

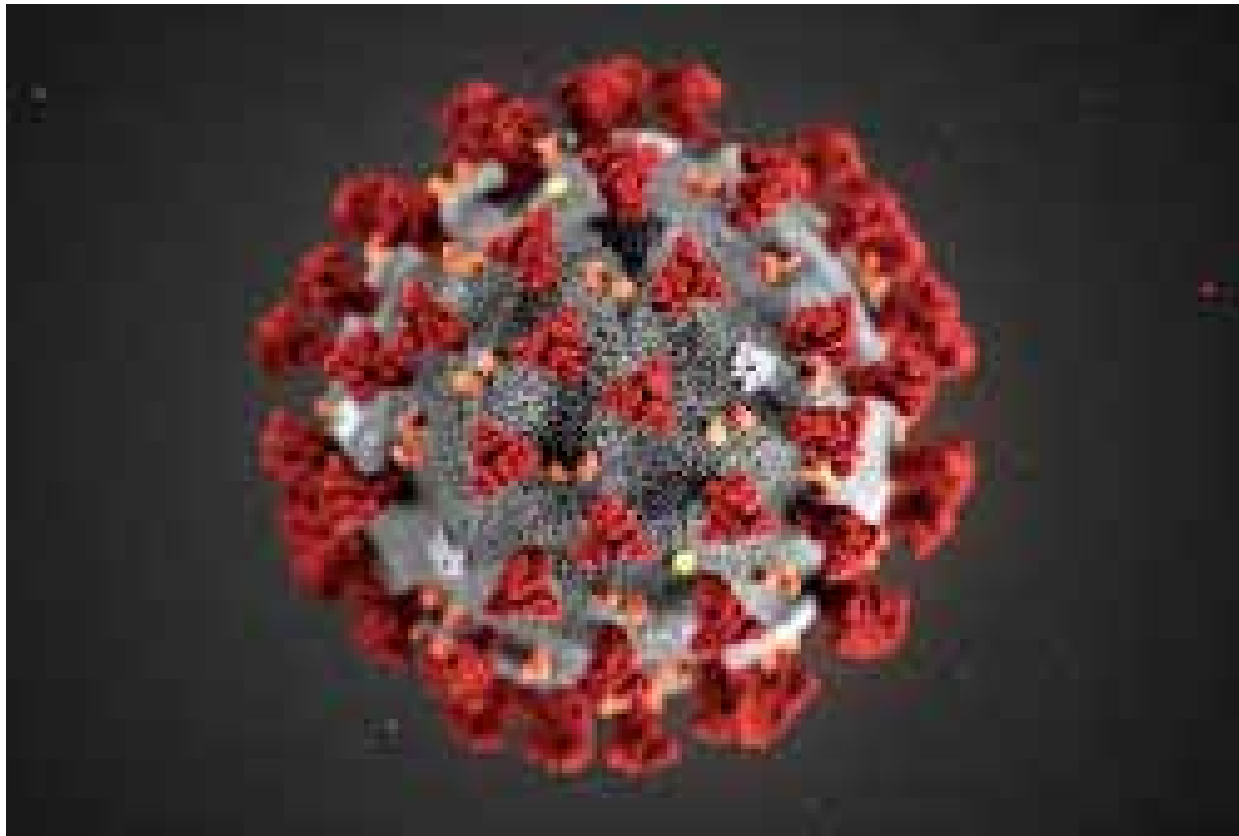


# INCIDENTAL CT FINDINGS SUSPICIOUS FOR COVID-19 ON HYBRID IMAGING

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## COVID-19 (SARS-CoV-2) (2019-nCoV)


- A *Betacoronavirus* in the same subgenus as the SARS virus, bats being the likely source
- 2002: the first *Betacoronavirus* infection causing SARS Co-V was documented in southern China
- 2012: *Betacoronavirus* epidemic thought to have originated in camels, transmitted to humans in Saudi Arabia, causing MERS (Middle East Respiratory Syndrome (MERS-Co-V). Similar clinical syndrome as SARS
- COVID-19: novel coronavirus identified in Wuhan, China



COVID-19



## COVID-19 LUNG PATHOPHYSIOLOGY

- Microthrombi in alveolar capillaries (45% post-mortem exams).
  - May be related to hypercoagulability, direct endothelial injury, complement activation, or other processes
  - Mid 70's, high BMI, cardiovascular disease, HT, DM, immunosuppression
- 

## COVID-19 Lung Pathology

- Acute diffuse alveolar damage consistent with early ARDS
- Organizing pneumonia may occur after 10 days
- Common causes of death: pneumonia and PE
- Lung inflammation and hypercoagulability state contribute to fatal illness

## COVID-19 AND IMAGING

- CT Chest abnormalities have been identified in pts prior to development of symptoms and even prior to detection of viral RNA from upper respiratory specimens
- Lung involvement increases over the course of illness, with a peak in severity at 10-12 days after symptom onset

