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TANAFFOS

Diagnostic Yield of Transbronchial Needle Aspiration (TBNA) for Cases with Intra-Thoracic Lymphadenopathies

Hamid Reza Jabbar Darjani, Arda Kiani, Mehdi Bakhtiar, Negar Sheikhi

Tracheal Disease Research Center, NRITLD, Masih Daneshvari Hospital, Shahid Beheshti University of Medical Sciences, Tehran- Iran.

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Correspondence to: Kiani A
Address: NRITLD, Shaheed Bahonar Ave, Darabad, TEHRAN 19569, P.O:19575/154, IRAN
Email address: ardakiani@yahoo.com

Background: Evaluation of the lymph nodes in cases with lung cancer for diagnosis or staging has been considered since many years ago. Various methods have been developed for obtaining a sample from lymph nodes. This study was conducted in a research institute with high patient turnover and aimed at evaluating the diagnostic yield of TBNA and effective factors on diagnosis and related complications in patients with pulmonary lesions.

Materials and Methods: Our understudy population included all patients suffering from undiagnosed intrathoracic lymphadenopathies with no accompanying pulmonary lesions on chest CT scan who had been hospitalized in Masih Daneshvari Hospital or referred to its bronchoscopy unit. After determining the anatomic location of lymphadenopathy (LAP), patients underwent fiberoptic bronchoscopy (FOB) and TBNA using 19-gauge eXcelon aspiration needle. Four samples were taken from each patient from the same LAP location. In this study, 39 patients were evaluated.

Results: The most common anatomic location of lymph node involvement among our understudy patients was the paratracheal area which was involved in 14 (45.2%) patients followed by subcarinal area in 12 cases (38.7%) and hilar involvement also in 12 cases (38.7%). Five patients (15.6%) had lymphadenopathies in other anatomical locations. Evaluation of the aspirates obtained by TBNA showed that the sample was adequate and diagnostic in 21 patients (55.26%), adequate but non-diagnostic in 9 patients (23.68%) and inadequate in 8 cases (21.06%). Definite diagnosis was made in 22 patients among which the most common diagnosis was atypical and malignant lesions in 11 cases (50%) followed by sarcoidosis in 8 (36.36%), tuberculosis (TB) in 2 (9.09%) and other diagnoses in 1 (4.55%) case.

Conclusion: Based on our study results, TBNA was diagnostic in more than half the cases. Various studies have reported a wide range of results in this respect but all of them including ours emphasize on the acceptable diagnostic yield of this technique.

Key words: Lymph node, Lymphadenopathy, Transbronchial needle aspiration (TBNA)

INTRODUCTION

Evaluation of the lymph nodes in cases with lung cancer for diagnosis or staging has been considered since many years ago. Various methods have been developed in order to obtain a sample from lymph nodes. Mediastinoscopy is among these methods in which lymph nodes are directly observed and sample is taken. Another method is needle aspiration which is done through various techniques.

Transbronchial needle aspiration (TBNA) is an intratracheal method. In order to reach a higher precision and elevating the diagnostic yield, more advanced

techniques like Endobronchial Ultrasonography (EBUS) are employed. Considering the high rate of complications in mediastinoscopy and high costs of EBUS, it is preferable to use TBNA which is simple, cheap and available in every bronchoscopy unit. It can be easily performed if the therapist knows the anatomical location of bronchial lymph nodes. TBNA of mediastinal lymph nodes was first described in 1949. Performing TBNA using a flexible bronchoscope was first reported in 1981 (1). TBNA makes diagnosis and staging of pulmonary and mediastinal lesions (especially lung cancer) possible with minimal invasion and even with no endobronchial disease (1, 2). Despite these advantages, TBNA is not employed as much as it should be and it is usually underutilized. However, since researchers are increasingly gaining knowledge in this respect, this trend seems to be changing (3-5). The most common indication of TBNA is for diagnosis and staging of lung cancer. However, TBNA is used for endobronchial, submucosal, peribronchial (in case of presence of a pressure effect from outside,) and peripheral lesions as well. TBNA may be the only diagnostic procedure feasible in patients in whom mediastinoscopy is contraindicated due to the presence of bleeding/hemorrhagic disorders (2, 5, 6). Numerous factors can affect the diagnostic value of TBNA including:

- Risk of malignancy determined by taking patient history and clinical examinations
- Location and size of lesions or lymph nodes and appearance of lesions (like spiculation) determined by CT scan imaging
- Apparent involvement of carina determined via bronchoscopy

Other factors impacting its diagnostic yield are experience and expertise of the therapist who performs the procedure, type of needle, number of attempts, number of aspirates, and presence of a cytologist (1).

