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EFFICACY OF TRUCUT / CORE BIOPSY IN LUNG LESIONS

Pathology

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ABSTRACT

Background: CT-guided core needle biopsy is an accurate method of diagnosis of lung lesions and has become essential for patient management. Objectives: This study aims to evaluate the efficacy of tru-cut/core biopsy in diagnosing lung lesions and to analyze the morphological spectrum for accurate classification. It further seeks to correlate clinical, radiological, cytological and histopathological findings to enhance diagnostic precision. **Methodology:** A prospective study was carried out in Department of Pathology, Mahadevappa Rampure Medical College Kalaburagi from July 2019 to December 2021. CT-guided biopsy was done in radiologically suspected lung mass lesions. Samples were studied for histopathology Additionally, immunohistochemical staining was employed wherever feasible to support and refine the histopathological diagnosis. **Results:** A total of 114 lung lesion cases were studied, most commonly involved age group was 51–60 . Male-to-female ratio was 3. 75: 1. Cough was the most common symptom (63. 2%), and 67. 5% were smokers. Both lungs were equally involved and mean lesion size of 5. 5 cm on HRCT. FNAC was performed in 13cases. 83. 33% lesions were neoplastic, 10. 52% non-neoplastic, and 6. 14% inadequate. Among neoplastic lesions, adenocarcinoma (39), squamous cell carcinoma (31), and small cell carcinoma(17)were most common, with rare cases of leiomyosarcoma and metastatic GIST. Cyto-histopathological correlation in 13cases showed 90. 9%sensitivity, 100% specificity, and 92. 3%diagnostic accuracy. Subsequently , IHC was done in 19cases, and EGFR testing in 6adenocarcinomas. **Conclusion:** Therefore, CT-guided core needle biopsy is highly accurate compared to aspiration cytology and when carried out under experienced guidance yields adequate material for diagnosis and classification of lung lesions. Efficient management of lung carcinoma can be achieved with modern technological advances as it has a high sensitivity, specificity and diagnostic accuracy.

KEYWORDS

Core needle biopsy, Lung biopsy, Lung lesions, Adenocarcinoma lung, Squamous cell carcinoma

INTRODUCTION

Lung cancer is the leading cause of cancer-related mortality for which a histologic or cytologic confirmation of malignancy is required before treatment. It is also a major healthcare problem in India. It is heartening to note that the healthcare community in general & oncologists in particular are steadily increasing their contribution to global medical knowledge on lung cancer. [1] Tru-cut /core lung biopsy is an interventional procedure performed to diagnose lung pathology by obtaining a small core of lung tissue performed percutaneously under Computed Tomography guidance has emerged as one of the leading diagnostic procedures. With the help of this technique, the establishment of the histological characteristic of suspect lesions, their differentiation, extent, or spread can be done, and subsequently, a treatment protocol can be adopted. [2] Lung biopsy is usually indicated for obtaining a final diagnosis on the basis of histopathological features. With the help of this final diagnosis, treatment planning is done. It also plays a very important role in establishing the prognosis of malignant and premalignant lesions. [3]

A pulmonary nodule is defined as a single discrete pulmonary opacity that is surrounded by normal lung tissue that is not associated with adenopathy or atelectasis and appears white round with soft-tissue density, measures<3cm. Nodule size is closely correlated to the risk of malignancy; those under 2cm are malignant in 20-66% of cases. Masses which are lesions larger than 3cm are malignant in 80-99% of cases. [2]

Solitary pulmonary nodules are more common in nonsmokers and in the young. They include granulomas (which include infectious such as tuberculosis, histoplasmosis, or noninfectious such as sarcoidosis and rheumatoid arthritis), and hamartomas. Multiple nodules are caused by malignant causes such as metastases, non-Hodgkin lymphoma, and Kaposi sarcoma, or benign causes such as septic emboli, fungal infection, abscess, tuberculosis, and pneumoconiosis. [2]

Lung cancer remains a major problem globally. Despite recent advances, the disease remains the number one cause of cancer death and portends one of the lowest 5-year survival rates among all cancer types. [4]

