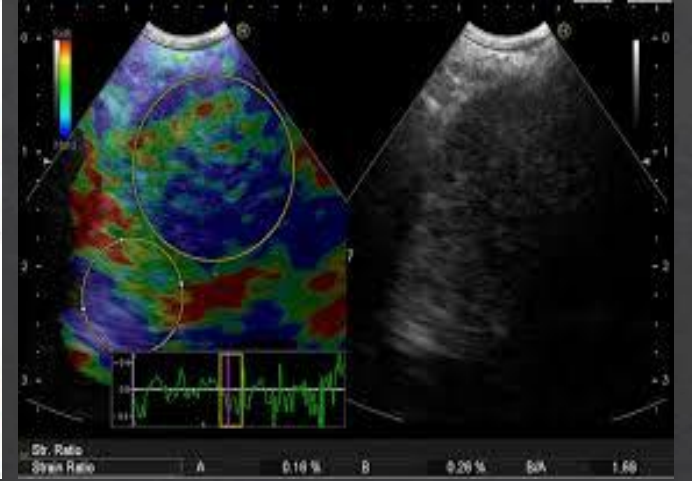
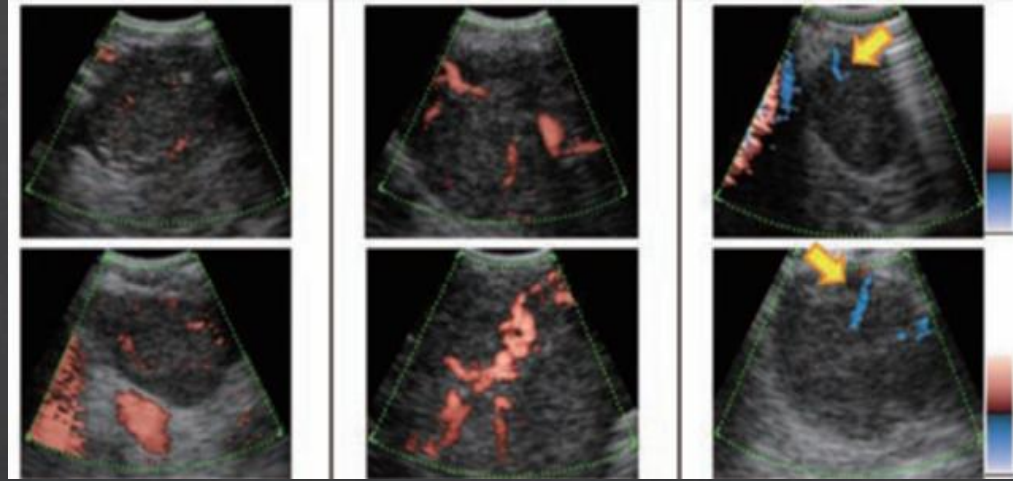


# Benign ve Malign Hastalıklarda

# EBUS-TBİA



Doç. Dr. Ersin GÜNAY  
Afyon Kocatepe Üniversitesi Tıp Fak.  
Göğüs Hastalıkları AD

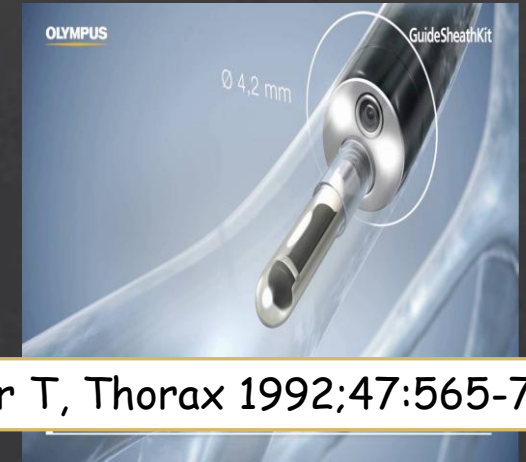
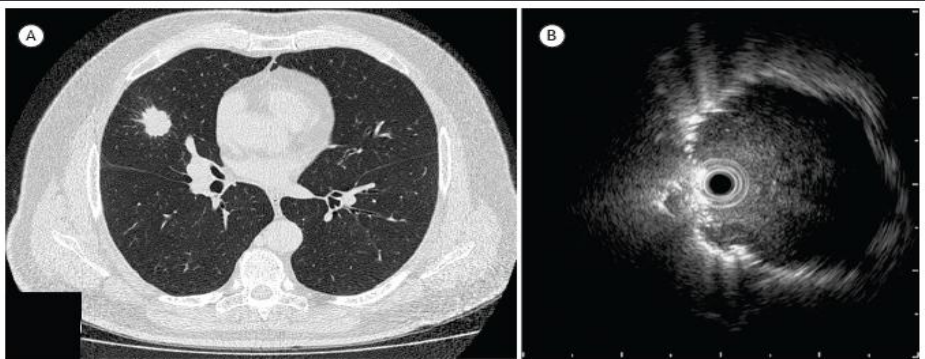
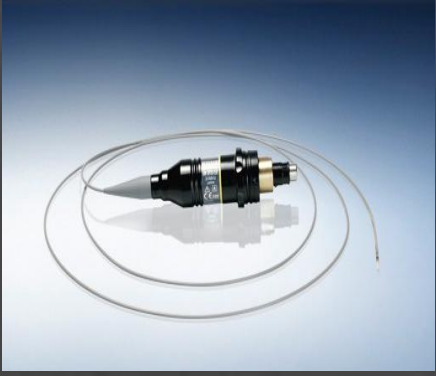
# Sunum Planı

- ◆ EBUS Genel Özellikler (radial ve konveks)
- ◆ Malign Hastalıklarda EBUS
- ◆ Benign Hastalıklarda EBUS
- ◆ Ultrasonografik Özelliklerle Ayrım Mümkün mü?
- ◆ Olgu Örneği

# Endobronşiyal Ultrason (EBUS)

## 1-Radial probe EBUS (miniprob) (1990'lar)

- ◇ 2.8 mm işlem kanalı ile kullanım (2mm ultraminyatür prob)
- ◇ Periferik kitle, SPN ve lenf nodlarının görüntülenmesi
- ◇ TBNA ve biyopsi için rehberlik (kılavuz katater ile)
- ◇ Vasküler ve non vasküler yapıların ayırt edilmesi
- ◇ Tümör invazyonunun değerlendirilmesi (erken evre Tm)
- ◇ Endobronşiyal tedavi için rehberlik



Hürter T, Thorax 1992;47:565-7

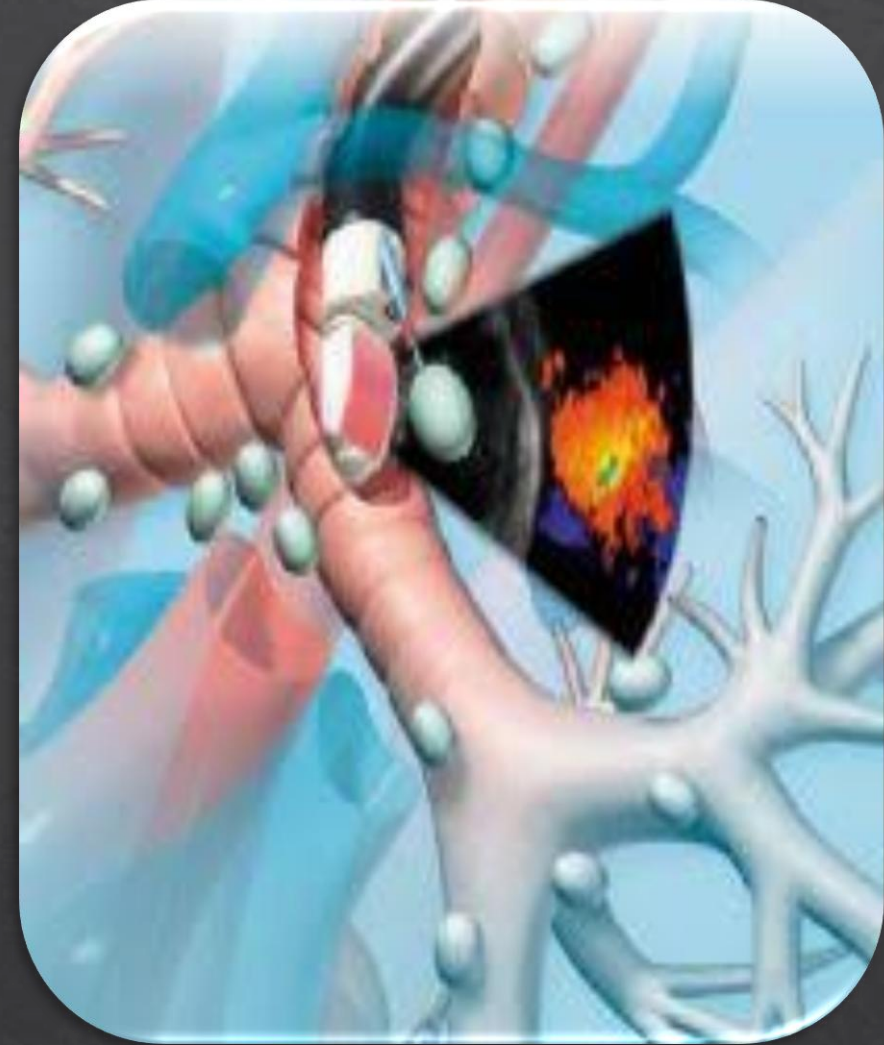


# Endobronşiyal Ultrason (EBUS)

## 2- Konveks Prob-EBUS (CP-EBUS)- TBİA

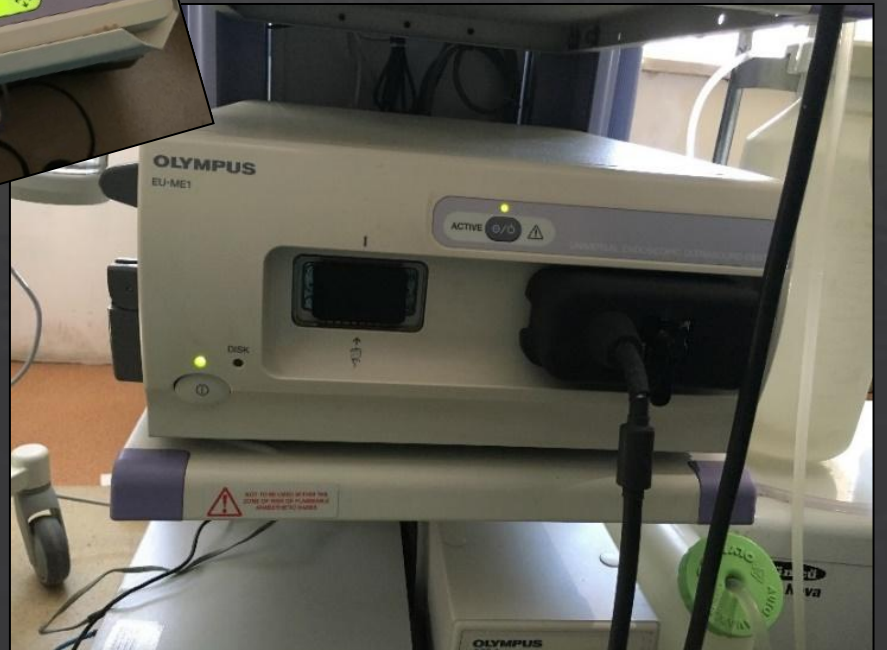
- ◆ 2000'li yıllarda geliştirildi.
- ◆ CP EBUS-TBİA, mediasten ve hiler alana komşu yapıları görüntülemeye ve gerçek zamanlı örneklere yarayan minimal invaziv bir yöntem

- Lenf Nodları
- Tümör
- Ana vasküler yapılar (Doppler)



Yasufuki K, Oncol Rep 2004;11:293-6.  
Yasufuki K, Chest 2004;126:122-8.





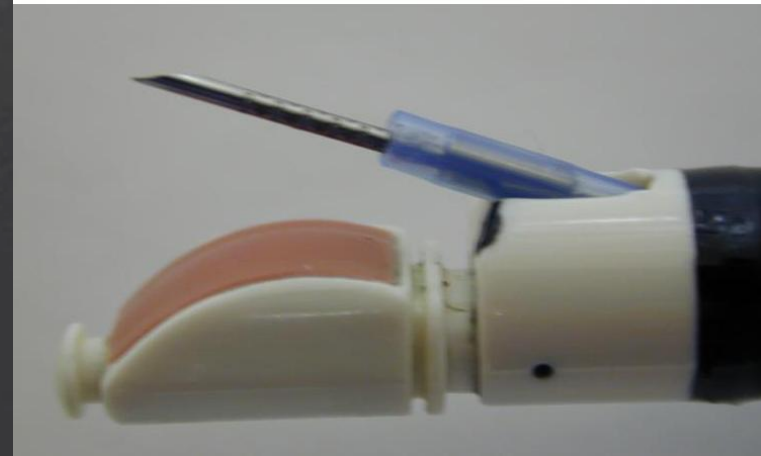
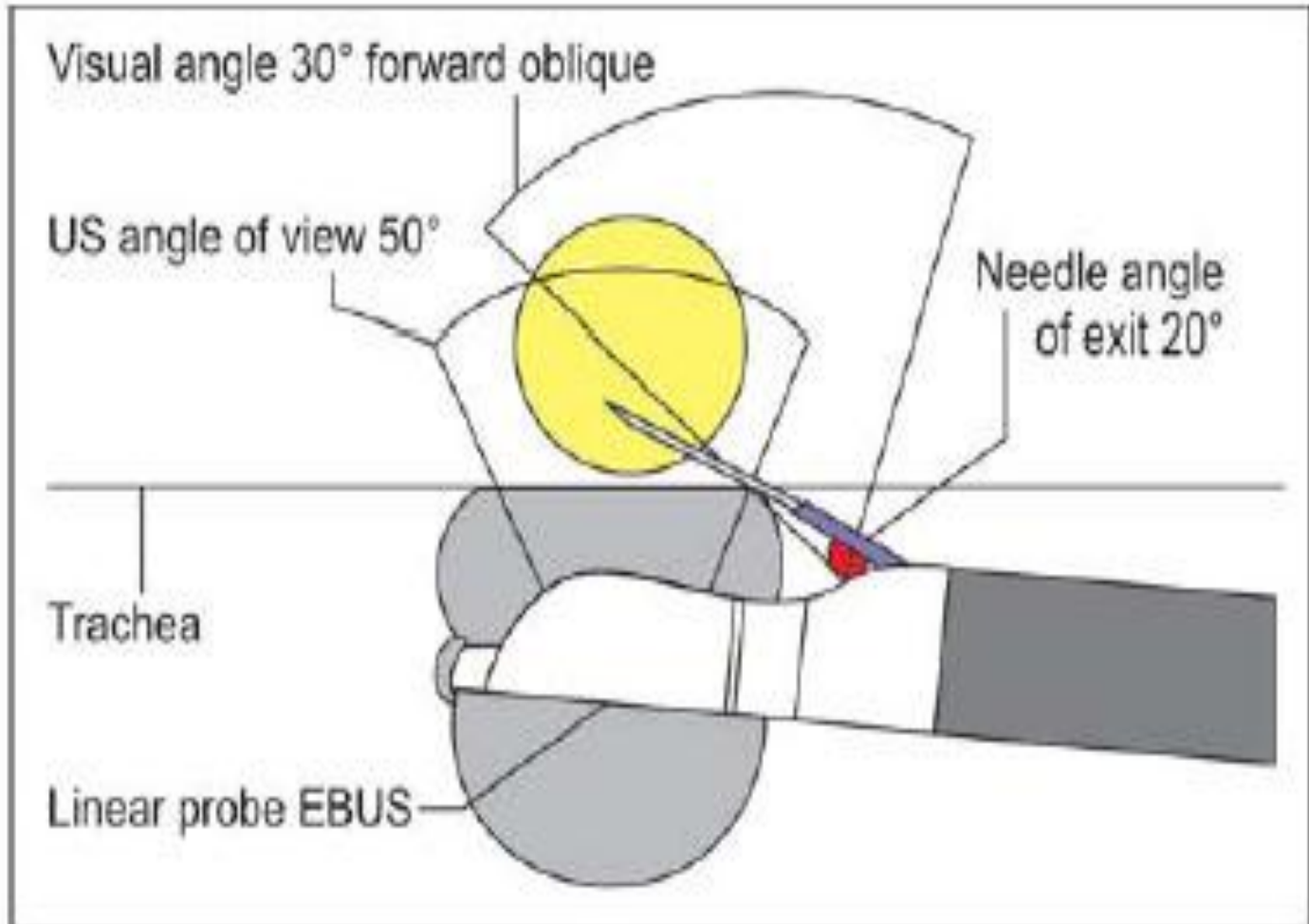
# SKOP



EBUS probu 6,9mm dıř apı olan, 2.2mm alıřma kanalına sahip toplamda 89 cm uzunluęu olan **kompleks video bronkoskoptur.**

