

Dual Energy CT in the study of pulmonary perfusion

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Disclosure Statement

Nothing to disclose.

Introduction

- Various lung diseases can affect lung perfusion status. This change in perfusion can be the result of:
 - morphologic changes
 - reflex changes
- Dual Energy CT (DECT) can differentiate iodine from normally present air, blood and parenchyma

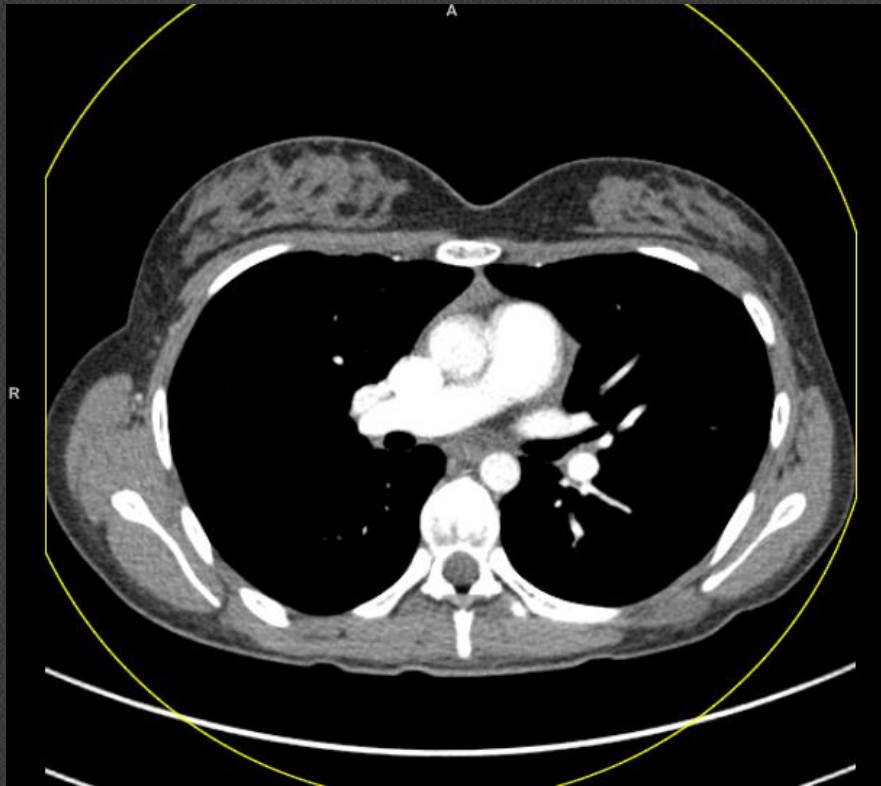


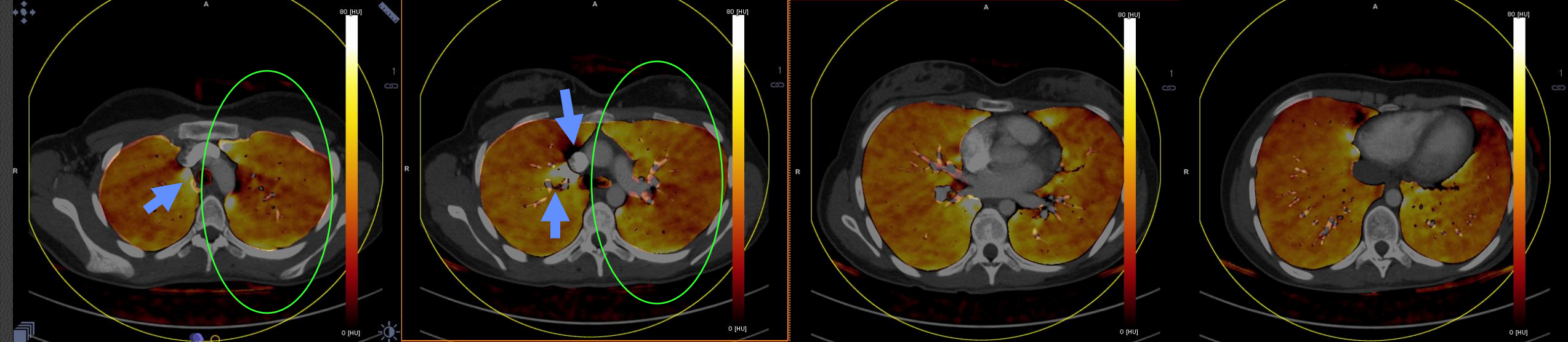
DECT may be a tool to study regional perfusion of the lung and may offer, in addition to anatomic information, simultaneous functional information

DECT

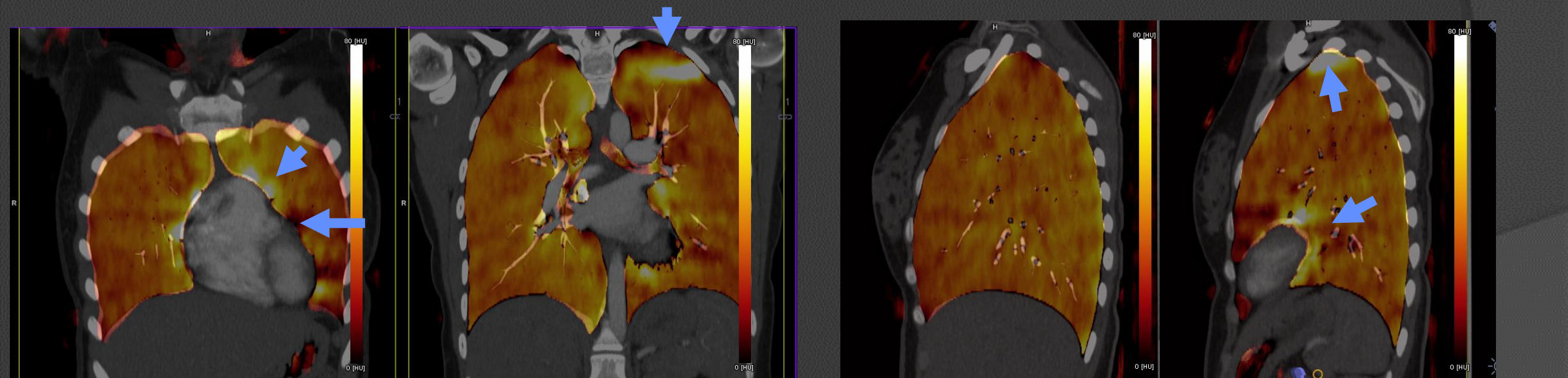
- Produces images that reflect the regional volume of blood by 'enhancing' the lung areas to which fresh blood is being delivered that is equilibrated with an amount of iodine.
- Vascular obstruction/ narrowing will decrease regional volume of blood by reducing blood in capillaries. Pulmonary Embolism
- Increased blood flow will dilate capillaries and recruit new capillaries, and will increase regional volume of blood.

Normal Lung Perfusion





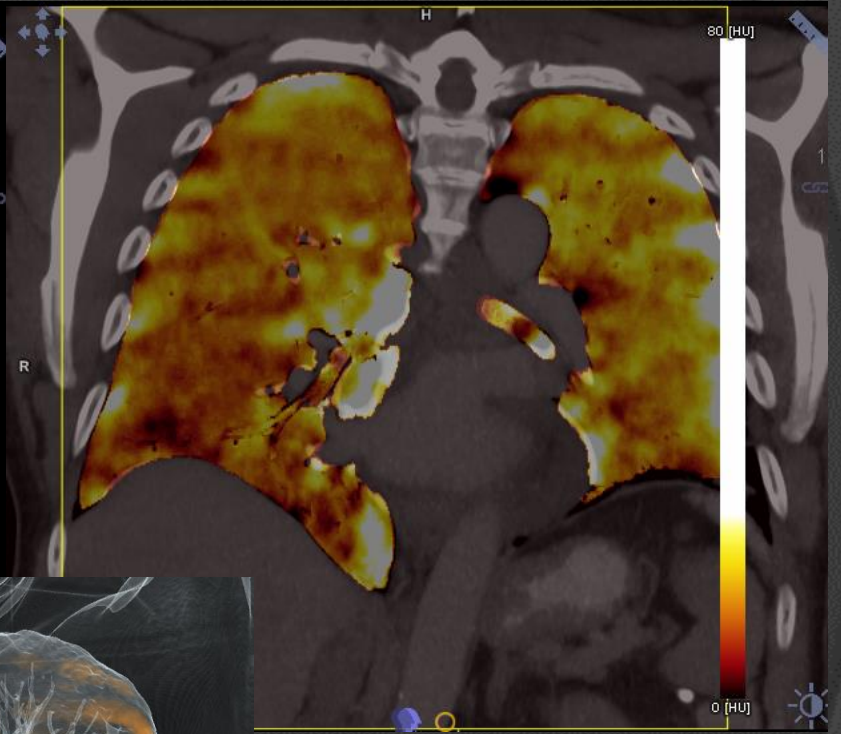
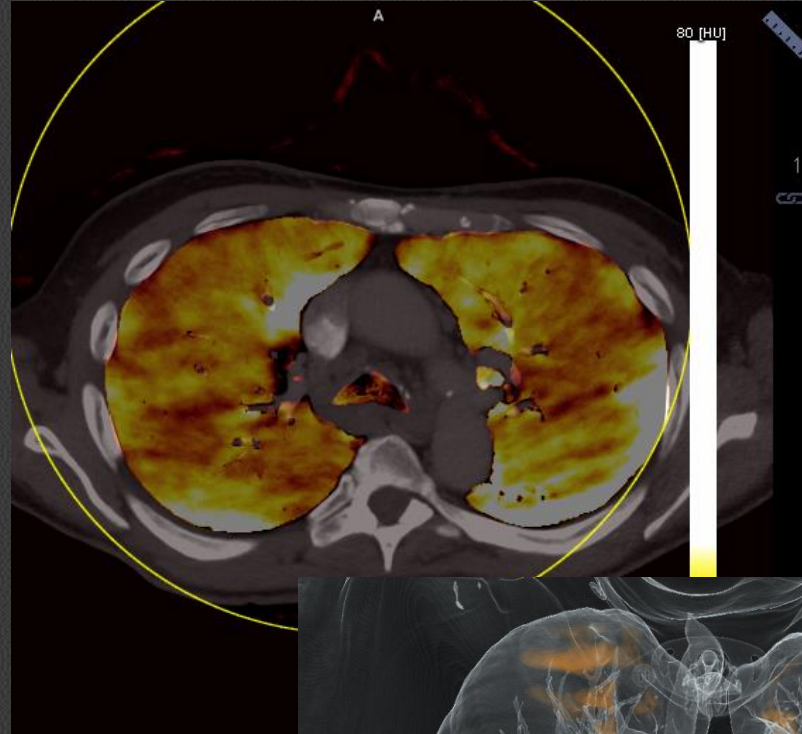
Normal Lung Perfusion



