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RESEARCH ARTICLE
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ROLE OF CT GUIDED BIOPSY IN CHARACTERIZATION OF PRIMARY AND SECONDARY PULMONARY LESIONS.

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ABSTRACT
Computed tomography guided lung biopsy is invasive method for obtaining tissue samples from lung for histopathological analysis. This study evaluates the diagnostic yield and safety for CT guided lung biopsy. This is retrospective study of 40 patients with solitary or multiple pulmonary lesions who underwent CT guided biopsy and then tissue samples sent for histopathological analysis and correlation is done with diagnostic yield of 95%. From which largest group is malignant lesion among which adenocarcinoma is more common followed by squamous cell carcinoma. No major complication is seen.

AIMS AND OBJECTIVE
- To present role of CT guided lung biopsy in characterization of solitary and multiple pulmonary lesions.
- To guide clinician, in treatment of primary and secondary lung tumor.
- For prognosis of underlying treated cases.

INTRODUCTION
- Lung nodules are well defined round to oval area of soft tissue opacity identified on a chest X-ray or CT scan. It can occur due to various pathology including primary lung cancer or secondary due to metastasis from primary tumour elsewhere in the body. Radiological assessment of nodule is done but depending on risk factors, further analysis may be needed including a biopsy of the nodule.
- Biopsy helps to rule out benign condition and infection and in case of malignancy biopsy helps to know type of lung cancer and planning management according to that.
- It helps in staging the primary and secondary lesion so according to that palliative or surgical planning can be done.

Solitary pulmonary nodule (**SPN**) is defined as a relatively well-defined round or oval pulmonary parenchymal lesion equal to or smaller than 30 mm in diameter. It is surrounded by pulmonary

parenchyma and/or visceral pleura and is not associated with lymphadenopathy, atelectasis, or pneumonia.

Causes of a SPN

- Most common - Benign granuloma (previous infection)
- Less common - Bronchial carcinoma, Metastasis, Organising pneumonia, Hamartoma.
- Much less common - Mucoid impaction, Abscess, Infected bulla, Infarct, Haematoma, Rheumatoid nodule, Wegener's granuloma, Carcinoid, Sarcoid granuloma
- Very rare - Arterio-venous malformation, Intrapulmonary lipoma, Amyloid, Hydatid cyst

SPN: malignant characteristics.

- Size - Diameter of more than 3 cm is very suggestive of malignancy.
- Margin - Ill-defined or spiculated border is a strong pointer towards malignancy.
- Calcification position - Eccentric calcification raises the suspicion of a scar carcinoma.

Causes of multiple pulmonary nodules

- Inflammatory /Infective – Granulomas, Septic emboli / lung abscesses, Fungal pneumonia, Tuberculosis (miliary and bronchopneumonia), Chickenpox pneumonia
- Neoplastic – Metastases, Bronchioloalveolar cell carcinoma, Lymphoma, Kaposi's sarcoma, Mycosis fungoid
- Autoimmune disease - Rheumatoid nodules, Wegener's granulomatosis,
- Vascular -Arteriovenous malformations, pulmonary infarcts, Other – Sarcoidosis, Silicosis, Langerhans cell histiocytosis (granulomatosis)

INDICATIONS FOR LUNG BIOPSY

- A new or enlarging solitary nodule or mass on the chest radiograph or CT
- Multiple nodules in a patient not known to have malignancy or who has had a prolonged remission.
- Persistent focal infiltrates, either single or multiple, for which no diagnosis has been made by sputum or blood culture, serology or bronchoscopy in patient with risk factors.
- Hilar mass following negative bronchoscopy.

Contraindication for lung biopsy

- Abnormal coagulation profile includes: Platelet count <100 000/ml, APPT ratio or PT ratio >1.4
- Previous pneumonectomy
- Mechanical ventilation
- Vascular lesions, either aneurysms or arteriovenous malformations, should have been identified by CT and should not be subjected to biopsy.
- Uncooperative patient.

CLINICAL CASES

Total 40 patients with suspicious lung lesion taken for biopsy between duration 1st January to 30th April 2023.