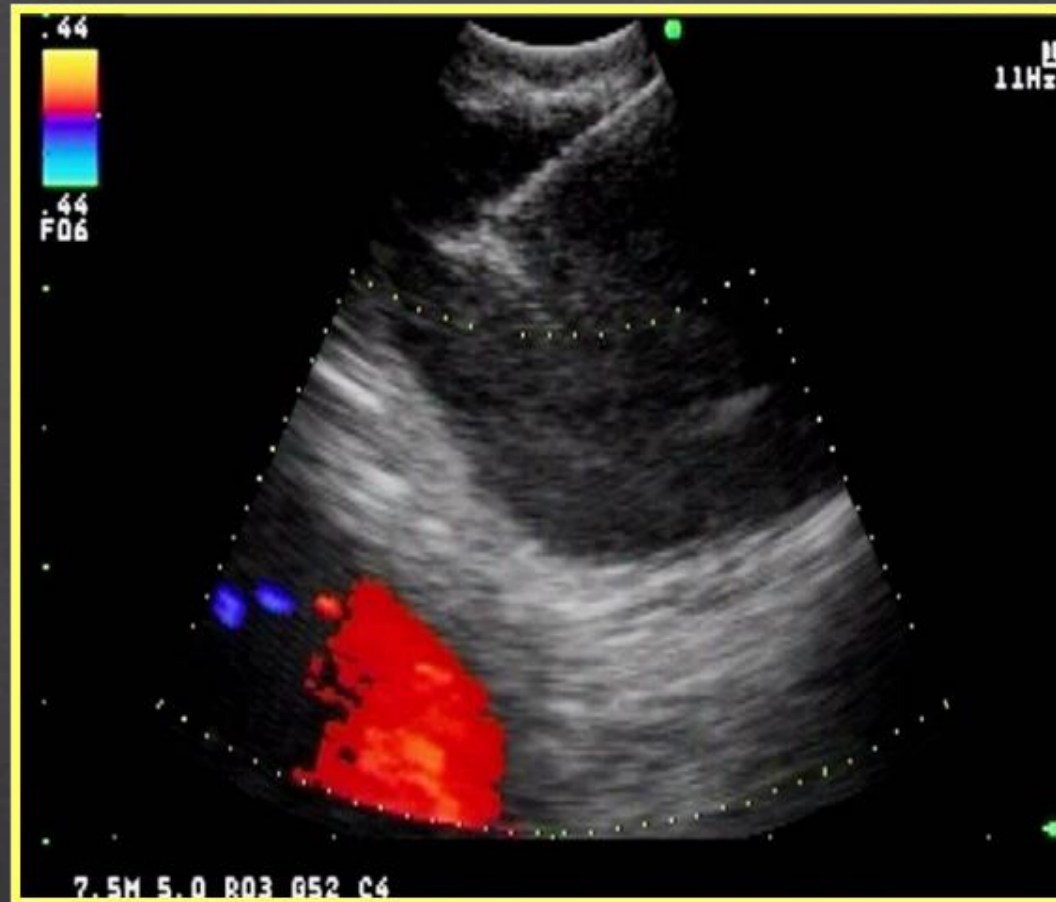


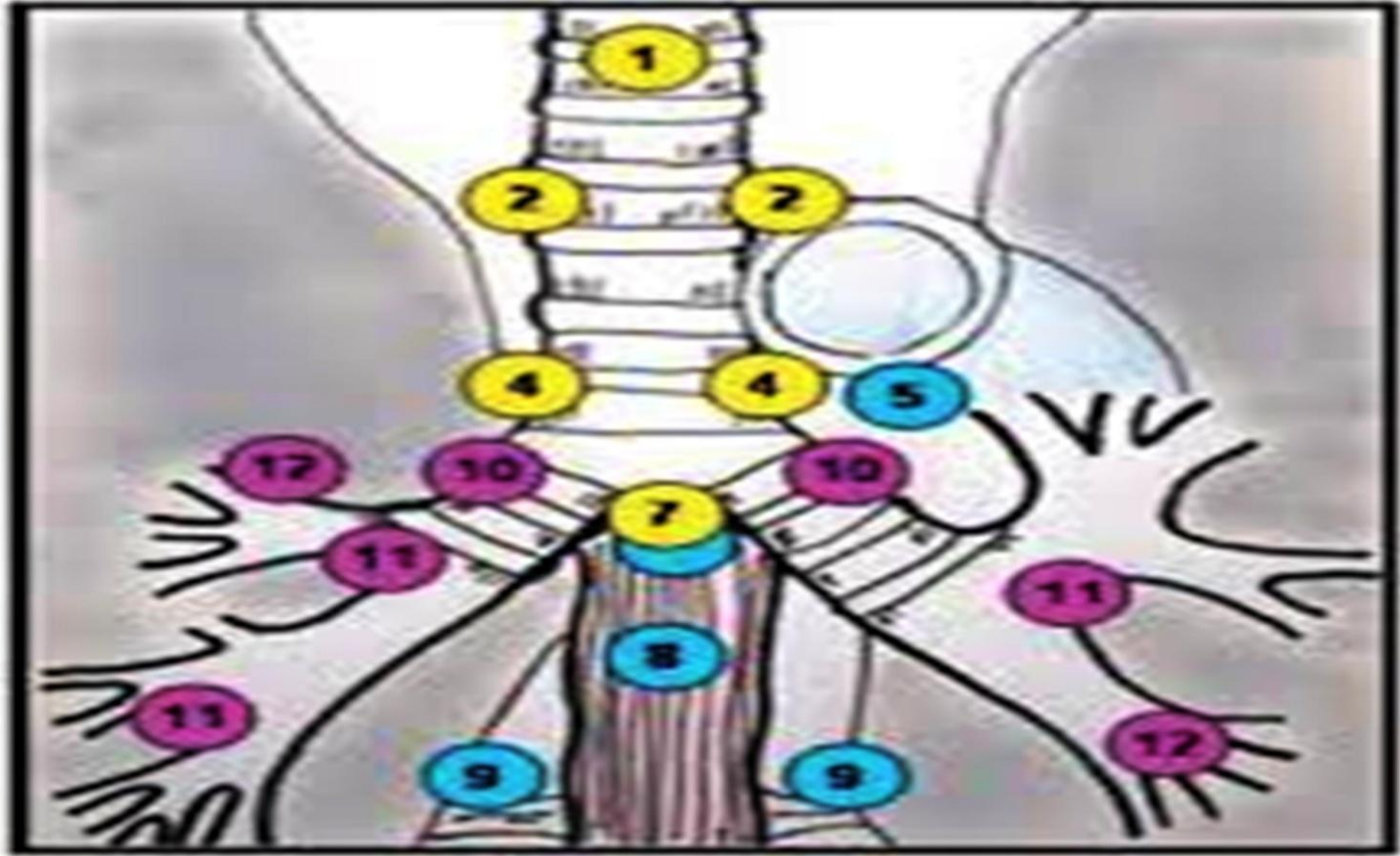
# GÖRÜŞ AÇISI





# Doppler Modu



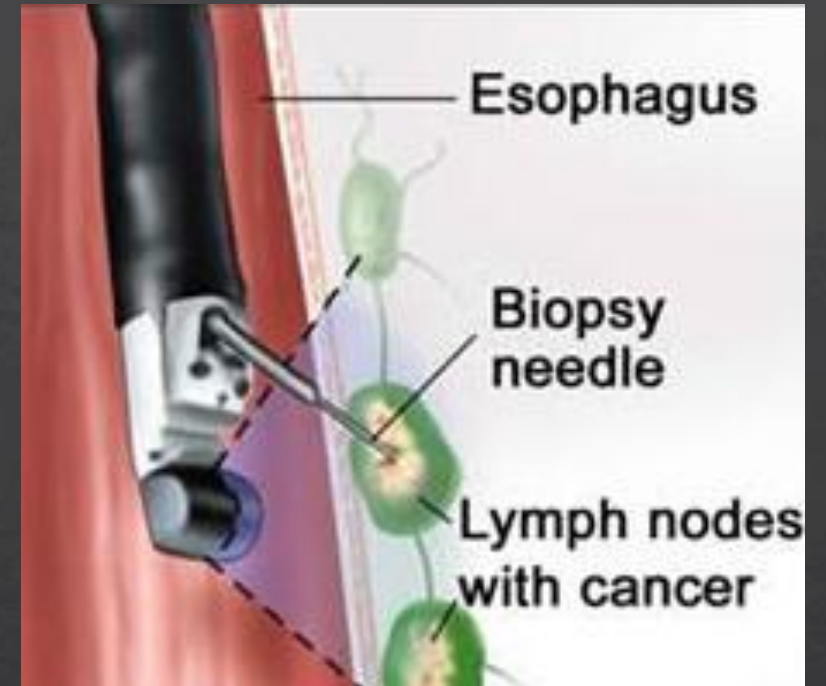


- EBUS-TBNA and Mediastinoscopy
- EBUS-TBNA
- EUS-FNA

# EBUS

◆ MALIGN HASTALIKLAR

◆ BENİGN HASTALIKLAR





# MALIGN HASTALIKLARDA EBUS

## KULLANIM ALANLARI

- ◆ Evreleme ve Tekrar Evreleme (re-staging)

# Mediastinal Evreleme

## Non-invaziv Yöntemler:

BT



PET



## İnvaziv Yöntemler:

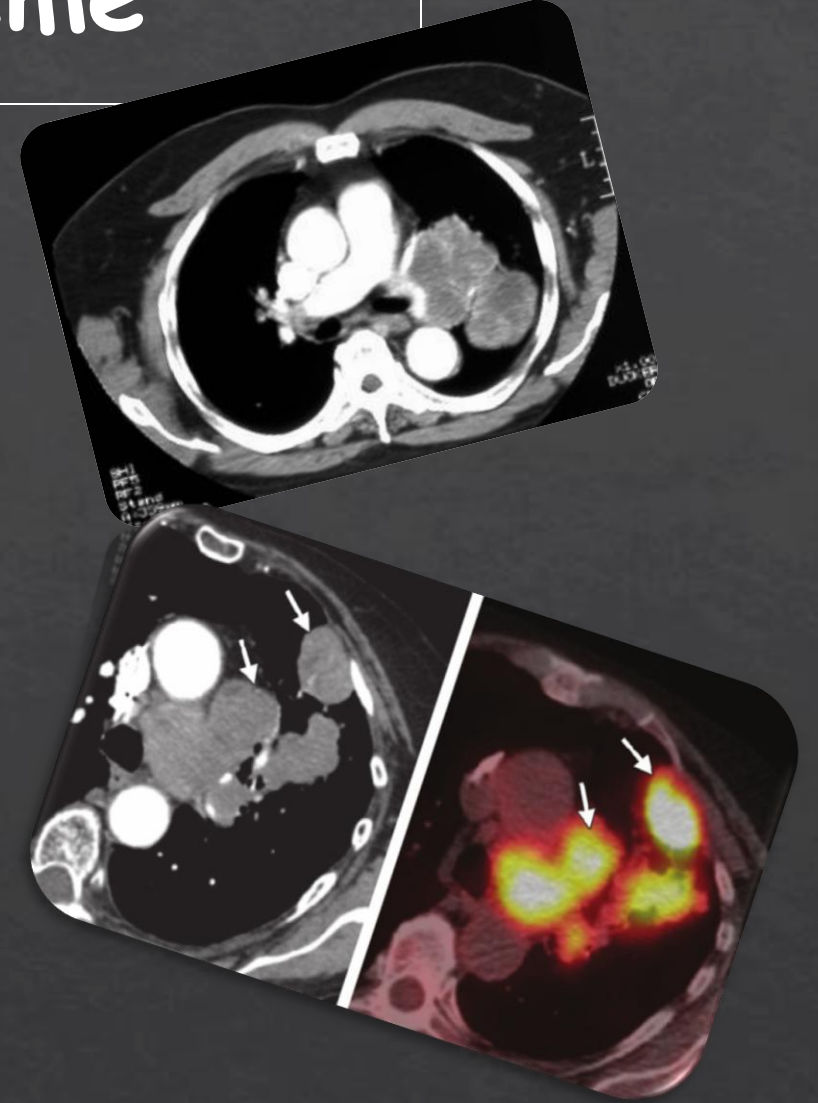
İğne Biyopsileri.

Cerrahi:  
Mediastinoskopi, VATS

Minimal İnvaziv:  
TBNA (Wang), EBUS, EUS, Tru-cut Bx

# Non-invaziv evreleme

- Standard BT: > 10 mm çaplar anormal  
Duyarlılık : ~ 60%  
Özgüllük : ~ 80%
- FDG-PET: SUVmax >2.5 anormal  
Duyarlılık : ~ 80%  
Özgüllük : ~ 90%
- PET-BT: Kombine edildiğinde.  
Duyarlılık : ~ 90%  
Özgüllük : ~ 94%



Radiology 1999; 213: 530  
Chest 2003; 123: 137s



Hasta cerrahiye aday ise

EVRELEME İÇİN

Mediastendeki lezyonun

HİSTOPATOLOJİK

olarak incelenmesi gerekmektedir.

Cancer 1992; 70: 1102

Ann Thorac Surg 1991; 51: 253

Am J Respir Crit Care Med 1997; 156: 320

# MEDIASTENİN İNVAZİV EVRELEMESİ



# Ne zaman?

- ◆ BT'de büyümüş lenf nodu
- ◆ N1 patolojik lenf nodu
- ◆ PET-BT'de yüksek SUVmax değeri



**İNVAZİV EVRELEME**

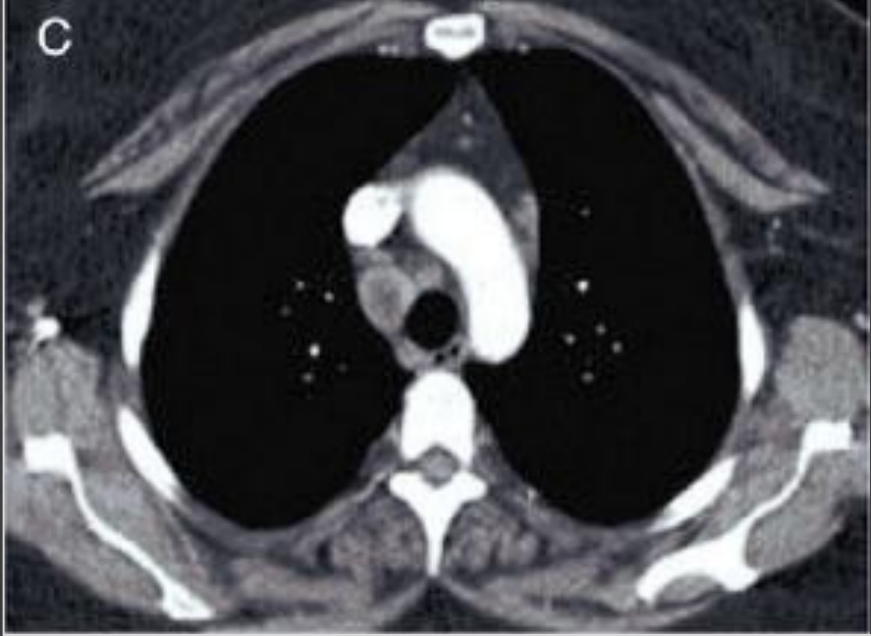




◆ Tumorün yoğun mediastinal infiltrasyon yapmış olduğu ve uzak metastazı bulunmayan olgularda:

◆ Mediastinal evreleme için invaziv konfirmasyon yapmaksızın BT ile değerlendirme genellikle yeterli olacaktır.

(Grade 2C)



- ◆ Belirgin mediastinal lenf nodu genişlemesi olan (ve uzak metastazı olmayan), mediastinal lenf nodlarında;
  - ◆ **PET tutulumu olsun yada olmasın mediasteninin invaziv evrelemesi önerilmektedir**  
(Grade 1C) .



- ◆ PET'de aktivite olan ve BT'de normal olarak izlenen mediastinal lenf nodlarında (uzak metastaz olmaksızın)
  - ◆ İnvaziv mediastinal evreleme, sadece görüntülemeye tercih edilmelidir
- (Grade 1C) .





- ◆ Radyolojik olarak mediasteni normal (BT ve PET bulguları ile)
- ◆ Santral tümör veya N1 lenf nodu genişlemesi olan
- ◆ Uzak metastazı olmayan
- ◆ N2, 3 tutulumu açısından orta derecede şüpheli hastalarda

Mediasteninin invaziv evrelemesi önerilmektedir

(Grade 1C)



- Bu hasta grubunda iğne tekniklerinin (EBUS-TBIA, EUS-İİA veya kombine EBUS/EUS-İİA) en iyi ilk test olarak cerrahi evrelemeye tercih edilmesi önerilmektedir (Grade 2B)
- İğne teknikleri ile yapılan evreleme negatif ise klinik şüphenin halen yüksek olduğu hastalarda cerrahi evreleme yapılmalıdır.

# MALIGN HASTALIKLARDA EBUS

## KULLANIM ALANLARI

### ◆ Evreleme ve Tekrar Evreleme (re-staging)

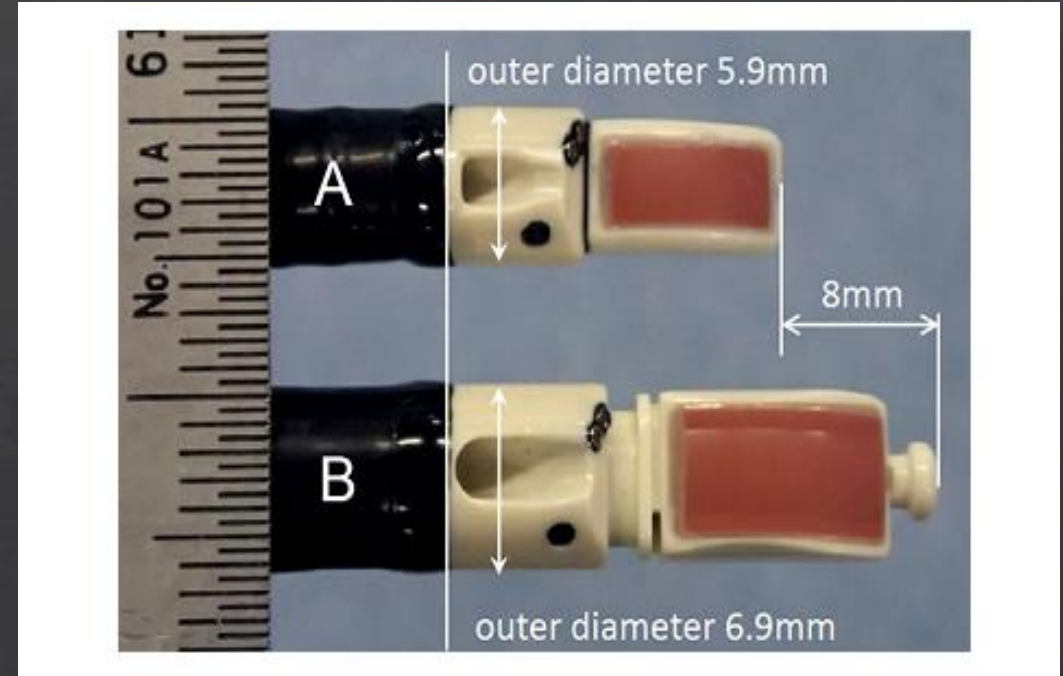
- Örnekleme **N3** → **N2** → **N1** sırası ile yapılmalıdır.
- «Cortex to cortex» aspirasyon
- 21-22 Gauge iğne arasında tanısal olarak anlamlı fark yok
- Örnekleme için en az 15-20 kez iğne ileri geri hareket etmeli
- Kaç kez örnekleme yapalım?
  - En az 3 örnekleme (sens:%95,sps:%100)
  - Moleküler analiz için en az 4 örnekleme
- **ROSE** (Yerinde Hızlı Sitolojik Değerlendirme) gerekli mi?



# MALIGN HASTALIKLARDA EBUS

## KULLANIM ALANLARI

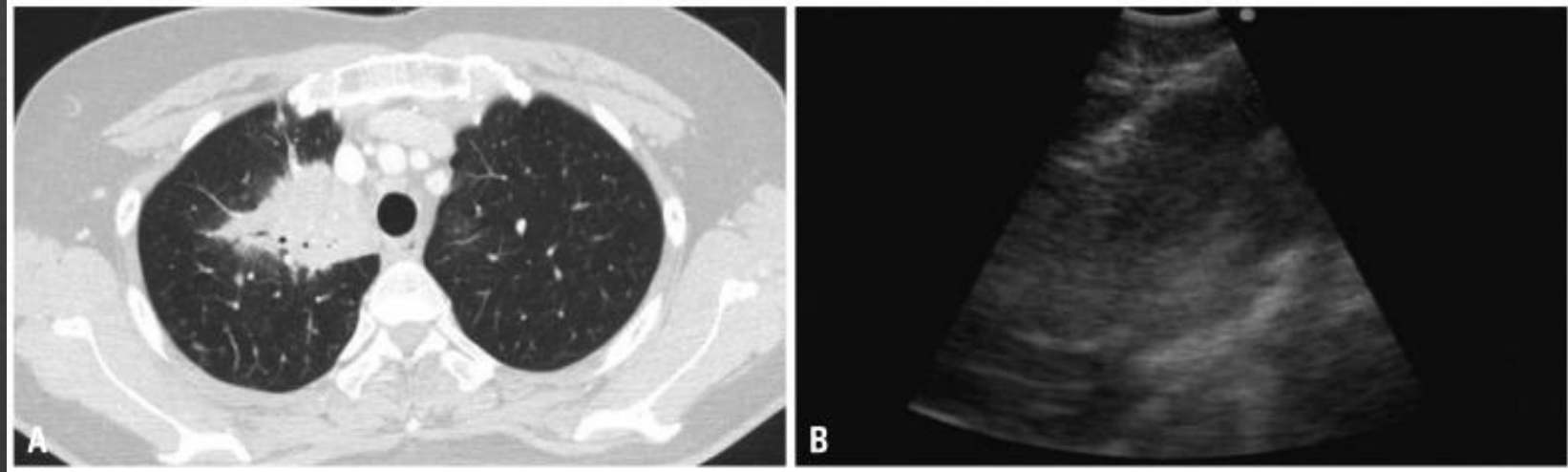
- ◆ Evreleme ve Tekrar Evreleme (re-staging)
- ◆ N1 Evreleme



# MALIGN HASTALIKLARDA EBUS

## KULLANIM ALANLARI

- ◆ Evreleme ve Tekrar Evreleme (re-staging)
- ◆ Santral kitlelerin tanısı



## Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration for the Diagnosis of Central Lung Parenchymal Lesions

**Purpose:** The purpose of this study was to evaluate the usefulness of convex probe endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) for detecting malignancy in parenchymal pulmonary lesions located adjacent to the central airways. **Materials and Methods:** We retrospectively reviewed the diagnostic performance of EBUS-TBNA in consecutive patients with high clinical suspicion of a centrally located primary lung cancer who had undergone EBUS-TBNA at the Samsung Medical Center between May 2009 and June 2011.

**Results:** Thirty-seven patients underwent EBUS-TBNA for intrapulmonary lesions adjacent to the central airways. Seven lesions were located adjacent to the trachea and 30 lesions were located adjacent to the bronchi. Cytologic and histologic samples obtained via EBUS-TBNA were diagnostic in 32 of 37 (86.4%) of patients. The final diagnosis was lung cancer in 30 patients (7 small cell lung cancer, 23 non-small cell lung cancer), lymphoma in one and malignant fibrous histiocytoma in one patient. The diagnostic sensitivity of EBUS-TBNA in detecting malignancy and detecting both malignancy and benignity was 91.4% and 86.5%, respectively. Two patients experienced minor complications. **Conclusion:** EBUS-TBNA is an effective and safe method for tissue diagnosis of parenchymal lesions that lie centrally close to the airways. EBUS-TBNA should be considered the procedure of choice for patients with centrally located lesions without endobronchial involvement.

