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Imaging of COVID-19

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Disclosure

- This presentation has been created using multiple resources including Society of Thoracic Radiology and RSNA online and published data.
- It is very likely that diagnostic criteria will be modified over time, however as of now (03/2020) this is an updated version of current preliminary imaging findings with CT.

COVID-19 Reporting

- Because of the low specificity of airspace opacities for COVID-19, the terms coronavirus or COVID-19 should **not be used** unless there is a high clinical suspicion.

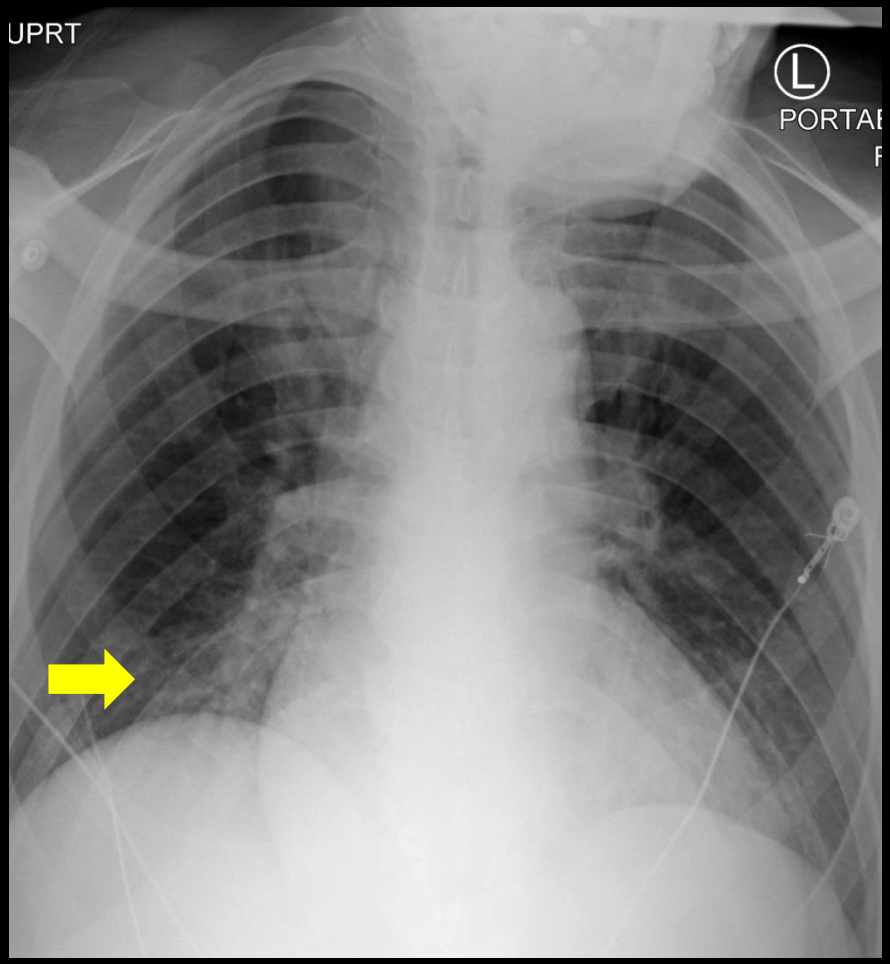
CXR Reporting Guidelines if COVID-19 is suspected clinically.

- Please note CXR is insensitive for detecting early airspace disease.
- If you have a **negative** radiograph
- **IMPRESSION:** Negative for airspace disease. Please note that chest radiography has a low sensitivity for subtle airspace disease such as “ground-glass opacities”

CXR Reporting Guidelines if COVID-19 if suspected clinically.

