



A STUDY OF IMAGING SIGNS OF THORACIC LESIONS AND COMPARISON OF IMAGING DIAGNOSIS BY CT WITH FINAL DIAGNOSIS BASED ON HISTOPATHOLOGY/CYTOLOGY:

Radiodiagnosis

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ABSTRACT

Background:

CT has been one of the greatest inventions of the 21st century. In the right pair of hands it can do wonders to a suffering patient. The time is not far where CT diagnosis will be considered a Gold standard for the diagnosis of the Thoracic Lesions. Presently the final diagnosis as a rule should be considered after taking Histo-pathological confirmation. This study puts in a sincere effort to study and understand the signs of thoracic lesions and compare this data with that of the Histo-pathological confirmation.

KEYWORDS

Imaging Signs, Thoracic Malignancy, Histo-pathology, Cytology

Introduction:

As the progression of pulmonary malignancy is high, pulmonary lesions need to be diagnosed early. Granulomas and bronchogenic cancers constitute the vast majority of pulmonary nodules. The incidence of malignant disease ranges from 10 to 70% with an average of 40%.¹ Other common causes of pulmonary nodules are hamartomas, metastases, infarcts, vascular malformations, focal inflammatory masses and lipid pneumonia etc. in decreasing order of frequency.²

A solitary pulmonary nodule (SPN) is a round or oval opacity smaller than 3 cm in diameter that is completely surrounded by pulmonary parenchyma and is not associated with lymphadenopathy, atelectasis, or pneumonia. Lung lesions greater than 3 cm in size are defined as lung masses.³ A SPN is noted on up to 0.2% of chest radiographs.³ Bronchogenic carcinoma is the commonest cancer in men and in women it comes after breast, colon and skin cancers. The single most important etiological factor is cigarette smoking.

Metastatic lung disease in adults are usually from cancers of the breast, gastrointestinal tract, kidney, testes, head and neck tumours or from a variety of bone and soft tissue sarcomas. Haematogenous pulmonary metastases occur in the form of one or more discrete pulmonary nodules located usually in the outer portions of the lungs, a distribution that is most evident on CT.⁴ The nodules are usually spherical and well defined, but they may be almost of any shape and can also have an irregular edge occasionally. Such irregular edges are seen particularly with metastases from adenocarcinomas. Cavitation is occasionally seen in pulmonary metastases which is a particular feature of squamous cell carcinoma. Calcification is very unusual except in osteosarcoma and chondrosarcoma.⁵ Even if the primary tumour shows calcification, e.g. in breast and colon, visible calcification in pulmonary metastases is rare. The rate of growth of metastases is highly variable; in some choriocarcinomas and osteosarcomas, for example, it may be explosive and the lesions double in volume in less than 30 days.^{6,7}

This study puts in a sincere effort to record and correlate the tissue procured by CT guided interventional procedures with the cytopathological and histopathological findings in the diagnosis of thoracic lesions. This study is intended to benefit the practicing Radiologists to identify and thus help to quickly diagnose and take desperate immediate interceptive measures to stop the natural progression of the disease.

Aims and Objectives:

To record and correlate the material (tissue) procured by CT guided interventional procedures (fine needle aspiration cytology, automated core needle biopsy) with the cytopathological and histopathological findings in the diagnosis of thoracic lesions.

Materials and Methods:

This is a hospital based observational study of CT guided interventional procedures in patients with thoracic lesions diagnosed by imaging methods like chest radiograph, CT or MRI scans. These

patients were referred to the department of radiodiagnosis for CT guided thoracic interventions from the chest medicine department and other clinical departments of Kanachur Institute of Medical Sciences, Mangalore. The duration of the study is for a period of 18 months from September 2017 to April 2018.

INCLUSION CRITERIA:

- Patients with thoracic lesions referred for CT guided core biopsy, fine needle aspiration cytology or drainage.

EXCLUSION CRITERIA:

1. Non co-operative patients incapable of adequate breath-holding.
2. Uncorrected coagulation abnormalities.
3. Patients at high risk for pneumothorax or haemothorax due to difficult access to the lesions.

The nature of the lesions that was presented on CT was noted and then the specimen was collected using FNAC/CNB. The specimens that were thus procured were sent to the Department of Pathology for the final Diagnosis.

METHODS OF STATISTICAL ANALYSIS

1. Descriptive analysis was adopted to present the study data using percentages and proportions.
2. Validation of CT in diagnosing benign and malignant lesions of the thorax (when compared with final pathological diagnosis) was undertaken by computing validity measures like sensitivity, specificity, positive predictive value and negative predictive value.

Results:

Table 1 - Sex and age distribution of patients.

AGE GROUP IN YEARS	MALE	FEMALE	TOTAL NUMBER
BELOW 10	0	0	0
11 TO 20	0	1	1
21 TO 30	0	1	1
31 TO 40	0	1	1
41 TO 50	2	4	6
51 TO 60	4	3	7
61 TO 70	4	2	6
MORE THAN 70	3	1	4
TOTAL	13	13	26

Table 2 - CT evaluation of thoracic lesions.

TOTAL NUMBER	BENIGN	MALIGNANT	INDETERMINATE
26	8	16	2

Table 3 - Histopathology report of tissue obtained by core biopsy.