Type of lung biopsy According to the method of access

Percutaneous transthoracic lung biopsy

- PTLB is performed with imaging guidance and most frequently by a radiologist. aim is to diagnose a defined mass.
- Imaging modalities are computed tomography (CT), and ultrasound. Ultrasound is useful only where the tissue mass is in contact with the chest wall since the ultrasound beam does not pass through air and, hence, the aerated lung.

- Whenever possible, PTLB should be performed under ultrasound guidance as this is the safest, quickest, and least expensive method.
- For lesions not suitable for ultrasound guided biopsy, CT is now the preferred imaging modality.
- Magnetic resonance imaging (MRI) currently has a limited use because of expense, difficulty accessing the patient within the magnet, the relatively poor visualization of lung lesions, and difficulties with ferromagnetic instruments within the magnetic field.

Bronchoscopic lung biopsy

- Biopsy via a bronchoscope is useful for proximal endobronchial lesions but is unable to access more peripheral lesions.
- Transbronchial biopsy of diffuse lung disease may be assisted performed by a respiratory physician.
- Because it does not cross the pleura, pneumothorax is much less common than in percutaneous biopsy.

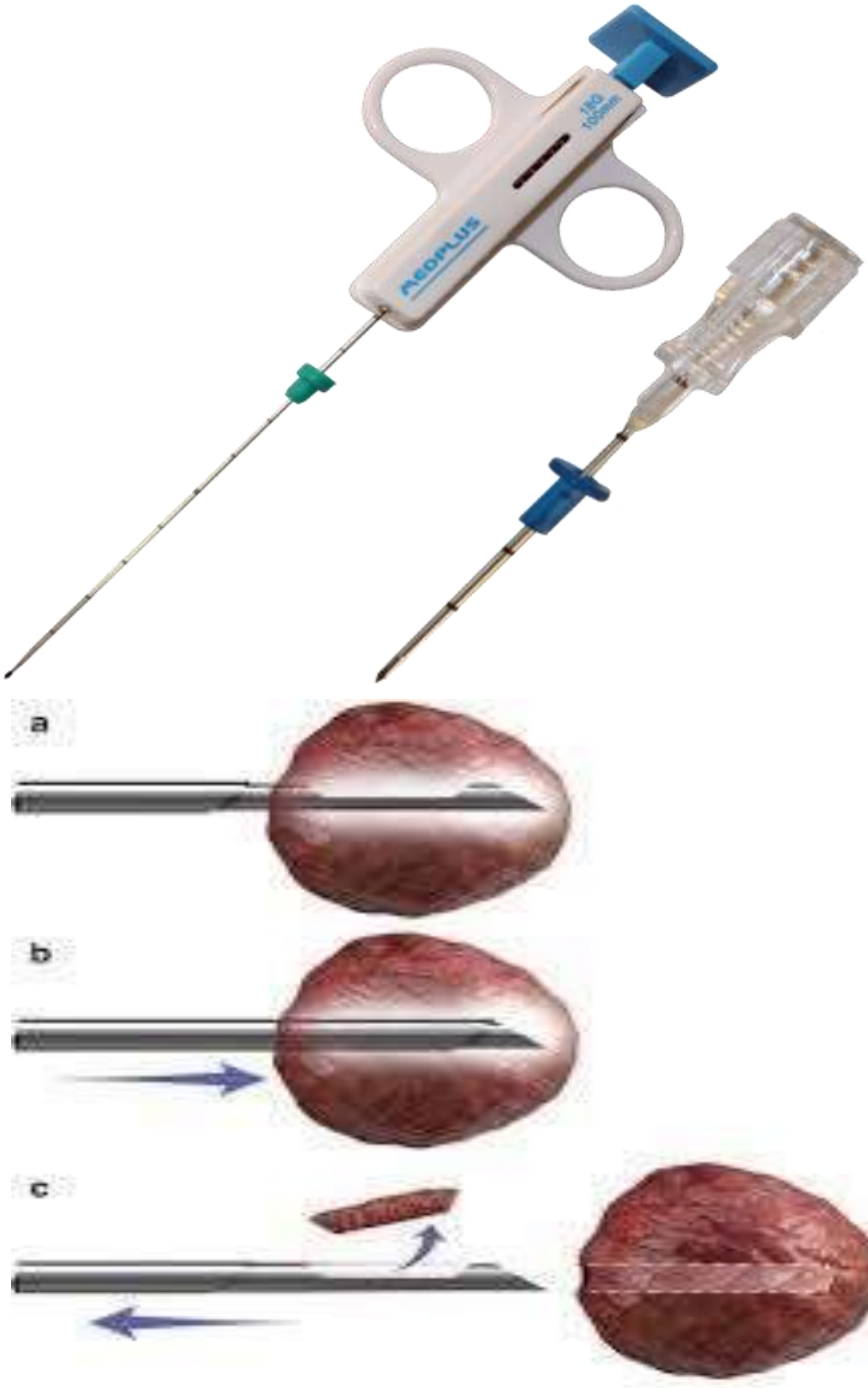
Open lung biopsy and video assisted thoracoscopic surgery (VATS)

