ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 08 | August - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ENDOBRONCHIAL ULTRASONOGRAPHY GUIDED TRANSBRONCHIAL NEEDLE ASPIRATION IN MEDIASTINAL AND HILAR MASSES

Pulmonary Medicine

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ABSTRACT

Introduction- Endobronchial ultrasound guided transbronchial needle aspiration (EBUS-TBNA) is a minimally invasive technique with a high diagnostic yield for the evaluation of mediastinal and hilar lymph node and masses via fine needle aspiration under direct sonographic visualisation. It has the potential to overcome the limitations encountered by various techniques of sampling the mediastinal and hilar lesions having an important modality in the field of interventional pulmonology which is safe and accurate. Even though EBUS-TBNA was shown to have high diagnostic yield decades ago, this intervention is still new in many of the tertiary centres of our country. **Objectives-** To determine the diagnostic yield of endobronchial ultrasound guided transbronchial needle aspiration in mediastinal and hilar lymphadenopathy and masses and also to assess the profile of different mediastinal and hilar lesions diagnosed by endobronchial ultrasound guided transbronchial needle aspiration. **Methodology-** This was a cross sectional study performed on 42 cases with radiological evidence of mediastinal and hilar lymphadenopathy and masses who attended Respiratory Medicine, Out Patient Department (OPD), Regional Institute of Medical Sciences (RIMS), Imphal, Manipur from September 2020 to August 2022. **Results-** This study determined the diagnostic yield of EBUS-TBNA to be 85.7% and among the malignant lesions diagnosed, adenocarcinoma was the most common histopathological type while granulomatous lesions of both caseating and non-caseating type were found to be the most common benign lesions. **Conclusion-** In the present study, EBUS-TBNA was found to be a safe novel intervention which should be regarded as the first choice in the diagnostic work up of mediastinal and hilar lesions considering its diagnostic yield without significant complication.

KEYWORDS

Endobronchial, mediastinal, hilar, lymphadenopathy, adenocarcinoma, granulomatous

INTRODUCTION

Mediastinal and hilar lymphadenopathy is a common clinical problem for which infection, neoplasia, granulomatous disease and reactive hyperplasia are the common causes.1 Lung cancer remains a fatal disease worldwide for which surgical treatment may offer a long-term survival. However, the indication and outcome of surgical resection depend on accurate preoperative staging of the cancer and the extent of intraoperative lymph node dissection.2 Therefore, patients with mediastinal lymphadenopathy or suspected lung cancer require accurate diagnosis and accurate lymph node staging for an optimal treatment.1,2

Various techniques for the diagnosis of mediastinal and hilar lymphadenopathy include the imaging techniques like computed tomography (CT) scan, positron emission tomography (PET) and direct sampling by mediastinoscopy, CT guided percutaneous needle aspiration, conventional bronchoscopic transbronchial needle aspiration (cTBNA), transesophageal ultrasonography guided needle aspiration, etc.3-5 However, as radiological investigations like contrast enhanced computed tomography (CT) of the chest and PET are limited by false negative and positive results, tissue confirmation of abnormal results becomes indispensible.6

At present, the best means to assess lymph node involvement is by direct tissue sampling for which mediastinoscopy, first described by Carlens in 1959, had been considered the gold standard.4,7 Mediastinoscopy which requires the use of an operating room and general anaesthesia with limited access to paratracheal (station 2 and 4) and subcarinal (station 7) lymph nodes has higher complication rate including arrhythmias, bleeding, injury to adjacent structures and has reported mortality and morbidity between 0.08 - 0.2% and 2% - 2.5% respectively.8 Conventional TBNA relies on correlation of CT imaging and anatomical knowledge for mediastinal lymph node sampling in the absence of a direct vision. Therefore, real-time sampling under direct vision is a logical development.

Oesophageal endoscopic ultrasound sarcoidosis.20-22 It has been reported to be an accurate and safe method to confirm a pathological diagnosis of sarcoidosis and has been recommended to be considered first for the histopathological diagnosis of stage I and stage II sarcoidosis.23 Endobronchial ultrasound-guided transbronchial needle aspiration has a high diagnostic yield in the investigation of suspected intrathoracic tuberculosis by means of aspiration of the intrathoracic lymph nodes and tracheobronchial wall adjacent to lung lesions.22

EBUS currently exists in two forms - radial EBUS and linear/convex probe EBUS. Radial probe (RP) EBUS utilizes a rotating transducer at the end of a probe and produces a 360° image to the long axis of the bronchoscope while linear/convex probe EBUS incorporates the ultrasound transducer at its distal end and utilizes a fixed array of transducers aligned in a curvilinear pattern generating a 50° image parallel to the long axis of the bronchoscope with Doppler capability which differentiates tissue from vascular structure while biopsy is performed under real-time imaging.24

Real-time convex probe TBNA has a tremendous impact on the diagnosis of mediastinal and hilar lymph nodes. It is routinely performed on a day-care basis and provides adequate samples for cytology, histology, molecular and microbiological diagnosis in patients with malignant as well as non-malignant diseases.