Incidence and mortality are improving, whereas globally the number of lung cancer cases is still increasing likely due to rising tobacco use in developing and lower- and middle-income countries. Globally incidence of new cases of lung cancer is 11. 4% & 18% death. India shares a great burden of this disease. According to Lung Cancer epidemiology, GLOBOCAN estimated that the average number of newly diagnosed cancer cases of lung & bronchus in 2021 in total is 235, 760, in males 119, 100 & in females 116, 660 & estimated death in total is 131, 880, in males 69, 410 & 62, 470 in females Carcinoma of the lungs is one of the most common malignancies and a major cause of cancer-related deaths worldwide. Every year more than 1. 6 million new people are diagnosed with lung carcinoma around the world. [5]

Lung cancer is one of the common causes of cancer death in women also. The male: female ratio is 2: 1, but recently increased in women, because of an increased percentage of smoking among them. [6]

There are several diagnostic modalities in the present era which are helpful in diagnosing lung tumors, of which tissue diagnosis is the most important one. Obtaining tissue from the lung is a challenging procedure due to difficulty in accessibility, the presence of vital structures and the major complications associated with it. Using a core needle biopsy technique overcomes these major issues & provides optimum tissue, thus help in arriving at conclusive diagnosis. The present study was undertaken to assess the diagnostic efficacy and safety of percutaneous tru-cut/core needle biopsy in patients with undiagnosed intra pulmonary mass lesions especially in apical or peripheral location [7]

The objectives of the study were a)to study the efficacy of tru-cut /core biopsy in lung lesions b)tostudy the morphologic spectrum of different lung lesions & to classify them.

Methodology

The present study included 114 cases of core needle biopsy of lung lesions received in the department of pathology, in a tertiary care institute. The duration of study included 2 years prospectively from July 2019 to December 2021.

All patients with mass lesions in the lung, accessible to needle including pleura were included in the study. Patients were excluded if they are uncooperative & informed consent could not be obtained due to permanent mental disability.

The decision for biopsy was made on reviewing the pre-biopsy CT scan. Consent was obtained from all the patients after explaining the procedure in their own vernacular language.

The procedure was performed using standard universal aseptic precautions. The patient was positioned prone or supine dependent on the skin entry site chosen. Biopsy specimens was not taken with the patient in a seated position because of the potential small risk of air embolus or fainting during the procedure. The breathing technique required during the procedure was explained to the patient and practiced beforehand. Deep breaths and coughing were avoided during the biopsy procedure. The skin entry site was sterilized with standardized antiseptic solution and the cutaneous and subcutaneous tissue infiltrated with lignocaine 2%, up to a maximum dose of 20ml. Following local anesthesia, BARD MAX CORE biopsy gun with an 18-gauge needle was inserted through skin & advanced to the lesion, intra-operative CT scan was performed to confirm the position of needle in the lesion. Once the needle was located in an appropriate position, the automated mechanism was activated moving the needle forward & filling the needle trough or shallow receptacle with core of tissue, operator triggering the cannula to close, the outer sheath instantly moves forward to cut and trap the tissue in the sample notch. The patients were observed for 2 hours & repeat chest CT scan was performed to evaluate procedural complications including pneumothorax & hemorrhage.

The specimen obtained was transferred in 10% buffered formalin to the department of pathology for processing. Routine paraffin embedded histopathological sections stained with hematoxylin and eosin stains. Immunohistochemistry was done wherever possible. The lesions were analyzed on histopathology and neoplastic lesions were classified as per WHO classification (2015)

Statistical Data Analysis: Statistical data was analyzed by IBM SPSS 21. 0version software. Data was spread on excel sheet and master chart was prepared. For qualitative data analysis, chi-square test and Fisher exact tests were applied. A P-value of less than 0. 05 was considered as significant.

