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Original Research Article

Role of multi slice computed tomography in lung parenchymal pathologies

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ABSTRACT

Background: Lung parenchymal pathologies cover a range of conditions such as interstitial lung diseases (ILD) bronchogenic carcinoma, pulmonary tuberculosis, aspergilloma, and many others. Multislice computed tomography (MSCT) has significantly aided in the diagnosis and management of lung parenchymal pathologies. Its high-resolution imaging capability and detailed cross-sectional view of the lungs help to detect and evaluate a wide range of pulmonary diseases with greater accuracy. Objective was to analyze the MSCT findings in patients with suspected lung parenchymal pathologies and assess its role in differential diagnosis and disease characterization.
Methods: An observational cross-sectional study was performed in 100 patients with clinical suspicion of lung parenchymal pathologies. All patients underwent MSCT and imaging findings were correlated with clinical data wherever available.
Results: The most common imaging features were consolidation (56%), cavitation (24%), ground-glass opacities (24%), fibrosis (23%). Infective pathologies accounted for the majority of findings, including consolidation, nodules, bronchiectasis, and cavitatory lesions. Neoplastic lesions were seen in 8% of cases, all showing advanced features such as lymphadenopathy and local invasion. Additional findings included pleural effusions (20%), pneumothorax (7%), and mediastinal involvement (58%). MSCT enabled accurate identification and characterization of various pathologies such as tuberculosis, bronchogenic carcinoma, ILD, aspergilloma, and allergic bronchopulmonary aspergillosis (ABPA).
Conclusions: MSCT plays a vital role in the early detection, accurate characterization, and staging of lung parenchymal diseases. Its high diagnostic yield enhances clinical decision-making and guides appropriate management strategies.

Keywords: Multislice CT, Lung parenchymal pathologies, Consolidation, Cavitation, Bronchiectasis, Ground-glass opacity, Interstitial lung disease, Bronchogenic carcinoma, Aspergilloma, ABPA, Pleural effusion, Chest CT

INTRODUCTION

Lung parenchymal pathologies include a wide range of conditions such as ILD, bronchogenic carcinoma, tuberculosis, and aspergilloma, which can become life-threatening if not diagnosed early.[1] While chest radiography is a widely used initial tool, its limitations in detecting subtle or complex lesions necessitate advanced imaging. MSCT offers significant advantages, including faster scan times, improved resolution, and superior anatomical coverage compared to conventional CT. The ability to perform multiplanar reconstructions and 3D volume rendering enhances diagnostic accuracy, particularly for evaluating airway and parenchymal abnormalities.[2] MSCT also provides tenfold better contrast resolution than conventional radiography, making it an invaluable modality for comprehensive thoracic disease evaluation.[3,4]

Aim and objective

Aim and objective were to determine the role of MSCT in lung parenchymal pathologies and aid in diagnosis of lung parenchymal pathologies.

METHODS

This was an observational cross sectional study conducted in department of radiodiagnosis and imaging, government medical college, Amritsar, after obtaining institutional ethics committee approval and written informed consent from patient. A minimum of 100 patients referred to the department of radiodiagnosis and imaging with chest pathologies in a period from august 2023 to April 2025 were subjected for the study. Spiral CT examination was performed on Philips brilliance multislice whole body scanner. Scanning was done, from apex to diaphragm, in a single breath hold of 25-35 seconds. Chest CT protocol followed in the present study-Slice thickness-0.68 mm, scan time-0.5-1 second, kV-140 Kv, mAs-200mAs, matrix size-768×768, FOV-35 cm, patient position-supine position and level of inspiration-full inspiration.

Contrast and prerequisite

Intravenous contrast was administered under aseptic conditions using 50 ml of contrast, typically ionic (Omnipaque), via rapid bolus injection. Test dosing, normal renal function, and allergy history were assessed; non-ionic contrast (e.g., iohexol) was used when indicated.

Inclusion criteria

The case selection was done at random, comprising of all age groups, sex and races.

Exclusion criteria

Pregnant females, patient who was not willing to give consent to participate in study and patient with absolute contraindication for contrast administration were excluded.

Statistical analysis

The data sheet was created which includes patients' demographic characteristics, presenting complaints and MDCT findings. The data was collected, tabulated and statistically analysed and valid conclusions were drawn.

