



ORIGINAL RESEARCH PAPER

Radiodiagnosis

ASSESSMENT OF SOLITARY PULMONARY NODULE WITH EXTRAPULMONARY NEOPLASMS ON PLAIN CHEST RADIOGRAPH AND CT SCAN

KEY WORDS: CT Scan, Solitary Pulmonary Nodule, Neoplasm

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ABSTRACT

Purpose: Assessment of solitary pulmonary nodule with extra pulmonary neoplasm on plain chest radiograph and CT scan.
Material And Methods: This retrospective study include 50 patients with an extra pulmonary malignant neoplasm and a solitary pulmonary nodule , done in over a 6 – month period in J.L.N. Medical College Ajmer. Images were reviewed for the presence of solitary lung nodule. The histological characteristic of the nodule were correlated with those of extra pulmonary neoplasm and with patient age and smoking history.
Results : A spectrum of extra pulmonary neoplasm were associated with solitary pulmonary nodule including Carcinomas of the head & neck (18%), Carcinomas of the Bladder, Cervix, Ovary, Prostate ,Breast, Oesophagus and Stomach (24%), Carcinomas of the Colon, Kidney, Thyroid and Uterus (18%), Sarcomas and Testicular carcinoma (22%).

INTRODUCTION

Solitary pulmonary nodule - a discrete, well - margined, rounded opacity less than or equal to 3 cm in diameter that is completely surrounded by lung parenchyma, does not touch the hilum or mediastinum ,and is not associated with lymph adenopathy, atelectasis or pleural effusion. Lesions larger than 3 cm are considered masses and are treated as malignancies until proven otherwise.^[2]

Although the causes may include many benign conditions, bronchogenic carcinoma as a cause of solitary nodules has been increasing, especially in the elderly. However, in developing countries, tuberculosis and fungal infections are important clinical entities in the differential diagnosis of an SPN, especially in young age, non-smokers, and immuno compromised individuals.^[3,4]

It is not uncommon for a patient who currently has or has previously had extrapulmonary neoplasm to develop a solitary pulmonary nodule.^[5]

However, these nodules may not always be malignant.^[1]

Such a nodule may be detected with chest radiography or computed tomography performed as part of the work-up or follow -up of the known extrapulmonary malignancy.^[6]

The determination of the etiology of such a nodule is usually important to direct the appropriate therapy e.g., observation , resection , chemotherapy, radiation therapy or a combined approach. Sometimes it is difficult or impractical to obtain tissue and thus establish a definitive diagnosis.

In such cases , it may be helpful to know the likelihood that such a nodule represents a benign lesion, metastasis or primary bronchogenic carcinoma.

AIMS & OBJECTIVES

- To determine the frequency of single lung metastasis , primary lung cancer and benign lesions in patients with solitary lung nodule and a primary extra pulmonary neoplasm.
- To evaluate the Chest Radiographs & CT characteristics of solitary lung nodule with a primary extra pulmonary neoplasm.
- To develop a statistical model to guide clinicians regarding choice of patient for diagnostic biopsy.

MATERIAL & METHODS

- A retrospective analysis of CT Scan & Chest

Radiographs of 50 patients with an extrapulmonary malignant neoplasm and a solitary pulmonary nodule , done in over a 6 – month period in JLN Medical College & Associated Hospital Ajmer.

INCLUSION CRITERIA

- Only those patients who are willing to participate in study will be included.
- Patients referred to the radiology department for CT scan/ X-ray, and found to have solitary pulmonary nodule, will be included in this study.
- Already diagnosed cases of solitary pulmonary nodule, which need follow up radiological investigations and were referred to our radiology department, will be included in study.
- Patients coming for CT scan for diseases other than solitary pulmonary nodule, and are accidentally found to have solitary pulmonary nodule, will be included in this study.

EXCLUSION CRITERIA

- Patients presenting to radiology department having solitary pulmonary nodule in past and are cured completely will be excluded from the study.

