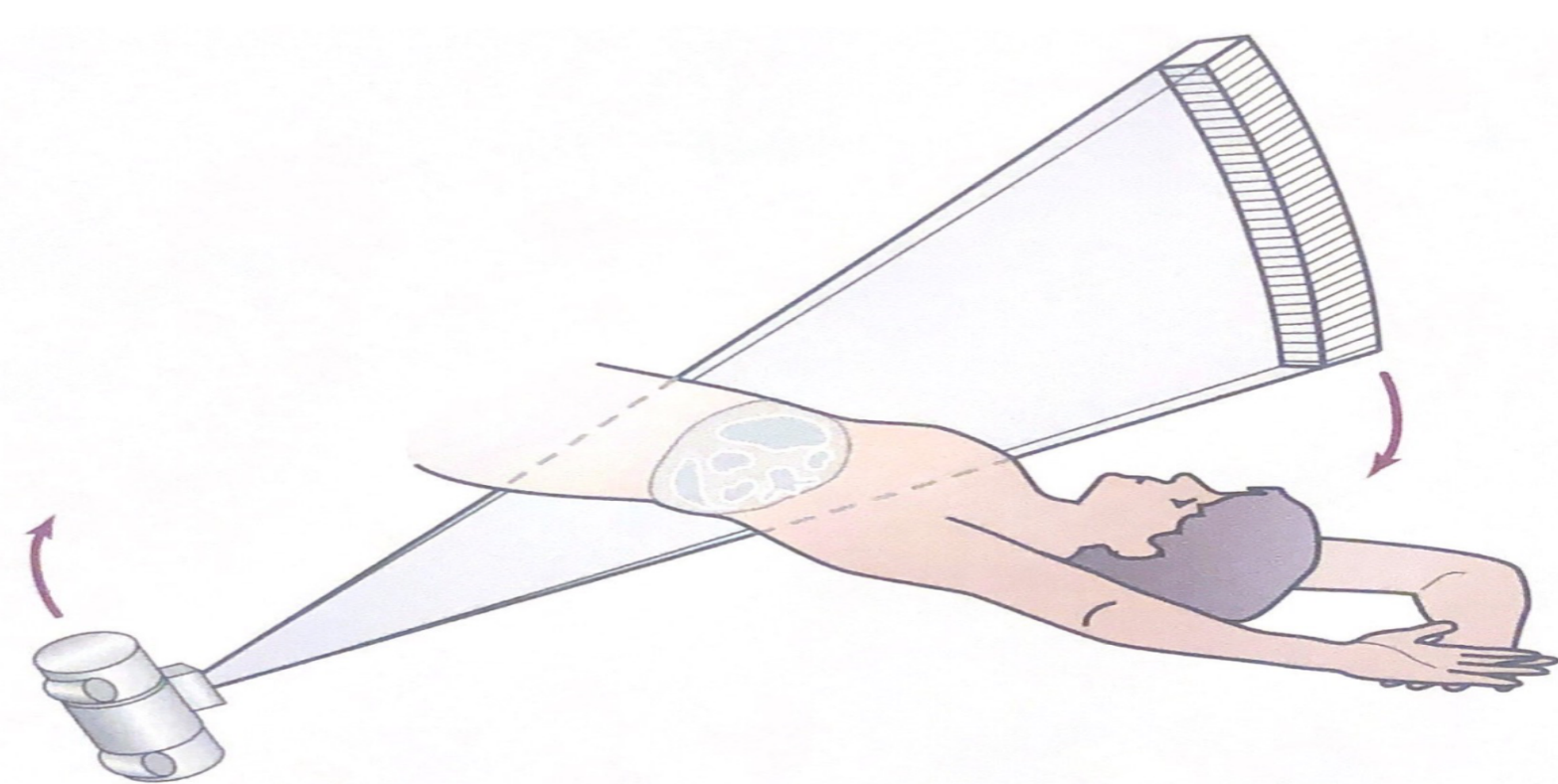


Use of Chest CT to Diagnose COVID-19

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Computed Tomography

- is the process of creating a cross-sectional tomographic plane of any part of the body by a rotating x-ray tube (Long, Rollins, & Smith, 2016).
- Images are displayed in three different planes: axial, sagittal, and coronal which provide different views of the anatomy of interest.
- **Equipment**
 - Studies in this research used different equipment to yield results.
 - For example, a study conducted by Li and Xia, used two scanners which consisted uCT 780, United Imaging or Somatom Force, Siemens Healthcare. While a study done by Gu et al., (2021) used Brilliance iCT, Philips Healthcare, and Aqilion 64, Toshiba.
 - These two studies yielded the same results using four different scanners by diagnosing COVID-19.
- **With Contrast vs. Without**
 - According to Long, Rollins, and Smith (2016), contrast medium is used in CT examinations to help distinguish normal anatomy from pathology and to make various disease process more visible.