Modalities	Positivity for malignancy, number (%)
EBUS-TBNA (n=37)	32 (86.4)
Conventional bronchoscopic biopsy (n=22)	5 (13.5)
Transbronchial lung biopsy (n=12)	0 (0)
Mucosal biopsy (n=10)	5 (13.5)
Timing of conventional bronchoscopy (n=22)	5 (13.5)
Prior to EBUS-TBNA session (n=19)	4 (10.8)
At the same time of EBUS-TBNA session (n=3)	1 (2.7)
Bronchoalveolar lavage (n=17)	0 (0)
Transthoracic needle aspiration (n=7)	1 (2.7)
Pleural fluid cytology (n=3)	1 (2.7)
Supraclavicular lymph node aspiration (n=6)	4 (10.8)
Thyroid aspiration cytology (n=1)	1 (2.7)
Sputum cytology (n=21)	1 (2.7)

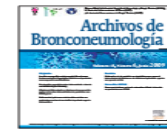


## Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration for the Diagnosis of Central Lung Parenchymal Lesions

**Purpose:** The purpose of this study was to evaluate the usefulness of convex probe endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) for detecting malignancy in parenchymal pulmonary lesions located adjacent to the central airways. **Materials and Methods:** We retrospectively reviewed the diagnostic performance of EBUS-TBNA in consecutive patients with high clinical suspicion of a centrally located primary lung cancer who had undergone EBUS-TBNA at the Samsung Medical Center between May 2009 and June 2011.

**Results:** Thirty-seven patients underwent EBUS-TBNA for intrapulmonary lesions adjacent to the central airways. Seven lesions were located adjacent to the trachea and 30 lesions were located adjacent to the bronchi. Cytologic and histologic samples obtained via EBUS-TBNA were diagnostic in 32 of 37 (86.4%) of patients. The final diagnosis was lung cancer in 30 patients (7 small cell lung cancer, 23 non-small cell lung cancer), lymphoma in one and malignant fibrous histiocytoma in one patient. The diagnostic sensitivity of EBUS-TBNA in detecting malignancy and detecting both malignancy and benignity was 91.4% and 86.5%, respectively. Two patients experienced minor complications. **Conclusion:** EBUS-TBNA is an effective and safe method for tissue diagnosis of parenchymal lesions that lie centrally close to the airways. EBUS-TBNA should be considered the procedure of choice for patients with centrally located lesions without endobronchial involvement.

Modalities	Positivity for malignancy, number (%)
EBUS-TBNA (n=37)	32 (86.4)
Conventional bronchoscopic biopsy (n=22)	5 (13.5)
Transbronchial lung biopsy (n=12)	0 (0)
Mucosal biopsy (n=10)	5 (13.5)
Timing of conventional bronchoscopy (n=22)	5 (13.5)
Prior to EBUS-TBNA session (n=19)	4 (10.8)
At the same time of EBUS-TBNA session (n=3)	1 (2.7)
Bronchoalveolar lavage (n=17)	0 (0)
Transthoracic needle aspiration (n=7)	1 (2.7)
Pleural fluid cytology (n=3)	1 (2.7)
Supraclavicular lymph node aspiration (n=6)	4 (10.8)
Thyroid aspiration cytology (n=1)	1 (2.7)
Sputum cytology (n=21)	1 (2.7)



Original Article

## Linear Endobronchial Ultrasound as the Initial Diagnostic Tool in Patients With Indications of Mediastinal Disease

Ignasi Garcia-Olivé,<sup>a,b</sup> Eduard Xavier Valverde Forcada,<sup>a</sup> Felipe Andreo García,<sup>a,c</sup> José Sanz-Santos,<sup>a</sup> Eva Castellà,<sup>c,d</sup> Mariona Llatjós,<sup>c,d</sup> Julio Astudillo,<sup>c,e</sup> and Eduard Monsó<sup>a,c</sup>

### ABSTRACT

*Introduction:* Linear endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) has proven useful for sampling mediastinal masses and nodes and staging lung cancer. The aim of this study was to assess the usefulness of this diagnostic tool in patients with indications of mediastinal disease that could not be diagnosed by noninvasive methods or white light bronchoscopy.

*Patients and Methods:* All patients undergoing linear EBUS-TBNA for the diagnosis of mediastinal masses and/or adenopathy at our endoscopy unit were included in the study. Diagnoses obtained by linear EBUS-TBNA or any surgical technique performed after a nondiagnostic EBUS-TBNA were considered as final.

*Results:* In the study population of 128 patients with a mean (SD) age of 62.0 (11.2) years, a total of 294 TBNAs were performed on 12 masses and 282 nodes. Satisfactory samples were obtained in 11 cases (91.7%) from masses and in 233 cases (82.6%) from nodes. Linear EBUS-TBNA was diagnostic, obviating the need for mediastinoscopy in 115 patients (diagnostic sensitivity, 89.8%). The technique confirmed the diagnosis in 85 of the 94 patients with cancer (90.4%), in 8 of the 10 patients with tuberculosis (80.0%), and in the 5 with sarcoidosis.

*Conclusions:* Linear EBUS-TBNA is a useful diagnostic tool in patients with mediastinal disease for whom a pathologic diagnosis is not achieved by noninvasive methods or white light bronchoscopy.



# MALIGN HASTALIKLARDA EBUS

## KULLANIM ALANLARI

- ◆ Evreleme ve Tekrar Evreleme (re-staging)
- ◆ Santral kitlelerin tanısı
- ◆ Ekstrapulmoner malignite metastazları



# The utility of endobronchial ultrasound-guided transbronchial needle aspiration in mediastinal or hilar lymph node evaluation in extrathoracic malignancy: Benign or malignant?

Elif T. Parmaksız, Benan Caglayan, Banu Salepci, Sevda S. Comert, Nesrin Kiral, Ali Fidan, Gulsen Sarac

## Abstract:

**OBJECTIVE:** Newly arising enlarged or hypermetabolic mediastinal/hilar lymph nodes (LNs) in patients with previously diagnosed extrathoracic malignancies raise suspicion of metastasis. Relatively high proportion of these LNs is due to a benign condition. We aimed to determine frequency of malignant LNs and role of endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) for clarification of the origin of suspicious LNs in these patients.

**METHODS:** Consecutive patients with a known extrathoracic malignancy and suspected hilar/mediastinal LN were included in this prospective study. Computed tomography (CT) of thorax and positron emission tomography-CT of all patients were taken. LNs with short axis >1 cm at CT of thorax and SUV  $\geq$  2.5 were accepted suspicious for malignancy. All patients underwent EBUS-TBNA for pathological verification of LNs. Patients with benign diagnosis either underwent invasive procedures or were followed up. The results were evaluated for frequency of malignant hilar/mediastinal LNs and sensitivity, specificity, and diagnostic values of EBUS-TBNA.

**RESULTS:** A total of 48 cases with a mean age of  $57.4 \pm 11.6$  were included. All cases had the diagnosis of an extrathoracic malignancy. 78 LNs were aspirated with EBUS-TBNA in 48 cases (1.62 LNs/patient). The mean short axis of aspirated LNs was  $1.51 \pm 0.63$ . Results of EBUS-TBNA revealed malignancy in 15 cases (31.2%), tuberculosis in six cases (12.5%), sarcoidosis in four cases (8.3%), and reactive adenitis in 23 cases (48%). The sensitivity, specificity, and negative predictive value of EBUS-TBNA for malignancy were 83.3%, 100%, and 90.9%, respectively. When both benign and malignant diseases were considered, sensitivity, specificity, negative predictive value, and diagnostic accuracy of EBUS-TBNA were 89.2%, 100%, 86.9%, and 93.7%, respectively.

**CONCLUSIONS:** The ratio of benign LNs in patients with extrathoracic malignancies is relatively high. EBUS-TBNA is a safe, minimally invasive, and effective method for clarification of intrathoracic LNs.

## The utility of endobronchial ultrasound-guided transbronchial needle aspiration in mediastinal or hilar lymph node evaluation in extrathoracic malignancy: Benign or malignant?

Elif T. Parmaksız, Benan Caglayan, Banu Salepci, Sevda S. Comert, Nesrin Kiral, Ali Fidan, Gulsen Sarac

### Abstract:

**OBJECTIVE:** Newly arising enlarged or hypermetabolic mediastinal/hilar lymph nodes (LNs) in patients with previously diagnosed extrathoracic malignancies raise suspicion of metastasis. Relatively high proportion of these LNs is due to a benign condition. We aimed to determine frequency of malignant LNs and role of endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) for clarification of the origin of suspicious LNs in these patients.

**METHODS:** Consecutive patients with a known extrathoracic malignancy and suspected hilar/mediastinal LN were included in this prospective study. Computed tomography (CT) of thorax and positron emission tomography-CT of all patients were taken. LNs with short axis >1 cm at CT of thorax and SUV  $\geq$  2.5 were accepted suspicious for malignancy. All patients underwent EBUS-TBNA for pathological verification of LNs. Patients with benign diagnosis either underwent invasive procedures or were followed up. The results were evaluated for frequency of malignant hilar/mediastinal LNs and sensitivity, specificity, and diagnostic values of EBUS-TBNA.

**RESULTS:** A total of 48 cases with a mean age of  $57.4 \pm 11.6$  were included. All cases had the diagnosis of an extrathoracic malignancy. 78 LNs were aspirated with EBUS-TBNA in 48 cases (1.62 LNs/patient). The mean short axis of aspirated LNs was  $1.51 \pm 0.63$ . Results of EBUS-TBNA revealed malignancy in 15 cases (31.2%), tuberculosis in six cases (12.5%), sarcoidosis in four cases (8.3%), and reactive adenitis in 23 cases (48%). The sensitivity, specificity, and negative predictive value of EBUS-TBNA for malignancy were 83.3%, 100%, and 90.9%, respectively. When both benign and malignant diseases were considered, sensitivity, specificity, negative predictive value, and diagnostic accuracy of EBUS-TBNA were 89.2%, 100%, 86.9%, and 93.7%, respectively.

**CONCLUSIONS:** The ratio of benign LNs in patients with extrathoracic malignancies is relatively high. EBUS-TBNA is a safe, minimally invasive, and effective method for clarification of intrathoracic LNs.

Table 3: Comparison of EBUS-TBNA results and final diagnosis in patients with known extrathoracic malignancies

Diagnosis	Final diagnosis		EBUS-TBNA	
	n	%	n	%
Malignancy	18	37.5	15	31.2
Breast	10	20.8	8	16.7
Colon	1	2.1	1	2.1
Gastric	2	4.2	1	2.1
Renal	2	4.2	2	4.2
Endometrium	1	2.1	1	2.1
Malignant melanoma	1	2.1	1	2.1
Pancreas	1	2.1	1	2.1
Tuberculosis	6	12.5	6	12.5
Sarcoidosis	4	8.3	4	8.3
Reactive adenitis	20	41.6	23	48

EBUS-TBNA = Endobronchial ultrasound guided transbronchial needle aspiration

	Malignite	Tüm tanılarda
Duyarlılık	% 83.3	% 89.2
Özgüllük	% 100	%100
(-) Prediktif Değer	% 90.9	% 86.9



Tu

Mediastinal or hilar LNs in extrapulmonary malignancy (n:63)

EBUS-TBNA: is result malignant ?

nts with extrapulmonary malignancy.

	N	%
	15	23.8
	11	17.4

**Table 4.** Diagnostic performances in the literature and our results.

Study/country	No. of patients	Sensitivity	Specificity	NPV	Accuracy
Song et al., 2011 (17), Korea	56	88%	-	85%	93%
Park et al., 2011 (15), Korea	59	81%	100%	-	-
Navani et al., 2011 (19), UK	161	87%	-	73%	88%
Tournoy et al., 2011 (18), Belgium	92	85%	-	76%	-
Parmaksiz et al., 2012 (27), Turkey	48	89.2%	100%	86.9%	93.7%
Özgül et al., 2013 (16), Turkey	40	90%	100%	90.9%	95%
Sanz-Santos et al., 2013 (28), Spain	117	86.4%	-	75%	90.3%
Our study, 2014, Turkey	63	78.2%	100%	88.3%	91.8%

histopathological diagnosis of medias

LN: lymph nodes; EBUS-TBNA: endobronchial ultrasound-guided transbronchial needle aspiration.

emia	1	1.5
	2	3.1



## Mediastinal mass diagnosed by endobronchial ultrasound as recurrent hepatocellular carcinoma in a post-liver transplantation patient

Abdul Hamid Alraiyes<sup>1</sup>, Pichapong Tunsupon<sup>2</sup>, Fayez Kheir<sup>3</sup> and Daniel A Salerno<sup>4</sup>

### Abstract

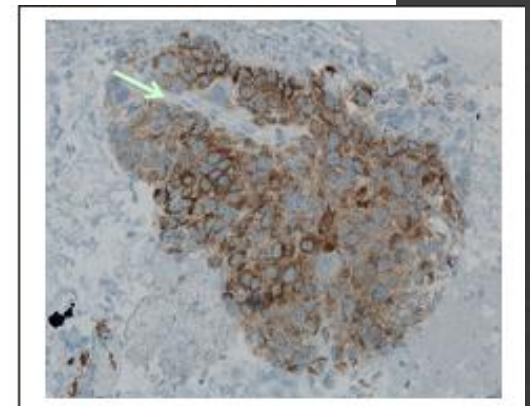
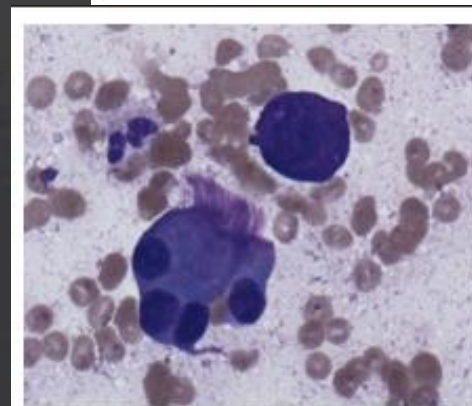
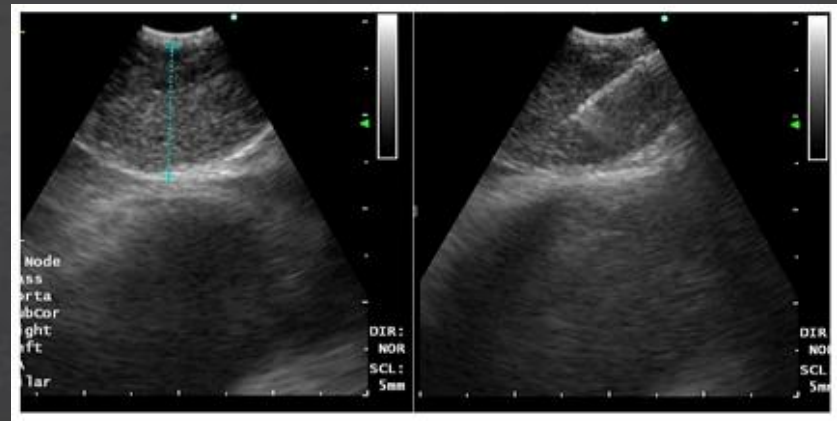
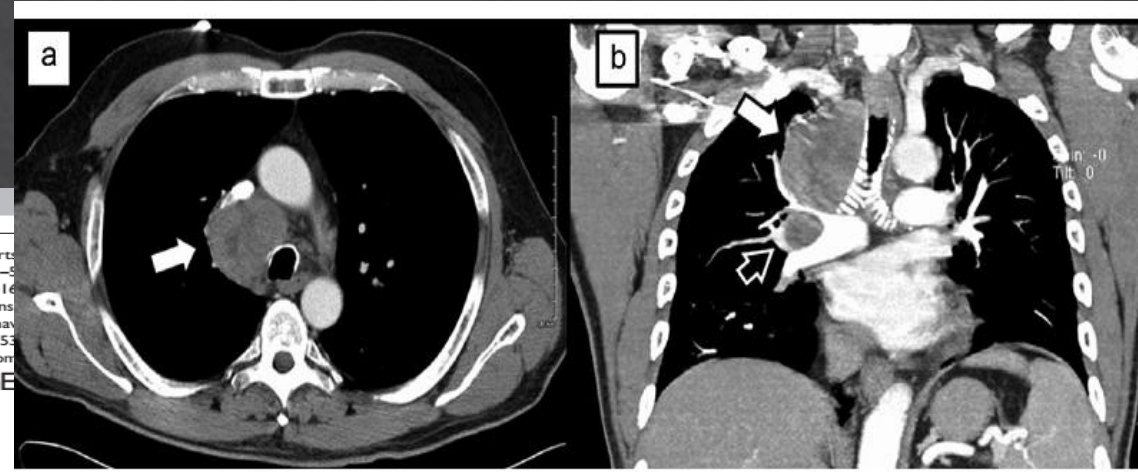
**Objective:** We presented a rare case of recurrent hepatocellular carcinoma after liver transplant manifested as an isolated mediastinal mass.

**Methods:** A 62-year-old man was referred for evaluation of atypical chest pain and abnormal finding of a computed tomography of the chest. He had history of chronic hepatitis C liver cirrhosis and hepatocellular carcinoma underwent orthotopic liver transplant as a curative treatment three years earlier.

**Results:** The computed tomography of the chest demonstrated paratracheal mediastinal lymphadenopathy. He subsequently underwent endobronchial ultrasound with transbronchial needle aspiration (EBUS-TBNA). The right paratracheal lymph node station 4R was sampled.

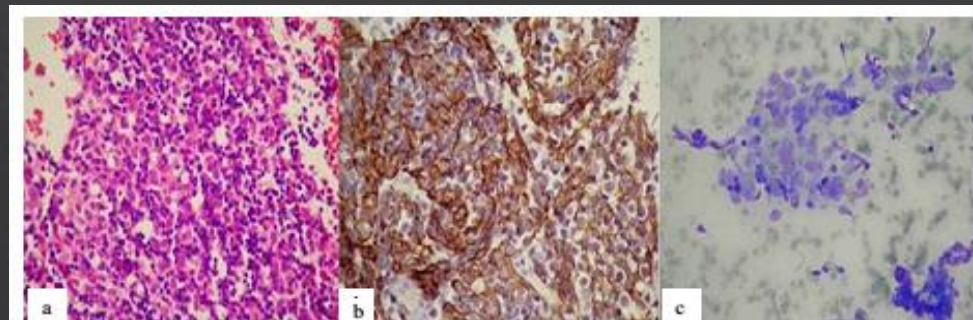
**Conclusion:** Pulmonologist should be cognizant of diagnostic utility of EBUS-TBNA in this clinical setting as more transplant patients on immunosuppressive medications with enlarged mediastinal lymphadenopathy of unknown origin will be referred for further evaluation.

SAGE Open Medical Case Reports  
Volume 4: 1-5  
© The Author(s) 2016  
Reprints and permissions  
sagepub.co.uk/journalsPermissions.nav  
DOI: 10.1177/2050313X16645753  
sco.sagepub.com



## Diagnosis of thymoma metastasis *via* endobronchial ultrasound-guided transbronchial needle aspiration

Ayperi Öztürk<sup>1\*</sup>, Taha Güllü<sup>1</sup>, Aydın Yılmaz<sup>1</sup>, Zafer Akta<sup>1</sup> and Funda Demirağ<sup>2</sup>



**Figure 2:** a. The neoplastic epithelial cells within dens nonneoplastic immature lymphocytes (HEX400). b Keratin 5/6 positive epithelial cell network (Keratin 5/6X400). c. Aspirate showing single and clustered tumour cells with lymphocytes (Giemsa X1000).