DESCRIPTION OF TOOLS

CT scan Machine: Philips MX-16
 Contrast agent used: Urografin

- Images were reviewed for the presence of solitary lung nodule. If present, the following nodular characteristics were recorded :

- Sidedness
- Distribution
- CT attenuation
- Shape
- Size
- Margins - Corona radiata sign - highly associated with malignancy.
- Lobulated or scalloped margins - intermediate probability.
- Smooth margins - more likely benign unless metastatic in origin.
- Calcification - Diffuse, central, laminated or popcorn calcifications are benign patterns of calcification. These types of calcification are seen in granulomatous disease and hamartomas.
- All other patterns of calcification should not be regarded as a sign of benignity. The exception to the rule above is when patients are known to have a primary tumor.

For instance the diffuse calcification pattern can be seen in patients with osteosarcoma or chondrosarcoma. Similarly the central and popcorn pattern can be seen in patients with GI-tumors and patients who previously had chemotherapy.

• The histological characteristics of the nodule were

correlated with those of the extrapulmonary neoplasm and with patient age and smoking history.

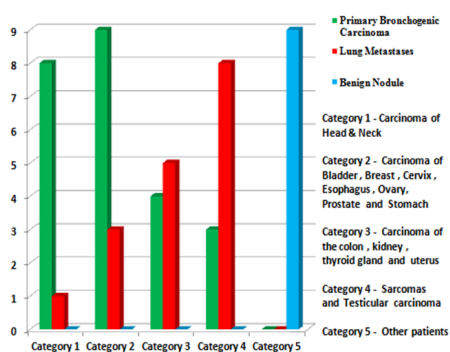
RESULTS

Distribution of cases was as per Figure 1 and Graph – 1.

Figure– 1: Distribution of cases.

Lung cancer	Primary Bronchogenic Carcinoma	Lung Metastases	Benign Nodule	Total Number of cases
Extrapulmonary Neoplasms				
Carcinomas of the Head & Neck	8	1	-	9
Carcinomas of the Bladder, Breast, Cervix, Esophagus, Ovary, Prostate and Stomach	9	3	-	12
Carcinomas of the colon, kidney, thyroid gland and uterus	4	5	-	9
Sarcomas and Testicular carcinoma	3	8	-	11
Other Patients	-	-	9	9
Total Number of cases	24	17	9	50

Graph – 1: Distribution of cases.



- Chief complaints of the patient - Severe shortness of breath, Headache, Altered mental status
- History of smoking was present.
- CT of the brain performed revealed an enhancing intra-axial lesion. Pathologically proven as a - Bronchogenic Carcinoma.

CASES

BENIGN PULMONARY NODULE

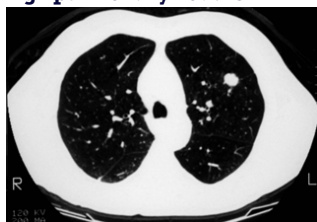
Right upper lobe nodule shows peripheral calcification and high Hounsfield unit enhancement, suggesting that the lesion is a calcified, benign pulmonary nodule (Figure – 1).

METASTATIC DEPOSIT

A 1.5 cm coin lesion in the left upper lobe in a patient with prior colonic carcinoma. Transthoracic needle biopsy findings confirmed this to be a metastatic deposit (Figure – 2).



Figure – 1: Benign pulmonary nodule.



METASTATIC DEPOSIT

Figure - 2 :Metastatic deposit Primary bronchogenic carcinoma with brain metastases (Figure – 3 to 5)



Figure -3

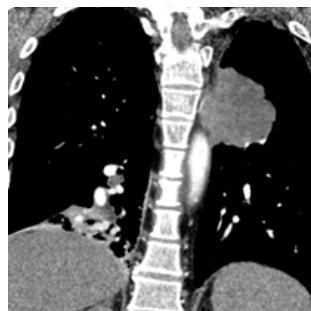


Figure -4



Figure -5

- **Lung metastases (Figure – 6 to 8)**
- Multiple calcified as well as soft tissue nodules in both the lung fields suggestive of lung metastases.
- Multiple enlarged necrotic mediastinal nodes seen, largest tracheo-bronchial node.