- Although these surgical procedures are able to provide larger samples of tissue with improved accuracy and specificity, the morbidity and length of stay are greater than with the other two methods of biopsy.

Before the procedure

- Informed consent should be taken and patient should be explained about need of procedure, complications.
- Complete blood count, serology and coagulation studies were performed.
- Prothrombin time (PT), activated partial thromboplastin time (APTT), and platelet count should be checked before percutaneous lung biopsy.
- All patients should have recent pulmonary function tests (spirometry) before needle biopsy. Patients with FEV1 <35% predicted should not undergo needle biopsy
- Recent chest radiographs and CT scans and all previous radiological investigations should be reviewed to decide if a biopsy is appropriate and must be available to the radiologist at the time of the biopsy.
- CT should preferably be performed before bronchoscopy.
- Repeat imaging should be performed if there has been significant change in the patient's clinical condition, if there has been significant delay before the biopsy is performed, or if the localizing CT scan at the time of the biopsy shows significant change.
- The patient should be positioned prone or supine dependent on the skin entry site chosen.
- A needle entry site which avoids crossing fissures, bullae and large vessels should be chosen if possible to reduce the incidence of pneumothorax and hemorrhage.
- The breathing technique required during the procedure should be explained to the patient and practiced beforehand. Deep breaths and coughing should be avoided during the biopsy procedure.

Instruments



Method

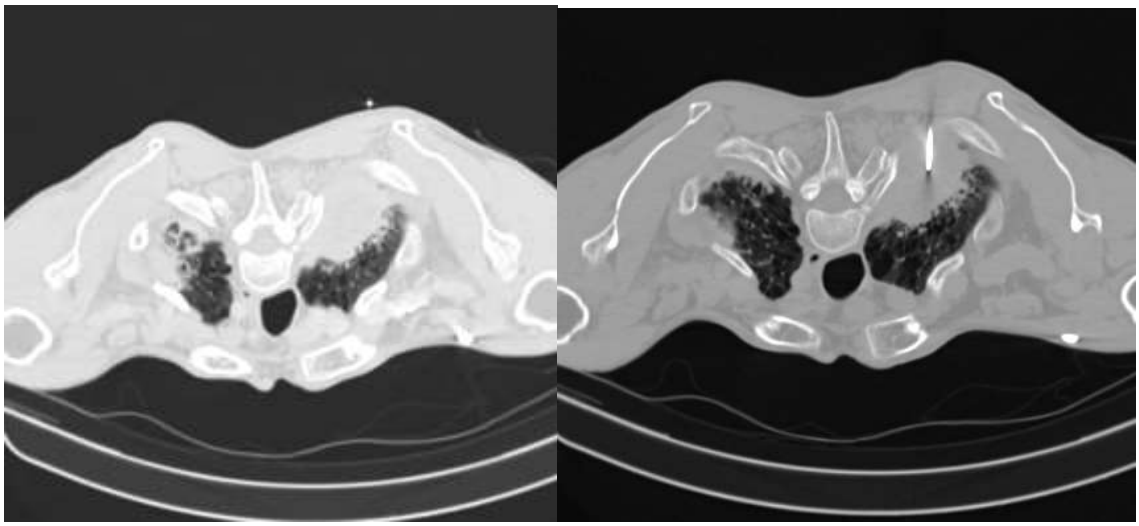
- The skin entry site should be sterilized with standardized antiseptic solution and the cutaneous and subcutaneous tissue infiltrated with lignocaine up to a maximum dose of 20 ml of a 2% solution. The

pleura should not be anaesthetized directly as this increases the risk of pneumothorax before the biopsy itself. Procedure in paediatric patient may require spinal anaesthesia.