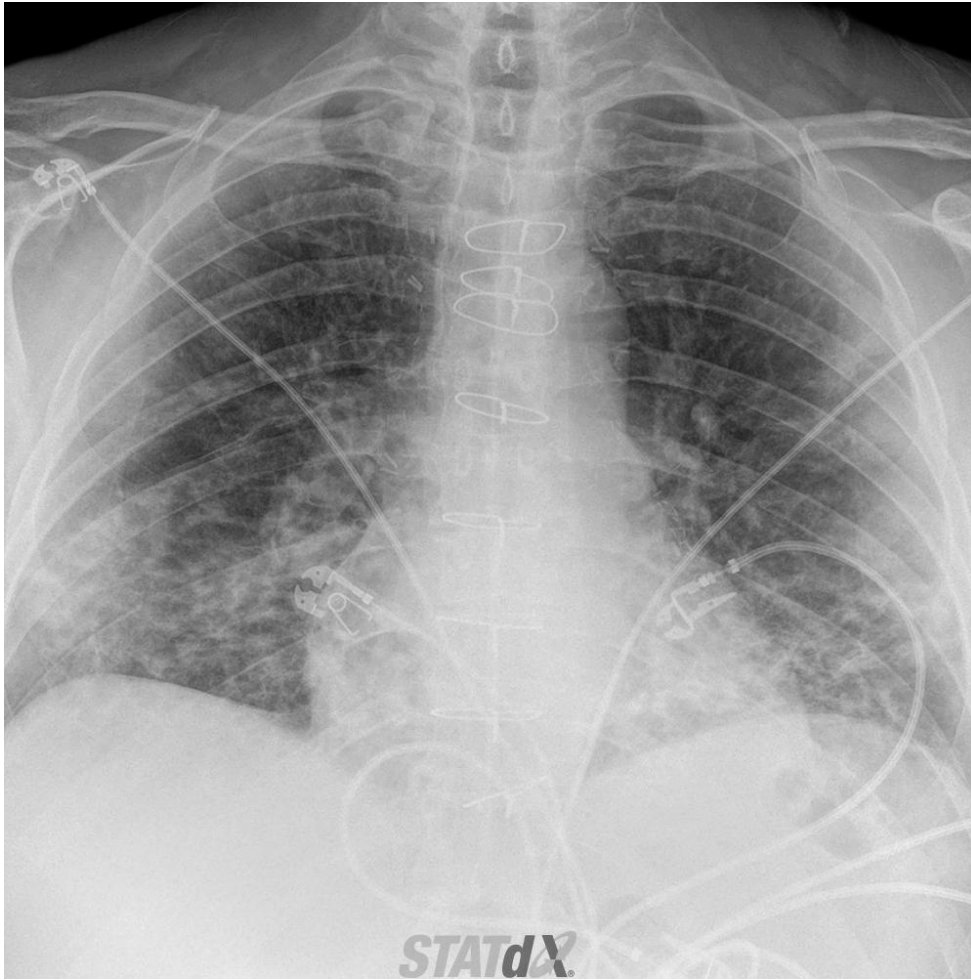


# COVID-19 IMAGING

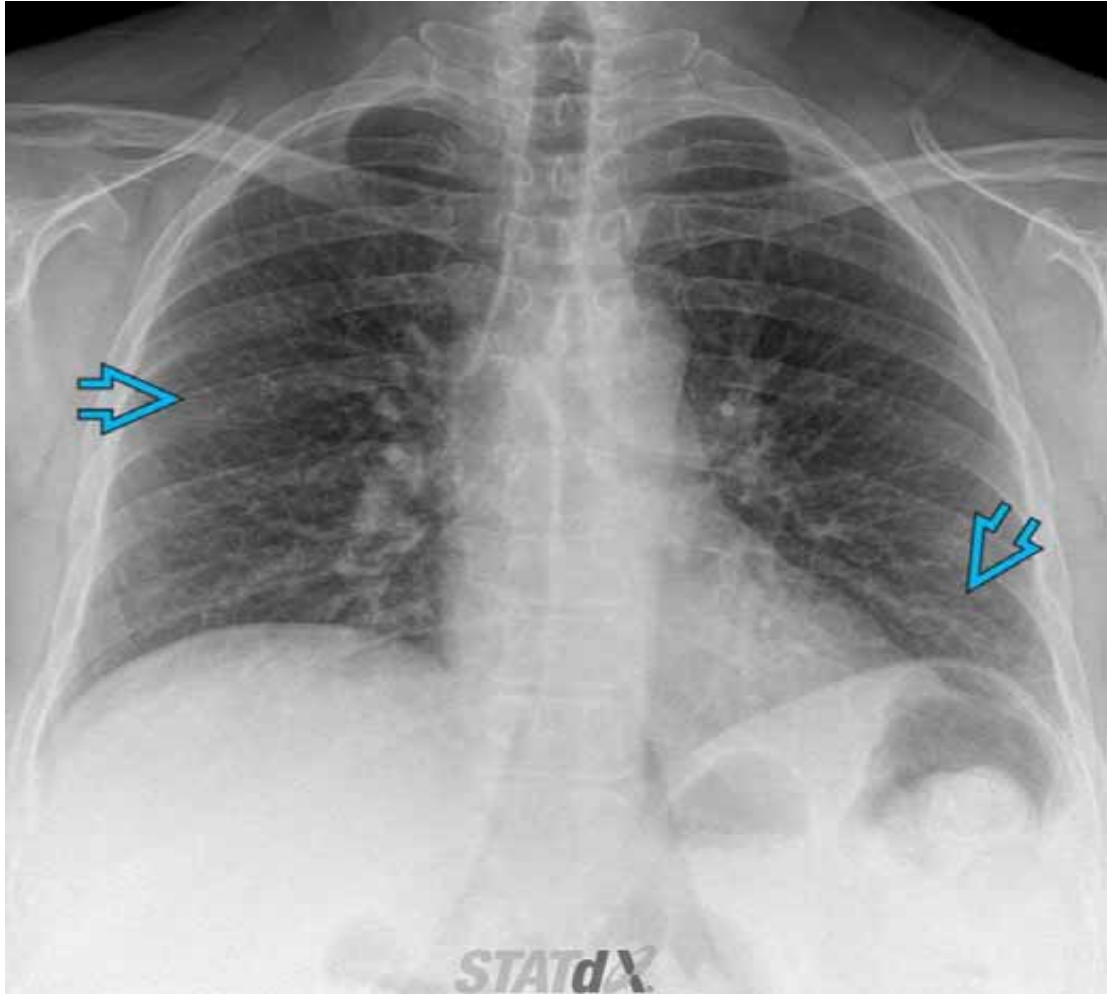
## **Radiography (CXR)**

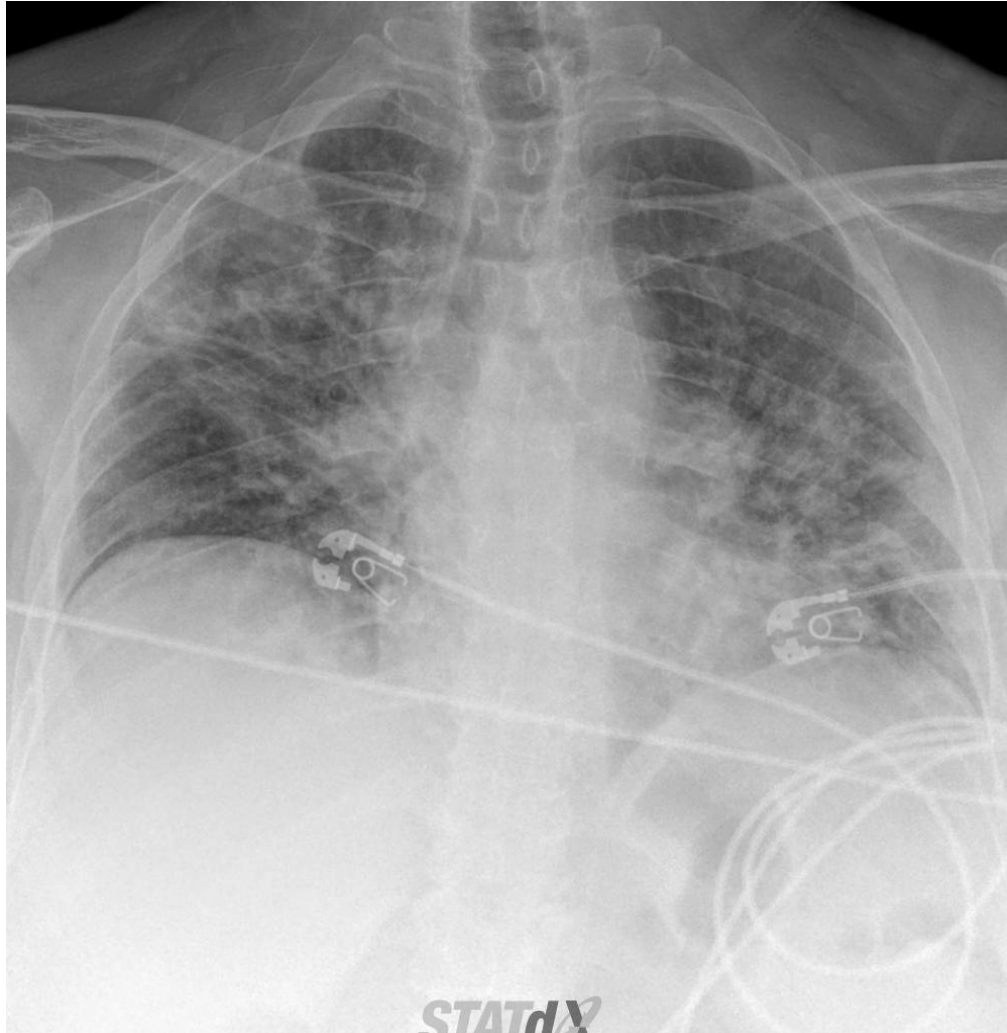
- May be normal in early or mild disease
- Multifocal ill-defined opacities that may be progressive











CXR

COMMON  
DIFFERENTIAL  
DIAGNOSES

- Pneumonia
- Acute respiratory distress syndrome



RSNA Expert Consensus Statement on  
Reporting Chest CT Findings Related to  
COVID-19 (STR, ACR) Mar 2020

# COVID-19 CT FINDINGS

## Consensus RSNA

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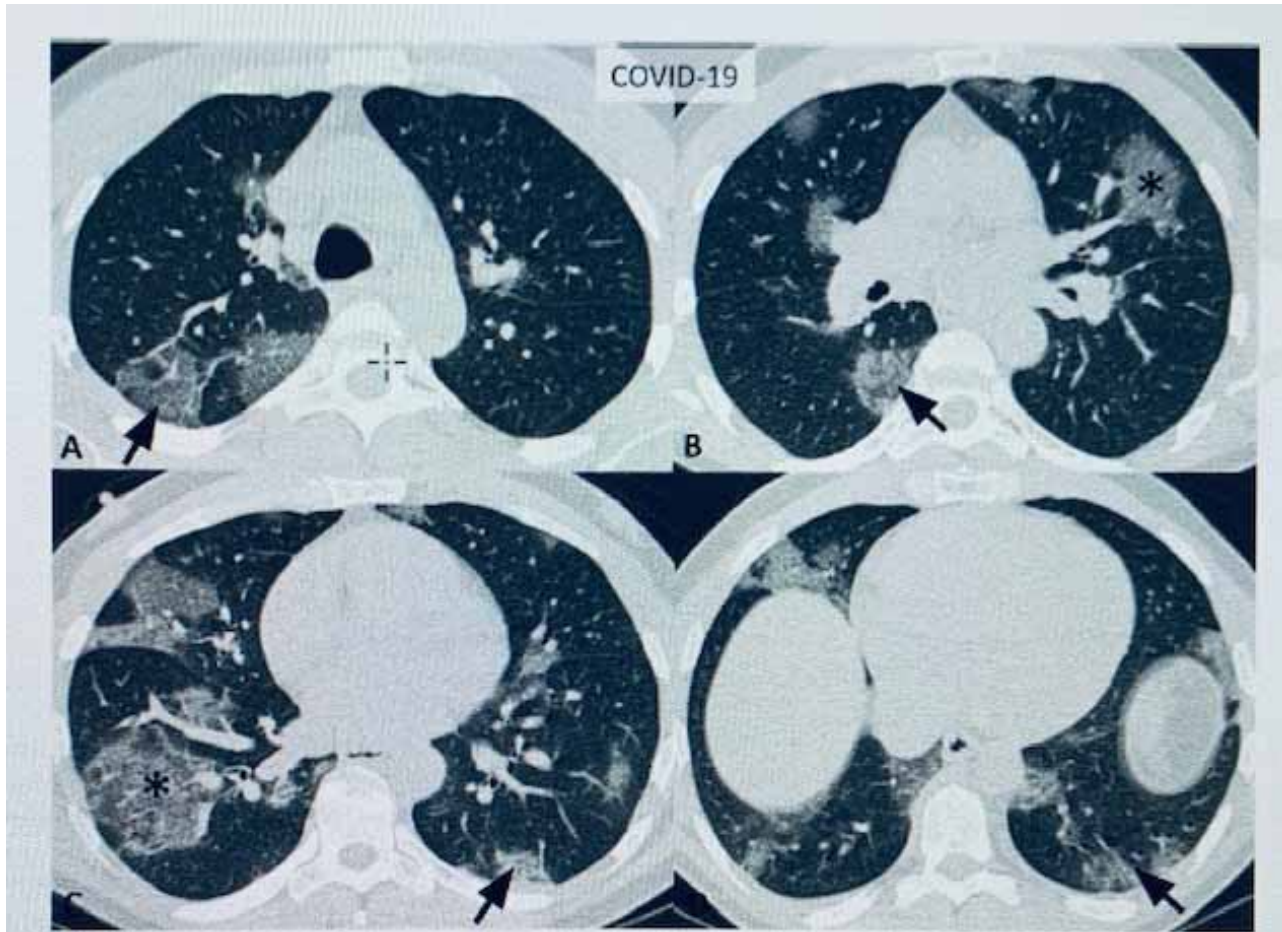
- TYPICAL FEATURES
- INDETERMINATE FEATURES
- ATYPICAL FEATURES
- NEGATIVE FOR PNEUMONIA

