

Original Article

Confirmation of histological type and select treatment metabolites to avoid unnecessary surgeries in patients with lung malignancies: A prospective observational study

DOI: dx.doi.org



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Received: 08 Aug 2022
Accepted: 13 Aug 2022
Published: 15 Aug 2022

Published by:
Sher-E-Bangla Medical College,
Barishal



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ABSTRACT

Background: Lung malignancies is considered one of the mostly deadliest diseases in the present world. There are various types of method to investigate the malignance and the aim of the investigation is to confirm the histological type and select the treatment metabolites to avoid unnecessary surgeries. **Objective:** To confirm histological type and select treatment modalities to avoid unnecessary surgeries in patients with lung malignancies. **Method:** This prospective observational study was carried out department of medicine in Chittagong Medical College Hospital, Chittagong, Bangladesh. 50 patients with clinical and radiological evidence of suspected log went under sputum cytology for ahgnant cell and CT guided FNAC from suspected lung lesion. **Results:** Among the 50 patients most of the patients were 51-60 years old and the highest number of the (94 %) patients were male. Radiologically thirty-eight (38) patients presented with consolidation, six (6) with

collapse and consolidation, three (3) with pleural effusion, three (3) with mediastinal enlargement underwent sputum for malignant cell and FNAC under CT guidance. Only three (3) sputum samples reveal criteria of malignant cell and one was suspicious for malignant cell, another 46 samples were negative for malignant cell. FNAC specimens showed twenty-two (22) patients as squamous cell carcinoma, fourteen (14) patients as adenocarcinoma, eight (8) as small cell carcinoma and three (3) as poorly differentiated carcinoma. In case of three (3) patients transthoracic FNAC under CT guidance could not be done due to deep seated and centrally placed lung lesion **Conclusion:** Sputum cytology for malignant cell is highly specific but insensitive. An adequate sample is prerequisite for successful detection of cancer cell in the sputum. FNAC under CT guidance can be used as accurate and safe method for the evaluation of lung carcinoma and it enables sub classification of Ca-lung in majority of the cases. The diagnostic yield is excellent and safe for the large, superficial and peripheral lesion.

Keywords: Sputum cytology, CT guided FNAC, Lung malignancies.

(The Planet 2022; 6(1): 111-118)

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INTRODUCTION

There is a significant rise in the incidence of lung malignancies is noticed at the end of this decade, It is presently considered one of the most common and deadly malignancies throughout the world.¹ Emphasis has shifted from diagnosis of malignancy in inoperable patients and confirmation of metastatic tumors to its use as a definitive diagnostic procedure on which crucial patient management decisions are based.² The oldest and most fundamental method is based on sputum cytology, which depends on the spontaneous exfoliation of malignant cells. A simple, practical method which has proved useful in suggesting, establishing or confirming the diagnosis of carcinoma of the lung is sputum cytology. The cytological examination of sputum is a valuable addition to the procedures for the diagnosis of carcinoma of the lung. Sputum examination for malignant cells remained the sheet anchor of diagnosis for over 60 years. It continues to be used because of the ease of sample acquisition.³ The final frontier for obtaining adequate material is fine needle aspiration cytology (FNAC) of bronchial growth. This is an invasive procedure and should therefore be subject to regular review. FNAC is the sole means of diagnosis of malignancy and it can be used with confidence to select treatment modalities and to avoid unnecessary surgeries in patients with lung malignancies. The main aims of investigations are to confirm the diagnosis, histological cell types and the definite extent of the disease. By the time the lung cancer is causing symptoms it will almost always be visible on the chest x-ray.^{4,5} Common radiological presentation of bronchial carcinoma is: (1) Unilateral hilar enlargement-caused by central tumor. (2) Peripheral pulmonary opacity-usually irregular but well circumscribed. May have irregular cavitations within it. (3) Lung, lobe or segmental collapse. (4) Pleural effusion (5) Broadening of mediastinum, enlarged cardiac shadow, elevation of hemi

diaphragm. (6) Rib destruction [6]. For establishment of histological cell typing following investigations are done: a) Sputum cytology b) Bronchoscope c) Fine Needle aspiration cytology (FNAC). In patients with metastatic disease the diagnosis can often be confirmed by needle aspiration or biopsy of affected lymph nodes, skin lesions, liver or bone marrow. Head CT, Radionuclide bone marrow scanning, Liver ultrasound, Bone marrow biopsy can be reserved for the patients with clinical, Hematological or biochemical evidence of tumor spread to such site.⁴

