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ORIGINAL ARTICLE

# The value of isovolumic acceleration for the assessment of right ventricular function in acute pulmonary embolism

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**KEYWORDS**
Pulmonary embolism;
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**Abstract**
*Aim:* The aim of this study was to assess the value of tricuspid annulus myocardial isovolumic acceleration (IVA) in the assessment of right ventricular function in patients with acute pulmonary embolism (PE).
*Methods:* Fifteen patients (mean age 60.6±11.3 years) with acute PE were enrolled and a control group was formed of 15 patients with a similar mean age (60.3±11.5). Patients who were diagnosed with acute PE by thoracic computed tomography angiography underwent transthoracic echocardiography at the time of diagnosis and at one month after diagnosis.
*Results:* In the control group IVA was 2.8±0.2 m/s$^2$, while in the acute PE group, it was 2.0±0.1 m/s$^2$ at the time of diagnosis and 2.9±0.1 m/s$^2$ at the end of the first month. When IVA values of acute PE patients at the end of the first month were compared with their initial values and those of the control group, they had normalized (control and acute PE $p<0.0001$; control and PE at one-month follow-up $p=0.983$).
*Conclusion:* In our study, IVA was shown to be a reliable marker of right ventricular systolic function in patients with acute PE.


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**PALAVRAS-CHAVE**
Embolia pulmonar;
Tempo de aceleração isovolumétrica;
Função ventricular direita

**Valor do tempo de aceleração isovolumétrica no estudo da função ventricular direita na embolia pulmonar aguda**

**Resumo**
*Objetivo:* O objetivo deste estudo consiste em determinar o valor do tempo de aceleração isovulométrica miocárdica do anel tricúspide (IVA) na avaliação da função ventricular direita em doentes com embolia pulmonar (EP) aguda.
*Métodos:* Quinze doentes (idade média 60,6 ± 11,3 anos) com EP aguda foram incluídos no nosso estudo e o grupo controle foi constituído por 15 doentes com idade média semelhante (60,3 ± 11,5). Após o diagnóstico de EP aguda por angiotomografia torácica computorizada, os doentes foram avaliados com ecocardiografia transtorácica, na altura do diagnóstico e no final do primeiro mês após o diagnóstico.
*Resultados:* Enquanto o valor do IVA foi de 2,8± 0,2 no grupo controle, no grupo com EP aguda foi 2,0± 0,1 na altura do diagnóstico e 2,9 ±0,1 no final do primeiro mês. Quando comparamos os valores de IVA dos doentes com EP aguda no final do primeiro mês com os valores iniciais e os valores do grupo controle, verificou-se que tinham normalizado (controle e EP aguda p <0,0001; controle e EP após um mês de seguimento p =0,983).
*Conclusão:* No nosso estudo o IVA revelou-se um marcador adequado da função sistólica ventricular direita em doentes com EP aguda.


**List of abbreviations**

| | |
|---|---|
| EF | ejection fraction |
| IVA | isovolumic acceleration time |
| MPI | myocardial performance index |
| PAP | pulmonary artery pressure |
| PE | pulmonary embolism |
| RV | right ventricular |
| RVEF | right ventricular ejection fraction |
| TAPSE | tricuspid annular plane systolic excursion |

## Introduction

Pulmonary embolism (PE) is a relatively common cardiovascular emergency. It is difficult to diagnose and may be overlooked since it does not present with a distinctive clinical manifestation. However, since early treatment is extremely effective, an early diagnosis is of the utmost importance. Initial treatment basically involves re-establishing the blood flow through the obstructed pulmonary arteries and preventing an early recurrence, which may prove fatal.[1]

In more than 50% of hemodynamically stable patients with PE, no evidence of right ventricular (RV) dysfunction can be observed on transesophageal echocardiography.[1,2] Severe RV dysfunction is seen only when hemodynamic collapse has occurred. In patients with echocardiographic evidence of RV dysfunction, the risk of mortality due to PE has been reported to be two times higher.[1,2] However, there is still no consensus on the definition of RV dysfunction as determined by echocardiography.[2]

Recent studies have indicated that tricuspid annulus myocardial isovolumic acceleration (IVA) measured by tissue Doppler is a reliable parameter for assessment of RV systolic function independently of variations in pre- and afterload and that a lower IVA is an early marker of RV systolic dysfunction.[3–5]

The aim of this study was to assess the value of tricuspid annulus IVA, measured by transthoracic tissue Doppler echocardiography, and other widely accepted RV function parameters at the time of diagnosis and one month later, in the assessment of RV function in patients with acute PE.

## Methods

Patients who presented to the emergency department of our hospital between February and October 2010 and were diagnosed with acute PE by thoracic computed tomography angiography were included in the study. Initially 19 patients with PE were included, but four of them were later excluded from the study since they were lost to follow-up. All the patients included in the study received thrombolytic treatment in standard doses after diagnosis. The control group consisted of eight males and seven females with no history of known cardiovascular disease or any systemic diseases other than hypertension or diabetes. The patients' histories were recorded and a 12-lead electrocardiogram was obtained. Complete blood count, urea, creatinine, serum sodium and potassium levels and other laboratory parameters were tested. Patients in whom the quality of the transthoracic echocardiogram was inadequate due to poor echogenicity, those with pre-existing advanced mitral valve disease, and those with RV hypertrophy due to cor pulmonale were excluded from the study. Written informed consent was obtained from all patients. Demographic characteristics,