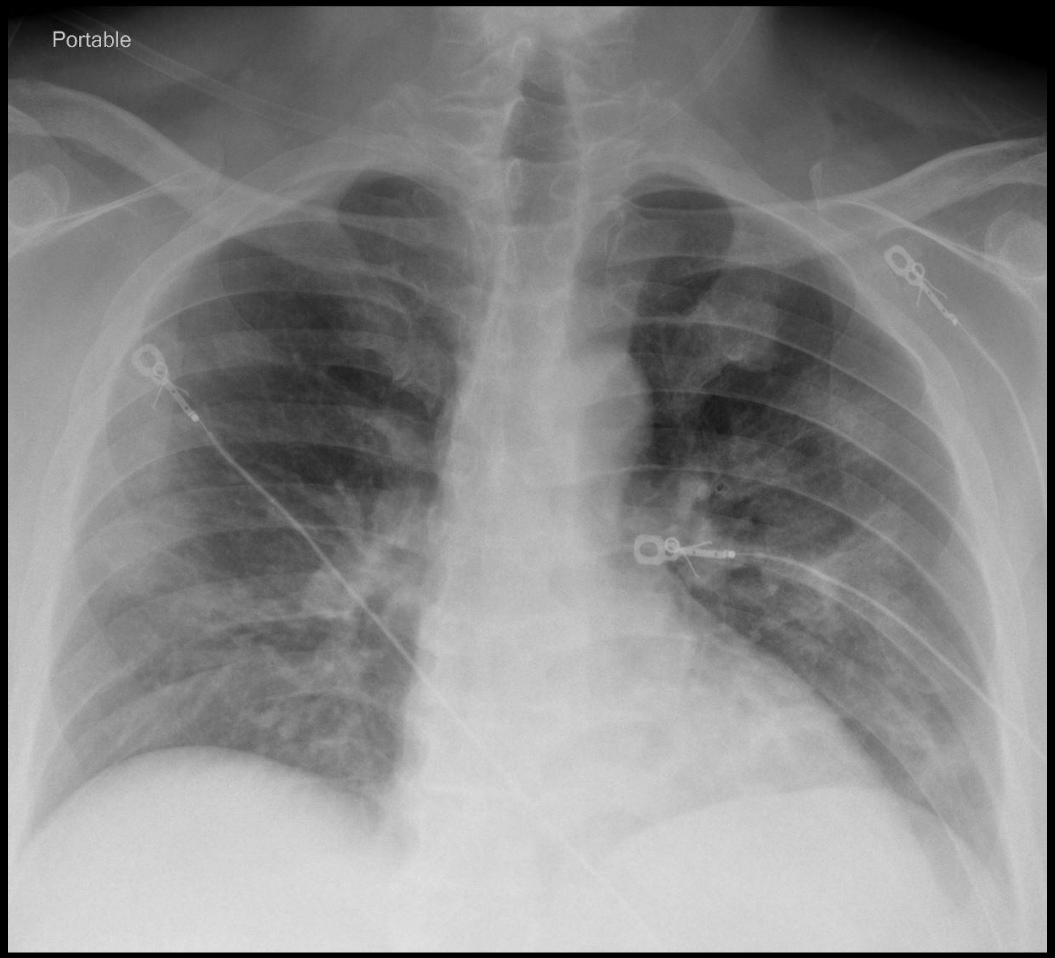
- If you have a **positive** radiograph with subtle generally lower lobe predominant early airspace opacities.
- **IMPRESSION:** Study is positive for airspace disease. Although nonspecific, based on clinical suspicion these findings could represent viral pneumonia.

CXR in a patient with + COVID-19



Note very subtle lower lobe interstitial opacities.

CXR in another patient with + COVID-19



Note lower lobe predominant airspace opacities.

When To perform CT chest For COVID-19

- CT chest should not be used to screen for or as a first-line test to diagnose COVID-19
- CT chest should be used sparingly and reserved for hospitalized, symptomatic patients with specific clinical indications for CT.
- Appropriate infection control procedures should be followed before scanning subsequent patients.

CT chest IN COVID-19

- Up to approximately 50% of patients with COVID-19 infection may have normal CT scans 0–2 days after onset of flu-like symptoms from COVID-19
- COVID-19 RT-PCR sensitivity may be as low as 60-70%; therefore patients with pneumonia due to COVID-19 may have lung abnormalities on chest CT but an initially negative RT-PCR.

Kane et al. https://pubs.rsna.org/doi/10.1148/radiol.2020200527

Radiology: Cardiothoracic Imaging

Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA.

Scott Simpson DO*[,1], Fernando U. Kay MD PhD*[,2], Suhny Abbara MD[2], Sanjeev Bhalla MD[3], Jonathan H. Chung MD[4], Michael Chung MD[5], Travis S. Henry MD[6], Jeffrey P. Kanne MD[7], Seth Kligerman MD[8], Jane P. Ko MD[9], Harold Litt MD PhD[1]

CT chest in COVID-19

High confidence features:

- Peripheral and bilateral groundglass opacities with or without consolidation or visible intralobular lines ("crazy-paving").
- Multifocal groundglass opacities of rounded morphology with or without consolidation or visible intralobular lines ("crazy-paving").
- Some authors have described a lower>upper lobe predominance of findings.
- Reverse halo sign can be seen later in the disease as a sign of organizing pneumonia.

