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CT Guided Fine Needle Aspiration Cytology of Lung Lesions: A Study of 60 Cases

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ABSTRACT

Worldwide, lung cancer is the most common cause of major cancer incidence and mortality in men, whereas in women it is the third most common cause of cancer incidence and the second most common cause of cancer mortality. This study aimed to assess the findings of CT-guided fine needle aspiration cytology (FNAC) in diagnosing lung lesions. This cross-sectional observational study was conducted in the department of pathology in Jalalabad Ragib-Rabeya Medical College Hospital, from January 2023 to December 2023. A total of 60 patients with suspected lung masses were selected as study subjects. A purposive sampling technique was adopted in this study. Collected data were analysed using descriptive statistics. Analysis of data was carried out by using a statistical package for social science (SPSS) 22.0 for Windows. The study comprised 60 participants, predominantly male (76.67%). Most lesions were in the right lung (50%), with the right lower lobe most affected (21.67%). Squamous cell carcinoma (45%) was the most common cytological finding, followed by inflammatory lesions (18.33%). Cytologically, 70% were malignant, with 25% benign and 5% suspicious. Radiologically, 76.67% were malignant, and 23.33% were benign. Complications of CT-guided FNAC included pneumothorax (3.33%), minor bleeding (3.33%), haemoptysis (1.67%), and infection (1.67%). This study concludes that CT-guided FNAC is a highly effective and safe diagnostic tool for diagnosing lung lesions. It aids in differentiating between benign and malignant lung lesions and also helps in the diagnosis of different types of lung cancers.

Keywords: *FNAC, Radiology, Lung lesion, CT scan.*

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INTRODUCTION

Computed Tomography (CT) guided fine needle aspiration cytology (FNAC) has emerged as a pivotal diagnostic technique for evaluating lung lesions. The precise imaging capabilities of CT allow for accurate localisation and sampling of pulmonary abnormalities, making it an indispensable tool in the management of lung cancer and other thoracic pathologies. The burden of lung cancer remains substantial worldwide, with it being the leading cause of cancer-related mortality in both men and women. Early and accurate diagnosis is crucial for improving patient outcomes, and CT-guided FNAC plays a crucial role in achieving this objective by providing cytological diagnosis that informs subsequent therapeutic decisions. The utility of FNAC in diagnosing lung lesions lies in its minimally invasive nature, combined with high diagnostic yield and relatively low complication rates.

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Traditional diagnostic methods, such as bronchoscopy and open lung biopsy, often have limitations in terms of accessibility to certain lung regions and associated morbidity. In contrast, CT-guided FNAC can reach both peripheral and centrally located lesions with high precision, guided by real-time imaging that enhances the accuracy of needle placement. This method is particularly beneficial for patients who are poor candidates for more invasive procedures due to co-morbid conditions or poor pulmonary reserve[1]. Several studies have demonstrated the diagnostic accuracy of CT-guided FNAC in lung lesions. For instance, a study by Khouri et al. reported a sensitivity of 92% and a specificity of 100% for CT-guided FNAC in diagnosing malignant lung lesions[2]. These findings emphasise the reliability and safety of CT-guided FNAC in clinical practice. Despite its high diagnostic accuracy, CT-guided FNAC is not without challenges. Factors such as the size and location of the lesion, the patient's respiratory movement, and the skill of the operator can influence the success rate and complication profile of the procedure. Common complications include pneumothorax, which occurs in approximately 20-25% of cases, though it is often self-limiting and requires minimal intervention[3,4]. Other less frequent complications include haemorrhage, infection, and air embolism[5,6]. Advancements in CT technology, including the development of multi-detector CT (MDCT) and real-time CT fluoroscopy, have further enhanced the efficacy of CT-guided FNAC. These technologies allow for more precise needle placement and reduced procedure time, thereby improving patient comfort and safety[7]. Furthermore, the integration of molecular and genetic testing on FNAC samples has expanded the diagnostic and therapeutic landscape, enabling personalised treatment approaches for lung cancer patients[8]. This study aimed to assess the findings of CT-guided fine needle aspiration cytology (FNAC) in diagnosing lung lesions.

