

CORRELATION BETWEEN CECT FINDINGS OF LUNG MASSES AND HISTOPATHOLOGICAL OUTCOME BASED ON CT GUIDED TRU-CUT BIOPSY

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ABSTRACT

INTRODUCTION:

Lung cancer is a leading cause of cancer-related deaths globally. Histopathological diagnosis is crucial for appropriate management of lung lesions detected by CT imaging. CT-guided Tru-cut biopsy is a highly accurate and sensitive diagnostic procedure in thoracic malignancy. The aim of this study was to investigate the correlation between the radiological features of lung masses and histopathological outcomes and to evaluate the usefulness of Tru-cut biopsy as an analytical strategy in lung tumors.

METHODS:

A cross-sectional study was conducted at Yenepoya Medical College Hospital, Mangalore, from July 2020 to January 2023. All patients diagnosed with a lung mass on CT imaging who underwent CT-guided biopsy were identified using complete enumeration. Histopathological reports of the biopsy specimens were obtained from the Department of Pathology. The provisional diagnosis given by the radiologists based on the CT findings was noted and correlation with the histopathological study was done using Fischer's exact test.

RESULTS:

29 patients were included in the study. The mean age was 58 years and male patients were more common than female patients (82.8% vs. 17.2%). Most patients (86%) had only one lesion and the majority of the lesions were located in the upper lobes of the lungs (37.9% on the right and 20.7% on the left). The shape of the lesions was lobulated in 79.3% of cases, while the margins were spiculated in 72.4% of cases. Heterogeneous enhancement was seen in 89.7% of cases. Other positive findings associated with the lesions included cavitations (6.9%), calcification (10.3%), lymphadenopathy (62.1%), pleural effusion (31.0%), lung collapse (27.6%), mediastinal involvement (24.1%) and chest wall invasion (17.2%). Histopathological analysis revealed that 86.2% of the cases were malignant while 13.8% were benign.

CONCLUSION:

CT-guided Tru-cut biopsy is a highly accurate and sensitive diagnostic procedure in thoracic malignancy. The study results provide valuable information on the radiological features of lung masses and their association with histopathological outcomes. These findings can be useful in guiding further evaluation and management of patients with lung masses. However it is important to note that the sensitivity and specificity of imaging in predicting the underlying pathology of lung masses may vary depending on the population studied and additional evaluation is often required to confirm the diagnosis.

Keywords - lung cancer, CT-guided biopsy, histopathology, radiological features.

1. INTRODUCTION

Lung cancer is a standout amongst the most widely recognized causes for malignancy related demise around the world. With the advent of CT an expanding number of lung carcinomas are detected and diagnosed. Lung malignancy is the most common cause of morbidity and mortality worldwide. With the advent of CT high numbers of lung lesions are detected and characterized. But histopathological diagnosis is often necessary to determine the appropriate management of these lesions. In this clinical scenario image-guided biopsy is one of the key methods to obtain tissue specimens. Several imaging techniques including computed tomography, fluoroscopy and ultrasound can be used to guide chest biopsies but CT is most frequently employed because of its high spatial and contrast resolution as well as its 3D imaging ability; in many cases CT is ideal based on the localization of the nodule or patient-related factors.[1]

Tru-cut biopsy is a simple procedure, safe, rapid, reliable technique for the diagnosis of lung mass lesions particularly with the aid of CT scan. The diagnostic precision has been reported as being >80% for benign disease and >90% for malignant disease. CT with core biopsy not only distinguishes between benign and malignant lesions but also helps in establishment of histological diagnosis of lung cancer, so instigation of appropriate chemotherapy or surgery is possible without unnecessary delay. CT-guided Tru-cut biopsy is an accurate and sensitive diagnostic procedure in thoracic malignancy.[2]

Indications include a new or enlarging solitary nodule or mass greater than 1cm in diameter, multiple nodules in a patient without known neoplastic disease or in prolonged remission, non-resolving consolidation, diagnosis of hilar masses following negative bronchoscopy, biopsy of malignant masses for molecular diagnosis and targeted therapy.[1] This study is conducted to correlate the radiological features of lung masses with histopathological outcomes and to survey the usefulness of Tru-cut biopsy as an analytic strategy in lung tumors [3].

By this study we intend to analyze the effectiveness of CECT imaging in the diagnosis of lung masses. All patients who are diagnosed to have lung mass on CT imaging and undergone CT guided biopsy according to the inclusion and exclusion criteria in Yenepoya Medical College Hospital from July 2020 to January 2023 were identified using Hospital information system. Histopathological reports of the biopsy specimens were obtained from the Department of Pathology. The provisional diagnosis given by the radiologists based on the CT findings were noted and correlation of CT findings with the histopathological study was done. Statistical significance of this correlation was calculated using Fischer's exact value and the two tailed p value was derived. Statistical analysis was done in respect to histopathological results.