RESULTS

A prospective study was conducted from July 2019 to December 2021, total of 114 cases of tru-cut lung biopsies were included, out of which 51cases were obtained in 2021 and 63cases in 2022. The age ranged between 21-90 year. Majority of the cases (66. 67%) were in the age group of 51-70years. Out of 114cases, 90 were males and 24 were females, with Male to Female ratio being 3.75:1. The common presenting complaints were cough (63. 2%), followed by breathlessness (33. 3%) and chest pain (28. 9%). Other complaints included fever (24. 5%), loss of weight (14. 9%) and appetite(16. 6%) and hemoptysis(3. 5%). Among 90 males, 76 were smokers & among 24 females, only one gave history of smoking. Out of 114 patients 67. 5% were smokers which was statistically very highly significant. (Table No. 1)

High resolution computed tomography (HRCT) was done in all 114cases. Right lung was involved in 58(50. 8%) and left lung in 56cases(49. 2%) and lower lobe was more commonly involved. The size of the lesions ranged from 2. 3cm to 12cm with a mean diameter of 5. 5cm. In majority of the cases(46. 9%), the size of the lesions was between 3. 1-5. 0cm. Mass with calcification/necrosis(44cases) was the most common finding on HRCT, followed by mass with consolidation(32cases), cavitation (27cases), mass with hyper dense areas and calcification(3cases), pulmonary nodule with ill-defined smooth margin(2cases), nodule with lobular septal thickening with cavitation(1case), Sequelae of pulmonary Koch's(3cases) and opacities with heterogenous confluent areas(2cases).

Fine needle aspiration cytology findings were available in thirteen cases of which four were Squamous cell carcinoma, three non-small cell carcinoma, two poorly differentiated carcinoma and one each of chronic non specific inflammation, granulomatous inflammation and small cell carcinoma and one was inadequate for interpretation. Core needle biopsy interpretation was done in all 114 cases. A total of 12cases (10.52%) were non-neoplastic, 95cases (83.33%) were neoplastic and inadequate for interpretation was seen in 7cases (6.14%).

The common non-neoplastic lesions (Fig: 1 , A- H & Fig: 2, A-D)were granulomatous inflammation and fungal infection. Most common neoplastic lesion (Fig: 3 A-f & Fig: 4: A-C)was adenocarcinoma followed by squamous cell carcinoma and small cell carcinoma. Also one case each of leiomyosarcoma (Fig:5 D-E) and metastatic gastrointestinal stromal tumour were diagnosed (Table No. 2).

Malignancy was diagnosed in 95 cases, of which immunohistochemistry were done in 26 cases. Among them TTF-1 in 5 cases of adenocarcinoma(Fig:3 F), pan-cytokeratin in 7 cases of squamous cell carcinoma(Figure:3 C), synaptophysin in 10 cases of small cell carcinoma and CD34 in 2 cases of solitary fibrous tumor of lung(Fig: % A-C), CD117 was positive in Metastatic GIST and H-Caldesmon(Fig: 5 F) in leiomyosarcoma with Ki67 proliferation index of 30% (Fig 5: E)and was negative for CK, CD117, Desmin, SMA, CD34, DOG1, STAT6, SS18, ERG, WT1 AND MELAN A.

The statistical analysis carried out based on cytohistopathological correlation in 13 cases, showed a sensitivity of 90. 29%, specificity of 100%, positive predictive value of 100% and negative predictive value of 66. 6%. The overall diagnostic accuracy is 92. 3%. Malignancy was diagnosed in 95 cases, of which immunohistochemistry were done in 26 cases. Among them TTF-1 in 5 cases of adenocarcinoma, pan-cytokeratin in 7 cases of squamous cell carcinoma, synaptophysin in 10 cases of small cell carcinoma and CD34 in 2 cases of solitary fibrous tumor of lung, CD117 was positive in Metastatic GIST and H-Caldesmon in leiomyosarcoma with Ki67 proliferation index of 30% and was negative for CK, CD117, Desmin, SMA, CD34, DOG1, STAT6, SS18, ERG, WT1 AND MELAN A.

EGFR Analysis: EGFR was done in 12 cases out of 39 cases of adenocarcinoma, and EGFR mutation was present in 2 cases.

(Table. 1) Table No. 1: History Of Smoking

History of smoking	Males		Females		Total	
	No.	%	No.	%	No.	%
Smokers	76	84.4	1	4.16	77	67.5
Non-smokers	14	15.6	23	95.84	37	32.5
Total	90	100.0	24	100.0	114	100.0
	p = 0.0002					

Out of 90 males 76 were smokers & among 24 females only one gave history of smoking. Out of 114 patients 67. 5% were smokers which was statistically very highly significant.