Kane et al.https://pubs.rsna.org/doi/10.1148/radiol.2020200527
Simpson et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200152

CT chest in COVID-19

Indeterminate confidence features:

- Multifocal non-rounded non-peripheral bilateral groundglass opacities without clear distribution.
- Please note more diffuse airspace disease can occur when the disease advances leading to an ARDS pattern.

Simpson et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200152

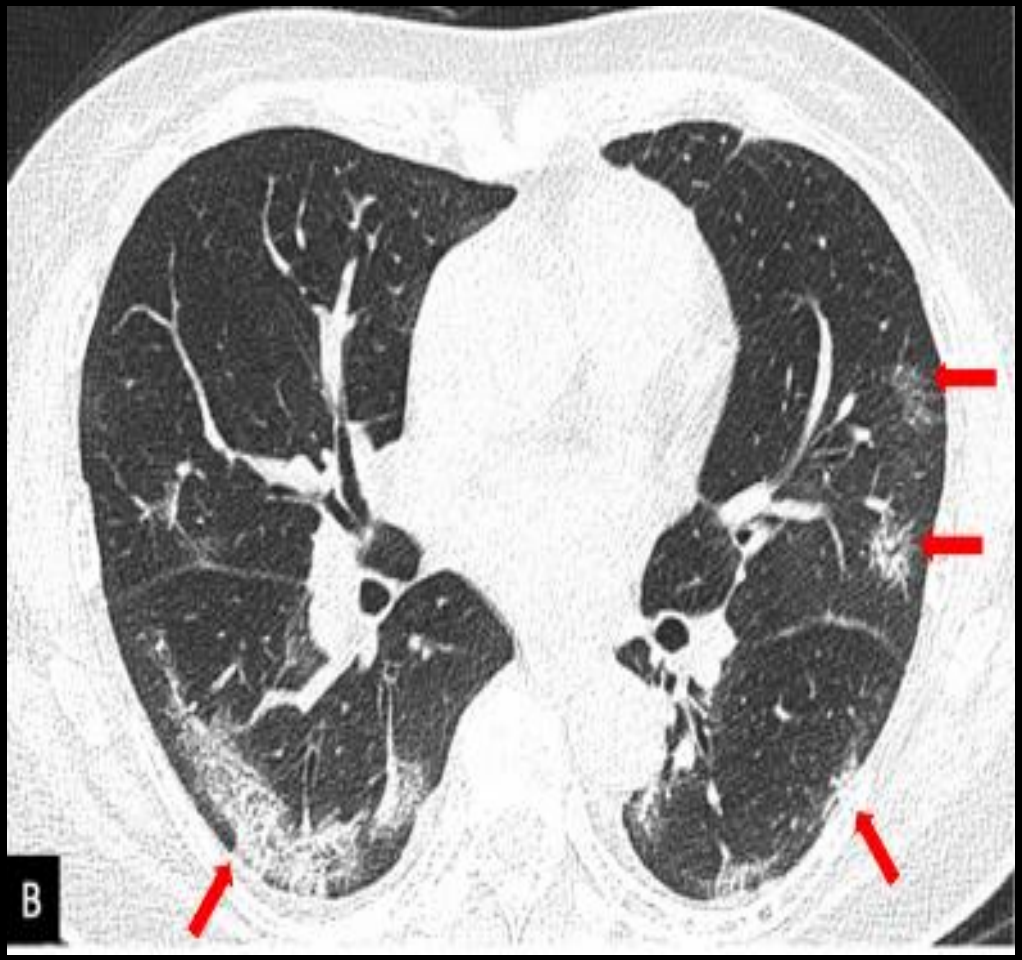
CT chest in COVID-19

Atypical findings suggesting an alternative diagnosis:

- Lobar pattern of consolidation, specially without groundglass opacity.
- Pleural effusion
- Multiple pulmonary nodules (centrilobular and tree in bud)
- Cavitation
- Lymphadenopathy