MATERIALS AND METHODS

The cross-sectional study was conducted in the department of pathology in Jalalabad Ragib-Rabeya Medical College Hospital, (JRRMCH), Sylhet in association with the department of radiology and imaging from January 2023 to December 2023. A total of 60 patients having pulmonary mass lesions suspected to be neoplastic by chest radiograph or CT scan were referred from different departments like medicine, oncology, and OPD. CT-guided FNAC of pulmonary mass lesions from each case was performed by the pathologist as an OPD procedure and also in the presence of an experienced radiologist. The skin surface was cleaned with an antiseptic solution and then a 22G spinal needle was introduced through a percutaneous/transthoracic approach, localising the exact position by CT scan after the measurement of the site and angle of the needle, the route of the needle, and the distance between the skin and lesion on the CT scan monitor. Following the placement of the needle, a CT scan slice was taken to ascertain whether the tip of the needle was within the mass. The aspirate was obtained by to and fro and rotating movement of the needle within the lesions and smears were prepared immediately from the sample in the CT scan room. Alcohol-fixed smears were stained with Papanicolaou (PAP) stain for cytopathological evaluation of the lesions. Patients were kept for 2 hours under observation. Patients of any age and both sexes with suspected neoplastic lesions who were willing to give consent were included in this study. Some data were collected from the patients through face-to-face interviews, and some were collected from investigation reports. All data were collected using a pre-formed questionnaire. The patient's full record, which includes confirmed clinical diagnosis, patient profile, clinical history, laboratory data, and other relevant data, was gathered according to the objectives of the study. Collected data were analysed using descriptive statistics. Analysis of data was carried out by using a statistical package for social science (SPSS) 22.0 for Windows. After analysis, the data were presented in tables. Ethical clearance was taken from the ethical committee of JRRMC. Informed written consent was obtained from the participants.

RESULTS

In this study, the majority of the patients belonged to the 50-59 years of age group (16, 26.7%), followed by the 60-69 years of age group (14, 23.3%). The mean age was 65.05 years [Table-I], and most of the patients were male 46 (76.7%) [Table-II]. In this study, the right lung was involved in the majority of the cases (50%), the left lung in (48.3%) patients, and both lungs in 1 (1.7%) patient [Table-III]. The most affected lobe was the right lower lobe 13 (21.7%), followed by, the right upper lobe 12 (20%) and hilum 12 (20%). The left lower lobe was affected in 11 (18.3%) patients [Table-IV]

It was observed that squamous cell carcinoma was the most predominant finding 27 (45%), followed by the inflammatory lesion 11 (18.3%), small cell

Table-I: *Age distribution of the respondents, n=60.*

Age (Years)	Frequency	Percentage
20-30	1	1.7
30-39	2	3.3
40-49	5	8.3
50-59	16	26.7
60-69	14	23.3
70-79	10	16.7
80-89	7	11.7
90-100	5	8.3
Mean± SD	65.05±16.09	

Table-II: *Sex distribution of the subjects, n=60.*

Sex	Frequency	Percentage
Male	46	76.7
Female	14	23.3

Table-III: *Patients according to involved lung, n=60.*

Lung involved	Frequency	Percentage
Right lung	30	50
Left lung	29	48.3
Both lung	1	1.7

Table-IV: *Patients according to the involved lobe of* the lung, n=60.

Involved lobe	Frequency	Percentage
RT upper	12	20
RT lower	13	21.7
Middle	2	3.3
Left upper	10	16.7
Left lower	11	18.3
Hilum	12	20

