Rev Port Cardiol. 2014;33(10):597–598

Revista Portuguesa de
Cardiologia
Portuguese Journal of Cardiology
www.revportcardiol.org

EDITORIAL COMMENT

Cardiac imaging in pulmonary embolism: Assessment of right ventricular dysfunction by tissue Doppler☆

Imagiologia cardíaca no tromboembolismo pulmonar: avaliação da disfunção ventricular direita por Doppler tecidular

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Pulmonary embolism (PE) is a relatively common entity in the emergency department, with high rates of mortality and morbidity when not treated promptly. It is also a diagnostic challenge in clinical practice, with a clinical presentation that is often unclear, especially in an acute context.[1] Mortality in undiagnosed PE is 4–6 times higher than in patients who are diagnosed and treated appropriately (in-hospital mortality of 6–8%, as opposed to overall mortality of 25–30% in untreated PE).[2,3]

The main difficulty for effective treatment of PE is timely diagnosis. Among the reasons for this diagnostic challenge are its sometimes subtle and non-specific clinical presentation, the need for a variety of diagnostic techniques, and the lack of a gold standard exam that is both readily available and easy to interpret.

Presented at the last Congress of the European Society of Cardiology (ESC), the latest ESC guidelines on the diagnosis and management of acute pulmonary embolism,[3] which replace the previous guidelines published in 2000 and 2008, focus on optimizing the diagnosis and treatment of PE, among other areas.

In more severe cases, occlusion of the pulmonary arterial bed by thromboemboli can cause acute right ventricular (RV) failure, which although potentially reversible, can be fatal. As the therapeutic approach depends on clinical presentation, immediate restoration of blood flow in obstructed pulmonary arteries is vital in hemodynamically unstable patients. Routine diagnostic exams such as chest X-ray, electrocardiogram and blood gas analysis are often altered in PE and their positive and negative predictive value for a diagnosis of PE are low.

Patients with echocardiographic evidence of right heart failure and increased filling pressures have double the risk of death if they have PE.[3,4] In the literature, the prevalence of RV dysfunction on echocardiography ranges between 30% and 50%.[5] Despite the complex geometry of the right ventricle and resulting difficulty in assessing systolic and diastolic function, it is essential to understand the mechanisms behind right heart failure, since this is one of the main causes of premature death in these patients.[6,7]

In this issue of the *Journal*, Selcuk et al.[8] present an elegant study entitled ''The value of isovolumic acceleration for the assessment of RV function in acute pulmonary embolism''. In it, echocardiographic indices of RV function were assessed in 15 patients with acute PE (mean age 60.6±11.3 years) and a control group (mean age 60.3±11.5 years) at two time points. Although the population was relatively small, the study is a good example of the deliberate early use of echocardiography in acute PE. Although information on the risk factors of the patients in the study is not provided, the benefits and accessibility of the technique are of great value in the early management of these patients.

DOI of original article:
http://dx.doi.org/10.1016/j.repce.2014.01.021

☆ Please cite this article as: Zimbarra Cabrita I. Imagiologia cardíaca no tromboembolismo pulmonar: avaliação da disfunção ventricular direita por Doppler tecidular. Rev Port Cardiol. 2014;33:597–598.

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There are several echocardiographic indices that are important in PE, particularly the so-called '60–60 sign' (reduced RV ejection fraction) and depressed contractility of the RV free wall compared with the RV apex ('McConnell sign').[9–11]

The main point of Selcuk et al.'s study, and its main merit, is to highlight the role of isovolumic acceleration time (IVA) in the early diagnosis of RV dysfunction. They found a statistically significant improvement in IVA at one-month follow-up (2.0 ± 0.1 m/s^2 at the time of diagnosis and 2.9 ± 0.1 m/s^2 at one month, $p<0.0001$).

As more sophisticated and specialized imaging techniques have become available at the bedside in acute situations, tissue Doppler echocardiography is increasingly used to assess RV function, particularly through IVA,[12] which, being unaffected by pre- or afterload, provides valuable information for the diagnosis and management of acute PE.[5] It should be used serially, particularly in more severe cases with hemodynamic compromise, as one of the routine diagnostic exams for such situations. Analysis of receiver operating characteristic (ROC) curves is a promising method for ascertaining the best cutoff of IVA for early identification of RV dysfunction.

Assessment of RV function can also be complemented by measurement of brain-type natriuretic peptide (BNP),[13] which is elevated when intracardiac pressures are increased. The N-terminal portion of BNP (NT-proBNP) has also been identified as an important marker of RV dysfunction.[14] Analysis of the relationship between RV systolic dysfunction by tissue Doppler and the functional repercussions of RV overload as estimated by BNP levels could also be of clinical value.

Conflicts of interest

The author has no conflicts of interest to declare.

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