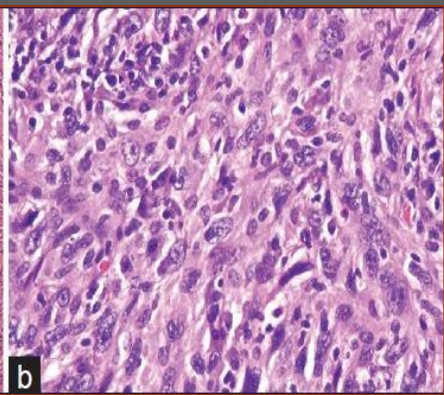
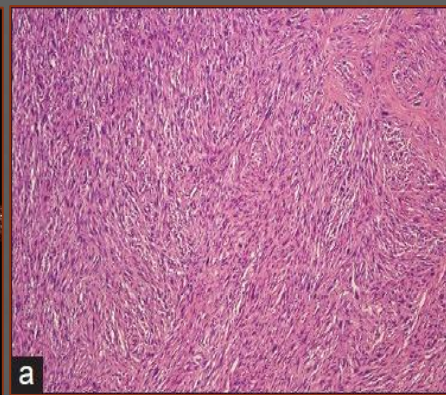
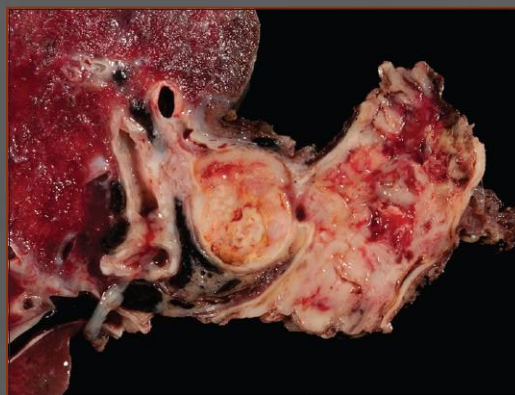
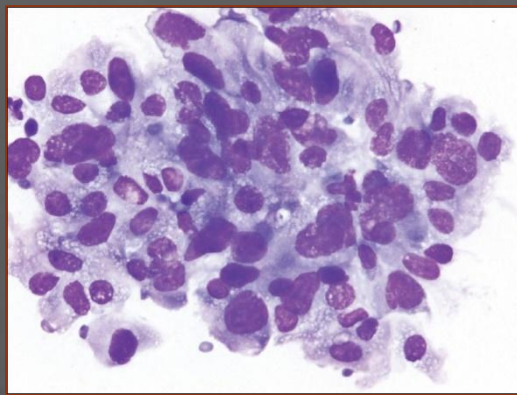
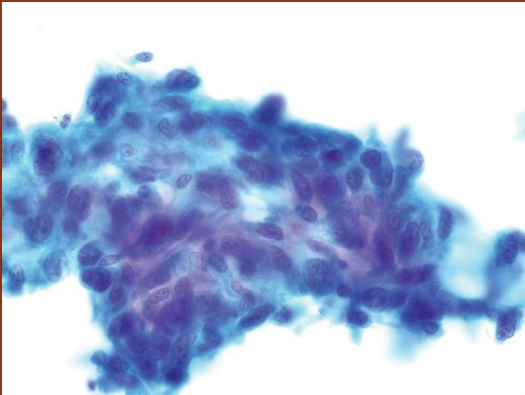
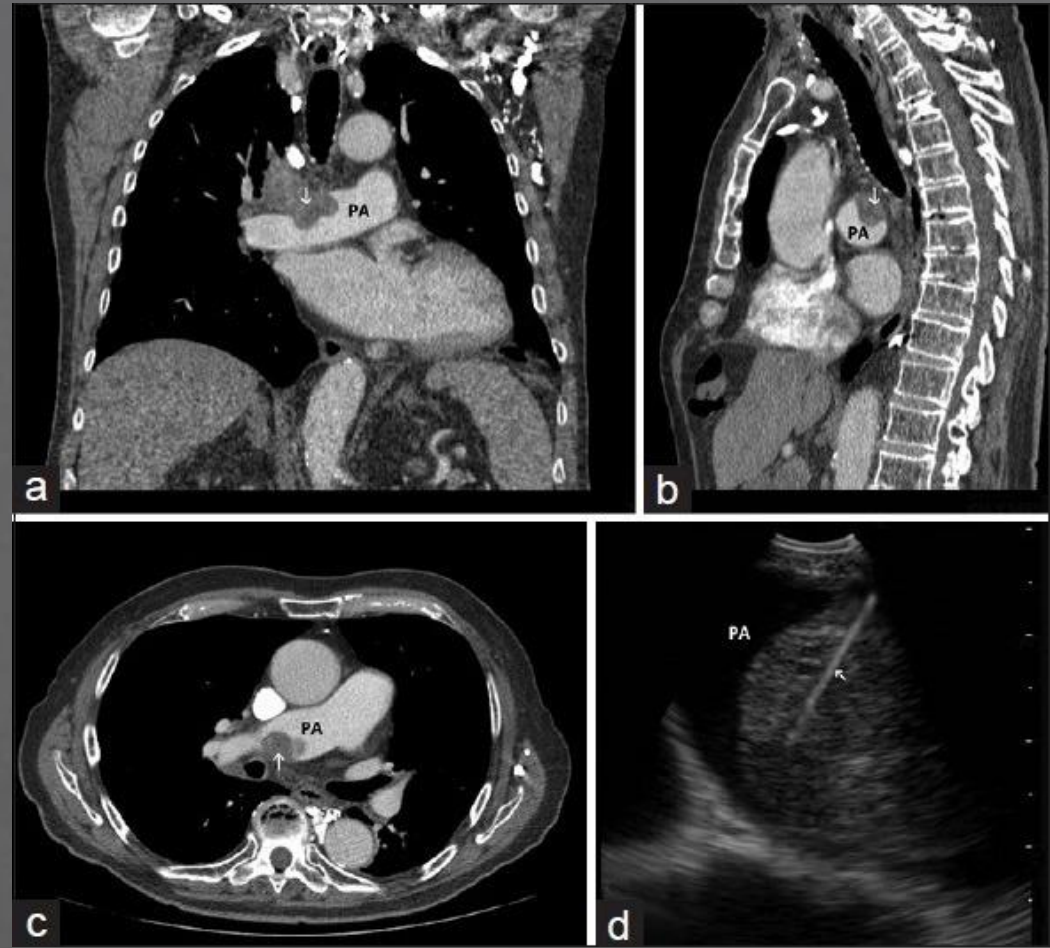


## Pulmonary artery intimal sarcoma diagnosed using endobronchial ultrasound-guided transbronchial needle aspiration

Nancy P. Caraway, MD, Davide Salina, MD, PhD, [...], and Gene Landon, MD

### » Case report

A 78-year-old man with three prior malignancies was referred to our institution for further evaluation of a hilar mass. He had been diagnosed with large B-cell lymphoma 12 years prior to his presentation to our institution. Two years after the diagnosis, the patient had been diagnosed with prostate adenocarcinoma and melanoma of the ear. Eight months prior to his presentation at our institution, the patient was seen by his local physician for persistent back pain. A thoracic spine-computed tomography (CT) showed a pathologic fracture of T-4 vertebra that was associated with a soft tissue mass as well as a hilar mass. An abdominal CT revealed a mesenteric mass and biopsy showed large cell lymphoma. The patient received palliative radiotherapy to the spine and chemotherapy. A restaging positron emission tomography (PET)-CT scan revealed a persistent hypermetabolic hilar mass.





# The utility of endobronchial ultrasound-transbronchial needle aspiration in lymphoma

Fayez Kheir, Ahmad Itani, Omar Assasa, Abdul Hamid Alraiyes<sup>1</sup>

Department of Pulmonary Diseases, Critical Care and Environmental Medicine, Tulane University Health Sciences Center, New Orleans, Louisiana, <sup>1</sup>Department of Medicine, Interventional Pulmonology, Roswell Park Cancer Institute, Buffalo, New York, USA

## ABSTRACT

**Background and Objectives:** Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is a minimally invasive procedure that has a well-established role in the diagnosis and staging of lung cancer. This technology is also widely used for the diagnosis of mediastinal masses and cysts as well as other inflammatory disorders such as sarcoidosis. However, the utility of this procedure in the diagnosis and subclassification of lymphoproliferative disorders (LPDs) is not clear. We performed a systematic review to evaluate EBUS-TBNA use in LPDs. **Materials and Methods:** PubMed, EMBASE, MEDLINE, Cochrane Library Plus, and ISI Web of Knowledge were searched for studies of clinical trials in English reporting diagnostic performance of EBUS-TBNA in lymphoma until September 2014. The overall sensitivity, negative predictive value (NPV), and diagnostic accuracy were evaluated. **Results:** Six trials involving 346 patients with suspected lymphoma were included. The overall sensitivity, NPV, and diagnostic accuracy ranged 38%-91%, 83%-96.4%, and 91%-97%, respectively. Further invasive surgery was needed only in 13-43% of the patients. None of the studies included in the present review reported important complications. **Conclusion:** Current evidence suggests that EBUS-TBNA can be used as an initial evaluation for patients with suspected lymphoma. Additional surgical procedures may be necessary if a sample is inadequate or negative with high suspicion of lymphoma. Further multicenter trials are needed to evaluate the diagnostic yield of EBUS-TBNA in lymphoma patients.

**Key words:** Endobronchial ultrasound (EBUS), lymphoma, mediastinal lymph nodes, transbronchial needle aspiration (TBNA)

**Table 1. Results of studies that assess the effectiveness and safety of endobronchial ultrasound-transbronchial needle aspiration in lymphoma**

Author	Type of study	Patients/procedures included	Reference/comparison test	Diagnostic performance					Complications
				S	Sp	PPV	NPV	Diagnostic Accuracy	
Marshall <sup>[7]</sup>	Retrospective	33 patients with history of lymphoma or new isolated mediastinal lymphadenopathy identified on computed tomography	Positive cytology and histology as final diagnoses Mediastinoscopy (n=3) Clinical and radiological follow-up	-	-	-	-	-	None
Moonim <sup>[11]</sup>	Prospective	100 patients with denovo or suspected relapsed mediastinal lymphoma	Positive cytology and histology as final diagnoses Mediastinoscopy (n=20)	89%	97%	98%	83%	91%	None
Senturk <sup>[10]</sup>	Retrospective						96%	97%	None
Steinfors <sup>[8]</sup>	Retrospective						96%	-	None
Iqbal <sup>[9]</sup>	Retrospective	involvement of both or a combination of other biopsy specimens and positive radiographic criteria	final diagnoses Mediastinoscopy (n=17) Biopsy at other sites (n=23)						None
Kennedy <sup>[6]</sup>	Retrospective	25 patients with suspected lymphoma (clinical, radiological data or other previous lymphoma)	Positive cytology and histology as final diagnoses Mediastinoscopy (n=1) Clinical and radiological follow-up	91%	100%	100%	93%	96%	None

**Duyarlılık: %38-91,**  
**NPV: %82-96.4,**  
**Tanısal Doğruluk: %91-97**

**ABSTRACT**

**Background and**...  
 ...invasive procedure  
 ...used for the diagnosis  
 ...the utility of this  
 ...performed a systematic  
 ...Cochrane Library  
 ...performance of  
 ...diagnostic accuracy  
 ...overall sensitivity  
 ...surgery was not  
 ...complications.  
 ...suspected lymphoma  
 ...of lymphoma.

**Key words:** Endobronchial

...minimally  
 ...also widely  
 ...However,  
 ...clear. We  
 ...MEDLINE,  
 ...diagnostic  
 ...NPV), and  
 ...cluded. The  
 ...er invasive  
 ...important  
 ...patients with  
 ...suspicion  
 ...patients.  
 ...n (TBNA)

S: Sensitivity; Sp: Specificity; PPV: Positive predictive value; NPV: Negative predictive value

**Table 1. Results of studies that assess the effectiveness and safety of endobronchial ultrasound-transbronchial needle aspiration in lymphoma**

Author	Type of study	Patients/procedures included	Reference/comparison test	Diagnostic performance					Complications
				S	Sp	PPV	NPV	Diagnostic Accuracy	
Marshall <sup>[7]</sup>	Retrospective	33 patients with history of lymphoma or new isolated mediastinal lymphadenopathy identified on computed tomography	Positive cytology and histology as final diagnoses Mediastinoscopy (n=3) Clinical and radiological follow-up	-	-	-	-	-	None
Moonim <sup>[11]</sup>	Prospective	100 patients with denovo or suspected relapsed mediastinal lymphoma	Positive cytology and histology as final diagnoses	89%	97%	98%	83%	91%	None

## CONCLUSION

EBUS-TBNA is a minimally invasive procedure that can be regarded as an initial evaluation in patients with mediastinal lymphadenopathy and suspected lymphoma. It has a higher yield in recurrent lymphoma than in the diagnosis of newly suspected lymphoma.

Kennedy <sup>[6]</sup>	Retrospective	25 patients with suspected lymphoma (clinical, radiological data or other previous lymphoma)	Positive cytology and histology as final diagnoses Mediastinoscopy (n=1) Clinical and radiological follow-up	91%	100%	100%	93%	96%	None
------------------------	---------------	--	--	-----	------	------	-----	-----	------

S: Sensitivity; Sp: Specificity; PPV: Positive predictive value; NPV: Negative predictive value

## ABSTRACT

**Background** minimally invasive procedure used for the diagnosis of the utility of EBUS-TBNA performed a systematic review in Cochrane Library. The diagnostic performance of EBUS-TBNA compared to overall sensitivity of mediastinal lymphadenopathy and suspected lymphoma. The overall sensitivity of EBUS-TBNA compared to overall sensitivity of mediastinal lymphadenopathy and suspected lymphoma.

**Key words:** Endobronchial ultrasound-transbronchial needle aspiration (TBNA)

minimally invasive procedure used for the diagnosis of the utility of EBUS-TBNA performed a systematic review in Cochrane Library. The diagnostic performance of EBUS-TBNA compared to overall sensitivity of mediastinal lymphadenopathy and suspected lymphoma. The overall sensitivity of EBUS-TBNA compared to overall sensitivity of mediastinal lymphadenopathy and suspected lymphoma.

n (TBNA)



**Table 1. Patients' characteristics**

sex	age at ex.	BMI	known medical condition	volume retrieved	aspiration time (min)	PE before TPEA PE anterior (mm)	PE after TPEA PE posterior seen in EBUS (mm)	PE after TPEA PE anterior (mm)	PE after TPEA PE posterior seen in EBUS (mm)	cytology	final diagnosis of PE	increase of 6 min walking distance (m)	FU max. PE in mm	died after FU 60days	Pericardiocentesis after FU	Remarks
f	55	25	Sjögren's Syndrome	600	30	12	17	6	9	benign	reference centre: No lymphoma	70	anterior PE 10	no	no	discrete arterial bleeding of pericardial sac
f	69	35,1	Morbus Fabry	150	18	10	16	8	14	benign	benign	18	anterior PE 14	no	no	hemodynamic instable during TPEA
m	72	23,2	Mesothelioma Stage IV	470	58	25	30	14	15	malignant	mesothelioma	71	anterior PE 15	no	no	intrapericardial pressure measurement via EBUS needle
m	76	31	NSCLC Stage IV	350	40	18	15	14	15	benign	benign	0	anterior PE 14	no	no	septated PE
f	59	22	Sjögren's Syndrome	450	58	14	22	8	14	benign	benign	65	anterior PE 14	no	no	intrapericardial pressure measurement via EBUS needle
f	52	20,2	SCLC Stage IV	180	20	14	19	12	11	malignant	SCLC	49	anterior PE 20	183 days after TPEA	yes	none
m	70	16,2	NSCLC Stage IV	20	15	22	25	22	25	bloody , hb 5g/dl	NSCLC	0	anterior PE 22	89 days after TPEA	no	septated PE, bloody
m	69	23	NSCLC Stage IV	180	32	23	28	18	24	malignant	malignant	33	anterior PE 24	76 days after TPEA	yes	none
m	79	23,3	NSCLC Stage IV	210	26	22	25	16	20	malignant	malignant	39	anterior PE 18	101 days after TPEA	no	none
f	79	21	NSCLC Stage IV	190	36	18	25	16	24	benign	benign	25	anterior PE 25	69 days after TPEA	yes	none

AI

Background (PE) to per... ex... ne... sup... can... the... reg... Re... any... cas... ov... un... giv... tra...

Heart: view... 2=... 5=... left... a... tion... lower

several treatment options beside an emulsion retrieval. we additionally build the bridge to possible other applications in different areas in future.

# MALIGN HASTALIKLARDA EBUS

## KULLANIM ALANLARI

- ◆ Evreleme ve Tekrar Evreleme (re-staging)
- ◆ Santral kitlelerin tanısı
- ◆ Ekstrapulmoner malignite metastazları
- ◆ Endobronşiyal tedaviye ve Tm cerrahisine rehberlik

# The Layer Structure of Central Airways as Described by Endobronchial Ultrasonography (EBUS)

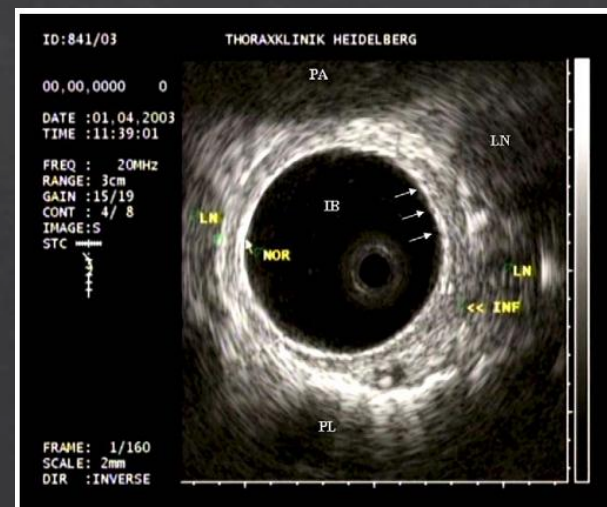
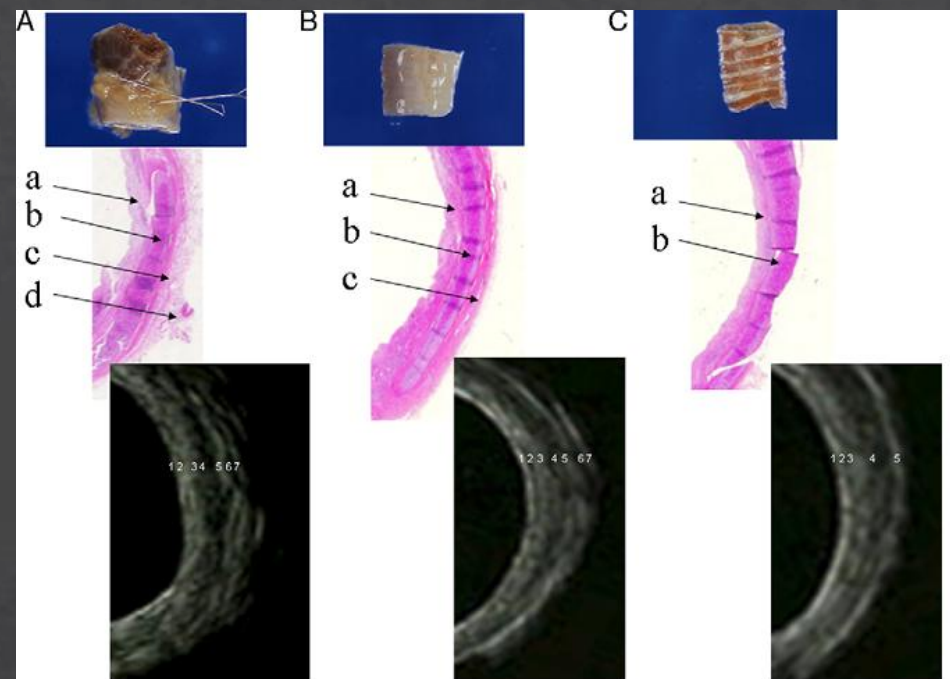
Taeko Shirakawa, MD, PhD, FCCP,\* Teruomi Miyazawa, MD, PhD, FCCP,\*  
and Heinrich D. Becker, MD, FCCP†

**Background:** For appropriate therapeutic decisions local staging of lung cancer is essential. This includes confirming the integrity of the wall of central airways. There is a controversy related to the central wall structure, as it is viewed by ultrasonography. This study was performed to investigate structure of the central airway wall using ultrasonic guidance, in vitro.

**Methods:** Postmortem tracheal specimens (n = 5) were prepared for analysis of their structure: with complete surrounding connective tissue (type A), with removed adjacent mediastinal tissue (type B), and after removal of the external fibroelastic layer (type C). Sonographic findings by endobronchial ultrasonography (EBUS) were compared with freshly resected specimens and to the histology.

