



doi • 10.5578/tt.59707
Tüberk Toraks 2018;66(2):109-114
Geliş Tarihi/Received: 22.11.2016 • Kabul Ediliş Tarihi/Accepted: 13.10.2017

KLİNİK ÇALIŞMA
RESEARCH ARTICLE

Efficacy and safety of endobronchial ultrasound-guided transbronchial needle aspiration through the pulmonary arteries for the diagnosis of left hilar lesions

Erdoğan ÇETİNKAYA¹
Mustafa ÇÖRTÜK²
Demet TURAN¹
Elif TANRIVERDİ¹
Murat ACAT²
Mehmet Akif ÖZGÜL¹

¹ Clinic of Chest Diseases, Istanbul Yedikule Chest Diseases and Chest Surgery Training and Research Hospital, Istanbul, Turkey

¹ İstanbul Yedikule Göğüs Hastalıkları ve Göğüs Cerrahisi Eğitim ve Araştırma Hastanesi, Göğüs Hastalıkları Kliniği, İstanbul, Türkiye

² Department of Chest Diseases, Faculty of Medicine, Karabük University, Karabük, Turkey

² Karabük Üniversitesi Tıp Fakültesi, Göğüs Hastalıkları Anabilim Dalı, Karabük, Türkiye

SUMMARY

Efficacy and safety of endobronchial ultrasound-guided transbronchial needle aspiration through the pulmonary arteries for the diagnosis of left hilar lesions

Introduction: Endobronchial ultrasonography (EBUS) is an endoscopic method that aids needle aspiration to see the bronchial wall and adjacent tissues with an ultrasound probe. Pulmonary arteries are rarely present between the bronchus wall and the tissue. In this case, it was necessary to make a selection between invasive processes and transbronchial needle aspiration (TBNA) through the pulmonary artery. There are few case reports about the safety of TBNA through the pulmonary artery. We aimed to present the results of EBUS guided TBNA through the pulmonary arteries.

Materials and Methods: The data on four cases (three men) in whom EBUS guided TBNA was performed through the pulmonary artery between August 2010 and December 2015 were reviewed retrospectively. Procedures were conducted under local anesthesia and conscious sedation. For TBNA, 22-gauge needles were used. Cases were monitored for 24 hour after the procedures. Antibiotic prophylaxis and onsite cytopathology were not used.

Results: All lesions existed were on the left hilar localization. Two of the diagnosed cases were carcinoma and one was the granulomatous lymphadenitis. We were not able to diagnose the last case. No complication was observed in any cases during the procedure.

Conclusion: EBUS guided TBNA through the pulmonary arteries at left hilar lesions is safe. The rate of diagnoses from the tissues obtained is high. No special preparation is needed for the cases have no the pulmonary hypertension.

Key words: Bronchoscopy; cytopathology; biopsy; diagnosis; pulmonary artery; safety

ÖZET

Sol hiler lezyonlarda transarteriyel endobronşiyal ultrasonografi rehberliğinde transbronşiyal iğne aspirasyonunun etkinlik ve güvenilirliği

Giriş: Endobronşiyal ultrasonografi (EBUS) işlemi ultrasound probu vasıtası ile bronş duvarı ve komşuluğundaki dokuları görerek

Yazışma Adresi (Address for Correspondence)

Dr. Erdoğan ÇETİNKAYA
İstanbul Yedikule Göğüs Hastalıkları ve Göğüs Cerrahisi Eğitim ve Araştırma Hastanesi, Göğüs Hastalıkları Kliniği, İSTANBUL - TÜRKİYE
e-mail: ecetinkaya34@yahoo.com

iğne aspirasyonu yapmaya yardımcı olan endoskopik bir yöntemdir. EBUS rehberliğinde transbronşiyal iğne aspirasyonu (TBİA) sırasında nadir de olsa bronş duvarı ile TBİA yapılmak istenen doku arasına pulmoner arterler girmektedir. Bu durumda daha invaziv işlemler ile TBİA yapmak arasında bir seçim yapmak gerekir. Pulmoner arter geçilerek TBİA işleminin güvenliği konusunda bildirilmiş çok az sayıda olgu sunumu mevcuttur. Bu makalede pulmoner arteri geçerek EBUS rehberliğinde TBİA olgularının sonuçlarının sunulması amaçlandı.

Materyal ve Metod: Ağustos 2010 ile Aralık 2015 tarihleri arasında pulmoner arter geçilerek EBUS rehberliğinde TBİA yapılan 4 olgunun (3 erkek) verileri retrospektif olarak irdelendi. İşlemler lokal anestezi ve bilinçli sedasyon ile yapıldı. TBİA için 22-gauge iğne kullanıldı. İşlem sonrasında olgular 24 saat süreyle hastanede takip edildi. İşlemler esnasında antibiyotik profilaksisi ve on-site sitopatoloji kullanılmadı.