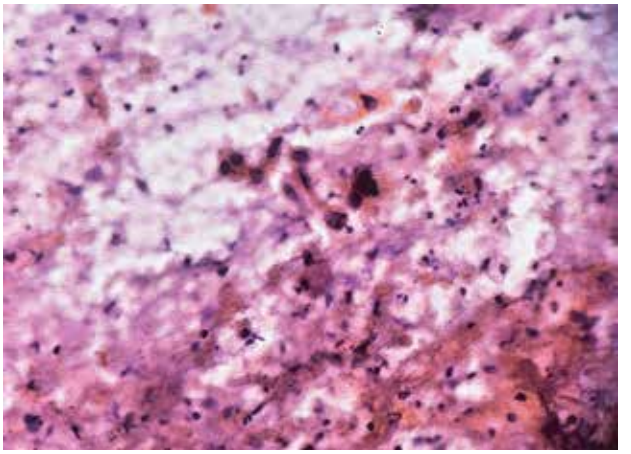

Figure-1: *Photomicroghraph showing cytology of squamous cell carcinoma.*

Table-V: *Patients according to cytological findings.*

Cytological finding	Frequency	Percentage
Squamous cell carcinoma	27	45
Adenocarcinoma	5	8.3
Small cell carcinoma	8	13.4
Tuberculosis	2	3.3
Inflammatory lesion	11	18.3
Suspicious for malignancy	3	5
Abscess	2	3.3
Large cell carcinoma	1	1.7
Metastatic squamous cell carcinoma	1	1.7

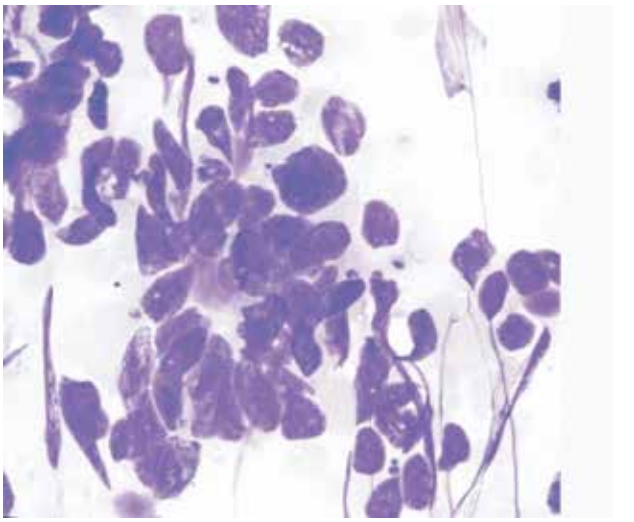

Figure-2: *Photomicrograph showing cytology of small cell carcinoma.*

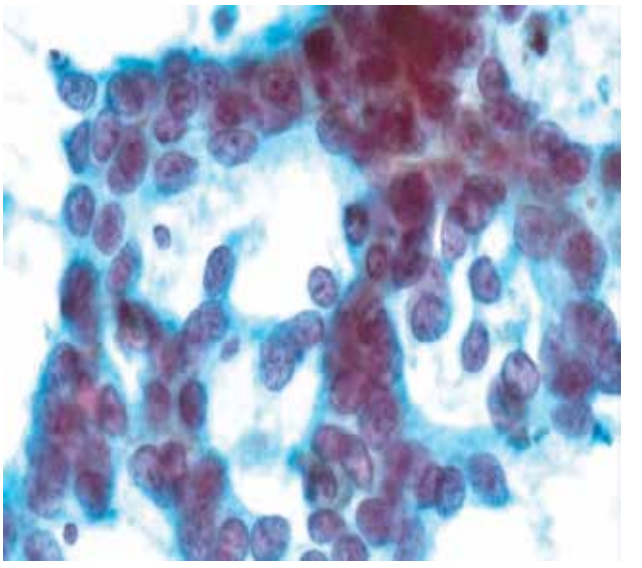

Figure-3: *Photomicrograph showing cytology of adenocarcinoma.*

Table-VI: *Patients according to type of lesion in cytology, n=60.*

Type of neoplasm	Frequency	Percentage
Benign	15	25
Malignant	42	70
Suspicious malignancy	3	5