**Results:** In type A specimens, we found 7 layers surrounded by a hazy structure. Type B specimens were also described as having 7 layers but without the hazy structure. Type C specimens were analyzed as having 5 layers only, lacking the external 2 layers. By comparison with histologic findings, the inner 2 layers in EBUS correspond to mucosa and submucosa, the third, fourth, and fifth layer to the cartilage, and the external 2 layers to loose and dense fibroelastic connective tissue surrounding the airway. This feature could be observed down to the lobar level and was tapering in the periphery toward the subsegmental bronchi.

**Conclusions:** In our in vitro study, we could confirm the clinical observation of the 7-layer structure of the central airways described by EBUS and correlate it to histologic findings.





# The Layer Structure of Endobronchial

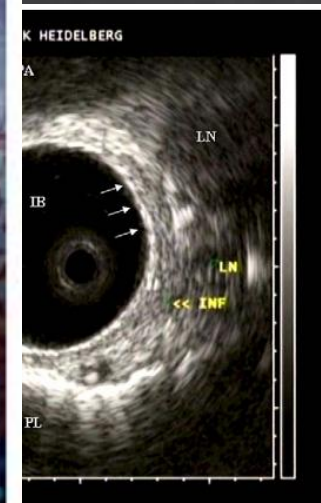
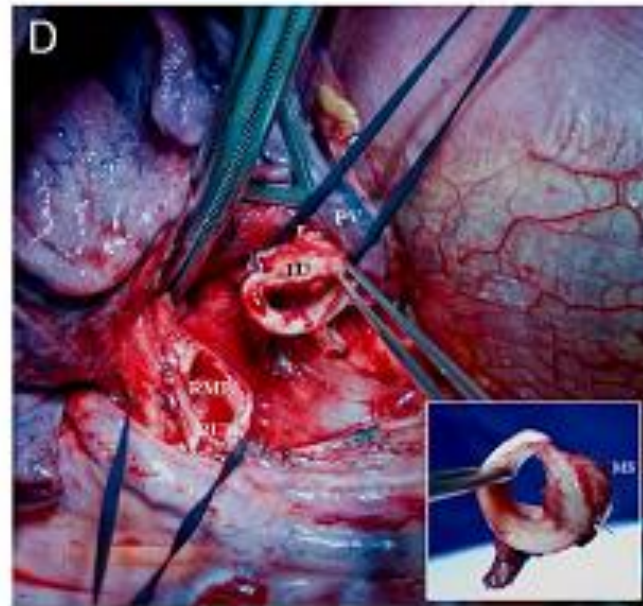
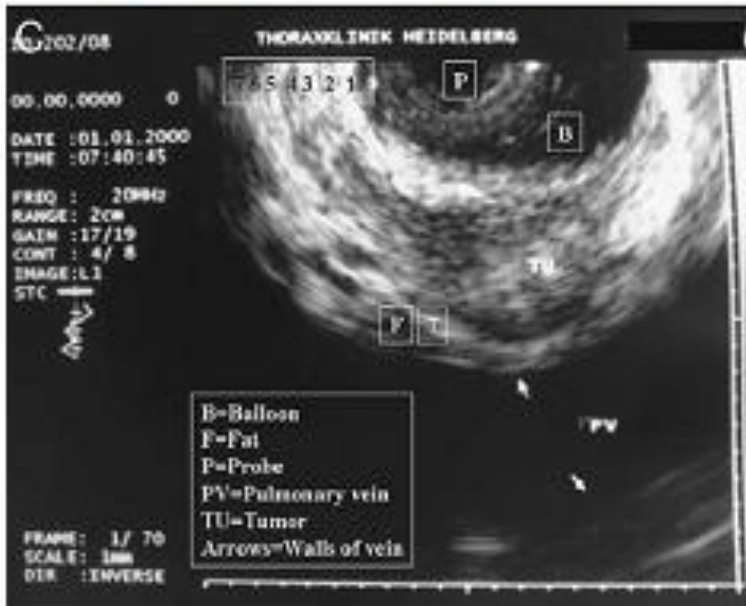
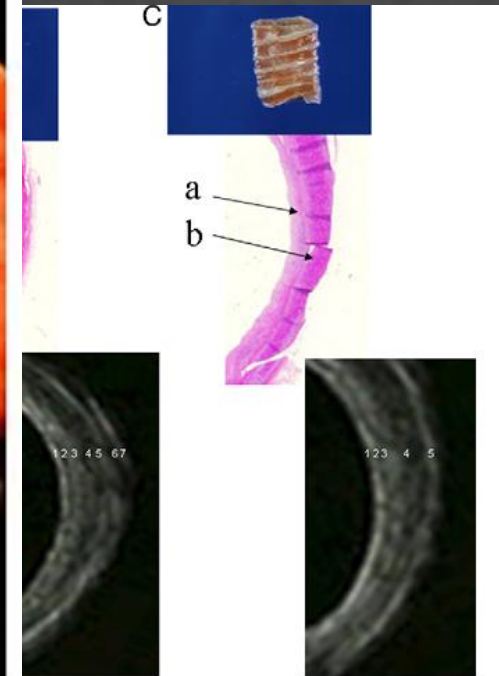
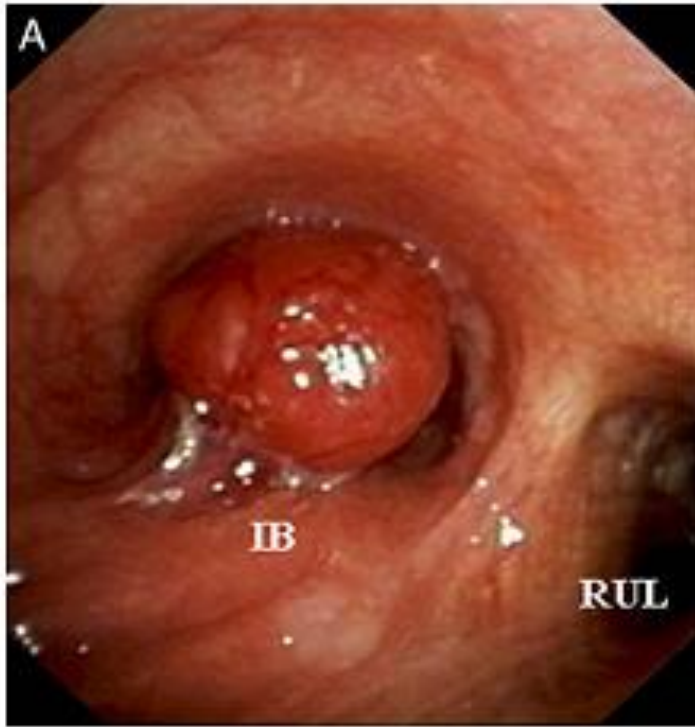
Taeko Shirakawa, MD  
et al.

**Background:** For application of lung cancer is essential of the wall of central bronchus. The central wall structure. This study was performed by airway wall using ultrasonography.

**Methods:** Postmortem specimens for analysis of the bronchial wall connective tissue (type A), muscle tissue (type B), and cartilage layer (type C). Sonography (EBUS) was performed on specimens and to the

**Results:** In type A specimens, a hazy structure. Type B specimens had 7 layers but without cartilage. By comparison with histology, EBUS correspond to the first and fifth layer to the cartilage and dense fibroelastic tissue. This feature could be used for tapering in the peripheral airway.

**Conclusions:** In our observation of the bronchial wall, the structure described by EBUS





# Endobronchial Ultrasound Reliably Differentiates Between Airway Infiltration and Compression by Tumor\*

Felix Herth, MD, FCCP; Armin Ernst, MD, FCCP; Martin Schulz, MD; and Heinrich Becker, MD, FCCP

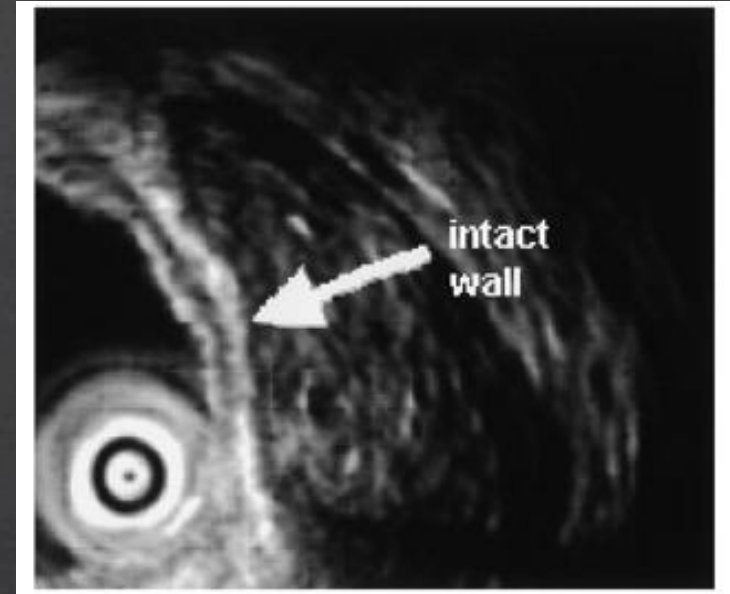
**Objective:** A frequent problem in patients with intrathoracic malignancies neighboring central airways is the question of whether the airway wall is infiltrated by the tumor or if it is merely compressed. This distinction can often not be made with certainty with the help of chest CT alone, but frequently necessitates surgical biopsy or exploration. We prospectively studied the utility of endobronchial ultrasound (EBUS) in this clinical circumstance.

**Methods and patients:** Between May 1999 and July 2000, 131 consecutive patients with central thoracic malignancies potentially involving the airways were enrolled into the study. Patients underwent chest CT followed by standard bronchoscopy together with EBUS and subsequent surgical evaluation. The bronchoscopists did not know the radiologist's interpretation of the chest CT before performing EBUS. The ability of chest CT and EBUS to distinguish between compression and infiltration was measured against the histologic results.

**Results:** One hundred five patients completed the trial by undergoing surgery. In 81 patients (77%), the CT scan was read as consistent with tumor invasion. EBUS only showed invasion in 49 cases (47%). Histology after surgery revealed a specificity of 100%, a sensitivity of 89%, and an accuracy of 94% for EBUS. Chest CT was far inferior, with a specificity of 28%, a sensitivity of 75%, and an accuracy of 51%.

**Conclusion:** We conclude that EBUS is a highly accurate diagnostic tool and superior to chest CT in evaluating the question of airway involvement by central intrathoracic tumors. In the hands of experienced endoscopists, EBUS may become the procedure of choice for this question.

(CHEST 2003; 123:458-462)



**Table 4—Correlation of CT Findings With Postoperative Findings in All Patients Undergoing Surgery (n = 105)**

CT	Surgery	
	Invasion	Impression
Invasion (n = 81)	41	40
Impression (n = 24)	14	10
Total (n = 105)	55	50

**Table 5—Correlation of EBUS Findings With Postoperative Findings in All Patients Undergoing Surgery**

EBUS	Surgery	
	Invasion	Impression
Invasion (n = 49)	49	0
Impression (n = 56)	6	50
Total (n = 105)	55	50

# MALIGN HASTALIKLARDA EBUS

## KULLANIM ALANLARI

- ◆ Evreleme ve Tekrar Evreleme (re-staging)
- ◆ Santral kitlelerin tanısı
- ◆ Ekstrapulmoner malignite metastazları
- ◆ Endobronşiyal tedaviye ve Tm cerrahisine rehberlik
- ◆ Transbronşiyal iğne ejeksiyonu (TBNI)



# Intratumoral chemotherapy for lung cancer: re-challenge current targeted therapies

**Abstract:** Strategies to enhance the already established doublet chemotherapy regimen for lung cancer have been investigated for more than 20 years. Initially, the concept was to administer chemotherapy drugs locally to the tumor site for efficient diffusion through passive transport within the tumor. Recent advances have enhanced the diffusion of pharmaceuticals through active transport by using pharmaceuticals designed to target the genome of tumors. In the present study, five patients with non-small cell lung cancer epidermal growth factor receptor (EGFR) negative stage IIIa–IV International Union Against Cancer 7 (UICC-7), and with Eastern Cooperative Oncology Group (ECOG) 2 scores were administered platinum-based doublet chemotherapy using combined intratumoral-regional and intravenous route of administration. Cisplatin analogues were injected at 0.5%–1% concentration within the tumor lesion and proven malignant lymph nodes according to pretreatment histological/cytological results and the concentration of systemic infusion was decreased to 70% of a standard protocol. This combined intravenous plus intratumoral-regional chemotherapy is used as a first line therapy on this short series of patients. To the best of our knowledge this is the first report of direct treatment of involved lymph nodes with cisplatin by endobronchial ultrasound drug delivery with a needle without any adverse effects. The initial overall survival and local response are suggestive of a better efficacy compared to established doublet cisplatin-based systemic chemotherapy in (higher) standard concentrations alone according to the UICC 7 database expected survival. An extensive search of the literature was performed to gather information of previously published literature of intratumoral chemo-drug administration and formulation for this treatment modality. Our study shows a favorable local response, more than a 50% reduction, for a massive tumor mass after administration of five sessions of intratumoral chemotherapy plus two cycles of low-dose intravenous chemotherapy according to our protocol. These encouraging results (even in very sick ECOG 2 patients with central obstructive non-small cell lung cancer having a worse prognosis and quality of life than a non-small cell lung cancer in ECOG 0 of the same tumor node metastasis [TNM]-stage without central obstruction) for a chemotherapy-only protocol that differs from conventional cisplatin-based doublet chemotherapy by the route, target site, and dose paves the way for broader applications of this technique. Finally, future perspectives of this treatment and pharmaceutical design for intratumoral administration are presented.

Wolfgang Hohenforst-Schmidt<sup>1</sup>  
Paul Zarogoulidis<sup>2,3</sup>  
Kaid Darwiche<sup>3</sup>  
Thomas Vogl<sup>4</sup>  
Eugene P Goldberg<sup>5</sup>  
Haidong Huang<sup>6</sup>  
Michael Simoff<sup>7</sup>  
Qiang Li<sup>6</sup>  
Robert Browning<sup>8</sup>  
Francis J Turner<sup>9</sup>  
Patrick Le Pivert<sup>10</sup>  
Dionysios Spyrtos<sup>2</sup>  
Konstantinos Zarogoulidis<sup>2</sup>  
Seyhan I Celikoglu<sup>11</sup>  
Firuz Celikoglu<sup>11</sup>  
Johannes Brachmann<sup>1</sup>

## BRIEF COMMUNICATION

### Endobronchial Ultrasound–Guided Transbronchial Needle Injection for Local Control of Recurrent Non–Small Cell Lung Cancer

Farrah Khan<sup>1</sup>, Christopher J. Anker<sup>2</sup>, Garth Garrison<sup>3</sup>, and C. Matthew Kinsey<sup>3</sup>

<sup>1</sup>Division of Hematology/Oncology, <sup>2</sup>Division of Radiation Oncology, and <sup>3</sup>Division of Pulmonary Disease and Critical Care Medicine, University of Vermont College of Medicine, Burlington, Vermont

#### Abstract

**Rationale:** Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is an established technique for the diagnosis of thoracic malignancies. Non-ultrasound-guided transbronchial needle injection has been used previously to deliver chemotherapeutic agents.

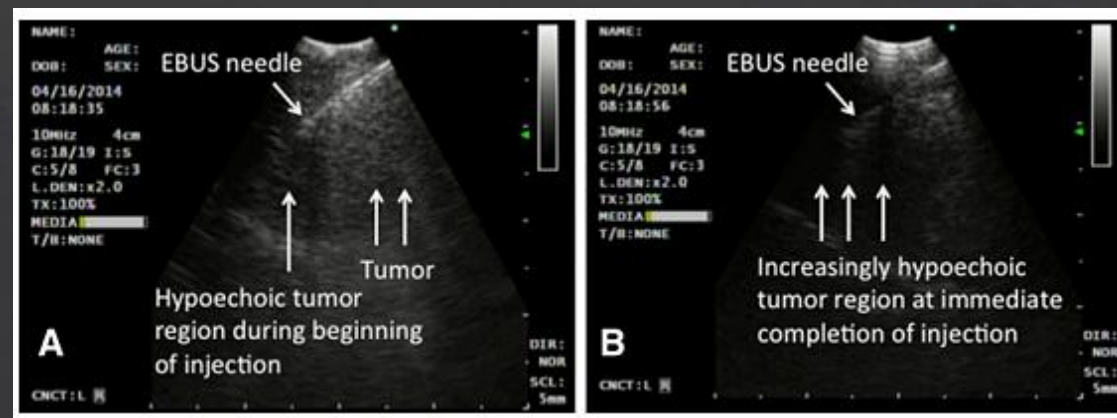
**Objectives:** To use endobronchial ultrasound-guided transbronchial needle injection (EBUS-TBNI) to achieve local control of recurrent early-stage lung cancer.

**Methods:** A 63-year-old man presented with recurrent early stage non-small cell lung carcinoma after chemotherapy and external

beam radiation. We used EBUS-TBNI to deliver cisplatin into the tumor located outside the airway. This procedure was performed on three separate occasions without complication.

**Measurements and Main Results:** EBUS-TBNI resulted in resolution of fluorodeoxyglucose avidity, measured by positron emission tomography-computed tomography, in the region at 4 weeks. However, at 5 months, there was evidence of distal recurrence.

**Conclusions:** This is the first description of EBUS-TBNI to treat local recurrence of lung cancer and one of the first reports of the use of EBUS for intratumoral therapy. Additional research is warranted to determine the clinical usefulness and safety of this therapeutic approach.



# Transbronşiyal iğne enjeksiyonu (TBNI)

- ◆ Enjeksiyon tedavileri ile ilgili sınırlı çalışma mevcut.
- ◆ Malign lenf nodlarına Sisplatin enjeksiyonu uygulanan Evre IIIa-IV NSCLC hastaları için bir çalışma mevcut
- ◆ Çalışmalarda komplikasyon bildirilmemiş.
- ◆ Nüks NSCLC olan hastaların tümörlerine direkt olarak TBNI ile KT (sisplatin) uygulamasında da komplikasyon bildirilmemiş.
- ◆ RT için referans noktasının belirlenmesi için işaretlemeye (fiducial marker) TBNI kullanılabilir.