- When the biopsy needle is being advanced or withdrawn the patient should suspend respiration. The patient may breathe gently with the needle in place. For lesions at the lung bases a breath held on gentle expiration may make the biopsy procedure easier. Wherever possible a needle entry site immediately cephalad to a rib should be chosen to avoid intercostal vessel puncture. Care should be taken to avoid the internal mammary vessels if the biopsy is performed adjacent to the costal cartilages and sternum.
- If an aspiration biopsy is performed, the central stylet is removed and a 10 ml syringe attached. Suction should then be applied while rotating and moving the needle to and fro during suspended respiration.
- A coaxial technique may be used to allow multiple passes and to reduce the number of pleural punctures. If a CNB is performed, it is important to confirm before the procedure that either the tip of the needle remains within the lesion once fired or stops in a safe place.
- The number of passes needed per procedure has not been defined. Most operators perform at least two. Variables to consider are: the difficulty of the procedure, complications arising from each biopsy, the quality of the specimen obtained, the characteristics of the lesion biopsied, and the need for specimens for cytological, histological and microbiological examination.
- Sample taken from lung lesion and sent for histopathological examination.
- Post biopsy 1 hour observation is necessary.
- Post procedural treatment given to reduce infection and pain.
- An erect chest radiograph should be performed 1 hour after the biopsy and is sufficient to detect the majority of post biopsy pneumothoraxes. Patients should be informed of the risks of delayed pneumothoraxes.
- The risk of pneumothorax is related to the needle passing through aerated lung and increases significantly if the lesion is not abutting the pleura. Intrapulmonary haemorrhage may occur with or without haemoptysis.
- The haemothorax is rare.
- tumor seeding along the needle tract, cardiac tamponade, and of chest infection (pneumonia) being converted to an empyema.

