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

Hwang et al. European J Radiol 2017
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
Artefacts

Perfusion

gradient

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
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
• G.M. Lung et al. Dual-Energy CT of the Lung. AJR 2012; 199: S40-S53
• M.Ohana et al. Thoracic dual energy CT: Acquisition protocols, current applications and future developments. Diagnostic and Interventional Imaging 2014; 95: 1017-1026