 - The process of introducing contrast can be done intravenously, orally, and rectally.
 - In chest CT scans acquired did not use contrast media to highlight the anatomy of interest when specifically focusing.



Demonstration of how CT scans are acquired using a rotating x-ray tube and multiple detectors.

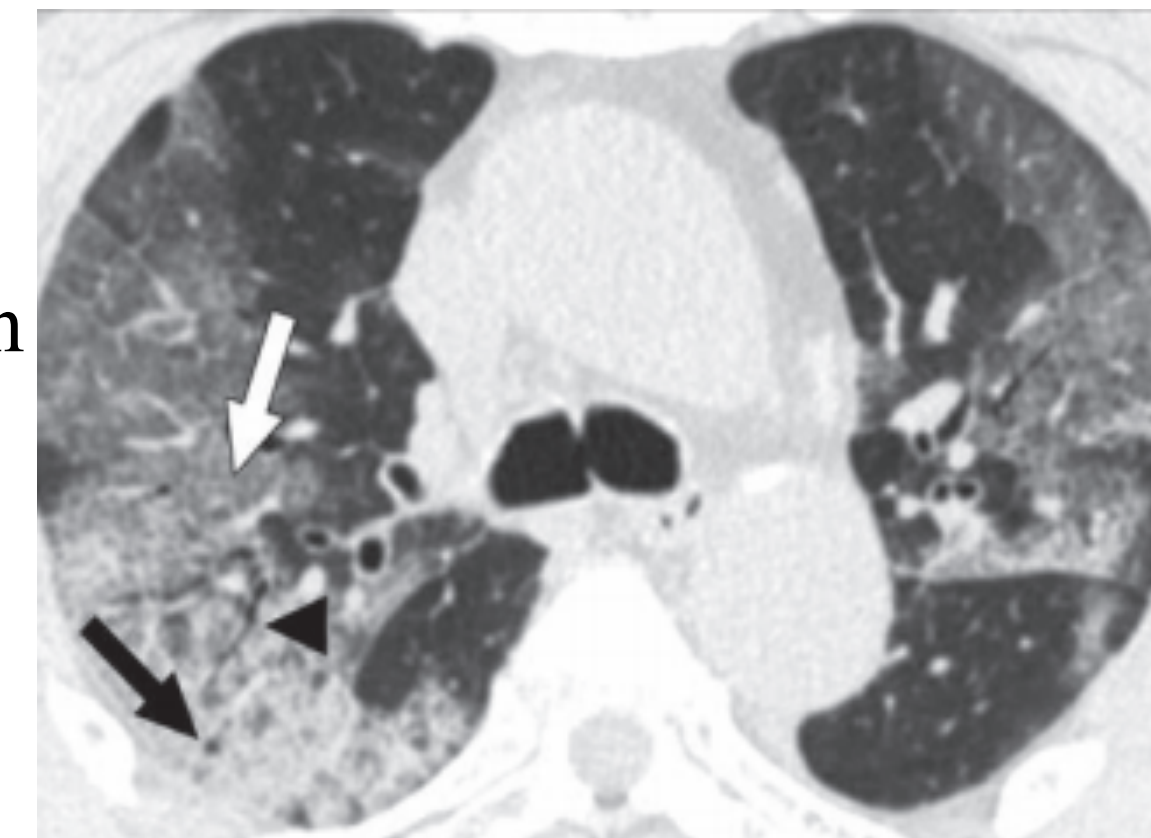
(Long et al., 2016)

COVID-19

- **Origin-** Wuhan, China-2019
- Defined as a respiratory illness transmitted contagiously from human to human.
- **Signs and Symptoms**
 - Most common symptoms associated with COVID-19 consist of fever, fatigue, poor appetite, cough, or no symptoms. (Li & Xia, 2020)
- **Findings and Abnormalities**
 - Research found the most common CT findings consisted ground-glass opacities (GGO), fibrous stripes, interlobular septal thickening, and consolidation.
 - A study conducted on lung changes in patients with COVID-19 found 90.8% of abnormal CT scans affected lungs bilaterally and 87.9% showed signs of two lobes involved.