Table-VII: *Patients according to type of lesion in radiology, n=60.*

Type of neoplasm	Frequency	Percentage
Benign	14	23.3
Malignant	46	76.7

Table-VIII: *Complications of CT-Guided FNAC.*

Complications	Frequency	Percentage
Pneumothorax	2	3.3
Minor bleeding	2	3.3
Haemoptysis	1	1.7
Infection	1	1.7

carcinoma 8 (13.4%), and adenocarcinoma 5 (8.3%) [Table-V]. Benign lesions were found in 15 (25%) cases and malignant in 42 (70%) cases in cytology. Moreover, 3 (5%) cases were suspicious of having malignancy [Table-VI]. It was observed that benign cases were found in 14 (23.3%) cases and malignant in 46 (76.7%) cases in radiology [Table-VII]. The most common complication was pneumothorax 2 (3.33%) and minor bleeding 2 (3.33%). Haemoptysis 1 (1.67%) and infection 1 (1.67%) were less common but notable complication, was observed in the study [Table-VIII].

DISCUSSION

The present study investigated the findings and complications associated with CT-guided fine needle aspiration cytology (FNAC) of lung lesions in a cohort of 60 patients. The majority of patients in this study were between 50-59 years of age (26.7%), followed by those in the 60-69 age group (23.3%). This age distribution is consistent with previous studies indicating that lung cancer predominantly affects older adults, typically those aged 50 and above[9,10]. The mean age was 65.05±16.09 years, which somewhat aligns with findings from Uzan et al[2]. In our cohort, males constituted 76.7% of the patients, while females made up 23.3%. This sex distribution is reflective of the higher prevalence of lung cancer in males, historically attributed to higher smoking rates among men[11]. Studies by Nour-Eldin et al. similarly reported a prevalence of male patients in their cohorts undergoing CT-guided lung biopsies[1]. The right lung was involved in 50% of the cases, slightly more than the left lung (48.3%). This distribution of lung involvement is comparable to findings by another author, who noted no significant predilection for the sides of lungs in their series of CT-guided biopsies[3]. Regarding lobe involvement, the right lower lobe (21.7%) and right upper lobe (20%) were the most commonly affected areas, followed by the left lower lobe (18.3%) and the hilum (20%). These findings are consistent with the anatomical distribution of primary lung tumours observed in previous studies, where the lower lobes are frequently affected[12]. The most prevalent cytological finding was squamous cell carcinoma (45%), followed by inflammatory lesions (18.3%), small cell carcinoma (13.4%), and adenocarcinoma (8.3%). This distribution aligns with global lung cancer histology trends, where squamous cell carcinoma and adenocarcinoma are the most common types[13,14]. In cytology, 70% of the cases were malignant, 25% were benign, and 5% were suspicious of malignancy. Radiological assessment showed 76.7% of cases as malignant and 23.3% as benign. The slight discrepancy between cytological and radiological findings underscores the complementary nature of these diagnostic modalities. Studies have shown that while radiology provides crucial anatomical details, cytology offers definitive cellular diagnosis, a synergy that enhances diagnostic accuracy[6]. The complication rate observed in this study was relatively low, with pneumothorax, and minor bleeding being the most common (3.3%, respectively), followed by haemoptysis, and infection (1.7%, respectively). However, these complications rates are not in line with those reported in the literature. For instance, Covey et al. reported a pneumothorax rate of approximately 20-25% in their series of lung biopsies, indicating that our results are consistent with established data[4.] The low incidence of significant bleeding and infection further supports the safety profile of CT-guided FNAC[7]. Our findings corroborate the high diagnostic accuracy and safety of CT-guided FNAC reported in previous studies. The slight variations in complication rates and diagnostic yields can be attributed to differences in patient populations, lesion characteristics, and procedural techniques.

LIMITATIONS

The study was carried out in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

CT-guided FNAC is a safe and reliable procedure for the diagnosis of lung lesions. FNAC not only distinguishes between benign and malignant lesions but also helps in tumour typing of lung cancer. The precise imaging capabilities of CT guided FNAC allow for accurate localisation and sampling of pulmonary abnormalities, making it an indispensable tool in the management of lung cancer and other thoracic pathologies. The demographic and clinical characteristics of our cohort, along with the detailed analysis of findings and complications, provide a comprehensive understanding of the procedure's and safety.

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