Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Pathology

Clinicopathological Evaluation of Endobronchial Ultrasound Guided Transbronchial Needle Aspiration (EBUS-TBNA) in Diagnosis of Mediastinal Lesions

Parvez M[1*], Khair M[2], Haque A K M A[3], Arjuman F[4], Azim M A[5]

[1]Associate Professor, Department of Pathology, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh
[2]Department of Respiratory Medicine, Bangladesh Specialized Hospital Limited, Dhaka, Bangladesh
[3]Department of Thoracic Surgery, Bangladesh Specialized Hospital Limited, Dhaka, Bangladesh
[4]Associate Professor, National Institute of Cancer Research and Hospital, Dhaka, Bangladesh
[5]Assistant Professor, Department of Nephrology, Shaheed Shaikh Abu-Naser Specialized Hospital, Khulna, Bangladesh

DOI: 10.36347/sjams.2022.v10i12.070 | **Received:** 18.11.2022 | **Accepted:** 27.12.2022 | **Published:** 31.12.2022

***Corresponding author:** Parvez M
Associate Professor, Department of Pathology, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh

Abstract **Original Research Article**

Background: The diagnosis of mediastinal lesions is not easy. Special techniques are indicated for evaluation and confirmation of diagnosis. ***Objectives:*** The aim of the study is the endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is an important tool for clinicopathological evaluation as well as diagnosis of different mediastinal lesions. ***Materials and Methods:*** It was an observational study. EBUS-TBNA was done in eighty six patients. All these individuals have mediastinal pathology. Endobronchial aspiration was done from the lesions seen by ultrasonography and its cytomorphological analysis was done. Tissue morphology was also examined from cell block preparation. Immediate post procedure complications were monitored. ***Results:*** In the study, total eighty six (86) cases with adequate material were included. Fifty one (51) cases were granulomatous lymphadenitis, necrotizing granulomatous lymphadenitis were identified in 20 cases and 28 had non-necrotizing granulomas and only three cases are granuloma with suppuration. Tuberculosis was diagnosed in 23 patients (26.7% of granulomatous) and sarcoidosis was found in twenty eight cases (32.6% of granulomatous). Seventeen (19.8%) patients had malignant disorders. Out of 17 cases of malignancy, adenocarcinoma was the predominant (07cases), five cases were non-small cell carcinoma, small cell carcinoma was four cases and non-Hodgkin lymphoma was only one. Eighteen cases (20.9%) had cytological features of reactive lymphadenitis. During procedure no complications developed. ***Conclusions:*** For diagnosis of different mediastinal pathology and collection of adequate cytological as well as tissue material (cell block), EBUS-TBNA is an important diagnostic procedure with minimal invasion.

Keywords: Endobronchial ultrasound (EBUS) -guided transbronchial needle aspiration (TBNA), mediastinal lymphadenitis, malignancy, granuloma, tuberculosis, sarcoidosis.

INTRODUCTION

Inflammation, infection, congenital anomalies, lymphadenopathy, and different primary as well as metastatic lesions can be seen in mediastinal region. Depending of the different region of the world the causes of lymphadenopathy of the mediastinum are different. In Bangladesh, tuberculosis (TB) is the more common causes of lymphadenitis. Sarcoidosis, lymphoma and metastatic diseases are the other common causes.

Computed tomography (CT)-guided FNAC, mediastinoscopy, or thoracoscopy were the different methods for collection of cytological smears and tissue material for diagnosis of lesions in the mediastinum [1]. However, the collection technique, patient's safety and cost had constraint in terms of tissue yield [2, 3]. In the recent years, endobronchial ultrasound (EBUS)-guided tissue sampling technique is the well liked and safe method for identifying the exact causes of diagnosis [4, 5].

In case of unknown pathological causes of lymph node enlargement in the mediastinum, EBUS-TBNA has an important clinical and diagnostic role [8-12].

To evaluate mediastinal pathology, the EBUS procedure training is cost-effective, more feasible, and

highly useful [13, 14]. In our study, we evaluate and assessed the diagnosis of mediastinal lesions of various causes and the effectiveness as well as safety profile of this technique.