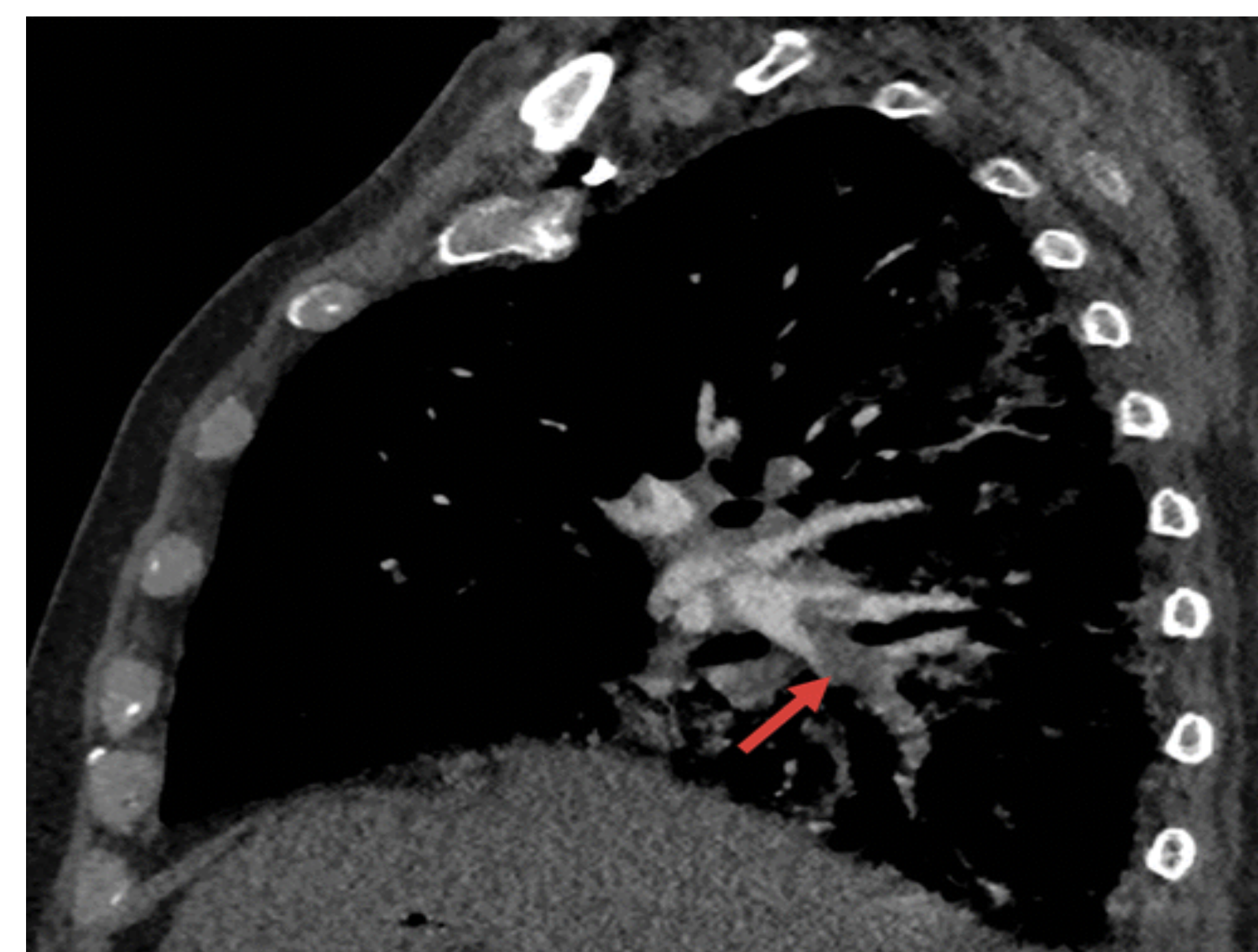
(Zhang et al., 2020)

- Serious condition of COVID-19.



Transverse CT scan shows evidence of multiple ground-glass opacities and consolidation with thickened interlobular and interlobular septum.

