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Research Article

EPIDEMIOLOGICAL AND CYTO-MORPHOLOGICAL SPECTRUM OF PULMONARY LESION BY CT GUIDED FNAC

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ABSTRACT

Background: CT-guided fine-needle aspiration cytology is an established, indeed effective and precise method for diagnosing of pulmonary lesions. Though this procedure has the possibility to lead lung complications. Therefore, this study aimed to learn about the pathological spectrum of pulmonary lesions, examine the pattern of FNAC diagnosis of lung lesions, and analyse and compare the data with published figures.

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Material & method: This study was carried out at the Pathology Department of Tairunnessa Memorial Medical College and Hospital, as well as the Popular Diagnostic Center in Gazipur, Bangladesh, where all cases were FNAC and cytologically diagnosed. From September 2000 to April 2022, a total of 171 cases were evaluated. All of the patients had nodular or mass lesions in their lungs and were diagnosed with a CT-guided FNAC by following a standard procedure.

Result: Out of 171 cases about 119 (69.59%) were male and 52 (30.40 %) female. It was noticed that approximately 117 (68.42%) were malignant cases. Of these, most common malignancy was adenocarcinoma (43.27%). There were about 31.67 % benign lung lesions cases. Among them, 17.54%, 8.87%, 3.5%, and 1.67% cases had pulmonary inflammatory lesions, tuberculosis, aspergillosis and abscess, respectively.

Conclusion: CT guided FNAC can diagnose pulmonary lesion fairly and accurately as well as may leading to less morbidity & mortality as treatment can be started early.

KEYWORDS

Computed tomography, Fine needle aspiration cytology, Pulmonary lesion, Lung cancer.

INTRODUCTION

The lung is a vital organ of the body that is exposed to several environmental exposures such as airborne microorganisms, natural allergens, automobile exhaust fumes, and smoking, which induces a wide range of pulmonary diseases ranging from infectious to neoplastic that are responsible for the majority of worldwide mortality and morbidity. [1] Among them, lung carcinoma is the leading cause of cancer-related deaths worldwide. [2] Correct and early detection is the key to successful management of lung diseases. Various invasive and non-invasive procedures are used for identifying lung diseases. Usually two types of lung diseases namely diffuse and nodular or mass can be observed in the radiological imaging of lung pathology.

Fine-needle aspiration cytology (FNAC) is a diagnostic method first used as a diagnostic tool by Martin and Ellis. [3] Back to 1883, Leyden initiated using this technique for the detection of lung carcinoma and almost a 100 years later in 1986, lung infection was started being identified by this procedure by Manbriel. [4] By the virtue of technological advancement, FNAC (Fine needle aspiration cytology) is now- a-days administered with a computed tomography (CT) scan which has made this procedure more accurate, safe, quick and dependable procedure for detecting pulmonary lesions. [4, 5] Mondal et al., reported that the FNAC not only differentiates benign from malignant lesions, but it also helps in lung cancer tumor typing, enabling for the immediate commencement of therapeutic intervention such as chemotherapy or surgery.[4] This whole procedure involves a teamwork approach, in which the presence of pathological staff during the procedure may improve the overall sensitivity and accuracy of tumor typing by reducing the number of needle passes and thus easing patient pain or trauma. If the aspirated material is not properly processed, the entire process would be a waste. [6]

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Evidence suggests that FNAC with CT scan can diagnose malignancy in 93–96.6% cases. [7] 100% specificity for a malignant diagnosis by FNAC with CT scan was reported by Sterrett et al. in their thoracic review study. [8] Recently, the diagnostic accuracy is reported to be greater than 80% in benign disease and greater than 90% in malignant disease. [3] Lung FNA was correlated with histology showed an overall positive predictive value of 99% in a multicenter analysis conducted by the College of American Pathologists. [9] However, previous authors have reported 22-45 % risk of pneumo-thorax in CT guided FNAC. [3] As a consequence, this study was undertaken to know the pathological spectrum of pulmonary lesions and to examine the pattern of FNAC diagnosis of lung lesions and to analyze and compare the data with published figures by conducting a retrospective study of lung FNAC diagnosis.