A new minimally invasive method of mediastinal biopsy is direct endobronchial ultrasound guided TBNA using the probe EBUS performed under conscious sedation [6]. Although the usefulness of EBUS-TBNA for the evaluation of hilar and mediastinal lymph nodes, staging of lung cancer [6 –13] as well as role in metastatic lung tumors [14, 15] have been reported, a few is known about the clinical impact of this method for non-lung cancer-related mediastinal tumors [16–18]. The aim of the present study was to find out the diagnostic role of EBUS-TBNA in mediastinal masses of unknown etiology in the absence of known pulmonary malignancy and to assess the impact of EBUS-TBNA on patient's managements.

MATERIALS AND METHODS

It was an observational study. Total 86 patients in the respiratory medicine department of Bangladesh Specialized Hospital, Dhaka was included during the period of January 2019 to February 2021. The patient having mediastinal and/or hilar lesions evident on chest radiograph / CT scan were included. The study was approved by the ethical review committee of the hospital. Informed consent was taken from all the patients. The study included history, clinical examination and other routine investigations, platelet count, PT, APTT and CT scan of the chest. A 22-gauge needle under ultrasound and color Doppler guidance with bronchoscope (BF-UC 180F, Olympus, Tokyo, Japan) was used for aspiration. Appropriate conscious sedation was done during the procedure. Identifications of lymph nodes stations and the numbers were determined according to the International Association of the Study of Lung Cancer Classification. At least three passes of the needle per lesion was given during collection. Material collected by needle aspiration were fixed in 95% ethyl alcohol and stained by Hematoxyline & Eosin stain and Papanicolaou stain. The smears were examined for cytopathologically (e.g. granulomas, necrosis, suppuration and tumor cells etc.). Ten percent (10%) buffer formalin was use for cell blocks material and after processing tissue morphological evaluation was done from this specimen. Patient was closely observed for any immediate complications. SPSS software and other statistical tests were applied for analysis of data.

RESULTS

Eighty six patients were identified, among those 48 men, mean age 44.2 years; range, 15 to 80 years [Table 1]. The final diagnosis was determined by EBUS-TBNA cytomorphological examination and from tissue morphology of cell blocks preparations.

Thirty six of the patients were in age of below 40 years, 24 patients out of 86 patients were in group of 40-50 years and 26/86 patients in the range of 50-80 years.

Fever and cough was the most common clinical manifestation of the patients (43). Seventeen (17) cases had weight loss, hemoptysis and cough. Sixteen cases fever was the only clinical finding. Cough and dyspnea were found in only two cases [Table 1].

Table 1: Age, Sex and Clinical characteristics of the patients

Characteristics	**Findings**
Age distribution (years)	15-80
Mean age group (years)	44.26
Sex distribution Male	 48
Female	38
Symptom profiles	Fever: 16 Fever and Cough: 43 Weight loss, hemoptysis and cough: 17 Cough and hemoptysis: 08 Cough and breathlessness: 02

In our study, the subcarinal lymph node is the most common (69.8%), followed by hilar (15.1%), paratracheal (12.8%), and pretracheal (2.3%) lymph nodes.

The sample adequacy was performed by cytopathologist on the basis of rapid on-site evaluation of smears prepared just after collection with a rapid staining procedure.

Fifty one (51) cases were granuloma cytologically, necrotizing granulomatous lymphadenitis was found in 20 patients, non-necrotizing granulomas were 28 cases and three cases were granuloma with suppuration. Fifteen cases out of fifty one (15/51) were tuberculosis. These were confirmed by acid-fast bacilli (AFB) seen on Zeihl–Neelsen staining. The diagnosis of sarcoidosis as well as sarcoid-like granuloma was done on the basis of non-necrotizing granuloma, AFB not found on ZN stain and other supportive clinical

information as well as laboratory investigations e.g. angiotensin- converting enzyme positive, tuberculin test negative, raised ESR and radiological findings in 36/51 patients (Fig. 1).