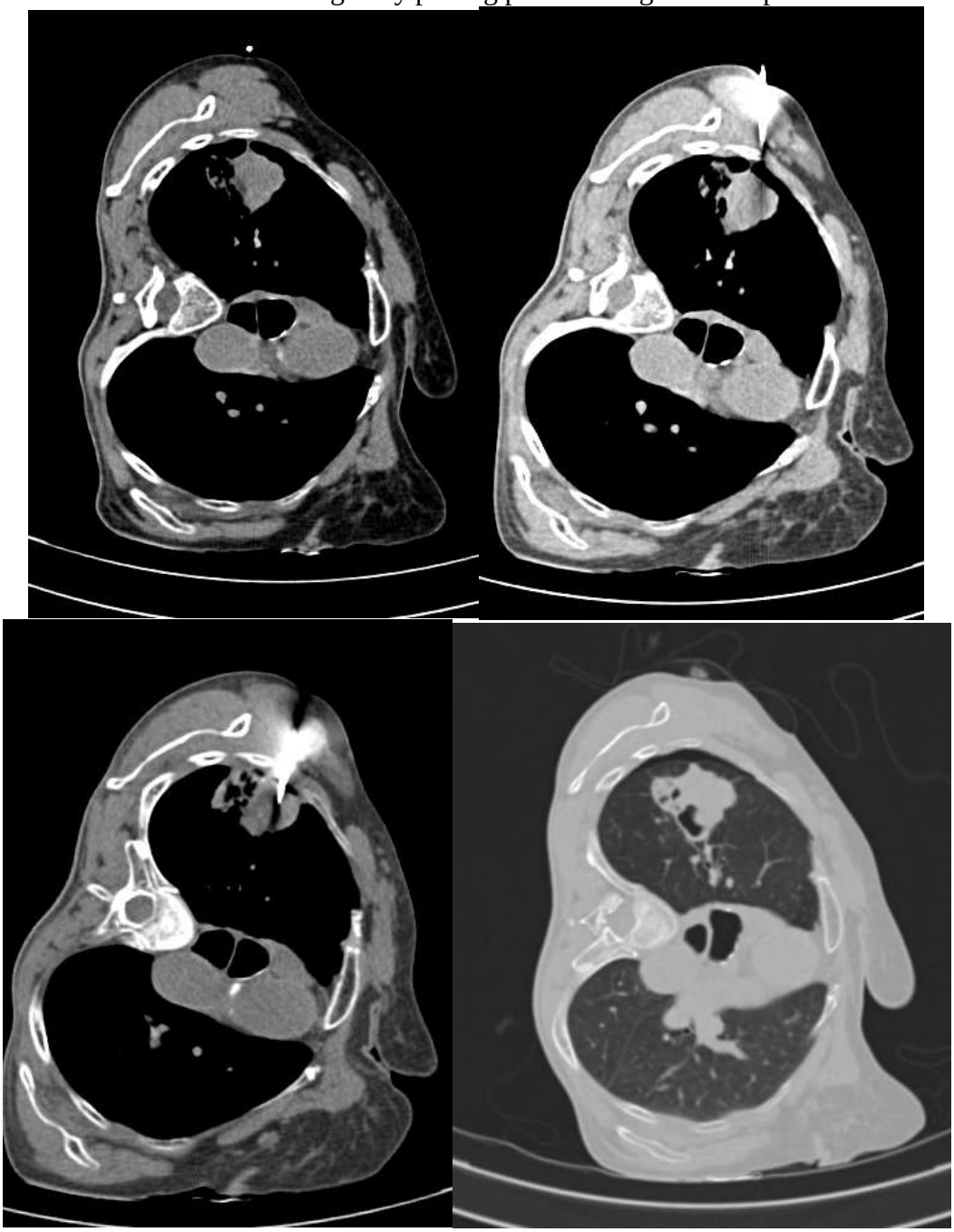
Case 1

- Biopsy was done from right upper lobe
- Patient is kept in prone position as the lesion in posterolateral segment of right upper lobe.
- Lesion is pleural based so less risk of pneumothorax.
- Needle was passed from behind so there is no significant risk of major vessels damage.