2. METHODOLOGY

STUDY DESIGN: Cross sectional study

STUDY SITE: Yenepoya Medical College Hospital, Mangalore

STUDY DURATION: July 2020 to January 2023

PARTICIPANT DETAILS

SOURCE OF DATA: Patients attending Yenepoya Medical College Hospital, Mangalore who meet the inclusion and exclusion criteria.

SAMPLE SIZE: Complete enumeration (29)

METHOD OF SAMPLING (SAMPLING TECHNIQUE): Complete enumeration.

RANDOMIZATION AND BLINDING (IF ANY): Nil

INCLUSION CRITERIA:

- Patients diagnosed to have lung masses on CT imaging and undergone CT guided biopsy of the same.

EXCLUSION CRITERIA:

- Lung biopsies acquired through other modalities.
- Other tumors.

DETAILS OF THE METHODOLOGY INCLUDING DETAILS OF SAMPLE COLLECTION:

Approval of the Institutional Ethics Committee was taken before conducting the study. The study was conducted in accordance with the ethical norms as laid down in the Declaration of Helsinki. Strict confidentiality of the information collected was maintained. All the data are saved in a private laptop which is password protected. Only researchers and guides have access to the data. The requirement for informed patient consent was waived.

All patients diagnosed to have lung mass on CT imaging and undergone CT guided biopsy in Yenepoya Medical College Hospital from July 2020 to January 2023 were identified using Hospital information system. Histopathological reports of the biopsy specimens were obtained from the Department of Pathology.

18G needles were used to acquire the specimen. Received biopsy specimens were fixed in formalin and stained with haematoxylin and eosin and sections were studied. Latest WHO recommendations for small biopsies were followed while reporting. The tumors were classified as small cell carcinoma [SCC] or Non-small cell carcinoma [NSCC]. If the tumor cell had neuroendocrine morphology it was classified as SCC. Immunohistochemical markers like CD56 and TTF-1 were used in difficult cases. CT scan was used to measure the mass and to locate the tumor.

Along with that node involvement and metastasis was assessed using the CT scan. The provisional diagnosis given by the radiologists based on the CT findings were noted and correlation of CT findings with the histopathological study was done. Statistical significance of this correlation was calculated using Fischer's exact value and the two tailed p value was derived. Statistical analysis done in respect to histopathological results.

DETAILS OF ANALYSIS

Data is analyzed using the IBM SPSS software. Categorical data is described using frequencies and percentages and continuous data described using mean and standard deviation. Chi-square test is used to compare percentages. A *p*-value of less than 0.05 is considered statistically significant.

3. RESULTS

The study provides a detailed description of the characteristics of lung masses seen on CECT imaging including their age and gender distribution, number and location of the lesions, shape and margins of the lesions, enhancement characteristics and other positive findings associated with the lesions.

The age distribution of the patients in the study ranged from 35 to 77 years with a mean age of 58 years. The majority of the patients (41.4%) were over 60 years old. The gender distribution was skewed towards male patients (82.8%). These demographic characteristics

are important to consider when evaluating lung masses as age and gender can affect the likelihood of certain types of lung lesions such as lung cancer.

Regarding the characteristics of the lung lesions, most patients (86%) had only one lesion, while 6.9% had multiple lesions. The majority of the lesions were located in the upper lobes of the lungs (37.9% on the right and 20.7% on the left), followed by the lower lobes (20.7% on the left and 6.9% on the right). These findings are consistent with previous studies that have shown that lung masses are more commonly located in the upper lobes of the lungs.

The shape of the lesions was lobulated in 79.3% of cases, while 20.7% were round. The margins of the lesions were spiculated in 72.4% of cases, nodular in 17.2% of cases and irregular in 10.3% of cases. The lobulated shape and spiculated margins of the lesions are commonly associated with malignancy and are important features to evaluate when considering the possibility of lung cancer.

Heterogeneous enhancement was seen in 89.7% of cases, while homogenous enhancement was seen in 10.3% of cases. This is an important finding as heterogeneous enhancement can be associated with malignancy and can help guide further evaluation of the lesion.

Other positive findings associated with the lesions included cavitations (6.9%), calcification (10.3%), lymphadenopathy (62.1%), pleural effusion (31.0%), lung collapse (27.6%), mediastinal involvement (24.1%) and chest wall invasion (17.2%). These variables are important to consider when evaluating lung masses as they can provide clues to the underlying pathology of the lesion.

Histopathological analysis of the lung lesions revealed that 86.2% of the cases were malignant, while 13.8% were benign. This finding highlights the importance of further evaluation of lung masses as the majority of cases were found to be malignant.

Overall, the study provides a comprehensive evaluation of the characteristics of lung masses seen on CECT imaging and their association with histopathological outcomes. These findings can be useful in guiding further evaluation and management of patients with lung masses.

Table 1: Age distribution of the patients in the study.