RESULTS

Among 100 patients evaluated for suspected lung parenchymal pathologies, the most common CT finding consolidation (56%), followed by ground-glass opacities and cavities (24% each), fibrosis (23%), and nodules (20%). Less frequent patterns included bronchiectasis (11%), emphysema (9%), and tree-in-bud appearance (16%). Clinico-radiological correlation revealed infective pathologies in 58% of cases, with pulmonary tuberculosis (9%), ILD (8%), and neoplastic lesions (8%) being leading specific diagnoses. Rare conditions included AVM, PAH, and Rasmussen's aneurysm.

Table 1: Age group vs sex distribution.

Age group (in years)	Female, N (%)	Male, N (%)	Total, N (%)
1-10	2 (5.41)	1 (1.59)	3 (3)
11-20	4 (10.81)	3 (4.76)	7 (7)
21-30	3 (8.11)	15 (23.81)	18 (18)
31-40	6 (16.22)	12 (19.0)	18 (18)
41-50	7 (18.92)	6 (9.52)	13 (13)
51-60	5 (13.51)	14 (22.22)	19 (19)
61-70	9 (24.32)	10 (15.87)	19 (19)
71-80	1 (2.70)	1 (1.59)	2 (2)
81-90	0 (0)	1 (1.59)	1 (1)
Total	37 (100)	63 (100)	100 (100)

Table 2: CT findings of different lesions in lung parenchymal pathologies, (n=100).

CT scan findings	N	Percentage (%)
Consolidation	56	56.00
Collapse	13	13.00
Mass lesion	8	8.00
Nodule	20	20.00
Cysts	13	13.00
Cavity	24	24.00
Fibrosis	23	23.00
Emphysematous changes	9	9.00
Bronchiectasis	11	11.00
Honeycombing	2	2.00
Septal thickening	5	5.00
Crazy paving	4	4.00
Ground glass opacity	24	24.00
Tree in bud appearance	16	16.00
Calcification	21	21.00

Table 3: Probable diagnosis, (n=100).

Probable diagnosis	N	Percentage (%)
ABPA	2	2.00
Abscess	2	2.00
AVM	1	1.00
Fungal ball	2	2.00
Fungal granuloma	2	2.00
ILD	8	8.00
Lung abscess	4	4.00
Neoplastic	8	8.00
PAH	1	1.00
Post primary TB	1	1.00
Pulmonary metastasis	1	1.00
Pulmonary TB	9	9.00
TB and Rasmussen's aneurysm	1	1.00
Infection	58	58.00
Total	100	100.00

