Inner Spaces
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Points

- Pulmonary thrombo-embolism (PTE) is a common problem in clinical practice
- Earlier, using V/Q scanning and other clinico-laboratory parameters, the diagnosis was difficult
- Today, the most cost-effective and accurate way of diagnosing PTE is by performing a CT angiography (CTA) of the pulmonary arteries using 16-slice or 64-slice CT scanners, whereby even the distal, subsegmental vessels can be evaluated

Pulmonary Thrombo-Embolism

There are many paradigm shifts that occur in medicine. The diagnosis and management of pulmonary thrombo-embolism (PTE) is one of them; a marked change has occurred in the diagnosis and treatment of PTE in the last five years, predominantly driven by the use of CT angiography (CTA).

PTE is commonly seen in an acute setting and associated with considerable morbidity and mortality. It is most commonly seen in the hospital setting, following surgery, but has also been known to occur after prolonged flights and is a known risk in patients with deep vein thrombosis (DVT). Though earlier considered abnormal, PTE is also reasonably common in India.

Before the advent of CTA, the diagnosis of PTE was at best indirect, using a combination of clinical and nuclear medicine techniques. The presence of DVT in the correct clinical setting and the presence of a ventilation/perfusion (V/Q) mismatch were considered diagnostic. Catheter pulmonary angiography has been the gold standard, but was not always feasible in an acutely sick patient.

The current and new algorithms in PTE diagnosis include the use of D-Dimer assessment, which has a high negative predictive value and CTA. Virtually all patients with a positive D-Dimer test, in the correct clinical setting, are usually referred for a CTA of the pulmonary arteries.

CTA is best performed on a 16-slice or 64-slice multi-slice CT (MSCT). Intravenous contrast is given in such a way that the pulmonary arteries are maximally opacified (Fig. 1). This allows accurate evaluation of the pulmonary vascular tree, upto the subsegmental level. The diagnosis of acute PTE is very straightforward. Any filling defect seen within the "white" opacified pulmonary tree represents a thrombus/embolus (Fig. 2).

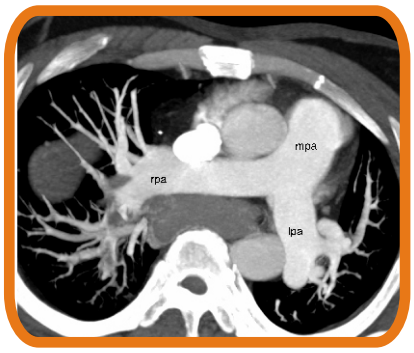

Fig. 1

Fig. 1: CTA of the pulmonary arteries shows a well-opacified, "white" pulmonary tree. mpa main pulmonary artery, lpa left pulmonary artery, rpa right pulmonary artery

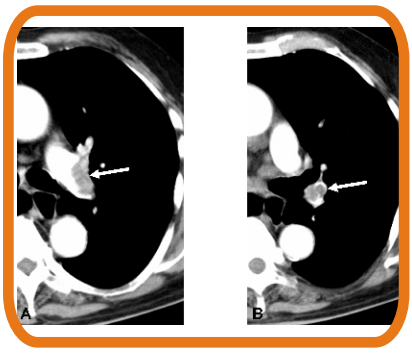

Fig. 2

Fig. 2 (A,B): PTE. Filling defects (arrows) are seen in the in the left pulmonary artery (A) and its lower lobe branch (B).

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These may fill-up the lumen almost entirely (Fig. 2) or may be seen either in an en-plaque manner along the wall or projecting minimally into the lumen (Fig. 3). The lesions may be large and obvious (Fig. 2) or very subtle (Fig. 4), especially in those with minimal symptoms. The MPA is often dilated due to the presence of associated pulmonary hypertension (Fig. 5) and in severe cases, even the right ventricle (RV) is dilated. DVT can also be diagnosed by scanning at the same time through the legs (Fig. 6).

There may be associate findings such as lung infarcts (Fig. 7) and pleural effusion. The lung segments supplied by the affected arteries/arterioles may show increased lucency, due to reduced perfusion (Fig. 8), though this is more a feature of chronic PTE.

In many cases, with appropriate treatment, the lesions resolve. In some, and in those with recurrent PTE, a chronic situation may develop with abnormal pulmonary arterioles and lung changes of a mosaic perfusion with pulmonary hypertension (Fig. 8). This is often more difficult to diagnose, since the patients present with non-specific dyspnea.

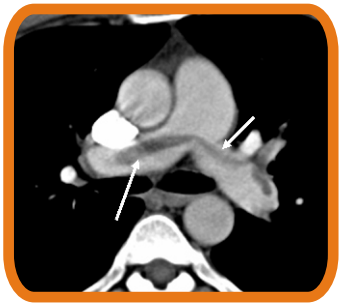

Fig. 3

Fig. 3: PTE. CTA shows a saddle-shaped thrombus (arrows) extending from the RPA to the LPA.

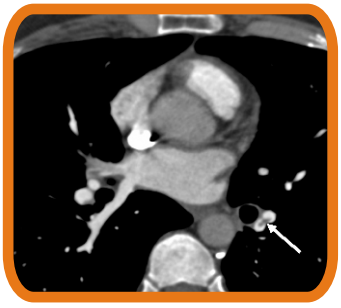

Fig. 4

Fig. 4: PTE. A subtle filling-defect (arrow) due to PTE is seen at the bifurcation of one of the left lower lobe arterial branches. The rest of the vessels are normal.

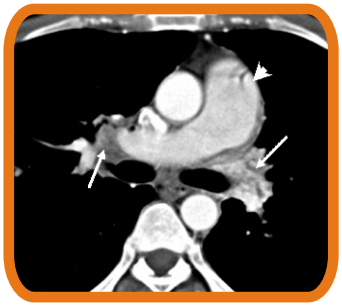

Fig.5

Fig. 5: PTE with pulmonary hypertension. In this patient with extensive defects (arrows) in both pulmonary arteries and irregular lumina, the MPA is dilated (arrowhead), a finding highly suggestive of pulmonary hypertension.

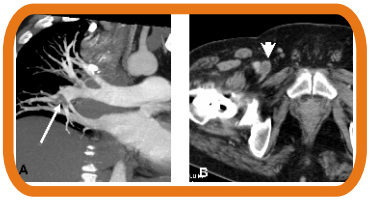

Fig. 6

Fig. 6 (A, B): PTE with DVT. A filling-defect due to PTE (A) is seen in the right lower lobe pulmonary artery (arrow). Another section through the groin (B) shows thrombus within the right common femoral vein (arrowhead).

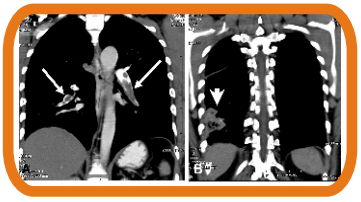

Fig. 7

Fig. 7 (A, B): PTE with lung infarct. Filling-defects are seen due to PTE (A) in both pulmonary arteries (arrows) with an infarct (arrowhead) in the right lower lobe (B).

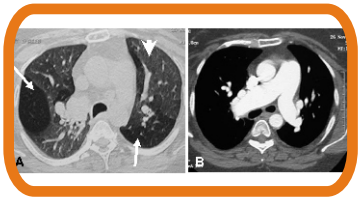

Fig. 8

Fig. 8 (A, B): Chronic PTE. Lung window image (A) shows a mosaic pattern due to areas of hypoperfusion (arrows) intermingled with areas of normal perfusion (arrowheads). The CTA image show pulmonary hypertension with dilatation of the MPA.

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