# COVID-19 CT FINDINGS

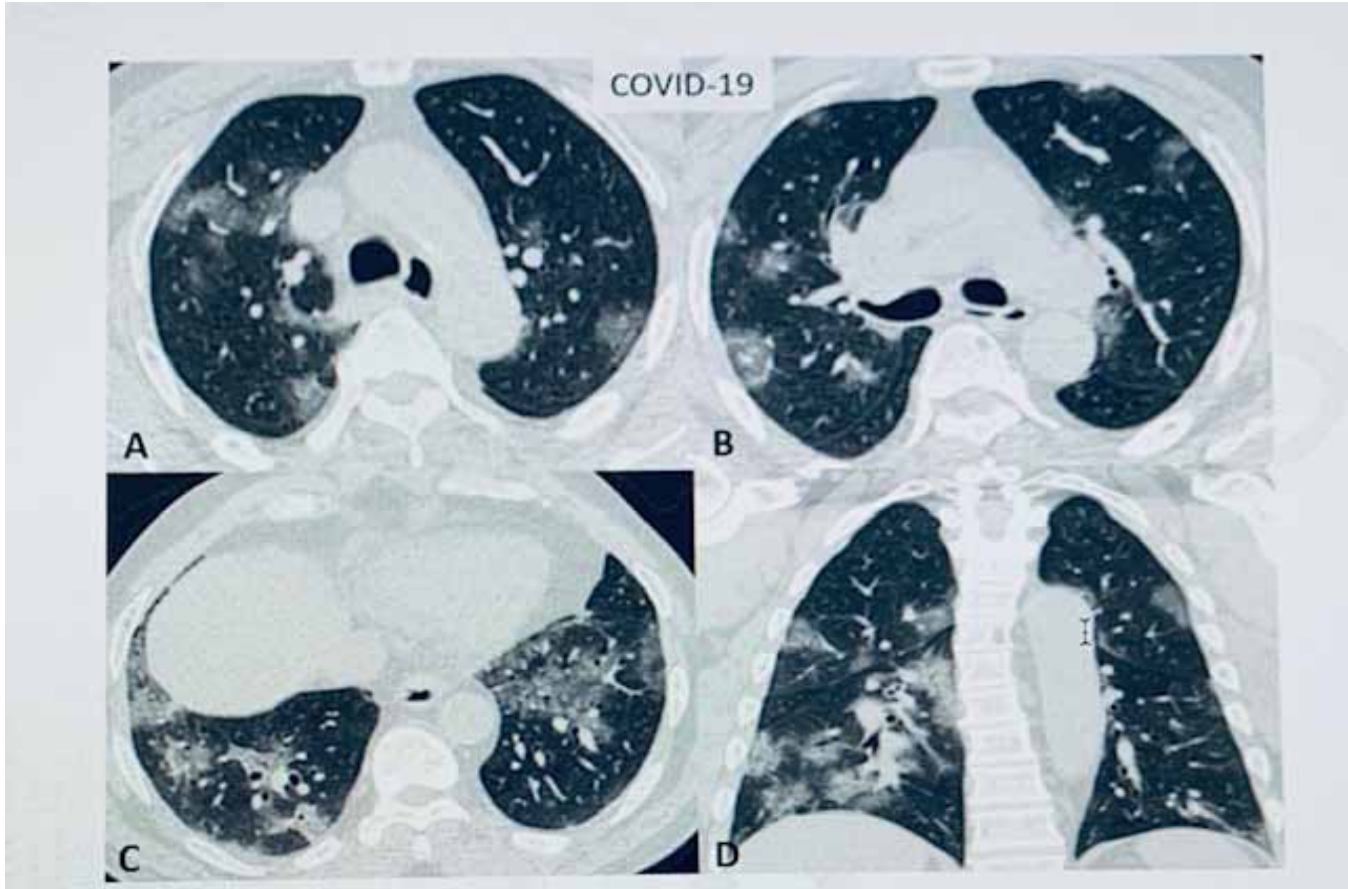
## TYPICAL FEATURES

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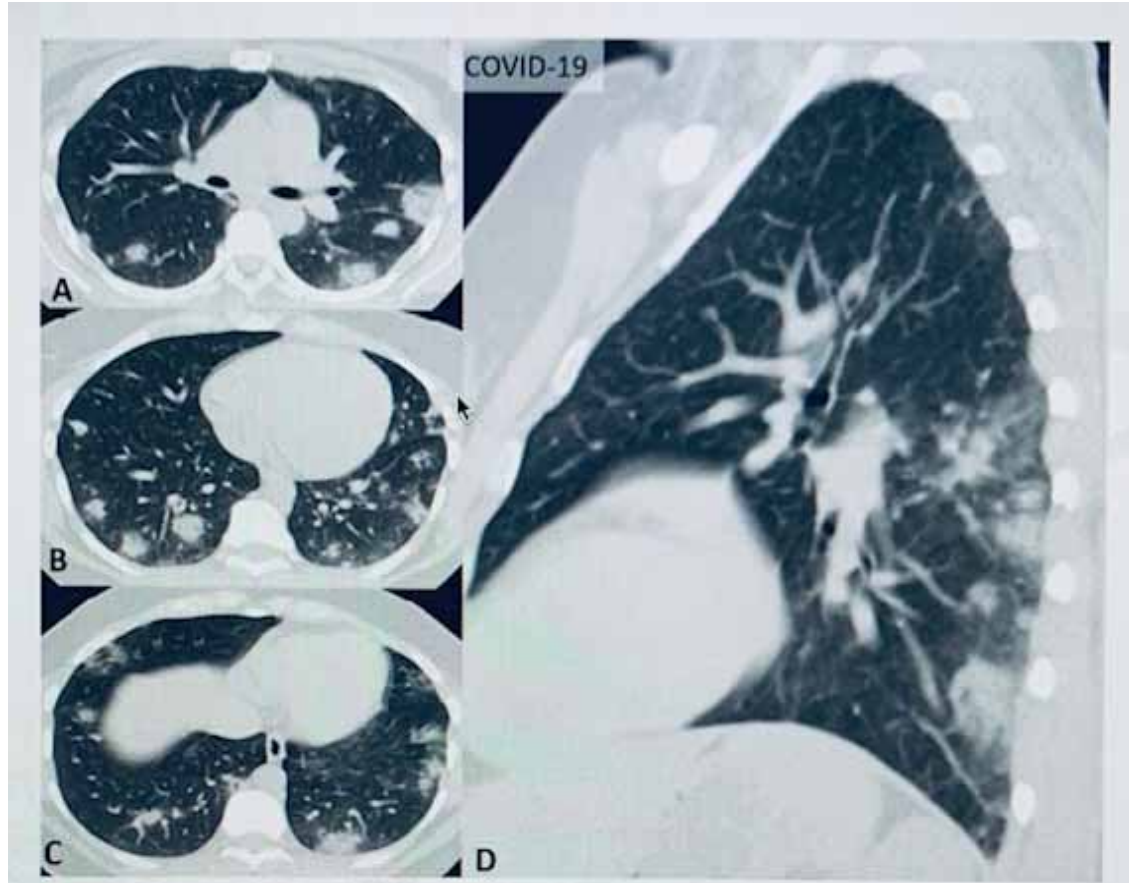
- Peripheral, bilateral GGO w/wo consolidation or visible intralobular lines (“crazy-paving”)
- Multifocal GGO of rounded morphology w/wo consolidation or visible intralobular lines (crazy-paving”)
- Reverse halo sign or other findings of organizing pneumonia (seen later in the disease)

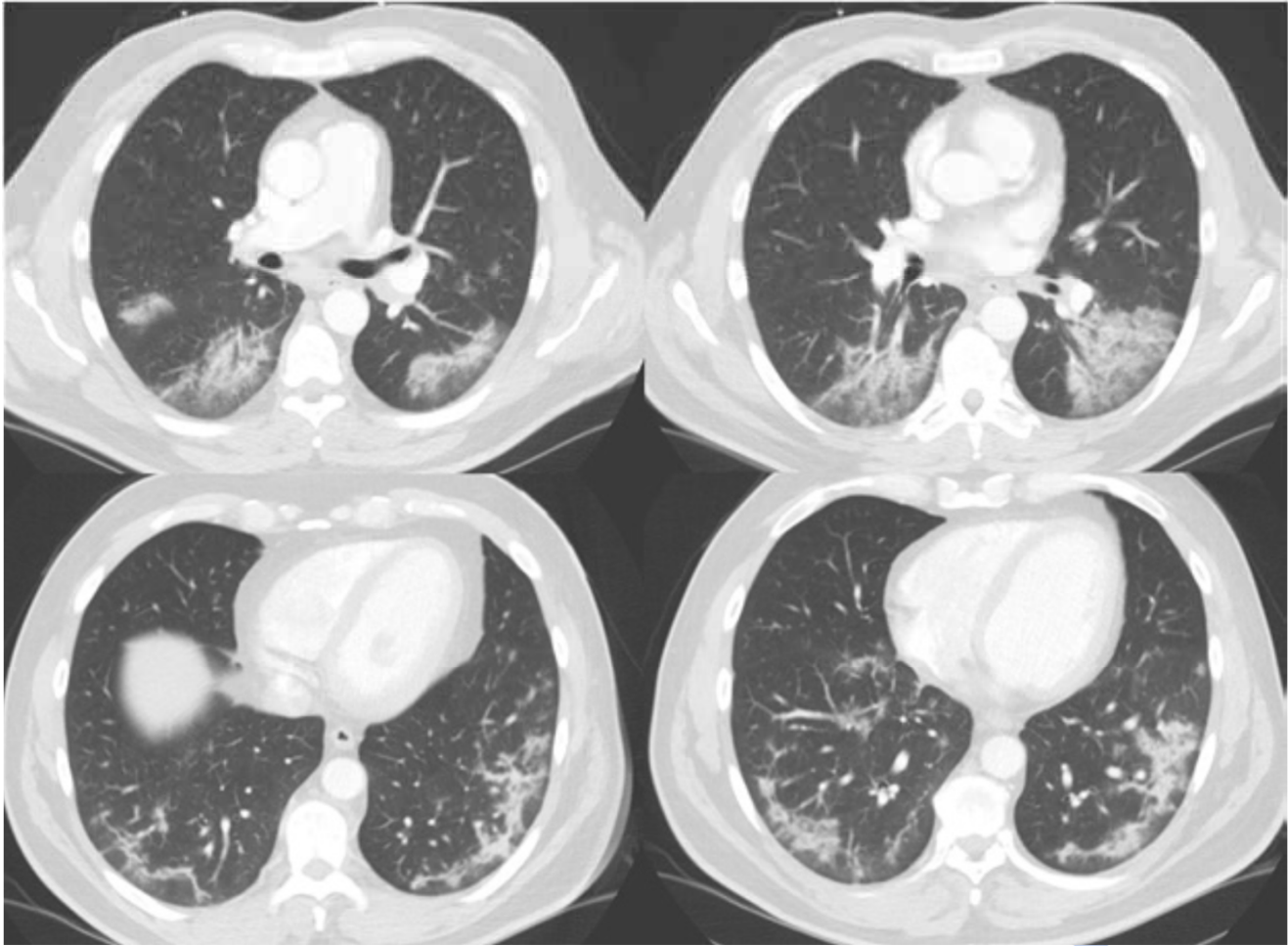


RSNA Mar 2020









RSNA Apr 2020

TYPICAL  
FEATURES  
PATTERN  
DIFFERENTIAL  
DIAGNOSES

- Viral pneumonias especially influenza
- Acute lung injury patterns particularly organizing pneumonia (drug toxicity, malignancy, and connective tissue disease or idiopathic)

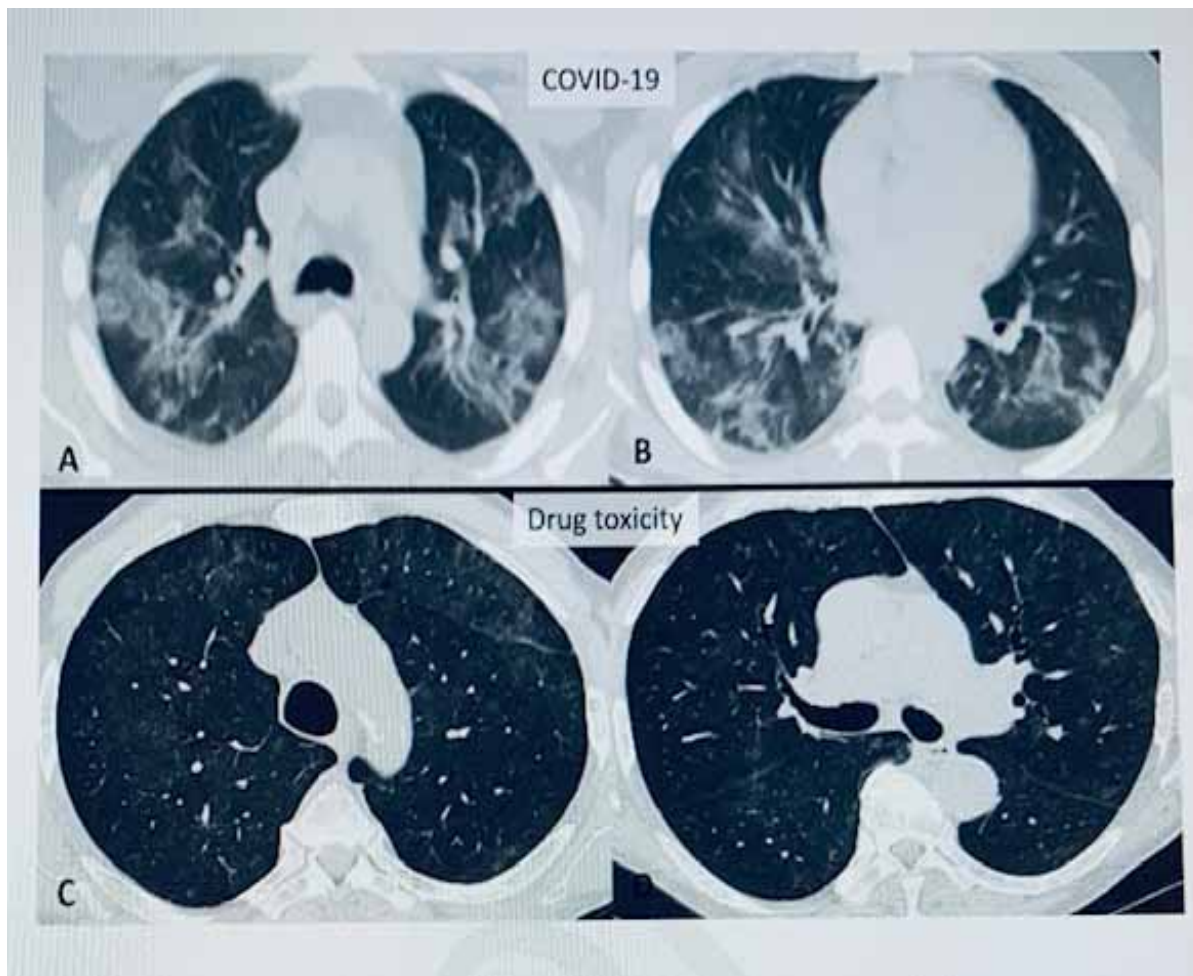


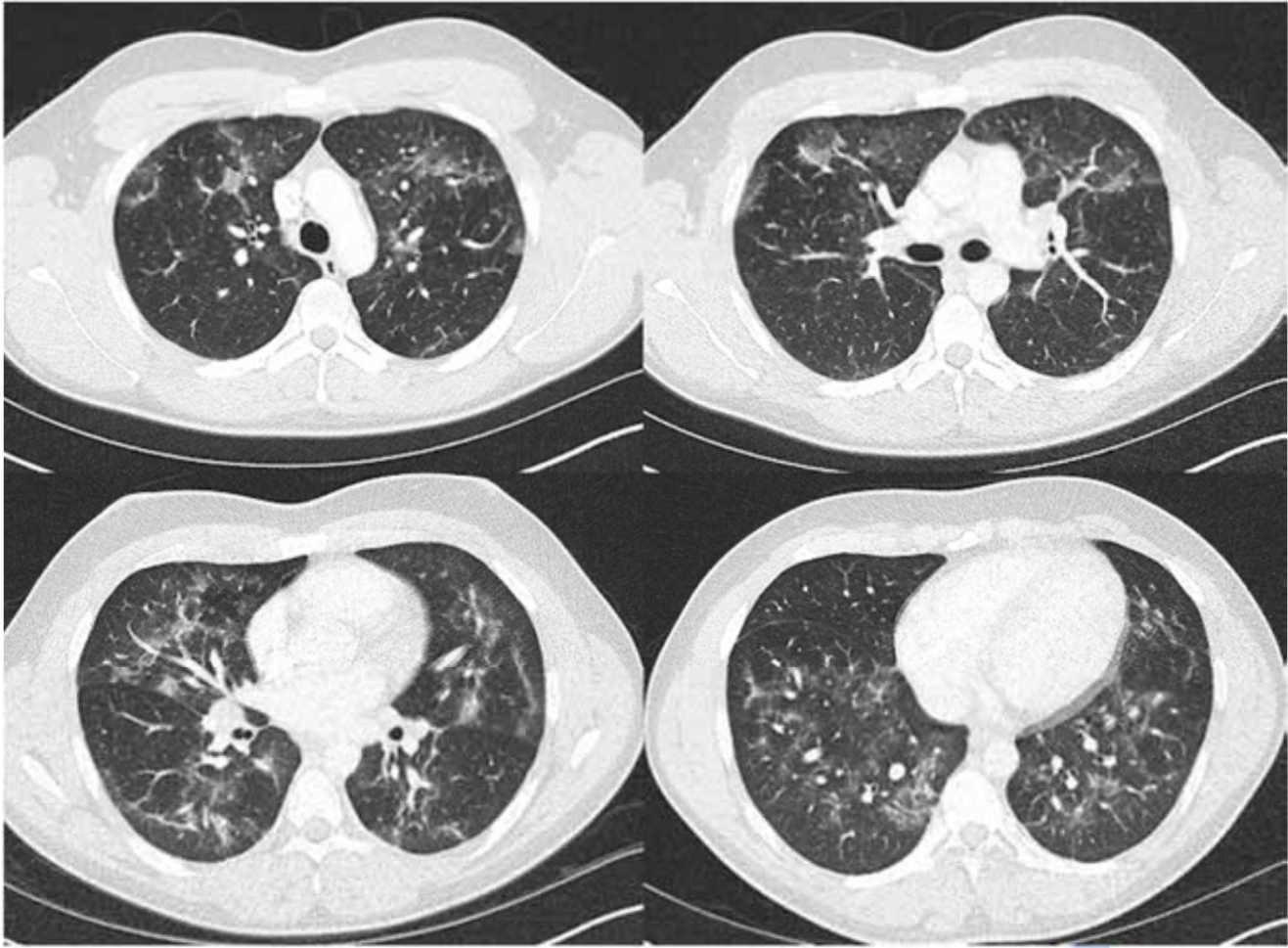
# COVID-19 CT FINDINGS INDETERMINATE FEATURES