Even though EBUS-TBNA was introduced decades ago, it is still not available in many of the tertiary centres in our country. This study was conducted to evaluate the diagnostic yield of this novel intervention in our set up so as to enable us to extend its benefits to a wider population requiring it who would otherwise remain undiagnosed.

AIMS AND OBJECTIVES

1. To determine the diagnostic yield of endobronchial ultrasound guided transbronchial needle aspiration in mediastinal and hilar lymphadenopathy and masses.
2. To assess the profile of different mediastinal and hilar lesions diagnosed by endobronchial ultrasound guided transbronchial needle aspiration.

MATERIALS AND METHODS

This study was a hospital based cross sectional study conducted from September 2020 to August 2022. 42 patients of both gender who attended Respiratory Medicine Out Patient Department (OPD), Regional Institute of Medical Sciences (RIMS), Imphal, Manipur with radiological evidence of mediastinal and hilar lymphadenopathy and masses were included in this study.

Ethical approval from the Institution and valid informed consent from the patient were taken. Detailed histories of all the patients who participated in the study were recorded. They were subjected to thorough detailed clinical examination; blood investigations like LFT, KFT, PT, INR, APTT were done for all patients. Mantoux test, sputum examination for AFB and sputum CBNAAT were also done. Chest X-ray PA view and Contrast enhanced CT scan of the thorax were taken. All the patients were subjected to examination of the airways by conventional bronchoscope prior to the insertion of the EBUS bronchoscope. EBUS guided bronchoscopy was performed and the targeted lymph node or masses were identified using bronchoscopic visualisation and ultrasound imaging. Then, EBUS guided TBNA of the targeted lymph node or mass was performed and the slides prepared with the samples obtained were sent for cytological examination. Data was analysed using SPSS V21 for windows. A p-value of less than 0.05 was considered statistically significant.

guided fine needle aspiration (EUS-FNA) was developed in the 1980s for evaluation of gastrointestinal malignancies especially the oesophagus. Because of the close proximity of the oesophagus to mediastinal structures, EUS-FNA was used in lung cancer to sample accessible mediastinal lymph nodes. However, there were some stations not accessible via the oesophagus but would be accessible from the airway. This led to the development of closely related Endobronchial Ultrasound Guided Transbronchial Needle Aspiration (EBUS-TBNA) in the 1990s.6 Endoesophageal and endobronchial ultrasound guided fine needle aspiration has the advantage of being performed under conscious sedation with excellent yield.9-14

Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is a minimally invasive technique that allows sampling of mediastinal lymph nodes via fine needle aspiration under direct sonographic visualisation. It has a low rate of morbidity and its utility in the diagnosis of mediastinal lymphadenopathy secondary to malignancy, lymphoma and sarcoidosis has been demonstrated.7,15-17

EBUS-TBNA allow access to the paratracheal lymph node stations (levels 2R, 2L, 4R, 4L), the subcarinal lymph nodes (level 7), the hilar, interlobar and lobar lymph nodes (level 10, 11 and 12) which are not at all accessible by both EUS-FNA and Mediastinoscopy.7 It can accurately sample even small mediastinal nodes avoiding unnecessary surgical exploration.18 EBUS-TBNA was first reported in 2004 with a high diagnostic yield for evaluation of mediastinal and hilar lymph nodes.7

The role of EBUS-TBNA in the diagnosis and staging of lung cancer is well established.19 Also there is increasing evidence regarding EBUS-TBNA to be considered as the first examination of choice in the evaluation of patients with intrathoracic granulomatous lymphadenopathies (IGLs) such as tuberculous lymphadenitis and

