

EVALUATION OF PRIMARY LUNG MALIGNANCY BY COMPUTED TOMOGRAPHY - STUDY OF 100 CASES

Radiology

Manisha

**Narayanbhai
Solanki**

Assistant Professor, Department of Radiology, GMERS Medical college & Hospital, Sola, Ahmedabad, Gujarat, India.

Vasantkumar

Jethabhai Rathod*

Assistant Professor, Department of Radiology, B.J. Medical college & Civil Hospital, Ahmedabad, Gujarat, India. *Corresponding Author

Sunil Virsingbhai

Charpot

Assistant Professor, Department of Radiology, GMERS Medical college & Hospital, Sola, Ahmedabad, Gujarat, India.

Falguni Ahan Shah

Professor, Department of Radiology, GMERS Medical college & Hospital, Sola, Ahmedabad, Gujarat, India.

ABSTRACT

BACKGROUND: Lung cancer is the leading cause of cancer-related deaths worldwide in both men and women. CT scan is the dominant modality in use for lung lesions. Aim of this study was to know relative frequency of different histopathological types of primary lung malignancy & to know their various CT appearances.

MATERIAL & METHOD: This prospective study was done in our institute GMERS Medical college & Hospital, Sola, Ahmedabad, Gujarat, India. It included 100 cases of lung lesions, which had undergone CT scan examination from January 2018 to December 2019 & which were later proved to be primary lung malignancy on further workup.

RESULTS: In our study, Maximum patients were in the age group 60 – 69 yrs. M:F ratio was around 2:1. Most common histopathological type was Adenocarcinoma followed by Squamous cell carcinoma. Majority of cases of Adenocarcinoma were having peripheral lesion, whereas all cases of Small cell carcinoma & majority of cases of Squamous cell carcinoma were having central lesion.

CONCLUSION: Adenocarcinoma is the most common type of primary lung malignancy. Spectrum of CT findings in primary lung malignancy includes peripheral nodule or mass, consolidation, hilar mass, endobronchial nodule, lymphangitis carcinomatosa, hilar/mediastinal lymphadenopathy and pleural effusion. CT remains the important investigation for diagnosis and evaluation of primary lung malignancy with a reasonable degree of diagnostic accuracy.

KEYWORDS

Lung Malignancy, Carcinoma, Computed tomography(CT).

INTRODUCTION:

Lung cancer is the leading cause of cancer-related deaths worldwide in both men and women. Known risk factors for lung cancer are Tobacco smoking, Increasing age, Occupational exposures to various substances (asbestos, arsenic, nickel, chromium, beryllium, cadmium, chromium, mustard gas, pesticides, and radon or uranium), Diffuse pulmonary fibrosis, Chronic obstructive lung disease (chronic bronchitis and emphysema), Genetic predisposition. CT scan is the dominant modality in use for lung lesions. CT is used to validate & further characterize the plain film abnormalities. CT scan is widely used in suspected or known case of primary lung malignancy. Aim of this study was to know relative frequency of different histopathological types of primary lung malignancy & to know their various CT appearances.

MATERIAL & METHOD:

Study type: Prospective study

Study period: January 2018 to December 2019

Study setting: Department of Radiology, GMERS Medical college & Hospital, Sola, Ahmedabad, Gujarat, India

Sample size: 100 patients

Study procedure:

Study included 100 cases of lung lesions which were later proved to be primary lung malignancy on further workup. CT scans were done using Siemens Somatom Emotion 16 slice CT scanner. Precontrast & postcontrast axial scan of thorax with upper abdomen (to include liver and adrenal glands) was done in all patients. Each patient was studied in detail with relevant clinical history and clinical examination findings. Tissue sample for confirmatory diagnosis was obtained by different methods (viz., USG guided biopsy, CT guided biopsy [Figure 1], Bronchoscopic biopsy & Bronchoalveolar lavage).

RESULTS:

After analysis of data of 100 patients, following results were obtained.

TABLE 1: AGE & SEX DISTRIBUTION

Age Group	No. of Male Patients	No. of Female Patients	Total No. of Patients
30-39 yrs	01	-	01
40-49 yrs	06	4	10
50-59 yrs	16	10	26
60-69 yrs	23	12	35
70-79 yrs	17	6	23
>80 yrs	05	-	05
Total	68	32	100

TABLE 2: HISTOPATHOLOGICAL TYPES OF PRIMARY LUNG CANCER & THEIR LOCATION

Type	No. of Patients with Central lesion	No. of Patients with Peripheral lesion	Total No. of Patients
Adenocarcinoma	11	34	45
Squamous cell carcinoma	20	11	31
Small cell carcinoma	21	-	21
Large cell carcinoma	-	3	3
Total	52	48	100

