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The Diagnostic Yield of Endobronchial Ultrasound-guided Transbronchial Needle Aspiration (EBUS-TBNA) Technique in Assessment of Mediastinal Lymph Nodes

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ABSTRACT

BACKGROUND

Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) technique provides a complementary assessment of the areas of mediastinal lymph node involvement, and allows sampling of suspected lymph nodes. But, the usefulness of EBUS-TBNA in assessing all areas of mediastinal lymph nodes is little known and it seems that such assess is dependent on various factors related to the patient's condition and especially the characteristics of local lymph nodes. We aimed to evaluate the utility of EBUS-TBNA in assessing mediastinal lymph nodes and the factors associated with this utility.

METHODS

This cross-sectional study was performed on 40 patients suspected to mediastinal lymphadenopathy scheduled for assessment by EBUS-TBNA and mediastinoscopy. The diagnostic yield of EBUS-TBNA to mediastinal lymph nodes was evaluated and non diagnostic cases evaluated by mediastinoscopy.

RESULTS

In evaluation with EBUS-TBNA, the diagnostic yield of EBUS in assess to mediastinal lymph nodes, including 34 out of 40 cases was equal to 85%. The size of lymph node (lower than 10mm), the area of sample (left and right upper paratracheal), and the nature of the lymph node sample (benign type) were associated with lower diagnostic yield for EBUS-TBNA.

CONCLUSION

The diagnostic yield of EBUS in assessing mediastinal lymph nodes for sampling and diagnosis is 85%. This benefit is expected in the case of lesions larger than 10 mm, lesions of a malignant nature, as well as lesions in the inferior paratracheal and subcarinal stations.

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KEYWORDS

EBUS- mediastinoscopy-node

INTRODUCTION

A variety of techniques are available to assess mediastinal nodes including endoscopy-based techniques, radiological procedures such as computed tomography (CT) or magnetic resonance imaging (MRI), nuclear medicine-related techniques such as positron emission tomography (PET), and even surgical procedures, including mediastinoscopy and video thoracoscopy. In addition, ultrasound-guided techniques have opened up a new arena for assessing the malignancy of these lymph nodes. Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) and Endoscopic ultrasound, fine-needle aspiration (EUS-FNA) are new alternatives for surgery to evaluate these lymph nodes and their staging [1-15]. Evaluation of lymph nodes using EBUS biopsy has enabled excellent and more accurate evaluation of the right and left paratracheal and subcardinal regions [16-19].

In addition, EBUS provides two-way access to the Hilar and Interlobar areas. Access to intrapulmonary nodes will be also possible with the use of radial mini-probes [20-23]. In general, both EBUS and EUS techniques provide a complementary assessment of almost all areas of mediastinal lymph node involvement, and their combined use allows sampling of suspected lymph nodes. These techniques play also an important role in the evaluation and clinical follow-up of mediastinal lymphadenopathy. In addition, ultrasonic methods are of particular importance because of their ability to sampling lymph nodes. The use of EBUS-TBNA technique has led to a significant improvement in biopsy results [2-6]. In this regard, evaluation and TNM staging related to lung cancer has become possible with 94% sensitivity and 100% specificity [3]. In meta-analysis, the diagnostic sensitivity of EBUS-TBNA ranged between 88% and 98% [7]. But ultrasonic methods may not be able to structurally evaluate lymph nodes as seen on CT or MRI. Also, evaluation of vascularity and perfusion, resistance index, elasticity of lymph nodes and perfusion changes under antiangiogenetic treatment is possible only in the last two techniques [4].

In addition to their many benefits, the accuracy and sensitivity of ultrasound-guided techniques in assessing mediastinum is still debated. It should be noted that mediastinoscopy is the surgical gold standard method for staging lymph nodes and differentiating between malignant and benign lymph nodes [7]. In fact, what makes the mediastinoscopy method superior to ultrasonic methods is its easier and more accurate access to the target tissue for sampling, and in this regard, it is sometimes difficult to obtain the tissue through ultrasonic methods. In particular, the usefulness of EBUS-TBNA in accessing mediastinal lymph nodes is little known and it seems that such assess is dependent on various factors related to the patient's condition and especially the characteristics of local lymph nodes. What we have done in the present study was to evaluate the utility of EBUS-TBNA in assessing mediastinal lymph nodes and the factors associated with this utility.