Procedure Details:-

Patient preparation and premedication: The patients were advised to report nil per oral (at least 6 h for solids and 4 h for liquids) on the day of the procedure. All patients received 5ml of 4% lignocaine solution delivered through nebulisation over 15 minutes immediately before bronchoscopy. After securing peripheral intravenous access, supplemental oxygen was administered via nasal cannula. Intravenous glycopyrrolate was given with the aim to reduce airway secretion. Sedation was done with intravenous midazolam and pentazocine. Local anaesthesia was obtained using topical spray with 10% lignocaine spray on the posterior pharynx. Patient preparation and premedication: The patients were advised to report nil per oral (at least 6 h for solids and 4 h for liquids) on the day of the procedure. All patients received 5ml of 4% lignocaine solution delivered through nebulisation over 15 minutes immediately before bronchoscopy. After securing peripheral intravenous access, supplemental oxygen was administered via nasal cannula. Intravenous glycopyrrolate was given with the aim to reduce airway secretion. Sedation was done with intravenous midazolam and pentazocine. Local anaesthesia was obtained using topical spray with 10% lignocaine spray on the posterior pharynx.

The EBUS-TBNA procedure: Examination of the airways by conventional bronchoscope using Fibreoptic video bronchoscope (FUJIFILM EB530 T) was done prior to the insertion of the EBUS bronchoscope (EB-530US). EBUS guided bronchoscope was inserted via the oral route through a mouth gag with the patient in the supine position. An additional 2% lignocaine solution was infused through the scope during the procedure at the level of the vocal cords and the carina.

The balloon at the tip of the bronchoscope was inflated with saline and coupled to the airway walls for examination of all mediastinal and hilar lymph node stations or peribronchial masses accessible by EBUS prior to the TBNA procedure. The lymph node station was determined according to the new international lymph node map proposed by the International Association for the Study of Lung Cancer.

The targeted lymph node or masses were identified using bronchoscopic visualisation and ultrasound imaging. When the bronchoscope was positioned at the target site, a dedicated 21-gauge needle (NA-201SX-4022, Olympus) was inserted into the working channel. The needle was extended from the bronchoscope through the bronchial wall and it punctured the lesions and the tissue was aspirated. The aspirate was, then, blown onto a glass slide by pushing air using a 20-mL syringe. Aspirated material was also obtained for cell block cytology. Other adjunctive procedures, such as endobronchial biopsy, bronchoalveolar lavage and bronchial brushings were performed wherever indicated based on the patient profile and flexible bronchoscopic examination findings. If more than one node was detected, the decision of which node to puncture was on the physician's judgment based on the findings from the CT scan images. Each target nodal station was punctured at least twice. Serious complications such as respiratory failure, bleeding requiring transfusion, pneumothorax, pneumomediastinum or minor complication such as oxygen desaturation or arrhythmia were not encountered during the procedure. Local haemostasis was achieved by instillation of 1 to 2ml of 1:10,000 adrenaline solution through the bronchoscope as near to the bleeding spot as possible. All patients received supplemental oxygen and hemodynamic monitoring (heart rate, blood pressure, and pulse oximetry saturation) was done during the procedure. Patients were discharged from the hospital on the same day while some patients were admitted and discharged soon.

Pathological examination: Some amount of the aspirate was smeared onto glass slides and air-dried. The rest of the aspirate was placed into a mixture of formalin and alcohol in order to obtain a cell block for histological examination in some cases. Then, the samples were sent to the pathology department as soon as the smears were air-dried.

Demographic data, sites of primary malignancies, radiological and CT findings, EBUS findings, stations of aspirated LNs, cytological and histological findings and diagnoses, final diagnoses and procedure-related complications were recorded. Informed consent was obtained from all the patients for the procedure.

RESULTS AND OBSERVATION

A total of 42 participants were enrolled for EBUS-TBNA in department of Respiratory Medicine RIMS during the study period of September 2020 to August 2022.

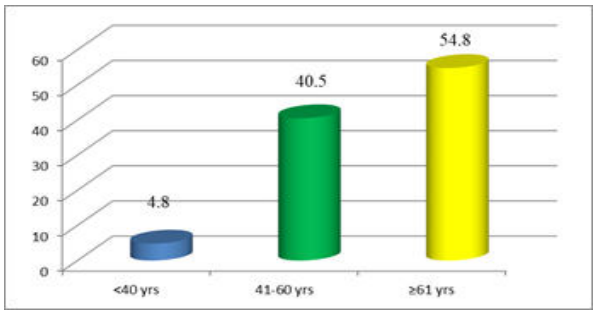


Figure 1: Age wise distribution of participants (N=42)