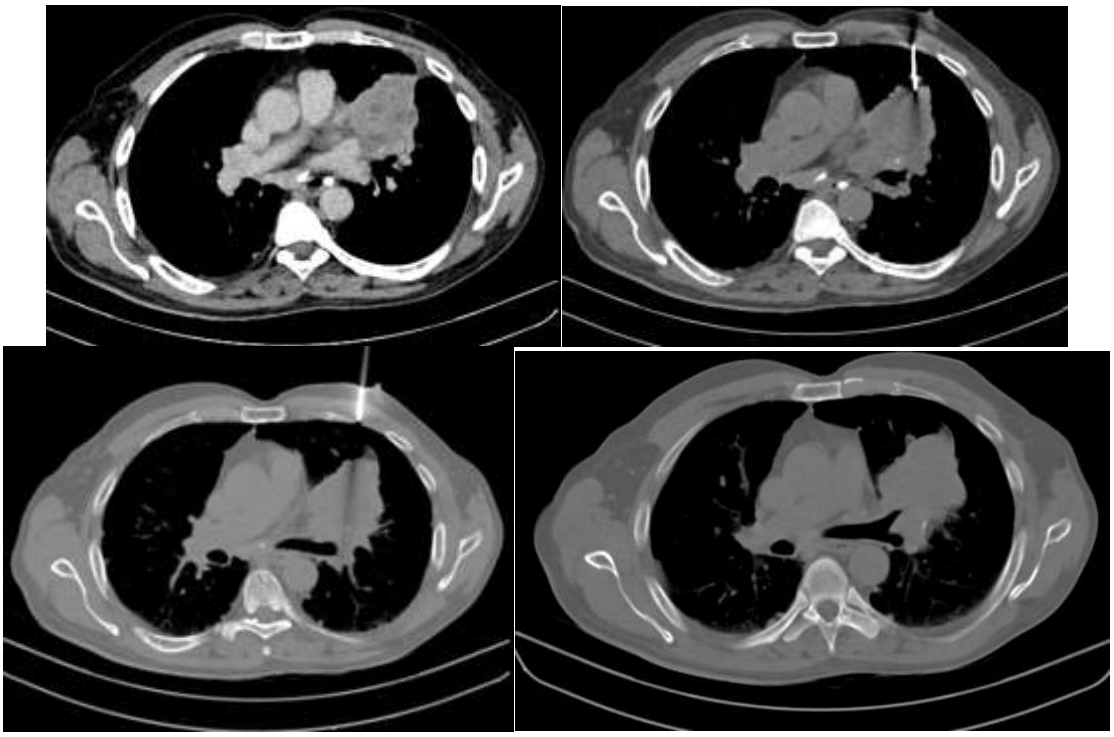
Case 2

- This patient has mass in anterior segment of right upper lobe on peripheral location. so, biopsy is taken in left lateral position due to easy accessibility but lung parenchyma is pierced which increases risk of pneumothorax. Which is managed by putting patient in right lateral position.



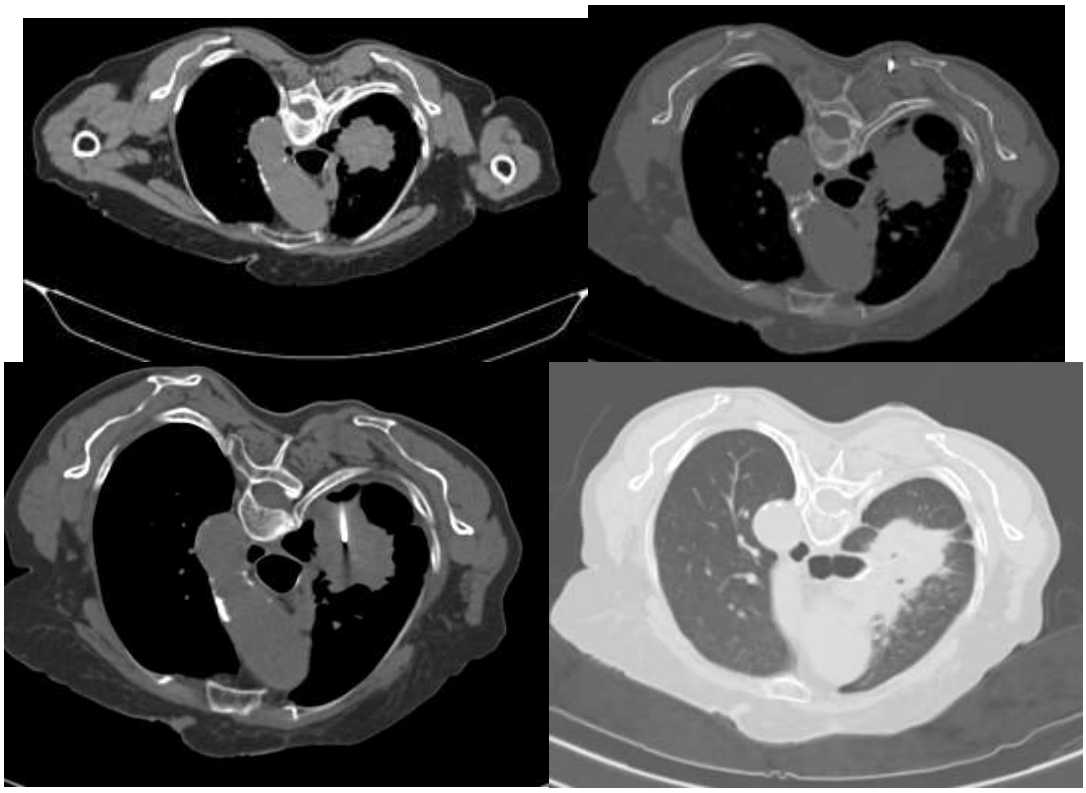
Case 3

- A 60 year old male patient presented with left upper lobe mass which is seen adjacent to mediastinal pleura, lesion is encasing trachea and left pulmonary artery so, biopsy should be performed under CECT guidance. Preprocedural evaluation of all thoracic vessels should be perfomed to rule out any aneurysm.