Table 2: Histopathological Spectrum Of Lesions

Histopathological diagnosis	Number of cases	Percentage (%)
I. Non-neoplastic lesions	**12**	
Granulomatous inflammation	3	2.63
Inflammatory pseudotumor	2	1.75
Bronchopneumonia	2	1.75
Fungal infection a) Candida & Aspergillosis b) Cryptococcus c)Coccidioidomycosis	3 1 1 1	2.63
Non-specific inflammatory lesion	1	0.87
Pleural fibrosis	1	0.87
II. Neoplastic lesions	**95**	
Adenocarcinoma Variants a) Lepidic b) Mucinous	39 9 12	34.21

c) Non-mucinous d)Moderately differentiated e) Poorly differentiated	10 5 3	
Squamous cell carcinoma Grading: a) Well differentiated b) Moderately differentiated c) Poorly differentiated	31 4 18 9	27.19
Small cell carcinoma	17	14.91
Large cell carcinoma	3	2.63
Adeno squamous carcinoma	1	0.87
Solitary fibrous tumor of pleura	2	1.75
Leiomyosarcoma	1	0.87
Metastatic GIST	1	0.87
III. Inadequate for interpretation	**7**	**6.14**
Total	**114**	**100**

Histopathological and cytological correlation were possible in 13 cases of which 9 cases were concordant and 4 were discordant**. Among** 4 discordant cases one case diagnosed as chronic non- specific inflammation on cytology was diagnosed as granulomatous inflammation on histopathology, two cases reported as poorly differentiated carcinoma on cytology were diagnosed to be adenocarcinoma on histopathology and one case was not satisfactory for diagnosis on cytology which was diagnosed as poorly differentiated squamous cell.

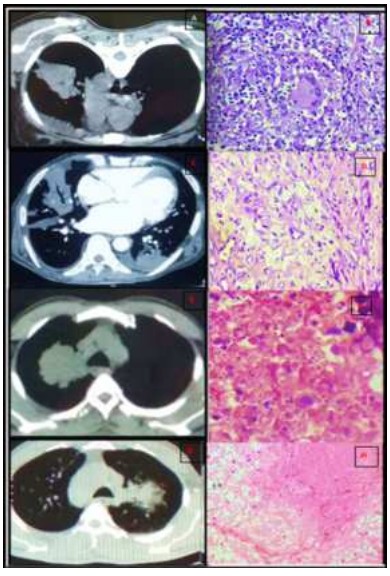

Figure: 1: Non neoplastic lesions . 1A: Left lung-Well defined mass with cavitation. 1B: Granulomatous inflammation, granuloma with epithelioid Cells Langhan's giant cells (H&E: HP) . 1C: Inflammatory pseudotumor: Consolidation in right lower lobe. 1D: Fibroblastic proliferation with fibro collagenous tissue & capillary channels (H&E: HP). 1E: Cryptococcus: Solitary pulmonary nodule with ill-defined smooth margin. 1F: PAS positive budding yeast form with infiltration of inflammatory infiltrate and necrosis. 1G: Candida & Aspergillosis Multifocal airspace opacification with soft tissue attenuation

1H: Hyphae & septate fungi with infiltration of inflammatory infiltrate (H&E: LP)

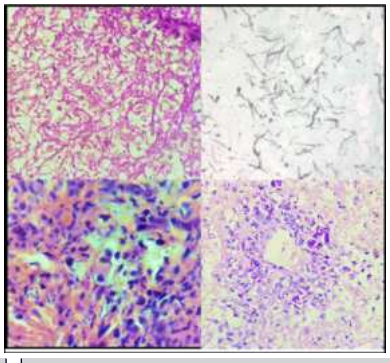

Figure 2: Fungal lesion with special stains . 2A: Aspergillus: Pseudo hyphae branching hyphal structure with infiltration of inflammatory infiltrate (PAS positive: oil immersion). 2B: Thick branching hyphae with pseudohyphae (GMS: oil immersion). 2C: Coccidiodomycosis: Fungal spherules with infiltration of inflammatory Infiltrate. (H&E : OIL IMMERSION) . 2D: PAS positive spherules (PAS POSITIVE: OIL IMMERSION)