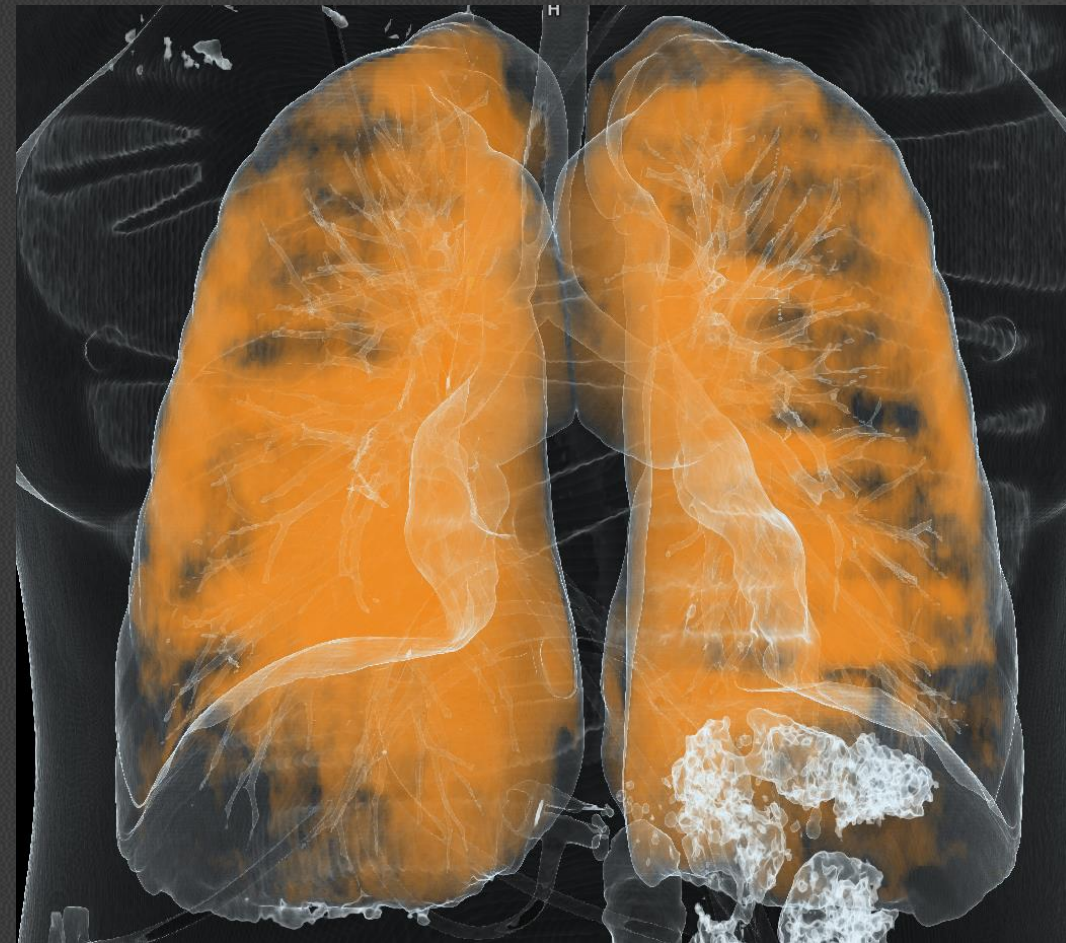
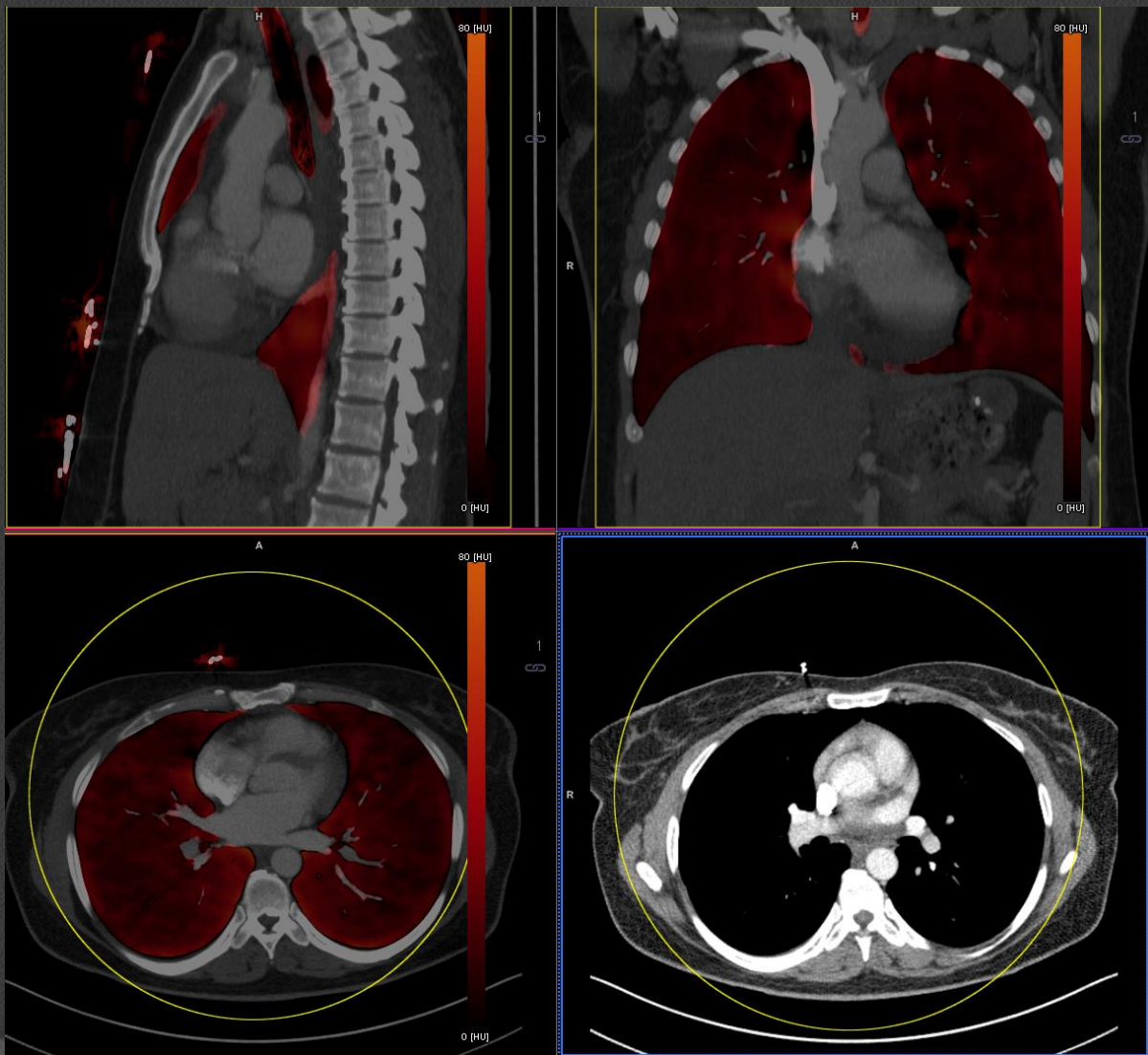
Artefacts

Perfusion gradient

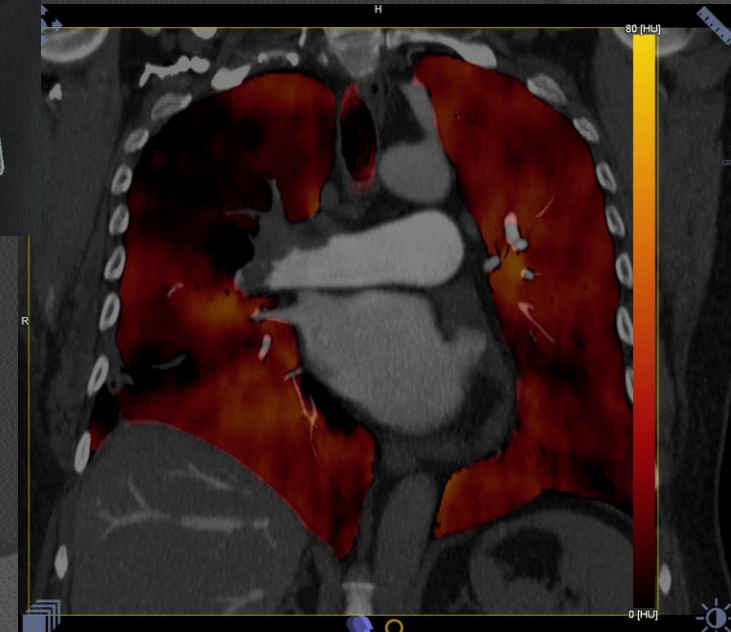
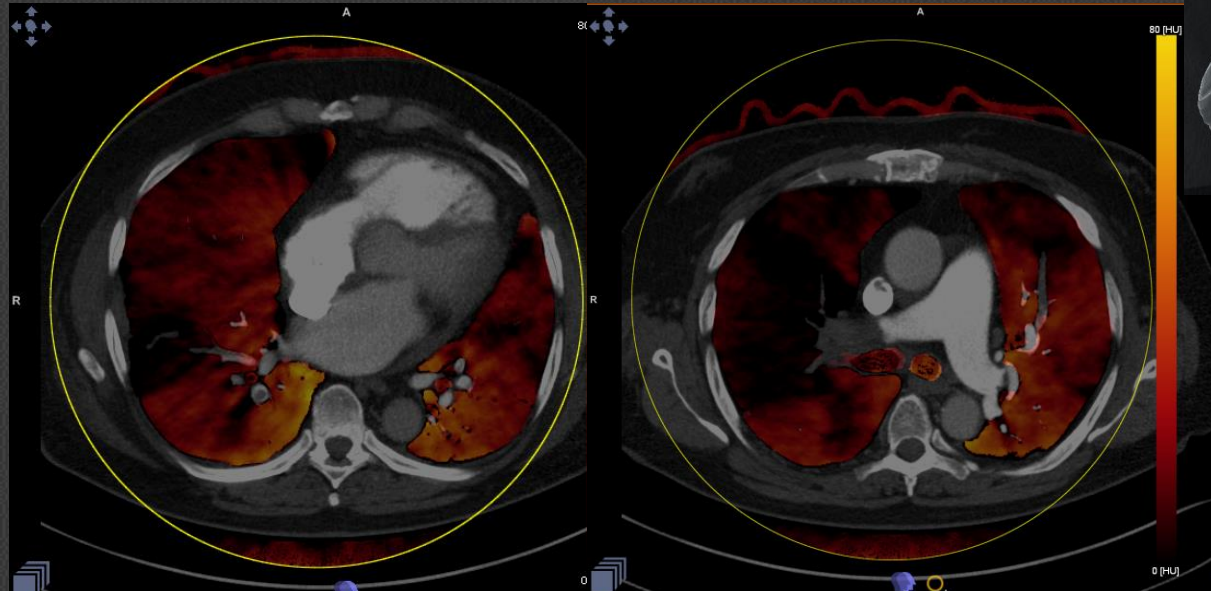
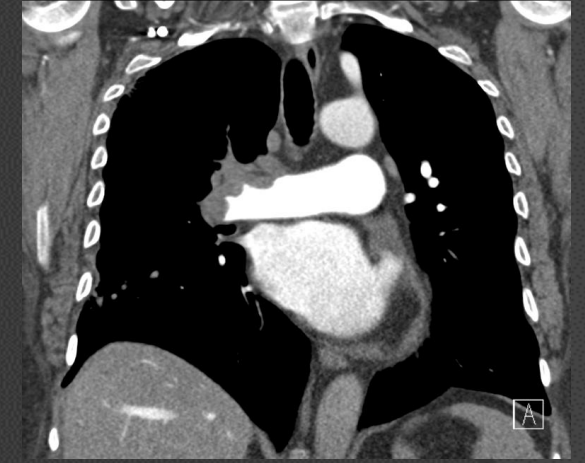
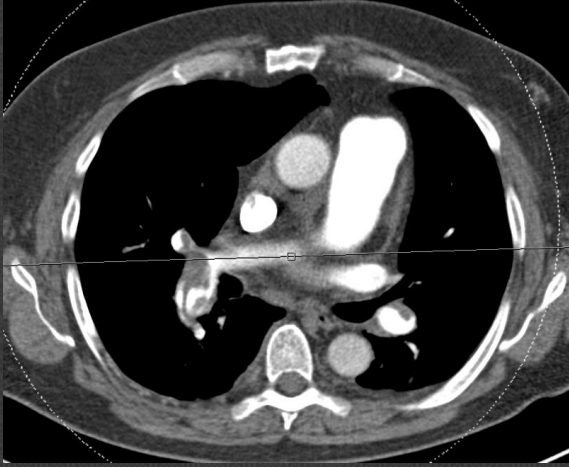
Insufficient Amount of Contrast