Case 4

- A 68-year-old patient presented with right upper lobe mass which is difficult to assess through posteriorly because of position of scapula and ribs. So, needle is navigated accordingly.



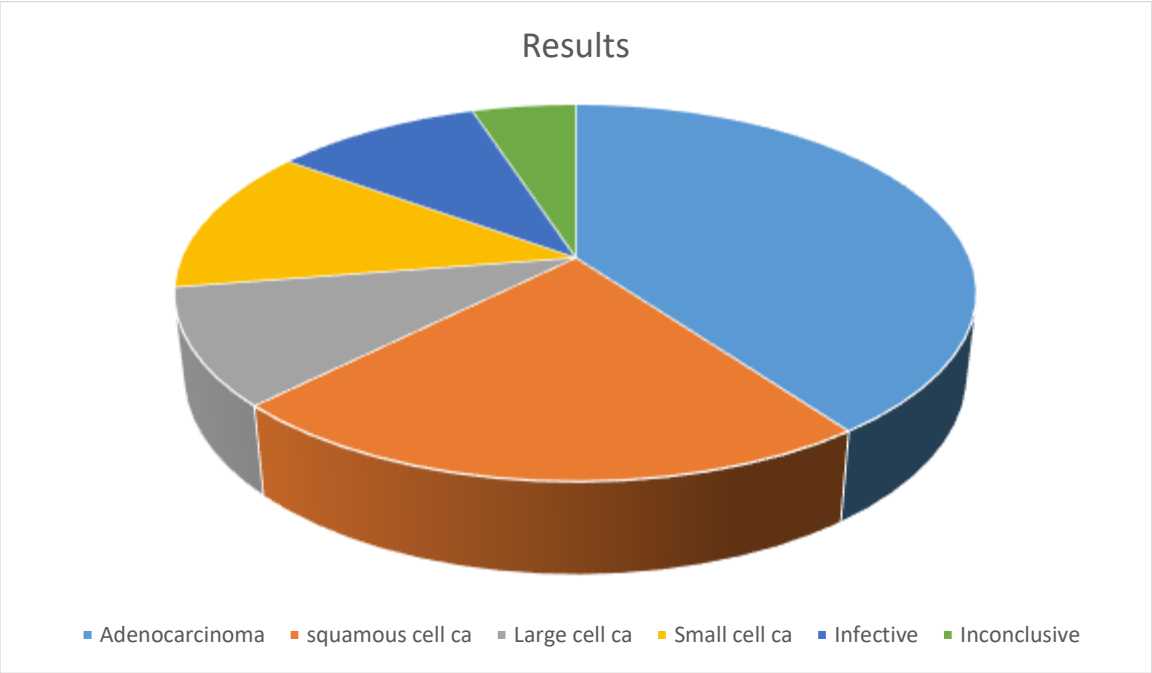
RESULTS

- The obtained tissue samples are immediately placed on glass slides and immersed in 10% formalin solution. Cell samples or FNAB samples are fixed in low-molecular-weight dextran lactated Ringer's solution for staining.

- The reported diagnostic accuracy rate is dependent on the size of the lesion, the location of the lesion, operator experience, type of needle used (FNA or CNB), choice of biopsy technique, the pretest probability of malignancy, and the expertise of the reporting pathologist.
- Larger lesions are more likely to allow a positive diagnosis of malignancy to be made.
- Although some operators have reported no significant differences in results between lesions more or less than 2 cm.
- Macroscopic examination (visual inspection) of the biopsy specimen may also enable an estimate of the likelihood of achieving a diagnosis per procedure

Recommendations

- False positives should be less than 1%.
- Adequacy of sample should be over 90%.
- Sensitivity for malignancy should be within the range of 85–90% in lesions over 2 cm.