Age distribution	F	%
≤ 40 yrs	2	6.9%
41 – 50 yrs	2	6.9%
51 – 60 yrs	13	44.8%
>60 yrs	12	41.4%
Total	29	100%

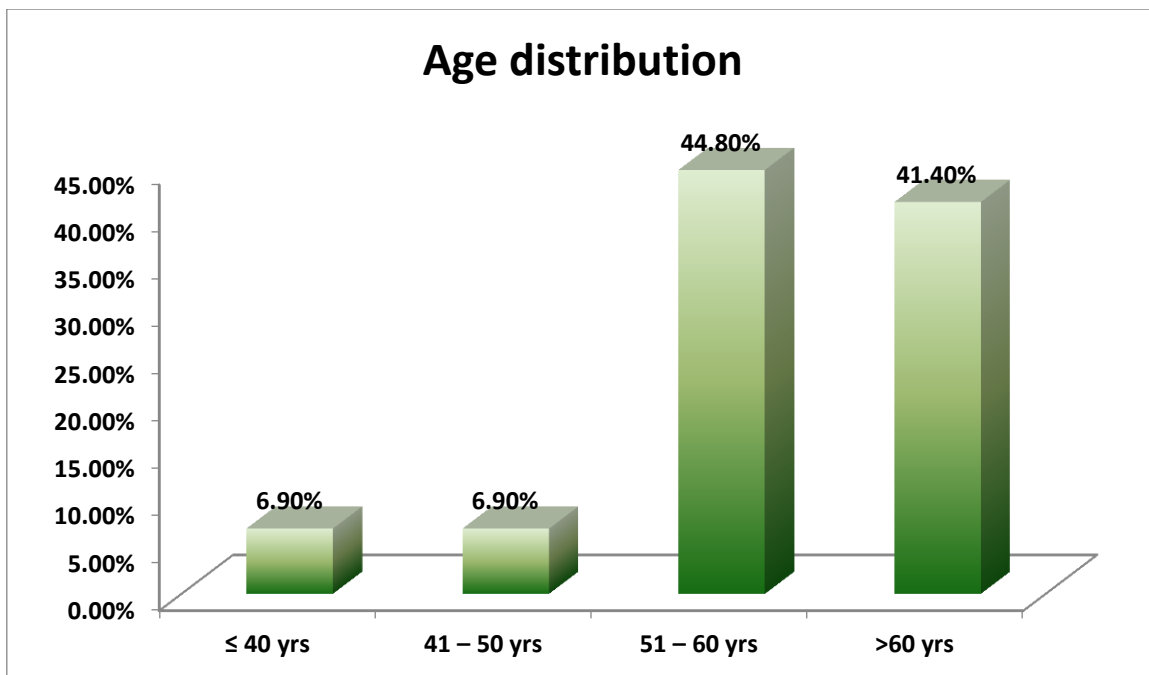


Table 2: Gender distribution of the patients in the study.

Gender distribution	F	%
Male	24	82.8%
Female	5	17.2%
Total	29	100%

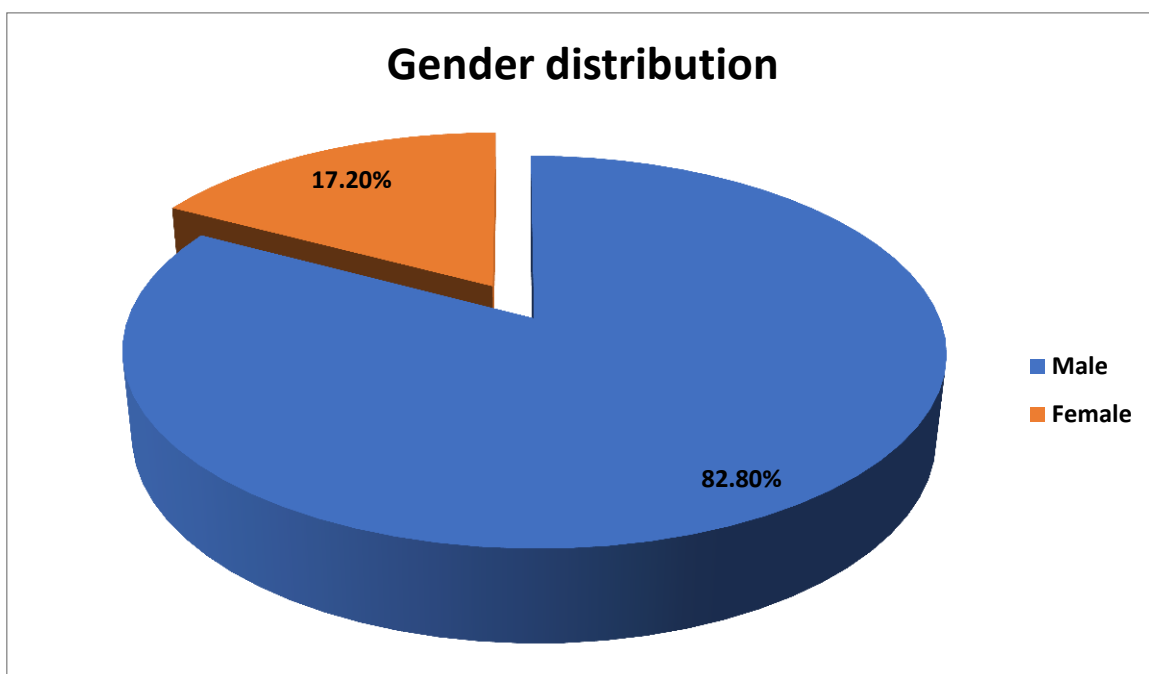


Table 3: Number of lesions:

No. of lesions	F	%
One	25	86.%

Two	1	3.4%
Three	1	3.4%
Multiple	2	6.9%
Total	29	100%

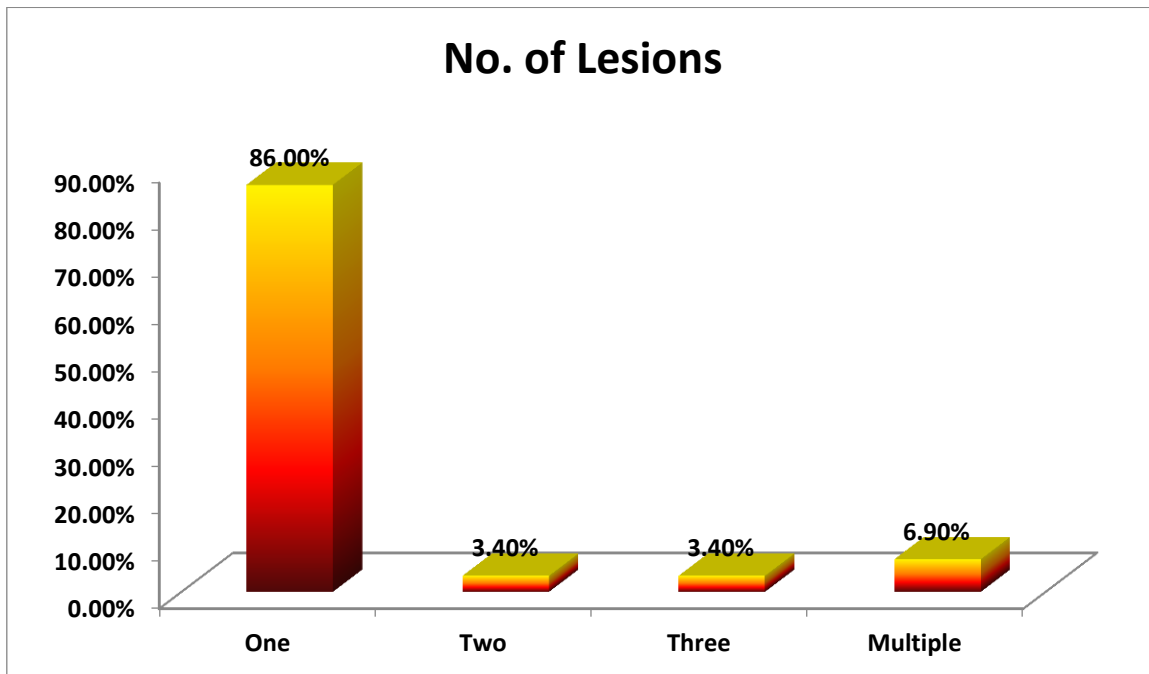


Table 4: Location of lesions:

Location of the lesions	F	%
Left hilum	2	6.9%
Right hilum	1	3.4%
Left lower lobe	6	20.7%
Right lower lobe	2	6.9%
Left upper lobe	6	20.7%
Right upper lobe	11	37.9%
Right middle lobe	1	3.4%
Total	29	100%