- Left para hilar lingual lobe of lung shows calcified scarring with surrounding heterogeneously enhancing soft tissue lesion of size 42 x 28 mm.
- Multiple poorly enhancing hypodense lesions seen in both lobes of liver of average size 1-3 cm, suggestive of liver metastases.



Figure - 6



Figure - 7



Figure - 8

Lung cancer left upper lobe (Figure – 9 to 14) A left upper lobe nodule with central lucency and poorly circumscribed margins was diagnosed as actinomycosis based on needle biopsy findings. Computed tomography (CT) scan of the patient in the previous image. After needle biopsy, the presence of classic sulfur granules confirmed a diagnosis of actinomycosis.

Figure – 9 to 14: Lung cancer left upper lobe.



Figure - 9

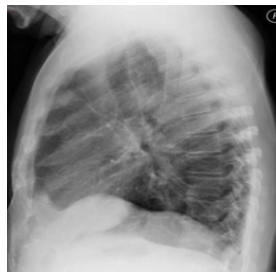


Figure - 10

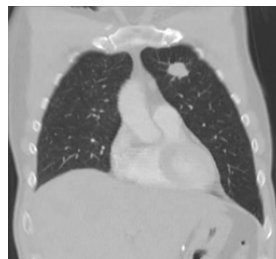


Figure - 11

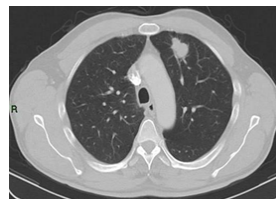


Figure - 12



Figure - 13

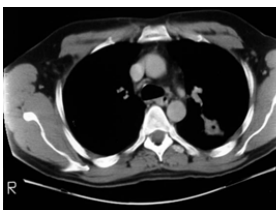


Figure - 14

Lung metastases with renal cell carcinoma (Figure – 15, 16)

Left Renal mass arising from midpole with perinephric involvement suggestive of malignant mass - Renal Cell Carcinoma. Subcentimeter lung nodule in right basal lung suggestive of lung metastases.



Figure - 15

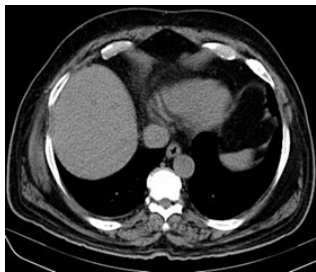


Figure -16
Oesophageal carcinoma with primary bronchogenic carcinoma

Right upper lobe posterior segment of lung shows enhancement, cavitary nodule with irregular margins. Malignant oesophagus mass involving mid and lower thoracic oesophagus with mediastinal nodal, lung, lytic bony metastasis (Figure- 17,18).

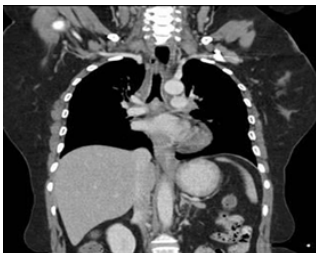


Figure - 17



Figure - 18
Primary bronchogenic carcinoma with bony metastases

Left lower lung shows collapse with underlying heterogeneously enhancing lesion. Multiple cervico-dorsal vertebrae at C6, C7, D2, D12, L1, L2 and L3 levels and in manubrium and sternum. Left lower lung mass with bilateral lung, liver and bony secondaries (figure-19).

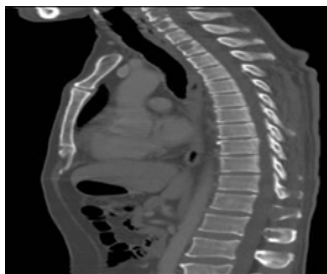


Figure - 19

CONCLUSION

- Solitary lung nodule in patients with extrapulmonary malignancies showed a variety of patterns on CT.
- Nearly half of the non-calcified solitary pulmonary nodules identified in this series were malignant.
- The likelihood of a spread depends on the histological characteristics of the extrapulmonary neoplasm and the patient's smoking history.
- Lung cancer was more common than metastatic disease.

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