Considering the vast complications of mediastinoscopy and high costs of EBUS, we can simply use TBNA which is cheap and available in every bronchoscopy unit and the therapist only needs to know the anatomy of the bronchial lymph nodes. This study was conducted in a research institute with high patient turnover and aimed at evaluating the diagnostic yield of TBNA and effective factors on diagnosis and complications in patients with pulmonary lesions.

MATERIALS AND METHODS

Our understudy population included all patients suffering from undiagnosed intrathoracic lymphadenopathies with no accompanying pulmonary lesions on chest CT scan who had been hospitalized in Masih Daneshvari Hospital or referred to its bronchoscopy unit.

Patients who met the inclusion criteria were selected using non-probability accidental or convenience sampling and were consecutively evaluated during the study period.

Mediastinoscopy is the Gold Standard for diagnosis of mediastinal lymphadenopathies. Our goal was to increase the diagnostic yield of TBNA close or ideally equal to that of mediastinoscopy. Patients with undiagnosed intrathoracic lymphadenopathies and no accompanying pulmonary lesions on CT scan, underwent FOB and TBNA using 19-gauge eXcelon aspiration needle after determining the anatomic location of LAP. Each patient underwent 4 samplings from the same LAP location. After performing bronchoscopy and making sure of an existing prominence or opening of main carina or right or left secondary carina and matching it with patient's CT (CT should be with contrast and taken in the recent week), the most probable site of lymphadenopathy was selected and aspiration needle was inserted as shown in figure 1 (1,7,8).

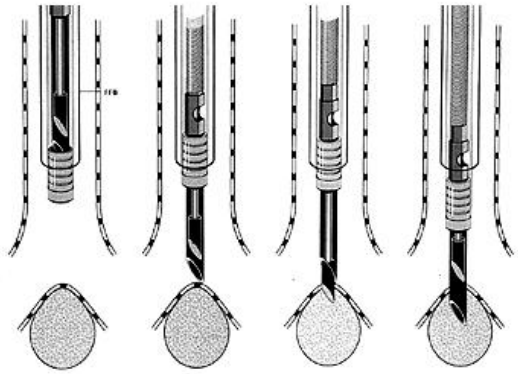

Figure 1. Transbronchial needle aspiration for histology by Wang needle.

Unlike EBUS where needle can be fixed on the bronchoscope, in TBNA there is no place for fixing the needle. Similar to forceps biopsy, when the needle tip exits the bronchoscope we can insert it into the desired location using one of the below mentioned 3 techniques:

1- By contact: Place the head/tip of the needle cap vertically adjacent to the desired location and ask the assistant to insert the needle.
2- By pressure: Remove the needle cap and insert the needle into the desired location vertically.
3- Needle tip and head of bronchoscope are placed in close contact over the desired location and needle is inserted.

In this study we used the 2nd technique. We made sure that the needle is inserted into the desired location and then fixed the needle end which contains a fixable syringe and works as suction by creating vacuity. We extracted and re-inserted the needle 5 to 6 times. Then the needle was pulled back into the needle cap, it was extracted and placed on the prepared slides. By releasing the air trapped inside the needle, samples were poured on the slides. Direct smears were prepared from the first two samples. The third sample was placed in formalin in order to prepare cell block and the 4th sample was transferred to the lab for preparing smear and mycobacterium culture. After finishing the aspiration, a biopsy sample was obtained from the bronchial mucosa where TBNA had been performed and evaluated histopathologically. Data regarding patients' clinical symptoms, anatomic location of LAP, primary and final diagnoses of samples were collected in a specific questionnaire.

Collected data were analyzed using SPSS version 11.5 software, independent sample t-test, chi square test, and Fisher's exact test.

Making a definite diagnosis with the help of bronchoscopy and TBNA can obviate the need for using invasive diagnostic procedures like mediastinoscopy and mediastinotomy and subsequent long hospital stays. It also prevents imposing high costs on patients and complications associated with invasive procedures.

