfunction, the left ventricular ejection time is prolonged and is related to the severity of diastolic impairment.⁽⁵⁾

Methodology

After receiving their verbal and written consent, a case-control research with a total of 80 young age participants was conducted. The research took place from January through April of 2021. A sample was taken from the Al- Furat teaching hospital's consultation room.

Patients who have been diagnosed with systemic hypertension (non- complicated) and receiving antihypertensive drugs are. In order to eliminate selection bias, those who have fluctuated blood pressure measures and do not receive antihypertensive drugs are not involved. With varied BMI levels, The patients were grouped into 2 groups: Control group (I), n=40 (male: 24) and hypertensive group (II), n=40 (male: 24). The velocities of (E) and (A) waves of MV inflow, as well as the DT of the LV filling, are measured

using pulsed-wave Doppler. Using tissue Doppler in the 4-chamber view, the peak early diastolic velocity of the lateral and medial mitral annulus (e') is calculated, giving E/e' .



Calculation of E/e' ratio

Calculation of PCWP is based on the following formula:

$$PCWP = (E/e' \times 1.25) + 1.9 \text{ (Nagueh Formula).}^{(6)}$$

Results

The mean ET, E/e , and PCWP values by research group at various BMIs are shown below. When compared to normotensive people, we found that E/e ($P: 0.001$) and PCWP ($P: 0.001$) are considerably greater. There is no difference in the ejection time of the left ventricular outflow tract between the research groups (P value: 0.6).

LVMI, ET, E/e , and PCWP values in the Two groups at various BMIs.

Data	Group I Total=40 (male:24) (24-39yr old) (21.8-28.5 BMI)	Group II Total=40 (male:24) (22-41yr old) (23.2-37.2 BMI)	P
ET (ms)	256.05±19.4	260.15±30	0.6
E/e	3.98±0.9	8.01±3.21	0.0001
PCWP (mmHg)	8.3±1.02	11.4±2.84	0.0001

Values presented as $M \pm SD$. ET: ejection time of left ventricle out flow, PCWP: pulmonary capillary wedge pressure

Discussion

When compared to normotensive people, we found that E/e and PCWP are much higher. There is no difference in the ejection time of the LVOT between the research groups.

The major consequence of hypertension on the heart is diastolic dysfunction, which can occur even in normal systolic function of the LV. This means that poor diastolic parameters can be observed with normal LV systolic performance.⁽⁷⁾

We looked at the findings of a research published in 2000 by Giovanni de S et al., which found that hypertension patients with normal or supranormal systolic function might have aberrant diastolic markers.⁽⁷⁾ Because diastolic function contributes greatly to the creation of maximal cardiac output, it is largely relied on for optimal functional capacity. To sustain proper LV filling and a normal COP throughout the activity, it is vital to have the ability to achieve diastolic filling rates that are greater than systolic ejection rates.⁽⁸⁾

As a result, during exercise, the LAP should rise to a limit that allows for a satisfactory driving gradient and adequate ventricular filling.⁽⁹⁾ An increase in LAP delivered to the vasculature of pulmonary system leads to increased tachypneic breathing and exercise intolerance.⁽⁸⁾

Conclusion

In managed hypertension individuals, E/e and PCWP are high, indicating impaired diastolic function.

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