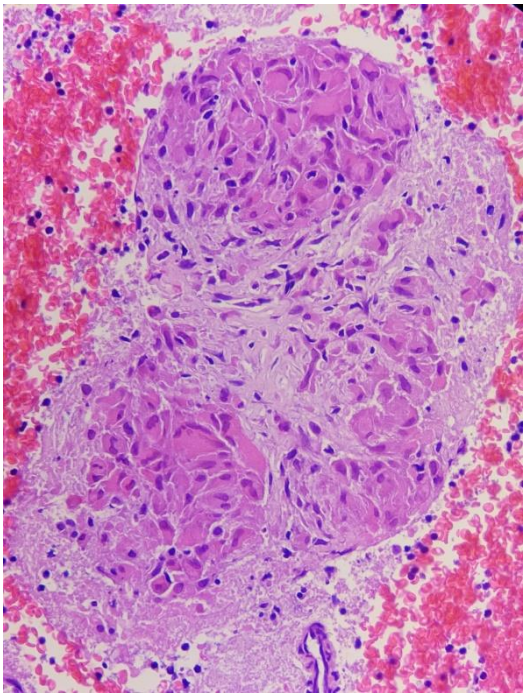

Fig. 1: Photomicrograph showing epithelioid cell granulomas from cell block preparation (H&E, low power)

Seventeen (19.8%) patients had malignant disorders. Out of 17 cases of malignancy, adenocarcinoma was the predominant (07cases), five cases were non-small cell carcinoma, small cell carcinoma was four cases and non-Hodgkin lymphoma was only one. Eighteen (18) cases (20.9%) had cytological features of reactive lymphadenitis.

There was no immediate complications were observed during the procedure.

DISCUSSION

In our study, we evaluated eighty six (86) patients presenting to the respiratory medicine department of Bangladesh Specialized Hospital. In different studies, the diagnosis of mediastinal lesions by EBUS-TBNA had a wide range of variation in the number of cases and mean age.

The total cases varied from 15 in a study by Rintoul *et al*., to more than five hundred in a study by Herth *et al*., [14-16]. In this study, the age ranged between 15years to 80 years with mean age of 44.26 years that implied a relatively younger age of involvement [16-18]. Current recommendations and other studies, the lesions were targeted at least thrice on the basis of radiological data [18, 19]. The subcarinal 60 [69.8%] and hilar [15.1%]) lymph nodes followed by paratracheal (12.8%), which include highest targeted in other studies as well [20, 21].

In our study, the adequate samples were included and these have more diagnostic yield.

The diagnostic yield ranging from 93.5% to 100% in different studies have been reported [16, 21, 22]. However, around 88% by Dhamija *et al*. and 78% by Gupta *et al* reports yield in their studies [23-25]. These were due to size of lesion, sample size, calcifications of lesions and difficulties in collection procedure.

Out of 86 cases, 59.3% were granulomatous pathology. The reactive change (20.9%) was the next common pathology. The malignant lesions were seen in 19.8% cases. In Srinivasan *et al*., reported 37 cases, out of these sarcoidosis was 53.8%, tuberculosis was 23.3%, and malignancy was 17.9% [25]. Malignancy was the main etiology in western publications.

Granulomatous pathology divided into mycobacterial and sarcoid in different studies. In our study, we divided granulomatous etiology on the basis of cytopathological evaluation along with clinical and laboratory findings. [26-28] On the basis of these criteria, tuberculosis was identified in 23 cases (26.7% of granulomatous) and sarcoidosis in twenty eight cases (32.6% of granulomatous).

Malignancy was seen in 19.8% cases. Our findings in comparison with other studies of western regions, malignancy were a small proportion of cases. Other significant observation was cell blocks preparation increased the diagnostic yield. Special studies like immunohistochemistry can also evaluate from the cell block materials.

There were 20.9% (18) patients have cytological features of reactive lymphadenitis. Sometimes these cases were required more confirmation by other invasive procedures.

Fever was seen as an immediate complications and it was observed in 28 patients. It was slightly higher compared to other data. Other mild complications included cough and bleeding at the puncture site were observed. However, in our study, no major complication was identified. EBUS-guided fine needle aspiration is not only a safe technique but also helps us obtaining tissue material for diagnosis with minimal invasion.

