



## Dual Energy CT (DECT) Perfusion Imaging in the Lungs

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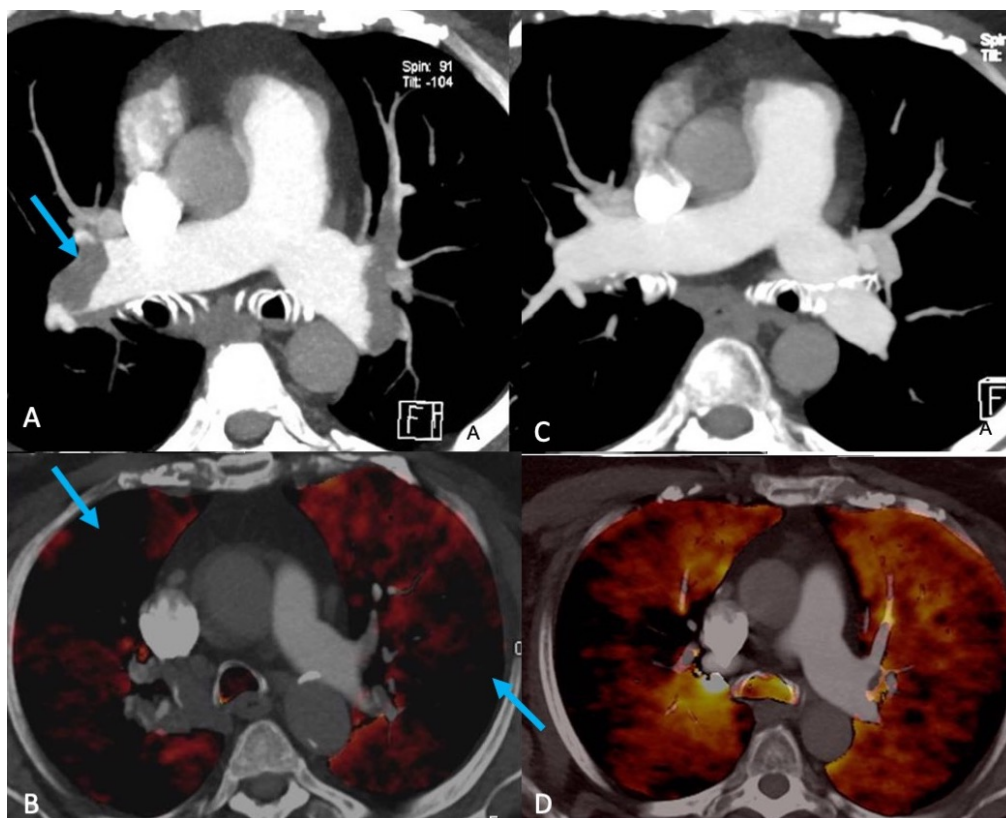


Fig 1 (A-D): Acute pulmonary thromboembolism. CT pulmonary angiogram (CTPA) (A) shows filling defects (arrow). The DECT perfusion map (B) shows bilateral perfusion defects (arrow). Three months after treatment, the CTPA (C) shows complete regression of the thromboembolism and the perfusion defects (D).

Perfusion imaging with angiography in different parts of the body is used to assess vascularity and ischemia, e.g. brain, tumors, etc.

Similarly, perfusion imaging in the lungs is useful to assess the effects of conditions that affect the pulmonary vasculature. This requires dual energy imaging, i.e. dual energy CT (DECT) at the time of the CT pulmonary angiogram (CTPA).

In patients with acute pulmonary thromboembolism, dual energy perfusion maps show peripheral wedge-shaped areas of reduced perfusion representing perfusion defects (Fig. 1). These DECT iodine maps are also useful for better visualization of the thrombi in small segmental or subsegmental branches. Improvement of these perfusion

defects and thrombi helps us document response to treatment (Fig. 1).

In chronic pulmonary thromboembolism (CTEPD), perfusion defects on DECT (Fig. 2) help us confirm the diagnosis and assess the extent of the downstream vascular changes.

In Covid-19 patients, at the height of the pandemic, DECT allowed us to evaluate and understand the associated vasculopathy and microangiopathy, especially in those who did not have overt thromboembolism, but were still symptomatic (Fig. 3).

The usefulness of CT pulmonary angiograms can be improved by using dual energy scanning so that the perfusion maps can give us additional information to improve diagnosis and disease understanding.



*At a glance:*

- ◆ Dual energy CT (DECT) is needed to assess perfusion in the lungs.
- ◆ DECT perfusion imaging is useful in patients with acute and chronic thromboembolism, to assess both, the functional impact of the disease and response to treatment.
- ◆ Ideally, all CT pulmonary angiograms (CTPAs) should be done using dual energy scanning for the added information from the perfusion maps.

