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Spiral-computed tomography (CT) is a new imaging modality implemented on a continuously rotating CT scanner, taking advantage of a continuous table feed.[1] Recent studies demonstrated the advantage of this technique to study the mediastinal vessels.[2,3] Using this technique, we designed a specific protocol adapted to the emergency situation of acute pulmonary embolism. This new protocol was prospectively evaluated in 10 patients with suspected massive pulmonary embolism (PE).

Ten patients (4 men and 6 women, aged 18 to 76 years [average 43]) with suspected acute massive PE underwent spiral CT and pulmonary angiography. Three of these patients with confirmed PE underwent new spiral CT and pulmonary angiography to follow the evolution of the thrombi treated with thrombolytic therapy. Thus, a total of 13 spiral CTs were performed and compared with pulmonary angiography. Six of them were performed before pulmonary angiography. The delay between CT and pulmonary angiography was <12 hours, except in 1 case where there was a 36-hour span. Spiral CT was performed with a Somatom Plus S scanner (Siemens, Erlangen, Germany) using a 5 mm thick collimation, a 5 mm/s table feed, reconstruction of overlapped images (3 mm intervals), and a total scanning time of 40 seconds. Therefore, the length of the scanning volume was 20 cm. Seventy ml of sodium oxitalamate (Telebrix 30, Guerbet, Aulnay-sous-Bois, France) was injected into an antecubital vein at the rate of 1.5 ml/s with a delay of 15 seconds. The acquisition was performed without altering the patient's breathing pattern. The patient left the table as soon as the acquisition was completed. In all, the procedure lasted <5 minutes/patient, including positioning. Pulmonary angiography was performed with selective right and left pulmonary arteriograms recorded in the posteroanterior projections. In 6 cases, additional oblique projections were recorded.

TABLE 1 Comparison of Diagnoses Obtained with Spiral Computed Tomography (CT) and Pulmonary Angiography (PA)

	Spiral CT	
	+	−
+ PA	71*	10*
− PA	2*	268*

*Numbers of thrombi.
+ = Detected by pulmonary angiography or spiral computed tomography.
− = Not detected by pulmonary angiography or spiral computed tomography.

The CT scans and pulmonary angiograms were evaluated randomly by 2 radiologists (A.B. and F.D.) and a decision was reached by consensus. The 2 readers were unaware of the findings of 1 technique when the other technique was analyzed. The total number of main, lobar, and segmental pulmonary thrombi or emboli detected with spiral CT was determined for each lung and compared with the angiographic findings using the K *statistics as a means of assessing agreement.*

Among the 10 original patients, massive PE was diagnosed with both spiral CT and pulmonary angiography in 7 cases. Three patients had no PE. PE was also detected with both techniques in the 3 controlled patients. Therefore, using pulmonary angiography as the reference, the sensitivity and specificity of spiral CT were 100%. Seventy-one thrombi were detected with both spiral CT and pulmonary angiography (Figure 1). Two segmental thrombi depicted with spiral CT were not seen with pulmonary angiography. This was due to small thrombi that could not be detected with unilateral angiogram. Ten segmental thrombi diagnosed with pulmonary angiography were not depicted with spiral CT and 268 arteries were considered normal with both