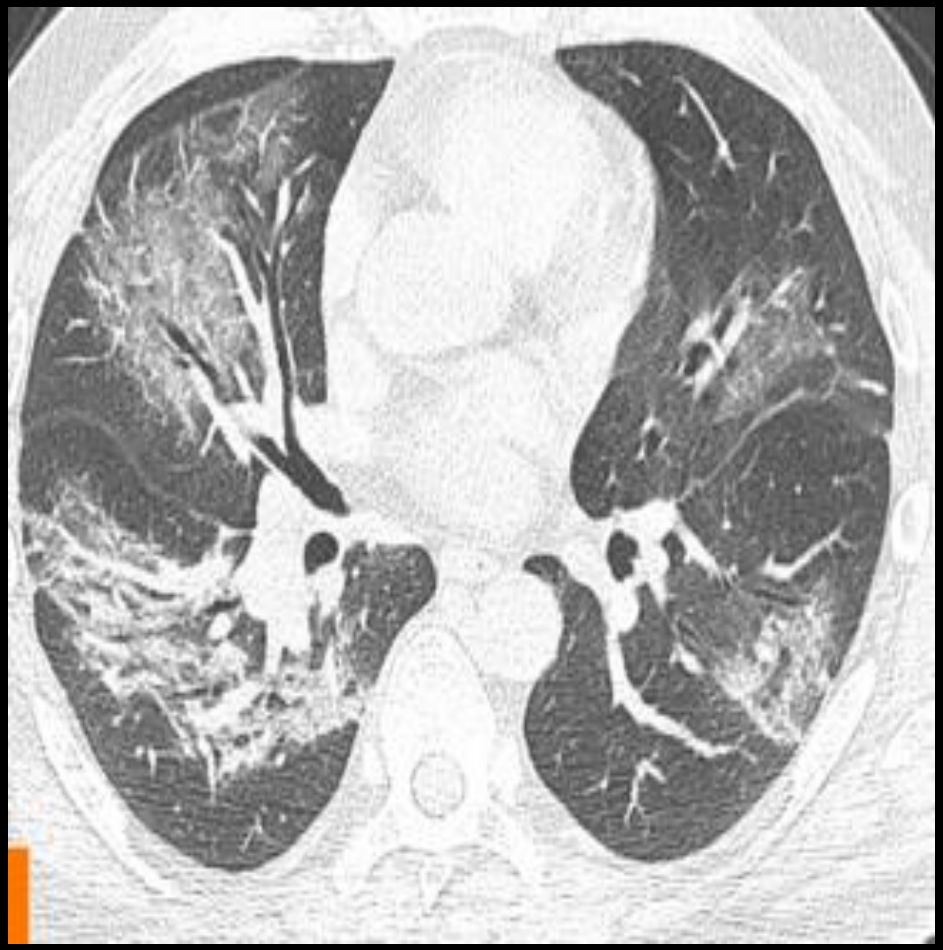
Kane et al.https://pubs.rsna.org/doi/10.1148/radiol.2020200527
Simpson et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200152

Case #1 of +COVID 19



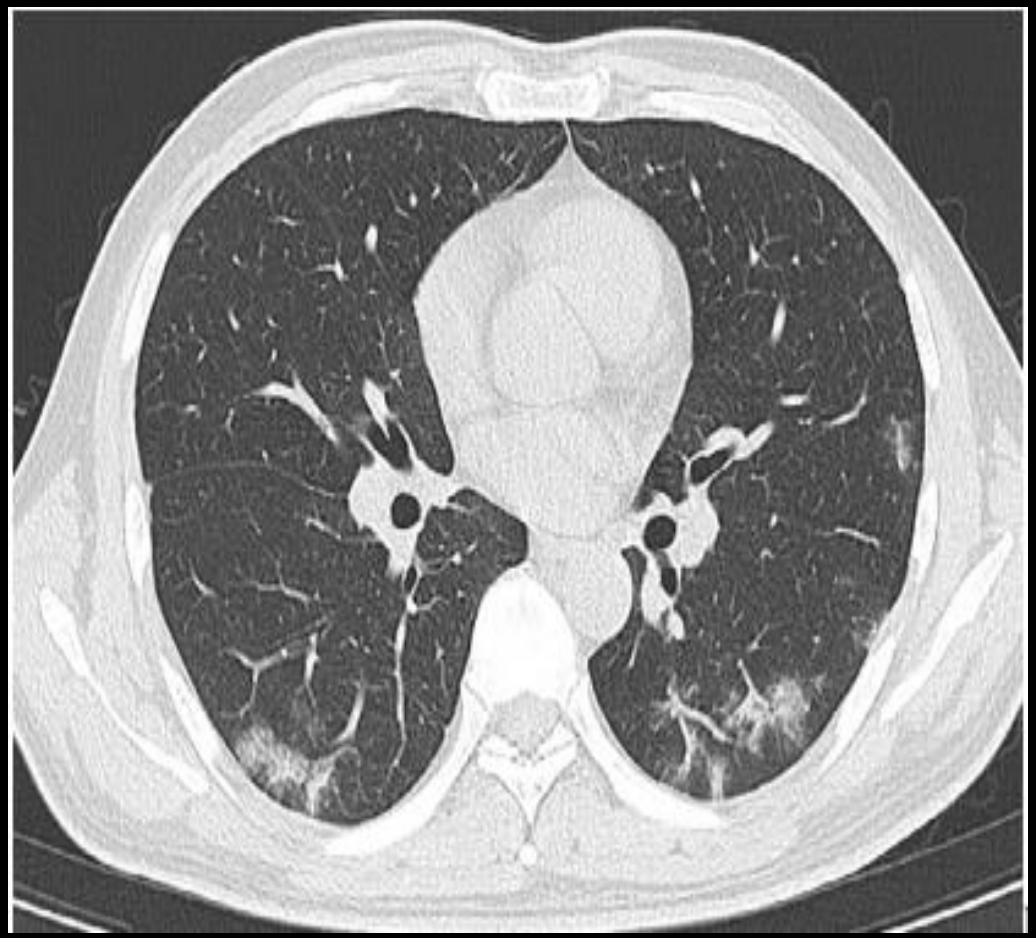
Ming-Yen Ng et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200034