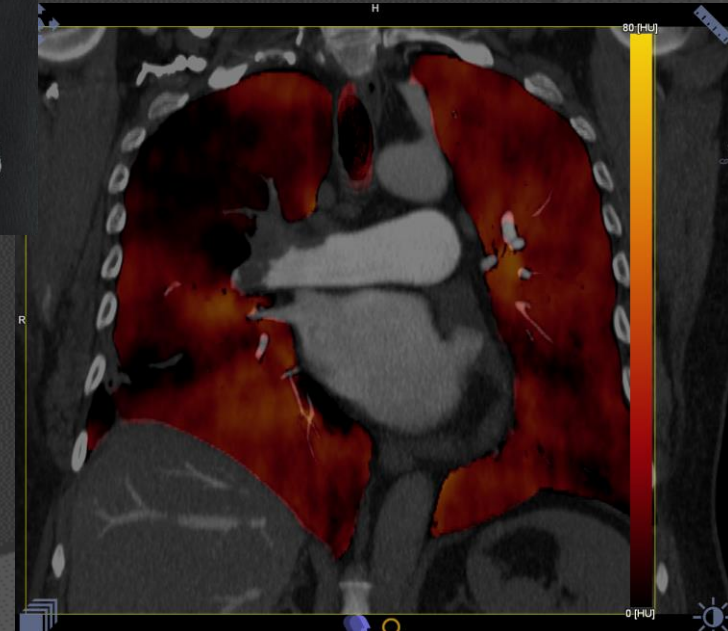
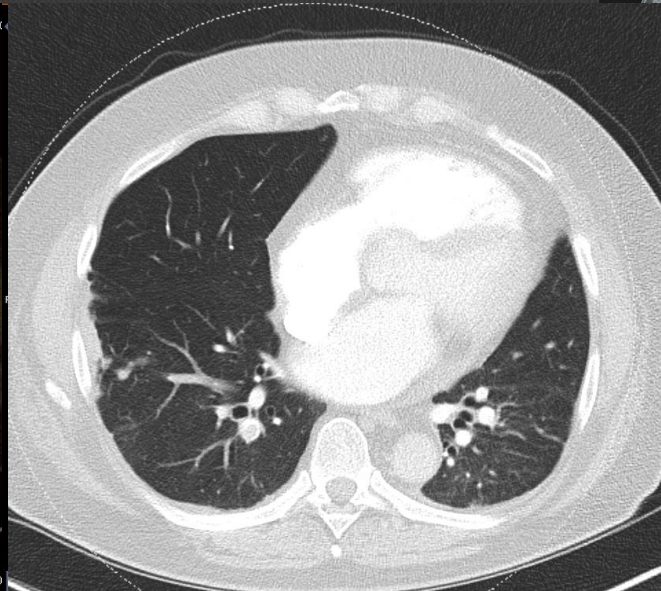
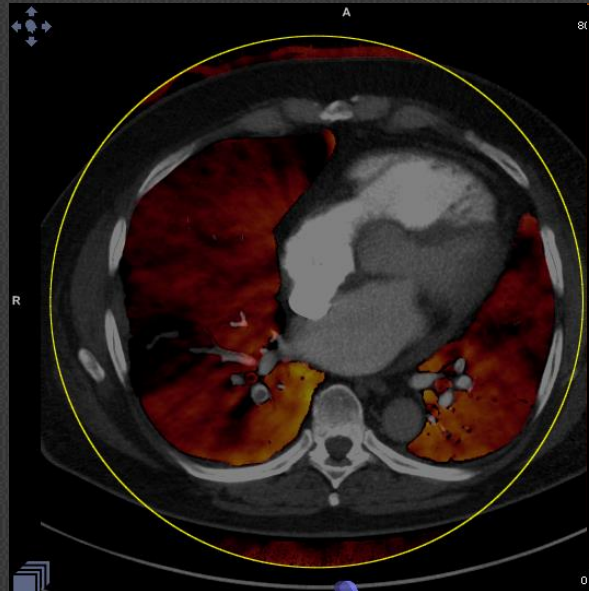
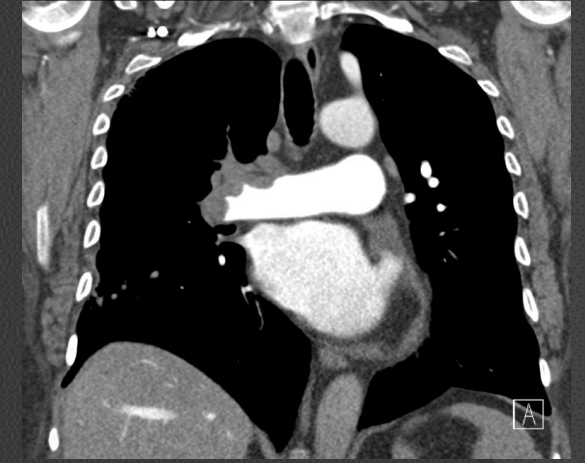
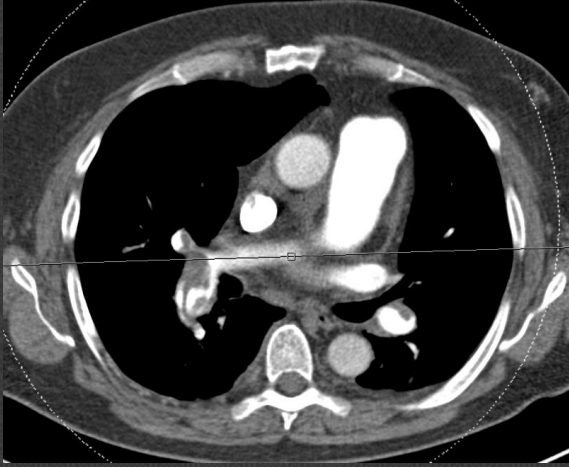
Inhomogeneous Contrast Equilibration



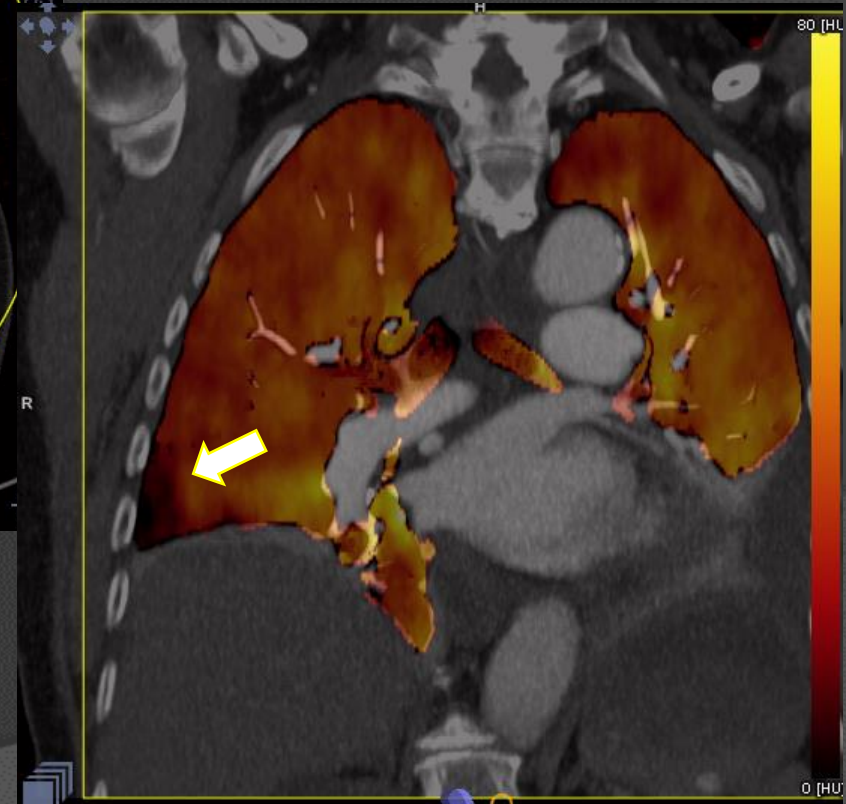
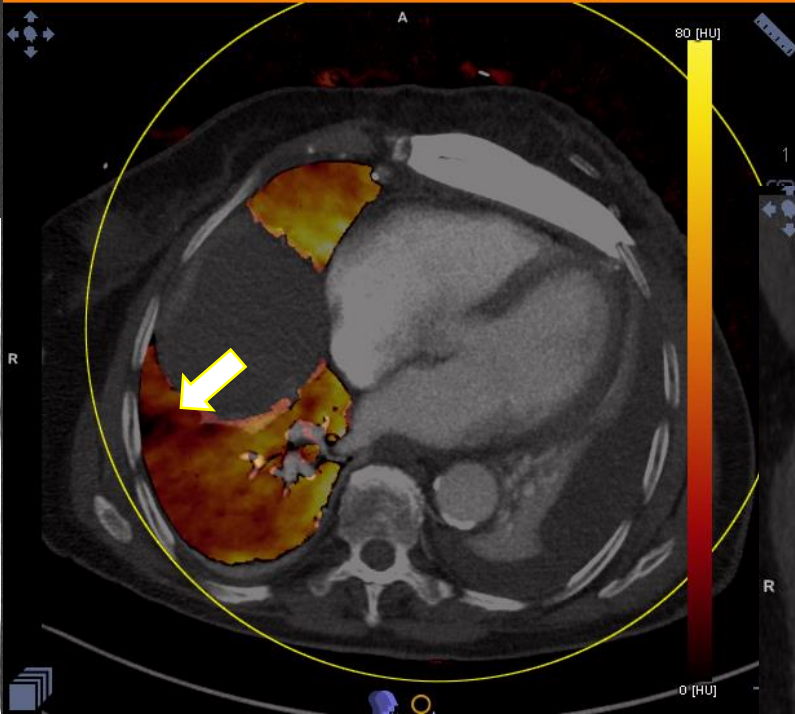
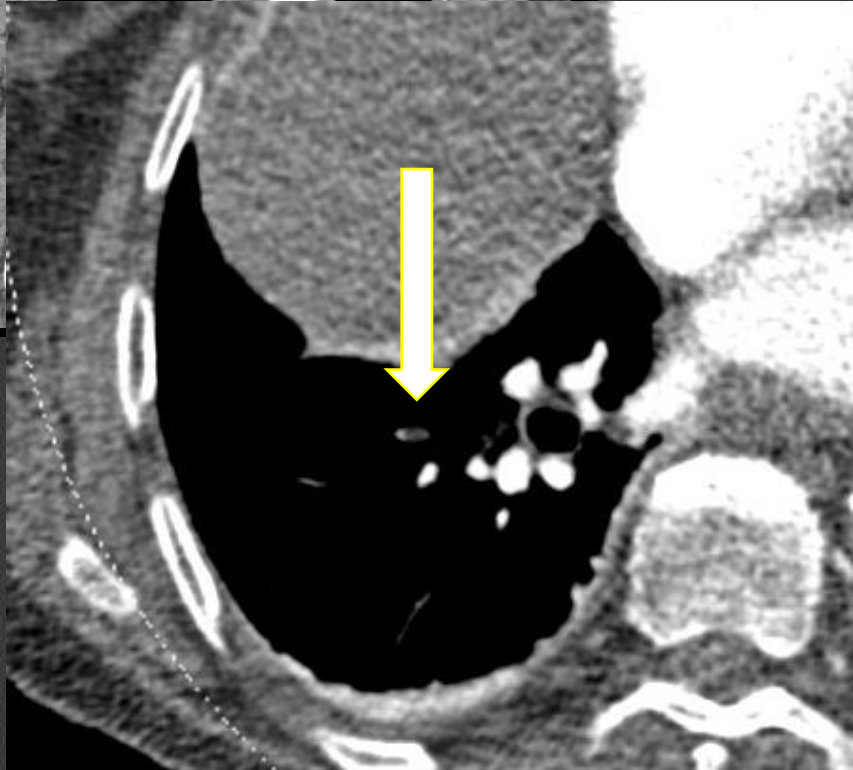
Acute Pulmonary Embolism