OBJECTIVE

To confirm histological type and select treatment modalities to avoid unnecessary surgeries in patients with lung malignancies.

METHODOLOGY

It was prospective observational study. The study place was Department of Medicine, Chittagong Medical College Hospital, Chittagong, Bangladesh. Where data were collected from January 2019 to June 2020. A total number of 50 patients whose Suspected history, symptoms and risk profile of having primary lung cancer which is evidenced by chest radiography and CT scan, suggestive of malignancy considered for the study population. Sample were collected through purposive sampling as per inclusion and exclusion criteria. All the patients age more than 18 years old and having no prior confirmed diagnosis for current suspicious lung tumor and FEV1 at least 40% predicted to be included in the study. But the patients who are unwilling to give consent, seriously ill patient with co-morbid conditions like LVF, COPD with respiratory failure, severe SVC obstruction etc, Distant metastasis, previously diagnosed bronchial carcinoma are excluded from the study. The following investigations were carried out for each case: i) CBC ii) CXR-PA view iii) BT, CT iv) Sputum for malignant cell v) FNAC

under CT guidance to collect cytological specimen.

Sputum collection

Sputum can either be induced or collected spontaneously. The second technique used for collection yielded the best results! However, for peripheral cancer (not Visible endoscopic ally) induced sputum is most informative. "A sputum sample is considered representative if alveolar macrophages or bronchial epithelial cells are present because this shows that the samples originate from deep within the lung. For best results, obtain the sample fasting in the morning! If it can't obtain the sample b for the patient has breakfast, though, wait at least an hour after he's eaten before trying to get a good sample, instruct the patient to take at least three deep breaths, then force out a deep cough. Explain that deep breathing helps loosen secretions and bring them to the back of the throat. Emphasize the importance of bringing up sputum, the thick secretions from the lungs, rather than expectorating saliva, the thin secretions from the mouth.⁷⁻

⁹ i) To prepare patient, have him drink plenty of fluids on the evening before the test, provided that he's not on a fluid restriction. The additional intake will boost sputum production overnight and assure that to get a good sample. ii) A total of 2 early morning deep cough specimens collected 2 days in a row iii) Patient was advised to brush teeth and rinse mouth thoroughly prior to coughing. iv) Specimen was collected in a sterile plastic container labeled with the patient's first and last name. v) Sample was submitted to the laboratory with a completed Cytopathology requisition.¹⁰

METHODS AND PROCEDURE OF CT GUIDED FNAC

First, an axial scan of area of interest only was done to locate the lesion; the best approach (Supine or prone) was judged and the skin puncture site was marked with a radio opaque marker. After clea ng and

draping, local anesthetic (2% Xylocaine) was infiltrated at the site of puncture. Thy 20-gaug spinal needle was then inserted during suspended respiration, directing the tip of needle towards "the lesion. With the tip of the needle located in the outer edge of the lesion, a repeat slice of the area of interest was taken to check the exact position of its tip. The stylet was then withdrawn 2-3 cm and the needle was advanced into the mass with a rotating motion during suspended respiration, so that its tip lied within the target lesion. 20-ml syringe was attached to the needle's hub and the plunger was pulled back, and during continued hard suction, the needle was jiggled to free material from the lesion to the needle's lumen. The aspirate was smeared on slides and fixed in 95% alcohol for cytological evaluation, whereas large fragment were placed in a formalin solution for histopathologic examination. A repeat slice in the area of interest was taken to rule out pneumothorax. If any amount of pneumothorax developed, patient was kept under observation for 24 hours and a chest X-ray PA view was done after 24 hr to rule out any subsequent development of pneumothorax. In case no complication arose, patient was discharged. The final diagnosis of each lesion was determined by histopathology.¹¹