Drug Des Devel Ther 2013;7:571-83  
Ann Am Thorac Soc 2015;12:101-4  
Ann Thorac Surg 2010; 89: 368-73

# Transbronşiyal iğne ejeksiyonu (TBNI)

◊ Enjek

◊ Maliq

hasto

◊ Çalışr

◊ Nüks

(sispl

◊ RT iç

TBNI

NSCLC

marker)

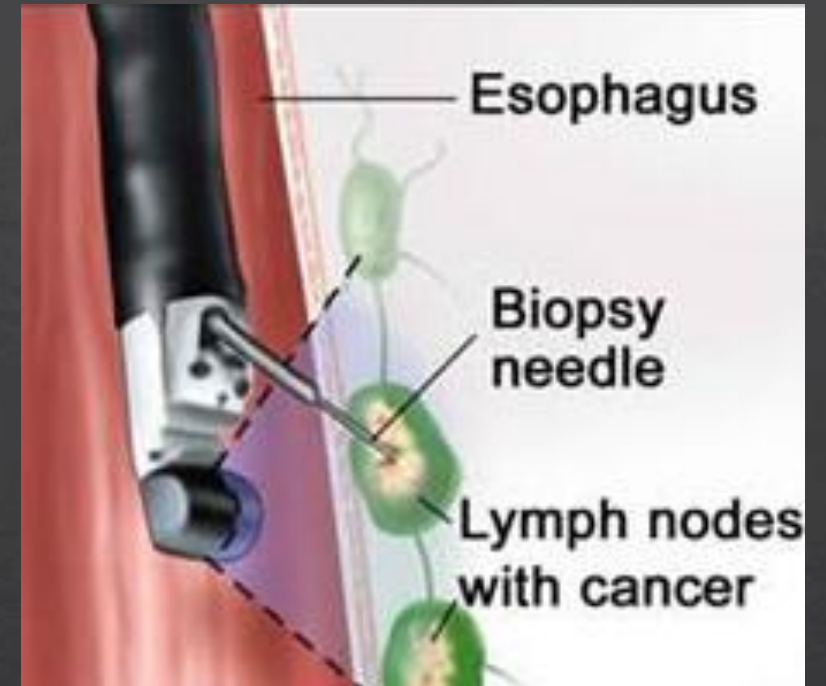
Drug Des Devel Ther 2013;7:571-83  
Ann Am Thorac Soc 2015;12:101-4  
Ann Thorac Surg 2010; 89: 368-73



# EBUS

◆ MALİGN HASTALIKLAR

◆ BENİGN HASTALIKLAR



# BENİGN HASTALIKLARDA EBUS

## TANILAR ve KULLANIM ALANLARI

- ◆ İnflamatuvar Hastalıklar

# BENİGN HASTALIKLARDA EBUS

## TANILAR ve KULLANIM ALANLARI

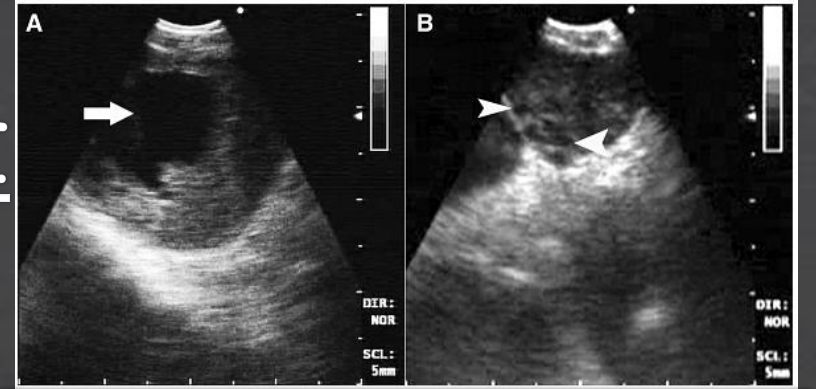
- ◆ İnflamatuvar Hastalıklar



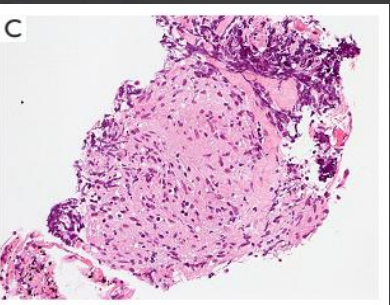
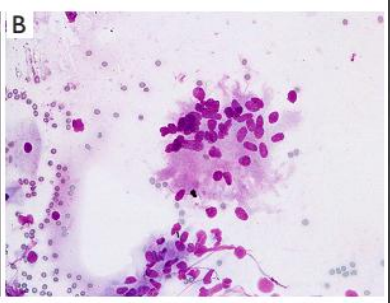
# BENİGN HASTALIKLARDA EBUS

## TANILAR ve KULLANIM ALANLARI

### ◆ İnflamatuvar Hastalıklar

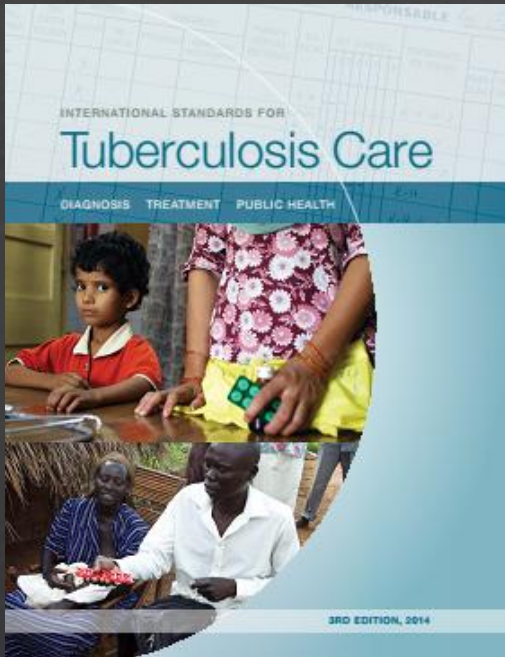


- ◆ Sarkoidoz ve Tüberküloz (TB) mediastinal LAP yapan ve bir biri ile en sık karışan inflamatuvar hastalıklardır
- ◆ Sarkoidoz ve TB ayırımında önemli noktalar;
  - ◆ Klinik
  - ◆ Mikrobiyolojik inceleme (M. Tbc)
  - ◆ PPD testine yanıt
  - ◆ Granülomlar arasında mikroskopik ayırım (Kazeifiye/ NonKazeifiye)

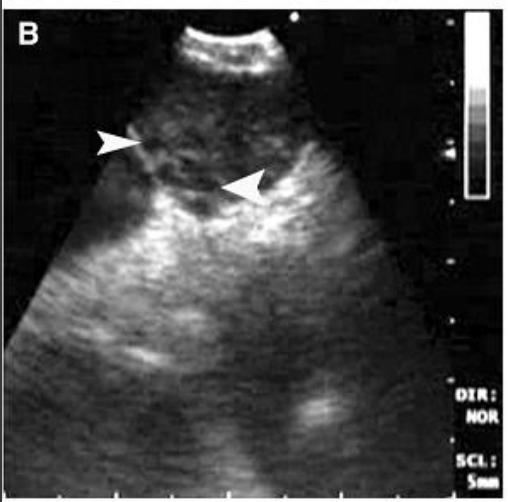
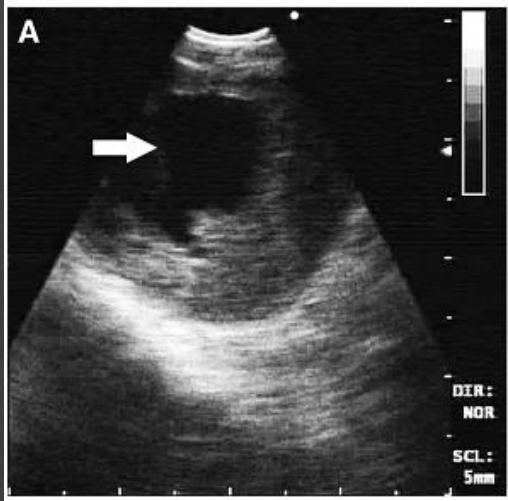


# Tüberküloz (TB) Lenfadenit

- ◆ TB lenfadenit en sık ekstrapulmoner TB
- ◆ En sık servikal LN tutulurken bunu Mediastinal, Supraklavikuler ve İnguinal LN'ları takip eder
- ◆ Tüberküloz kesin tanısı → mikrobiyolojik olarak (+)
  - tanısal materyalin (doku v.s.) mikrobiyolojik & histopatolojik inceleme
- ◆ Mediastinal LN TB tanısı için EBUS
  - ◆ Mediastinoskopiye göre daha az invaziv bir yöntemdir
  - ◆ Ayaktan ve bilinç düzeyinde sedasyon yeterli



# Tüberküloz (TB) Lenfadenit



- ◆ Lenf nodundan EBUS ile örnek alındığında, ARB ile pozitif boyanma oranı %2.2 ile %10.4 arasında değişmektedir.
- ◆ EBUS ile elde edilen lenf nodu materyalinde TB kültür pozitifliği ise %50.
- ◆ TB tanısı için alınan lenf nodu örneğinin sitopatolojik inceleme ile beraber ARB ile boyanması ve kültüre ekilmesi tanı başarısını >%90'lara çıkarmaktadır.



## The diagnostic accuracy of endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) in mediastinal tuberculous lymphadenitis

Onur Fevzi ERER<sup>1</sup>, Serhat EROL<sup>2\*</sup>, Ceyda ANAR<sup>1</sup>, Can BİÇMEN<sup>3</sup>, Zekiye AYDOĞDU<sup>4</sup>, Serir AKTOĞU<sup>1</sup>

**Background/aim:** Mediastinal lymph nodes are the second most commonly affected lymph nodes in tuberculous lymphadenitis. It is often difficult to diagnose tuberculosis in patients with lymphadenopathy without parenchymal lesions. The aim of this study was to describe the diagnostic utility of endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) in patients with isolated mediastinal tuberculous lymphadenitis (MTLA).

**Materials and methods:** This study included 527 patients who had undergone EBUS-TBNA between December 2012 and December 2014. Patients with the final diagnosis of MTLA were evaluated. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of EBUS-TBNA were calculated.

**Results:** The prevalence of MTLA in all patients who had undergone EBUS-TBNA for mediastinal lymphadenopathy of unknown etiology was 5.2% (28/527). EBUS-TBNA was diagnostic in 21/28 (75%) patients, and the remaining 7 patients required additional procedures for confirmation of diagnosis. Sensitivity, specificity, PPV, NPV, and accuracy of combined cytopathological and microbiological examinations of EBUS-TBNA in the diagnosis of MTLA were 87.5%, 98.5%, 91.4%, 98%, and 94.4%, respectively. There were no major complications.

**Conclusion:** EBUS-TBNA is a safe and effective procedure for the diagnosis of MTLA. When microbiological and cytopathological examinations of samples are combined, EBUS-TBNA demonstrates good diagnostic accuracy and NPV for the diagnosis of MTLA.

Duyarlılık	Özgüllük	NPD	Tanısal doğruluk
% 87.5	% 98.5	% 98	% 94.4

Table 2. Microbiological and cytopathological results of MTLA patients.

N	EBUS PCR	Sputum		EBUS		EBUS-TBNA histopathology			Med	
		AFB	Cx	AFB	Cx	NGI	GI	A	AFB	Cx
1	-	-	-	-	-	+			Ø	Ø
2	-	-	+	-	-	+			Ø	Ø
3	+	-	-	-	-			+	Ø	Ø
4	-	-	-	-	-			+	Ø	Ø
5	-	-	-	-	+			+	Ø	Ø
6	-	-	-	-	-		+		Ø	Ø
7	-	-	-	+	+		+		Ø	Ø
8	-	+	-	+	+	+			Ø	Ø
9*	Ø	-	-	-	-		+		-	-
10	Ø	-	-	-	+			+	Ø	Ø
11	-	-	-	+	+	+			Ø	Ø
12	+	-	-	-	-			+	Ø	Ø
13	Ø	-	-	-	+		+		Ø	Ø
14	-	-	-	-	-		+		Ø	Ø
15	-	-	-	-	-	+			Ø	Ø
16	+	-	-	+	+		+		Ø	Ø
17*	-	-	-	-	-		+		-	+
18*	-	-	-	-	-		+		-	-
19	Ø	-	-	-	-	+			Ø	Ø
20	-	-	-	-	-	+			Ø	Ø
21	-	-	-	-	+		+		Ø	Ø
22	Ø	-	-	-	+		+		Ø	Ø
23 <sup>b</sup>	-	-	-	-	-	+			-	+
24	-	-	-	-	+		+		Ø	Ø
25	-	-	+	-	+		+		Ø	Ø
26	+	-	-	-	+		+		Ø	Ø
27	-	-	-	-	+		+		Ø	Ø
28	Ø	-	-	-	-			+	Ø	Ø
Total	4	1	2	4	13	8	14	6	0	2

## Utility of endobronchial ultrasound-guided transbronchial needle aspiration in patients with tuberculous intrathoracic lymphadenopathy: a multicentre study

Neal Navani,<sup>1</sup> Philip L Molyneaux,<sup>2</sup> Ronan A Breen,<sup>3</sup> David W Connell,<sup>2</sup> Annette Jepson,<sup>4</sup> Matthew Nankivell,<sup>5</sup> James M Brown,<sup>1</sup> Stephen Morris-Jones,<sup>6</sup> Benjamin Ng,<sup>7</sup> Melissa Wickremasinghe,<sup>2</sup> Ajit Lalvani,<sup>2</sup> Robert C Rintoul,<sup>7</sup> George Santis,<sup>3</sup> Onn Min Kon,<sup>2</sup> Sam M Janes<sup>1</sup>

THORAX

### ABSTRACT

**Background** Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) has emerged as an important tool for the diagnosis and staging of lung cancer but its role in the diagnosis of tuberculous intrathoracic lymphadenopathy has not been established. The aim of this study was to describe the diagnostic utility of EBUS-TBNA in patients with intrathoracic lymphadenopathy due to tuberculosis (TB). **Methods** 156 consecutive patients with isolated intrathoracic TB lymphadenitis were studied across four centres over a 2-year period. Only patients with a confirmed diagnosis or unequivocal clinical and radiological response to antituberculous treatment during follow-up for a minimum of 6 months were included. All patients underwent routine clinical assessment and a CT scan prior to EBUS-TBNA. Demographic data, HIV status, pathological findings and microbiological results were recorded.

**Results** EBUS-TBNA was diagnostic of TB in 146 patients (94%; 95% CI 88% to 97%). Pathological findings were consistent with TB in 134 patients (86%). Microbiological investigations yielded a positive culture of TB in 74 patients (47%) with a median time to positive culture of 16 days (range 3–84) and identified eight drug-resistant cases (5%). Ten patients (6%) did not have a specific diagnosis following EBUS; four underwent mediastinoscopy which confirmed the diagnosis of TB while six responded to empirical antituberculous therapy. There was one complication requiring an inpatient admission.

**Conclusions** EBUS-TBNA is a safe and effective first-line investigation in patients with tuberculous intrathoracic lymphadenopathy.

- ◆ 156 hastadan 146'sına EBUS TBİA ile TB tanısı (%94)
- ◆ Patolojik tanı 134 hastada Tb ile uyumlu (%86)
  - ◆ Tanı konulamayan 19 hasta (%12) lenfosit hakim; 3 hasta (%2) Yetersiz örnek
- ◆ Mikrobiyolojik olarak 82 hasta (%53) pozitif
  - ◆ 27 hasta (%17) Yayma(+)
  - ◆ 74 hasta (%47) kültür (+)
  - ◆ 15 (%10) hasta kx (+) Patoloji (-)

# Rapid Diagnosis of Mediastinal Tuberculosis With Polymerase Chain Reaction Evaluation of Aspirated Material Taken by Endobronchial Ultrasound–Guided Transbronchial Needle Aspiration

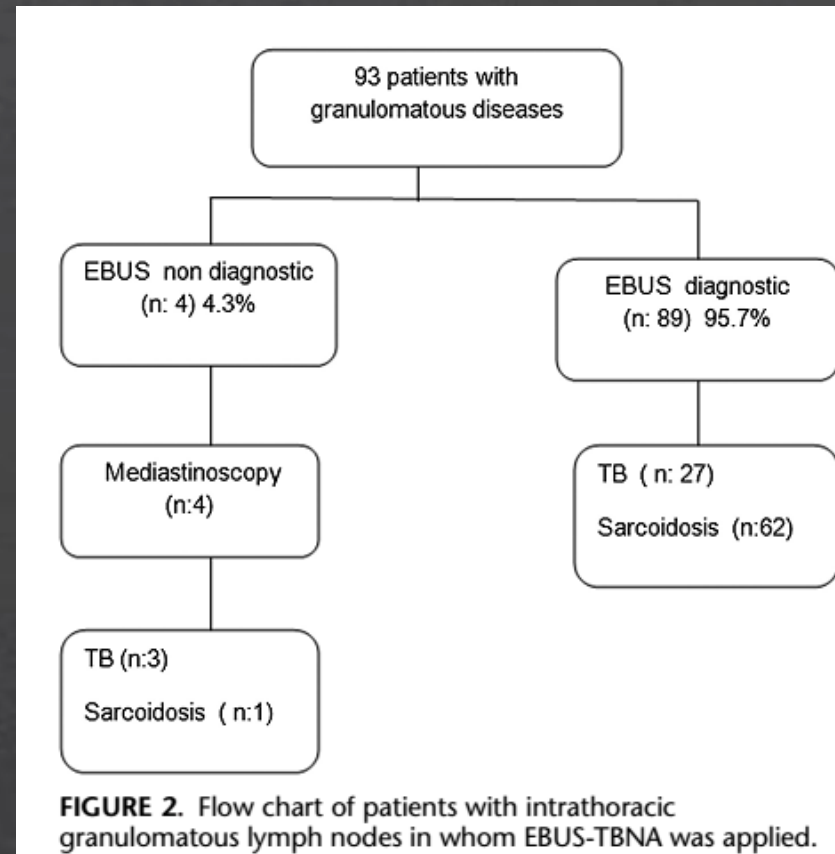
Aysegul Senturk, MD,\* Emine Arguder, MD,\* Habibe Hezer, MD,\* Elif Babaoglu, MD,\* Hatice Kilic, MD,\* Aysegul Karalezli, MD,\* and H. Canan Hasanoglu, MD†

**Background:** Endobronchial ultrasound–guided transbronchial needle aspiration (EBUS-TBNA) is a diagnostic method for tuberculosis (TB). This study was conducted to determine the efficiency of polymerase chain reaction (PCR) testing for detecting TB lymphadenitis in samples obtained by EBUS-TBNA.

**Materials and Methods:** A total of 93 consecutive patients with hilar/mediastinal lymphadenopathies and diagnosed with granulomatous diseases through histopathological evaluation were included in the study. The specimens provided by EBUS-TBNA were evaluated through pathological, microbiological, and molecular tests.

**Results:** Eighty-nine (95.7%) of the 93 patients had histopathologically granulomatous diseases by EBUS-TBNA. Tuberculosis was diagnosed in 27 (30.3%) patients and sarcoidosis was diagnosed in 62 (69.7%) patients. Four (4.3%) patients were diagnosed through mediastinoscopy. Endobronchial ultrasound–guided transbronchial needle aspiration had an overall diagnostic efficiency in TB of 96.9%, a sensitivity of 90.9%, and a specificity of 100%. *Mycobacterium tuberculosis* PCR was positive in 17 of the 30 patients. The sensitivity of PCR was 56.7%, the specificity was 100%, and the general efficiency of the test was 96.4%.

**Conclusions:** As a result, the use of *M. tuberculosis* PCR in the EBUS-TBNA specimens provides a rapid and an accurate diagnosis of TB. Therefore, we recommend the use of *M. tuberculosis* PCR in the EBUS-TBNA specimens as a rapid diagnostic method for mediastinal lymphadenopathies in patients with suspected TB.



- ❖ 93 granülopatöz hastalıktan 30'u TB tanısı
- ❖ 29'u EBUS ile TB tanısı (%96.9) , sensit:%90.9; Sps: %100)
- ❖ PCR 17 hastada (+) (Tanı etkinliği %94.4) (sens %56.7; sps:%100)



# Sarkoidoz

# Prospective study of endobronchial ultrasound-guided transbronchial needle aspiration of lymph nodes versus transbronchial lung biopsy of lung tissue for diagnosis of sarcoidosis

Masahide Oki, MD,<sup>a</sup> Hideo Saka, MD,<sup>a</sup> Chiyoe Kitagawa, MD,<sup>a</sup> Yoshihito Kogure, MD,<sup>a</sup> Naohiko Murata, MD,<sup>a</sup> Shu Ichihara, MD,<sup>b</sup> and Suzuko Moritani, MD<sup>b</sup>

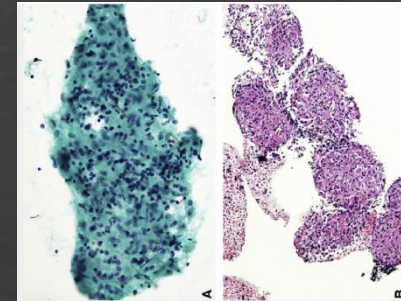
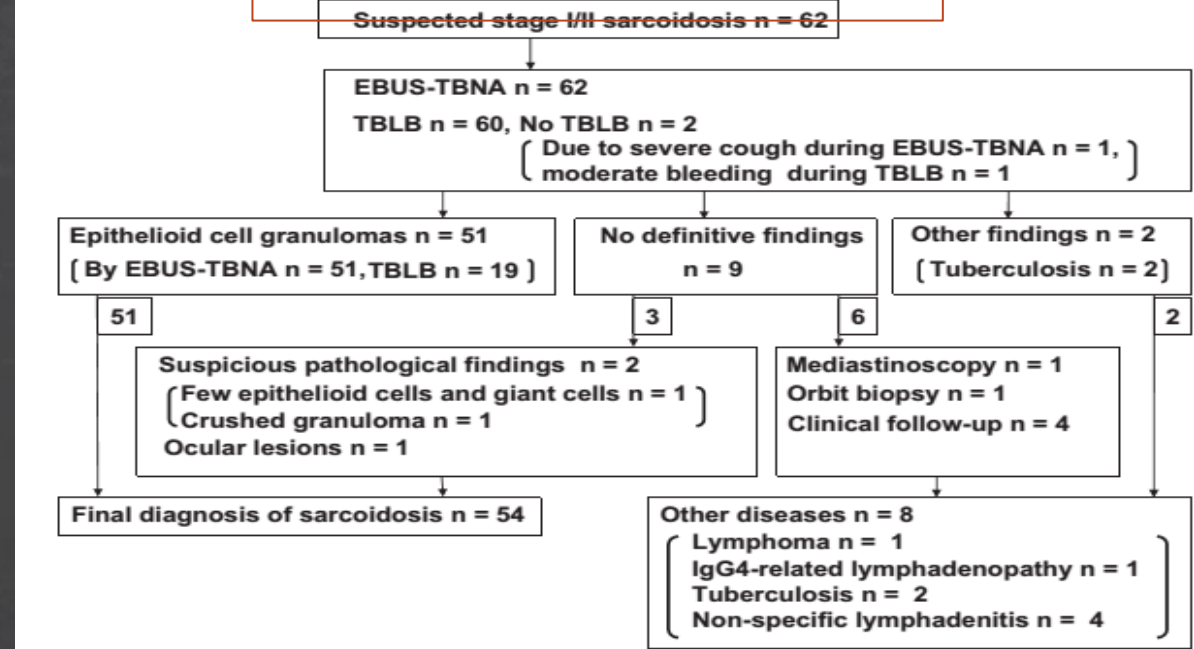
**Objective:** Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) has been reported to be an accurate and safe method to confirm a pathologic diagnosis of sarcoidosis. However, only a few retrospective or small prospective studies have been published on EBUS-TBNA versus transbronchial lung biopsy (TBLB), which has been the standard method for making a pathologic diagnosis of sarcoidosis so far. The aim of this study was to compare the diagnostic yield of EBUS-TBNA and TBLB through a flexible bronchoscope in patients with stage I and II sarcoidosis.

