Original Article

CT-Guided FNAC of Lung Lesions and Cytological Sub-Classification of Bronchogenic Carcinoma of 246 cases at a Tertiary Care Hospital

Md. Mamun Ali Biswas[1], Afroz Shirin[2], Abdul Mannan Sikder[3], Rajib Saha[4]

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Abstract

Background: *CT-guided fine needle aspiration cytology (FNAC) is a useful tool for evaluating lung nodules or masses. In view of the relative paucity of published studies regionally, this study was undertaken in the Department of Pathology, Enam Medical College & Hospital to see the use of the technique.* ***Materials and Methods:*** *Two forty six CT guided lung FNACs were performed during January 2017 to December 2018 and cytological diagnoses were made. Reported results and relevant data were recorded in the data sheet and then analyzed by standard statistical method.* ***Results:*** *Total number of cases were 246. Adequate samples were obtained in 228 (92.68%) cases, among the adequate samples 135 (59.41%) were malignant, and 93 (40.49%) were benign or non-malignant lesions. Among the benign lesions, lung abscess (36;38.70%) was the most common followed by pulmonary TB (27;29.03%). Adenocarcinoma (54;40%) was the most common type of bronchogenic carcinoma followed by squamous cell carcinoma (51;37.78%), small cell carcinoma (21;15.56%), NHL (6;4.44%) and large cell undifferentiated carcinoma (3;2.22%). In male persons, squamous cell carcinoma (42.85%) was the most common type of bronchogenic carcinoma, followed by adenocarcinoma (34.29%). In female, adenocarcinoma was the most common type (18;60%) of bronchogenic carcinoma, followed by squamous cell carcinoma (6;20%).* ***Conclusion:*** *FNAC is a safe method for the evaluation of lung nodules and it enables sub-classification of bronchogenic carcinoma in the vast majority of cases. It is also useful for the diagnosis of tuberculous pulmonary nodules.*

Key words*: Bronchogenic carcinoma; FNAC; Lung mass*

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Introduction

Diseases of the lung can be conveniently divided into diffuse and nodular categories. The nodular or mass lesions are more amenable to diagnose with Fine Needle Aspiration (FNA) of the lung. Different studies showed it can diagnose malignancy in 93−96.6% cases.[1,2] A review of thoracic FNA by Sterrett et al[3] revealed a specificity of 100% for a malignant diagnosis. A recent multicentre analysis by the College of American Pathologists, in which lung FNA was correlated with histology, and showed an overall positive predictive value of 99%.[3] The concordance of FNAC classification of tumours with subsequent

1. Associate Professor, Department of Pathology, Enam Medical College & Hospital, Savar, Dhaka.
2. Assistant Professor, Department of Pathology, Enam Medical College & Hospital, Savar, Dhaka.
3. Former Professor, Department of Pathology, Enam Medical College & Hospital, Savar, Dhaka
4. Former lecturer, Department of Pathology, Enam Medical College & Hospital, Savar, Dhaka.
Correspondence *Dr. Md. Mamun Ali Biswas, Email: drmamun73@gmail.com*

histological classification is as high as 70−85%.[4] Its false positive and false negative rates are 0.8% to 8%. False negative results are primarily due to inadequate sampling.[1] Transthoracic CT guided FNAC is also useful for the diagnostic evaluation of non-neoplastic benign nodules of effective etiology, including tuberculosis.[5] It can diagnose non-neoplastic benign lesions in 88% cases.[2] Pneumothorax, hemorrhage, hemoptysis and chest pain are usually encountered complication of CT-guided FNAC. Very few cases of complications require active management.[6] Inability to hold breath, severe chronic obstructive pulmonary disease (COPD), bleeding disorders, pulmonary arterial hypertension (PAH) and contralateral pneumonectomy cases are a few absolute or relative contraindications for CT-guided FNAC.[7] All these factors make CT-guided FNAC as a simple, safe, reliable and cost-effective diagnostic method that has resulted in decreased number of other invasive procedures including thoracotomies for diagnosis.[1]

The quality of a lung FNAC service can be evaluated by the overall percentage of diagnosis, the review of routine cases as well as the correlation with histological and clinical follow-up.[8,9,10] In view of the relative paucity of published studies regionally, a retrospective study of the lung FNAC diagnosis was performed to see the pattern of FNAC diagnosis of lung lesions and to analyze and compare the data with published figures.