MATERIAL AND METHOD

This study was conducted in the department of pathology in Tairunnessa memorial medical college and hospital, and popular diagnostic center which are situating in Gazipur, Bangladesh where all cases of FNAC and cytological diagnosis were carried out. A total of 171 cases were evaluated during a period of September 2000 to April 2022. All the cases had nodular or mass lesions in the lung and underwent a CT guided- FNAC.

Prior to go through the FNAC, all the participants went through routine examinations consisting of biochemical test, hematological test and plain chest X-ray (posterior/ anterior view and lateral views). Patients who were not able to hold their breath, or patients having severe chronic obstructive pulmonary diseases (COPD), bleeding disorders, PAH and having diagnosed malignancy elsewhere in the body and or developed secondary deposits in the lungs were excluded from the study.

CT guided FNAC was performed by an experienced pathologist in co-ordination with an expert radiologist as OPD procedure. Before going through the examination, all the respondents were informed about the benefits and risk of this method. The final procedure was beginning after receiving participants' both verbal and written consent.

In order to carry out the FNAC, the patients' skin surface was cleaned by povidone iodine and then 20 to 25 gauge spinal needles attached to 10 ml syringe was introduced through percutaneous / transthoracic approach localizing the exact position by CT scan after the measurement of the site and angle of entry of the needle, route of the needle and the distance between the skin and lesion on the CT scan monitor. CT scan slices were taken after needle placement to determine whether the needle tip was within the mass. The needle was reciprocated and twisted within the lesion to obtain aspirates. If her first aspiration was deemed ambiguous, she underwent a second FNA. There were no patients who required more than two aspirations. Smears were prepared on plain glass slides after aspiration for routine Papanicolaou staining, air-dried, and fixed in alcohol. A cytological diagnosis was made after examining stained slides under a microscope.

For two hours, patients were kept under observation. In this study, one patient developed a pneumothorax that was treated conservatively, and three patients complained of chest pain from the affected area. Both were handled cautiously. Standard statistical methods were used to analyze the reported results and related data, which were entered into datasheets.

Except for the first and last groups, patients were divided into four age groups for statistical analysis,

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each consisting of a decade. The first group consists of patients aged 20 and under, while the second group consists of patients aged 61 to 80.

RESULTS AND ANALYSIS

During this period, one hundred and seventy-one cases were analyzed and the results are shown in this section.

Table 1 illustrates that the participants' age ranged from 18 years to 80 years with mean age 47.25±19.72 years. Comparatively more number of cases were males than females. Out of 171 cases, about 119 (69.6%) were male and 52 (30.4%) were female. Male to female ratio was 2.3:1. Majority of patients were smoker 48 (28.1%) followed by betel leaf consumer (n= 43, 25%), non-smoker (n=23,13.5%), smoker & tobacco chewer (n=35 ,20.5%), and high salt consumer (n=22, 12.9%).

Table 1: Demographic information of study patients

Variables	Frequency, n (%)
Age of the patients	
<20	23 (13.5%)
21-40	42 (24.5%)
41-60	58 (33.9%)
61-80	48 (28.1%)
Mean ±Std. Deviation	47.25±19.72
Gender of the patients	
Male	119 (69.6%)
Female	52 (30.4%)
Habits of the patients	
Smoker	48 (28.1%)
Smoker & tobacco chewer	35 (20.5%)
Non smoker	23 (13.5%)
Betel leaf consumer	43 (25%)
High salt consumer	22 (12.9%)

Adenocarcinoma (n=74,43.27%) was the most common type followed by pulmonary inflammatory lesion (n= 30,17.54%), squamous cell carcinoma (n= 22 ,12.86%). In male, adenocarcinoma was the most common lesion (56 cases, 75.6%), followed by squamous cell carcinoma (19 cases, 86.4%) whereas in female, adenocarcinoma was the most common (18 cases, 24.4%), followed by pulmonary inflammatory lesion (12,40%).

