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Low Dose CT Scanning for Lung Cancer

Patrick Strouse

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Introduction

Lung cancer is the leading cause of cancer deaths worldwide. Computed Tomography (CT) is an imaging modality that produces cross sectional images, aiding in diagnosing lung cancer. Frequent scanning is required, therefore patients would benefit from low dose CT scans.

Computed Tomography (CT)

- “Computed Tomography is the process of creating cross-sectional tomographic plane of any part of the body in the form of imaging”. (Long, Rollins & Smith, 2019).
- CT utilizes x-rays to produce images which are created by the detectors and x-ray beam rotating around the patient.
- Pre-selected algorithms and calculations determine the speed of rotation by the x-ray beam to produce the proper slice thickness.
- The slice thickness is important to change bigger and smaller in order to catch possible masses that could be missed in a bigger slice. In turn this creates more radiation to the patient with more images.
- These slices can be reformatted to look at the images in an axial, coronal, sagittal, or oblique plane of the patients anatomy.
- 3D imaging can also be produced with proper slice thickness allowing for a more in depth look at the veins, arteries, and bone allowing for a better diagnosis.



CT scanning room with patient placed on the carbon fiber table (Regional One Health, 2019)

Lung cancer Statistics

- “In 2022 there is an estimated 236,740 new cases of lung cancer” (American Cancer Society, 2022)
- “Worldwide lung cancer mortality rates are available from GLOBOCAN 2012, There were an estimated 1.6 million deaths from lung cancer in 2012”. (Pinsky, 2018).
- Lung cancer is also the third most common kind of cancer affecting on average over 200,000 people every year. (Centers for Disease Control and Prevention, 2022)

Symptoms

- Coughing with or without blood.
- Chest pain.
- Shortness of breath.
- Wheezing.
- Always feeling tired.
- Bone pain.
- Weight loss with no known cause.

Risk Factors

- Cigarette smoking is considered the most common risk factor. “In the United States, cigarette smoking is linked to about 80% to 90% of lung cancer deaths.”. (Centers for Disease Control and Prevention, 2021).
- Radon, usually inhaled in homes unnoticed.
- Family history of lung cancer.
- Secondhand smoke.
- Exposure to asbestos

Low Dose CT

- Low Dose CT (LDCT) utilizes less radiation exposure than regular CT therefore reducing the patients radiation dose.
- Patients with an increased risk of lung cancer may consider annual lung cancer screening using low-dose CT scans
- Low dose CT has very limited effects on the image and lung cancer can still be diagnosed. “The LDCT-based quantitative-semantic score and radiomic signature, with good predictive performance, can be pre-operative and non-invasive biomarkers for assessing the invasive risk of pGGNs in lung cancer screening”.(Liu, et.al, 2022).
- Low Dose utilizes helical scan modes which continuously rotate around the patient, due to no overlapping in the normal sequential axial imaging of CT this provides less patient dose due to less images needing to be taken.

Advantages of Low Dose CT

- In comparison to normal CT Low Dose provides less radiation dose to the patient, multi detector CT provides a CT Dose Index (CTDI) of 21 (mgy) whereas Low Dose provides a CTDI of 2 (mgy),
- Images in Low Dose is very similar to those of normal CT and can detect lung cancer just as easily.
- “Patients screened with LDCT were diagnosed at earlier stages and less likely to die from their cancer.”(Durkin, et.al, 2021). This is due to being able to be scanned annually without worry of risk due to lower radiation dose.
- Patient history is retaken before every scan to help the M.D. determine if images need to continue.