RESULTS

In this study, 39 patients were evaluated out of which 22 were males (56.4%) and 17 were females (43.6%). The mean age of patients was 53.86±11.63 yrs. The mean age was 54.50±12.33 yrs in men and 53.06±11.03 yrs in women. No statistically significant difference was observed between the 2 groups in terms of mean age (P=0.71).

The most common complaints were cough (n=22, 73.3%), dyspnea (n=14, 46.7%), weight loss (n=14, 46.7%), hemoptysis (n=5, 16.7%) and fever (n=4, 13.3%). Table 4-1 compares the frequency distribution of patients' clinical complaints based on gender. No statistically significant difference was detected in this respect (Table 1).

Table 1. Frequency distribution of patients' clinical complaints based on gender.

Clinical symptoms	Gender		P-value
	Male	Female	
Dyspnea	9	5	0.72
Cough	12	10	0.28
Weight loss	10	4	0.28
Hemoptysis	4	1	0.62
Fever	3	1	0.27
Other symptoms	6	5	0.72

The most common site of lymph node involvement was paratracheal area which was involved in 14 patients (45.2%) followed by subcarinal involvement in 12 (38.7%) and hilar involvement in 12 (38.7%). In 5 patients, (15.6%) lymphadenopathy was present in other locations. Table 2 compares the location of lymphadenopathies based on patients' gender but no significant difference was observed in this respect.

Table 2. Frequency distribution of anatomic location of lymphadenopathy in patients based on gender.

Anatomic location	Gender		P-value
	Male	Female	
Paratracheal	9	5	0.33
Subcarinal	6	6	0.66
Hilar	7	5	0.52
Other	3	2	0.56

The samples obtained through TBNA were adequate and diagnostic in 22 patients (55.26%), adequate and non-

diagnostic in 9 (23.68%), and inadequate in 8 cases (21.06%). Results of TBNA based on patients' gender are compared in Table 3. However, differences were not statistically significant (P=0.37). Results of TBNA based on the anatomic location of lymphadenopathy are shown in Table 4.

Table 3. Results of TBNA based on patients' gender.

TBNA results	Gender	
	Male	Female
Adequate, diagnostic	14	8
Adequate, non-diagnostic	3	6
Inadequate	5	3

P=0.37

Table 4. Frequency distribution of TBNA results based on the anatomic location of lymphadenopathy.

Anatomic location of TBNA / Results	Adequate, diagnostic	Adequate, non-diagnostic	Inadequate	P-value
Paratracheal	8	3	3	0.96
Subcarinal	7	2	3	0.94
Hilar	8	1	3	0.52
Other	2	2	1	0.8

Definite final diagnosis was made in 22 patients. The most common diagnosis was atypical and malignant lesions in 11 cases (50%), followed by sarcoidosis in 8 (36.36%), TB in 2 (9.09%) and other diagnoses in 1 (4.55%). Rate of malignancy was higher in male gender (9 out of 11 cases). However, final diagnoses of patients were not significantly different in males and females (P=0.055).

In patients with atypia and malignancy the most common histopathologic diagnosis was small cell lung cancer (SCLC) which comprised 45.4% of all malignancies (5 cases). Cell atypia was observed in 4 cases (36.4%), adenocarcinoma in 1 case (9.1%) and metastatic lesion also in 1 patient (9.1%). Table 5 compares the distribution of malignant lesions in males and females. The difference between men and women in this regard was statistically significant (P=0.018).

Table 5. Frequency distribution of malignant lesions in males and females.

Pathology	Gender	
	Male	Female
SCLC	5	0
Adenocarcinoma	0	1
Cell atypia	4	0
Metastasis	0	1

DISCUSSION

TBNA is a less invasive bronchoscopic technique which is safe, reliable and cost effective for diagnosis of intrathoracic lymphadenopathies (9). The value of TBNA as a means for diagnosis of intrathoracic lymphadenopathies and also staging of lung cancer has been approved and confirmed in various studies (10-12). Advancements made in the realm of TBNA techniques including feasibility of onsite cytologic examination and evaluation, use of 19-gauge needles for core biopsy and endoscopic and endobronchial ultrasonic guidance have significantly increased the diagnostic yield of this procedure (10, 13, 14).

