

A simple and reliable computed tomographic measure for the evaluation of right ventricle remodelling in acute PE: right ventricle apical angle

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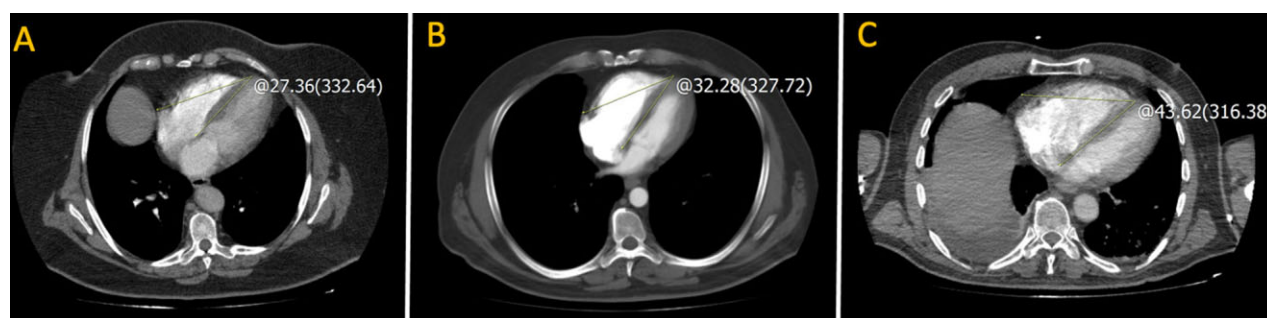
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Background and aims: In patients with acute pulmonary embolism (PE), right ventricular (RV) dysfunction as assessed by computed tomography (CT) and/or echocardiography has been considered to predict in-hospital and 30-day outcomes. In this study we proposed a novel CT measure for RV function, the apical angle (α_1) between the RV free wall and the interventricular septum (IVS), and for the left ventricle (LV) function, the apical angle (α_2) between the LV free wall and the IVS. We aimed to evaluate the predictive value of these angles to determine clinical and hemodynamic severity and in-hospital mortality (IHM) in acute PE patients.

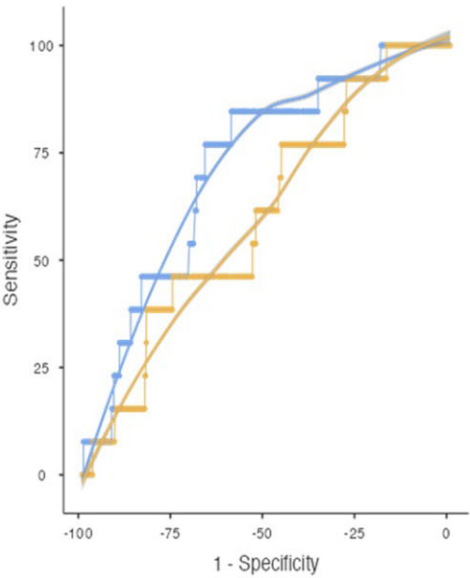
Methods: The study population comprised retrospectively evaluated 536 patients (age 59 $\pm$ 16.2 years, female 55.3 %) with acute PE in whom diagnostic work-up and risk-based treatments have been performed in accordance with currently available acute PE Guidelines. The severity of pulmonary arterial (PA) obstruction (Qanadli score) and RV/LV ratio were assessed on CT, and RV function and non-invasive estimation of pulmonary arterial systolic pressures (PASP) were evaluated with echocardiography. The α_1 was defined as the angle between the line from tricuspid medial annulus to the RV apex and second line from tricuspid lateral annulus to the RV apex, whereas α_2 was defined as the angle between the line from mitral medial annulus to the LV apex and second line from mitral lateral annulus to the LV apex.

Results: Anticoagulant treatment only and intravenous tissue plasminogen activator were noted in 49.6 % and 17.9 % of patients, respectively. Ultrasound-assisted thrombolysis and rheolytic thrombectomy were also used in 25% and 7.5 % of patients, respectively. The IHM rate was 5.9 %. The increase in α_1 was associated with a decrease in TAPSE/PASP ratio, and an increase in PESI score and a higher risk status ($p=0.047$, $p<0.001$, $p=0.001$ respectively), but α_2 showed no relation to PE severity ($p=0.78$). The value of α_1 in predicting in-hospital mortality was evaluated with a logistic regression analysis with a model including PESI score, RV/LV ratio and α_1 . PESI score and α_1 significantly predicted IHM ($p= <0.001$ and 0.027, respectively. OR for α_1 1.15, CI 95%[1.06-1.27]), but RV/LV ratio did not. In the receiver operating curve (ROC) analysis for IHM prediction, the cut-off value of 1.168 for α_1/α_2 ratio [area under the curve (AUC): 0.721; sensitivity:76.92 % and specificity: 65.8 %] and the cut-off value of 32.47 for α_1 (AUC: 0.718 ; sensitivity: 84.67 % and specificity: 59.5 %) provided higher prediction compared with cut-off value of 1.29 for RV/LV ratio (AUC : 0.604 ; sensitivity 76.9 % and specificity 45.87 %).

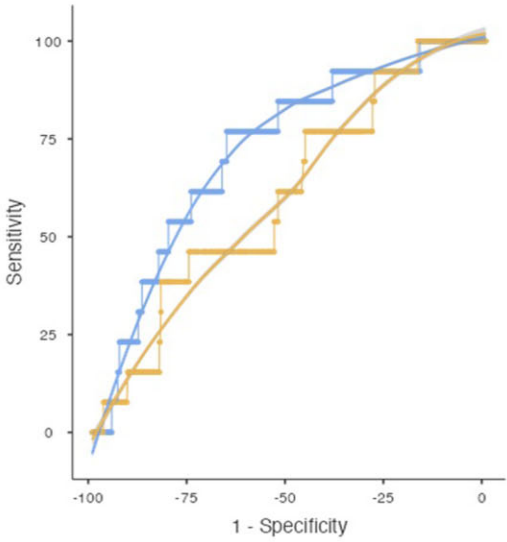
Conclusion: Either α_1 or α_1/α_2 ratio evaluation on CT seems to represent a simple and reliable approach in the assessment of RV acute remodelling in response to thrombo-obstructive pressure burden and for prediction of outcome in patients with acute PE.



Alpha 1 angle of different risk groups



var
alfa1
rvlvratio1



var
alfa1/alfa2
rvlvratio1

ROC curve