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Table 2: Diagnostic findings of FNAC of lung lesions (N=171)

Diagnosis	Sex		Total	M:F ratio
	Male	Female		
Adenocarcinoma	56	18	74 (43.27%)	3.11: 1
Squamous cell carcinoma	19	3	22 (12.86%)	6.33:1
Small cell carcinoma	9	1	10 (5.84	9:1
Pulmonary inflammatory lesion	18	12	30 (17.54%)	1.5:1
Tuberculosis	10	5	15(8.87%)	2:1
Metastatic adenocarcinoma carcinoma	6	0	6 (3.50%)	----
Undifferentiated carcinoma	4	1	5 (2.92%)	4:1
Aspergillosis	3	3	6 (3.50%)	1:1
Lung abscess	2	1	3 (1.76%)	2:1
Total	127	44	171 (100%)	

54 patients were developed benign lung lesions out of 171 patients. Out of 54 patients, pulmonary inflammatory lesion (30,17.54%) were found higher, followed by tuberculosis (15, 8.87%) aspergillosis (6,3.5%) and lung abscess (3, 1.76%).

Table 3: Distribution of subjects of benign lung lesions

Lesions	Number	Percentage
Pulmonary inflammatory lesion	30	17.54%
Tuberculosis	15	8.87%
Aspergillosis	6	3.50%
Lung abscess	3	1.76%
Total	54	31.67 %

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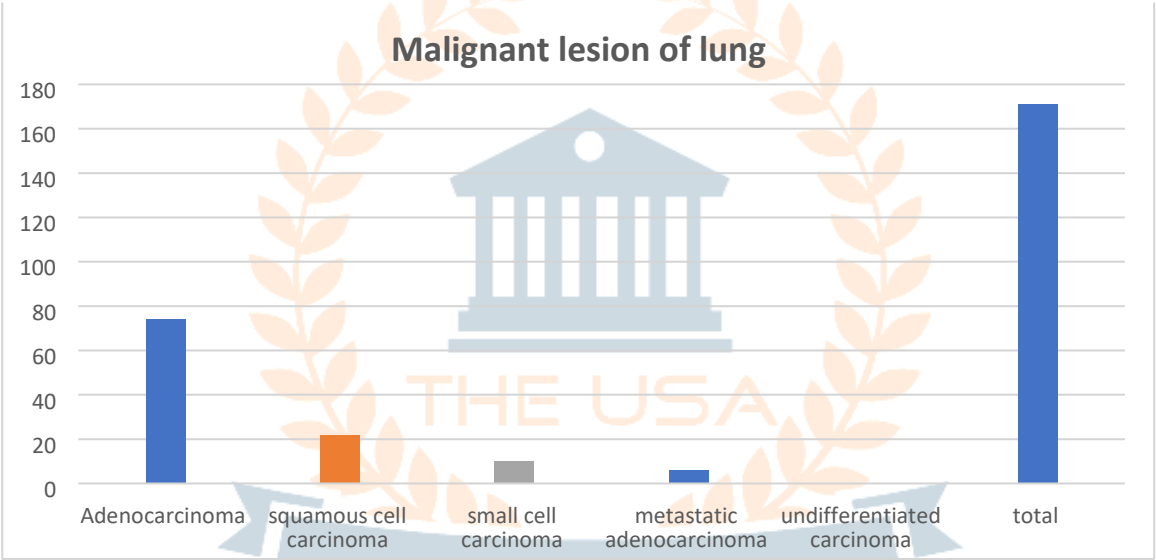
Figure 2 presents that 117 (68.42%) were malignant among the total 171 cases. Most common malignancy was adenocarcinoma (43.27%) followed by squamous cell carcinoma (12.86%), small cell carcinoma (5.84%). There was metastatic adenocarcinoma (3.50%) and undifferentiated carcinoma (2.92%).