Case #2 of +COVID 19



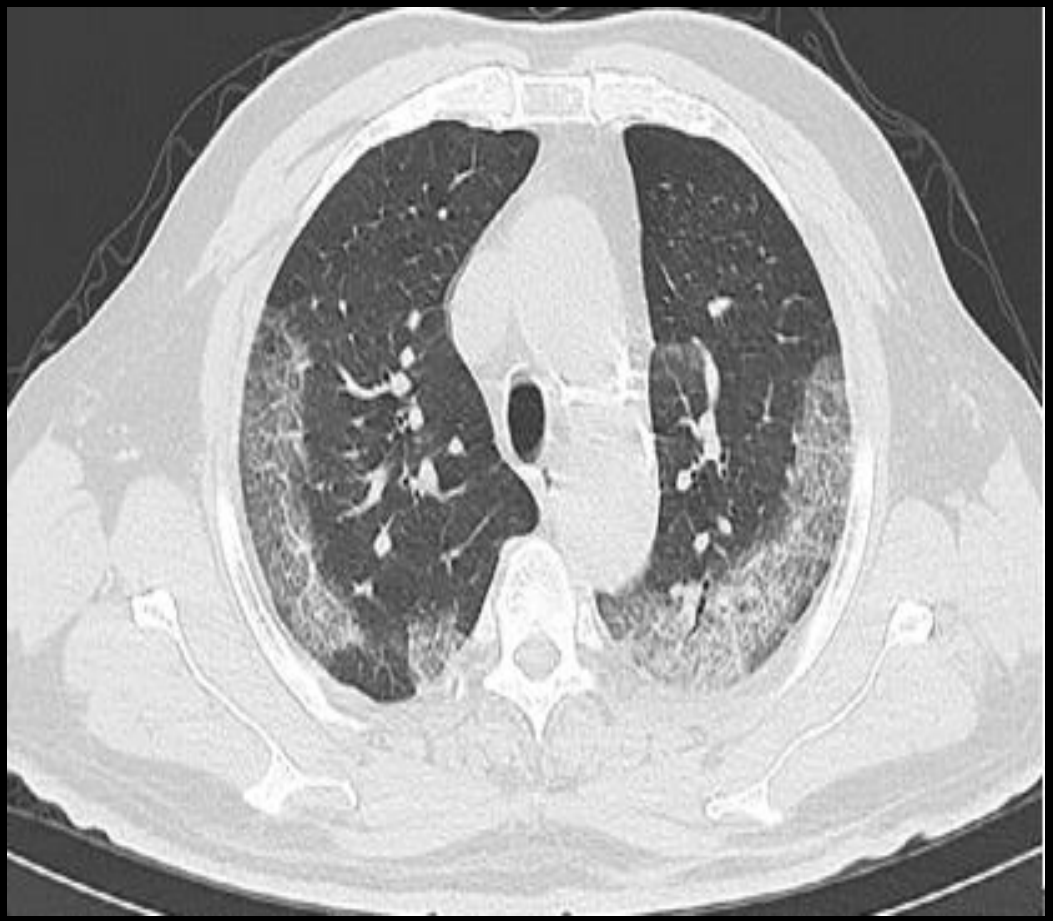
Ming-Yen Ng et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200034