CONCLUSIONS

EBUS-TBNA is a safe technique that have minimal invasion. EUS-TBNA may be able to replace more invasive methods for evaluating hilar or mediastinal lesions.

REFERENCES

1. Gossot, D., Toledo, L., Fritsch, S., & Celerier, M. (1996). Mediastinoscopy vs thoracoscopy for mediastinal biopsy: results of a prospective nonrandomized study. *Chest*, *110*(5), 1328-1331.
2. Vilmann, P., Krasnik, M., Larsen, S. S., Jacobsen, G. K., & Clementsen, P. (2005). Transesophageal endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) and endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) biopsy: a combined approach in the evaluation of mediastinal lesions. *Endoscopy*, *37*(09), 833-839.
3. McManus, T. E., Haydock, D. A., Alison, P. M., & Kolbe, J. (2008). Isolated mediastinal adenopathy: the case for mediastinoscopy. *The Ulster medical journal*, *77*(2), 97-101.
4. Herth, F. J., Lunn, W., Eberhardt, R., Becker, H. D., & Ernst, A. (2005). Transbronchial versus transesophageal ultrasound-guided aspiration of enlarged mediastinal lymph nodes. *American journal of respiratory and critical care medicine*, *171*(10), 1164-1167.
5. Hwangbo, B., Kim, S. K., Lee, H. S., Lee, H. S., Kim, M. S., Lee, J. M., ... & Zo, J. I. (2009). Application of endobronchial ultrasound-guided transbronchial needle aspiration following integrated PET/CT in mediastinal staging of potentially operable non-small cell lung cancer. *Chest*, *135*(5), 1280-1287.
6. Plat, G., Pierard, P., Haller, A., Hutsebaut, J., Faber, J., Dusart, M., ... & Ninane, V. (2006). Endobronchial ultrasound and positron emission tomography positive mediastinal lymph nodes. *European Respiratory Journal*, *27*(2), 276-281.
7. Kitami, A., Suzuki, T., Usuda, R., Masuda, M., & Suzuki, S. (2004). Diagnostic and therapeutic thoracoscopy for mediastinal disease. *Annals of thoracic and cardiovascular surgery*, *10*(1), 14-18.
8. Herth, F., Becker, H. D., LoCicero, J., & Ernst, A. (2002). Endobronchial ultrasound in therapeutic bronchoscopy. *European Respiratory Journal*, *20*(1), 118-121.
9. Chao, T. Y., Lie, C. H., Chung, Y. H., Wang, J. L., Wang, Y. H., & Lin, M. C. (2006). Differentiating peripheral pulmonary lesions based on images of endobronchial ultrasonography. *Chest*, *130*(4), 1191-1197.
10. Kurimoto, N., Murayama, M., Yoshioka, S., & Nishisaka, T. (2002). Analysis of the internal structure of peripheral pulmonary lesions using endobronchial ultrasonography. *Chest*, *122*(6), 1887-1894.
11. Bugalho, A., Doris, M. K., Hamacher, J., Eberhardt, R., & Herth, F. J. (2008). Endobronchial ultrasound: Practical aspects and clinical applications. *Revista Portuguesa de Pneumologia (English Edition)*, *14*(1), 55-88.
12. Rintoul, R. C., Skwarski, K. M., Murchison, J. T., Wallace, W. A., Walker, W. S., & Penman, I. D. (2005). Endobronchial and endoscopic ultrasound-guided real-time fine-needle aspiration for mediastinal staging. *European Respiratory Journal*, *25*(3), 416-421.
13. Hiirter, T., & Hanrath, P. (1990). Endobronchial sonography in the diagnosis of pulmonaryand mediastinal tumors. *Dtsch Med Wochenschr*, *115*(50), 18991905.
14. Omori, S., Takiguchi, Y., Hiroshima, K., Tanabe, N., Tatsumi, K., Kimura, H., ... & Kuriyama, T. (2002). Peripheral pulmonary diseases: evaluation with endobronchial US—initial experience. *Radiology*, *224*(2), 603-608.
15. Herth, F. J., Eberhardt, R., Vilmann, P., Krasnik, M., & Ernst, A. (2006). Real-time endobronchial ultrasound guided transbronchial needle aspiration for sampling mediastinal lymph nodes. *Thorax*, *61*(9), 795-798.
16. Herth, F. J., Ernst, A., Eberhardt, R., Vilmann, P., Dienemann, H., & Krasnik, M. (2006). Endobronchial ultrasound-guided transbronchial needle aspiration of lymph nodes in the radiologically normal mediastinum. *European Respiratory Journal*, *28*(5), 910-914.
17. Wahidi, M. M., Herth, F., Yasufuku, K., Shepherd, R. W., Yarmus, L., Chawla, M., ... & Feller-Kopman, D. J. (2016). Technical aspects of endobronchial ultrasound-guided transbronchial needle aspiration: CHEST guideline and expert panel report. *Chest*, *149*(3), 816-835.
18. Lee, H. S., Lee, G. K., Lee, H. S., Kim, M. S., Lee, J. M., Kim, H. Y., ... & Hwangbo, B. (2008). Real-time endobronchial ultrasound-guided transbronchial needle aspiration in mediastinal staging of non-small cell lung cancer: how many aspirations per target lymph node station?. *Chest*, *134*(2), 368-374.
19. Yasufuku, K., Nakajima, T., Motoori, K., Sekine, Y., Shibuya, K., Hiroshima, K., & Fujisawa, T. (2006). Comparison of endobronchial ultrasound, positron emission tomography, and CT for lymph node staging of lung cancer. *Chest*, *130*(3), 710-718.
20. Yasufuku, K., Chiyo, M., Sekine, Y., Chhajed, P. N., Shibuya, K., Iizasa, T., & Fujisawa, T. (2004). Real-time endobronchial ultrasound-guided transbronchial needle aspiration of mediastinal and hilar lymph nodes. *Chest*, *126*(1), 122-128.
21. Nakajima, T., Yasufuku, K., Iyoda, A., Yoshida, S., Suzuki, M., Sekine, Y., ... & Fujisawa, T. (2007). The evaluation of lymph node metastasis by endobronchial ultrasound-guided transbronchial needle aspiration: crucial for selection of surgical candidates with metastatic lung tumors. *The Journal of thoracic and cardiovascular surgery*, *134*(6), 1485-1490.