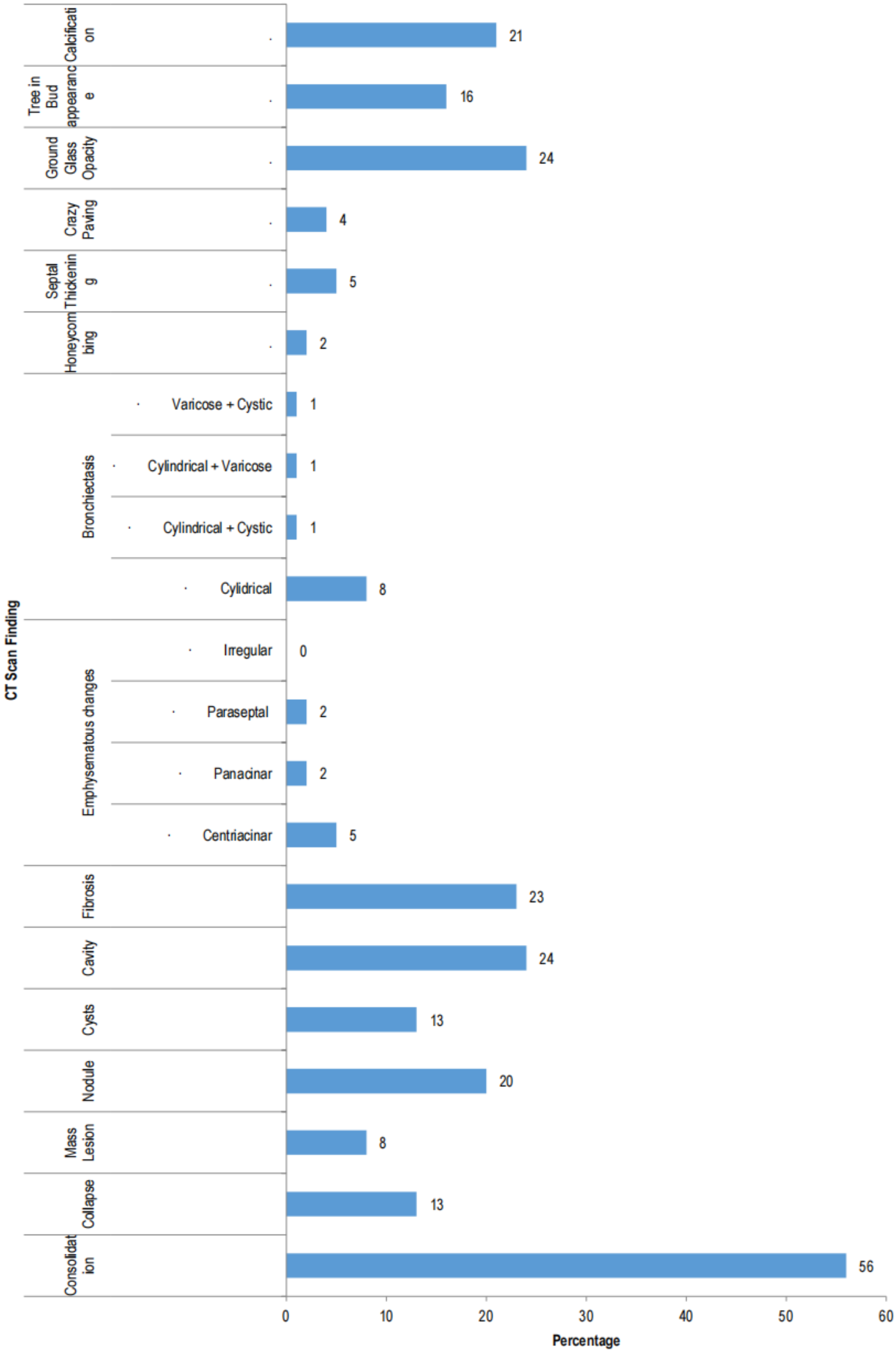

Figure 1: CT findings of different lesions in lung parenchymal pathologies, (n=100).