Case #3 of +COVID 19



Fang Yicheng et al. https://pubs.rsna.org/doi/pdf/10.1148/radiol.2020200432

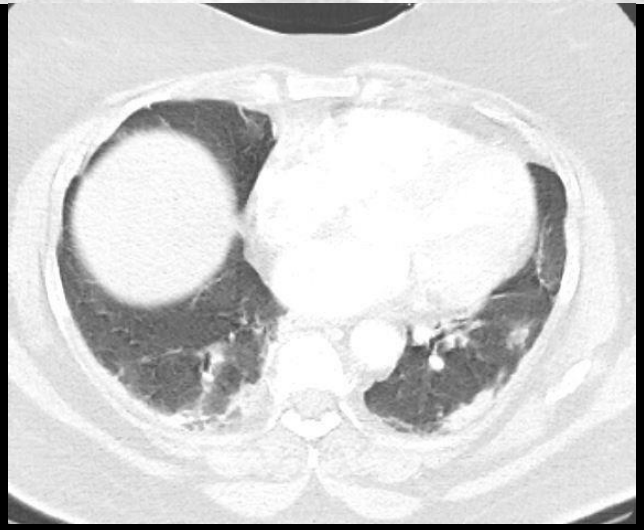
Case #4 of +COVID 19

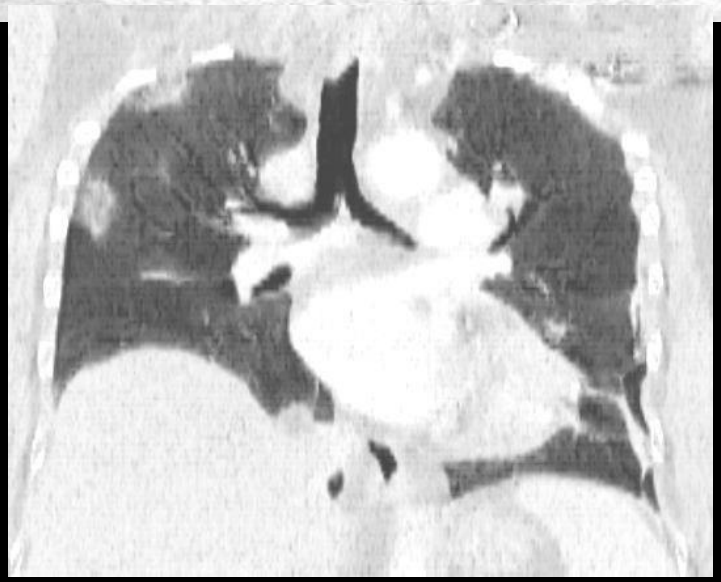


Fang Yicheng et al. https://pubs.rsna.org/doi/pdf/10.1148/radiol.2020200432