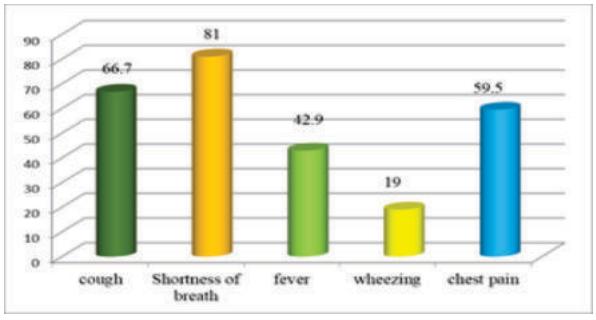


Figure 2: Prominent clinical symptoms at presentation (N=42)

Figure 2 shows that shortness of breath was the most common presenting symptom among the participants (81%) followed by cough (66%) and chest pain (59.5%). But majority of the participants presented with a combination of symptoms.

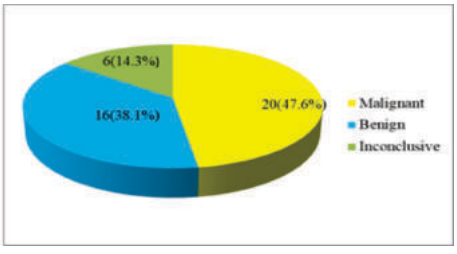


Figure 3. Distribution of types of mediastinal and hilar lesions diagnosed by EBUS-TBNA (N=42)

Figure 3 shows the majority of the cases were malignant (47.6%) followed by benign cases (38.1%) with 14.3% of inconclusive cases. Hence the diagnostic yield of EBUS-TBNA was 85.7%.

Table 2. Types of benign lesions (n=16)

Benign lesions(n=16)	Frequency	Percentage
Granulomatous lesions	7	43.75%
Organising inflammatory lesions	2	12.5%
Colloid with few benign thyroid follicular cells	1	6.25%
No evidence of malignancy	6	37.5%

Table 2 shows that the most common benign lesion was granulomatous lesions of both caseating and non caseating types which were later found to be tuberculosis and sarcoidoisis by histology, clinical profile and response to therapy on follow up.

Table 3. Location of lymph node stations sampled by EBUS-TBNA and number of TBNA passes to each lymph nodes

Lymph node stations	Number of accessed to the lymph nodes	Positive EBUS %
4R	20	12(60%)
2R	10	5/10(50%)
4L	8	5/8(62.5%)
2L	5	2/5(40%)
7	25	16(64%)
10R	7	3(42.8%)
10L	3	1(33.3%)
5	3	2(66.6%)

Table 1. Types of malignant lesions (n=20)

Types of malignant lesions	Frequency	Percentage (%)
Adenocarcinoma	11	55
Small cell carcinoma	5	25
Squamous cell carcinoma	2	10
Non hodgkins lymphoma	1	5
Undifferentiated carcinoma	1	5

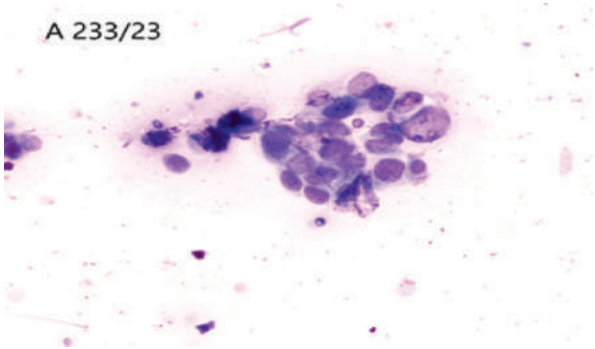
Table 1 shows that adenocarcinoma (55%) was the most common malignant lesions, followed by small cell carcinoma (25%) and squamous cell carcinoma (10%).

Table 4. Association of smoking status and types of lesions diagnosed by EBUS-TBNA (n=36)

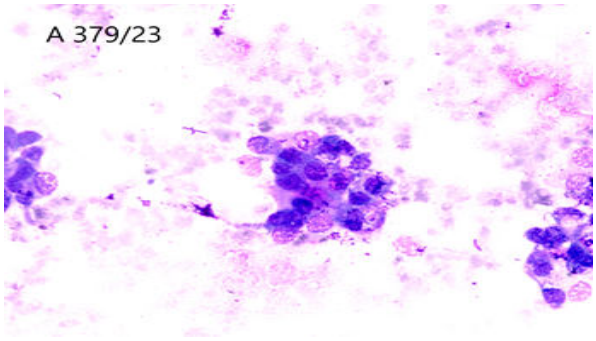
Smoking status	Type of lesions		P value*
	Malignant	Benign	
	n(%)	n(%)	
Smokers	16(64.0)	9(36.0)	0.159
Non smokers	4(36.4)	7(63.6)	