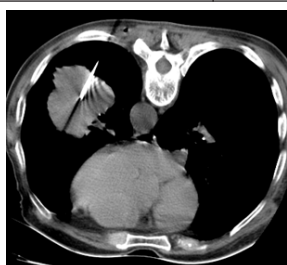
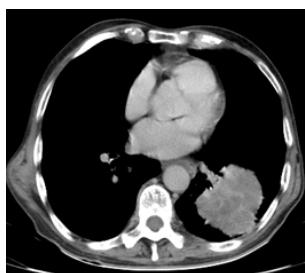
TABLE 3: CT FINDINGS

Finding	No. of patients
Peripheral Pulmonary nodule or mass	43
Consolidation	5
Hilar mass	45
Endobronchial polypoidal nodule	7
Calcification in lesion	08
Necrosis in lesion	14
Cavitation in lesion	09
Distal collapse/consolidation	17

Mediastinal invasion	12
Chest wall invasion	18
Vertebral invasion	05
Lymphangitis carcinomatosa	05
Hilar/Mediastinal lymphadenopathy	64
Pleural effusion	33
Distant Metastasis	36

TABLE 4: DISTRIBUTION OF METASTASIS

Site of metastasis	No. of Patients
Liver	12
Lung	11
Adrenal	09
Bones	07
Pleura	04
Brain	03
More than one organ	10

**Figure 1. Axial soft tissue window (prone) showing CT guided biopsy of lung mass.****Figure 2. CECT Thorax: Axial soft tissue window showing heterogeneously enhancing soft tissue density mass in left lower lobe. (Histopathology: Adenocarcinoma)****Figure 3. CT Thorax: Axial lung window showing right lower lobe mass with lobulated margin & tiny areas of cavitation. Background changes of interstitial lung disease are present. (Histopathology: Adenocarcinoma)****Figure 4. CT Thorax: Axial bone window showing right middle lobe mass invading the chest wall.****(Histopathology: Adenocarcinoma)****a.****b.****Figure 5. CECT Thorax: Axial (a) & coronal (b) images (soft tissue window) showing large heterogeneously enhancing soft tissue density mass in right upper lobe with central non-enhancing necrotic areas. (Histopathology: Squamous cell carcinoma)****a.****b.****Figure 6. CECT Thorax: Axial (a) & coronal (b) images (soft tissue window) showing Left hilar mass invading the mediastinum & encasing the left pulmonary artery with distal collapse of left lower lobe, left sided pleural effusion & mediastinal shift towards left side. (Histopathology: Squamous cell carcinoma)****Figure 7. CECT Thorax: Axial soft tissue window showing hepatomegaly with hypoenhancing multiple liver metastases and right adrenal metastasis.****DISCUSSION:**

Lung cancer mainly occurs in older people. Most people diagnosed with lung cancer are 65 or older; a very small number of people diagnosed are younger than 45. The average age of people when diagnosed is about 70.3. In our study, Maximum patients were in the age group 60 – 69 yrs. The youngest patient was 37 years old & eldest was 90 years old. In our study, 68 patients were male & 32 were female.

Adenocarcinoma is now said to comprise 40-50 % of all lung cancers. Squamous Cell Carcinoma currently accounts for about 20% of cases. Small cell carcinoma is the third most common histologic variety of primary lung cancer (15% to 20% of cases). Large Cell Carcinoma accounts for about 5% of lung cancers. In our study, most common histopathological type was Adenocarcinoma [Figure 2,3,4] followed by Squamous cell carcinoma [Figure 5,6].

In our study, majority of cases of Adenocarcinoma were having peripheral lesion, whereas all cases of Small cell carcinoma & majority of cases of Squamous cell carcinoma were having central lesion.

Primary lung cancer (especially adenocarcinoma & less commonly squamous cell carcinoma) can appear as consolidation with or without air-bronchogram. In our study, 5 cases presented as consolidation & all of them were Adenocarcinoma.

Cavitation has been detected in 7%-11% of primary lung cancers by plain radiography and in 22% by computed tomography.⁴ Cancers of squamous cell origin are the most likely to cavitate; this holds true for both primary lung tumors and metastatic tumors.⁵ Additionally, cavitation portends a worse prognosis.⁶ In a retrospective study of 60 patients conducted by Y Kunihiro et al.⁷, The maximum thickness of the cavity wall was significantly greater in squamous cell carcinomas than in adenocarcinomas; Ground-glass opacity and intratumoural bronchiectasis were significantly more common in adenocarcinomas than in squamous cell carcinomas. In our study, 9 cases were having cavitation, out of which 5 were Squamous cell carcinoma & 4 were Adenocarcinoma.