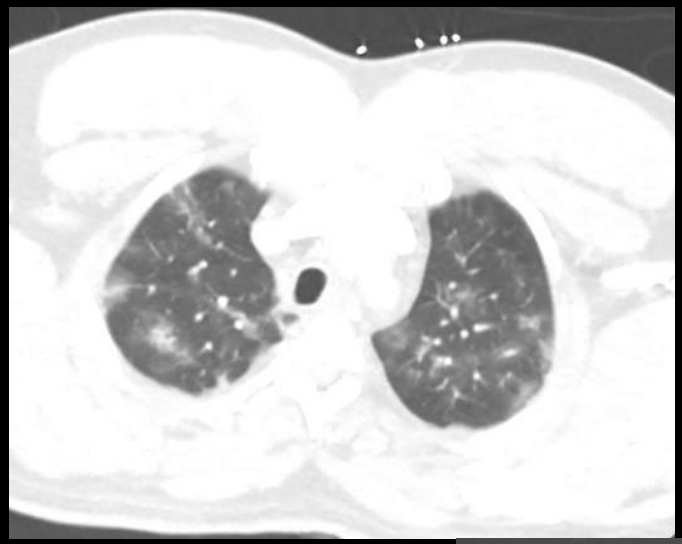
Case #5 of +COVID 19

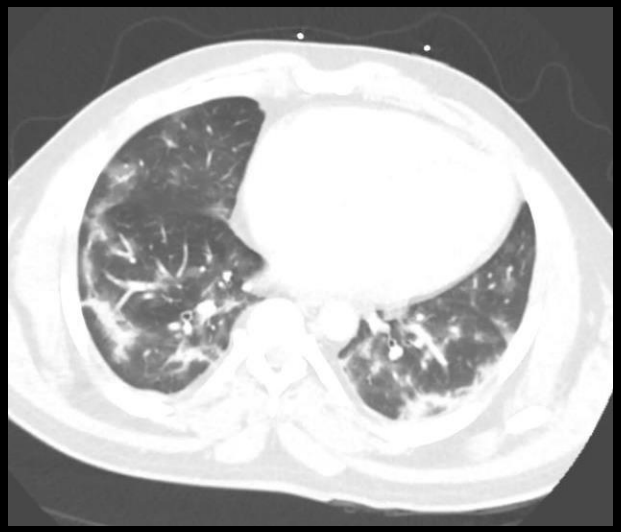
Case #6 of +COVID 19

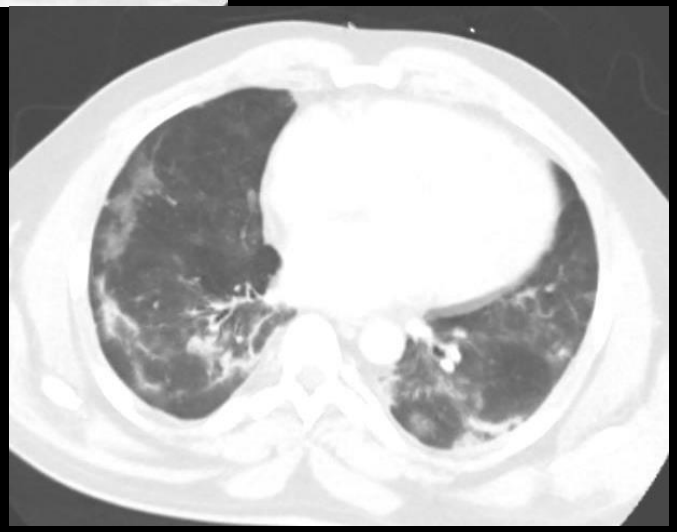




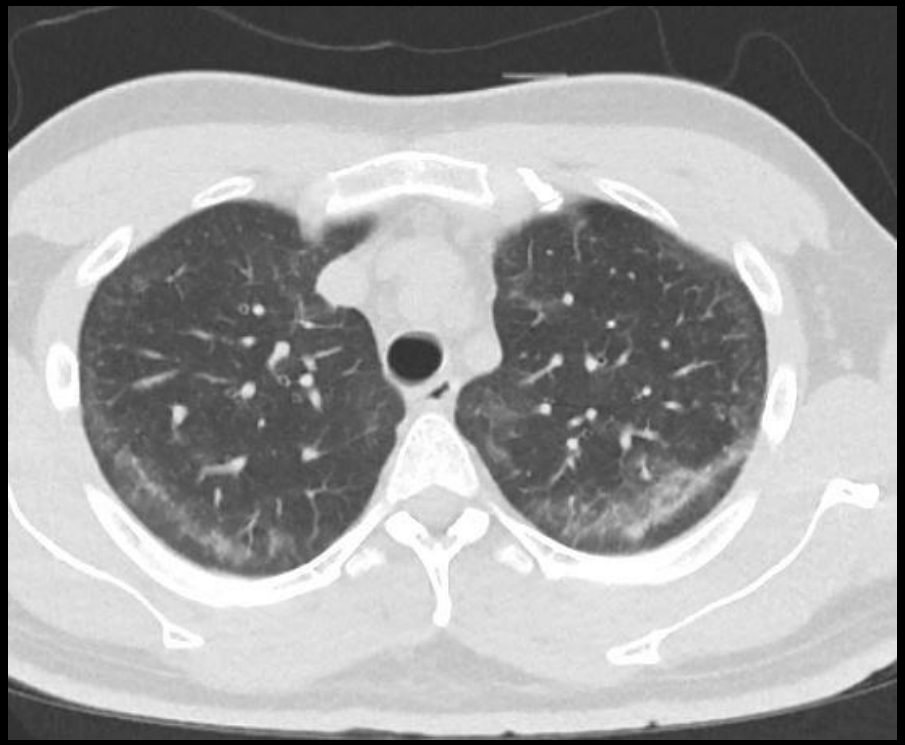
Case #7 of +COVID 19)