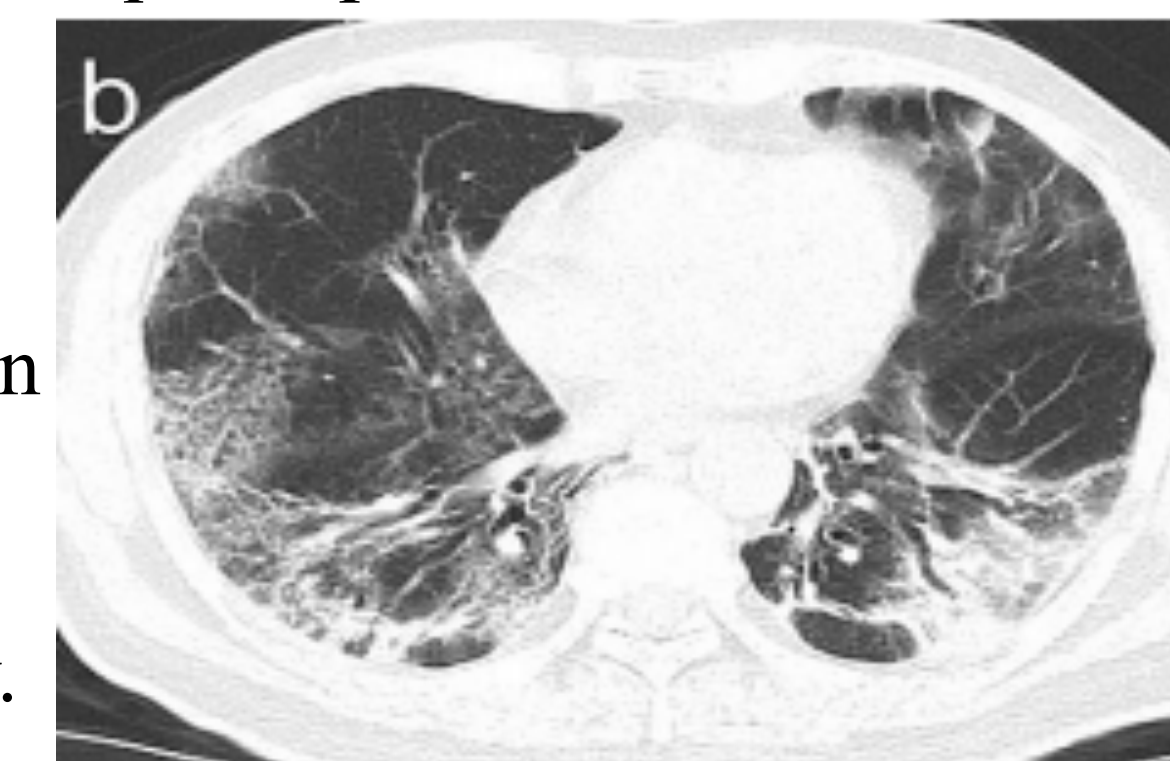
(Li & Xia, 2020)



COVID-19 infection resulting in a Pulmonary Embolism. (Kwee & Kwee, (2020)