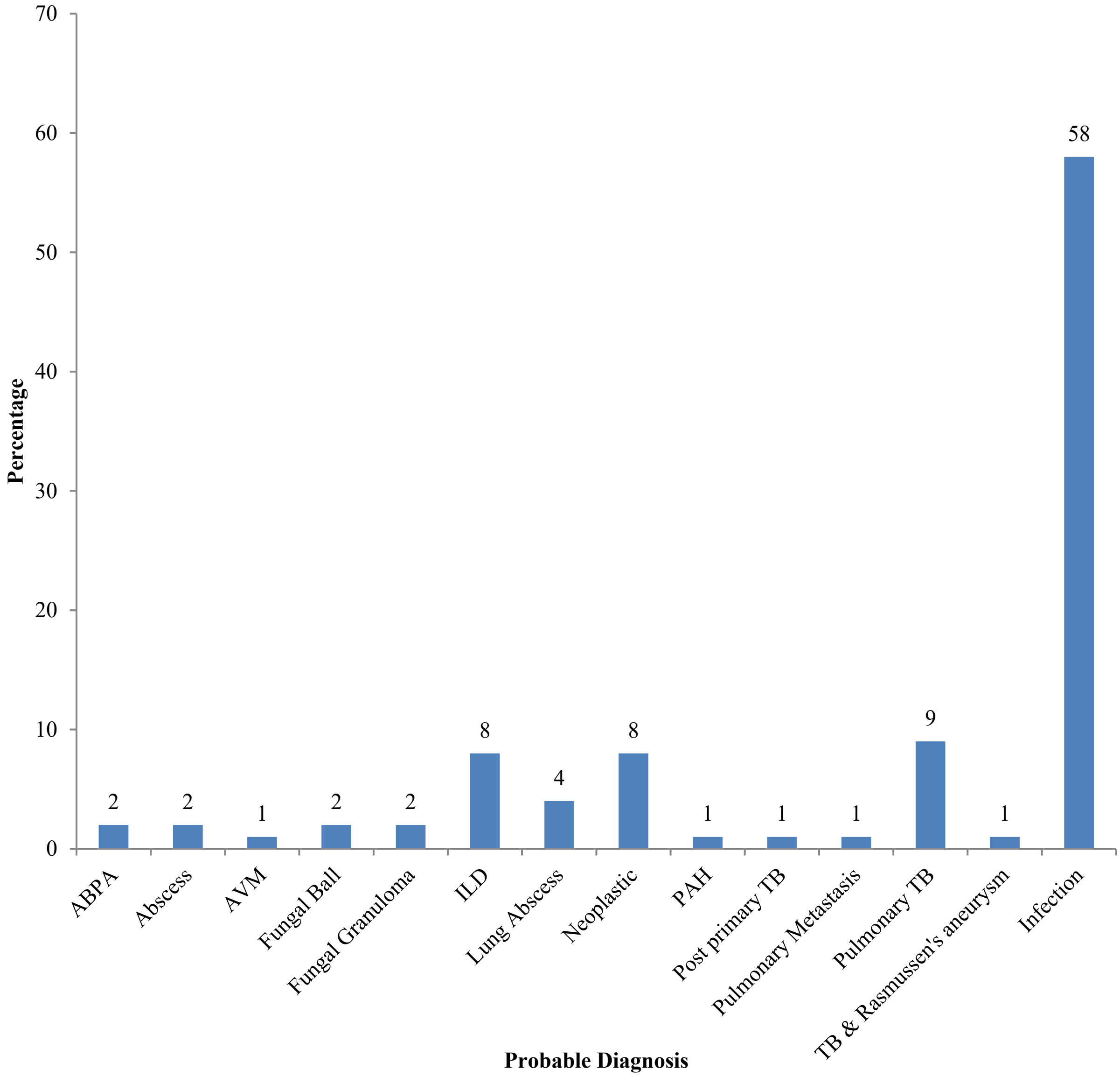

Figure 2: Probable diagnosis (n=100).

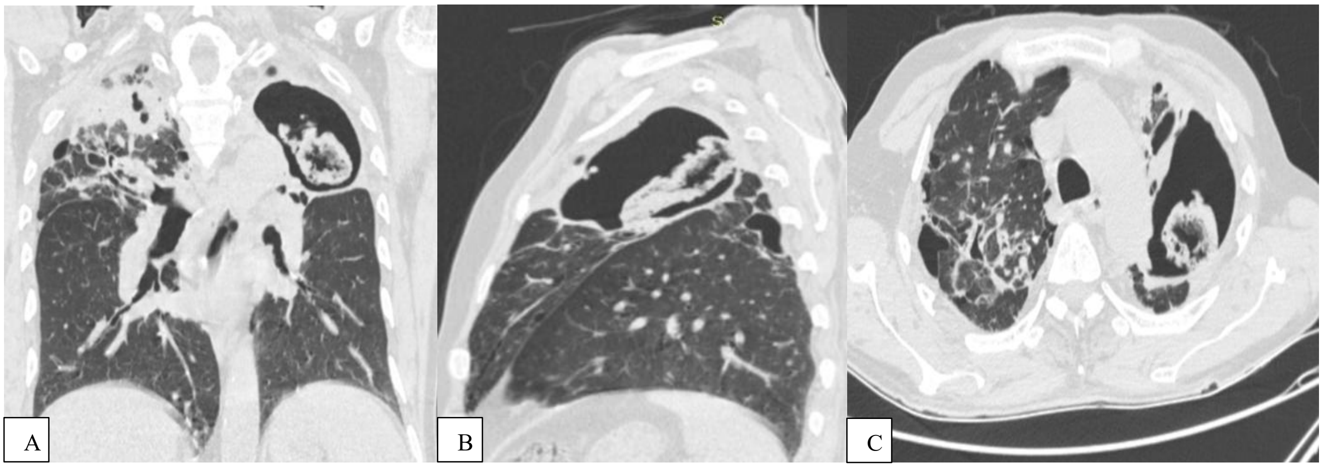

Figure 3 (A-C): HRCT lung images reveal multiple centriacinar nodules with tree-in-bud pattern and areas of consolidation with cavitation, suggesting post-primary TB with reactivation.

A thick-walled cavity with a developing fungal ball (monad sign) and associated bronchiectasis and paraseptal emphysema were noted.