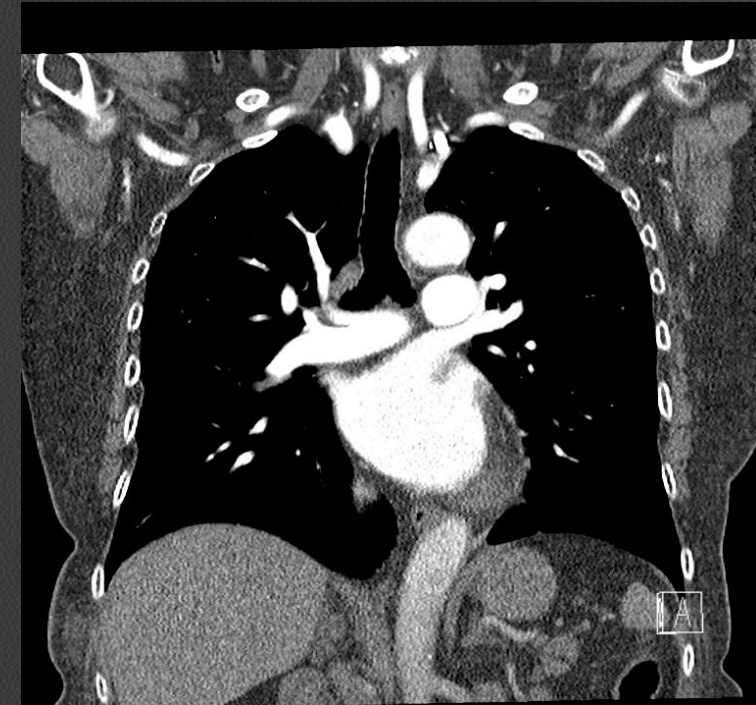
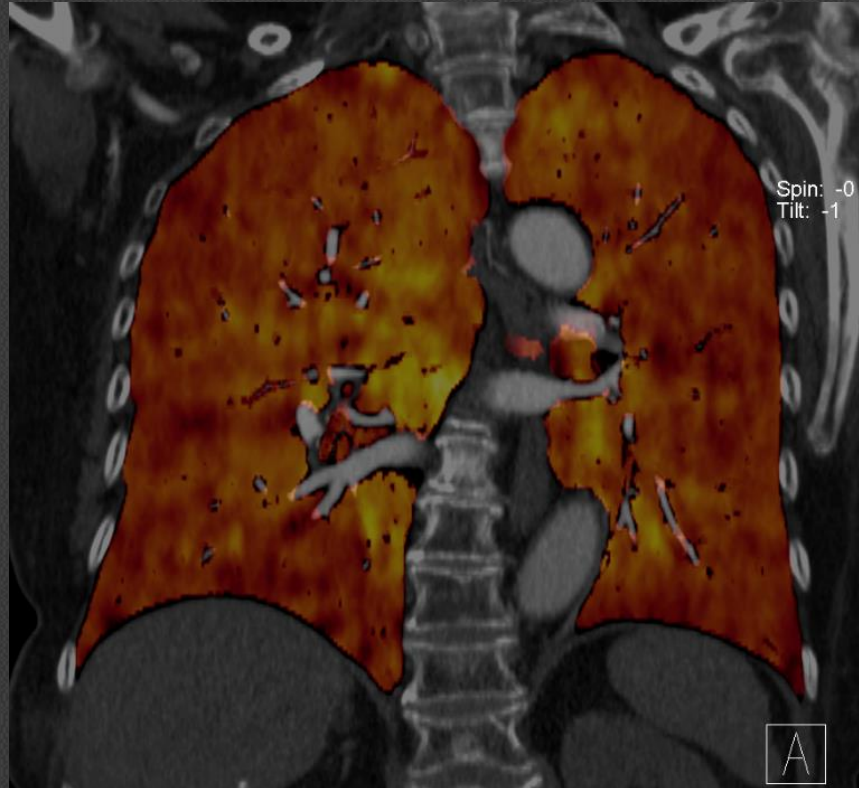
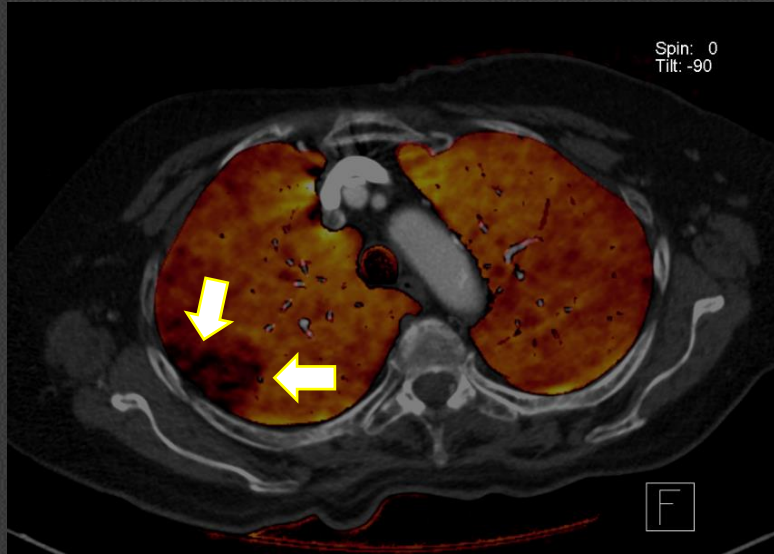
Acute Pulmonary Embolism



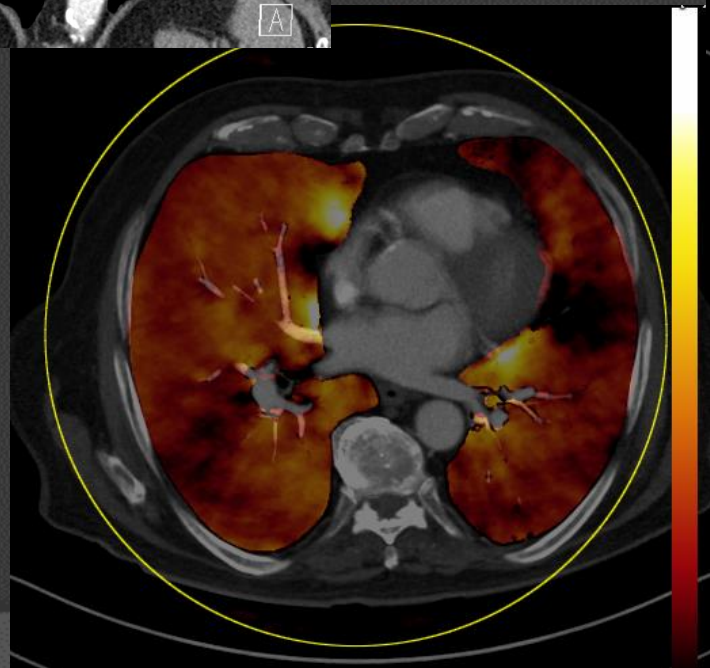
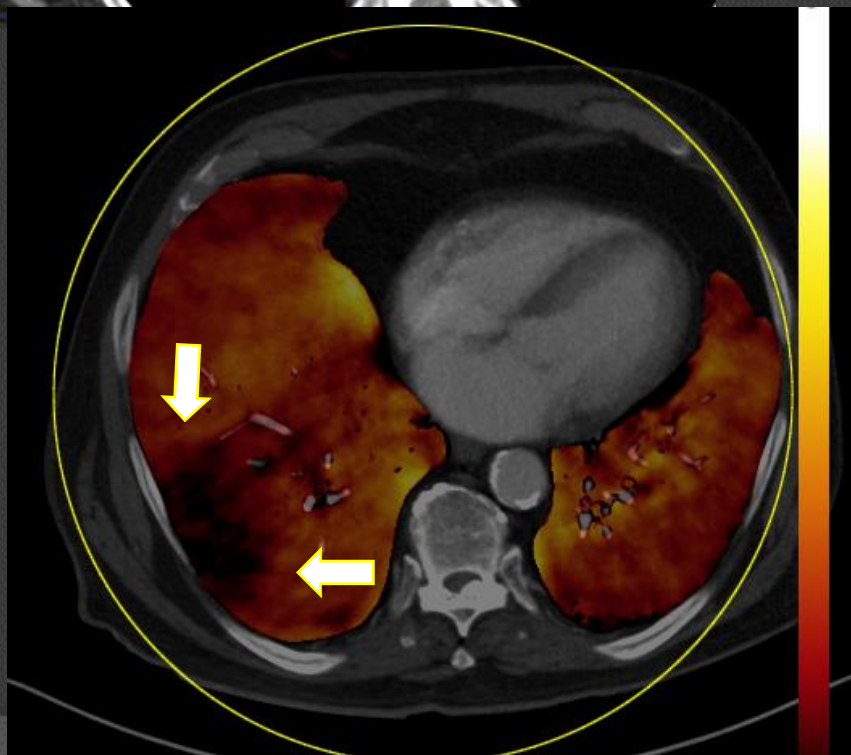
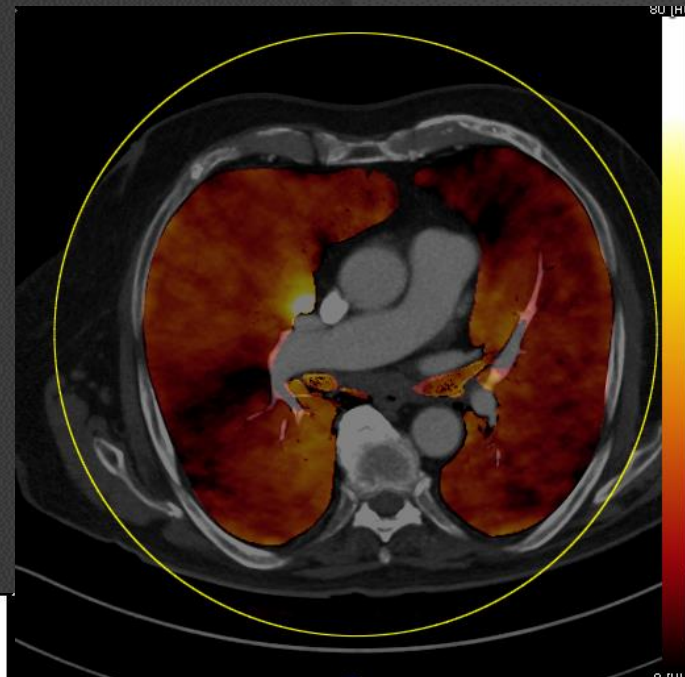
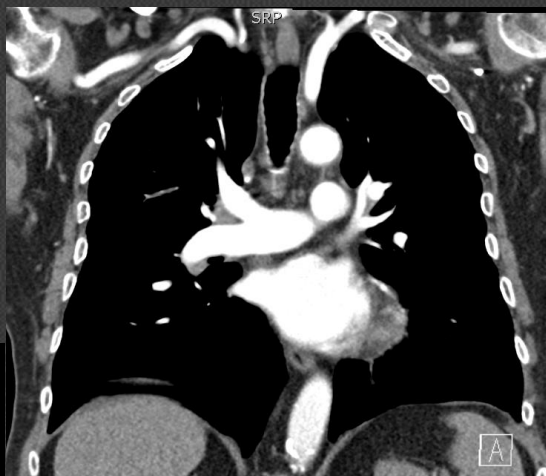
Pulmonary Embolism (Small Artery)