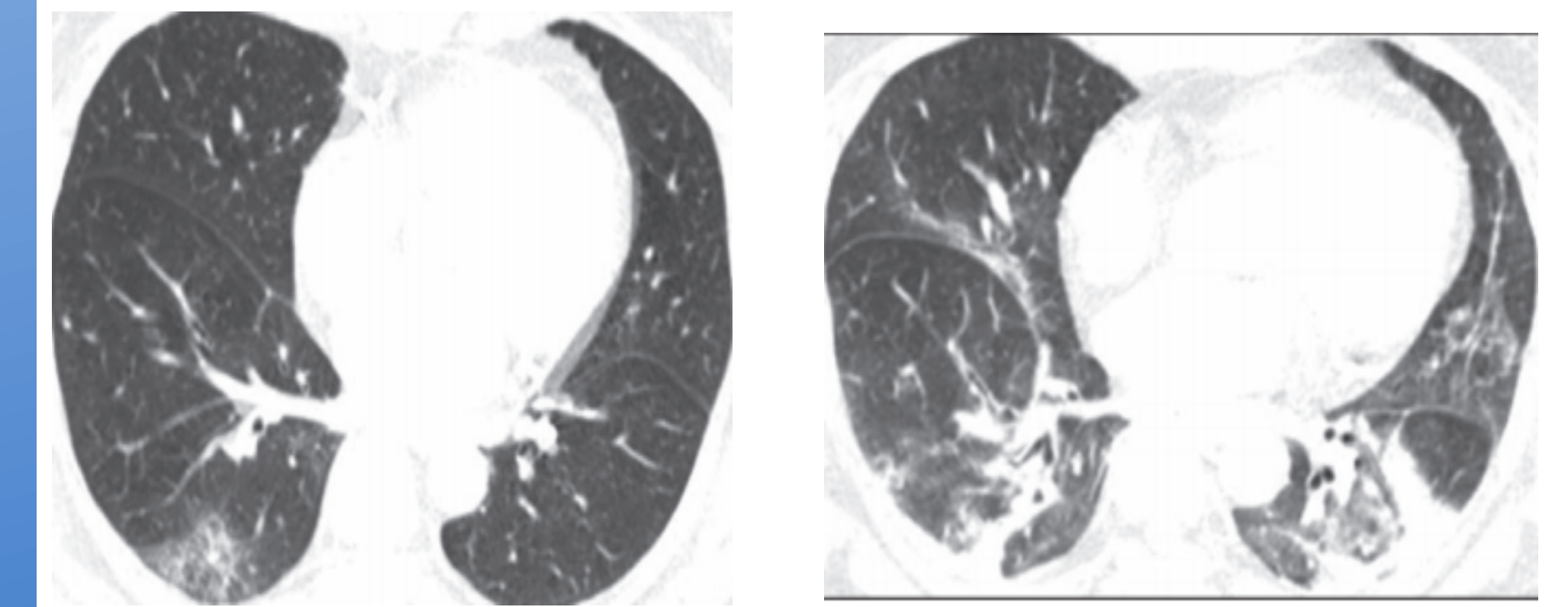
Diagnosis

- **Early Detection**
 - Chest CT scans have been proven to be a reliable source in detection of COVID-19 since the outbreak in 2019.
 - Early detection is essential in the diagnosis process in order to properly manage the spread of COVID-19.
 - A study conducted by Gu et al., (2021) found chest CT scans were more efficient than RT-PCR positive test results.
 - “The chest CT detection time of COVID-19 pneumonia was 2.61 days earlier than that of an initial RT-PCR positive result” (Gu et al.,2021).
 - **Misdiagnosis**
 - COVID-19 is similar to many other infectious diseases such as SARS, MERS, and the common flu so correct diagnosis of patients with COVID-19 is important.
 - According to Li and Xia (2020), COVID-19 was misdiagnosis 3.8% in a study that included 53 patients and a total of 99 CT scans. Two patients that were misdiagnosed had multiple underlying diseases which conflicted results.
 - The data collected concluded chest CT scans can be used as an effective source to diagnose COVID-19.
 - **Advantages**
 - CT scans are non-invasive procedures that can detect COVID-19 at the early stages of the infections.
 - The diagnosis period is much shorter as opposed to the RT-PCR test and allows for follow-up scans to track patients recovery to determine proper treatment plans.
 - According to Li et al. (2020), artificial intelligence was useful to differentiate COVID-19 from community acquired pneumonia and other diseases.
- Follow-up scan showing progression of COVID-19 infection bilaterally. (Zhang et al., 2020)



Case Study

- **Patient History**
 - A 61year old woman with COVID-19 diagnosed on January 27, 2020. Displayed symptoms of fever and cough and received six total chest CT scans.



Scan #1

vs.

Scan #6

- Scan #1- performed on January 16th and showed signs of GGO and consolidation in right lower lobe
- Scan #2- January 19th-GGO in right middle lobe and growing consolidation in right lower lobe
- Scan #3- January 24th- shows GGO and consolidation in both lungs
- Scan #4- January 27th- demonstrated residual consolidation and fibrosis
- Scan #5- January 31st- some consolidation resolved
- Scan #6- February 4th- increased consolidation

(Li & Xia, 2020)

Conclusion

- Research discussed shows importance and reliability chest CT scans have when diagnosing COVID-19.
- Efficient and accurate tool to quickly image the severity & follow recovery of infections present to provide proper treatment for patients.
- It has a short diagnosis period found to be around 2.61 days as opposed to RT-PCR test which can take twice as long.
- With development of technology, it is proven that software can be designed to accurately detect COVID-19 infections to avoid misdiagnosis to ensure proper management & treatment.