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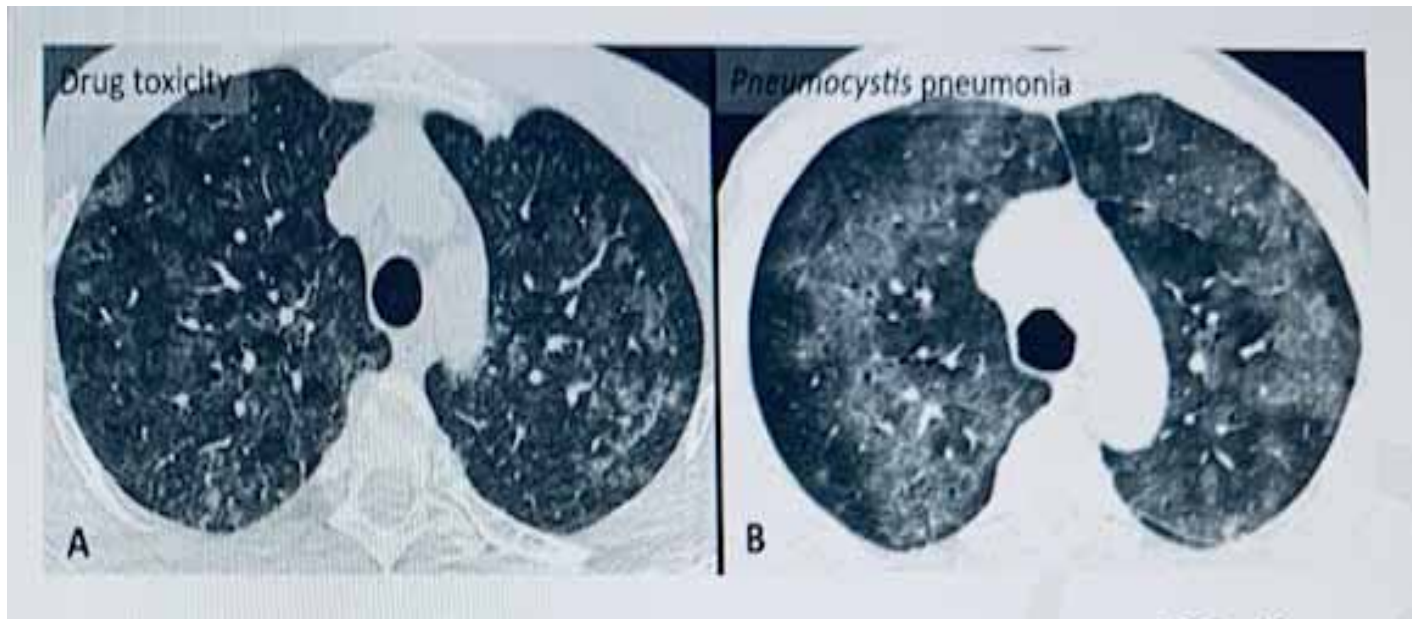
## **Absence of typical features AND presence of:**

- Multifocal, diffuse, perihilar, or unilateral GGO with or without consolidation, lacking a specific distribution and are non-rounded or non-peripheral
- Few very small GGO with a non-rounded and non-peripheral distribution





RSNA Apr 2020



INDETERMINATE  
FEATURES PATTERN  
DIFFERENTIAL  
DIAGNOSES

- Hypersensitivity pneumonitis
- *Pneumocystis* infection
- Diffuse alveolar hemorrhage among others
- **DIFFICULT TO DISTINGUISH BY IMAGING ALONE**





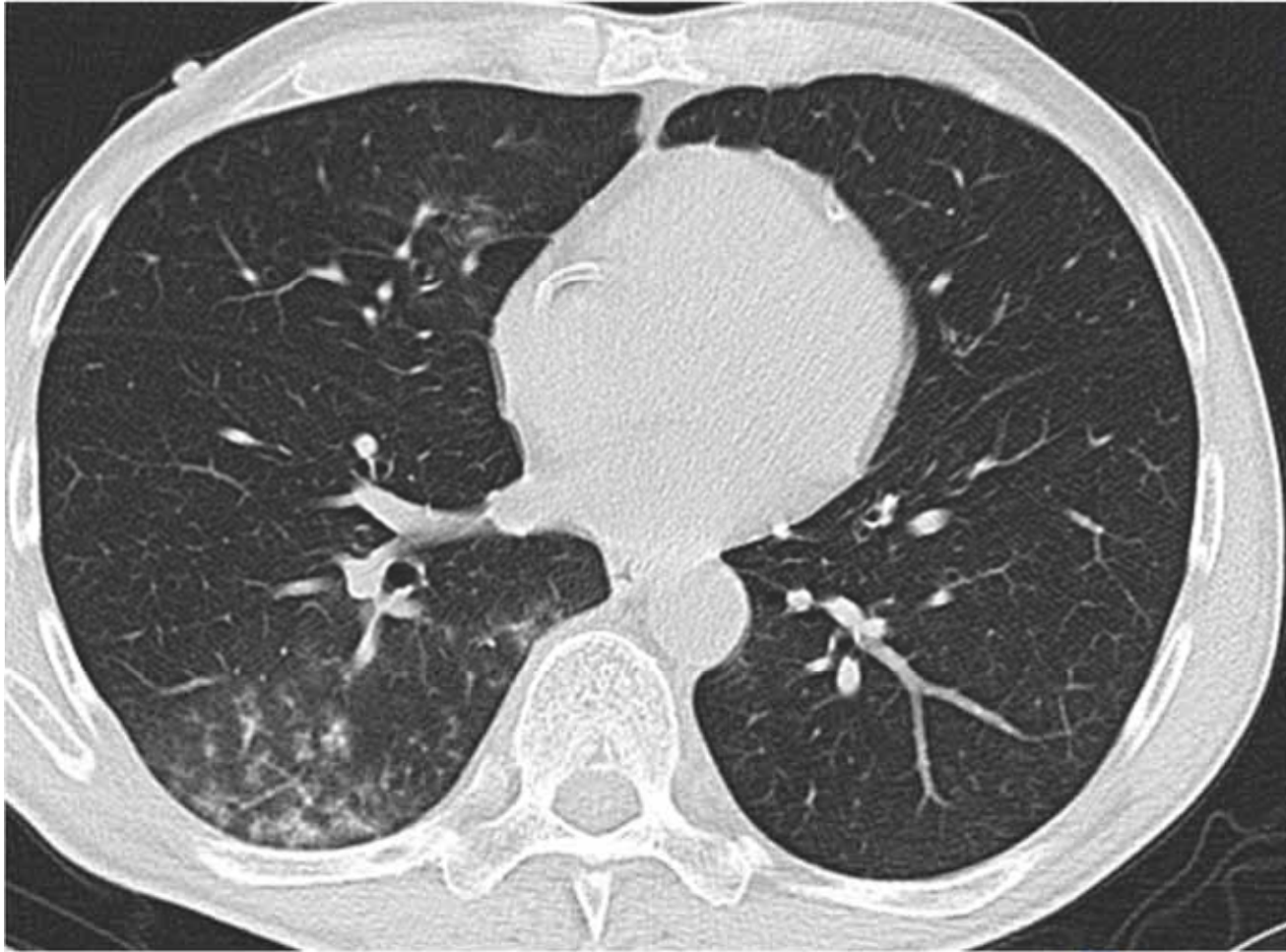
# COVID-19 CT FINDINGS

## ATYPICAL FEATURES

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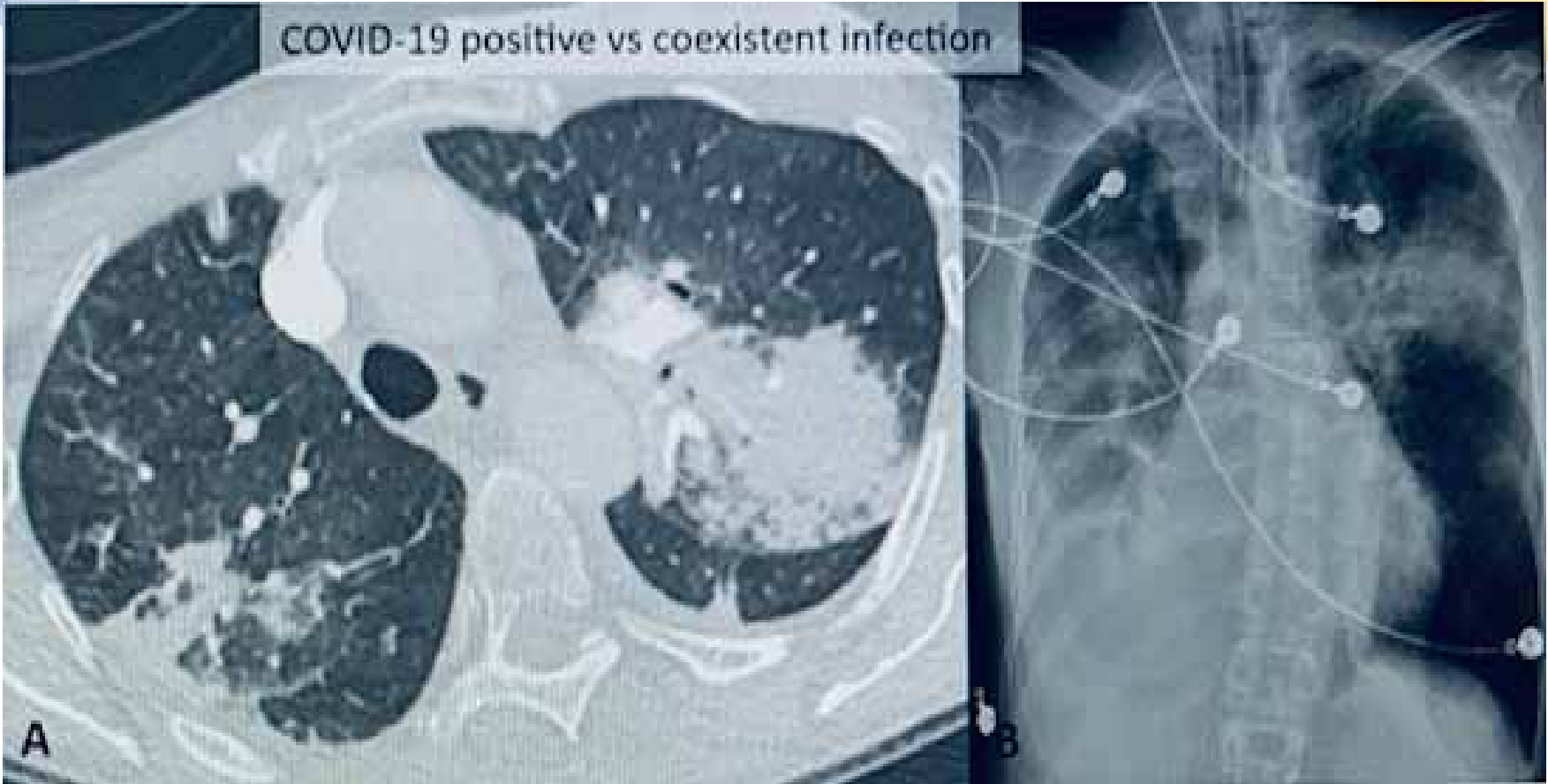
### **Absence of typical or indeterminate features AND presence of:**