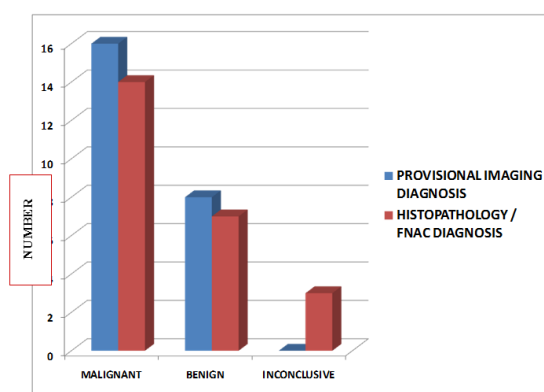
TISSUE	NUMBER	PERCENTAGE
BENIGN	5	23.81

MALIGNANT	14	66.67
INADEQUATE	0	0
NORMAL	2	9.52
TOTAL	21	100

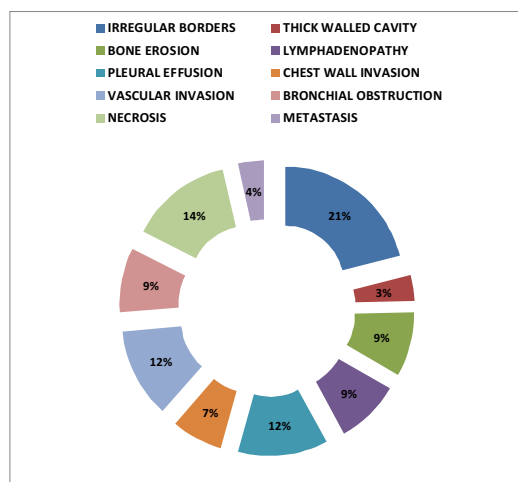
Table 4 - Cytology report of tissue obtained by fine needle aspiration

TISSUE	NUMBER	PERCENTAGE
BENIGN	2	28.57
MALIGNANT	0	0
INADEQUATE	5	71.43
NORMAL	0	0
TOTAL	7	100

Graph 1 – Benign and malignant lesions based on imaging and pathological diagnosis.



Graph 2 – Imaging signs of malignancy.



COMPARISON OF IMAGING DIAGNOSIS BY CT WITH FINAL DIAGNOSIS BY HISTOPATHOLOGY / CYTOLOGY FOR BENIGN AND MALIGNANT LESIONS OF THE THORAX:

Table 1 - Benign lesions.

	HISTOPATHOLOGY/CYTOLOGY REPORT		
CT	Positive	Negative	Total
Positive	6	2	8
Negative	1	15	16
	7	17	24

CT sensitivity for benign lesions – 75%

CT specificity for benign lesions – 93.75%

Positive predictive value of CT – 75%

Negative predictive value of CT – 93.75%

Table 2 - Malignant lesions.

	HISTOPATHOLOGY/CYTOLOGY REPORT		
CT	Positive	Negative	Total
Positive	14	2	16
Negative	0	7	7
	14	9	23

CT sensitivity for malignant lesions – 100%

CT specificity for malignant lesions – 77.78%

Positive predictive value of CT – 87.50%

Negative predictive value of CT – 100%

Discussion:

Image guided thoracic interventions are the result of advancements in cross-sectional imaging. CT is the most commonly used imaging modality for thoracic interventions. These minimally invasive thoracic interventions like CT guided transthoracic lung biopsy and transthoracic fine needle aspiration cytology have become very popular for the diagnosis and management of thoracic lesions and hence more invasive procedures such as thoracoscopy, mediastinoscopy and thoracotomy can be avoided.⁷

This study was designed to determine the efficacy of CT guided interventional procedures for the diagnosis of benign and malignant lesions of the thorax. In this hospital based observational study, the total number of patients was 26, of which 13 patients were males and the remaining 13 were females. The age group of the patients ranged from 16 years to 80 years. Maximum number of patients were in the age group of 51 to 60 years, with a value of 7 accounting for 27% of the total patients. This was followed by age groups 41 to 50 years and 61 to 70 years, each of which had 6 patients. There were 4 patients aged above 70 years. Age groups of 11 to 20 years, 21 to 30 years and 31 to 40 years had 1 patient each. There was only one pediatric patient, who was a female aged 16 years.

The 26 patients underwent imaging investigations like chest radiograph and CT scan for diagnosis of thoracic lesions. Then CT guided interventions which comprised of percutaneous transthoracic core needle biopsy and transthoracic fine needle aspiration cytology were done after the patients gave written consent for the procedure and after through patient preparation was done as described previously. The patients were also explained in their own language the type of procedure including risks and the complications like pneumothorax and pulmonary hemorrhage which may arise after the procedure. All patients were subjected for bleeding and clotting parameters in the form of clotting time, bleeding time, prothrombin time and activated partial thromboplastin time. Subjects with normal clotting and bleeding parameters were included in the study and the rest were excluded.

The maximum number of patients with thoracic lesions was in the 51 to 60 years age group which comprised of 7 patients. Thoracic CT revealed 16 lesions as being malignant based on certain imaging signs such as irregular borders, necrosis, bone erosion, chest wall invasion, vascular invasion, bronchial obstruction etc. which were more common in these malignancies. Malignant lesions usually have irregular borders and areas of necrosis when seen on imaging. Malignant thoracic lesions may also invade the chest wall and adjacent vascular structures. They can invade bronchi and cause airway obstruction.⁵ Five lesions were considered as being benign and the remaining five as indeterminate.

Conclusion:

CT evaluation and CT guided interventions are effective tools in the diagnosis and management of patients with thoracic lesions allowing prompt documentation of both benign and malignant lesions.

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