Figure 1: Distribution of cases according to malignant lesions of lung



Pathological findings of malignant lesion of lung is shown in figure 2. These images were captured during diagnosis among these study populations.

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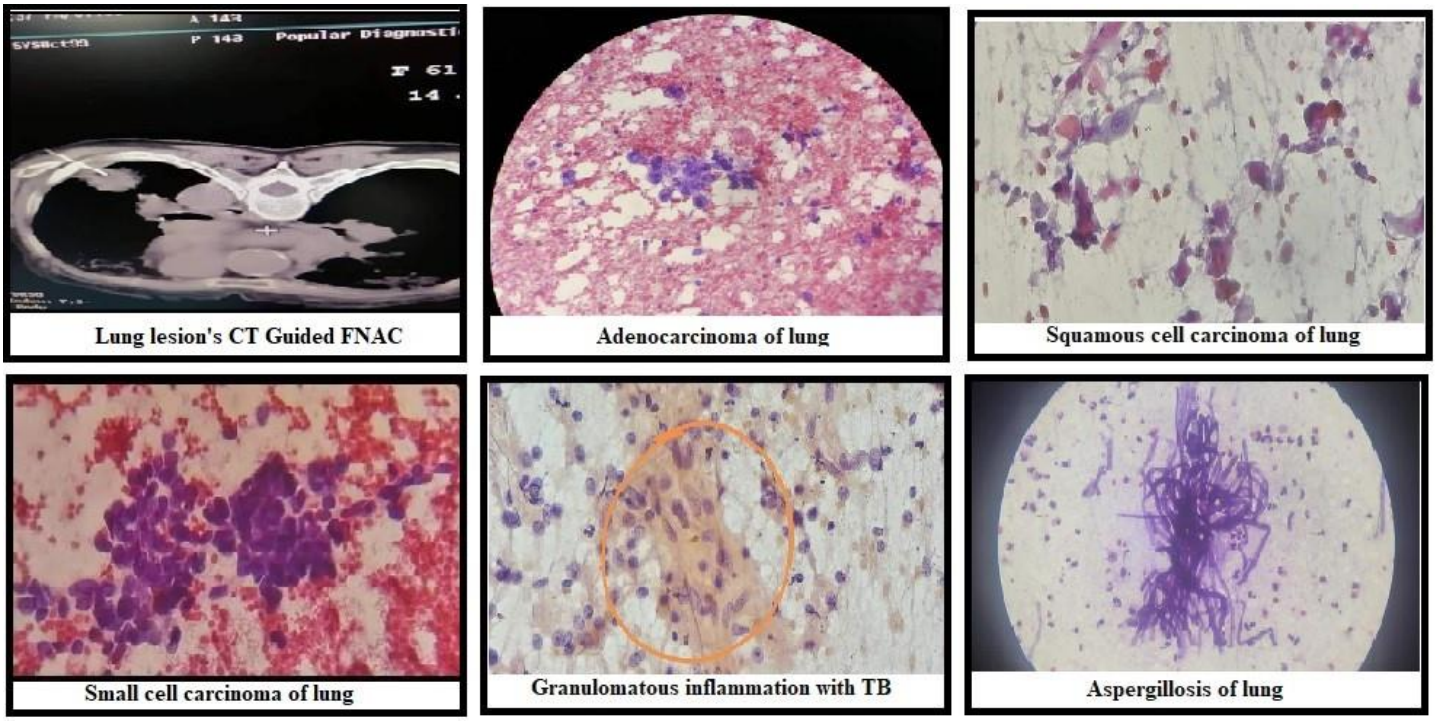
Figure 2: Different malignant lesions in lung diagnosed by CT guided FNAC



DISCUSSION

CT guided FNAC is worldwide accepted & established method of choice to determine the nature of lesion and effectively used in categorization and diagnosis of malignant and benign lesion. Hence it is a sensitive method for lung cancer diagnosis. Lung cancer is the second most common cancer and is the leading cause of cancer mortality worldwide for both men & women. [10]