- Isolated lobar or segmental consolidation without GGO
- Discrete small nodules (centrilobular, “tree-in-bud”)
- Lung cavitation
- Smooth interlobular septal thickening with pleural effusion



RSNA Mar 2020

COVID-19 positive vs coexistent infection



ATYPICAL  
FEATURES  
PATTERN  
DIFFERENTIAL  
DIAGNOSES

## **LOBAR OR SEGMENTAL CONSOLIDATION**

- In the setting of bacterial pneumonia
- Cavitation from necrotizing pneumonia
- Tree-in-bud opacities with centrilobular nodules as can occur with a variety of community acquired infections and aspiration



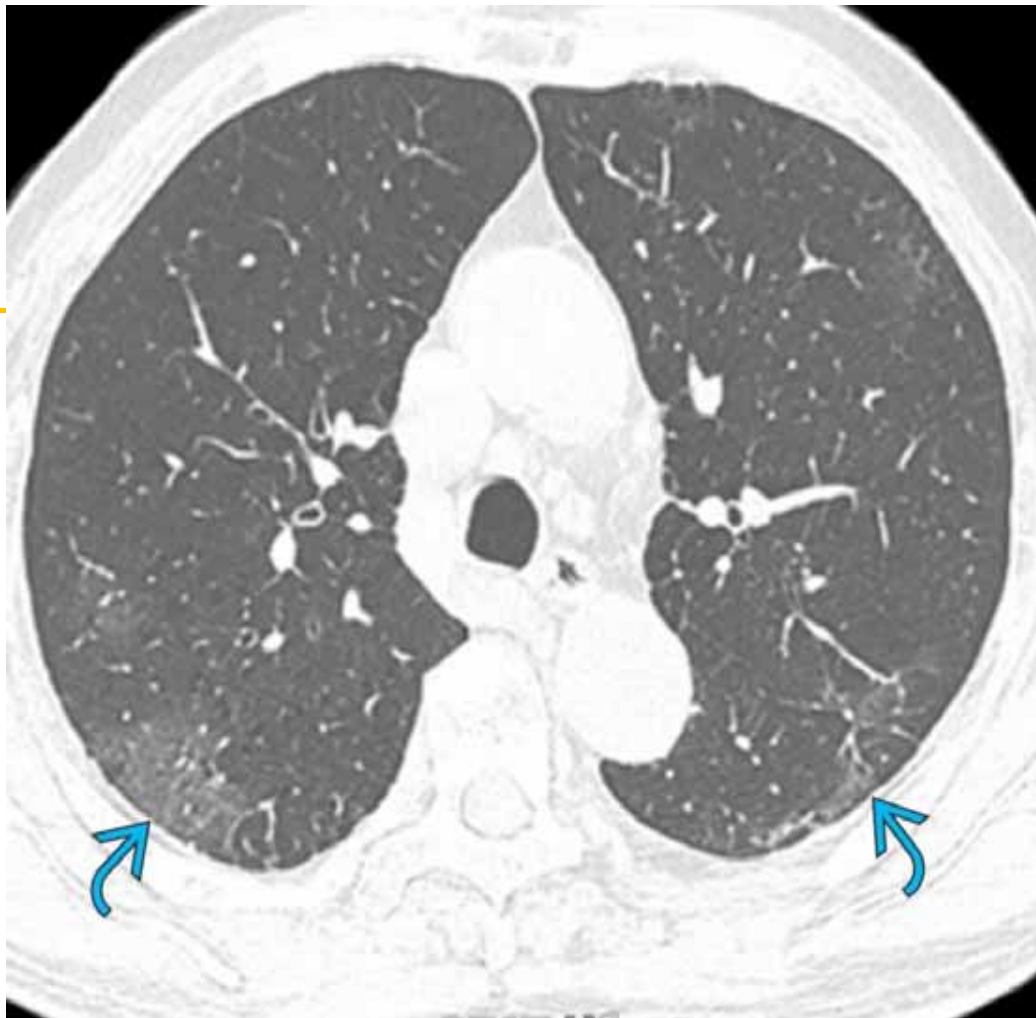


## NOTES/DISCLAIMERS

RSNA Mar 2020

- Inclusion in a report of above items may depend upon clinical suspicion, local prevalence, patient status as a PUI, and local procedures regarding reporting.
- CT is not a substitute for RT-PCR, consider testing according to local recommendations and procedures for and availability of RT-PCR

