



ORIGINAL ARTICLE

Assessment of right ventricular function by myocardial performance index in diabetic patients

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KEYWORDS

Myocardial performance index;
Right ventricle;
Tissue Doppler

Abstract *Background:* Assessment of right ventricular (RV) function remains difficult because of the RV complex shape. Data regarding RV performance in patients with diabetes are incomplete. The aim of this study was to assess the feasibility of pulsed wave tissue Doppler imaging and myocardial performance index (MPI) for the assessment of right ventricular function in diabetic patients without coronary artery disease.

Methods: The study included 20 diabetic patients, 20 diabetic hypertensive and 20 gender and age matched healthy subjects underwent standard echocardiography with tissue Doppler imaging (TDI) to assess RV function. Patients with myocardial ischemia, impaired left ventricular systolic function, valvular heart disease or other diseases which could alter the right ventricular performance were excluded.

Results: Myocardial performance index was significantly higher in diabetes compared to control group (0.41 ± 0.05 versus 0.27 ± 0.04 , $p = 0.001$). Peak myocardial systolic velocity (Sa), early diastolic myocardial velocity (Ea), and late diastolic myocardial velocity (Aa) were significantly lower in patients with diabetes mellitus (DM) compared to the control group ($p = 0.0001$). Isovolumetric relaxation time (IVRT) was significantly higher in DM group compared to control group ($p = 0.003$). MPI was significantly higher in diabetic hypertensive group versus DM alone group (0.46 ± 0.050 versus 0.41 ± 0.05 , $p = 0.01$). There was no correlation between MPI and blood glucose level and duration of diabetes.

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Conclusion: Myocardial performance index is a useful noninvasive tool for the detection of early right ventricular systolic and diastolic dysfunction in diabetic patients, regardless of coexisting hypertension.

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1. Introduction

The right ventricle (RV) is neglected in clinical practice, because there is lack of awareness of its pivotal role in cardiac and pulmonary vascular diseases.¹

Right ventricular function is the primary determinant of prognosis and effort tolerance in many groups of patients. Clinicians require measures that are widely available, easily obtained, highly reproducible, and provide clear information on prognosis, likely response to therapy or provide feedback on the success of therapeutic interventions. However RV function is notoriously difficult to evaluate, given its geometry, interrelationship with the left ventricle and sensitivity to alterations in pulmonary pressure.¹

In patients with left ventricular failure, myocardial infarction and pulmonary hypertension, RV function is an important predictor of mortality and quality of life.²

The majority of proposed methods of echocardiographic assessment of RV function are based on volumetric approximations of the RV. Such approaches have inherent limitations, first as volume related measures such as ejection fraction (EF) are load dependent; second because of the complex geometry of RV.³

The issue of RV geometry is usually overcome using geometry-independent parameters such as tricuspid annular velocity and Tei index. Tei index is calculated using Doppler as the ratio of the isovolumic contraction and relaxation times to the ejection time.¹

The volume calculation and estimation of EF are not ideal for the clinical assessment of RV function; however, regional myocardial wall motion detection by M-Mode and tissue Doppler velocities is probably the most useful method in clinical practice.⁴

Diabetes mellitus (DM) is a powerful risk factor for cardiovascular disease associated with high morbidity and mortality rates. Diabetic patients also have an increased incidence of heart failure which has been traditionally attributed to concurrent presence of ischemic or hypertensive heart disease. Yet, nowadays, according to recent scientific evidence, diabetic myocardial disease (DMD) is more and more being considered as a distinct nosologic entity, independent of the co-existence of CAD, arterial hypertension or other risk factors, with the potential to lead to a self-existent progressive development of heart failure.⁵

The vast majority of previous reports regarding myocardial dysfunction in patients with diabetes mellitus were dedicated to the left ventricle, ignoring the role of the RV. However, it is unlikely that the pathological sequel of metabolic disarrangements in diabetes spares the right sided myocardium.⁶

2. Aim of the work

This study was designed to assess the feasibility of pulsed wave tissue Doppler imaging and myocardial performance index

(MPI) for the assessment of right ventricular function in diabetic patients without coronary artery disease.

3. Patients and methods

3.1. Study populations

This study was carried out on 40 patients (test group) with diabetes mellitus, selected from outpatient cardiovascular clinic, Mansoura specialized medical hospital, Mansoura University, Egypt, during the period January 2010 –September 2010.

The test group is classified into:

- Group I: 20 patients with diabetes and normal blood pressure (DM group) (mean age 54.1 ± 4.96 years).
- Group II: 20 patients with coexisting diabetes and hypertension (DM HTN group) (mean age 56.0 ± 4.16 years).

The control group (group III) includes 20 healthy subjects (mean age 54.9 ± 3.99 years).

3.2. Exclusion criteria

- Coronary artery disease was excluded according to clinical, electrocardiographic (basal, exercise stress test), echocardiographic characteristics of myocardial ischemia. In about 22 patients, coronary angiography was normal.
- Rheumatic and congenital heart disease.
- Atrial fibrillation.
- Impaired LV systolic function (EF < 50%).
- Impaired hepatic or renal function, and advanced lung disease.
- Pulmonary hypertension.
- Patients with more than grade I tricuspid regurgitation.
- Patients with bad quality of echocardiographic imaging of the tricuspid annular motion.

Both test and control groups were subjected to clinical assessment, electrocardiography (ECG), laboratory, Doppler echocardiography (conventional and pulsed wave tissue Doppler imaging “PW-TDI”).

3.3. Clinical assessment

All patients were subjected to thorough history taking; full physical examination with special focus on age, sex, duration and therapy of diabetes, blood pressure and body mass index (kg/m^2).

3.4. Echocardiography

All patients and control groups underwent echocardiographic examination. Complete two-dimensional, M-mode and

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