DATA COLLECTION AND ANALYSIS

Both qualitative and quantitative (Mixed Method) data were collected by using a pre designed questionnaire. The questionnaire was prepared reviewing literature and consulting with medical research experts. After acceptance of research proposal by ethical review committee CMCH all procedures were started. All collected data were coding and input in SPSS-25 for further analysis. Both descriptive and inferential statistics done. Descriptive statistics included frequency distribution, percent, mean, standard deviation; graph, tables, figures and inferential statistics

included correlation, regression, ANOVA etc.

profile of having primary lung cancer which is evidenced by chest radiography and CT scan, suggestive of malignancy considered for the study population

RESULTS

A total number of 50 patients whose Suspected history, symptoms and risk

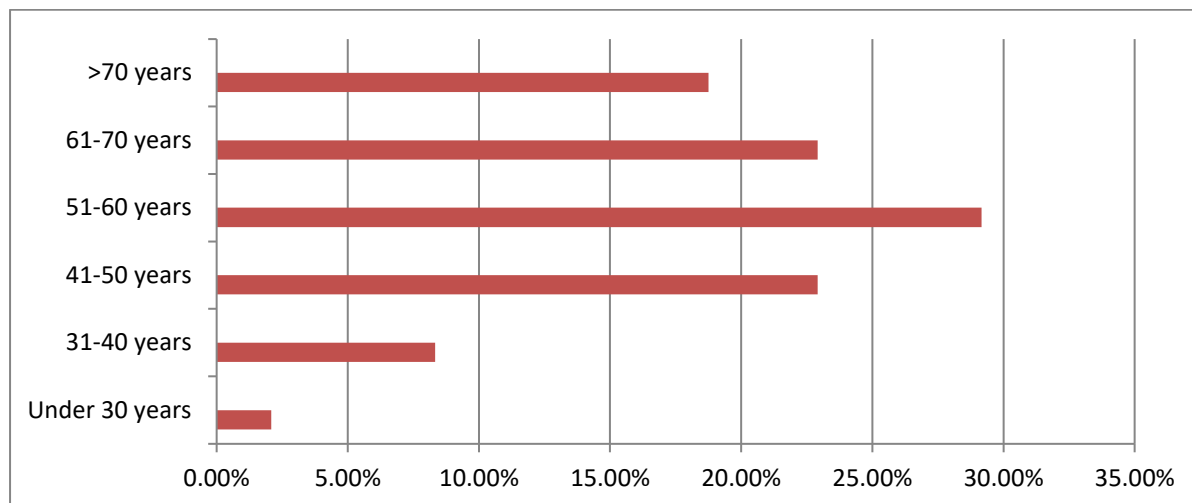


Figure-1: Age distribution of the patients

In figure-1 shows the age distribution of the patients, where most of the patients belong to 51 to 60 years age group. And the lowest age group were under 30 years old.

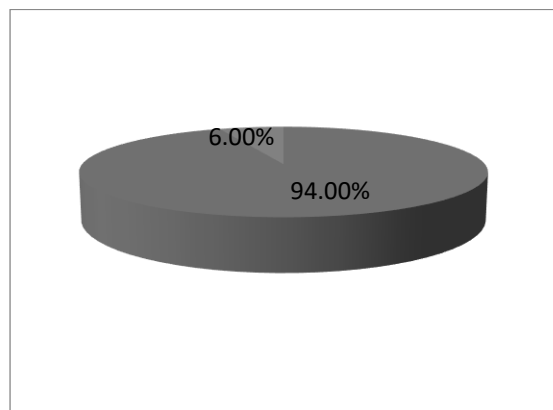


Figure-2: Gender distribution of the patients

In figure -2 shows the gender distribution of the patients, where most of patients 94% were male.