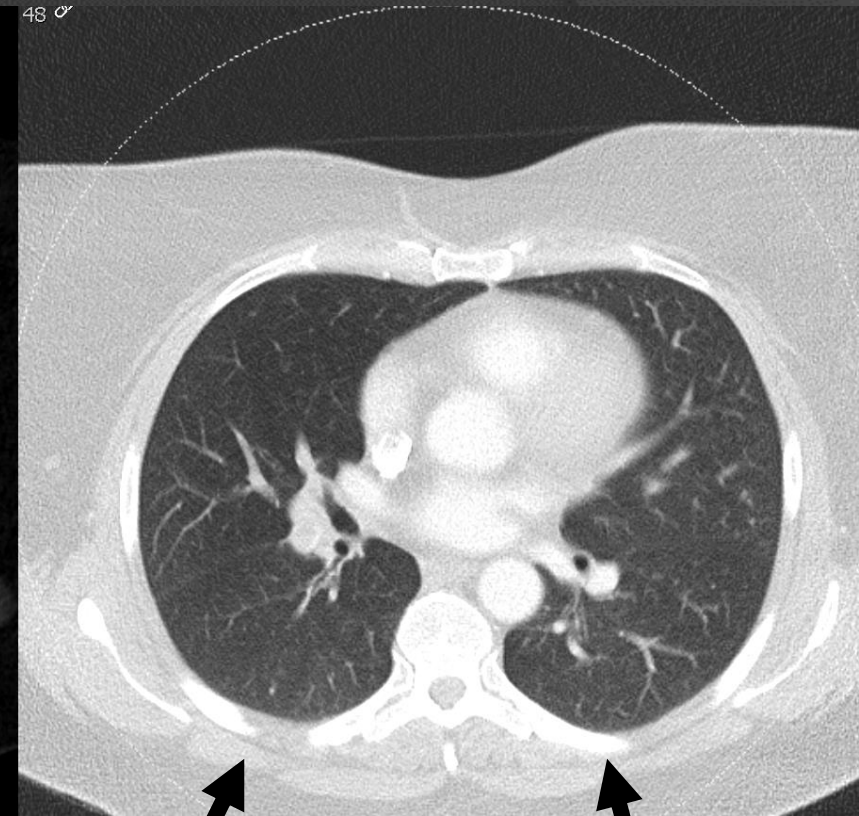
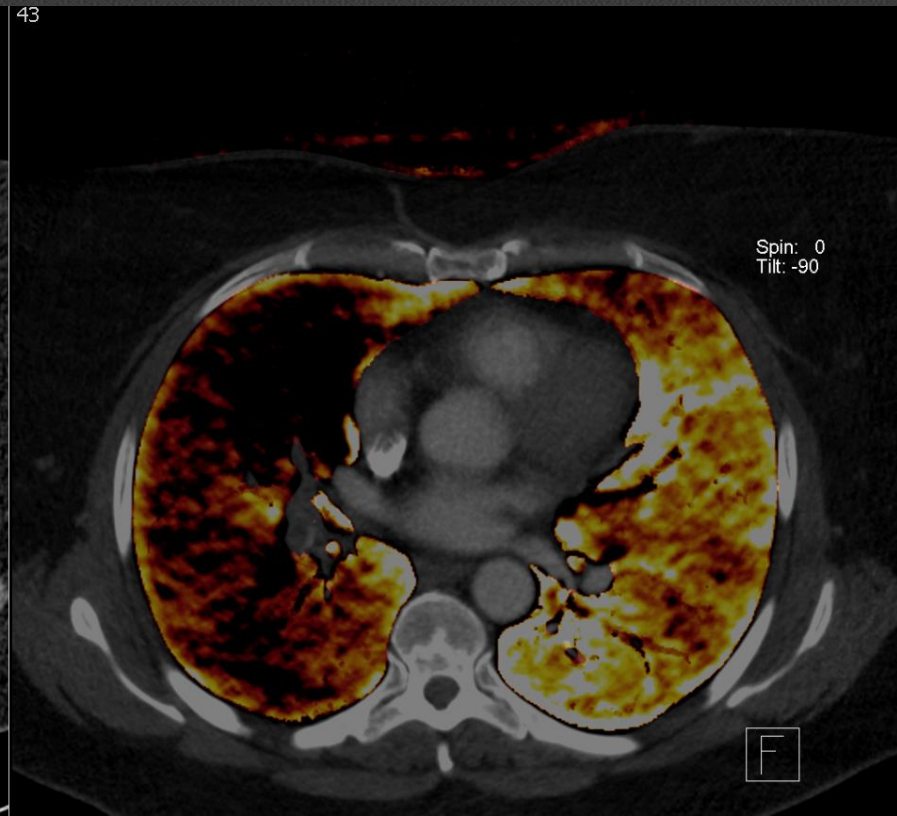
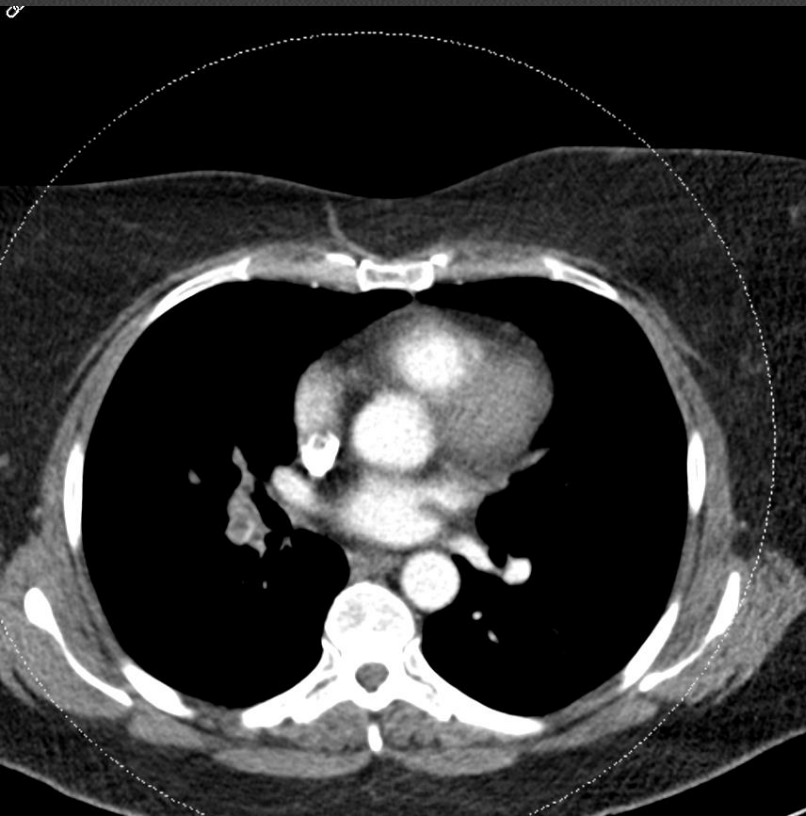
Pulmonary Embolism (Small Artery)?



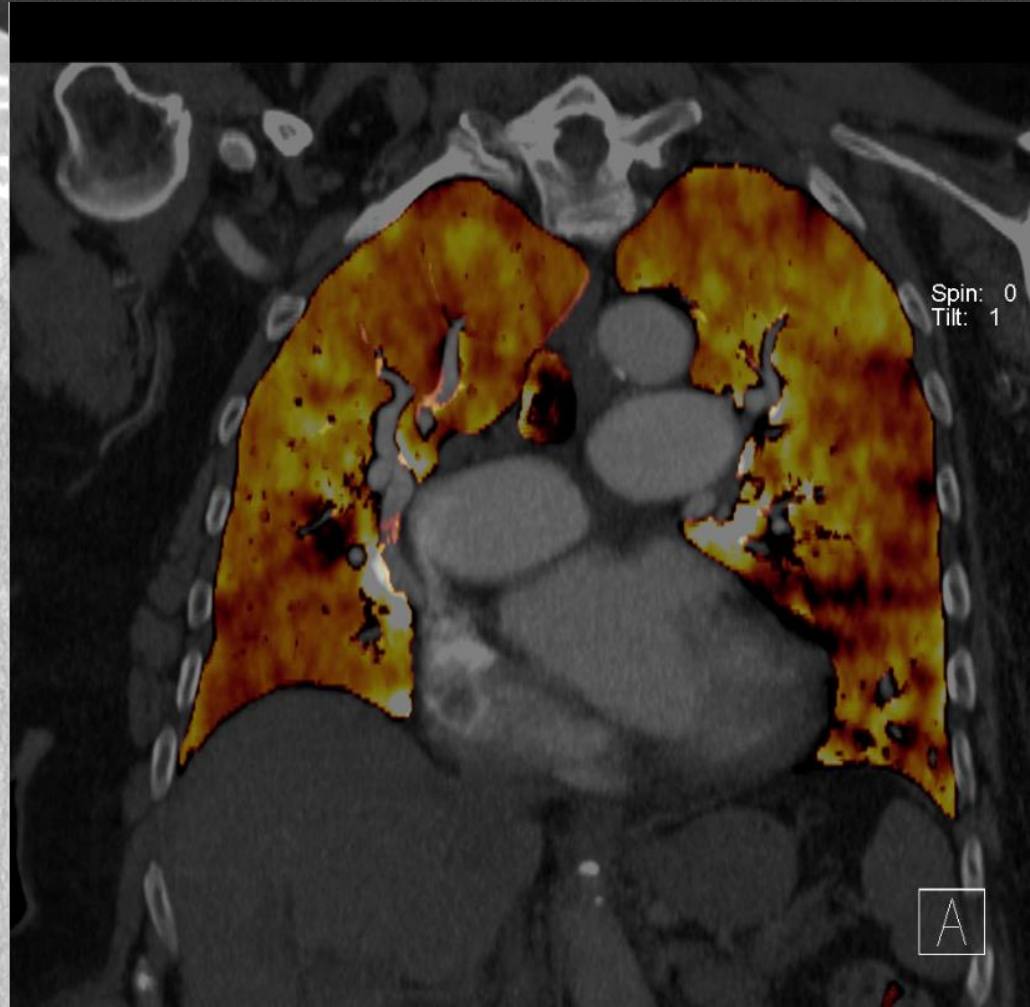
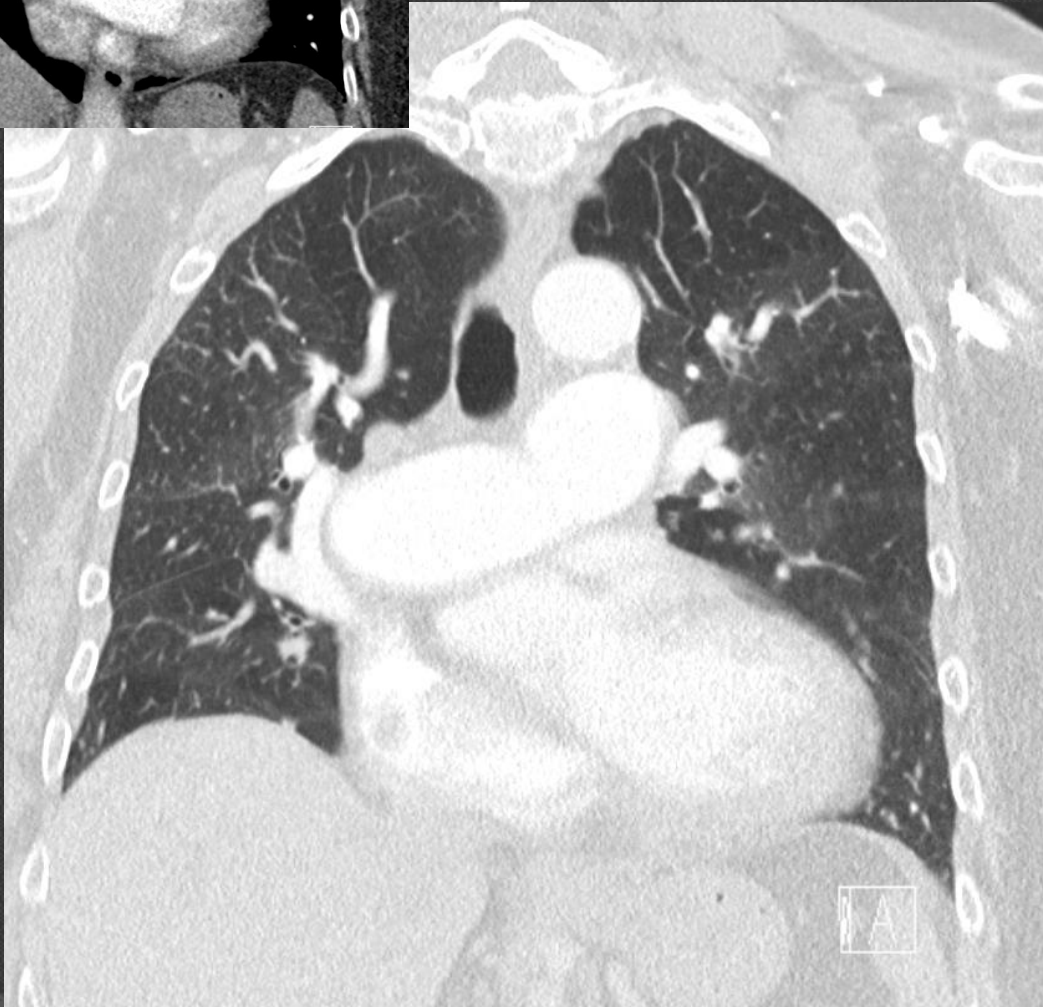
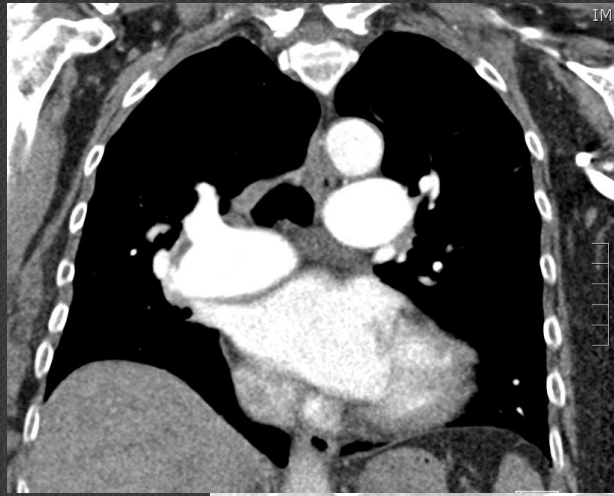
Multiple Small Clots?