RESULTS

Result of histopathological examination of 40 samples -

- 1. Adenocarcinoma (16)
- 2. Squamous cell carcinoma (9)
- 3. Large cell carcinoma (4)
- 4. Small cell carcinoma (5)
- 5. Infective (4)
- 6. Inconclusive (2)

Repeat biopsy indicated if biopsy is Inconclusive

CONCLUSION

- If the lesion is pleural based, then USG guided biopsy should be preferable.
- CT-guided lung biopsy is a minimally invasive and established method for the diagnosis of pulmonary lesions. This procedure may be considered for lung lesions with diagnostic failure by Trans bronchial examination and are present in peripheral areas.
- However, there is a higher incidence of complications associated with CT guided lung biopsy than with transbronchial examinations, including pneumothorax, intrapulmonary hemorrhage, systemic air embolism, or tumor seeding.

DISCUSSION

- Lung cancer broadly divided into non-small cell carcinoma and small cell carcinoma as they differ clinically regarding presentation, treatment, and prognosis:

Non-small cell lung cancer (NSCLC) (80%)

- Adenocarcinoma (35%)

most common cell type overall
most common in women
most common cell type in non-smokers but still most patients are smokers
peripheral

- Squamous cell carcinoma (30%)

strongly associated with smoking
most common carcinoma to cavitate
poor prognosis

- Large-cell carcinoma (15%)

peripherally located
very large, usually >4 cm

- Small cell lung cancer (SCLC) (20%)

almost always in smokers
metastasizes early
most common primary lung malignancy to cause paraneoplastic syndrome and SVC obstruction
worst prognosis
Other malignant pulmonary neoplasms include lymphoma and sarcoma (rare).

REFERENCES

1. Rivera MP, Mehta AC, WahidiMM. Establishing the diagnosis of lung cancer: diagnosis and management of lung cancer 3rd ed. American college of chest physicians evidence-based clinical practice guidelines. Chest 2013; 143: e142S-e165S. [PubMed] [Google Scholar]
2. MondoniM, SotgiuG, BonifaziM, et al. Transbronchial needle aspiration in peripheral pulmonary lesions: a systematic review and meta-analysis. EurRespirJ 2016; 48: 196-204. [PubMed] [Google Scholar]
3. SteinfortDP, KhorYH, ManserRL, Irving LB. Radial probe endobronchial ultrasound for the diagnosis of peripheral lung cancer: systematic review and meta-analysis. EurRespirJ 2011; 37: 902-910. [PubMed] [Google Scholar]
4. Ali MS, Trick W, MbaBL, MohananeyD, SetniJ, MusaniA. Radial endobronchial ultrasound for the diagnosis of peripheral pulmonary lesions: A systematic review and meta-analysis. Respirology2017; 22: 443-453. [PubMed] [Google Scholar]
5. Zhan P, Zhu QQ, MiuYY, et al. Comparison between endobronchial ultrasound-guided transbronchial biopsy and CT-guided transthoracic lung biopsy for the diagnosis of peripheral lung cancer: A systematic review and meta-analysis. Trans Lung Cancer Res 2017; 6: 23-34. [PMC free article] [PubMed] [Google Scholar]
6. Fielding DI, Chia C, Nguyen P, et al. Prospective randomized trial of endobronchial ultrasound-guide sheath versus computed tomography-guided percutaneous core biopsies for peripheral lung lesions. Intern Med J 2012; 42: 894-900. [PubMed] [Google Scholar]
7. Han Y, Kim HJ, Kong KA, et al. diagnosis of small pulmonary lesions by transbronchial lung biopsy with radial endobronchial ultrasound and virtual bronchoscopic navigation versus CT-guided transthoracic needle biopsy: A systematic review and meta-analysis. PLoSOne 2018; 13: e0191590. [PMC free article] [PubMed] [Google Scholar]

8. HurJ, Lee HJ, Nam JE, et al. Diagnostic accuracy of CT fluoroscopy-guided needle aspiration biopsy of ground-glass opacity pulmonary lesions. Am J Roentgenol2009; 192: 629-634. [PubMed] [Google Scholar]