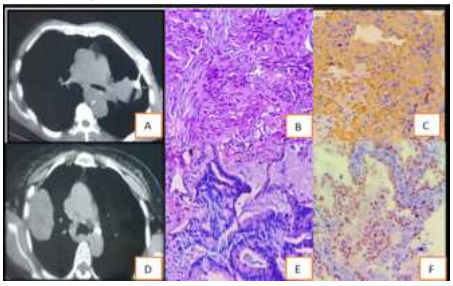

Figure 3: Neoplastic lesions 3A: Squamous cell carcinoma with Mass in lung parenchyma infiltrating into coastal space3B: Nests of polygonal cells arranged in sheets individual cell keratinization (H & E: HP). 3C: IHC-cytokeratin positive: HP. 3D: Adenocarcinoma lung lepidic type Lobulated mass with necrosis. 3E: Adenocarcinoma lung mucin secreting HP (H & E: HP) . 3F: IHC-TTF-1 positive

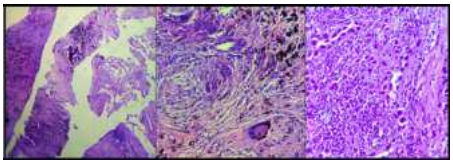

Figure 4: 4A: Small cell Carcinoma with healed tubercular granuloma and pneumoconiosis Tumor cells, granuloma and dilated alveoli. 4B: Langhan's giant cells containing epithelioid cell granuloma and anthracotic pigment (H &E: HP) with anthracotic pigment and fibrosis. (H & E stain: HP). 4C: Large cell carcinoma lung: Solid nests of polygonal cells with vesicular nuclei, moderate cytoplasm, irregular cell borders with fibrovascular stroma. (H & E: HP)

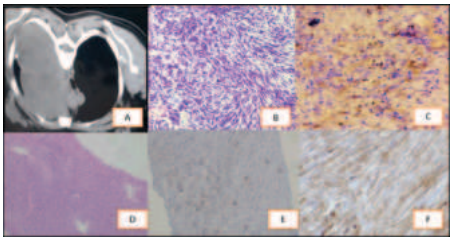

Figure 5: 5A: Solitary fibrous tumor of pleura with Ill-defined irregular soft tissue dense mass areas of hyper densities likely calcification. (H & E: HP). 5B: Bland spindle cell arrange ill-defined fascicles, with moderate cytoplasm & bland uniform chromatin (H & E: HP). 5C: IHC- CD34 positive 5D: Leiomyosarcoma: Spindle cells in sheeths and fascicles with hyperchromatic nuclei 5E: Ki 67 proliferation index 30% . 5F: H-caldesmon

DISCUSSION

The evaluation of patients with lung lesions is challenging due to various reasons. First the cause of the lesion must be determined and second, in the case of malignancy, it is crucial to determine the correct stage. The advanced computed tomography (HRCT) guided core biopsy technique has a major influence on the detection of suspected malignant lung nodules. [8]

The advantage of CNB includes preservation of tissue architecture of the specimen, which is important in the assessment and sub-typing of tumours by molecular testing which has great importance in targeted therapy. [9]

The tissues obtained via core biopsy allow better characterization of different cell types & it is a feasible technique in acquisition of cancer tissues for EGFR gene mutation analysis. The use of core biopsy in a single sitting resulted in a high diagnostic yield for pulmonary nodules smaller than 1 cm. The correct diagnostic determination of pathology of these nodules is imperative since the distinction between malignant and benign nodules is essential for treatment planning. [8]

Primary lung carcinomas have reached an epidemic proportion & therapeutic advancements that took place in the field of lung cancer have brought out the need for specific histological diagnosis. Diagnosis on small biopsy has become important because targeted therapies available are mainly administered to patients. Thus, the role of a skilled pathologist for accurate tissue diagnosis becomes very critical. [10]