*Fischer's Exact test

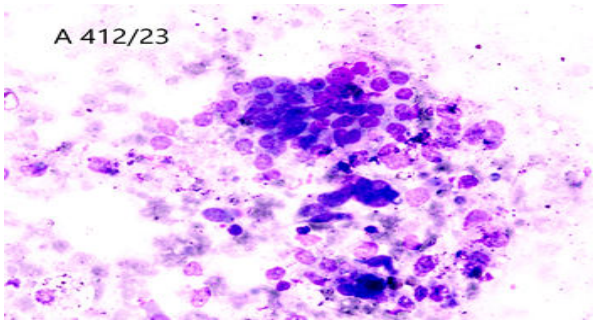
Table 4 shows that majority of the malignant cases were smokers while majority of the benign cases were non-smokers but it was not found to be statistically significant.



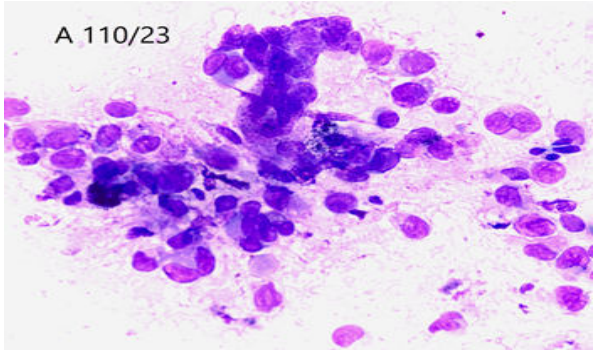
Picture 1: EBUS TBNA from subcarinal lymph node (7) shows tumor cells in loosely cohesive clusters. Individual cells show pleomorphic vesicular nuclei with conspicuous nucleoli and evidence of tumor cell cannibalism suggesting Metastatic Non-Small Cell Carcinoma favouring Adenocarcinoma.



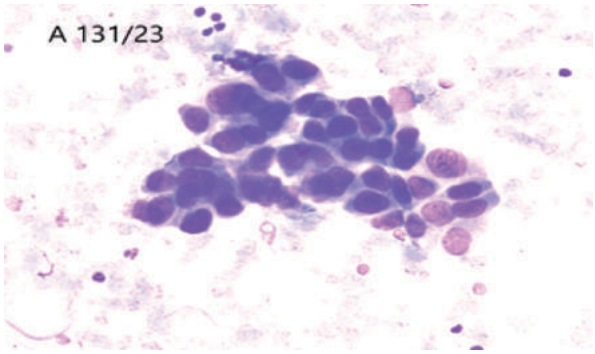
Picture 2: EBUS TBNA from right hilar lymph node (10 R) shows polygonal tumor cells with basophilic cytoplasm. Irregular chromocondensation with pleomorphic nuclei and prominent nucleoli suggesting Metastatic Non-Small Cell Carcinoma favouring Squamous Cell Carcinoma.



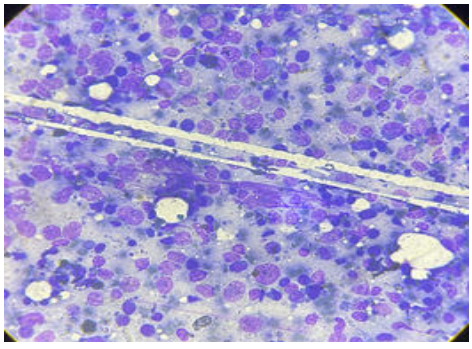
Picture 3: EBUS TBNA from right upper paratracheal lymph node (2R) shows sheet of tumour cells having irregular nuclear membrane and mildly pleomorphic hyperchromatic nuclei suggesting Metastatic Non-Small Cell Carcinoma favouring Squamous Cel



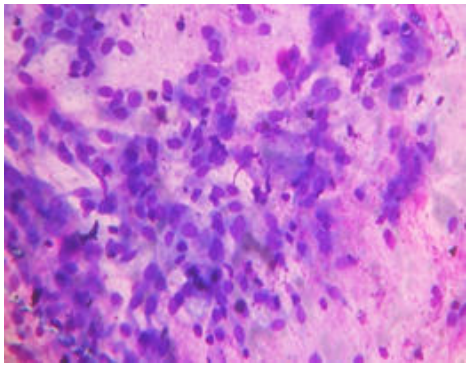
Picture 4: EBUS TBNA from right lower paratracheal lymph node (4R) shows tumour cells in discrete as well as in clusters. Cells have eccentrically placed pleomorphic vesicular nuclei with prominent nucleoli suggesting Metastatic Non-Small Cell Carcinoma favouring Adenocarcinoma. l Carcinoma.