MATERIALS AND METHODS

This cross-sectional study was performed on 40 patients suspected to mediastinal lymphadenopathy admitted to thoracic, pulmonary and other clinical wards of Valiasr Hospital and were consulted for thoracic surgery. The patients included those who were scheduled for assessment by EBUS-TBNA and mediastinoscopy and satisfied with both techniques by taking a written informed consent. Patients who did not tend to cooperate or had limited for surgery were excluded from the study. The initial method of examining mediastinal lymph nodes included EBUS-TBNA. In this method, patients underwent bronchoscopy and a special endotracheal

ultrasound probe was performed for the patient and a needle biopsy of the mediastinal lymph nodes was performed under ultrasonography guide and a sample was then sent for pathology assessment. The pathology response was followed and compared in terms of diagnostic or non-diagnostic sample and type of diagnosis. If the EBUS-TBNA sample was not diagnostic, patients underwent mediastinoscopy under anesthesia with a small incision about 2-3 cm above the sternal notch. Lymph node biopsy was performed with a special instrument and with direct view from inside the mediastinoscopic instrument. Pathological results were followed and compared in terms of diagnostic biopsy and type of diagnosis. Diagnostic pathological sampling (acceptable accessibility to lymph node) means providing enough tissue as a specific sample including the target lymph nodes and thus non-diagnostic sampling means that the sample was insufficient or lymph node biopsy was not performed, requiring another diagnostic procedure. Finally, the diagnostic yield of EBUS-TBNA to mediastinal lymph nodes was evaluated.

Categorical variables were compared using a chi-square test or Fisher's exact test . Quantitative variables were also compared with t test, or Mann U test. For the statistical analysis, the statistical software SPSS version 16.0 for windows (SPSS Inc., Chicago, IL) was used. P values of 0.05 or less were considered statistically significant.

RESULTS

In this study, a total of 40 patients underwent EBUS-TBNA to evaluate mediastinal lymph nodes. The mean age of patients was 51.26±5.56 years ranged from 28 to 71 years and 22 were male. Regarding history of cancer, the most common cancer found was lung cancer (40.0%) followed by esophageal cancer (7.5%), breast cancer (7.5%), lymphoma (7.5%), cervical cancer (5.0%), colon adenocarcinoma (5.0%), tongue squamous cell carcinoma (2.5%), and seminoma or germ cell tumor (2.5%).

Overall in evaluation with EBUS-TBNA, the diagnostic yield of EBUS in assess to mediastinal lymph nodes, including 34 out of 40 cases was equal to 85%. In this regard, there were 6 non-diagnostic cases that were evaluated by mediastinoscopy. The result for all cases in diagnostic mediastinoscopy included 2 cases of NSCLC, 1 case of lymphoma, 1 case of seminoma, 1 case of granuloma and 1 case of sarcoidosis (Figure 1).

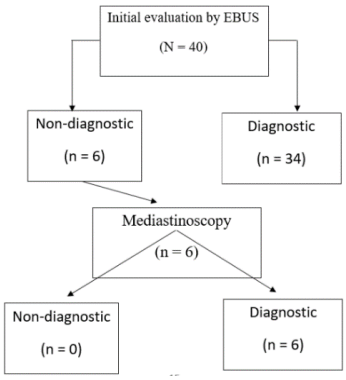

Figure 1: Diagnostic follow-up status through mediastinoscopy in non-diagnostic EBUS cases.

Characteristics	Utility rate	P value
Gender		0.656
Male	83.9%	
Female	86.1%	
Age subgroup		0.779
<50 years	86.7%	
>50 years	83.3%	
Size of lymph node		0.006
>10 mm	90.7%	
<10 mm	79.3%	
Location of lymph node		0.023
4R	93.4%	
4L	90.7%	
2R	76.5%	
RL	74.4%	
7	90.0%	
Lymph node nature		0.046
Malignant	89.9%	
Benign	80.1%	

Table 1: EBUS diagnostic utility based on underlying characteristics.

In the EBUS evaluation, the lymph node stations involved in the 98 extracted samples included the following areas: 4R trachea (right lower paratracheal) in 26 patients, 2R trachea (right upper paratracheal) in 18 patients, 4L trachea (left lower paratracheal) in 14 patients, 2L trachea

(left upper paratracheal) in 12 patients and 7 station (subcarinal) in 28 patients.

In the next phase of the project, we evaluated the factors related to diagnostic yield (Table 1). In this regard, the size of lymph node (lower than 10mm), the area of sample (left and right upper paratracheal), and the nature of the lymph node sample (benign type) was associated with lower diagnostic yield for EBUS-TBNA.