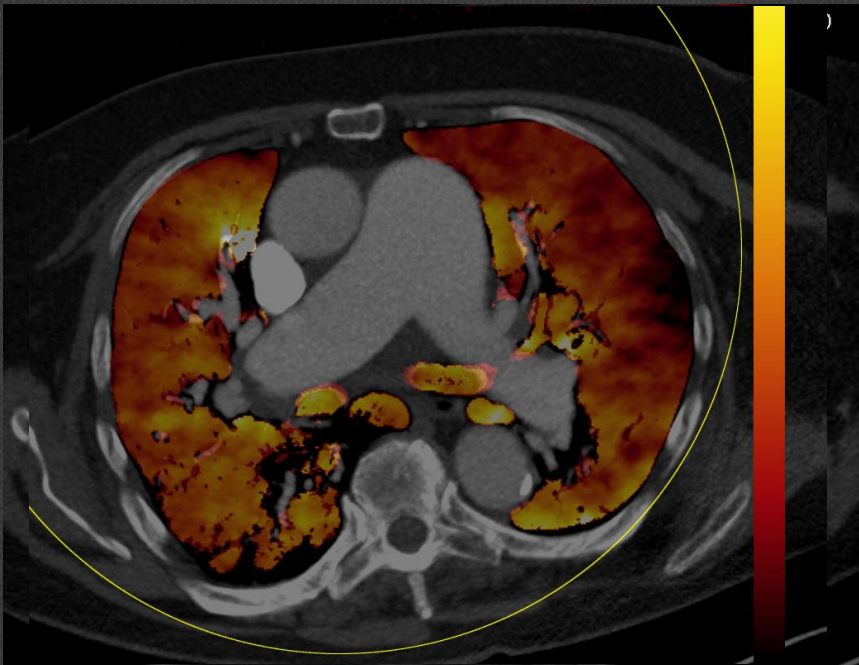
Acute Pulmonary Embolism



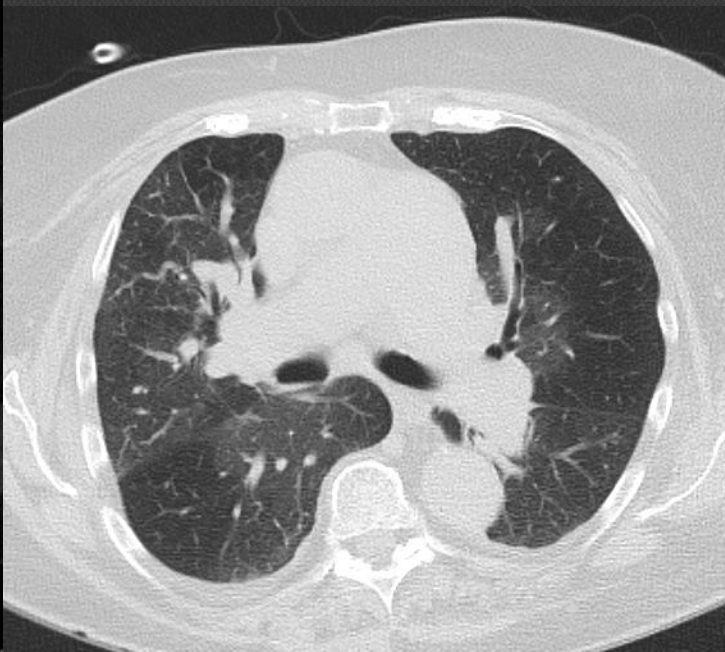
Chronic Pulmonary Embolism



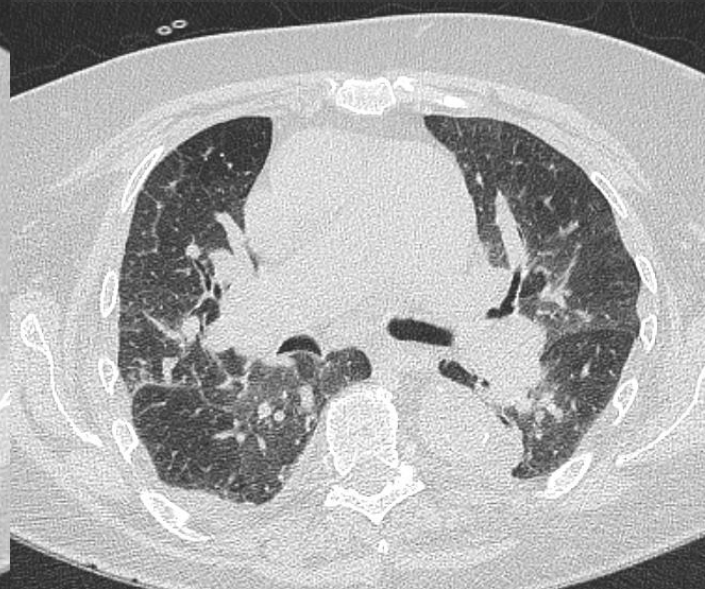
Chronic Pulmonary Embolism



Inspiration



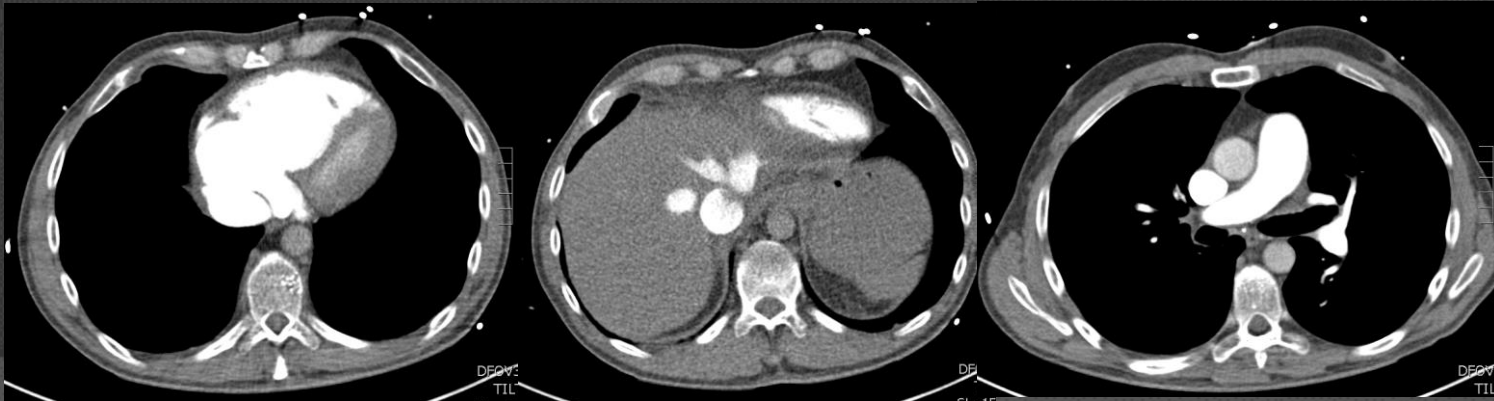
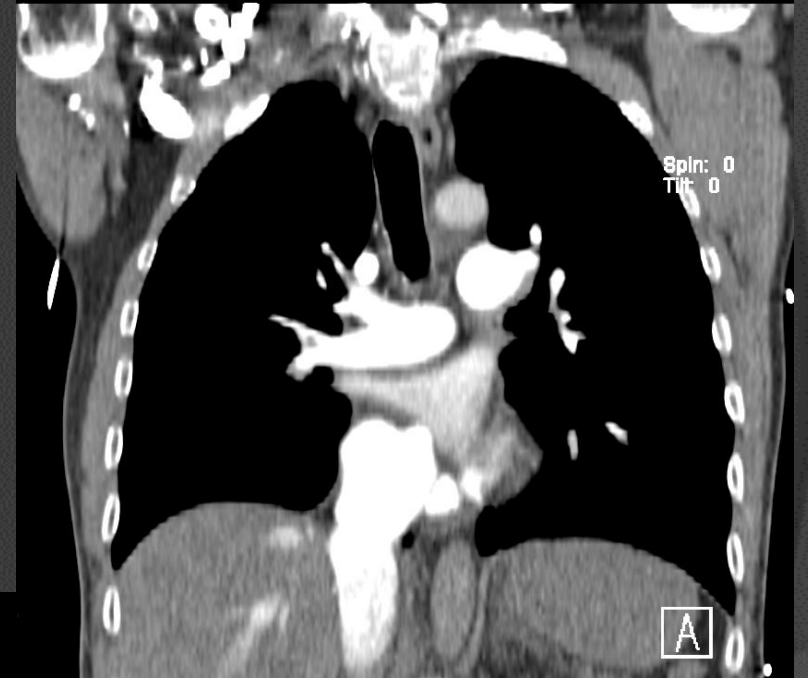
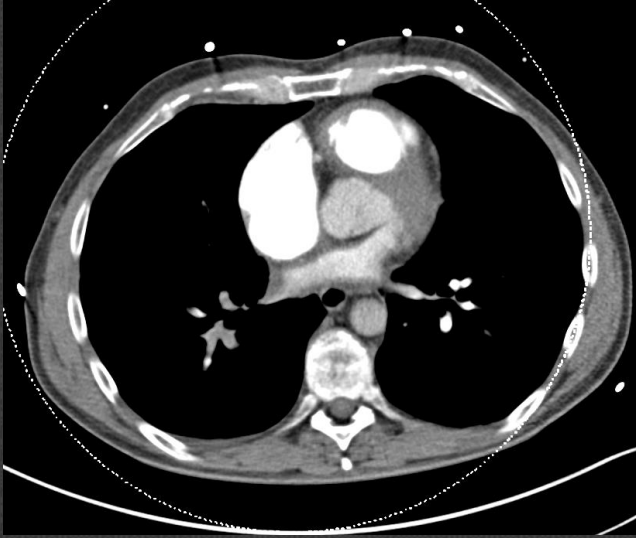
Inspiration