Materials and Methods

The study was a hospital-based retrospective study, done in Enam Medical College & Hospital, Savar, Dhaka where all cases of FNAC and cytological diagnosis were carried out. A total of 246 cases were evaluated for a period of two years, from January 2017 to December 2018. All the cases had nodular or mass lesions in the lung and underwent a CT guided-FNAC. Before the FNAC, routine biochemical, haematological and plain chest X-ray (anterior/posterior and lateral views) were carried out in all the cases. Patients who were not able to hold their breath, or patients having severe COPD, bleeding disorders, PAH and contralateral pneumonectomy and patient having diagnosed malignancy elsewhere in the body and developed secondary deposits in the lungs were excluded.

CT-guided FNAC was carried out as an outpatient procedure after explaining the risks and benefits. Informed consent was obtained from every subject. Aspirations were performed using 20 to 25 gauge spinal needles attached to 10 mL syringe under CT guidance. If the first aspirate was considered of doubtful adequacy, a second FNA was performed. No patients required more than two aspirations. All the patients were kept under observation for four hours. Apart from minor chest pain, no complaints were noted. Patients were instructed to report if necessary. After aspiration smears were prepared in plain glass slides, dried in air and fixed in alcohol for routine Papanicolaou staining. The stained slides were examined under microscope and cytological diagnoses were made. In case of malignancy, cytological sub-classification of bronchogenic carcinoma was done according to World Health Organization classification. Benign lesions where exact cytological diagnoses were not possible, were labelled as negative for malignant cells. If the smears reveal only blood and no cellular material, inadequate comments were made on cytological examination. Reported results and relevant data were recorded in the data sheet and then analyzed by standard statistical method. For statistical analysis patients were divided into five age groups, each comprising of a decade except the first and the last group. The first group consists of patients of 40 years or below and the last group consists of patients of 81 years and above.

Results

Among the total 246 cases, 186 were male and 60 were female with M:F ratio 3.1:1. Age ranges from 35 years to 95 years with mean age 64.35±11.33 years. Cytological examination showed inadequate cells in 18 (7.32%) cases. Adequate cells were found in 228 (92.68%) cases. Inadequate cases were not included in statistical analysis.

Cytological examination showed that 93 (40.79%)

cases were benign and 135 (59.21%) cases were malignant with benign:malignant ratio 1:1.45. Age range of patients with benign lesions was 35−82 years, mean age 61.55±11.70 years (Table I). Among the benign lesions, lung abscess was the most common type (36 cases, 38.70%) followed by TB (27 cases, 29.03%) (Table II).

Table I: Distribution of subjects of benign and malignant lung lesions according to age

Age	Benign	Malignant	Benign: Malignant ratio
<40 years	3	0	-
41−50 years	21	9	2.3:1
51−60 years	24	36	1:1.5
61−70 years	24	54	1:2.3
71−80 years	18	21	1:1.1
81+ years	3	15	1:5
Total	93	135	1:1.45

Table II: Types of benign lesions

Lesions	Number	Percentage
Lung abscess	36	38.70
TB	27	29.03
Non specific inflammatory lesion	24	25.81
Fungal infection	3	3.23
Negative for malignant cell	3	3.23
Total	93	100

Malignant lesions were more common in male (105 cases out of 135 cases) with a M: F ratio 3.5:1. Age range of subjects of malignant lesions was 45−95 years, mean age 66.55±10.65 years. Adenocarcinoma was the most common type followed by squamous cell carcinoma. In male squamous cell carcinoma was the most common lesion (45 cases, 42.85%), followed by adenocarcinoma (36 cases, 34.29%) whereas in female adenocarcinoma was the most common (18 cases, 60%), followed by squamous cell carcinoma (6 cases, 20%) (Table III).