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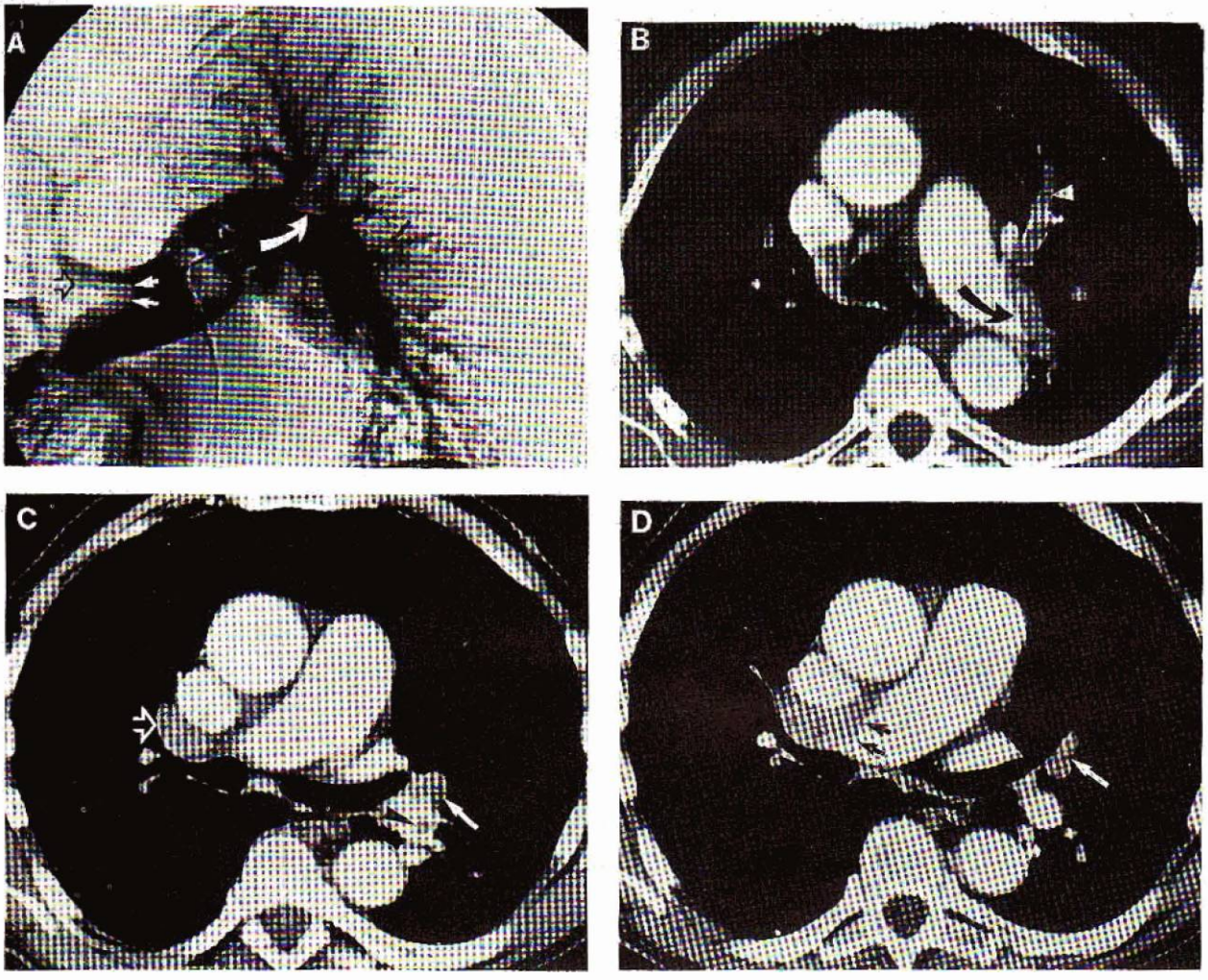

FIGURE 1. Pulmonary angiography and spiral-computed tomography (CT) of a patient with massive acute pulmonary embolism. *A*, right posterior oblique angiogram showing thrombi in the right pulmonary artery *(white arrowheads)*, in the right upper lobe artery *(open arrow)*, in the left pulmonary artery *(curved arrow)*, in the segmental ventral artery of the left upper lobe *(black arrowhead)*, and in the lingular arteries *(black arrow)*. *B*, spiral CT image depicting thrombi in the left main pulmonary artery *(curved arrow)* and in the segmental ventral artery of the left upper lobe *(arrowhead)*. *C*, spiral CT image showing thrombi in the right upper lobe artery *(open arrow)*, in the lingular arteries *(white arrow)*, and a small one in the left pulmonary artery *(arrowhead)* which is not depicted on the angiogram. *D*, spiral CT image demonstrating a large thrombus in the right main pulmonary artery *(black arrows)* and thrombi in the lingular arteries *(white arrow)*.

methods (Table 1). Therefore, a strong agreement between spiral CT and pulmonary angiography was noted (K = 0.90).

The diagnosis of central PE can be reached with conventional CT or magnetic resonance imaging. However, these techniques have not gained the accuracy of pulmonary angiography.[4,5] Spiral CT is a new method whose accuracy was demonstrated by Remy-Jardin et al.[3] The advantage of our protocol is that, although we used reduced volume of contrast medium and a very simple injection technique, the accuracy of the method remains excellent.

This is probably explained by the technical characteristics of spiral CT. The data used to reconstruct 1 slice are acquired in 1 second; therefore, motion artifacts are greatly reduced compared with conventional CT and the patient can quietly breathe without significant alteration of image quality. Because the total acquisition time is very short (40 seconds), a very good vascular opacification can be obtained with low-dose contrast media.[2]

This technique appears to be quick and safe because the examination time for the patient is very short, making monitoring easier. The low dose of contrast medium, the slow rate of injection, and the peripheral site of injection make this examination minimally invasive.

Similar to imaging and Doppler echocardiography, which permit assessment of cardiovascular compromise,[6] spiral CT represents a safe and effective diagnostic tool for acute and massive pulmonary embolism. Because this method is efficient in detecting emboli in the second to fourth division pulmonary vessels, it is probably also well suited for diagnosing submassive PE, but most likely ineffective in diagnosing peripheral PE.

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