In 1883, Leyden successfully performed percutaneous transthoracic needle biopsy (PTNB) of the lung in three patients with pneumonia according the records three years later, Menetrier was the first recorded to employ this technique for the diagnosis of lung cancer. So far, PTNB has a history of more than 100 years. In recent years, PTNB has increasingly been applied in clinical settings along with innovations in imaging devices, improvement of puncture needles, and advances in cellular pathology. Currently, PTNB is often performed under the guidance of ultrasound or computed tomography (CT) by a radiologist [11]

McEvoy D et al studied 81 cases of intrapulmonary mass by using pulmonary biopsy, in that final diagnosis was made in 79 of these 81 patients showed that core biopsy is a safe procedure and effective in the identification of malignant tumors. Its chief advantage over aspiration techniques is that the tissue core obtained permits a specific diagnosis in a patient with benign lesions, thus reducing the need for continued observation or diagnostic thoracotomy. [6]

Verma richa et al studied indeterminate lung lesions in 76 patients by using Single Puncture CT Guided fine-needle aspiration cytology (FNAC) and Tru-cut biopsy & showed that FNAC and biopsy are complementary to each other than done alone & they conclude that both the CT guided coaxial FNAC and trucut biopsy are complementary and should be done in a single sitting for a better diagnostic yield[12].

In the present study, the mean age was 58. 29 years which correlated well with study done by Beslic et al. [13] There was male predominance with male to female ratio being 3.75:1. Now a days, the incidence of lung cancer is increasing in females as there is increased frequency of smoking in them. It was observed that 67. 5% of patients were smokers in the present study which was statistically very highly significant. Among males 84. 4% were smokers. Study conducted by Mondal et al[14], Nalinimohan C et al[15], and Dogan C et al[16] showed statistically highly significant percentage of smoking history in male patients with lung lesions which accounted to be 56. 5%, 64. 7% and 55. 3% respectively.

The common presenting complaints were cough(63. 2%), followed by breathlessness(33. 3%) and chest pain(28. 9%) in the present study. Bhattacharya et al[17] showed cough being the major presenting complain in about 68% of patients in their study followed by fever in 15. 6% of patients. Hussain MF et al[2] showed 36. 2% presented with cough followed by 6. 2% with chest pain. Studies done by Mondal K et al[14], Roy S et al[18] and Aniruna D[19] et al showed the right lung being more commonly involved than the left lung. However, in the present study, slight predominance of right lung (50.8%) involvement was seen compared to left(49. 2%).

In a study done by Yang et al[20], 217 were malignant and 94 were benign lesion in a total of 311cases. In the present study 12 were non neoplastic and 95 were neoplastic. The higher number of neoplastic cases can be attributed to increased utilisation of biopsy procedure to acquire tissue for definitive diagnosis of malignancy suspected on radiological imaging studies. However, 7cases were inadequate for interpretation and were advised repeat biopsy.

Granulomatous lesions and fungal infections were most common non-neoplastic lesions in the present study which correlated with Bhattacharya et al[17] and Verma et al[21]. Bronchopneumonia accounted for 1.75% of cases which was lower than the study done by Bhattacharya et al (5.3%). Inflammatory pseudotumor is a quasineoplastic lesion consisting of inflammatory cells & myofibroblastic spindle cells. It appears as solitary, peripheral, sharply circumscribed lobulated mass on HRCT. Histopathologically Lesion can be divided into three patterns like organizing pneumonia pattern: characterized by airways filled with plump fibroblasts and foamy histiocytes, fibrous histiocytic pattern: characterized by spindle shaped cells arranged in whorl pattern & lymphohistiocytic pattern: characterized by lymphocytes & plasma cells with minimal fibrous connective tissue[22]. In the present study two cases were inflammatory pseudo tumour which had predominantly fibrous histiocytic pattern.

Among neoplastic lesions 34. 21% of cases were adenocarcinoma, 27. 19% were squamous cell carcinoma and 14. 91% were small cell carcinoma. However, study conducted by Roy S et al[18] and Mondal et al[14] showed higher percentage of adenocarcinoma.