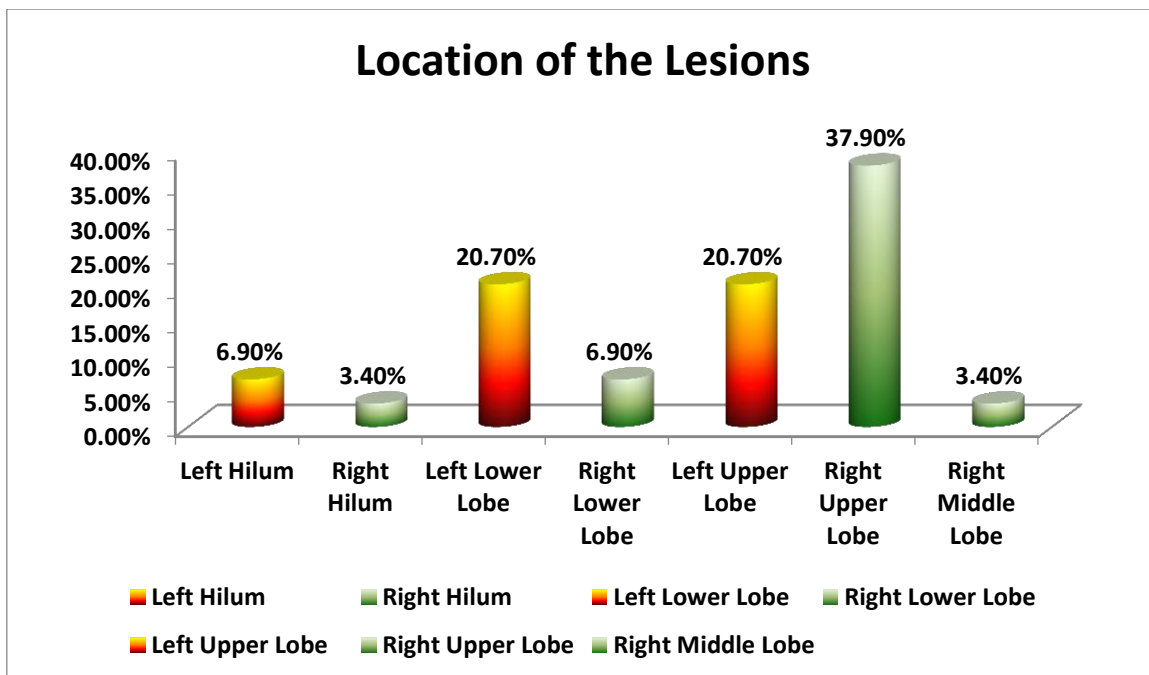


Table 5: Shape of the lesions:

Shape	F	%
Lobulated	23	79.3%
Round	6	20.7%
Total	29	100%

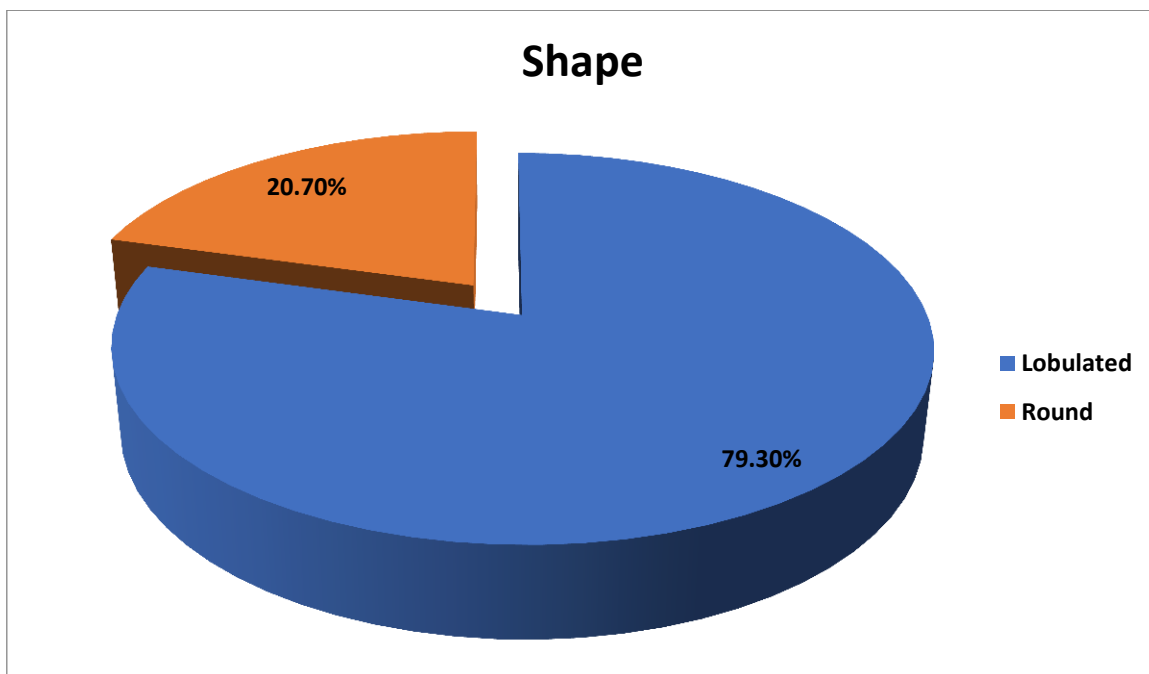


Table 6: Margins of the lesions:

Margins	F	%
Irregular	3	10.3%
Nodular	5	17.2%
Spiculated	21	72.4%
Total	29	100%

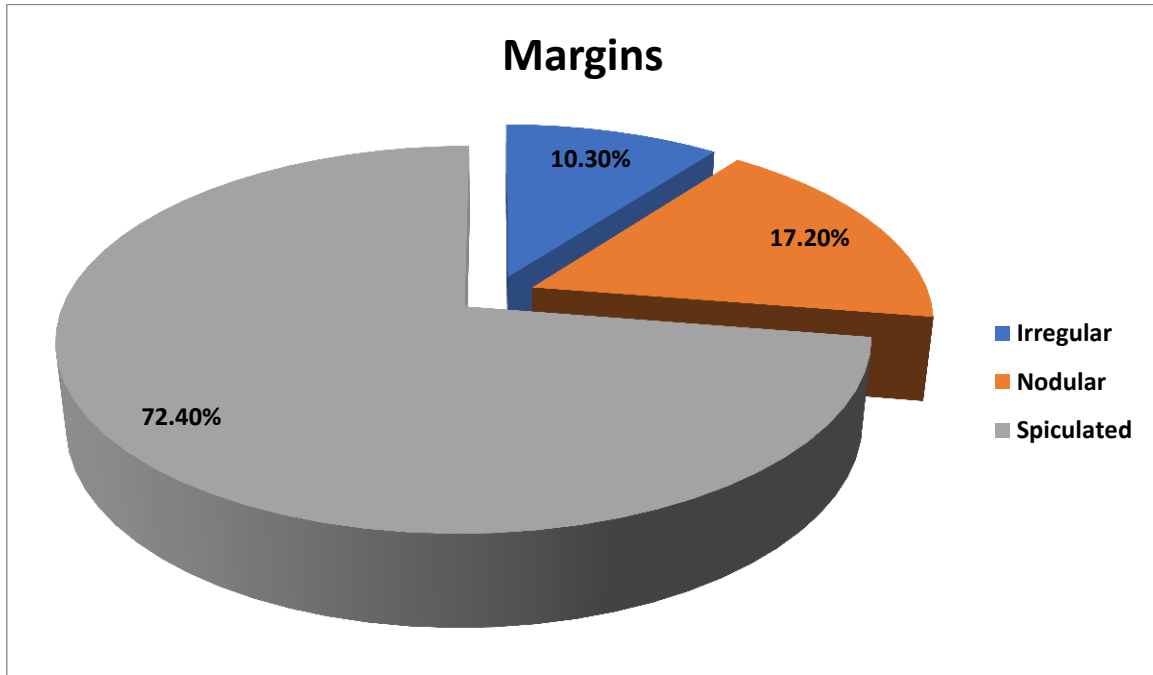


Table 7: Enhancement characteristics of the lesions:

Enhancement	F	%
Heterogeneous	26	89.7%
Homogenous	3	10.3%
Total	29	100%

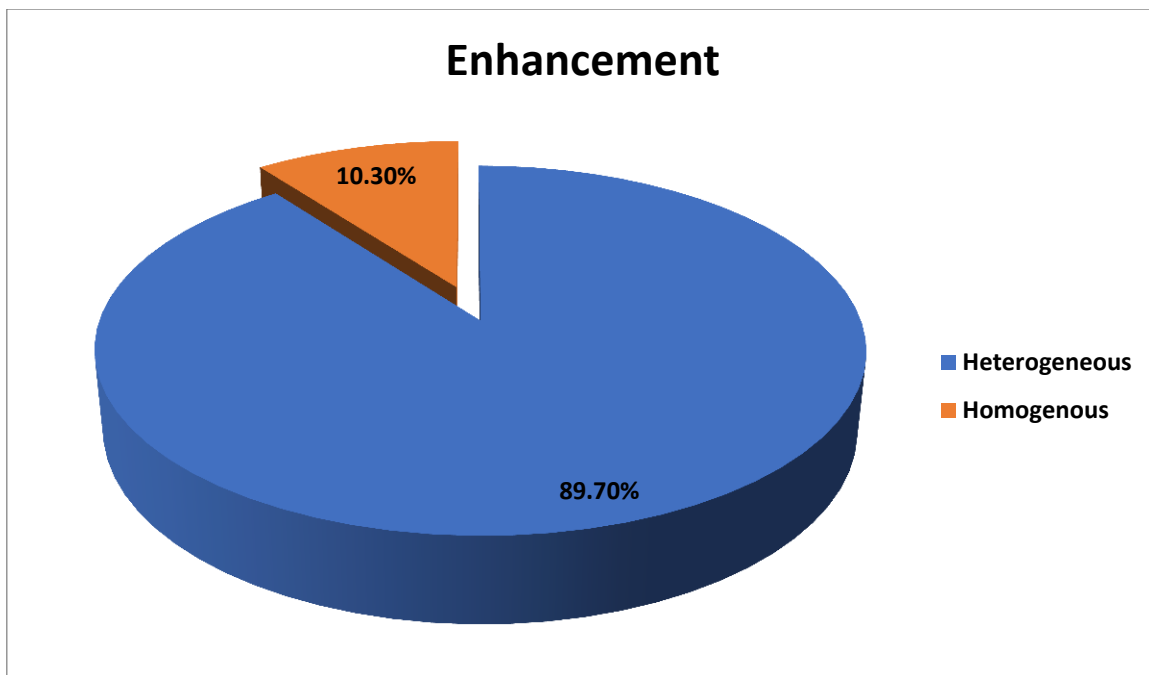


Table 8: Other positive findings associated with the lesions including cavitations, calcification, lymphadenopathy, pleural effusion, lung collapse, SVC involvement, mediastinal invasion, and chest wall invasion.