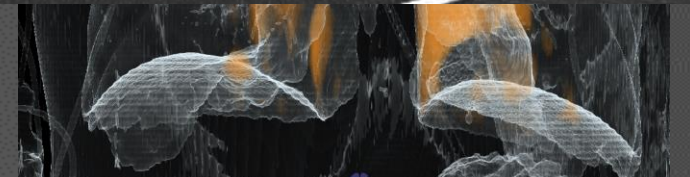
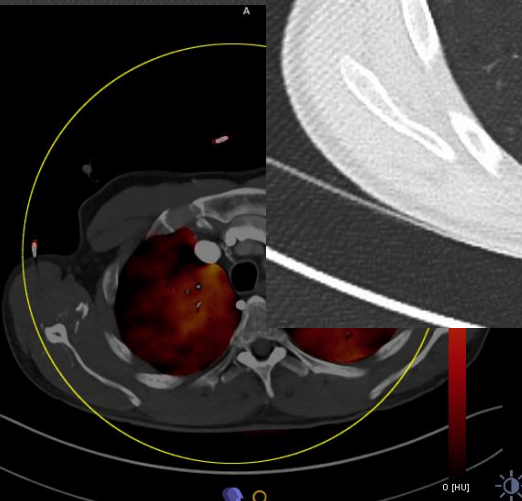
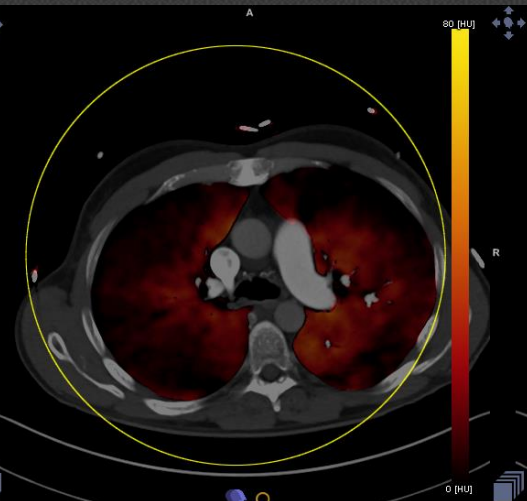
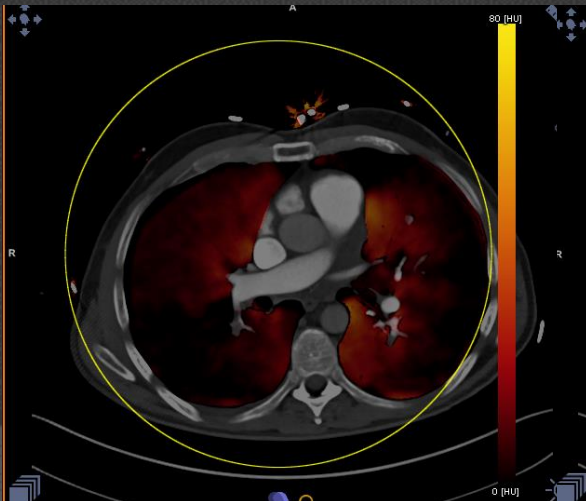
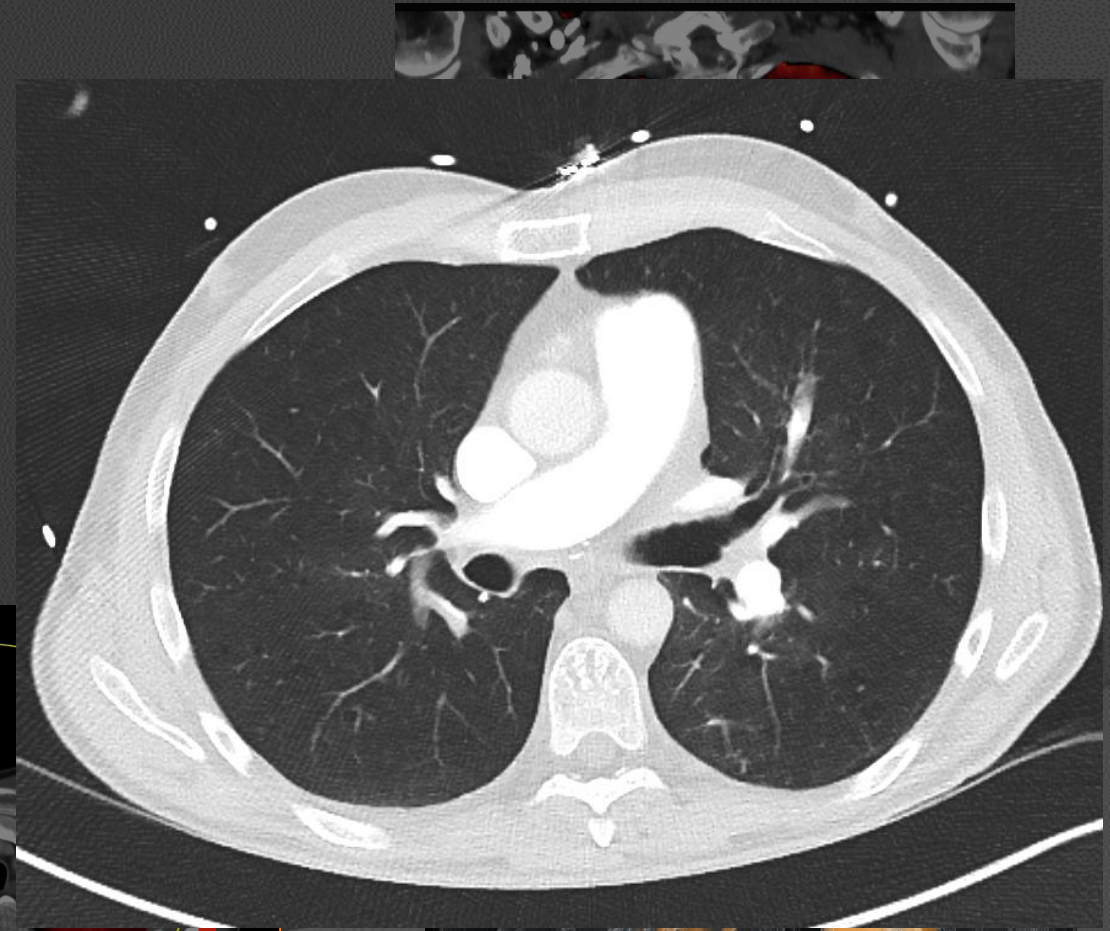
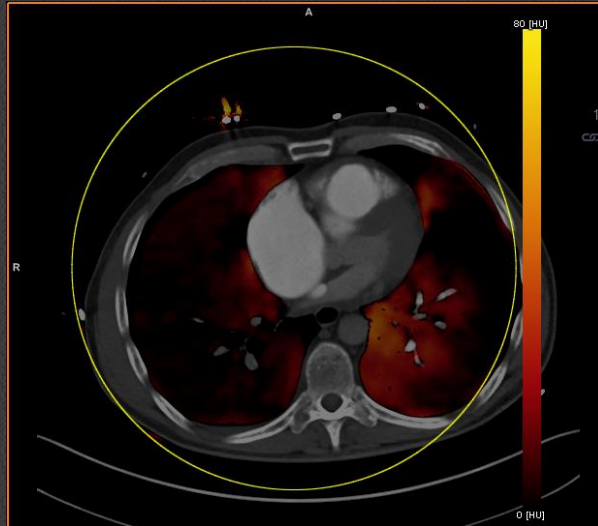
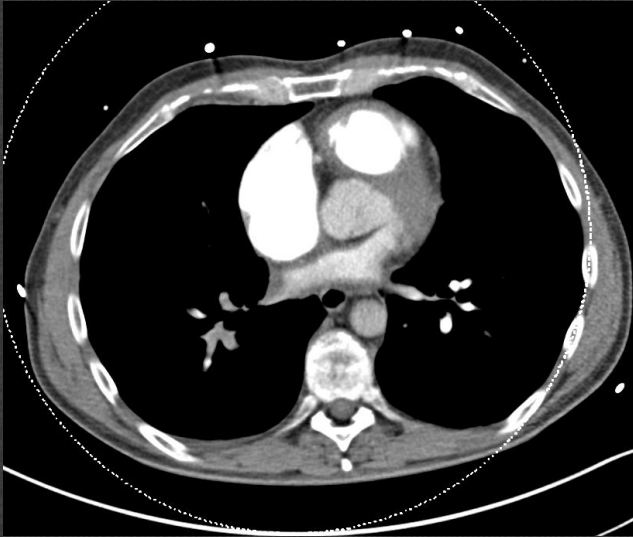
Expiration