Bulgular: Bütün lezyonlar sol hilus lokalizasyonundaydı. İşlem sonucu tanılar iki olguda karsinom, birinde ise granülomatöz lenfadenitti. Diğer olguda tanısız değildi. EBUS rehberliğinde TBİA işlemi sırasında hiçbir olguda komplikasyon görülmedi.

Sonuç: Sol hilus lezyonlarda pulmoner arter geçilerek yapılan EBUS rehberliğindeki TBİA işlemi güvenlidir. Elde edilen dokudan tanı konulma oranı yüksektir. Pulmoner hipertansiyon kliniği olmayan olgularda özel bir hazırlık gerektirmez.

Anahtar kelimeler: Bronkoskopi; sitopatoloji; biyopsi; tanı; pulmoner arter; güvenlik

INTRODUCTION

Transbronchial needle aspiration (TBNA) has been performed during bronchoscopy over the last two decades. Samples can be taken from the hilar or mediastinal lesions which cannot be observed by endobronchial, but with TBNA. TBNA is a safe method, although minor bleeding may occur; major bleeding rarely occurs even when a needle damages major vessels (1).

Areas apart from the inner bronchus cannot be visualized with classic bronchoscopy. Tissues around the bronchus can be visualized with the endobronchial ultrasonography (EBUS). The size and the structure of the lesion can be evaluated and synchronous samples can be obtained. Both diagnosis rates and patient safety are increased with EBUS guided TBNA (2).

The cases are rarely encountered where major vessels located between the bronchial wall and the lesion during EBUS. In such cases, performing a needle aspiration through the big vessels with EBUS guided TBNA or obtaining a tissue sample by use of more invasive methods. After aspiration needle used during EBUS passes the bronchial wall, it completely passes pulmonary arteries and reaches tissue desired to be taken a sample. It is called as either trans-arterial EBUS guided TBNA or EBUS guided TBNA through the pulmonary arteries. There are very few information except three case reports and one case series about possible complications during EBUS guided TBNA through the pulmonary arteries (3-6).

Our aim of the case series is to present safety and results of process of EBUS guided TBNA through the pulmonary arteries to reach lymph node at left hilus at four cases.

MATERIALS and METHODS

This is a case series study. We retrospectively collected information on EBUS cases at only our institutions. Demographic data of cases, radiologic and EBUS images were obtained by patient files. Convex probe EBUS has been performed for approximately 1000 people in a year at our department. Presented cases, obtained within 5 years and seen at 4 patients, are cases of EBUS guided TBNA passing through pulmonary arteries and performing needle aspiration biopsy from target tissue. EBUS is not performed for pediatric age group at our institutes. Any exclusion criteria are not submitted because all cases accept our proposal.

Four patient were enrolled in this study. EBUS guided TBNA was performed between August 2010 and December 2015 and the data were reviewed. In these four cases, there was no other hilar or mediastinal lesion that could be taken without EBUS guided TBNA through the pulmonary arteries. Obtaining samples from a lesion, it was necessary to perform EBUS guided TBNA through the pulmonary arteries or use a more invasive procedure. EBUS guided TBNA was performed for the patients who preferred transarterial needle aspiration. Informed written consents form were obtained from the patients.

Lidocaine was used for local anesthesia during bronchoscopy. Intravenous midazolam was used for conscious sedation in all the cases. EBUS was conducted using a fiberoptic ultrasound bronchoscope (Convex Probe EBUS; BF-UC 160F-OL8; Olympus Medical Systems, Tokyo, Japan). After the bronchoscope was guided to the target area, with real-time imaging, a 22-G aspiration needle with a syringe connected proximally (Model NA-201SX-4022, Olympus,

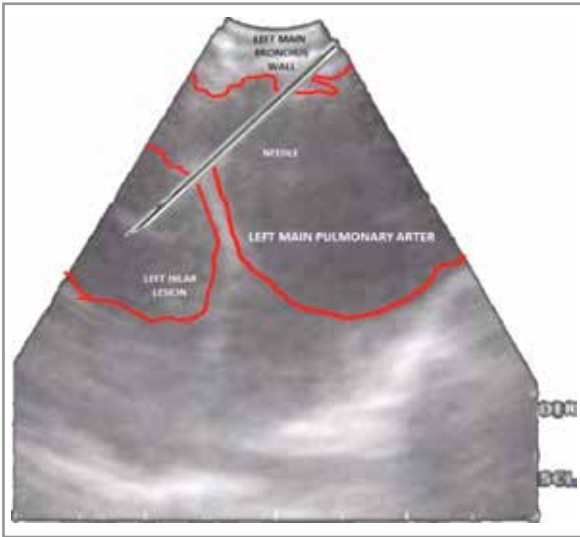


Figure 1. Schematic view of process of trans-arterial EBUS guided TBNA.

manufactured for this purpose) was pushed out from the distal tip of the bronchoscope and samples consisting of cells or tissue fragments were obtained as described previously (7). After the used needle during this process passed through bronchial wall and pulmonary arteries were passed from end to end, target tissue was reached (Figure 1). Rapid onsite cytopathology was not used during EBUS guided TBNA. After the procedure, patients were admitted to the hospital for a day and possible complications were monitored.

