Multislice CT angiography of peripheral pulmonary embolism

Essay

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بسم الله الرحمن الرحيم

وقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ ورَسُولُهُ والْمُؤْمِنُونَ

صدق الله العظيم

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Bahaa Mohammed Elrefaey Hassan

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List of Abbreviations

3D	:	Three-dimensional
AFE	:	Amniotic fluid embolism
AP	:	Antero-posterior
CAD	:	Computer-assisted diagnosis
CT	:	Computed tomography
CT	:	Computerized tomographic
CTA	:	Computed tomography angiography
CTPA	:	CT pulmonary angiography
CTPA	:	Multirow CT pulmonary angiography
CTPA	:	Computed tomographic pulmonary angiography
CTPA	:	Computed tomographic pulmonary angiography
CTPA	:	CT pulmonary angiography
DVTs	:	Deep Venous Thrombosis
ICRP	:	International Commission on Radiological Protection
MIP’s	:	Maximum intensity projections
MPVR	:	Multiplanar volume reformation
MRA	:	Magnetic resonance angiography
MRI	:	Than magnetic resonance imaging
PA	:	Pulmonary artery
PE	:	Evaluation of pulmonary embolism
PE	:	Pulmonary embolism

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PIOPED	:	Prospective investigation of pulmonary embolism diagnosis
V/Q	:	Ventilation-perfusion
V/Q scan	:	Ventilation–perfusion scintigraphy
VTE	:	Venous Thrombo-Embolism

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Introduction

Pulmonary embolism (PE) is a blockage of the main artery of the lung or one of its branches by a substance that has travelled from elsewhere in the body through the bloodstream (embolism). PE most commonly results from deep vein thrombosis that breaks off and migrates to the lung. A small proportion of cases are caused by the embolization of air, fat, or talc in drugs of intravenous drug abusers or amniotic fluid. The obstruction of the blood flow through the lungs and the resultant pressure on the right ventricle of the heart lead to the symptoms and signs of PE (**Braunwald et al., 2005).**

Multirow CT pulmonary angiography (CTPA) is the first-line imaging test in patients suspected for acute PE. After applying intravenous contrast material, CTPA can be performed within 4 to 6 seconds, and PE can be diagnosed in the case of interruptions of the contrast material in the pulmonary veins. With the first single-slice computed tomographic CT scanners, sensitivity was not optimal, especially in patients with a high pretest probability. A significant increase in sensitivity was seen with the introduction of multi-detector row CT scanners (**Huisman and Klok, 2009).**

Computed tomography angiography (CTA) of the pulmonary arteries has become the main diagnostic test for the evaluation of pulmonary embolism (PE). Not only due to the good availability, low cost and minimal invasiveness of this technique, but mainly because of the introduction of multi-detector CT techniques resulting in significant improvement in resolution, speed and image quality (**Hartmann et al., 2010).**

CT pulmonary angiography (CTPA) has become the de facto clinical" gold standard" for the diagnosis of acute pulmonary embolism (PE) and has replaced catheter pulmonary angiography and ventilation-perfusion scintigraphy as the first-line imaging method. The factors underlying this algorithmic change are rooted in the high-sensitivity and specificity, cost-effectiveness, and 24-hour availability of CTPA. In addition, CTPA is superior to other imaging methods in its ability to diagnose and exclude, in a single examination, a variety of diseases that mimic the symptoms of PE (**Henzler et al., 2011).**

Computed tomography (CT) is a useful alternative to conventional angiography not only for diagnosing chronic pulmonary thrombo-embolism but also for determining which cases are treatable with surgery and confirming technical success postoperatively. The presence of one or more of the radiologic signs (direct pulmonary artery signs, signs related to pulmonary hypertension, signs of systemic collateral supply and the parenchymal signs) arouses suspicion and allows diagnosis of this entity (**Castañer et al., 2009).**

CTPA is the investigation of choice in patients with a high clinical suspicion of pulmonary embolus and in those with pre-existing pulmonary disease. Chest CTPA, especially multidetector CT, has proven to be superior or equal to conventional angiography, and can detect smaller filling defects. A normal CTPA result alone has been shown to safely exclude PE in all patients in whom CTPA was requested to rule out this disease.

Patients with a good quality negative CTPA (multislice) do not require further investigation or treatment for PE. Compared with isotope scanning, CTPA is quicker to perform, rarely needs to be followed by other imaging, may provide the correct diagnosis when PE has been excluded and is now available in most hospitals (**Huisman et al., 2009).**

Although nonthrombotic pulmonary embolism (Tumor, hydatid, septic, fat, amniotic fluid, cement and foreign body pulmonary embolism) is a relatively uncommon condition, it often manifests with specific imaging features that lead to a correct diagnosis. Knowledge of appropriate imaging methods and familiarity with the specific imaging features of different types of pulmonary embolism should facilitate prompt, effective diagnosis (**Han et al., 2003).**

The chest radiograph is rarely, if ever, diagnostic of PE, and thus the main role of chest radiography is to identify important alternative diagnosis such as congestive heart failure and pneumonia. In the latter case, the diagnosis of PE can be dismissed early and the need for further, advanced imaging studies may be obviated **(Konstatntinides, 2007)**.