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RESEARCH ARTICLE
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ROLE OF PERCUTANEOUS CT-GUIDED NEEDLE BIOPSY (PCNB) OF LUNG MASSES WITH IMAGING FEATURES AND HISTOLOGICAL CORRELATION

Dr Saumil desai[1*], Dr Viraj shah[2], Dr Alpesh kalsariya[3]

[1*]Associate professor, Gujarat cancer & research institute, Gujrat, India
[2,3]senior resident, junior resident,Gujarat cancer & research institute, Gujrat, India

***Corresponding Author:** Dr Saumil desai
*Associate professor, Gujarat cancer & research institute, Gujrat, India

ABSTARCT

BACKGROUND

- CT guided percutaneous needle biopsy of the lung is an indispensable tool in the evaluation of pulmonary abnormalities due to high diagnostic accuracy in the detection of malignancy.
- Percutaneous biopsy in the lung plays a critical role in obtaining pathologic proof of malignancy, guiding, staging and planning treatment.

MATERIAL AND METHODS

- The study carried out is hospital based observational study in which 50 patients of all age group from 1st June to 31st December 2023 who were referred to the Department of Radiology in GCRI for further management were included in the study.
- Imaging features of the lung masses were studied and reviewed with the literature. Histological examination was followed up and correlated with the imaging features of CT.

RESULTS:

- The study group was predominantly male (80 %) with highest incidence of lung masses in 51-60 years age group (40 %). Adenocarcinoma was most commonly affected (42 % of cases). CT findings included pleural effusion being most common pathology associated with lung masses.

CONCLUSION

- Percutaneous CT guided biopsy is an effective highly accurate and safe method of obtaining tissue for the diagnosis of indeterminate pulmonary lesions.

KEYWORDS: Biopsy, Computed tomography, Interventional radiology, Lung, Histopathology.

AIMS AND OBJECTIVES

- To assess the role of CT in evaluating patient with lung cancer.
- To evaluate the pathological cell type of lung cancer on the basis of CT appearance of lung cancer.
- To record and correlate the tissue obtained by CT guided interventional procedures with cyto-pathological and histopathological findings in the diagnosis of lung cancer.

INDRODUCTION

- Lung cancer is one of the most common cancer in western world and also in India. It is the most common cancer in male in India with average incidence ranging from 8.7 to 13.5 per 100000 in year in different part of country.
- CT scan is the most popular guiding modality for thoracic interventions.
- CT scan provides precise information about size, shape & location of tumors. And most popular guiding modality for thoracic interventions, to know the pathology of tumors.
- CT scan in an excellent modality for detection, evaluation and staging of primary lung cancer disease.
- In radiology practice pathological diagnosis of the disease is of paramount importance and is always considered the gold standard.

MATERIAL AND METHODS

- Data of PCNB performed for lung masses from 1st June 2023 to 31st December 2023 were retrospectively evaluated. All biopsies were performed with 16 slice CT scan somatom emotion.
- Clinical, pathological records were obtained from hospital information system. Informed consent was taken.

INCLUSION CRITERIA

- 50 patients of all age group are included in the study from the time period from 1st June to 31st December 2023.

EXCLUSION CRITERIA

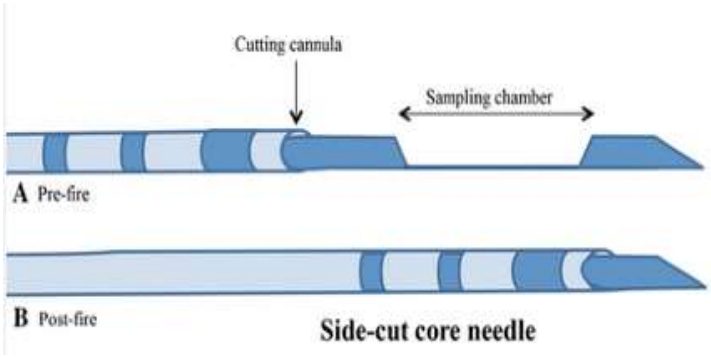
- Uncooperative patients are excluded from the study.
- Other excluded cases include bleeding diatheses, severe bullous emphysema, pulmonary hypertension and a highly vascular lesion and general contraindications for CT.