# OTHER COVID-19 EXAMPLES

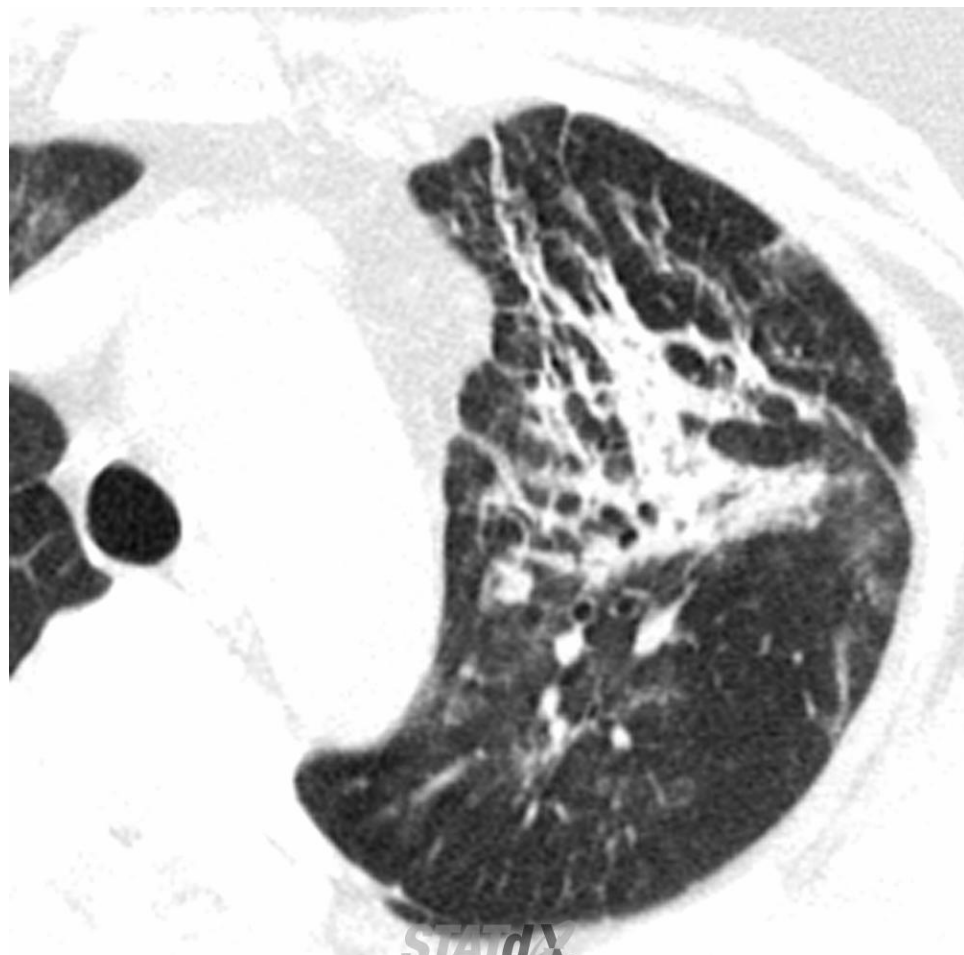


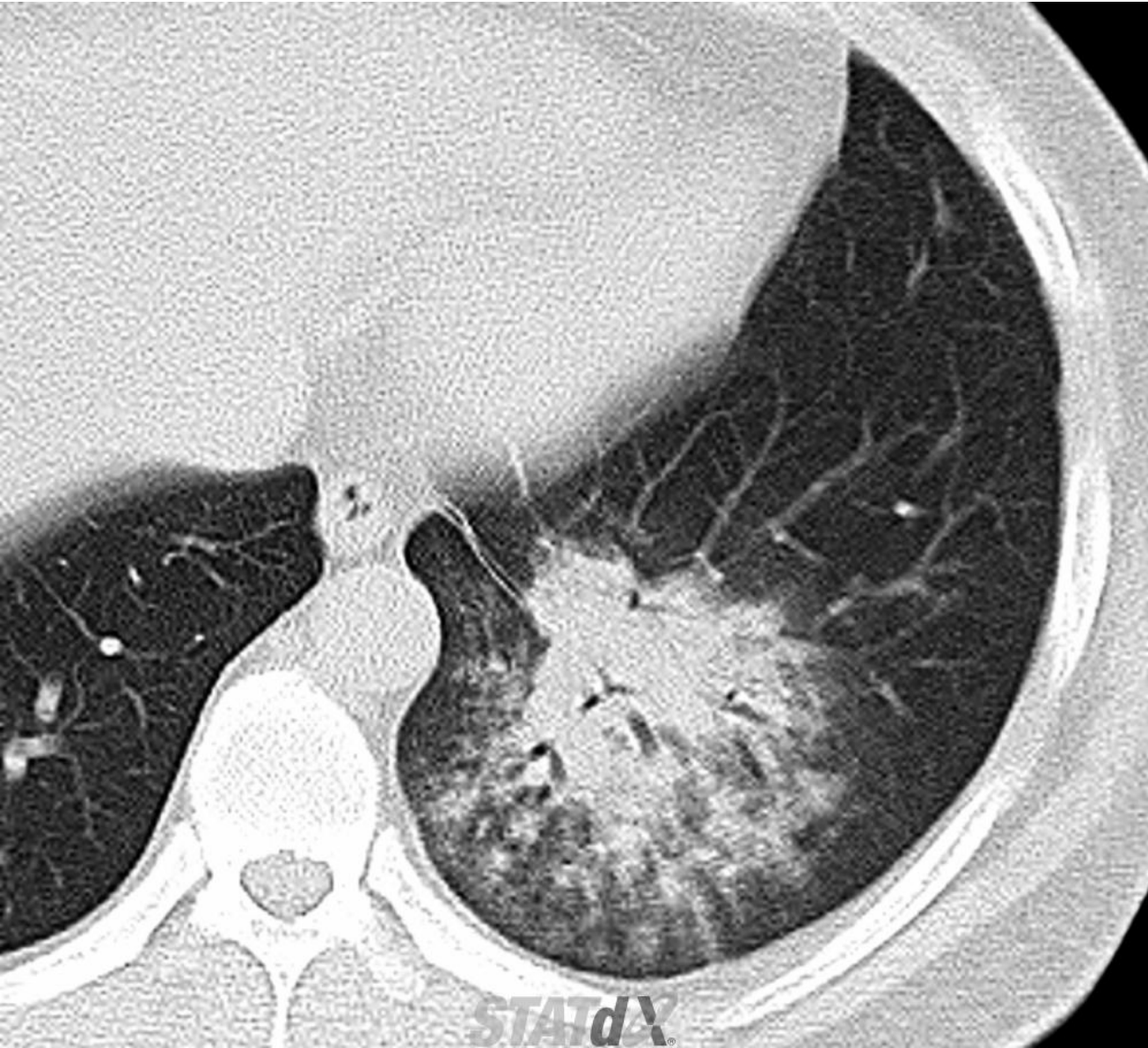


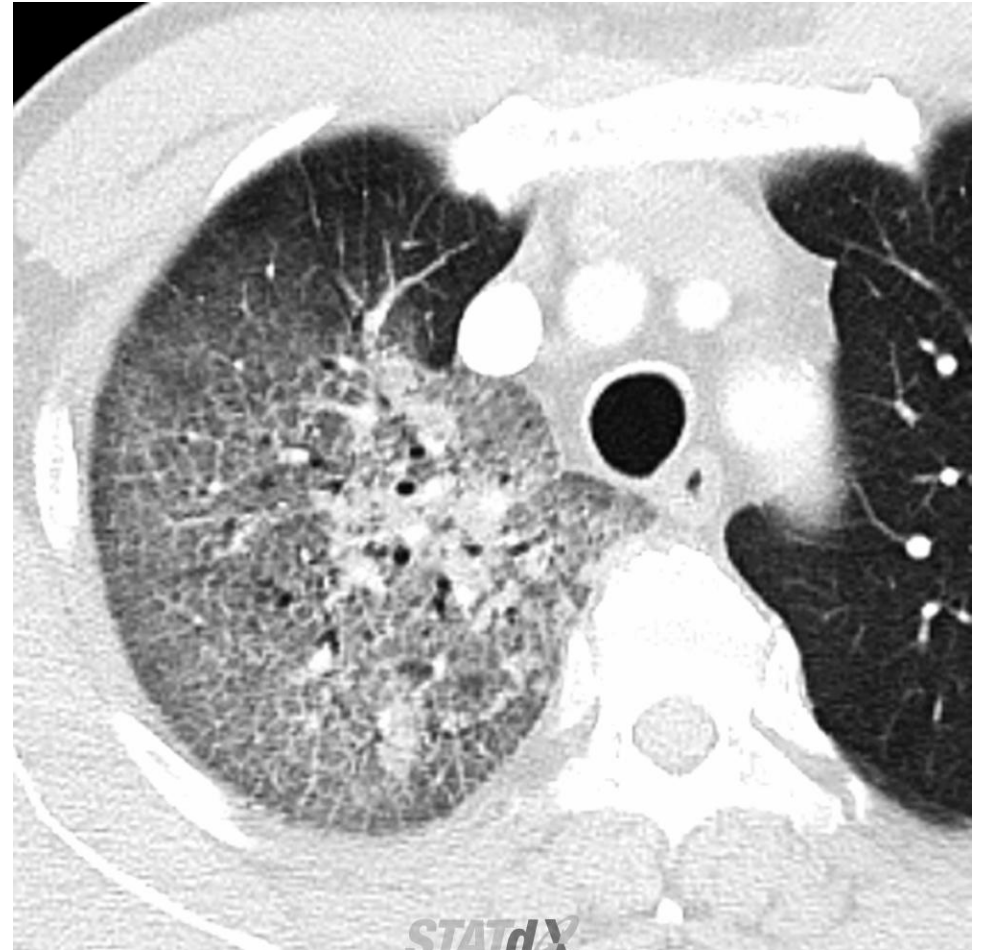




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# CT Chest

SENSITIVITY FOR COVID-19

60-98%

SPECIFICITY FOR COVID-19

25-53%

# Chest CT Findings and COVID-19

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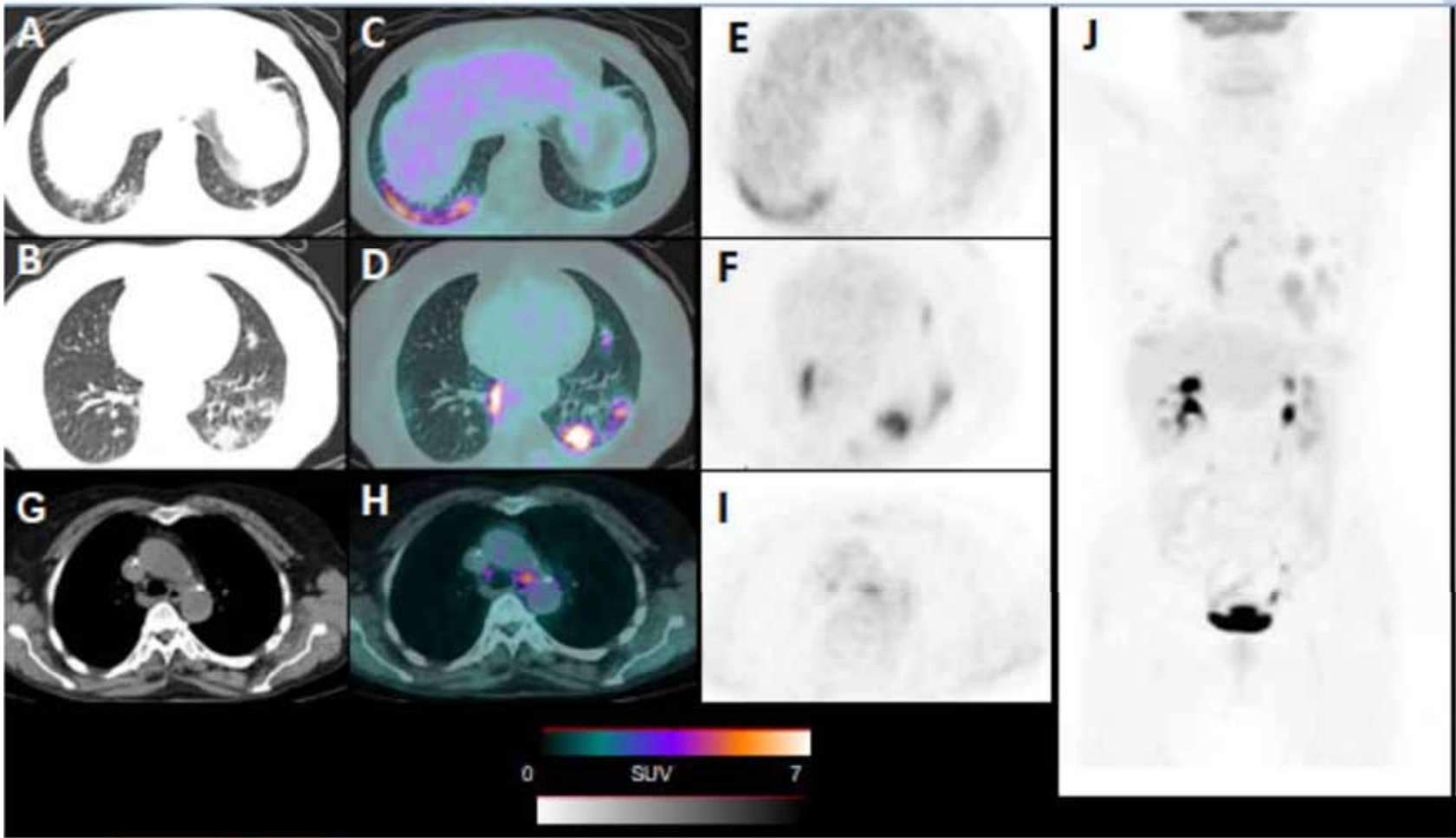
- Chest CT findings can precede positivity on RT-PCR
- Over 20% of patients with COVID-19 may have coexistent infections complicating the categorization of imaging observations
- Consensus between local imaging and clinical providers is essential to establish an agreed-upon approach
- Staff at the site should be notified to initiate SOP for potential exposure

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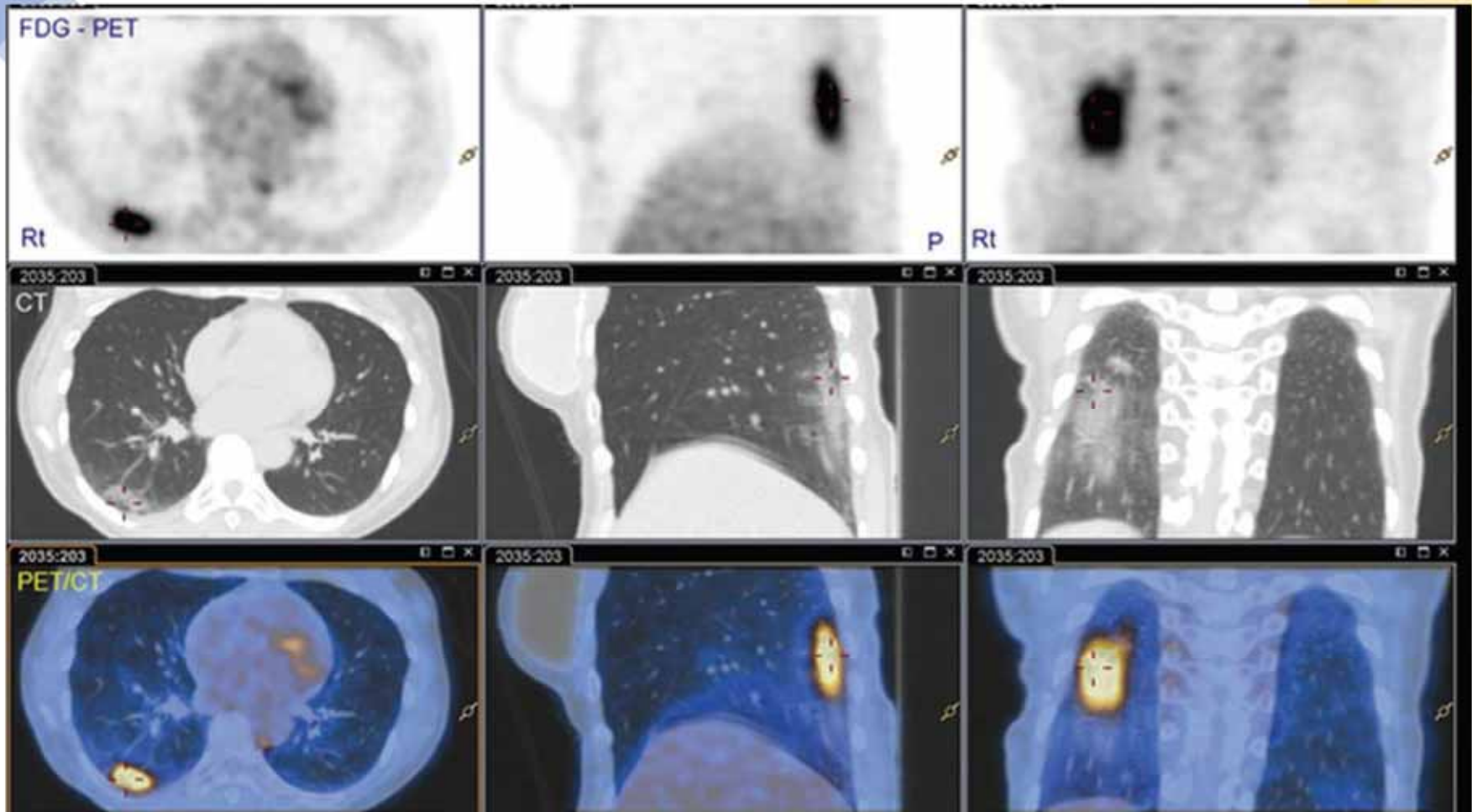
## COVID-19 AND FDG PET/CT