Finding	No.of patients	%
Cavitations	2	6.9%
Calcification	3	10.3%
Lymphadenopathy	18	62.1%
Pleural effusion	9	31.0%
Lung collapse	8	27.6%
SVC	0	0.0%
Mediastinal invasion	7	24.1%
Chest wall invasion	5	17.2%

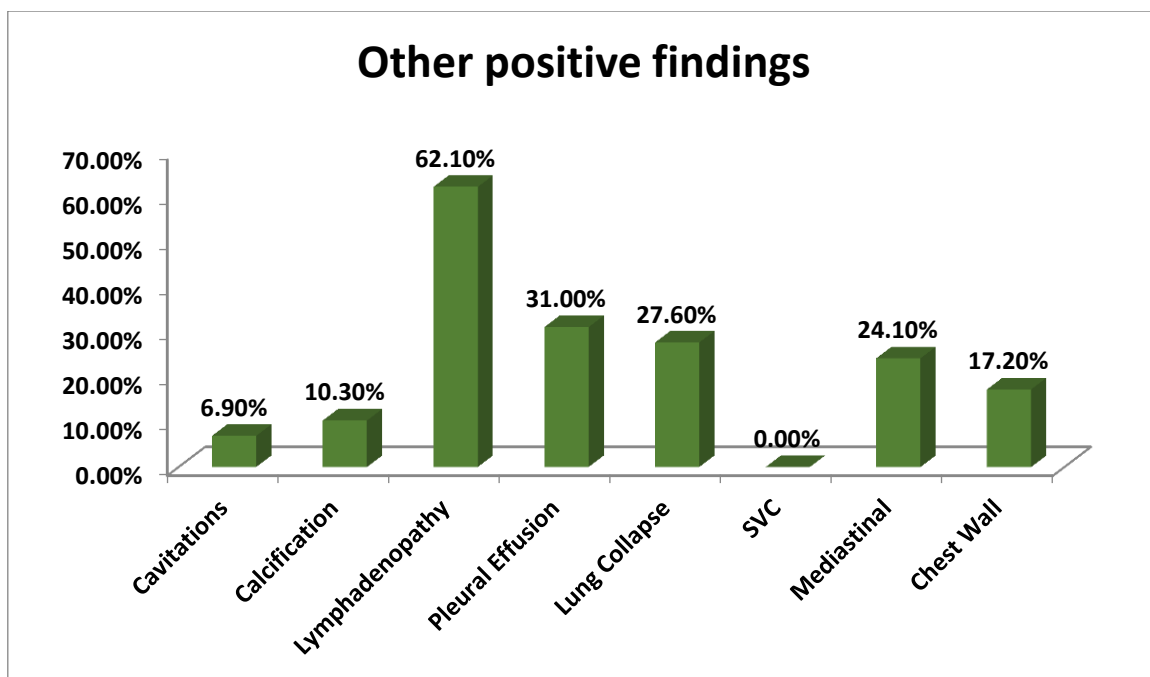
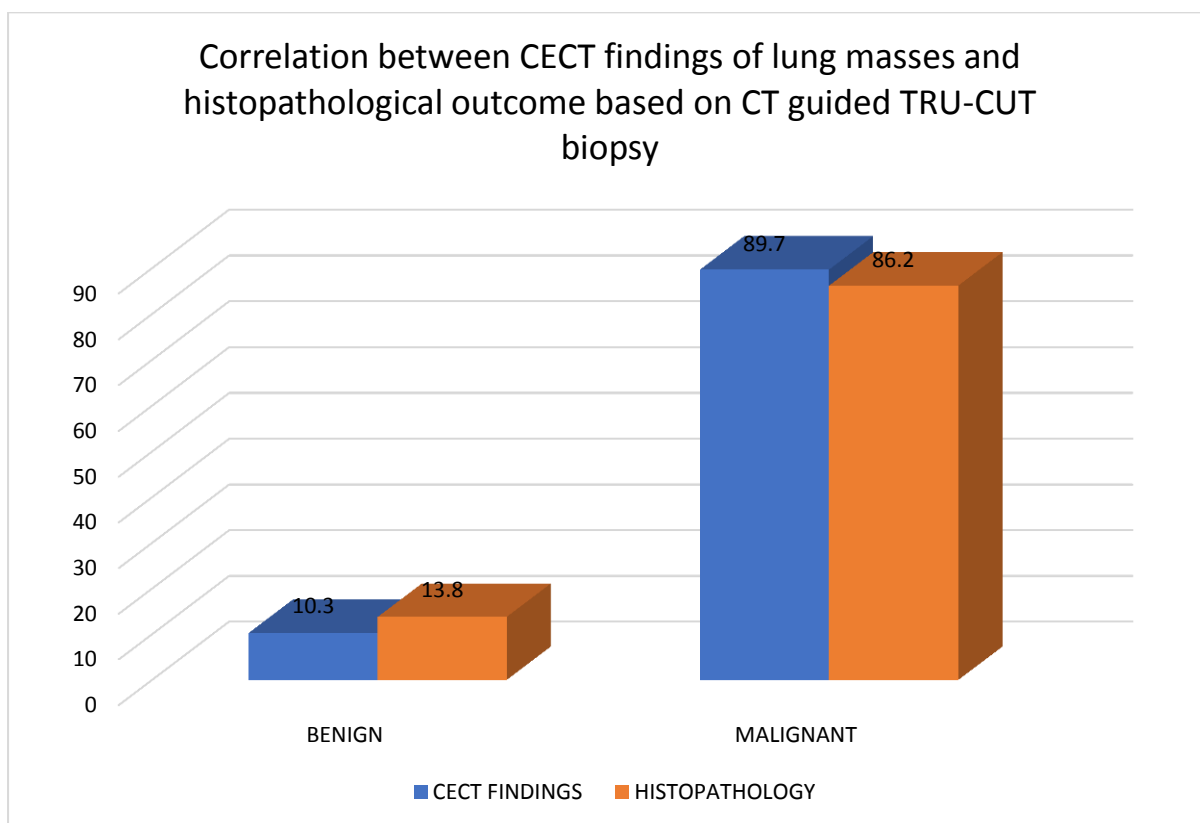