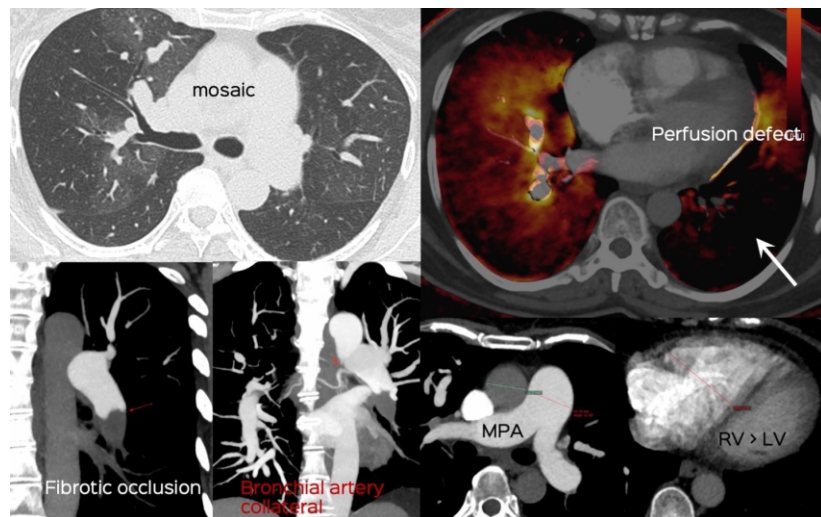
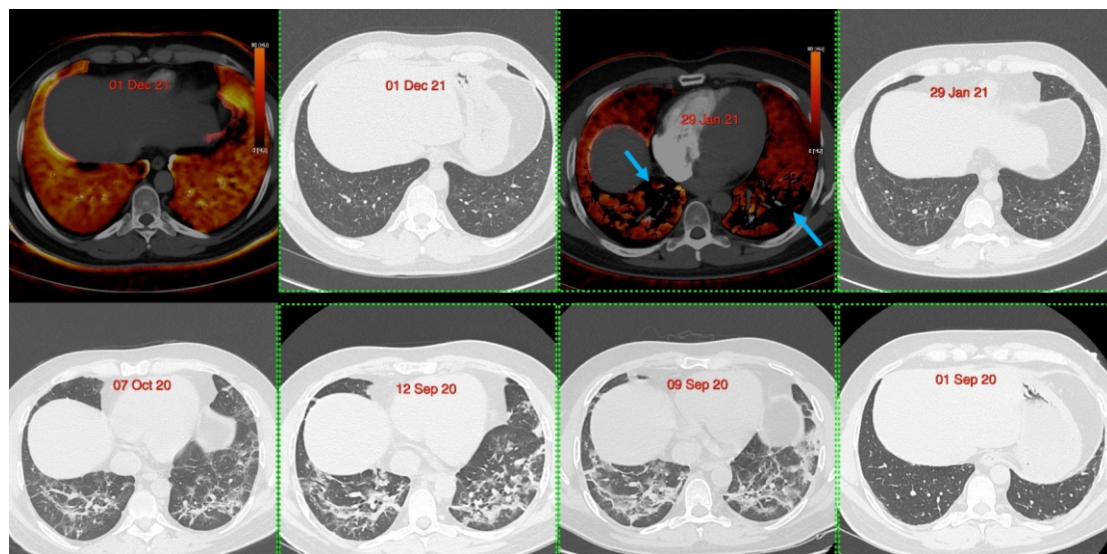


Fig. 2: Chronic pulmonary thromboembolism. This composite image shows the various findings in a 55-years old woman with CTEPH. The DECT map gives added confidence to the diagnosis and maps out the extent of functional change.

Fig. 3: Covid-19 vasculopathy. The bottom row shows the serial Covid-19 changes in a 40-years old patient worsening in Sep 20 and then gradual improvement. The patient was still symptomatic in Jan 21, where the DECT perfusion map shows significant lower lobe defects (arrows), despite improvement of the lung findings. The patient's symptoms gradually improved and the scan of 01 Dec 21 shows further lung improvement with complete regression of the perfusion defects.



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Owner, Printer & Publisher: Dr. Bhavin Jankharia

Published at: Dr. Jankharia's Imaging Centre Bhaveshwar Vihar, 383, S.V.P. Road, Prarthana Samaj, Charni Road, Mumbai 400 004.

Printed at: India Printing House, First Floor, 42, G D Ambedkar Marg, Opp. Wadala Post Office, Wadala, Mumbai 400 031