Large cell carcinoma in the present study was 2. 63% which was higher than study done by Mondal K et al[14] (1. 75%) and lower than the study done by Hussain MF et al[2] (7. 6%).

Study done by Aniruna D et al[19] showed most common histopathological diagnosis as squamous cell carcinoma followed by small cell carcinoma, adenocarcinoma, Hodgkin lymphoma, malignant mesothelioma and angiosarcoma. Where as in the present study the most common diagnosis was adenocarcinoma followed by squamous cell carcinoma and also seen were other neoplastic lesions like Adenosquamous carcinoma, solitary fibrous tumor of lung.

Solitary fibrous tumor of pleura is an uncommonly occurring tumor with an incidence of 2. 8% per 100, 000 individuals[23]. In the present study 2cases were diagnosed as solitary fibrous tumor of pleura which on CT presented as dense mass involving 2/3rd of the lung with lung tissue showing atelectasis, foci of calcification, immunohisto chemistry study showed CD34 positivity.

Primary pleural leiomyosarcoma is an extremely rare malignant tumour. Because of the rarity of pleural leiomyosarcoma and its similarity, both clinically and histologically to other pleural neoplasms, particularly sarcomatous mesothelioma, the diagnosis is mostly difficult. Patients usually present with dyspnea, chest pain or cough. Radiologically, a mass lesion and/or pleural effusion may be seen or sometimes it encases the lung similar to mesothelioma. In the present study, diagnosis of primary pleural leiomyosarcoma was challenging in a 55year old lady who presented with cough and chest pain. On HRCT a large pleural based mass was seen with thick walls extending into right upper lobe. Core needle biopsy was performed which showed interlacing bundles of spindle cells with coarse chromatin and frequent mitosis. A panel of immunohistochemical markers were carried out which showed H-caldesmon positivity.

Treatment for GIST has been considerably changed by the introduction of molecularly targeted therapies against c-KIT and PDGFRA using imatinib and sunitinib. In particular, imatinib has been demonstrated to improve progression-free survival in patients with advanced illness. Gain-of-function mutations in exons 11 and 9 make up the majority of the somatic mutations in c-KIT, and exon 11 mutations are associated with enhanced objective responses, time to tumour progression, and overall survival in patients receiving imatinib. [24]

Cytological and histopathological comparison was possible in 13 cases. The cytological findings were concordant with histopathological findings in 9 cases. In 4 cases there was discrepancy. These findings were correlated with those of Hussain MF et al showed cyto-histopathological concordance in 12 cases out of 20 cases.

Complications following trucut/core needle biopsy of lung are a well-known fact despite undertaking all precautions. The common complications are pneumothorax and pulmonary haemorrhage. Less frequently hemoptysis, subcutaneous hematoma, infection, air embolism and chest pain. In the present study 13cases(11. 4%) had pneumothorax and 3cases(2. 6%) had pulmonary haemorrhage.

CONCLUSION

Lung cancer is the most common cancer worldwide and leading cause of cancer death. Classification of lung carcinoma has undergone significant change since 2015. Histopathological and immunohisto chemical characteristics of lung carcinoma has been studied extensively and criteria's are established which play a major role in the patient management. Application of these criteria's utilizing small core of tissue helped in prognostic significance especially in adenocarcinoma where a targeted therapy can be achieved .

The introduction of modern diagnostic imaging techniques, mainly CT-guided tru-cut (core)biopsy, has enabled the detection and location of lesions which are not easily accessible to surgical biopsies.

Hence core needle biopsy is a preferable diagnostic method that helps in planning effective management and better prognosis. It is a minimally invasive and cost-effective technique with very minimal complications. Core needle biopsy is highly accurate compared to aspiration cytology and when carried out under experienced guidance yields adequate material for accurate diagnosis of different types of lung lesions, and especially in further classification of lung malignancies utilizing ancillary techniques.

It has a high sensitivity, specificity, and diagnostic accuracy and highly recommended in the diagnosis and management of lung carcinoma with modern technological advances.

Ethical Approval:

"All procedures performed in the current study were approved by IRB and/or national research ethics committee (20211114 and 26/11/2023) in accordance with the 1964 Helsinki declaration and its later amendments."

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