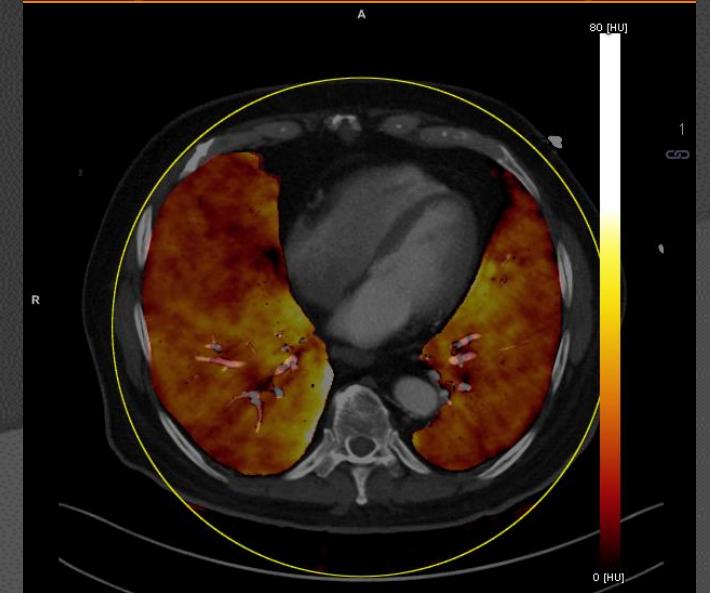
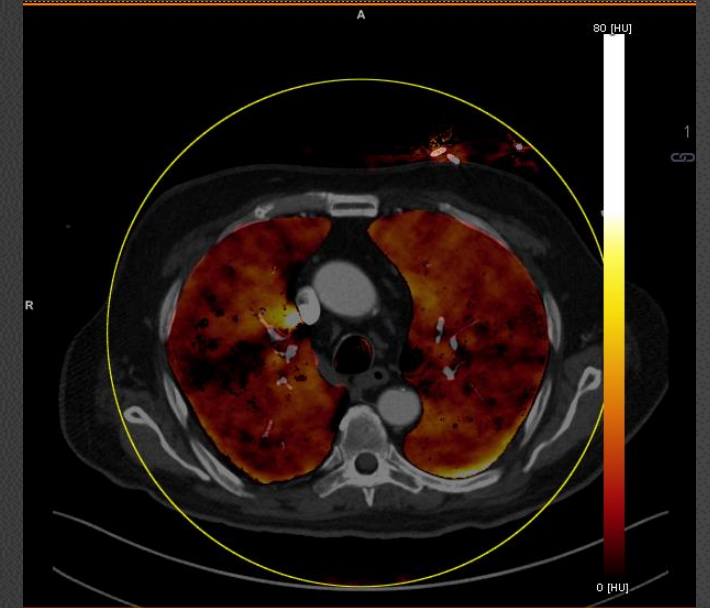
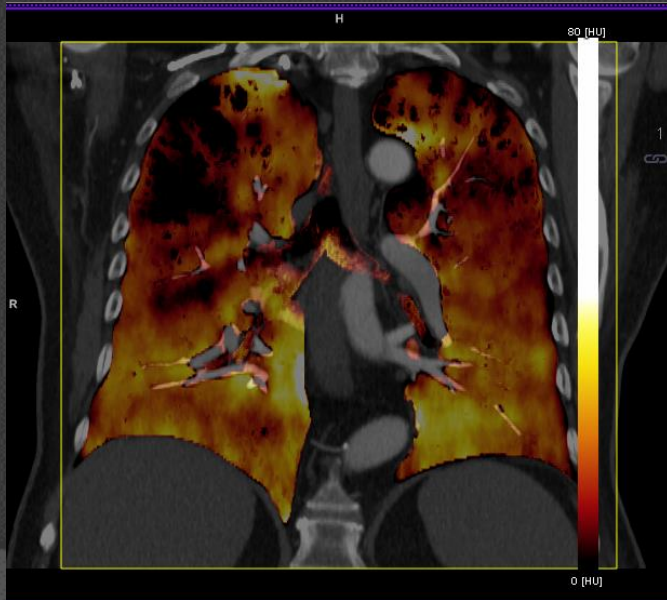
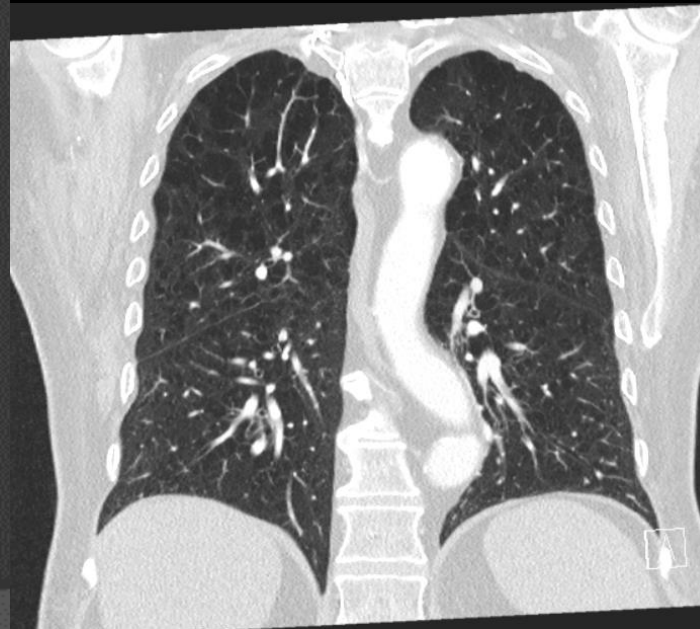
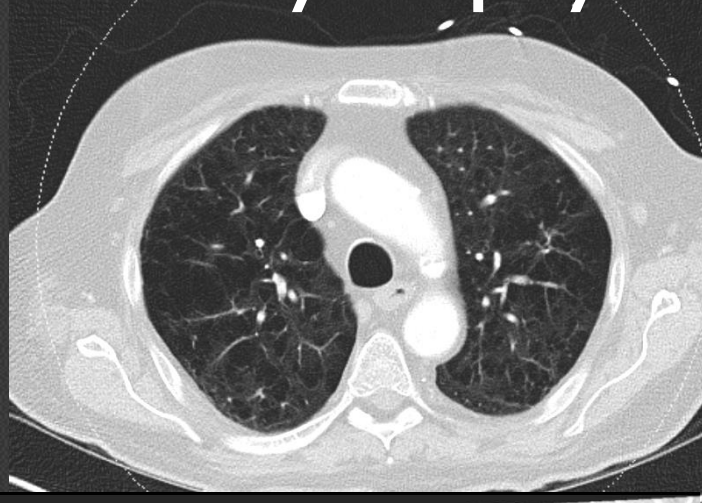
Acute and Chronic Embolism, Pulmonary Hypertension



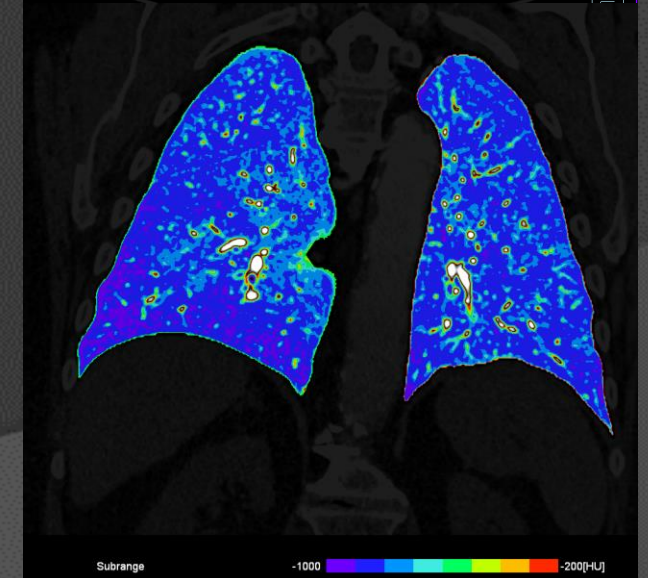
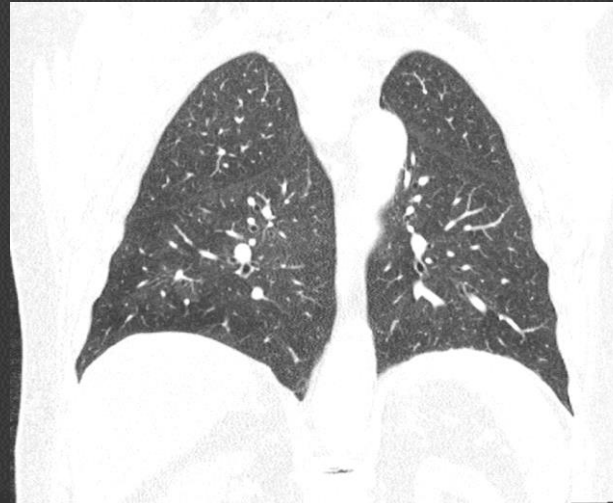
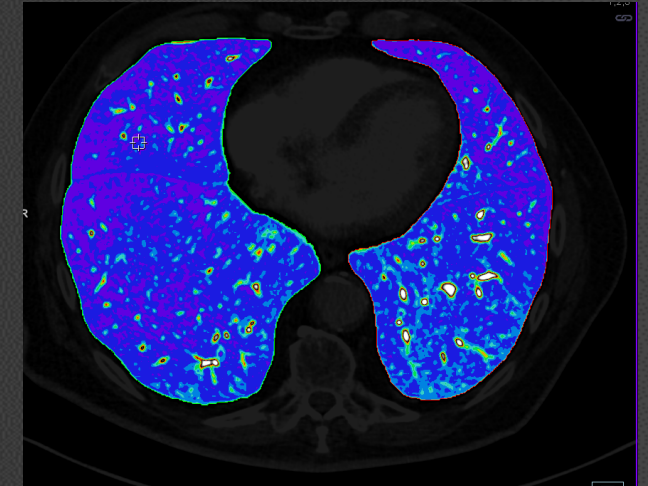
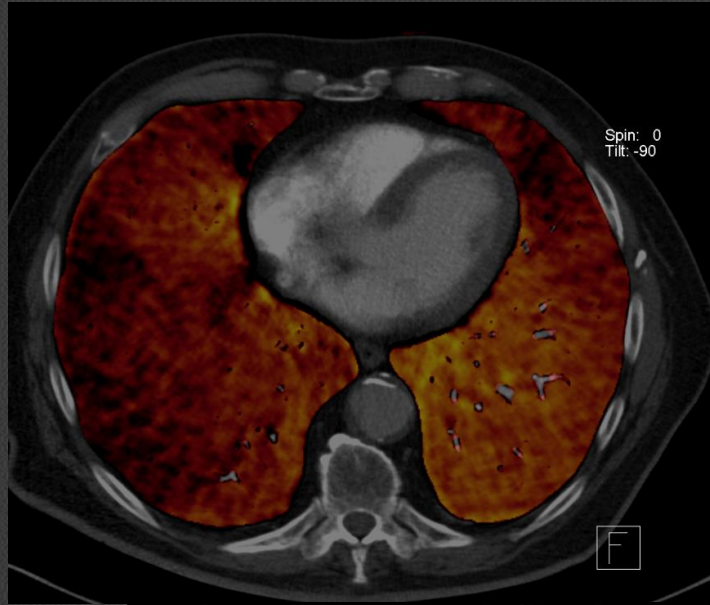
Acute and Chronic Embolism, Pulmonary Hypertension



Pulmonary Emphysema



Pulmonary Embolism??



Summary

- Dual Energy CT is an adequate tool to study lung perfusion abnormalities in patients suspected of PE (acute and chronic)
- Dual Energy CT can direct the observer towards small peripheral intravascular clots
- Be aware of artefacts:
 - technical
 - insufficient contrast
- Always look at lung window settings
- Always correlate with clinical findings

Suggested Reading

- S. Galvez Garcia et al. Dual-energy CT (DECT) pulmonary angiography in acute pulmonary thromboembolism: causes, semiology and potential diagnostic pitfalls. Epos 2016 poster c-1598
- A. Otrakji et al. Dual Energy CT: Spectrum of Thoracic Abnormalities. Radiographics 2016; 36: 38-52
- MJ Kang et al. Dual-Energy CT: Clinical Applications in Various Pulmonary Diseases. Radiographics 2010; 30: 685-698
- G.M. Lung et al. Dual-Energy CT of the Lung. AJR 2012; 199: S40-S53
- S.M. Bollen en M.J.C.M. Rutten. Dual-energy CT: nieuwe diagnostische mogelijkheden. Ned Tijdschr Geneesk 2017; 161: D1580
- H.J. Hwang et al. The role of dual-energy computed tomography in the assessment of pulmonary function. European Journal of Radiology 2017; 86: 320-334
- M.Ohana et al. Thoracic dual energy CT: Acquisition protocols, current applications and future developments. Diagnostic and Interventional Imaging 2014; 95: 1017-1026