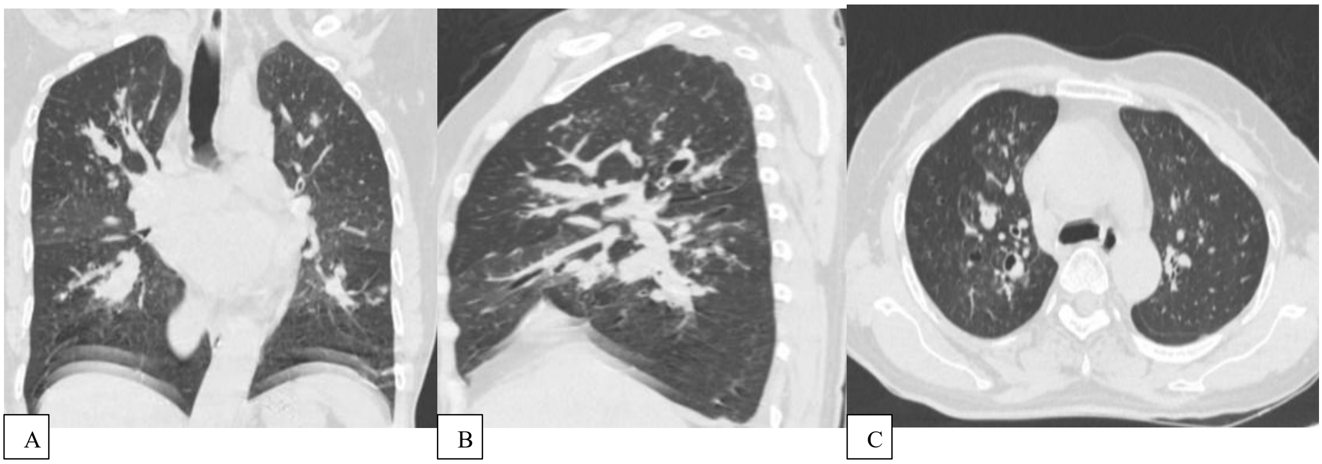

Figure 4 (A-C): HRCT lung images show central cystic and tubular bronchiectasis in bilateral upper and right middle lobes with mucoid impaction, producing a "finger-in-glove" appearance.

Along with a history of asthma, findings are suggestive of ABPA.

DISCUSSION

This study included 100 patients with suspected lung parenchymal pathologies evaluated by MSCT. The mean age was 44.7 years, with a male predominance. Common symptoms included fever (55%), breathlessness (48%), and cough (37%). MSCT revealed consolidation (56%), cavitation and ground-glass opacities (24% each), fibrosis (23%), nodules (20%), and mass lesions (8%). Infective etiologies were most common, particularly in cases with consolidation, nodules, and cavities. Bronchiectasis was seen in 11%, predominantly infective or ABPA-related. Mediastinal involvement was noted in 58%, while pleural pathologies occurred in 28%, including effusion, pneumothorax, and pleural thickening. Out of 100 patients evaluated with MSCT, one patient demonstrated a lung mass with a thick-walled cavity containing a dependent soft tissue component and an air crescent sign, findings consistent with a fungal ball. Franquet et al emphasized the role of CT in diagnosing pulmonary aspergilloma and ABPA.[7] Four cases of lung masses were detected in our study, with MSCT showing 100% accuracy, highlighting its reliability in the assessment of mass lesions, in agreement with Kaneko et al who reported the superiority of CT over chest radiography for detection of small peripheral lung tumors.[13] Multiple pulmonary nodules were identified in 16 patients (16%): nine infective, three ILD, and two neoplastic. Similar to our findings, Herold et al reported spiral CT as the most sensitive modality for the detection of lung metastases.[5] Cystic and cavitary lesions were observed in 35 patients, of which 19 (19%) were of infective origin, including tuberculosis. This is consistent with the observations of EL-Sabaa et al who demonstrated the usefulness of CT in evaluating such lesions.[11] Solitary pulmonary nodules were seen in four patients (4%), supporting the findings of Erasmus et al that morphological analysis is essential in their characterization.[14]

Strength and limitations

This study underscores the diagnostic value of MSCT in detecting a broad range of lung parenchymal abnormalities, including both common and uncommon patterns. MSCT enabled detailed anatomical assessment, supporting provisional diagnoses and clinical decisions across a diverse patient group. However, limitations include its single-center design, small sample size (n=100), and reliance on imaging-clinical correlation without consistent histopathological confirmation, which may introduce diagnostic bias. The absence of follow-up data and comparison with other imaging modalities (e.g., MRI, PET-CT) further limits assessment of MSCT's long-term utility and relative diagnostic performance.