Table-1: Chest X-ray findings of the patients

X-ray findings	Number of Patients	percentage
Consolidation	38	79.17%
Collapse with consolidation	6	12.5%
Pleural effusion	3	6.25%
Mediastinal enlargement	3	6.25%
Avitary lesion		
Right sided lesion	28	58.33%
Left sided lesion	22	42.67%

In table-1 shows the chest x-ray findings of the patients. Among the 50 patients 28 patients(58.33%) had right sided lesion and 22 patients(42.67%) had left sided lesion.

Table-2: Sputum sensitivity of the patients

Type	Number of cases	Percentage
Squamous cell carcinoma	2	4.00%
Adenocarcinoma	1	2.00%
Small cell carcinoma	1	2.00%
Undiagnosed	46	92.00%
Total	50	100%

In table-2 shows the sputum sensitivity of the patients, where only 8% specimens had been diagnosed and 46 patients (92.00%) could not be diagnosed by sputum cytology.

Table-3 Site of tumors at CT scan

Type of lesion	Number of cases	Percentage
Peripheral lesion	28	58.33%
Central lesion	22	42.67%

In table-3 shows the site of tumors at CT scan of the patients, where only 58.33% specimens had peripheral lesion and 42.67% had Central lesion.

Table-4: Histological type of Ca-Lung done by CT-guided FNAC

Type	Number of cases	Percentage
Squamous cell carcinoma	22	44%
Adenocarcinoma	14	28%
Small cell carcinoma	8	16%
Poorly differentiated carcinoma	3	6%
Undiagnosed	3	6 %
Total	50	100%

In table-4 shows the Histological type of Ca-Lung done by CT-guided FNAC of

the patients, where the majority portion 94% specimens had been diagnosed.

Table-5: CT guided FNAC related Complications

Complication	Number of cases	Percentage
Pneumothorax (Minor)	4	8.00%
Hemoptysis	4	8.00%

In table-5 shows that 8% of the patients had Pneumothorax (Minor) CT guided FNAC related Complications and 8% had Hemoptysis CT guided FNAC related Complications.

DISCUSSION

The most commonest age group affected by Ca-lung in this study was in between 51 to 60 years (29.17%). Next common age group in between 41-50 years (22.92%) and 61-70 years (22.92%). Le Roux⁹ studied 4000 patients and found 15% of patients below the age of 50 years and 10% above the age of 70 years. 75% of the patients were in the 60-70 years old. In this selective study 47 patients were male and only 3 patients were female giving male- female ratio-15:1 In Bignal J R et al. study male-female ratio was 10:1 Silverberg E and Lubera UJ et al. showed that male-female ratio in 1960 was 7:1 but in 1988 it had fallen to 2:1. ¹²⁻¹⁴ All the above studies show the increasing incidence. The male female ratio in our study is not consistent with any of the above studies. This may be due to the fact that this study was small and selective, high smoking rate in men and low in women in our country and general tendency of our female patients to avoid hospital admission. The most common radiological finding was consolidation (79.17%). pleural effusion was noted in 6.25% of the patient. Fifty patients under went for cytological examination of sputum for malignant cell, a final diagnosis of primary bronchial carcinoma had been

