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Myocardial Performance Index as Related to Age in Normal Men With ideal Body Mass Index

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Tie index or what is called the myocardial performance index (MPI) is a ratio of isovolumic relaxation time and isovolumic contraction time to the ejection time. Global systolic and diastolic function is better estimated by this index, also it may be used as a sensitive marker for prediction a symptomatic heart failure and offering predictive information in various clinical situations. In the same context,
increases in the age have been shown to exert an impact on the left ventricle (LV) preload and afterload and consequently LV function. Additionally Of note, studies regarding age specific cut-off points of MPI are limited and needs further assessment. Further, reports on interrelationship between MPI and different age groups are limited. This study is aimed to inspect the relationship between MPI and age. A total of 100 normal individuals were involved in this study. Each participant was subjected to thorough clinical and laboratory check up to exclude diseases that might affect the results. Four groups are divided on the bases of age: GROUP A: From 20 to 29year. GROUP B: from 30 to 39year, GROUP C: From 40 to 49 year, and GOUP D: From 50 to 60 year or more. Echocardiography was done for all participants with standard left lateral position. MPI was calculated as IVCT+IVRT/ET. In results, MPI was not changed significantly with age. Regarding individual components of Tei index, both ET and IVCT showed no relation with age, although the ET showed slight increase with increasing age, while IVRT was significantly different among age groups. In conclusion, myocardial performance index exhibited no relation with increasing age in normal men.

Keywords: Myocardial performance index, isovolumic contraction time, isovolumic relaxation time, ejection time.

Abbreviations: MPI: Myocardial performance index, IVCT: isovolumic contraction time, IVRT: isovolumic relaxation time, ET: ejection time, LV: Left ventricle.

Introduction

A relatively recent index of global heart function, the Doppler-derived Tei index or the myocardial performance index (MPI) and it represents the ratio of isovolumic contraction time and isovolumic relaxation time to the ejection time.(1) In a cross sectional study, the Tei index has been revealed to be a good indicator for heart failure (2), It is still in debate whether this index is helpful in anticipating future occurrences of cardiac failure independently of other echocardiographic parameters. It's been employed as a sensitive measure of left ventricle status. The MPI is valuable in assessing global function of the heart than other individual echocardiographic parameters estimating the systolic or diastolic function of the heart since it incorporates systo- diastolic informations. The MPI has been demonstrated to be beneficial in measuring left ventricle global function in various situations, including cardiac failure, ischemic heart disease, amyloidosis and heart transplant.(1, 3, 4,5, 6, 7) During the first three years of life, Tei was affected by age, displaying a steady reduction until the age of three, after which no additional changes are evident. The Tei index for children under the age of three years was so much higher than for children aged three to eighteen

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years. [8] The changes in the MPI with age may reflect alterations in the cardiac properties of the left ventricle throughout maturation in newborns and children. The ratio of total collagen to total protein returns to normal after Five months of development, and the ratio of type 1 collagen (rigidity component) to type 3 collagen (elasticity components) returns to normal after Three years.[9] The relationship between MPI and adult age is still poorly understood.

Methods:

Methods: A total of 100 healthy males were involved for this cross-sectional study after written and oral agreement was obtained. The following criteria have to be met in order to rule out any conditions that could have influenced the results:

a) Not diabetic, hypertensive, or suffering from any current or prior cardiac or respiratory illnesses.

b) Avoiding medications that may have an adverse effect on the results.

All participants reported their age, family history, and personal habits. To rule out endocrine and cardiac co-morbidities, a thorough physical examination was performed.

On the basis of age, all participants were separated into four groups:

- GROUP A (N=36): participants aged 20 to 29.
- GROUP B (N=28): 30 to 39 years old.
- GROUP C (N=19): participants aged 40 to 49.
- GROUP D (N=17): participants aged 50 to 60 years or older.

All echocardiographic and Doppler investigations were carried out by a single examiner at Al-Furat teaching hospital, utilizing two-dimensional (2D) Vivid E9 equipment with a 2-4 MHz transducer made in the United States. (See Figure1).

Figure 1 Vivid E9 echo equipment

MPI was computed by using a Doppler sample volume to measure both left ventricle outflow and mitral inflow; isovolumic contraction time can be recorded from the A wave end to the start of the AV opening (under the assistance of simultaneous ECG recording). ET is the distance between the opening and closing of the AV. The IVRT was calculated from the closure of the AV to the beginning of the E signal of mitral inflow. Of note, measuring IVCT is rather difficult without using synchronized ECG tracing, as in many instances the end of A wave is not so clear (Figure 2).