CONCLUSION

This study emphasizes the vital role of MSCT in evaluating lung parenchymal pathologies. In 100 patients, MSCT effectively identified key abnormalities, including consolidation (56%), cavitation (24%), and ground-glass opacities (24%), with infections being the most common underlying cause. It also detected mass lesions (8%), mediastinal involvement (58%), and pleural abnormalities (28%), aiding in disease staging and management. MSCT distinguished overlapping patterns such as infectious, neoplastic, and interstitial pathologies, and accurately characterized ABPA, ILD, and fungal infections. Overall, MSCT proved to be a sensitive, non-invasive imaging tool, essential for comprehensive diagnosis and clinical decision-making in thoracic diseases.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Jadhav SP, Singh H, Hussain S, Gilhotra R, Mishra A, Prasher P, et al. Introduction to Lung Diseases. In: Dua K, Löbenberg R, Malheiros Luzo ÂC, Shukla S, Satija S, editors. Targeting Cellular Signalling Pathways in Lung Dis. Singapore: Springer. 2021;1-25.
2. Tack D, Howarth N. Missed Lung Lesions: Side-by-Side Comparison of Chest Radiography with MDCT. In: Hodler J, Kubik-Huch RA, von Schulthess GK, editors. Diseases of the Chest, Breast, Heart and Vessels 2019-2022: Diagnostic and Interventional Imaging. Cham (CH): Springer. (IDKD Springer Series). 2019.
3. Prokop M. General principles of MDCT. Eur J Radiol. 2003;45(1):S4-10.
4. Beigelman-Aubry C, Brillet PY, Grenier PA. MDCT of the airways: technique and normal results. Radiol Clin North Am. 2009;47(2):185-201.
5. Herold CJ, Bankier AA, Fleischmann D. Lung metastases. Eur Radiol. 1996;6(5):596-606.
6. Prokop M. Multislice Computed Tomography of the Lung Parenchyma. In: Marincek B, Ros PR, Reiser M, Baker ME, editors. Multislice CT: A Practical Guide. Berlin, Heidelberg: Springer. 2001;145-56.
7. Franquet T, Müller NL, Giménez A, Guembe P, de La Torre J, Bagué S. Spectrum of pulmonary aspergillosis: histologic, clinical, and radiologic findings. Radiographics. 2001;21(4):825-37.
8. Kim HY, Song KS, Goo JM, Lee JS, Lee KS, Lim TH. Thoracic sequelae and complications of tuberculosis. Radiographics. 2001;21(4):839-58.
9. Ahn MI, Gleeson TG, Chan IH, McWilliams AM, Macdonald SL, Lam S, et al. Perifissural nodules seen at CT screening for lung cancer. Radiology. 2010;254(3):949-56.
10. Van't Westeinde SC, de Koning HJ, Xu DM, Hoogsteden HC, van Klaveren RJ. How to deal with incidentally detected pulmonary nodules less than 10 mm in size on CT in a healthy person. Lung Cancer. 2008;60(2):151-9.
11. El-Sabaa A, Fathi A, Atta M, Kishk S. The Role of Multi-Detector Computed Tomography in the assessment of cystic and cavitary pulmonary Lesions. Alexandria J Med. 2010;46(2):195-206.
12. Narayanaswamy I, Jayaram N, Ashwathappa S. Multidetector Row Computed Tomography (MDCT) Evaluation of Bronchogenic Carcinoma and Histopathological Correlation. Int J Med Imaging. 2015;3(4):82-8.
13. Kaneko M, Eguchi K, Ohmatsu H, Kakinuma R, Naruke T, Suemasu K, et al. Peripheral lung cancer: screening and detection with low-dose spiral CT versus radiography. Radiology. 1996;201(3):798-802.
14. Erasmus JJ, Connolly JE, McAdams HP, Roggli VL. Solitary pulmonary nodules: Part I. Morphologic evaluation for differentiation of benign and malignant lesions. Radiographics. 2000;20(1):43-58.

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