This study evaluated the diagnostic yield of conventional TBNA. At present, we try to improve the diagnostic value of TBNA by the guidance of procedures like endobronchial sonography, and transesophageal sonography. Some studies have shown the increased value of TBNA performed with the guidance of these procedures. For example, Herth and colleagues in a randomized clinical trial compared conventional TBNA with TBNA under the guidance of EBUS (14). Our study results showed a significant increase in diagnostic yield of TBNA from 71% to 80% following the use of ultrasound guidance. However, conventional TBNA is still in center of attention. TBNA under EBUS guidance requires advanced expensive equipments which are not available in every medical center (10). In addition, this technique requires special expertise; whereas, conventional TBNA does not need any of these and can be potentially used wherever bronchoscopy equipments are available (10).

In general, 3 situations may occur following TBNA:

1- Sample is adequate for making a specific cytologic or histologic diagnosis
2- Sample is inadequate or has a poor quality
3- Sample is adequate for cytology (cellularity is good with abundant lymphoid tissue and abundance of lymphoid cells) but definite diagnosis is not possible (9, 10).

Based on our study results, TBNA samples were adequate and diagnostic in 22 patients (55.26%). Positive rate of TBNA results is various in different studies. In a study by How and colleagues on 25 patients, TBNA was positive in 15 patients (60%) (15). In a study by Lannes et al, on 74 patients, 46% of samples were adequate and diagnostic (16). Cetinkaya and colleagues in their study evaluated 60 patients with hilar or mediastinal adenopathies detected on chest CT scan (17). Lymph node biopsy samples were adequate in 59 out of 60 samples and the diagnoses were made in 45 out of 60 cases (75%). In some other studies like the one by Herth, the diagnostic yield of this technique was reported to be about 80%.

According to some studies in 15 to 20% of cases TBNA provides adequate samples but making a specific diagnosis is not possible (10,18). In our study the samples were adequate but non-diagnostic in 9 patients (23.68%) which is in accord with the above mentioned studies. However, the reported rate in this respect shows a wide range of diversity in different studies. For example, in Cetinkaya study, only 1 out of 60 samples (1.6%) was inadequate. This rate in a study by Lannes et al. was reported to be about 11% (16, 17).

The obtained TBNA samples were inadequate in 8 patients (21.06%) in our study. This rate was 43% in Lannes et al. study (16). In a study by Shah et al. on 129 patients suspected for lung cancer, TBNA aspirates were adequate in 71% of cases (19).

As you can see, TBNA results are widely diverse and our study result is in an acceptable range. This diversity may be due to various study conditions. In some studies, TBNA has been performed under imaging guidance like EBUS and this has increased its diagnostic yield. Different sample sizes and understudy populations can also affect the result. Type of pathologic diagnosis, size of lymph node, and cytologist's expertise and experience also play a role in this respect (20).

In our study, a definite diagnosis was reached in 22 patients. The most common diagnosis was malignant lesions and atypia in 11 cases (50%), followed by sarcoidosis in 8 (36.36%), TB in 2 (9.09%) and other diagnoses in 1 (4.55%).

In Lannes et al. study, 34 (46%) of all the studied cases were positive out of which 30 cases (88%) were malignant (16). Small cell carcinoma was the most common diagnosis detected in 10 out of 34 cases (29%). Other diagnoses included squamous cell carcinoma in 7 (21%), adenocarcinoma in 7 (21%), non small cell carcinoma in 6 (17%), sarcoidosis in 2 (6%) and tuberculosis in 2 (6%)(16).

In a study by Wang et al, 77 patients were evaluated out of which 38 cases had lung cancer, 35 had benign pulmonary disease and 4 had no definite diagnosis (20). TBNA was successfully carried out in 222 out of 225 cases (98.7%). Rate of positive TBNA was 81.6% in patients with bronchogenic carcinoma (31 out of 38 cases). The diagnosis of lung cancer was confirmed via TBNA only in 9 cases. A total of 63 lymph nodes in 38 lung cancer patients were aspirated by TBNA with a positive rate of 65.1% (41 out of 63 cases).In Cetinkaya et al. study on 60 patients, diagnoses included 21 cases of TB, 21 cases of sarcoidosis, 15 cases of carcinoma and 3 cases of lymphoma (17).

We had limitations in our study. The most important one was not confirming the results by a Gold Standard like surgery. However, similar studies usually have the same limitation (9, 21). Nonetheless, by comparing the results of TBNA and those of gold standard diagnostic methods a more definite statement can be made regarding the sensitivity, specificity and diagnostic yield of this method. The other limitation of this study was our small sample size.

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