PLANNING AND ACCESS ROUTE

- Position and approach to lesion is decided based on location and adjacent relation to major vessels and muscles with help of previous radiological investigation.
- If required I.V contrast given for the identification of necrotic area, fluid content, normal vascular structure and precise delineation of lesion with regards to anatomical environment.
- Entry point and needle trajectory plotted on axial CT cuts and a radiopaque marker is used for planning.
- Povidone iodine painting and Chlorhexidine antiseptic solution cleaning done with adequate antibiotics prophylaxis.
- 1% lignocaine/lidocaine - Procedure were done under local anesthesia and draping is done.
- Co-axial needle with stylet within is repositioned at soft tissue-tumor interface and confirmatory scan is taken for accurate trajectory of needle.

EQUIPMENTS

- Hypodermic Needle with syringe and gauze pieces etc.
- 18 G true cut biopsy needle
- Singe or Co-axial needle set
- Or 22 G Lumbar puncture
- 1% lidocaine / lignocaine



PATIENTS POSITIONING AND BREATHING INSTRUCTIONS

- During a lung biopsy, the prone position is preferred as it allows the least chest wall motion with an added advantage of a comfortable biopsy side down post biopsy positioning of the patient.
- The supine position is associated with moderate chest wall motion, while the lateral decubitus position is associated with the maximum chest wall motion.
- However, patient positioning should be based mainly on lesion accessibility and the safest path to the lesion.
- Most upper lobe lung lesions can be targeted during gentle breathing and no special breathing however, breath holding instructions are important during biopsy of lung lesions closer to diaphragm due to respiratory motion.

ADVANTAGES OF CT GUIDED BIOPSY OVER OTHER METHODS

- CT guided biopsy has better pre-procedural planning of percutaneous needle biopsy, because its high spatial resolution and large field of view.
- It permits multiplanar reformations to obtain more adequate path of needle.
- Structures like (Blood vessels) can be safely avoided by doing contrast.
- It provides good positioning of bones, viscera and muscles
- Done by using local anesthesia.
- It has Less post-procedural complications.
- CT guided biopsy is relatively cost effective.

OBSERVATIONS AND RESULTS

HISTOPATHOLOGICAL TYPES	NUMBER	PERCENTAGE
ADENOCARCINOMA	21	42
SQUAMOUS CELL CARCINOMA	12	24
SMALL CELL CARCINOMA	5	10
NON SMALL CELL CARCINOMA NOS	4	8
METASTASIS	3	6
INCONCLUSIVE	5	10

Comparison of Adenocarcinoma and Other Lung Carcinoma According to Central and Peripheral Location

Pathological types	Centrally located	Peripherally located	Percentage
Adenocarcinoma	7	14	28.6 %vs 71.4%
Small cell carcinoma	2	3	40% vs 60%
Squamous cell carcinoma	9	3	75% vs 25%

Percentage Distribution of Tumors by Mediastinal lymphadenopathy

Pathological types	Number of cases	Mediastinal lymphadenopathy	Percentage
Adenocarcinoma	21	12	57.14 %
Small cell carcinoma	5	4	77.77 %
Squamous cell carcinoma	12	5	43.75 %

Percentage Distribution of Tumors by Mediastinal invasion

Pathological types	Lesion with mediastinal invasion	Percentage
Adenocarcinoma	4	19.04 %
Squamous cell Ca	7	56.25 %
Small cell ca	2	44.44 %

Percentage Distribution of Tumors by presence of pleural effusion

Pathological types	Number of cases	Pleural effusion	Percentage
Adenocarcinoma	21	6	28.57 %
Small cell carcinoma	5	2	44.44 %
Squamous cell carcinoma	12	2	18.75 %

Percentage Distribution of Tumors by associated collapse-consolidation

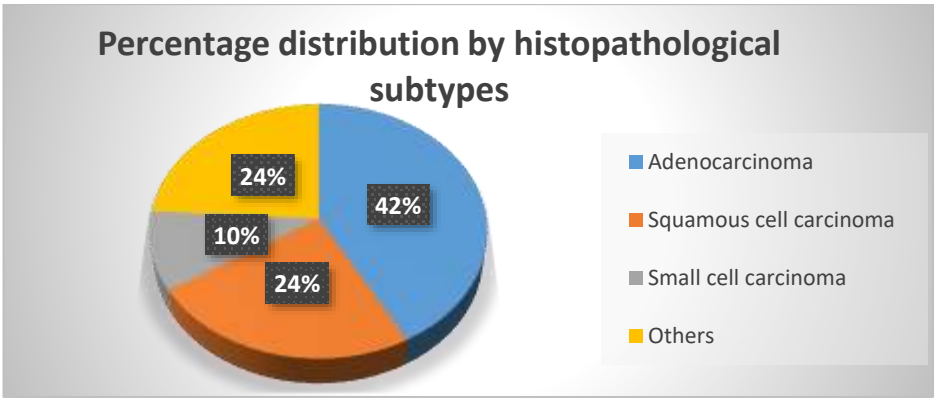
Pathological types	Lesion with collapse consolidation	Percentage
Adenocarcinoma	**8**	**38.09 %**
Squamous cell Ca	**7**	**56.25 %**
Small cell ca	**3**	**55.55 %**