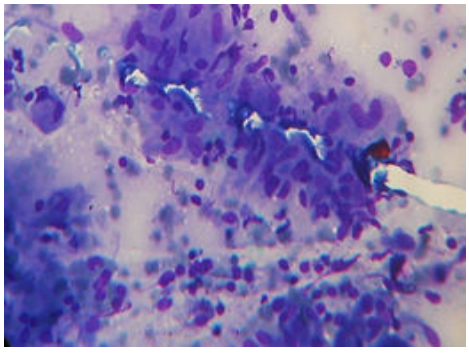
Picture 5: EBUS TBNA from right hilar (10R) and subcarinal (7) lymph node shows columnar to cuboidal tumour cells with irregular nuclear membrane and mild to moderate pleomorphic vesicular nuclei suggesting Adenocarcinoma with metastasis to hilar and subcarinal lymph node.



Picture 6: Diffuse Large Cell Non- Hodgkin's Lymphoma



Picture 7: Photomicrograph of organising inflammmatory lesions



Picture 8: Photomicrograph of non-caseating epithelioid granuloma

DISCUSSION

Mediastinal and hilar lymphadenopathy is a common clinical problem which is sometimes, difficult to treat particularly in tuberculosis (TB)-

endemic countries like India, where a coexistence of TB and malignancy is known to exist. In a TB-endemic country, both thoracic and extra-thoracic malignancies with mediastinal lymphadenopathy can be metastatic, tuberculous or rarely a sarcoid reaction to the malignancy. It is, therefore, important to differentiate between the various aetiologies to institute appropriate therapy and establish prognosis.

The endobronchial ultrasound (EBUS) uses an ultrasound along with a bronchoscope to visualize the airway wall and the structures adjacent to it. Real-time EBUS-guided TBNA of the mediastinal and hilar lymph nodes is a minimally invasive method of mediastinal tissue sampling under conscious sedation which is now becoming a standard of care that is safe and has a good diagnostic yield with minimal complications.

It can be used as a guide in the evaluation of invasion of mediastinal structures, in the diagnosis of mediastinal and hilar lymph nodes, in the diagnosis of lung cancer, in the staging and endobronchial treatment of lung cancer, in the evaluation of benign central airway stenosis to make treatment decisions, such as laser ablation or stent placement. There are two EBUS devices, radial probe and linear/convex probe (CP). The most important advantage of the CP-EBUS is the simultaneous imaging and its possibility for a repeated procedure.

The British Thoracic Society (BTS) guidelines for EBUS-TBNA32 mentioned two meta-analyses by Adams et al and Gu et al who has reported the sensitivity of EBUS-TBNA as 88% (95% CI 70% to 90%) and 0.93 (95% CI 91 to 944) respectively and one systemic review by Varele–Lema et al who reported the sensitivity of EBUS-TBNA as 85% to 100% with a specificity of 100% in all these reports.

Many journals have mentioned a variable diagnostic yield of EBUS-TBNA. Ernst A et al8 mentioned the diagnostic yield of EBUS-TBNA with radial probe to be 71 to 85% while the real-time EBUS with a linear probe pushed the positive yields further to 86 to 100% range. Touray S et al30 also reported it as an established diagnostic tool with a variable diagnostic yield ranging from 62% - 93%.

In our present study, the overall diagnostic yield of EBUS-TBNA was found to be 85.7% which is within the range mentioned by the previous authors. However, the diagnostic yield of EBUS-TBNA reported by Sahajal D et al31 was 61.2% while Touray S et al30 reported a 61.4%, which were much lower than our result.

Nonetheless Bhatti HA et al26 found that the diagnostic yield of EBUS–TBNA for centrally located peribronchial pulmonary lesion excluding the lymph node to be 95%. Also, Ernst A et al8 found that the diagnostic yield of EBUS TBNA in the diagnosis and staging of radiologically enlarged mediastinal lymph node stations accessible by both EBUS-TBNA and mediastinoscopy was 91% which is again higher than our study.