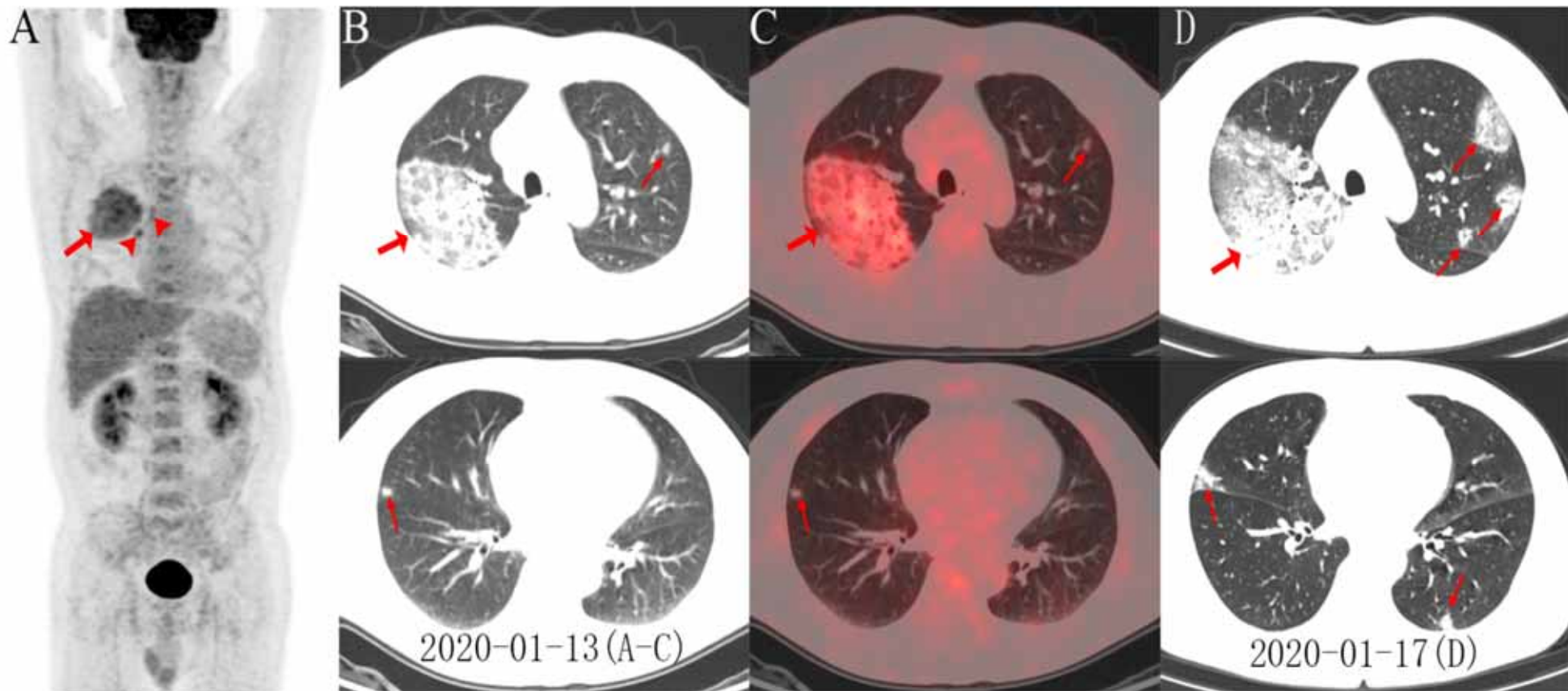
- Usually and incidental finding
- Lungs
- Lymph nodes