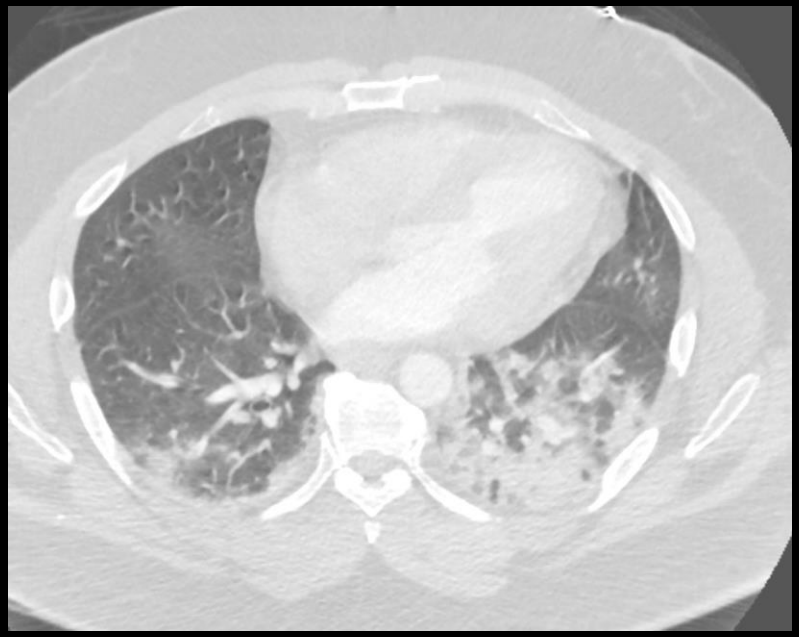




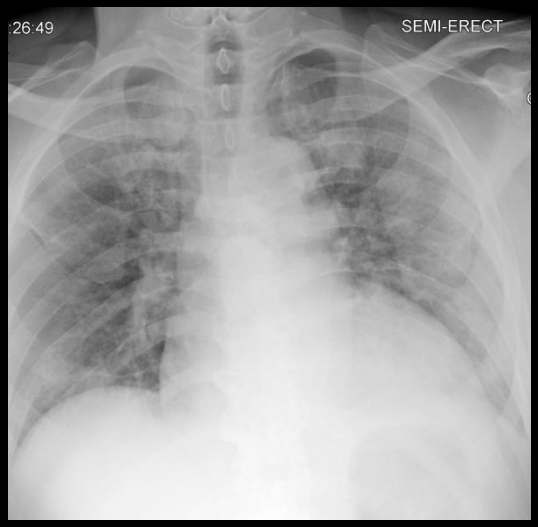
Case #8 of +COVID 19

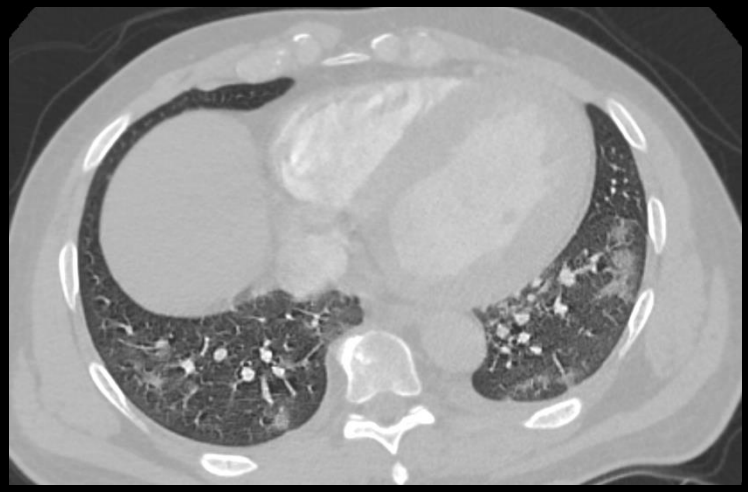


Case #9 of +COVID 19



Patient under investigation with suspicious features for COVID-19





CT Chest Reporting Guidelines If COVID-19 is suspected clinically

- Scenario #1: Typical appearance (high confidence) :
- Impression: “Commonly reported imaging features of viral pneumonia including (COVID-19 pneumonia) are present. Other processes such as organizing pneumonia as can be seen with drug toxicity and connective tissue disease, which can cause a similar imaging pattern.”

Simpson et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200152

CT Chest Reporting Guidelines If COVID-19 is suspected clinically

- Scenario #2: Indeterminate findings (intermediate confidence):
- Impression: “Imaging features can be seen with atypical infection such as viral pneumonia including (COVID-19 pneumonia), though are non-specific and can occur with a variety of infectious and noninfectious processes.”

Simpson et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200152

CT Chest Reporting Guidelines If COVID-19 is suspected clinically

- Scenario #3: Atypical findings (low confidence) :
- Impression: “Imaging features are atypical or uncommonly reported for (COVID-19) pneumonia. Alternative diagnoses should be considered.”

Simpson et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200152

CT Chest Reporting Guidelines If COVID-19 is suspected clinically

- Scenario #4: Negative findings:
- Impression: “No CT findings present to indicate pneumonia.” (Note: CT may be negative in the early stages of COVID-19.)

Simpson et al. https://pubs.rsna.org/doi/10.1148/ryct.2020200152

CT Chest Reporting Guidelines If COVID-19 is NOT suspected clinically

- If you are strongly concerned for COVID-19, you should communicate and discuss findings with the treatment team.
- If COVID-19 is not suspected clinically there is still debate between different authors in regards to using the term “coronavirus” or “COVID-19” in the impression.

Thank you