The possible reasons for the low yield of our study compared to these studies could be: 1) Rapid on-site cytological evaluation (ROSE) was not used because of limitations of manpower and economy. 2) We did not use the molecular testing such as polymerase chain reaction from aspirated samples which could have established TB in some cases. 3) The number of TBNA passes to each lesion, for some cases, were less than what is recommended due to risky puncture and intolerance by the patient like excessive coughing during the procedure leading to abrupt termination of the procedure or prompting the bronchoscopist to complete the procedure quickly due to concerns of the patient both of which might have led to less thorough sampling.

Medford ARL et al6 mentioned that ROSE was the gold standard and increased the yield of EBUS-TBNA by confirming an adequate sample using the smear technique. Also, Figueiredo VR et al28 considered the presence of a cytopathologist during the procedure essential for determination of a satisfactory material collected for diagnosis and their contribution to screening and processing of samples for other procedures such as histochemistry, immunohistochemistry, genetic mutation testing and culture.

In our study, adenocarcinoma was the most common histological type among the malignant lesions constituting 55% of all the malignancy. Similar results were reported by Ye T et al1 who found adenocarcinoma being the most common histological type in their study. Figueiredo VR et al28 also found adenocarcinoma as the most common histological subtype. Recently, adenocarcinoma has been known as the most common histological subtype of non-small cell lung cancer. Also, some recently published studies in India supported those findings. Malik et al29 found that adenocarcinoma was the most common type of lung cancer in India. But, Bhatti HA et al26 in their study of diagnostic yield of EBUS-TBNA in centrally located peribronchial lesions found that squamous cell carcinoma was the most common histological subtype.

16 (38.1%) of the mediastinal and hilar lesions was found to be benign lesions of which the most common one was granulomatous lesions (7; 43.75%) of both caseating and non-caseating subtype. Those granulomatous lesions were later found as sarcoidosis (2 cases) and tuberculosis (5 cases) by histology, clinical profile, radiological follow- up and response to treatment which was not part of the study, being a cross-sectional study. Similar results of benign lesions were reported by Ye T et al.1

6 (37.5%) of the benign cases were categorised as no evidence of malignancy because the cytologist could not give a definite picture of these lesions despite the presence of enough lymphocytes in the specimens. The possible reasons for the enlargement of these lymph nodes could have been a reaction to an underlying comorbidity for which a designation 'reactive hyperplasia' or 'reactive lymphadenopathy' could be made.

Reactive lymphadenopathy is found in a number of chronic conditions like emphysema, chronic bronchitis, interstitial lung disease, bronchiectasis, pulmonary arterial hypertension, heart failure and connective tissue disease.27 Therefore, the enlargement of those lymph nodes could have been triggered by the coexistence of some of these co-morbidities to our study population. But, a limitation of our study was that mediastinoscopy or surgical resection was not done for histological confirmation of these lesions raising the possibility of an inaccurate categorization. Because, when a case of tuberculosis or carcinoma was expected to have a progression of lymphadenopathy on serial imaging without treatment, a case of sarcoidosis, however, could regress or remain quiescent resulting in resolution or stability of lymphadenopathy on serial imaging even without treatment. Hence, such cases of benign lesions which were categorised as no evidence of malignancy, in the absence of further pathological sampling for tissue confirmation, has chances of inaccurate categorisation. However, we further investigated those cases by other modalities like bronchoscopic biopsy, washing, brushing and even pleural fluid analysis whenever applicable. But, the findings of these modalities are not considered as part of this study.

6 (14.3%) of the total cases were categorised as inconclusive cases because on cytological examination they had inadequate specimens in the absence of lymphocytes with predominant blood cells. American college of chest physician (ACCP)33 guidelines mentioned a minimum of three separate needle passes per sampling site in patients suspected of having lung cancer in the absence of rapid on-site evaluation (ROSE). In our study, the number of passes to each lesion, for some cases, were less than what is recommended due to risky puncture and intolerance by the patient during the procedure. The inconclusive cases were further investigated by other modalities like bronchoscopic biopsy, washing, brushing and even pleural fluid analysis whenever applicable even though the findings were not considered for part of this study.

2 (12.5%) of the cases had organising inflammatory lesions. There was a case of ectopic thyroid which was indicated by colloid with few benign thyroid follicular cells in the cytological report of EBUS-TBNA.

In the present study, the most sampled and maximum number of successful EBUS-TBNA passes was from the subcarinal (7) and right upper paratracheal(4R) stations. Gurioli C et al25 also found that the most sampled lymph nodes were in the subcarinal and right lower paratracheal regions. Similar results were also reported by Ernst A et al8 who found a higher accuracy of EBUS-TBNA in subcarinal lymph nodes followed by the right lower paratracheal lymph nodes.