**Methods:** A total of 62 patients with suspected stage I and II sarcoidosis were included in this prospective study. EBUS-TBNA was performed (2 lymph nodes, 2 needle passes for each lymph node), followed by TBLB (5 biopsy specimens from multiple lung segments) in the same setting. The final diagnosis of sarcoidosis was based on clinicoradiologic compatibility and pathologic findings.

**Results:** Of the 62 patients enrolled, 54 were given a final diagnosis of sarcoidosis. The diagnostic yield of EBUS-TBNA and TBLB for sarcoidosis by showing noncaseating epithelioid cell granuloma was 94% (stage I, 97%; stage II, 88%) and 37% (stage I, 31%; stage II, 50%), respectively. The difference was statistically significant ( $P < .001$ ). One case of pneumothorax and 3 cases of moderate bleeding (7%) resulted from TBLB, and 1 case of severe cough (2%) from EBUS-TBNA.

**Conclusions:** The diagnostic yield of EBUS-TBNA for stage I and II sarcoidosis is higher than for TBLB. (J Thorac Cardiovasc Surg 2012;143:1324-9)

## EBUS TBNA vs TBBx



◆ 62 Evre 1-2 Sarkoidoz şüpheli hastadan 54 hastaya Sarkoidoz tanısı konulmuş.

◆ EBUS TBNA= 51/54 (%94)

◆ TBBx= 19/52 (%37) (P<0.001)

(2 hastaya TBBX yapılamamış)

TABLE 2. Diagnostic yield of EBUS-TBNA versus TBLB for sarcoidosis

Chest radiographic staging	EBUS-TBNA		TBLB		P value
	Patients diagnosed/examined (%)		Patients diagnosed/examined (%)		
Stage I	37/38	(97)	11/36	(31)	<.001
Stage II	14/16	(88)	8/16	(50)	.027
Total	51/54	(94)	19/52	(37)	<.001

EBUS-TBNA, Endobronchial ultrasound-guided transbronchial needle aspiration; TBLB, transbronchial lung biopsy.

J Thorac Cardiovasc Surg 2012;143:1324-9

# Combination of endobronchial ultrasound-guided transbronchial needle aspiration with standard bronchoscopic techniques for the diagnosis of stage I and stage II pulmonary sarcoidosis

NEAL NAVANI,<sup>1</sup> HELEN L. BOOTH,<sup>3</sup> GABRIJELA KOCJAN,<sup>2</sup> MARY FALZON,<sup>2</sup> ARRIGO CAPITANIO,<sup>2</sup> JAMES M. BROWN,<sup>1</sup> JOANNA C. PORTER<sup>3</sup> AND SAM M. JANES<sup>1</sup>

Official Journal of the Asian Pacific Society of Respiriology  
**Respirology**

## ABSTRACT

**Background and objective:** Standard bronchoscopic techniques (transbronchial lung biopsy and endobronchial biopsy) provide a diagnosis in 70% of patients with pulmonary sarcoidosis. Previous data suggest that endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) has a high sensitivity in patients with sarcoidosis. The feasibility and utility of combining EBUS-TBNA with standard bronchoscopic techniques is unknown. The aim of this study was to evaluate the feasibility, safety and efficacy of combined EBUS-TBNA and standard bronchoscopic techniques in patients with suspected sarcoidosis and enlarged mediastinal or hilar lymphadenopathy.

**Methods:** Forty consecutive patients with suspected pulmonary sarcoidosis and enlarged mediastinal or hilar lymph nodes (radiographical stage I and stage II) underwent EBUS-TBNA followed by transbronchial biopsies and endobronchial biopsies under conscious sedation.

**Results:** Thirty-nine out of 40 patients successfully underwent combined EBUS-TBNA and standard bronchoscopy. Twenty-seven patients were diagnosed with sarcoidosis, eight had tuberculosis, two had reactive lymphadenopathy, two had lymphoma and one had metastatic adenocarcinoma. In patients with sarcoidosis, the sensitivity of EBUS-TBNA for detection of non-caseating granulomas was 85%, compared with a sensitivity of 35% for standard bronchoscopic techniques ( $P < 0.001$ ). The diagnostic yield of combined EBUS-TBNA and bronchoscopy was 93% ( $P < 0.0001$ ).

**Conclusions:** Combination of EBUS-TBNA with standard bronchoscopic techniques is safe and feasible, and optimizes the diagnostic yield in patients with pulmonary sarcoidosis and enlarged intrathoracic lymphadenopathy.

**Table 2** Diagnostic yields of endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA), standard bronchoscopy and the combination in patients with sarcoidosis

	Number of patients with positive diagnosis (%)				
	EBUS-TBNA	Transbronchial lung biopsy (TBLB)	Endobronchial biopsy (EBB)	Standard bronchoscopy—TBLB and EBB	Combined EBUS-TBNA + standard bronchoscopy
Stage I sarcoidosis ( $n = 18$ )	16 (89)	2 (12) <sup>†</sup>	0 (0) <sup>†</sup>	2 (12) <sup>†</sup>	17 (94) <sup>†</sup>
Stage II sarcoidosis ( $n = 9$ )	7 (78)	6 (67)	3 (33)	7 (78)	8 (89)
Overall ( $n = 27$ )	23 (85)*	8 (31)	3 (11)	9 (35) <sup>†</sup>	25 (93)**

\*  $P < 0.001$  comparing yield from EBUS-TBNA with those from standard bronchoscopy; \*\*  $P < 0.0001$  comparing yields from combined EBUS-TBNA and standard bronchoscopy with those from standard bronchoscopy alone.

<sup>†</sup> One patient with stage I sarcoidosis did not undergo standard bronchoscopy after EBUS-TBNA.

◊ Standart FOB ile (TBBx/EndoBronş BX) sarkoidoz tanısı %70

◊ EBUS TBNA ile tanı daha yüksek (>%90)

◊ Kombinasyonunun tanıya etkisi?

◊ EBUS TBNA vs FOB (%85 vs %35  $p < 0.001$ )

◊ Kombinasyon vs FOB (%93 vs %35  $p < 0.0001$ )



# Lymph node characteristics of sarcoidosis with endobronchial ultrasound

Mehmet Akif Ozgul<sup>1</sup>, Erdoğan Çetinkaya<sup>1</sup>, Gamze Kirkil<sup>2</sup>, Guler Ozgul<sup>3</sup>, Yasin Abul<sup>3</sup>, Murat Acat<sup>1</sup>, Hilal Onaran<sup>2</sup>, Halide Nur Urer<sup>4</sup>, Nuri Tutar<sup>5</sup>, H. Erhan Dincer<sup>6</sup>

## ABSTRACT

**Background:** Sonographic features of lymph nodes on endobronchial ultrasound (EBUS) have been shown to be useful in prediction of malignancy in mediastinum and hilum. The aim of this study was to assess the utility of morphologic features of mediastinal and/or hilar lymph nodes obtained by EBUS in patients with sarcoidosis. **Materials and Methods:** We retrospectively reviewed the records of 224 patients with mediastinal/hilar lymph node enlargements who underwent EBUS for diagnostic purpose. The lymph nodes were characterized based on the EBUS images as follows: (1) Size; based on short-axis dimension, <1 cm or ≥1 cm, (2) shape; oval or round, (3) margin; distinct or indistinct, (4) echogenicity; homogeneous or heterogeneous, (5) presence or absence of central hilar structure, and (6) presence or absence of granular (sandpaper) appearance. **Results:** One hundred (24.4%) nodes exhibited indistinct margins while 309 (75.6%) had distinct margins. One hundred and ninety nine (48.7%) nodes were characterized as homogeneous, and 210 (51.3%) nodes as heterogeneous. Granular appearance was observed in 130 (31.8%) lymph nodes. The presence of granules in lymph nodes on EBUS had the highest specificity (99.3%) for the diagnosis of sarcoidosis. Logistic regression analysis revealed the finding of distinct margin alone as an independent predictive factor for the diagnosis of sarcoidosis. **Conclusions:** The presence of granular appearance in lymph nodes by EBUS had the highest specificity (99.3%) for the diagnosis of sarcoidosis. Lymph nodes having distinct margins tend to suggest sarcoidosis.

**Key words:** Diagnosis, echoic features, endobronchial ultrasonography,



**Table 3. Diagnostic yield of each endobronchial ultrasound image for sarcoidosis**

Morphologic category	Sensitivity %	Specificity %	Positive predictive value %	Negative predictive value %
Size >10 mm	100	9.3	35.7	100
Shape				
round	84	38.9	40.9	82.8
Margin				
distinct	84	30.8	37.9	79.3
Echogenicity				
homogeneous	81.3	73.1	60.3	88.6
Granules				
Present	82.6	99.3	98.4	91.9
Central hilar structure present	40	95.3	30	66.3

When a mediastinal/hilar lymph node in a patient with a suspected diagnosis of sarcoidosis by radiological/clinical data shows only benign lymphocytes on cytology, ultrasonographical features of lymph nodes such as granular (sandpaper) appearance and distinct margin would reassure the diagnosis of sarcoidosis and helps to limit multiple passes in a lymph node and sampling of multiple stations where ROSE is available.

In the present study, we have found that, although lymph nodes of patients with sarcoidosis are often round, may have a granular appearance, homogeneous echogenicity, and distinct margin, logistic regression analysis revealed that the only independent predictive factor for the diagnosis of sarcoidosis was the presence of a distinct margin. Further prospective studies are recommended to confirm the utility of sonographic features during EBUS-TBNA.

# BENİGN HASTALIKLARDA EBUS

## TANILAR ve KULLANIM ALANLARI

- ◆ İnflamatuvar Hastalıklar
- ◆ Substernal Tiroid Nodülleri

# Endobronchial ultrasound-guided transbronchial needle aspiration for thyroid cyst therapy: A case report

PENG LI<sup>1</sup>, WEI ZHENG<sup>1</sup>, HONGBO LIU<sup>1</sup>, ZHENYONG ZHANG<sup>2</sup> and LI ZHAO<sup>1</sup>

Video Article

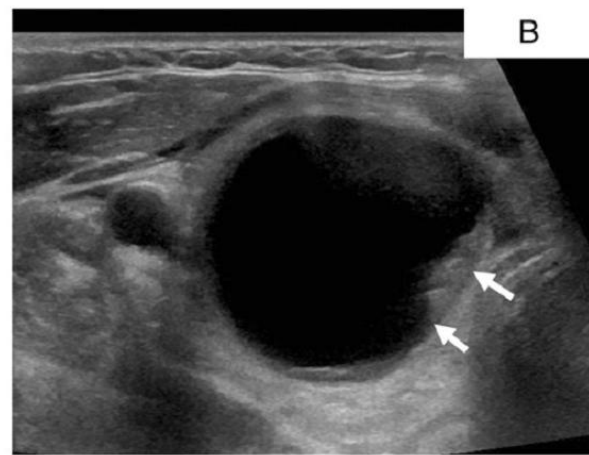
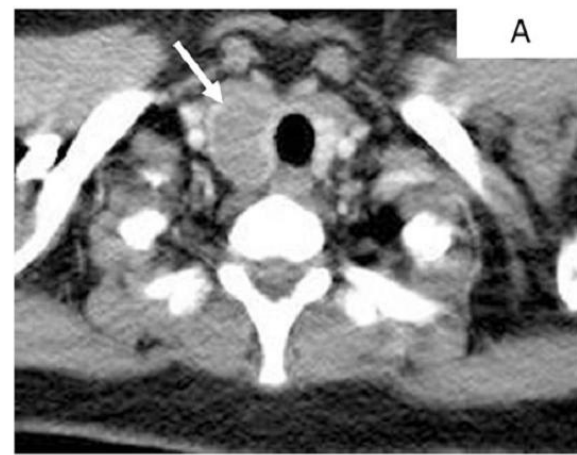
## Substernal Thyroid Biopsy Using Endobronchial Ultrasound-guided Transbronchial Needle Aspiration

Abhishek Kumar<sup>1</sup>, Arjun Mohan<sup>1</sup>, Samjot S. Dhillon<sup>2</sup>, Kassem Harris<sup>2</sup>



## Endobronchial ultrasound-guided transbronchial needle aspiration of thyroid: Report of two cases and systematic review of literature

Karan Madan, Saurabh Mittal, Vijay Hadda, Deepali Jain<sup>1</sup>, Anant Mohan, Randeep Guleria



## Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration of Thyroid Nodules

### Pushing the Boundary Too Far?

- Chest 2012; 142:1690-1
- Exp Ther Med. 2017;13(5):1944-1947
- J Vis Exp. 2014;93:e51867
- Lung India 2016;33:682-7



Author	Year	Number of patients	Age	Sex	Indication for EBUS-TBNA other than thyroid lesion	Thyroid lesion size	Intrathoracic/extrathoracic location of thyroid lesion	Airway narrowing	Anesthesia	EBUS needle size	Number of passes	Rapid on-site evaluation	TBNA	EBUS-TBNA	Complications
Casal <i>et al.</i>	2014	12	64 years (range: 44-84 years)	Male - 10 Female - 2 Male/female - 5:1	Yes In 9 out of 12 (75%)	22.5 mm (range: 10-43 mm)	5 out of 12 (41.6%) strictly intrathoracic	No	11 - laryngeal mask airway with general anesthesia 1 - Under moderate sedation through oropharyngeal approach	22 G	4 (average)	Yes	5%) tic ancy st rcinoma - B-cell ma rcinoma 5%)	None	
Chalhoub <i>et al.</i>	2010	1	74 years	Female	No Incidentally detected STN on CT thorax for suspected PE	Not described	Intrathoracic (Substernal)	No	Conscious sedation	22 G	4	Not described	thyroid	None	
Chalhoub <i>et al.</i>	2012	1	72	Male	No Incidentally detected substernal STN on CT thorax for suspected PE	Not described	Intrathoracic	No	Conscious sedation	22 G	4	Not described	thyroid	None	
Steinfort <i>et al.</i>	2010	1	56	Female	Yes Evaluation of suspected lung cancer with right upper lobe lung mass and mediastinal lymphadenopathy	2.5 cm cystic mass	Extrathoracic Upper right paratracheal region posterior to medial aspect of right clavicle	No	Conscious sedation	22 G	Not described	Yes	thyroid	None	
Sanchez-Font <i>et al.</i>	2012	1	69	Not described	Yes	8 mm×7 mm	Extrathoracic Upper right paratracheal subglottic	No	Not described	Not described	Not described	Not described	thyroid nodule	None	
Kennedy <i>et al.</i>	2012	1	49	Female	Yes Mediastinal lymphadenopathy and lung nodules, follow-up case of endometrial Ca posthysterectomy Thyroid nodule detected on EBUS examination	2 cm Homogenous nodule in Right lobe Accessible by ultrasound-guided fine needle aspiration	Extrathoracic	No	Not described	Not described	Not described	Not described	thyroid nodule	Yes Developed abscess 8 days later requiring drainage twice and intravenous antibiotics recovered	
Jeebun <i>et al.</i>	2009	1	46	Female	No Posterior mediastinal mass, later on diagnosed as of thyroid origin	Not described	Intrathoracic	Yes	Conscious sedation	22 G	3	Not described	thyroid tum	None	
Jette <i>et al.</i>	2012	1	68	Female	No Thoracic inlet mass, diagnosed as goiter, had total thyroidectomy in past	Not described	Intrathoracic	Not described	Not described	Not described	Not described	Not described	thyroid tum	None	
Roh <i>et al.</i>	2013	1	65	Male	No Right paratracheal mass, diagnosed of thyroid origin on EBUS	4.5 cm×2.9 cm	Intrathoracic	No	Not described	Not described	Not described	Not described	thyroid tum	None	

PE: Pulmonary embolism, CT: Computed tomography, EBUS-TBNA: Endobronchial ultrasound-guided transbronchial needle aspiration, STN: Solitary thyroid nodule

# BENİGN HASTALIKLARDA EBUS

## TANILAR ve KULLANIM ALANLARI

- ◆ İnflamatuvar Hastalıklar
- ◆ Substernal Tiroid Nodülleri
- ◆ Mediastinal Kist ve Abseler (Drenajı)

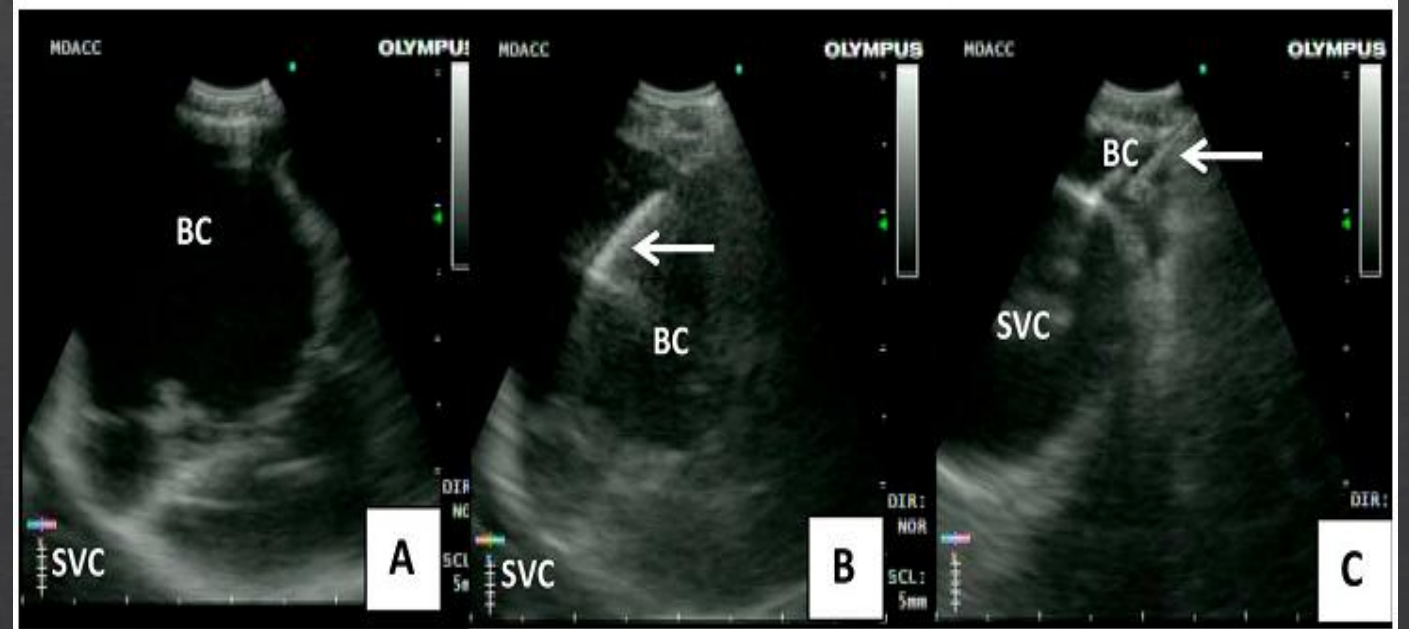
# Cystic Lesions of the Thorax

## Role of Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration

Andrew Twehues, MD, and Shaheen Islam, MD

### A Watery Mediastinal Mass

Horiana B. Grosu<sup>1</sup>, Rodolfo C. Morice<sup>1</sup>, David Ost<sup>1</sup>, Georgie A. Eapen<sup>1</sup>, and Carlos A. Jimenez<sup>1</sup>