Table III: Types of malignant lesions (n=135)

Type of lesions	Number (%)	Male	Female	M:F ratio
Adenocarcinoma	54 (40)	36 (34.29)	18 (60)	2:1
Squamous cell carcinoma	51 (37.78)	45 (42.86)	6 (20)	7.5:1
Small cell carcinoma	21 (15.56)	18 (17.14)	3 (10)	6:1
NHL	6 (4.44)	6 (5.71)	0 (0)	-
Large cell undifferentiated carcinoma	3 (2.22)	0 (0)	3 (10)	-

Discussion

Different studies showed that in cytological diagnosis of lung lesions prevalence of malignancy ranges from 61% to 70.7% and prevalence of benign lesion ranges from 29.3% to 39%, excluding the inadequate samples.[9,10] The prevalence of malignancy in our study was quite similar with the above studies, but was significantly less than 81.8% and 80.5% found in a similar study done by Stewart et al[10] and Sing et al[11].

Present study showed a higher incidence of adenocarcinoma which was similar to the study of Stewart et al[10] and Tan et al[12]. However, Gouliamos et al[9] found squamous cell carcinoma as the commonest diagnosis**.** Prevalence of small cell carcinoma of present study was quite similar to some other studies.[10,12,13] The prevalence of large cell carcinoma in present study was similar to Tan et al[12], but much less than Stewart et al[10] (Table IV). However, this variation could be explained by the fact that international figures have shown comparable difference in incidences of primary lung adenocarcinoma and squamous cell carcinoma in different population.[13] The prevalence of adenocarcinoma of present study could also be explained by the fact that adenocarcinomas are more often peripherally located and thus more amenable to diagnosis by transthoracic FNAC.[13]

Table IV: Cytological sub-classification of bronchogenic carcinoma by different studies[10,12]

Name of tumours	Tan et al	Stewart et al	Present study
Adenocarcinoma	49.4%	43.2%	40%
Squamous cell carcinoma	16%	19%	37.78%
Small cell carcinoma	9.4%	12%	15.56%
Large cell carcinoma	2.7%	20.6%	2.22%
Others	25.2%	5.2%	4.44%

Our cytological sub-classification of bronchogenic carcinoma was also similar to histological classification of other published data of 1993 to 1997 from the Singapore Cancer Registry which showed that histologically adenocarcinoma was the most common type of bronchogenic carcinoma which constituted 39.7% of total malignant cases, followed by squamous cell carcinoma (27.0%), small cell carcinoma (11.9%) and large cell carcinoma (7.7%).[14] Other less common variety of bronchogenic carcinomas together constituted 13.7% of cases. Wahbah et al[15] also showed histologically adenocarcinoma was the most common type of bronchogenic carcinoma, followed by small cell carcinoma and large cell carcinoma. Our study also found that squamous cell carcinoma was the most common type of bronchogenic carcinoma in male and adenocarcinoma was the most common type of bronchogenic carcinoma in female which is similar to other studies. [10,12,13,16] Adequacy of samples obtained by lung FNAC have been reported to be between 80−95%, which was also similar to our adequacy (92.77%).[1,8] However, immediate assessment of the FNAC specimen by a cytotechnologist, with further passes made when necessary, has been shown to improve the adequacy rate of the technique, the figure remarkably reaching 100% in a prospective study by Santambrogio and co-workers; but like other developing countries we had no facility of immediate assessment of smears by a trained cytotechnologist.[16]

Our study reaffirms the use of FNAC in the diagnosis of pulmonary tuberculosis (TB).[5] In series based on western populations, TB cases constituted 0.2−1.5% off all FNAC cases for lung nodules.[9,17] In Singapore, TB was found in 5.3% of cases of lung FNAC. In studies from India, the corresponding figures range from 2.1% to 20%.[5] In our study TB was found in 29.03% of benign lung FNAC cases. Clearly, TB figures prominently as an important differential diagnosis in the clinical problem of lung nodule, particularly in Asia.

FNAC is an accurate and safe method for the evaluation of lung nodules or masses and it enables sub-classification of bronchogenic carcinomas in the vast majority of cases. It is also useful for the diagnosis of tuberculous pulmonary nodules.

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