The 41-60 age people were found to have the highest number of cases (48/171). It is the period of human adulthood that immediately precedes the onset of old age. Whereas study conducted by Agrawal et al., found that it was higher in age group 61 to 70 years of age. [10]

In this study, male preponderance (69.59%) was noticed. Out of 171 study subjects, about 119 (69.59%) were male and 52 (30.40 %) were female. In some previous studies in a similar setting, the percentage of males was found to be higher such as in a study conducted by Tan and his colleagues, 71.1% of males were affected. [11] Similarly, 78.9%, 80.6% and 64.51% males were affected in the study conducted by Saha A et al, Bandyopadhyay et al and Mondal et al respectively. [12, 13, 4] This can be stated that the present study result is similar to the above-cited studies' in the case of gender-based prevalence of lung carcinoma. Male predominance may be due to the greater incidence of pulmonary diseases in males because of smoking habits & occupational hazards. [14,15,16]

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In this study, history of smoking was present in 48 cases followed by betel leaf consumer (n= 43,25%), smoker & tobacco chewer (n=35,20.5%), non-smoker (n=23,13.5%) and high salt consumer (n=22,12.9%). Similarity in high prevalence of smoking (60.71%) was found in study by Agrawal et al. [10]

Except for insufficient samples, cytological diagnosis of pulmonary lesions revealed that the prevalence of malignant disease ranged from 61% to 70.7%, and the prevalence of benign lesions ranged from 29.3% to 70.7%, according to various studies. It is shown to be in the 39% range. [17,18] The prevalence of malignancies in our study (68.4%) was very similar to the previous studies, but higher than the 81.8% and 80.5% reported in similar studies by Stewart et al. and Sing et al. [18, 19]. However, malignant lesions are far more common than benign lesions worldwide, as evidenced by our findings. This high percentage of malignant patient is probably due to as most of the inflammatory conditions are now a day effectively treated by antibiotics. The tuberculosis cases and malignant cases are non-responsive to antibiotics and they suffer chronically and come to diagnostic CT guided FNAC. [20]

In the current study, adenocarcinoma (43.27%) was identified as the most common malignancy followed by squamous cell carcinoma (12.86%), small cell carcinoma (5.84%), metastatic adenocarcinoma (3.50%) and undifferentiated carcinoma (2.92%). Similarly, a higher incidence of adenocarcinoma was also found in some prior studies conducted by Stewart et al and Tan et al. [18,11] In contrast, squamous cell carcinoma was noticed as the commonest diagnosis in a research carried out by Gouliamos et al. [17] Small cell carcinoma is known to be aggressive tumor of common subtypes. Cytological diagnosis plays very crucial role in finding out this carcinoma. In our series, 09 cases were diagnosed as small cell carcinoma by cytological examination and they responded well to treatment. Furthermore, tuberculosis is another important finding other than malignancy in ongoing studies. The results indicated that this study had 8.87% of TB cases which shows some similarity with a study done in Singapore. [11] However, a study conducted by the previous author found more TB cases [7] than this study, which casts some doubt on the lung FNAC method.

CONCLUSION

FNAC of a lung mass guided by a CT scan is the simplest, fastest, and most accurate method for diagnosing a lung tumor preoperatively, avoiding unnecessary surgery and inconvenience caused by biopsy. This is one of the cost effective procedure with high diagnostic accuracy for the evaluation of both malignant and benign diseases of lungs when done by competent personnel. FNAC is an outpatient procedure with low complication rates and high diagnostic accuracy, even in the sub classification of lung tumors. Due to high sensitivity and specificity of CT guided FNAC in lungs malignancy, early diagnosis and early treatment is possible thus reducing morbidity and mortality. Although CT guided core biopsy is an excellent option in terms of histopathological access and subsequent immunohistochemistry feasibility, CT guided FNAC is a reliable and appropriate tool for early life saving intervention in Bangladesh due to cost effectiveness, almost no complication, minimal invasiveness, lack of need for anesthetic, analgesic, antibiotic, and high accuracy in skilled hands.

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