DISCUSSION

Suspected lymph nodes in the mediastinal region can be accessed with the aim of assessing lymphadenopathy or any malignancy through invasive interventions such as thoracoscopy or minimally invasive interventions including biopsy through mediastinoscopy with high accuracy. But sometimes it is associated with patients' dissatisfaction with such interventions and can also be associated with some adverse complications. In this regard, the use of imaging-based methods, especially ultrasonography, has received much attention due to the nature of non-invasiveness and the lack of need for radiation. In this regard, today, the use of needle sampling technique through EBUS has helped to assess the mediastinal lymph nodes, but sometimes with the non-diagnostic nature of the sample (in fact, sampling not from lymph nodes but adjacent tissues) has led. Accordingly, full access to the target tissue and therefore the usefulness of this method is overshadowed. In fact, it seems that various factors in the usefulness of this technique are effective in accessing the target tissue, which in order to increase the applicability of this technique, it is necessary to identify them. What we focused on in the present study was, first, to determine the diagnostic yield of this technique in achieving tissue and in fact the diagnostic nature of the tissue, and secondly, to determine the factors that affect this accessibility and diagnostic utility of tissue. In the first place, the usefulness of this method in achieving diagnostic tissue was 85%. In fact, of the 40 suspected specimens examined, 34 had the tissue sampled by this method completely diagnostic. Therefore, the remaining 6 samples underwent mediastinoscopy to achieve the final diagnosis, all of which led to access to diagnostic tissue. In a 2011 study, a retrospective analysis was performed on 243 consecutive patients who underwent EBUS-TBNA over a 4-year period.

Demographic and clinical information and pathological outcomes were examined at different time intervals to assess the effects of the potential learning curve. These steps were performed by two experienced bronchoscopists at a university medical center. Samples were in 83% of patients. The overall diagnostic utility was 66% [23]. Although according to this study, mediastinoscopy can be considered as the gold standard in achieving diagnostic tissue, but EBUS-TBNA, due to its non-invasive nature and also with acceptable usefulness, can be a completely acceptable alternative to mediastinoscopy or other invasive methods.

The most important point of this study was to determine the underlying factors that made EBUS difficult to access the target tissues of the area. The size of the lesion, the location of the lesion in the mediastinum and relative to the trachea, as well as the benign or malignant nature of the lesion were reported as three important factors in accessing or not accessing the target tissue through EBUS. Accordingly, lesions less than 10 mm, benign rather than malignant lesions, as well as lesions in the 2R and 2L positions may be associated with lower probability of EBUS access to the target tissue. Studies have shown that using the EUS technique and performing a biopsy can accurately assess the lymph nodes of the mediastinum, mainly the lower mediastinum, including the subcardinal region, paraesophageal region, and pulmonary ligament region. This technique also provides access to the left paratracheal region and part of the left hilar region. Using this technique, it possible to evaluate large lymph nodes well, but examining smaller lymph nodes can be difficult

due to difficult access. It is also difficult to evaluate and sample the para aortic lymph nodes and sampling this area is possible hard due to the accumulation of large mediastinal vessels [24]. In this regard, the use of a 25G needle with a transaortic approach will be the only option to achieve lymph nodes in this area [25]. Also, the lymph nodes in the right paratracheal and hilar areas can be examined when they are enlarged due to the establishment of a specific anatomical position of the trachea. In fact, the presence of a trachea will prevent the right mediastinum from being seen [26].

In this regard, using the EBUS technique is very practical. Evaluation of lymph nodes using EBUS biopsy has enabled excellent and more accurate evaluation of the right and left paratracheal and subcardinal regions. In addition, EBUS provides two-way access to the Hilar and Interlobar areas. Access to the lymph nodes of intrapulmonary nodes will only be possible with the use of radial mini-probes. In a study by Ernst et al [27], comparing FNA with EBUS and mediastinoscopy for the diagnosis of mediastinal adenopathy found the difference between the two procedures in the examination of the subcarinal lymph nodes and there was no significant difference in other lymph node stations. Our study confirmed the superiority of mediastinoscopy in the examination of subcarinal lymph nodes [27]. In a study by Inderpaul et al [28], evaluation using EBUS made it possible to examine lesions in the subcarinal lymph nodes in 37 of 159 patients, and it was ultimately recommended that negative cases on bronchoscopy needle biopsy be followed by mediastinoscopy. In this study, it was proved that this method is useful in assessing the lesions adjacent to the central air structures with a sensitivity of 90% and specificity of 100%. Also, according to our study, in the study of Fernandez et al [29], the possibility of access and evaluation of lymph nodes less than 10 mm by EBUS is much faster and easier. Therefore, it seems that EBUS provides high-utility access to mediastinal lymph nodes, and if used in conjunction with mediastinoscopy, pathological evaluation of suspected lymph nodes with high sensitivity and accuracy is possible.

CONCLUSION

As a final conclusion, the diagnostic yield of EBUS in assessing mediastinal lymph nodes for sampling and diagnosis is 85%. This benefit is expected in the case of lesions larger than 10 mm, lesions of a malignant nature, as well as lesions in the inferior para tracheal and subcarinal areas.

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