Table 9: Correlation between CECT findings of lung masses and histopathological outcome based on CT guided TRU-CUT biopsy.

CECT FINDINGS		HISTOPATHOLOGY	
BENIGN	MALIGNANT	BENIGN	MALIGNANT
3 (10.3%)	26 (89.7%)	4 (13.8%)	25 (86.2%)



4. DISCUSSION

Our study found that the mean age of patients with lung masses was 58 years and that male patients were more common than female patients with a gender distribution of 82.8% and 17.2% respectively. These findings are consistent with previous studies that have shown a higher incidence of lung cancer in older patients and in male patients [4]. However it is important to note that our study had a small sample size of 29 patients which may limit the generalizability of our findings [5].

Regarding the number and location of lesions, our study found that the majority of patients had only one lesion, while a small percentage had multiple lesions. Most of the lesions were located in the upper lobes of the lungs followed by the lower lobes. These findings are consistent with some previous studies that have shown that lung masses are more commonly located in the upper lobes of the lungs (3, 4). However, some studies have also reported a higher incidence of lung masses in the lower lobes of the lungs (5, 6) suggesting that the location of lung masses may vary depending on the population studied [6].

Our study found that most of the lesions had a lobulated shape and spiculated margins. These findings are important as lobulated shape and spiculated margins are commonly associated with malignancy and are important features to evaluate when considering the possibility of lung cancer [7]. However, it is important to note that the specificity of these features in predicting malignancy may vary depending on the population studied and additional evaluation is often required to confirm the diagnosis [8].

Heterogeneous enhancement was seen in the majority of cases in our study which is consistent with some previous studies that have shown that heterogeneous enhancement can be associated with malignancy and can help guide further evaluation of the lesion [9]. However, some studies have also reported a higher incidence of homogeneous enhancement in lung masses [10] suggesting that the enhancement characteristics of lung masses may vary depending on the population studied.

Other positive findings associated with the lesions in our study included cavitations, calcification, lymphadenopathy, pleural effusion, lung collapse, mediastinal involvement and chest wall invasion. These variables are important to consider when evaluating lung masses as they can provide clues to the underlying pathology of the lesion. However, it is important to note that the prevalence of these variables may vary depending on the population studied and additional evaluation is often required to confirm the diagnosis [11].

Our study found that the majority of cases (86.2%) were malignant, while a small percentage (13.8%) were benign. These findings highlight the importance of further evaluation of lung masses as the majority of cases were found to be malignant. This is consistent with previous studies that have shown that the majority of lung masses are malignant. However, it is important to note that the sensitivity and specificity of imaging in predicting the underlying pathology of lung masses may vary depending on the population studied and additional evaluation is often required to confirm the diagnosis.

The correlation between the CECT findings of lung masses and histopathological outcome based on CT-guided TRU-CUT biopsy is an important aspect of our study as it provides valuable information on the accuracy of imaging in predicting histopathological outcomes. Previous studies have shown that imaging can be highly accurate in predicting the underlying pathology of lung masses with reported accuracy ranging from 70-95% [12,13].

5. CONCLUSION

CT-guide Tru-cut biopsy is an accurate and sensitive diagnostic procedure in thoracic malignancy. The findings of this study provide valuable information on the radiological

features of lung masses and their association with histopathological outcomes. These findings can be useful in guiding further evaluation and management of patients with lung masses. However it is important to note that the sensitivity and specificity of imaging in predicting the underlying pathology of lung masses may vary depending on the population studied and additional evaluation is often required to confirm the diagnosis.

6. REFERENCES

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