made only 4 (8%) patients, there were 3 patient with positive cytology and 1 patient with suspicious cytology. All of these patients submitted an adequate and satisfactory sputum samples. In a Study From the Department of Respiratory Medicine, Kings Cross Hospital, Dundee⁴ group-208 patients with positive cytology and 17 suspicious with cytology. First Department of Internal Medicine, Nagoya University School of Medicine Nagoya, Japan Studied the role of sputum cytology and factors influencing the rate of positivity of sputum cytology in 103 patients with lung cancer. Sputum cytology was positive in 71.8% of these patients.¹ In our study the result of sputum sensitivity is not consistent with other study. In 95.83% of our patients the diagnosis was not confirmed by sputum cytology. Many factors may contribute this.¹⁵ (1) Inadequate number and unsatisfactory sputum specimens; (2) Sputum infected and frankly purulent; (3) Patient unable to produce sputum; (4) Size and position of the tumor; (5) Histology of the tumor; (6) Tumor does not exfoliate; (7) Degeneration of malignant cells in the sputum before examination. In this study a significant number of patients in the negative group (25%) produced no satisfactory specimens. For consistent and reliable results special care must be taken to ensure adequate and satisfactory sputum samples. The staff collecting the samples should be experienced in the correct technique and should give explicit instructions to the patient. There is good evidence that the greater the number of satisfactory samples examined the greater the likelihood of confirming the diagnosis. As an experienced cytologist requires 10-20 minutes to examine each slide for practical purposes it is generally accepted that three or four satisfactory samples are optimal. The presence of pus in the specimens makes cytological examination unsatisfactory and contributes to a negative result. This was not an important factor as in the majority of patients the sputum was mucoid and purulence was present in

similar proportion of the positive and negative groups. A large number of patients submit secretions from the upper respiratory tract or saliva. All samples should, therefore, be screened for the presence of alveolar histiocytes before proceeding with the examination for malignant cells. Many patients with advanced bronchial carcinoma are in poor physical condition and might be unable to co-operate sufficiently to produce satisfactory samples. Although there was a larger number of a patient in poor condition in the negative group this was not statistically significant and thus was not a major factor contributing to negative cytology. It is in these patients that sputum cytology is particularly useful as it may obviate more invasive investigations. Degeneration of tumor cells can occur if there is a long delay in reaching the laboratory. In scanty specimens drying can also cause damage to the cells, resulting in failure of cytological diagnosis. Better results are obtained if the slides are smeared and fixed immediately, and prepared by an experienced cytologist or technician.¹⁶ Thus handling and preparation of the sputum samples in the laboratory is an important factor determining the outcome of cytology. For optimal results suspicious portions of sputum or blood tinged areas should be carefully selected and then gently crushed between two slides to form a uniform smear.¹⁷ Extremely thin or thick smears are microscopically unsatisfactory. Alternatively the sputum samples may be homogenized before spreading on the slides.¹⁸ These techniques are time consuming and require considerable attention to detail which can easily be neglected in a busy routine laboratory. In conclusion there was no single reason why patients with bronchial carcinoma had negative sputum cytology. Transthoracic FNAC under CT guidance and pathological examination of aspirated materials was done in this study. In only 6.25% cases CT guided FNAC failed due to deep seated and centrally placed lung lesion. 45.83%

squamous cell carcinoma, 29.17% adenocarcinoma, 16.67% small cell carcinoma and 6.25% poorly differentiated carcinoma were found in this study. In this study Conclusive cytodiagnosis was made in 47 patients resulting in a diagnostic accuracy of 94 %. In K.B. Than et al.⁵ study transthoracic FNAC of lung was 93.4% sensitive for malignancy. This study was also showed 49.4% adenocarcinoma, 16% squamous cell carcinoma, 22.5% metastatic and others. All the patients tolerated the procedure well. The most common complaint was pain at the puncture site, which lasted for a few hours (4-8 hours) and subsided without medication. Pneumothorax occurred in 4 (8%) cases and haemoptysis is also occurred in 4 (8 %) cases. In all 4 cases, the pneumothorax was noted within 12 hours of the procedure and it was mild to moderate in amount. These patients were kept under strict observation for any deterioration. A chest radiograph was done after 24 hours and it was observed the amount of pneumothorax was mild in all the case. None of these patients required chest tube insertion. The hemorrhage noted in 4 cases was small in amount and required no treatment. The ultimate aim of image guided histological or cytological study is to avoid unnecessary thoracotomy and achieve a definite diagnosis with reasonable accuracy and minimum side effects.

