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

ORIGINAL ARTICLE

One-shot diagnostic and prognostic assessment in intermediate- to high-risk acute pulmonary embolism: The role of multidetector computed tomography

Rui Baptista[a,b,*], Inês Santiago[c], Elisabete Jorge[a,b], Rogério Teixeira[a,b], Paulo Mendes[a], Luís Curvo-Semedo[d], Graça Castro[a], Pedro Monteiro[a,b], Filipe Caseiro-Alves[b,d], Luís A. Providência[a,b]

[a] Cardiology Unit, Hospitais da Universidade de Coimbra, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal
[b] Faculty of Medicine, University of Coimbra, Coimbra, Portugal
[c] Radiology Department, Hospital Infante D. Pedro, Aveiro, Portugal
[d] Radiology Unit, Hospitais da Universidade de Coimbra, Centro Hospitalar e Universitário de Coimbra, Coimbra, Portugal

Abstract
Introduction: Contrast-enhanced multidetector computed tomography (MDCT) is useful for the diagnosis of pulmonary embolism (PE). However, current guidelines do not support its use for risk assessment in acute PE patients.
Objectives: We compared the prognostic impact of MDCT-derived indices regarding medium-term mortality in a population of intermediate- to high-risk PE patients, mostly treated by thrombolysis.
Methods: Thirty-nine consecutive patients admitted to an intensive care unit with acute PE were studied. All patients had a pulmonary MDCT on admission to the emergency room as part of the diagnostic algorithm. We assessed the following MDCT variables: right ventricular/left ventricular diameter (RV/LV) ratio, arterial obstruction index, pulmonary artery-to-aorta diameter ratio and azygos vein diameter. A 33-month follow-up was performed.
Results: Mean age was 59.1±19.6 years, with 80% of patients receiving thrombolysis. Follow-up all-cause mortality was 12.8%. Of the MDCT-derived variables, only the RV/LV ratio had significant predictive value, being higher in patients who suffered the endpoint (1.6±0.5 vs. 1.9±0.4, p=0.046). Patients with an RV/LV ratio ≥1.8 had 11-fold higher medium-term all-cause mortality (3.8% vs. 38.8%, p<0.001). Regarding this endpoint, the c-statistic was 0.78 (95% CI, 0.60–0.96) for RV/LV ratio and calibration was good (goodness-of-fit p=0.594). No other radiological index was predictive of mortality.
Conclusions: MDCT gives the possibility, in a single imaging procedure, of diagnosing and assessing the prognosis of patients with intermediate- to high-risk PE.

* Corresponding author.
 E-mail address: ruibaptista@gmail.com (R. Baptista).

Although further studies are needed, the simple-to-calculate RV/LV ratio has good discrimination and calibration for predicting poorer outcomes in patients with acute PE.
© 2012 Sociedade Portuguesa de Cardiologia Published by Elsevier España, S.L. All rights reserved.

Angiografia pulmonar por tomografia computadorizada em doentes com tromboembolia pumonar de médio a alto risco: avaliação diagnóstica e prognóstica num só exame

Resumo

Introdução: A angiografia pulmonar por tomografia computadorizada com contraste (angio-TC) é recomendada para o diagnóstico mas não para a estratificação de risco em doentes com tromboembolia pulmonar (TEP).

Objectivos: Determinar o impacto prognóstico a médio-prazo de vários índices radiológicos obtidos na angio-TC em doentes com TEP de médio a alto risco, a maioria tratados com fibrinólise.

Métodos: Estudaram-se 39 doentes admitidos numa unidade de cuidados intensivos por TEP, todos com angio-TC prévia realizada na urgência e seguiram-se durante 33 meses. Mediram-se as seguintes variáveis: razão entre os diâmetros do ventrículo direito e ventrículo esquerdo (índice VD/VE), índice de obstrução arterial, razão ente os diâmetros da artéria pulmonar e aorta e diâmetro da veia ázigos.

Resultados: A idade média foi de 59,1 ± 19,6 anos; 80% dos doentes foram tratados com fibrinólise. Durante o período de seguimento clínico, a mortalidade foi 12,8%. Das variáveis analisadas, apenas o índice VD/VE demonstrou valor preditivo, sendo significativamente mais elevado nos doentes que faleceram (1,6 ± 0,5 *versus* 1,9 ± 0,4, p=0,046). Os doentes com um índice VD/VE ≥ 1,8 tiveram uma incidência 11 vezes superior de mortalidade a médio prazo (3,8% *versus* 38,8%, p < 0,001). Relativamente a este *endpoint*, o *c-statistic* foi de 0,78 (95% IC 0,60–0,96) e a calibração elevada (*goodness-of-fit* p=0,594). Nenhum outro índice radiológico demonstrou associação com a mortalidade.

Conclusões: A angio-TC permite num único exame, em doentes de médio e alto risco, diagnosticar e estratificar o risco da TEP. Apesar de serem necessários mais estudos, o índice VD/VE pode identificar doentes com pior prognóstico após uma TEP.

© 2012 Sociedade Portuguesa de Cardiologia. Publicado por Elsevier España, S.L. Todos os direitos reservados.

Introduction

Pulmonary embolism (PE) ranges from asymptomatic forms to life-threatening massive arterial pulmonary bed obstruction and may be responsible for up to 15% of all in-hospital deaths.[1] Mortality is thought to be caused in part by right ventricular (RV) pressure overload resulting in RV dilatation and dysfunction (RVD), ischemia with ensuing failure and ultimately death.[2]

PE can be difficult to diagnose and risk stratification is paramount, in order to choose the best therapeutic option for each patient.[3,4] Contrast-enhanced multidetector computed tomography (MDCT) is currently the gold standard for diagnosing PE and has a growing role in risk stratification. Recent evidence has confirmed the good correlation between echocardiography and MDCT-derived indices of RVD and the ratio of right ventricular to left ventricular (RV/LV) short-axis diameters has emerged as the most accurate sign of RVD.[5,6] Also, the extent of PE (the thrombus burden in the pulmonary bed) has been proposed as an important parameter for predicting RVD and death.[7-9] At the same time, the number of patients with low-risk PE is increasing, due to

the lower threshold of clinical suspicion and greater availability of diagnostic techniques.[10]

However, the majority of studies assessing RV/LV ratios exclude the most severe patients from MDCT analysis, particularly hemodynamically unstable patients. This is reflected by the low mean RV/LV ratios reported in the literature, ranging from 1.1[5,11] to 1.32.[12,13] Moreover, the proportion of patients undergoing thrombolytic therapy in these studies was also low.

Our aim was to compare the prognostic impact of various MDCT-derived RVD indices on medium-term mortality in a population of intermediate- to high-risk PE patients, most of them treated by thrombolysis.

Methods

Patient population

We retrospectively studied all patients with intermediate- to high-risk PE admitted to the intensive care unit of our department between November 2005 and July 2008. The diagnosis of PE was confirmed by 4- or 64-detector