Calcification in a pulmonary nodule (PN) on imaging indicates a high probability that the lesion is benign. But not all calcified PN are benign.⁸ The widespread use of computed tomography (CT) has increased the sensitivity of detecting calcification in malignant tumors.⁹ In our study, 8 patients were having calcification in primary lung cancer.

ADENOCARCINOMA:

75% of Adenocarcinomas present as a peripheral nodule or mass. On thin-slice CT, adenocarcinoma most often appears as a nodule of soft tissue attenuation (solid), but a nodule of ground-glass opacity (GGO) with some solid components (subsolid or part solid) or a nodule entirely of GGO (nonsolid) may be seen. IMA (Invasive Mucinous Adenocarcinoma) has a propensity for multicentric, multilobar, and bilateral lung involvement, likely as the result of aerogenous metastases (metastatic spread via airways). Diffuse or multifocal lung involvement may have the appearance of lung consolidation or multiple illdefined nodules, which are solid or of GGO.²

SQUAMOUS CELL CARCINOMA (SCC):

SCC frequently (65%) arises in main, lobar, or segmental bronchi. A polypoid endobronchial mass or bronchial obstruction is frequently seen on CT. Hilar mass is also common due to the central location of the tumor, with local invasion and involvement of hilar lymph nodes. Atelectasis, consolidation, mucoid impaction (mucous bronchograms), and bronchiectasis are common findings, reflecting the presence of bronchial obstruction. Only about 30% of SCCs present in the lung periphery as a lung nodule or mass. Central necrosis and cavitation are more common than with other cell types.²

SMALL CELL LUNG CARCINOMA (SCLC):

SCLC originates from neuroendocrine cells, and electron microscopy shows neurosecretory granules in many cases of small cell carcinoma. Immunohistochemical analysis is helpful in distinguishing SCLC from other tumors. Small cell carcinoma tends to occur in the main or lobar bronchi and is associated with extensive peribronchial invasion and a large hilar or parahilar mass. Endobronchial tumor masses are less common than with SCC, but the large tumor mass frequently compresses bronchi. Atelectasis may be associated. This tumor is commonly associated with marked mediastinal lymph node enlargement. It is a common cause of superior vena cava (SVC) syndrome. Presentation as a lung nodule is very uncommon, accounting for less than 5% of cases. SCLC is a common cause of endocrine and neurologic paraneoplastic syndromes, including inappropriate antidiuretic hormone secretion, Cushing's syndrome, acromegaly, autoimmune neuropathy (Eaton-Lambert syndrome), encephalomyelitis, and limbic encephalitis.²

LARGE CELL CARCINOMA:

It tends to present as a large peripheral mass; more than 60% are larger than 4 cm at presentation. It is similar to adenocarcinoma in its radiologic characteristics (except for its large size) and behavior. As with adenocarcinoma, it tends to metastasize early and has a relatively poor prognosis.²

More than half of lung cancer patients have metastatic disease at presentation. Bones, adrenals, brain, and liver are the common distant metastatic sites.¹⁰ An autopsy study of 175 individuals with lung cancer metastases conducted by Milovanovic et al¹¹ revealed that Lung cancer most commonly spread through bloodstream to the liver (34.3%) and adrenal glands (32.6%), followed by bones (14.9%) and other organs: central nervous system (CNS) (12%), kidney (10.9%), myocardium (9.1%), pancreas (5.1%), spleen (4%), stomach (2.3%) and small or large intestines (3.4%), thyroid gland (1.7%), and the ovary (0.6%). In our study, most common site of distant metastasis

was liver [Figure 7]. 10 patients had metastasis in more than one organ. Radiological evaluation of brain for metastasis was not done in each and every patient of our study.

In our study, significant number of patients presented with advanced disease and metastasis, when the disease was non-resectable and the prognosis was poor.

CONCLUSION:

CT scan is the dominant modality in use for lung lesions. CT is used to validate & further characterize the plain film abnormalities. Evaluation of a patient with known or suspected primary lung malignancy requires the detection and characterization of the lesions involving the lungs, hila, mediastinum, pleura & chest wall. Adenocarcinoma is the most common type of primary lung malignancy. Spectrum of CT findings in primary lung malignancy includes peripheral nodule (solid, part solid or nonsolid) or mass, consolidation with or without air-bronchogram, hilar mass with or without producing cut-off of bronchus, endobronchial nodule with or without distal collapse/consolidation, lymphangitis carcinomatosa, hilar/mediastinal lymphadenopathy and pleural effusion. CT scan is essential in TNM staging of primary lung malignancy. CT remains the important investigation for diagnosis and evaluation of primary lung malignancy with a reasonable degree of diagnostic accuracy.

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