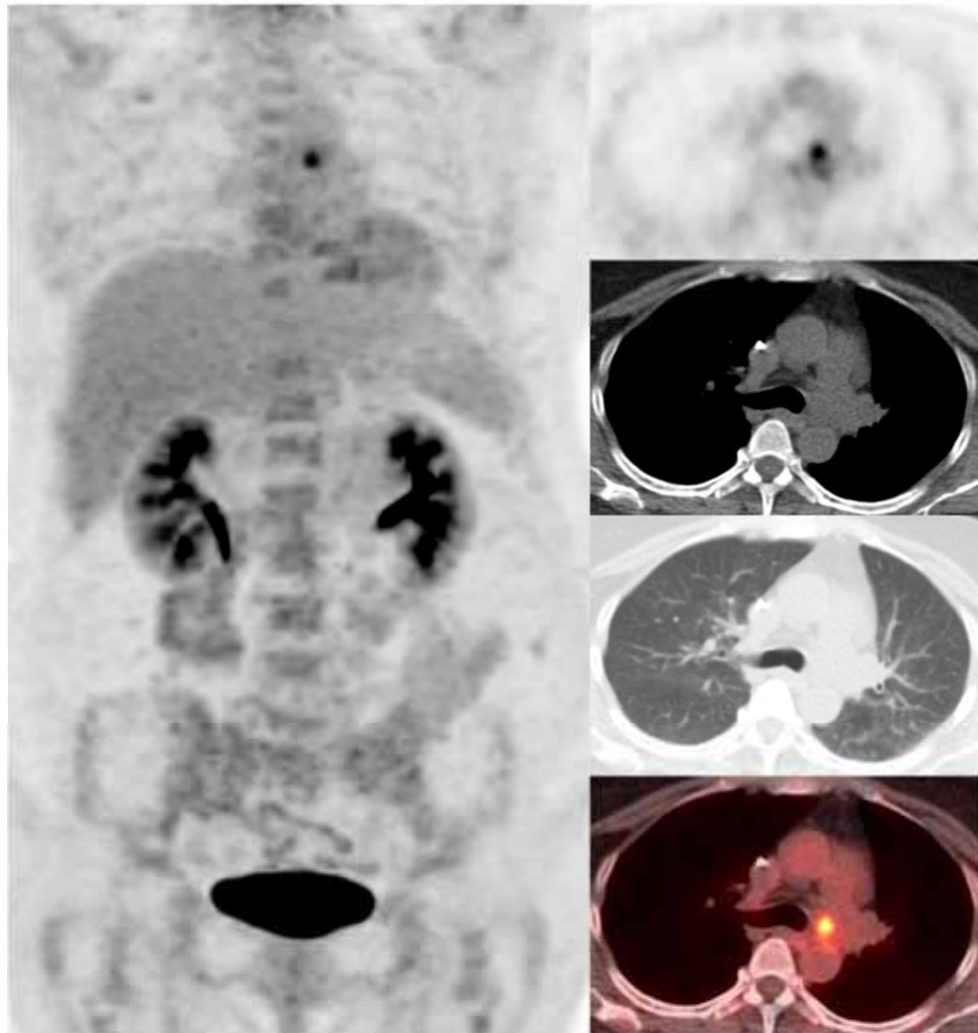




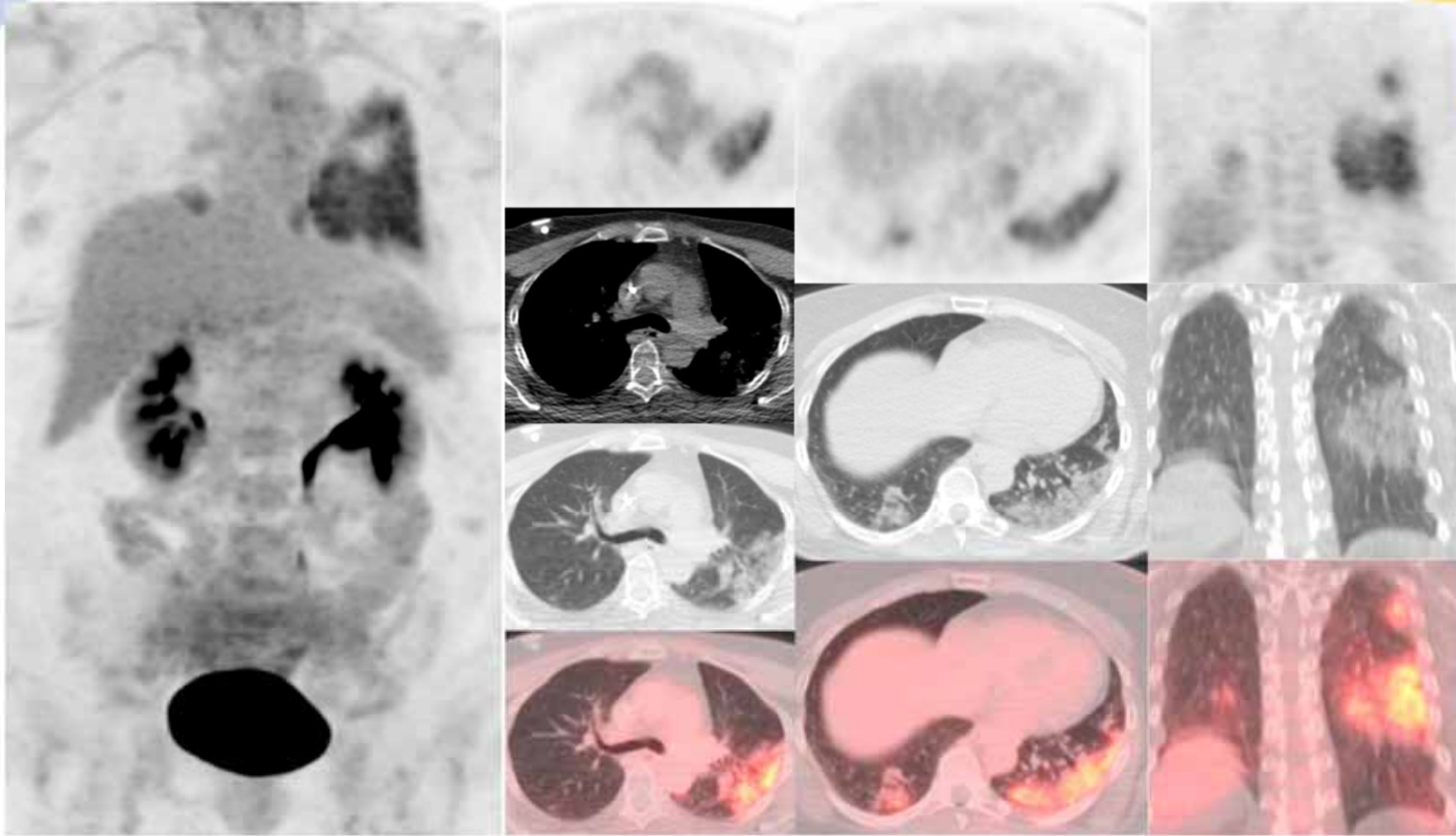




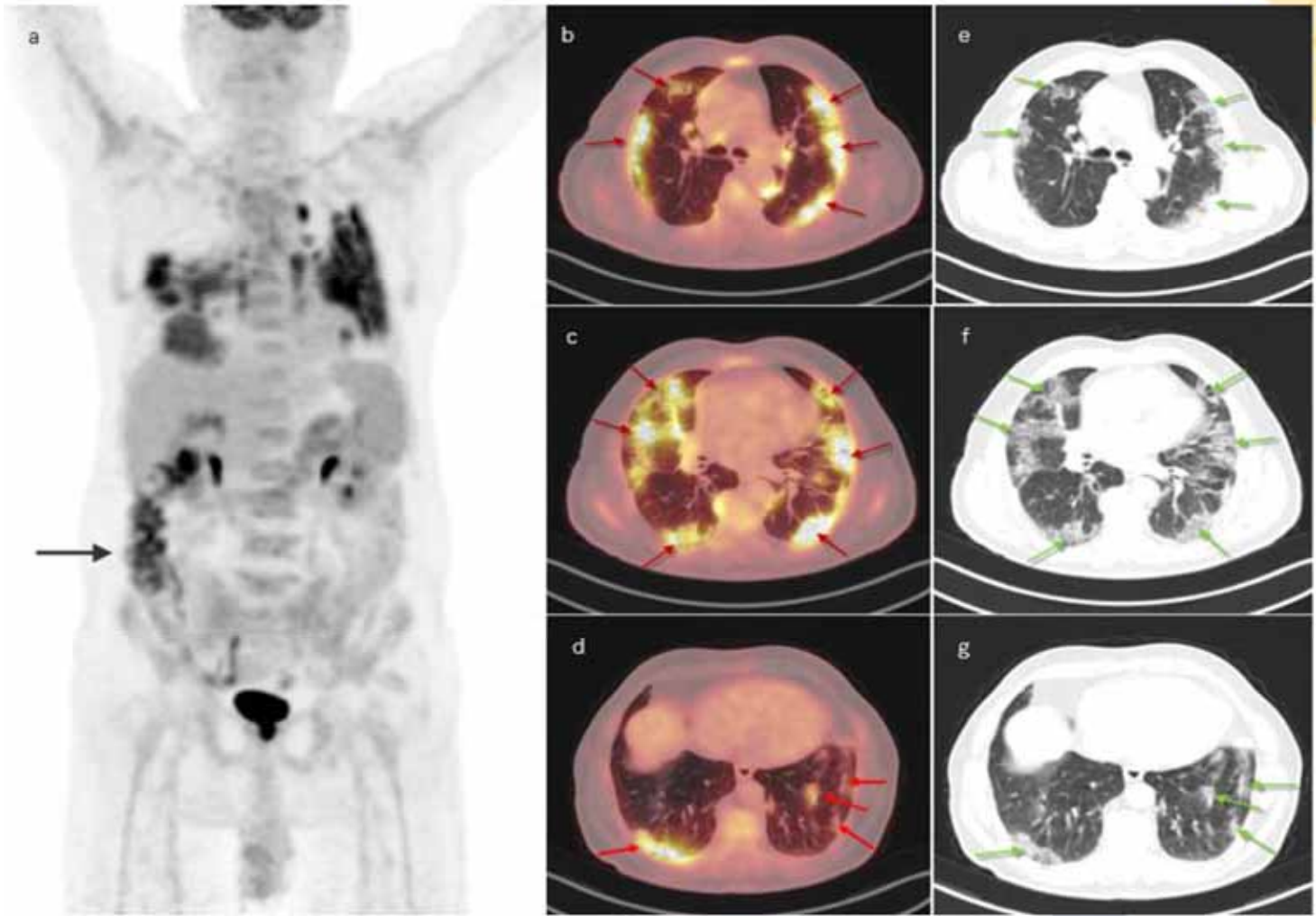




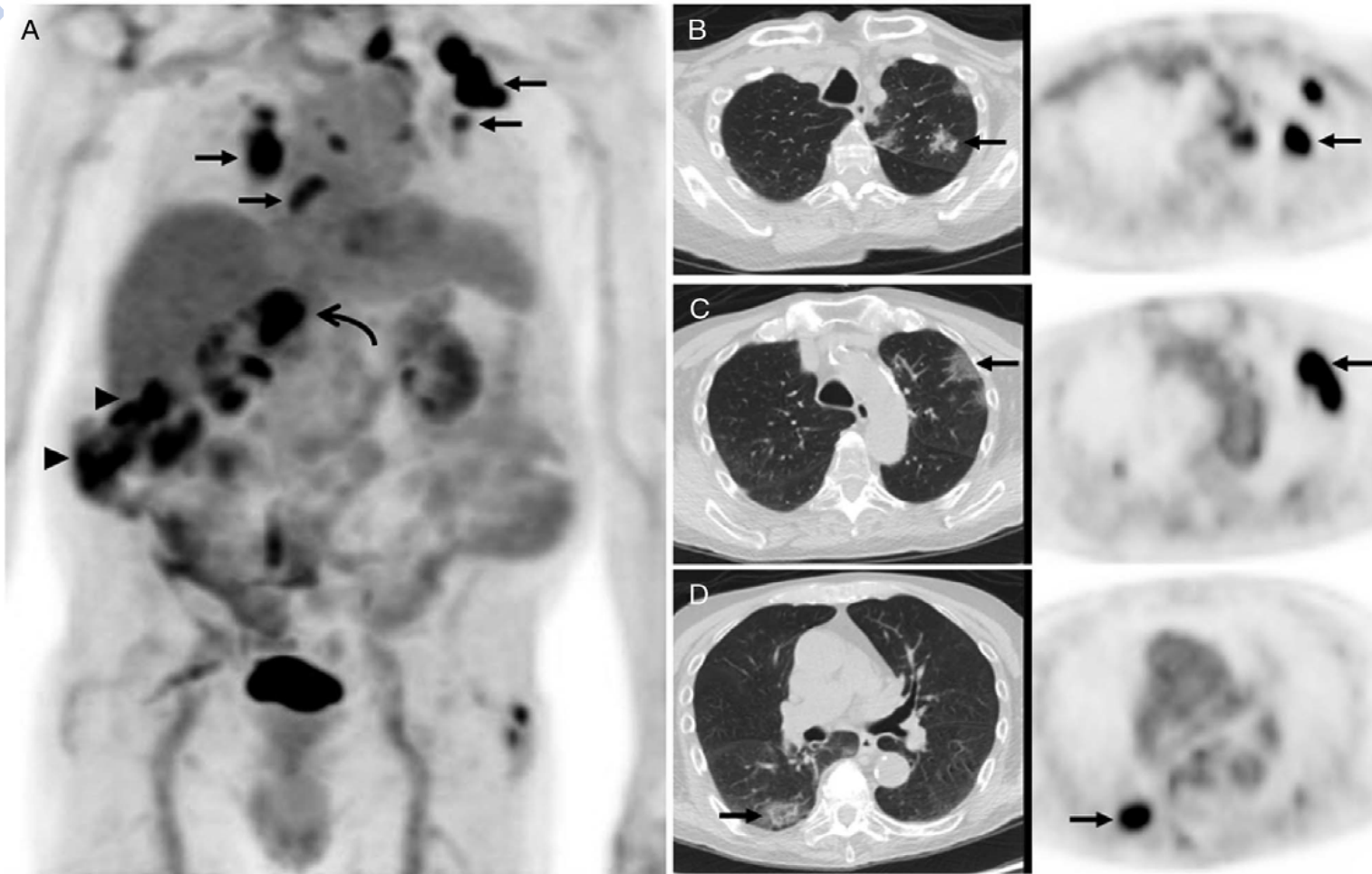
Chuang et al CNM 2020

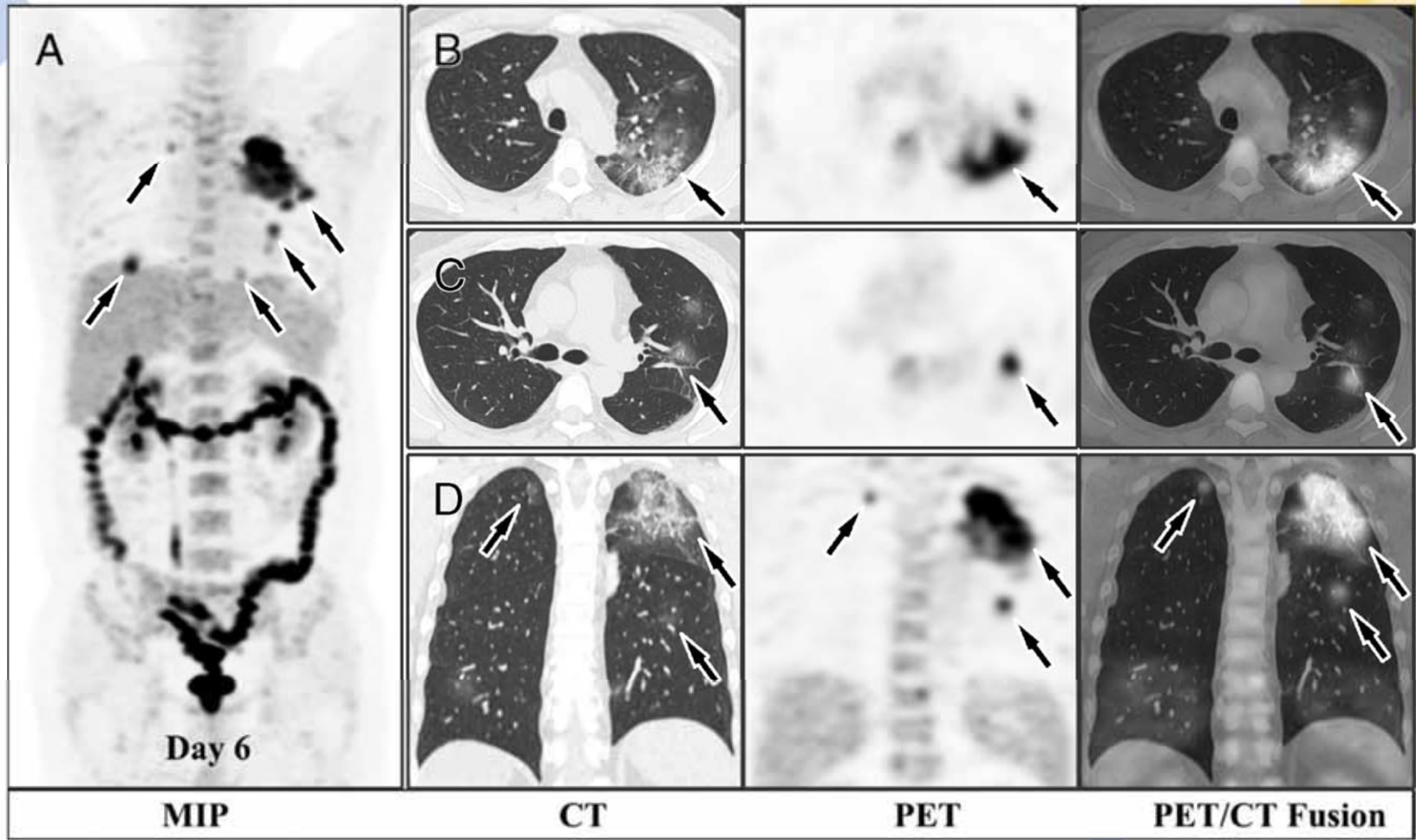



Chuang et al CNM 2020




Amini et al EJNM 2020



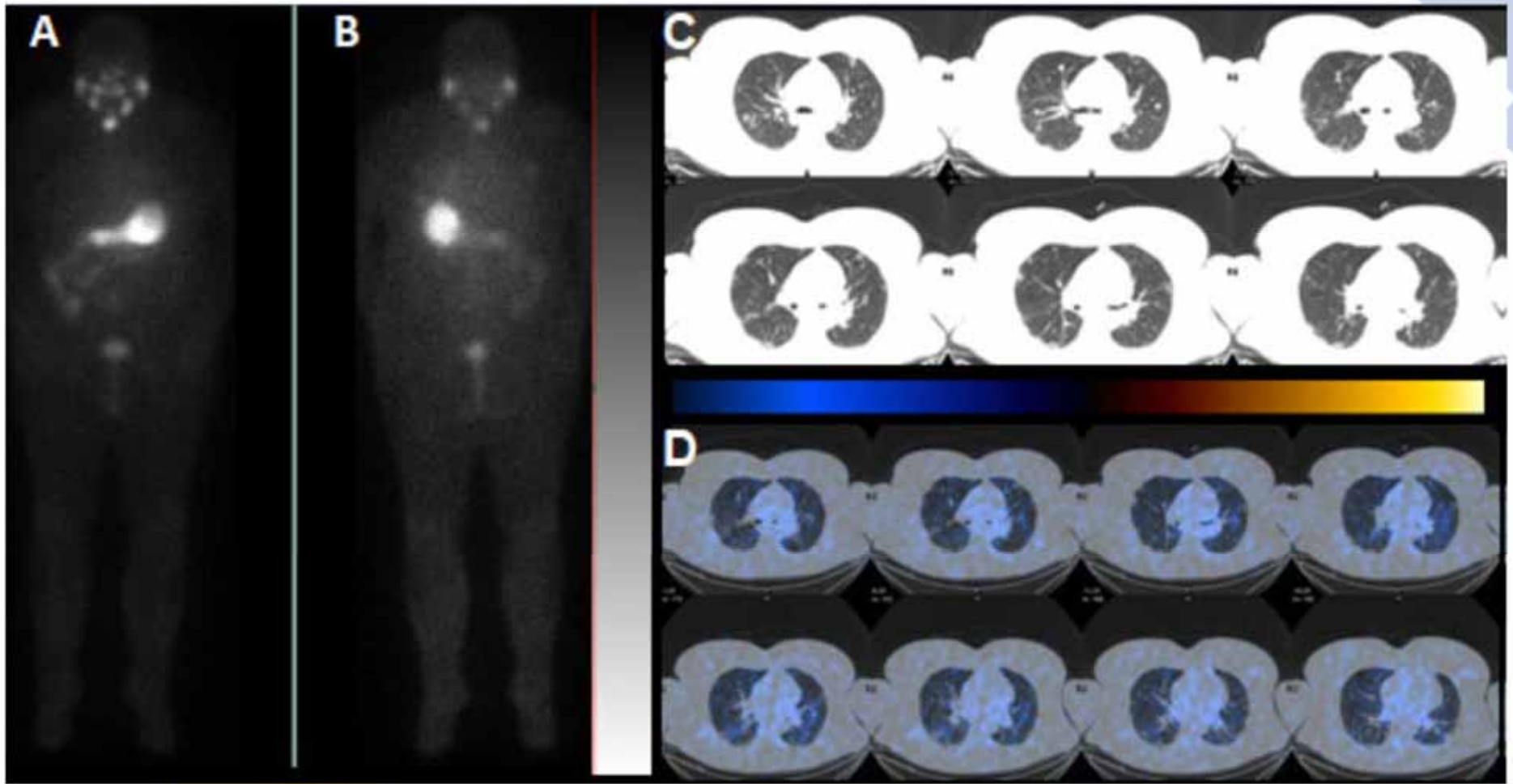




## COVID-19 AND SPECT/CT

- Usually an incidental finding
  - Lungs
- 





Albano JNM April 2020.