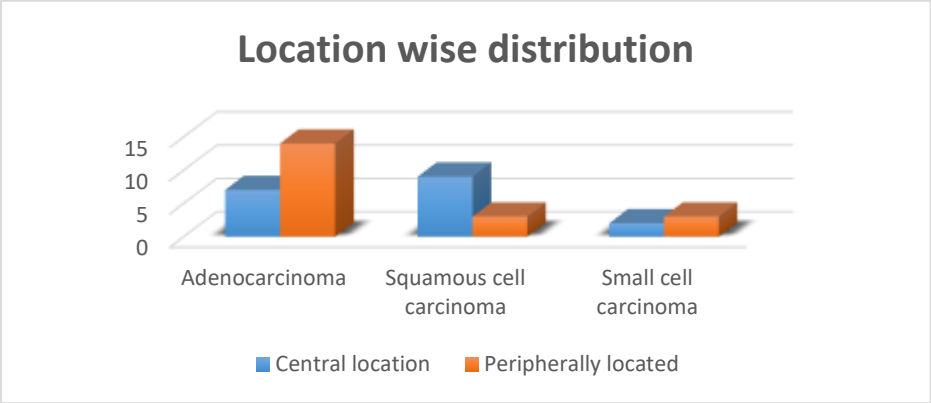
DISCUSSION WITH REVIEW OF LITERATURE

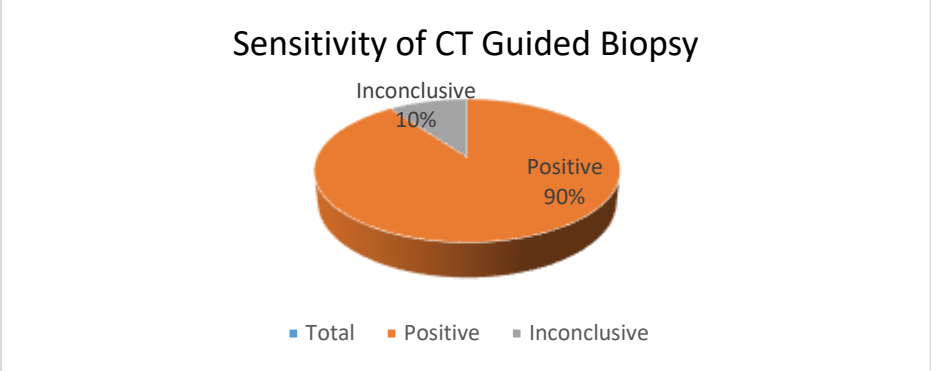
- **Adenocarcinomas** are mostly peripherally located tumor and rarely shows cavitation. These are frequently associated with enlarged hilar and mediastinal lymphadenopathy. Pleural effusion is commonly seen.
  Squamous cell carcinoma These are more often centrally located. Cavitation are seen in majority of cases. Being centrally located, they may lead to segmental or lobar lung collapse.
  Small cell carcinomas These are the most malignant form of the neuroendocrine tumor and most often present with massive enlarged mediastinal and hilar lymphadenopathy. Cavitation is rare and mediastinal invasion is commonly seen.
- **Metastasis** Usually metastasis are multiple in number and are predominantly seen in lung bases.