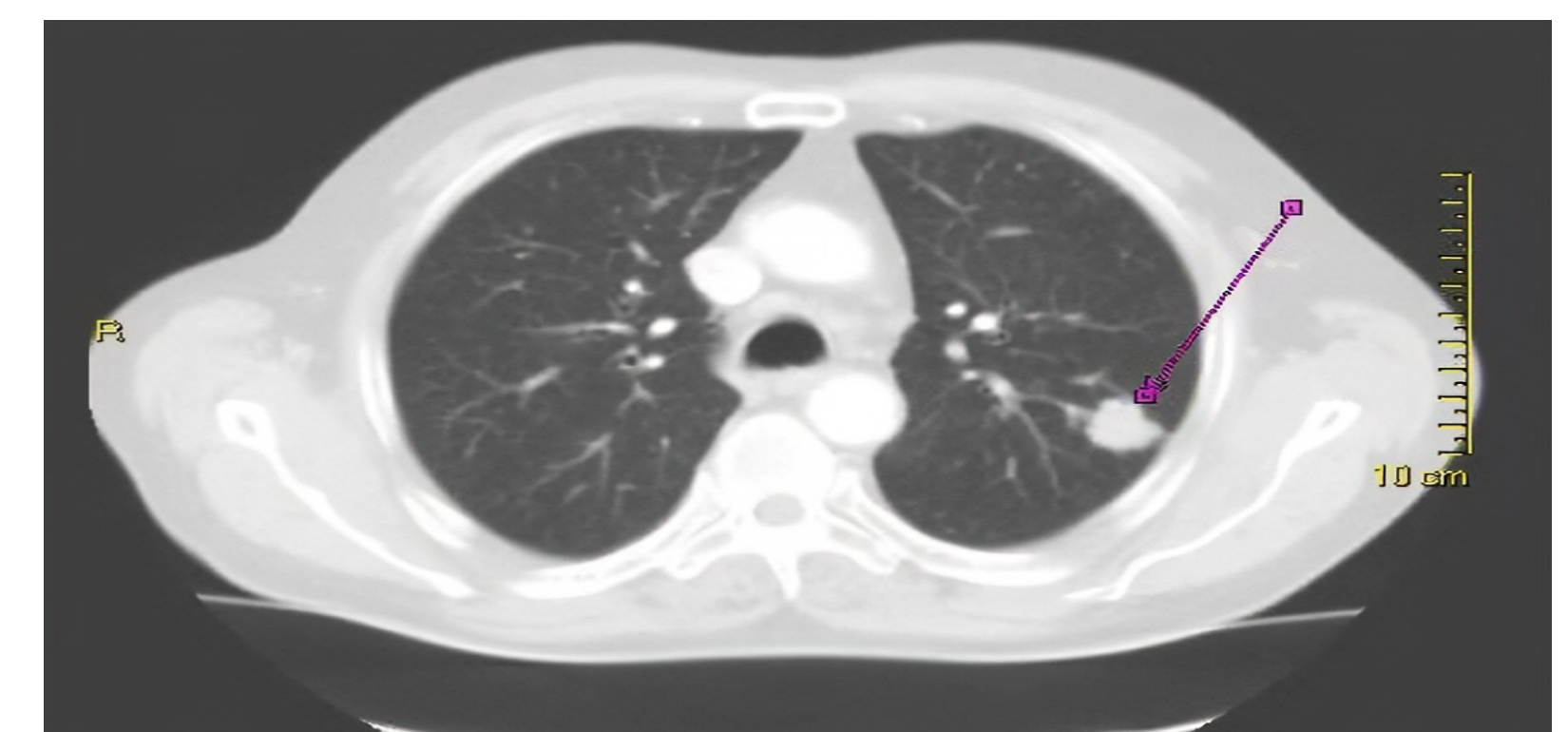
Disadvantages of Low Dose CT

- Utilization of Low Dose CT remains low due to unfamiliarity of the scan from physicians.
- The scan is typically only ordered for patients that have many risk factors including current smoking or history of smoking for a long time, if a patient does not have many risk factors this would not be ordered.
- This scan is not familiar with many insurance companies in different parts of the world and could cause issues with availability. (Pinsky, 2018)

Comparison images



Axial view of a normal chest CT showing lung cancer in the left lung. (little, 2017)



Axial view of Low Dose CT showing cancer in the left lobe proving little to no difference in quality from generic CT to Low Dose. (Culture world news, n.d.)

Conclusion

Low Dose Computed Tomography is a new scan that can detect lung cancer early which makes it a necessity for those at risk for the disease. More research is being conducted on Low Dose CT in order to become more popularized amongst physicians.