CONCLUSION

This study was done on very small, selected admitted patients in department of medicine, Chittagong Medical College Hospital. Most of the patients were symptomatic with advanced cancer process. Sputum cytology yielded evidence of malignancy in 8%. Positive cytology was more likely where tumor were large, centrally situated associated with collapse and consolidation. Thus it showed 97.92% sensitivity in diagnosis and histological classification Ca-lung. The present study confirmed that CT guided FNAC can be

used safe, easily available and approachable, cost effective method for the diagnosis of Ca-lung and accurately sub classify the types of bronchogenic carcinoma

REFERENCES

1. Editorial, *A Perspective on Cytology of Lung Cancer*, *Indian J Chest Dis Allied Sci* 2004; 46 81-83), P., ... Ruengiam, C. (1998). *Diagnostic value of bronchoalveolar lavage and postbronchoscopic sputum cytology in peripheral lung cancer*. *Respirology (Carlton, Vic.)*, 3(2), 131-137.
2. *Indian Journal of Thoracic and* 11, Number 2 / December,
3. *Age and Ageing*, May, 1993 by C.I.A. Jack, J.D.H. Sheard, B. Lippitt, A. Fromholtz, C.C. Evans, C.R.K. Hind).
4. *Cytopathology Volume 8 Issue 4*, Pages 223 - 229 Published Online: 29 Oct 2003)
5. *Tumors of the respiratory tract and lung-Respiratory disease*. In Kumer and Clark *Clinical Medicine*, 6th edition, edinburgh : Saunders 2006 :910-915.
6. Stanley JH, Fish GD, Andriole JG, et al. *Lung lesions: cytological diagnosis by fine needle biopsy*. *Radiology* 1987; 162:389-91. 400 JP Sing13. Haramati LB. *CT-guided automated needle biopsy of the chest*. *AJR* 1995; 165: 53-55.
7. American Association of Respiratory Care. "AARC clinical practice guideline: Nasotracheal suctioning 2004 revision and update." 2004. www.rcjournal.com/contents/09.04/09.04.1080.asp (8 Aug. 2005).
8. Munden, J., Eggenberger, T., & Wittig, P. (Eds). (2003). *Handbook of primary care procedures* (pp. 419 — 421). Philadelphia: Lippincott Williams & Wilkins.
9. Breuninger, C., Follin, S., et al. (Eds). (2001). *Handbook of nursing procedures* (pp. 755 — 759). Springhouse, PA: Springhouse Corporation.
10. *Patient instruction/collection procedure cytopathology urine and sputum collection techniques*, Laboratory Information Center 770-3600 ,Calgary Laboratory Services
11. *Computed Tomography (CT) Guided Transthoracic Needle Aspiration Cytology In Difficult Thoracic Mass Lesions-Not approachable By* USG P SINGH, L GARG, V SETIA01-02
12. Hansell D M : *International techniques*. In Armstrong P, Wilson A G, Dee P, et al

- (eds); *imaging of disease of louis, mosby*
1995:894-912
13. *Le Roux B. T: Cancer of the lung, Cancer*1968;23;136
 14. *Bignal, J. R: Bronchogenic carcinoma. Survey of 317 patients. Lancet.*1955; 1:786
 15. *Silverberg E, and Lubera, U. J; Cancer statistics. C A* 1988;38:2.
 16. *Assessment of factors influencing the result of sputum cytology in Bronchial carcinoma doi:10.1136/thx.36.2.143*
1981;36;143-146 *Thorax* ,M D Clee and D J Sinclair Updated information and services can be found at:
<http://thorax.bmj.com/cgi/content/abstract/36/2/143>)
 17. *Davidson's Principles and practice of medicine-20th edition.*
 18. *Harrison's Text Book of Internal Medicine -17th edition*
 19. *Cox JE, Chiles C, McManus CM, Aquino SC, Choplin RH. Transthoracic needle aspiration biopsy with variables that affect risk of pneumothorax. Radiology* 1999; 212:165-168.