22. Medford, A. R. (2010). Endobronchial ultrasound-guided transbronchial needle aspiration. *Pol Arch Med Wewn*, 120, 459-66.
23. Dhamija, A., Basu, A., Sharma, V., Bakshi, P., & Verma, K. (2015). Mediastinal Adenopathy in India: Through the Eyes of Endobranchial Ultrasound. *The Journal of the Association of Physicians of India*, *63*(9), 15-18.
24. Gupta, D., Dadhwal, D. S., Agarwal, R., Gupta, N., Bal, A., & Aggarwal, A. N. (2014). Endobronchial ultrasound-guided transbronchial needle aspiration vs conventional transbronchial needle aspiration in the diagnosis of sarcoidosis. *Chest*, *146*(3), 547-556.
25. Srinivasan, A., Agarwal, R., Gupta, N., Aggarwal, A. N., & Gupta, D. (2013). Initial experience with real time endobronchial ultrasound guided transbronchial needle aspiration from a tertiary care hospital in north India. *The Indian Journal of Medical Research*, *137*(4), 803-7.
26. Navani, N., Molyneaux, P. L., Breen, R. A., Connell, D. W., Jepson, A., Nankivell, M., ... & Janes, S. M. (2011). Utility of endobronchial ultrasound-guided transbronchial needle aspiration in patients with tuberculous intrathoracic lymphadenopathy: a multicentre study. *Thorax*, *66*(10), 889-893.
27. Tremblay, A., Stather, D. R., MacEachern, P., Khalil, M., & Field, S. K. (2009). A randomized controlled trial of standard vs endobronchial ultrasonography-guided transbronchial needle aspiration in patients with suspected sarcoidosis. *Chest*, *136*(2), 340-346.
28. Asano, S. (2012). Granulomatous lymphadenitis. *J Clin Exp Hematop*, 52, 1-16.