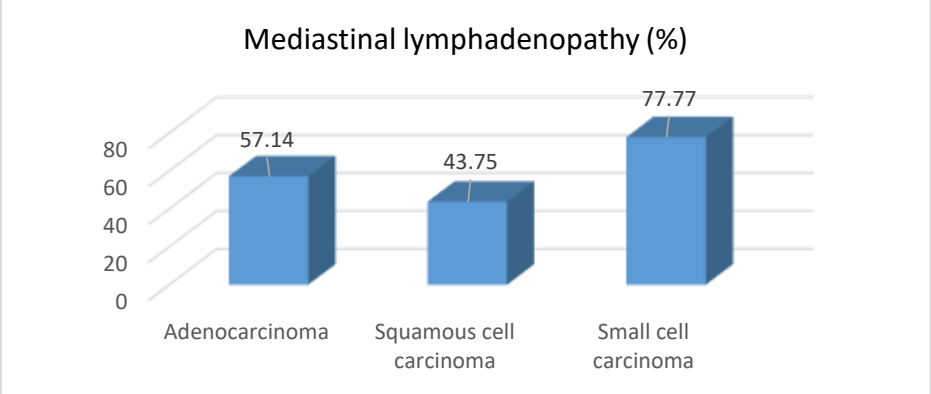
ANALYSIS

- Out of 50 patients 45 histopathological reports were positive.
- Sensitivity of the CT guided biopsy is 90 %.
- Maximum percentage of histopathological type in the study is of Adenocarcinoma followed by Squamous cell carcinoma.
- Central location favors Squamous Cell Carcinoma and Peripheral location favors Adenocarcinoma.
- Cavitation is more commonly associated with Squamous Cell Carcinoma.
- Mediastinal lymphadenopathy was more commonly seen in Small cell carcinoma, however it was equivocally seen in Adeno and squamous cell carcinoma.
- Pleural effusion was more commonly associated with Small cell carcinoma followed by Adenocarcinoma.
- Distal collapse consolidation was more associated with small cell and squamous cell carcinoma.




Location wise distribution
15
10
5
0
Adenocarcinoma
Squamous cell carcinoma
Small cell carcinoma
Central location
Peripherally located

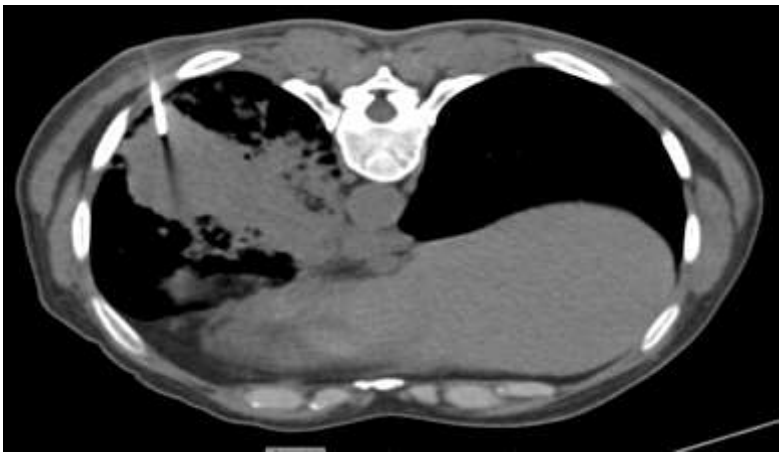

Sensitivity of CT Guided Biopsy
Inconclusive
10%
Positive
90%
Total
Positive
Inconclusive


Mediastinal lymphadenopathy (%)
80
60
40
20
0
57.14
43.75
77.77
Adenocarcinoma
Squamous cell carcinoma
Small cell carcinoma

CASE I

- 52 years Male patient.
- CT s/o heterogeneously enhancing lesion involving left supra hilar and hilar region extending into posterior segment.
- Associated left sided mild pleural effusion and mediastinal lymphadenopathy and sub segmental collapse.
- Histopathology s/o Small cell carcinoma

CASE II



- 55 yrs Male patient
- CT s/o enhancing soft tissue density lesion in posterobasal segment of left lower lobe with internal necrosis, peripheral in location and associated mediastinal lymphadenopathy.
- Histopathology s/o Adenocarcinoma

CASE III

- 61 YRS Male patient
- CT s/o enhancing soft tissue density lesion involving posterior segment of right upper lobe, central in location, showing internal cavitation and necrosis.
- Histopathology s/o Squamous cell carcinoma

CASE IV

- 32 years patient
- CT s/o heterogeneously enhancing soft tissue density lesion peripheral in location involving right middle lobe
- Histopath s/o Adenocarcinoma

CONCLUSION

- Percutaneous CT-guided needle biopsy (PCNB) of the intrathoracic lesions is a well-established technique for obtaining tissue for histopathological examination and various other tests.
- PCNB is a safe and accurate procedure for diagnosis of indeterminate lung masses.
- Careful planning and technique with knowledge of pitfalls result in low complication and successful outcome.

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