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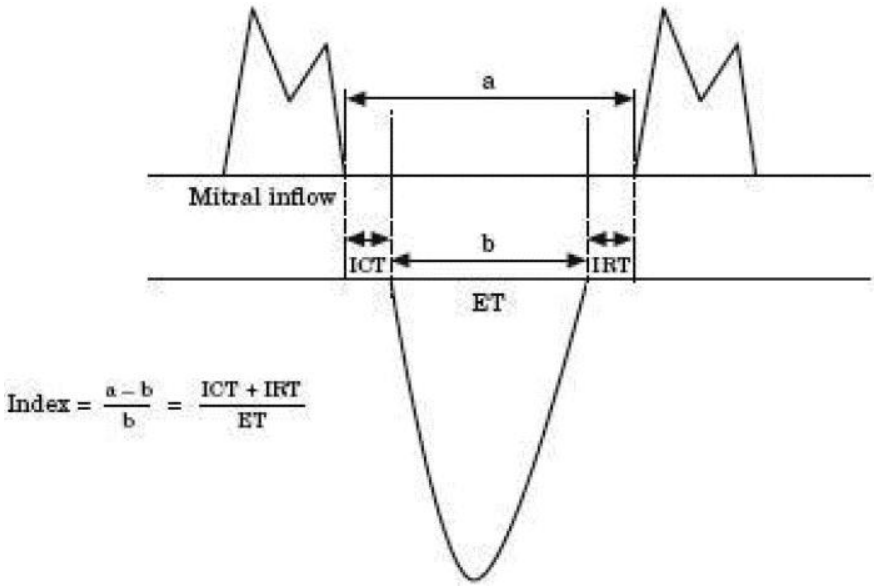

Figure 2simultaneous recording of MPI from left ventricle out flow tract, in 5 chamber view

Measurements must be re-assessed Five to Seven times to reduce observer errors and assure accuracy of readings of these intervals utilizing the pulse wave Doppler,[10] in our work, at least Five Doppler waveform intervals were averaged..

Results

MPI was not changed significantly with age. Regarding individual components of Tei index, both ET and IVCT showed no relation with age, although the ET showed slight increase with increasing age, while IVRT was significantly different among age groups.

The values of MPI and its individual components according to age groups

Data (M±SD)	**Group A (20-29 years) BMI=22.3±2.2 N=36**	**Group B (30-39 years) BMI=23.1±2.4 N=28**	**Group C (40-49 years) BMI=22.4±2.8 N=19**	**Group D (≥ 50years) BMI=24.3±2.6 N=17**	**Total N=100**	**Anova P value**
MPI	0.37±0.05	0.39±0.05	0.38±0.06	0.41±0.05	0.38±0.05	Not significant
IVCT (ms)	41.04±14.4	39.4±11.1	37.8±10.8	39.1±10.4	39.6±11.7	Not significant
IVRT (ms)	67.5±16.7	75.6±17.7	75.4±18.1	85.5±16.1	74.3±18.0	significant
ET (ms)	287.06±23.5	292.7±23.9	295±28.4	300.6±10.4	292.4±23.2	Not significant

Values presented as mean±SD. MPI: myocardial performance index, IVCT: isovolumic contraction time, IVRT: isovolumic relaxation time, ET: ejection time.

Discussion

The MPI may be altered by circulatory changes associated with aging, but little is known about this. In young and middle-aged people, some researchers determined that the myocardial performance index (Tei-index) is unaffected by age. [6,11,12] This backs with our findings that MPI was unaffected by increasing age. Individual MPI components have been proven to experience considerable changes with age.[13] In our study, ET changed significantly with age in people with an optimal BMI; earlier research has found similar results, indicating that LV ET can change with age.[14,15] Notably, when ideal BMI was taken into account in our study, ET exhibited a substantial change with increasing age, in contrast to Kirk et al., 2004 [10], who found that ET was unaffected with increasing age, citing normal BMI as one of the prerequisite exclusion criteria,

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which Kirk did not address. Kirk et al., 2004 [10] indicated that IVCT did not vary with age; this finding was consistent with our findings. Other researchers have found that aging causes a significant increase in IVRT in healthy people.[10,16, 17, 18, 19] The current study confirmed this relationship (From the youngest to the oldest subjects, the isovolumic relaxation period increased from 60 to 108 milliseconds). These alterations in the MPI individual components caused a non-significant changes with age in the MPI, since both IVRT and ET were significantly increased.

Conclusion

We came to the conclusion that MPI did not alter with age in adult healthy men.

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