This study was approved by the local ethics committee.

RESULTS

Four patients (three male and one female) were enrolled in this study. The mean age was 56.25 ± 4.35 years. Between 50 and 60 years of age underwent convex-probe EBUS using a 22-G needle; diagnostic tissue was obtained from lymph node station 10 L by

traversing the pulmonary artery. Description of patient demographics, comorbidities, and details of the procedure with final diagnosis in 4 patients who underwent EBUS guided TBNA were given in Table 1.

The first case had prostate carcinoma. A chest tomography (CT) scan of his lungs observed a solid lesion (< 4.5 cm) was in the left hilus. A positron emission tomography (PET) CT scan was showed intense F-18 flurodeoxyglucose (FDG) uptake (maximal standardized uptake value, $SUV_{max} = 9.5$ g/mL) in the left prevascular lymphatic area at the mediastinum. A round hypoechogenic lesion that filled the convex probe EBUS (CP-EBUS) and left hilar area extended through the aortopulmonary area. Furthermore, the lesion was in front of the pulmonary artery. It was sampled twice with a 22-G needle by bypassing the pulmonary artery under EBUS guidance.

The second case had recurrent pulmonary embolism. Thus, the patient used an oral anticoagulant. Her intraabdominal, breast, and the urogenital areas were scanned for malignancies because it was thought that the recurrent pulmonary embolism may have been secondary to a malignancy. However, no malignancy were found. Low-molecular-weight heparin (LMWH) was used after discontinuing the oral anticoagulant 1-week prior EBUS guided TBNA. The last dose of LMWH was applied 24 h before the procedure. It was given an EBUS and CT image of 2nd case (Figure 2).

In 3 cases, presented with a headache and balance disorder. CT revealed a mass (3 cm) in the left lung hilus. In PET CT, the lesion in the left lung hilus showed enhanced FDG uptake ($SUV_{max} = 6.65$ g/mL) and the image was consistent with metastasis in the brain. In the CP-EBUS, a round lymph node (3.11 cm) with a heterogeneous internal structure and clear contours in the left hilar area and in front of the pulmonary artery was found. TBNA under EBUS guidance was performed twice. A cytopathological evaluation of the

Table 1. Demographic characteristics and final diagnosis of the patients

| Case no | Gender | Age | Comorbidities | Final diagnosis |
|---------|--------|-----|--------------------|---|
| 1 | Male | 60 | Prostate carcinoma | Prostate carcinoma metastasis |
| 2 | Female | 50 | Pulmonary embolism | Granulomatous lymphadenitis |
| 3 | Male | 57 | Lung cancer | Anthracosis (Lung cancer metastasis was diagnosed via video-assisted thoracoscopic surgery) |
| 4 | Male | 58 | Lung cancer | Small-cell lung carcinoma |

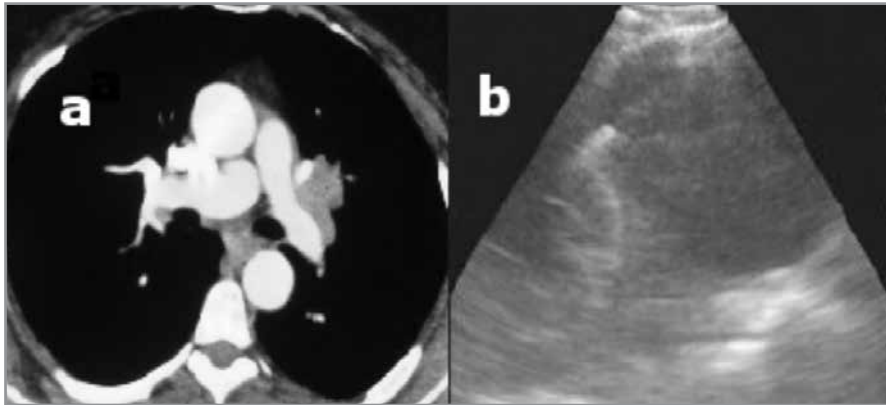


Figure 2. CT image (a) and EBUS image (b) of the mass seen in the left hilus and in front of the pulmonary artery.

aspirated material indicated that there were anthracotic pigments, anthracitic histiocytes, and leukocytes. Video-assisted thoracoscopic surgery was performed on the patient. Non-small cell lung carcinoma was diagnosed.