In our study, it was found that majority of the malignant cases were female while majority of the benign cases were male but it was not found to be statistically significant. So, no association could be made

between malignancy and gender. This increased in female prevalence may be attributable to the increased prevalence of smoking in females. Also, the traditional use of wood for cooking, poor ventilation and second-hand smoking might contribute to the increased risk of lung cancer especially in female population of this region.

In the present study, majority of the malignant lesions belong to the older age group (≥ 61years) while majority of the benign lesions belong to the younger age group(< 40 years), but there was no association between malignancy and age. However, it was observed that there was a significant increase in the risk of malignancy with increase in the age.

In this study, although patients presented with combination of different symptoms, the most frequent complaint was shortness of breath presented by 81% of the patient which was also seen in other previous studies. Other prominent symptoms include cough (66.7%), chest pain (59.5%), fever (42.9%) and wheezing (19%).

In our study, majority of the malignant cases were smokers (64%) while majority of the benign cases (63.6%) were non-smokers. But, an association could not be made between smoking and malignant or benign lesions.

There was no significant complication during the procedure and no procedure related death in our study. Figueiredo VR et al28 mentioned that the reported rate of complications including minor complications such as bronchospasm and endobronchial bleeding as well as severe complications like pneumomediastinum and mediastinitis ranges from 0.5-1.2%. Considering these results, we found EBUS-TBNA a very safe procedure with the advantage of repeated procedures in case of negative sampling.

There is still ongoing technological development of EBUS-TBNA. There are reports of new methods which aimed at improving EBUS guided sample collection like the use of mini forceps for the collection of lymph node fragments through small perforation in the bronchial wall. Also, analysis of genetic profile of tumours has recently been included in the EBUS-TBNA protocols.

The indications for EBUS are likely to increase in the future as the potential of this technology becomes better understood. Radial probe EBUS can provide information about the airway wall while linear EBUS with convex probe allows real time imaging of the central pulmonary vasculature.6

It is, therefore, important to optimally utilize this novel intervention along with the routine bronchoscopy whenever applicable.

CONCLUSION

Patients with mediastinal lymphadenopathy or suspected lung cancer require accurate diagnosis and accurate lymph node staging for an optimal treatment. EBUS-TBNA which is a minimally invasive technique allows sampling of mediastinal lymph nodes via fine needle aspiration under direct sonographic visualisation and it has high diagnostic yield and low rate of morbidity.

In our study, we found that the diagnostic yield of EBUS-TBNA is 85.7%. Among the results, malignant lesions were found to be more common among females when compared to males. It was more prevalent among age group of 61 years and above which showed an increased risk with advancing age. Among the malignant lesions diagnosed, adenocarcinoma was the most common histopathological type. It was also found that granulomatous lesions of both caseating and non-caseating type were the most common benign lesions. No significant complication occurred during the procedure and there was no procedure related significant morbidity or mortality.

EBUS-TBNA should be considered as the first investigation of choice for the diagnosis of the mediastinal and hilar lesions. It is a safe diagnostic intervention and has huge prospects of enhancing the field of interventional pulmonology in future.

REFERENCES

1. Ye T, Hu H, Luo X, Chen H. The role of endobronchial ultrasound guided transbronchial needle aspiration (EBUS-TBNA) for qualitative diagnosis of mediastinal and hilar lymphadenopathy: a prospective analysis. BMC Cancer 2011;11(1):100-6.
2. Kuo CH, Chen HC, Chung FT, Lo YL, Lee KY, Wang CW, et al. Diagnostic value of EBUS-TBNA for lung cancer with non-enlarged lymph nodes: a study in a tuberculosis-endemic country. PLoS One 2011;6(2):16877-85.
3. Fritscher-Ravens A, Soehendra N, Schirrow L, Sriram PV, Meyer A, Hauber HP, et al. Role of transesophageal-endosonography guided fine-needle aspiration in the diagnosis of lung cancer. Chest 2000;117(2):339-45.
4. Hammoud ZT, Anderson RC, Meyers BF, Guthrie TJ, Roper LO, Copper JD, et al. The current role of mediastinoscopy in the evaluation of thoracic disease. J Thorac Cardiovasc Surg 1999;118(5):894-9.
5. Garpestad E, Goldberg S, Herth F, Garland R, Locicero J, Thurer R, et al. CT fluoroscopy guidance for transbronchial needle aspiration: an experience in 35 patients. Chest 2001;1 19(2):329-32.