Limitations of Computed Tomography Angiography in the Diagnosis of Pulmonary Embolism

To the Editor: After reading the interesting article by Jiménez et al[1] published in *Archivos de Bronconeumología* in which they advise against the use of single-detector spiral computed tomography (CT) angiography of the chest as the only diagnostic test for ruling out pulmonary embolism, we agree with the authors´ advice regarding patients with a high clinical probability for pulmonary embolism. However, certain limitations owing to the restrictive design of their study led to an extremely low predicted value (65%) for pulmonary embolism. This contrasts with a recent cohort study that included a larger number of patients.[2] The conclusion from that study was that withholding anticoagulation therapy from patients with suspected pulmonary embolism and negative findings on CT angiograms appears to be safe based on a 3-month cumulative incidence of venous thromboembolic events of 0.5% (95% confidence interval, 0.1%-1.0%), which differs greatly from the 35% (95% confidence interval, 26%-45%) reported by Jiménez et al.[1] What are the possible explanations for such disparate results?

The editorial accompanying the article by Jiménez et al pointed out some of the study limitations, for example, the small patient population, radiologists not specialized in the pulmonary vascular system, and no calculation of interobserver variation of image readings[3]; these limitations were acknowledged and justified by the authors of the study. Another limitation could be that there was no mention of the mean delay between symptom onset and/or the clinical suspicion of pulmonary embolism and performing CT angiography—since long delays can produce false negative results. Likewise, no reference was made to the quality of the studies.

The diagnostic success of CT angiography depends, among other factors, on appropriate technique (such as proper injection volume and perfusion rate of contrast material, minimal delay in acquisition time of adequate images, etc) and the physical state and cooperation of the patient. These are factors that determine the quality of a study and are essential for correct interpretation of images. In our hospital we carried out a study on CT angiography performed over 3 years in patients with clinical

suspicion of pulmonary embolism. The study may be useful in illustrating the possible effects of the above-mentioned limitations on the results of a study. A total of 275 patients were enrolled (95 with pulmonary embolism; prevalence, 35%) and received subsequent clinical follow-up for a minimum of 3 months. CT angiography evaluation was considered of optimal quality if there was adequate contrast-enhanced visualization of the central, lobar, and segmental pulmonary arteries[4]; the other studies (41 in our cohort, 15%) were considered of suboptimal quality.

The diagnostic yield of CT angiography in our cohort was as follows: sensitivity, 83%; specificity, 96%; positive and negative predictive values, 92%; and precision, 92%. Twenty-five percent of the false negative CT angiograms were in the studies of suboptimal quality. These results are similar to those published recently in the much-awaited PIOPED II study, designed to evaluate diagnostic characteristics of multidetector CT angiography.[5] That study once again emphasized the importance of pretest clinical probability when interpreting the images.

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