The 4th case presented with paresthesia in his hands and hemoptysis. A mass lesion (4×5 cm) that surrounded the left pulmonary artery was determined with CT. In PET-CT, the same lesion showing increased FDG uptake ($SUV_{max} = 9.6$ mg/dL). Conventional flexible bronchoscopy and TBNA with flexible bronchoscopy (through station 11 L) were performed once in this case. A cytopathological diagnosis could not be made. CP-EBUS revealed two round LAMs with hypoechoic internal structures, the biggest of which was 24 mm in the left hilar (10 L) station. The biggest LAM was sampled twice. Based on cytopathological examinations of the samples taken, small-cell lung carcinoma was diagnosed.

There were no complications associated with the procedures.

DISCUSSION

Endobronchial ultrasonography has a high success rate, also it is a safe and minimally invasive method for examining mediastinal lymph nodes and masses (1). Mediastinoscopy is the gold standard method for diagnosis with pathological examination after taking samples from mediastinal lymph nodes (8). EBUS guided TBNA also has a high success rate to diagnose mediastinal lesions, which is why it has been used with increased frequency in recent years (9,10).

During a conventional TBNA, the needle may occasionally enter a major vessel. However, the probability of serious bleeding is low (1). We witness such bleeding quite rarely during TBNA procedures in our clinics. It is thought that the elastic structure of the vessels and compression of mediastinal structures are effective against bleeding (3).

The sonographical anatomy of tissues around bronchus can be observed during EBUS. Vessels with blood flow are seen with the aid of doppler during sonographical imaging and performing a biopsy can simply be achieved without damaging the vessels. However, sometimes it is necessary to sample lesions by bypassing the pulmonary artery. Reports on such cases lack apart from a few cases presentations and one case series (3-6). Two cases were presented by Boujaoude et al., the lesions in the right hilus in both cases were sampled with EBUS guided TBNA using a 21-G needle (3). In the other two reports lesions in the left hilar area were diagnosed using a 22-G needle through the pulmonary artery (4,5). In a case series reported by Folch et al. that territory of lymph node station 5 was sampled with EBUS guided TBNA using both a 21-G and 22-G needles through the pulmonary artery for 10 cases (6). No significant complications were reported. To the best of our knowledge, no other case presentation or study has been reported on EBUS guided TBNA through the pulmonary artery.

Some other cases of EBUS guided TBNA with needle aspiration for lesions inside the pulmonary artery have been reported (11-13). No significant complications were reported in any of them. Dusemund et al. reported a lesion inside the left descending pulmonary artery

occluding the artery based on EBUS guided TBNA; they diagnosed metastatic synovial sarcoma (11). In that case, due to the possible development of bacteraemia related to the intravascular intervention, 2.2 g amoxicillin and clavulanic acid was used. Dhamjia et al. diagnosed metastatic breast carcinoma by obtaining a sample with EBUS guided TBNA from a lesion inside the left pulmonary artery (11). There was no information on the diameter of needle in either cases. Horowitz et al. took a sample from a mass inside the left pulmonary artery using EBUS guided TBNA with a 21-G needle (12). Another study reported paraaortic lesions sampled after through the aorta with a 22-G needle under an endoscopic ultrasonography (EUS) guidance; the study consisted with 14 cases, and no significant complications developed (14).

Pulmonary hypertension (PHT) was not reported in previous case reports. Although it has been reported that the possibility of bleeding is high for PHT cases during flexible bronchoscopy, but there are no concrete data supporting for such cases (15). Animal experiments have shown that endovascular biopsy attempts from the pulmonary artery are safe even in hypertensive animals (16). There are no reports of attempts to bypass the pulmonary artery in humans with PHT. We believe that it is important to carefully evaluate the advantages and disadvantages of EBUS guided TBNA before performing in PHT patients.

In our study, a 22-G needle was used and previous studies have used both 21-G and 22-G needles and no important complications have been reported. In only one reported case, a prophylactic antibiotic was used because of an intravascular attempt (10). We were not used a prophylactic antibiotic before the procedure.

Our study had some limitations. Firstly, this is a retrospective-uncontrolled case series. Secondly, our case series had small number of included patients (4). Thus, it is not appropriate to conclude that the procedure is safe with a high yield.

CONCLUSION

The EBUS guided TBNA procedure through the pulmonary artery at the left hilus is a safe method. Antibiotic prophylaxis is not necessary before EBUS guided TBNA procedure through the pulmonary artery. The rate of diagnosis is relatively high with a cytopathological examination of the tissue samples obtained. Because of few number of patients and

publications, prospective studies performed with great number of patients about safety and efficiency of EBUS guided TBNA procedure through the pulmonary artery are needed.

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