J Bronchol Intervent Pulmonol 2011;18:265-268  
Am J Respir Crit Care Med 2013;187: 1135-6

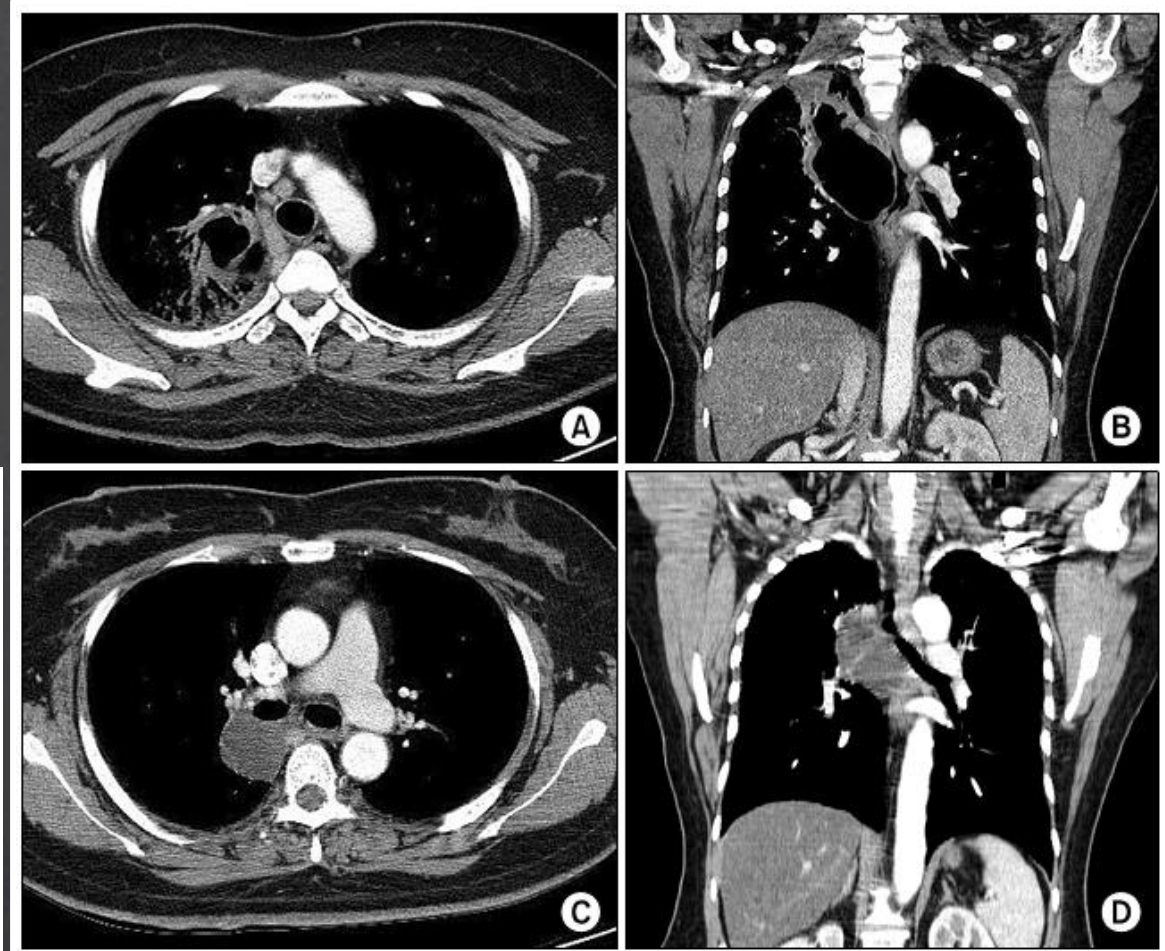


# Bronchogenic Cyst Rupture and Pneumonia after Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration: A Case Report

Goohyeon Hong, M.D.<sup>1\*</sup>, Junwhi Song, M.D.<sup>2\*</sup>, Kyung-Jong Lee, M.D.<sup>1</sup>, Kyeongman Jeon, M.D., Ph.D.<sup>1</sup>, Won-Jung Koh, M.D., Ph.D.<sup>1</sup>, Gee Young Suh, M.D., Ph.D.<sup>1</sup>, Man Pyo Chung, M.D., Ph.D.<sup>1</sup>, Hojoong Kim, M.D., Ph.D.<sup>1</sup>, O Jung Kwon, M.D., Ph.D.<sup>1</sup>, Sang-Won Um, M.D., Ph.D.<sup>1</sup>

## Mediastinitis of bronchogenic cyst caused by endobronchial ultrasound-guided transbronchial needle aspiration

Takuya Onuki, Masami Kuramochi & Masaharu Inagaki



Tuberc Respir Dis 2013;74:177-180  
Respirology Case Reports 2014;2:73-75

# BENİGN HASTALIKLARDA EBUS

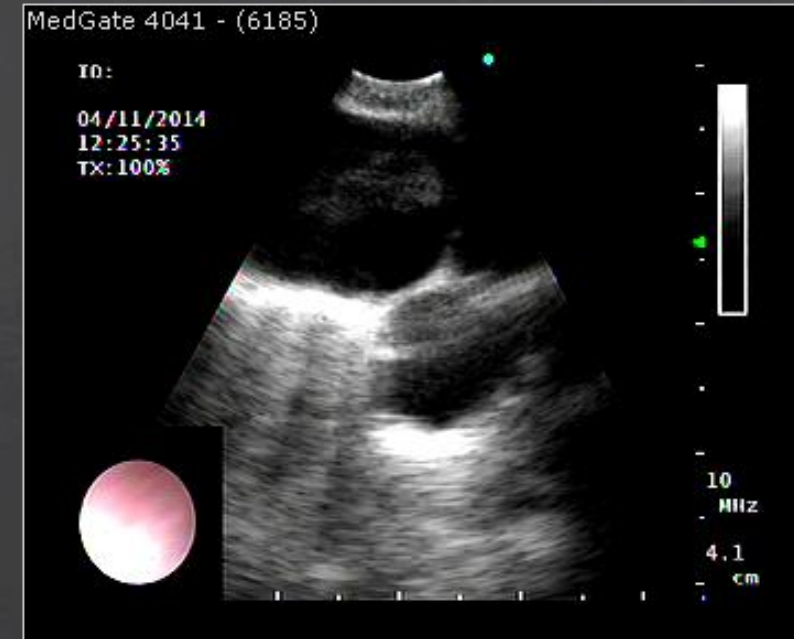
## TANILAR ve KULLANIM ALANLARI

- ◆ İnflamatuvar Hastalıklar
- ◆ Substernal Tiroid Nodülleri
- ◆ Mediastinal Kist ve Abseler (Drenajı)
- ◆ Pulmoner Tromboemboli tanısı

# Pulmoner Tromboemboli (PTE) tanısı

- Pulmoner Trombo Emboli (PTE) tanısı  
(Ana pulmoner arterde emboli varlığında)
  - Kontrast (allerji, nefropati vs)
  - Gebe
  - YBÜ'nde yatan ve BT anjio tetkiki yapılamayan
  - %96 tanı verimliliği

(orta ve alt lob pulmoner arterlerde tanı değeri düşük)



Am J Emerg Med 2016;34:684  
Arch Bronconeumol 2013;49:268-71  
Respirol Case Rep 2015;3:141-4  
Tuberk Toraks 2011;59:318-20



PATOLOJİK TANI ÖNCESİ  
BENİGN ve MALİGN AYRIMI MÜMKÜN MÜ?

# PATOLOJİK TANI ÖNCESİ BENİGN ve MALİGN AYRIMI MÜMKÜN MÜ?

◆ Lezyonun Ultrasonografik özellikleri

# PATOLOJİK TANI ÖNCESİ BENİGN ve MALİGN AYRIMI MÜMKÜN MÜ?













◆ Lezyonun Ultrasonografik özellikleri

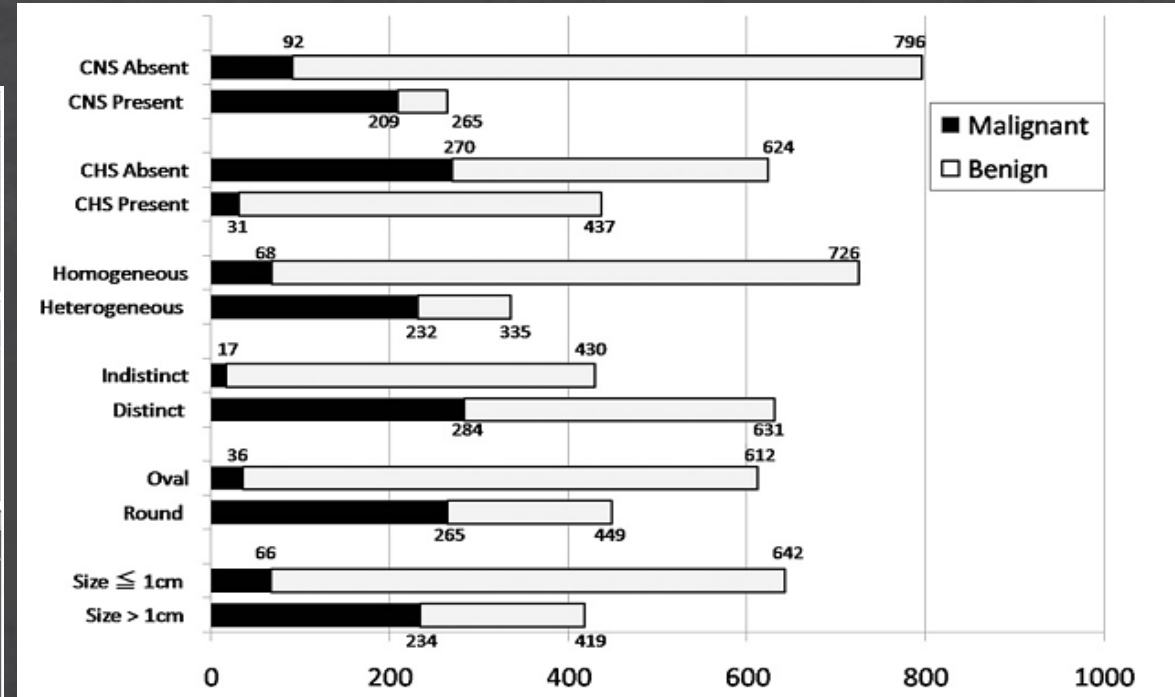
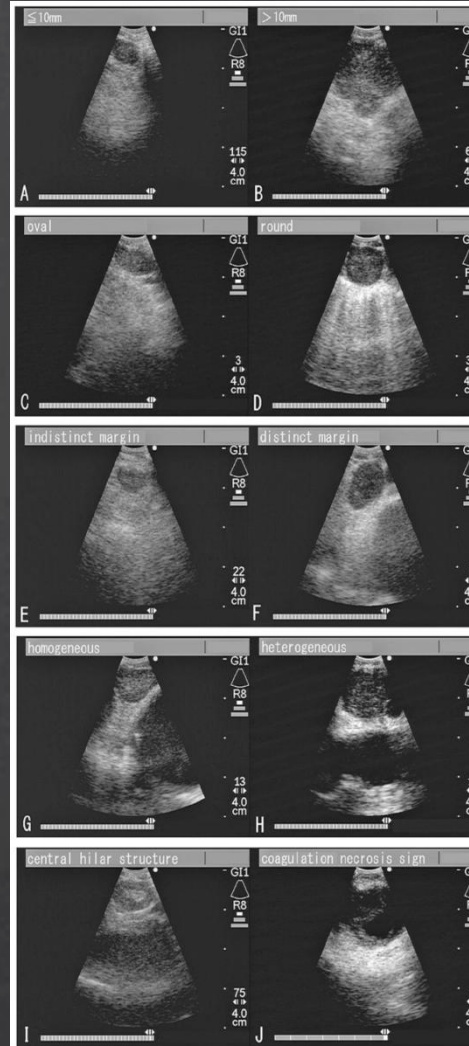




## The Utility of Sonographic Features During Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration for Lymph Node Staging in Patients With Lung Cancer

A Standard Endobronchial Ultrasound Image Classification System

Size	Shape	Margin	Echogenicity	Central Hilar Structure	Coagulation Necrosis Sign
 (a) ≤ 1cm	 (c) oval	 (e) indistinct	 (g) homogeneous	 (i) present	 (k) present
 (b) >1cm	 (d) round	 (f) distinct	 (h) heterogeneous	 (j) absent	 (l) absent



- <math>< 1\text{cm}</math> Benign; <math>\geq 1\text{cm}</math>: Malign
- Oval: Benign Yuvarlak: Malign
- Düzensiz sınır: Benign, Düzgün: Malign
- Koagülasyon Nekrozu (+): Malign ; (-) Benign
- Santral hiler yapısı varlığı: Benign
- Homojen: Benign ; Heterojen: Malign



## Using Endobronchial Ultrasound Features to Predict Lymph Node Metastasis in Patients With Lung Cancer

Table 4—ORs Describing the Risk of Malignancy by Nodal Characteristics

EBUS Pathology	Predictor	Variable	OR (95% CI)	P Value
Radiographic characteristics	PET scan activity	Normal	Ref	...
		Increased	3.48 (1.40-8.64)	.0072 <sup>a</sup>
	CT scan lymph node size	< 10 mm	Ref	...
		10-20 mm	2.89 (1.11-7.52)	.029 <sup>a</sup>
> 20 mm		34.38 (6.02-196.48)	< .0001 <sup>a</sup>	
Ultrasound characteristics	Size	Continuous: change of 5 mm	1.57 (1.23-1.99)	.0002 <sup>a</sup>
		< 10 mm	Ref	...
		10-20 mm	3.39 (1.77-6.46)	.0002 <sup>a</sup>
		> 20 mm	10.28 (4.31-24.50)	< .0001 <sup>a</sup>
	Shape	Triangular	Ref	...
		Oval	3.50 (1.54-7.96)	.0028 <sup>a</sup>
		Round	4.16 (1.67-10.36)	.0022 <sup>a</sup>
		Draping	1.49 (0.46-4.89)	.51
	Echogenicity	Hyperechoic	Ref	...
		Hypoechoic	1.47 (0.51-4.30)	.48
Isoechoic		0.61 (0.11-3.32)	.56	
Borders	Well-defined	Ref	...	
	Indistinct	0.98 (0.58-1.66)	.93	
Procedural characteristics	Biopsy location	Center	Ref	...
		Periphery	0.97 (0.56-1.66)	.91

- ◇ ≥ 10 mm: Malign
- ◇ Yuvarlak ve Oval şekil : Malign ,
- ◇ Üçgensel Şekil: Benign
- ◇ Ekojenite ve Sınır özelliği ; Ayırıcı değil
- ◇ Santral veya periferik örnekleme arasında fark yok

# INTRA- AND INTEROBSERVER AGREEMENT AMONG BRONCHIAL ENDOSONOGRAPHERS FOR THE DESCRIPTION OF INTRATHORACIC LYMPH NODES

IGNASI GARCIA-OLIVÉ,<sup>\*†‡</sup> JOAQUIM RADUA,<sup>§||</sup> PERE SERRA,<sup>\*‡</sup> FELIPE ANDREO,<sup>\*†‡¶</sup>  
JOSE SANZ-SANTOS,<sup>\*†¶</sup> EDUARD MONSÓ,<sup>†¶#</sup> ANTONI ROSELL,<sup>†\*\*††</sup> ENRIQUE CASES-VIEDMA,<sup>††</sup>  
ALBERTO FERNÁNDEZ-VILLAR,<sup>§§</sup> MANUEL NÚÑEZ-DELGADO,<sup>§§</sup> RICARDO GARCÍA-LUJÁN,<sup>|||</sup>  
JOSEP MORERA,<sup>\*†‡</sup> and JUAN RUIZ-MANZANO<sup>\*†‡¶</sup>



Fig. 1. Questionnaire web page screenshot.



Table 2. Mean intra- and inter-rater agreement

	Intra-rater agreement		Inter-rater agreement	
	Mean kappa ( $\kappa$ )	95% CI	Mean kappa ( $\kappa$ )	95% CI
Reviewer's diagnosis (malignant or not)	0.555	0.487, 0.627	0.337	0.175, 0.473
Proposed signs of malignancy				
CNS present	0.721	0.533, 0.902	0.340	0.052, 0.649
CHS absent	0.565	0.376, 0.732	0.251	-0.057*, 0.558
Heterogeneous echogenicity	0.441	0.272, 0.614	0.098	-0.073*, 0.332
Distinct margin	0.407	0.264, 0.533	0.274	0.108, 0.416
Round shape	0.615	0.542, 0.687	0.445	0.338, 0.563
Size >1 cm	0.826	0.729, 0.908	0.641	0.452, 0.823

Table 3. Mean intra- and inter-rater agreement (malignant nodes)

	Intra-rater agreement		Inter-rater agreement	
	Mean kappa ( $\kappa$ )	95% CI	Mean kappa ( $\kappa$ )	95% CI
Reviewer's diagnosis (malignant or not)	0.627	0.445, 0.809	0.423	0.170, 0.662
Proposed signs of malignancy				
CNS present	0.713	0.528, 0.886	0.451	0.125, 0.755
CHS absent	0.213	0.013, 0.424	0.208	-0.030*, 0.438
Heterogeneous echogenicity	0.502	0.258, 0.718	0.080	-0.183*, 0.380
Distinct margin	0.581	0.391, 0.732	0.385	0.172, 0.612
Round shape	0.565	0.403, 0.728	0.288	0.109, 0.529
Size >1 cm	0.907	0.820, 0.973	0.754	0.526, 0.934

Table 4. Mean intra- and inter-rater agreement (nonmalignant nodes)

	Intra-rater agreement		Inter-rater agreement	
	Mean kappa ( $\kappa$ )	95% CI	Mean kappa ( $\kappa$ )	95% CI
Reviewer's diagnosis (malignant or not)	0.484	0.332, 0.648	0.243	0.074, 0.431
Proposed signs of malignancy				
CNS present	0.500	0.121, 0.862	0.025	-0.121*, 0.472
CHS absent	0.631	0.449, 0.796	0.260	-0.046*, 0.580
Heterogeneous echogenicity	0.439	0.242, 0.617	0.114	-0.113*, 0.358
Distinct margin	0.349	0.208, 0.470	0.212	0.062, 0.377
Round shape	0.637	0.485, 0.790	0.517	0.392, 0.703
Size >1 cm	0.774	0.642, 0.895	0.515	0.316, 0.773

CHS = central hilar structure; CNS = coagulation necrosis sign.

\* Negative values of  $\kappa$  indicate absence of effective agreement.

Table 2. Mean intra- and inter-rater agreement

Intra-rater agreement

Inter-rater agreement

## Ultrasonografik Özelliklerde

### Intraobserver Uyum:

Boyut (Tam uyum)

Koagulasyon Nekrozu ve Şekil (Önemli miktarda- Substantial uyum)

Santral Hiler Yapı (Orta Uyum)

Heterojenite ve Sınır Özelliği (Makul uyum (Fair))

### Interobserver Uyum

Boyut (Önemli miktarda- Substantial uyum)

Şekil (Orta Uyum)

Koagulasyon Nekrozu İşareti ve Sınır Özelliği (Makul Uyum (Fair))

### Benign/Malign Ayrımında

Intraobserver uyum (Orta Uyum)

Interobserver uyum (Makul uyum (Fair))

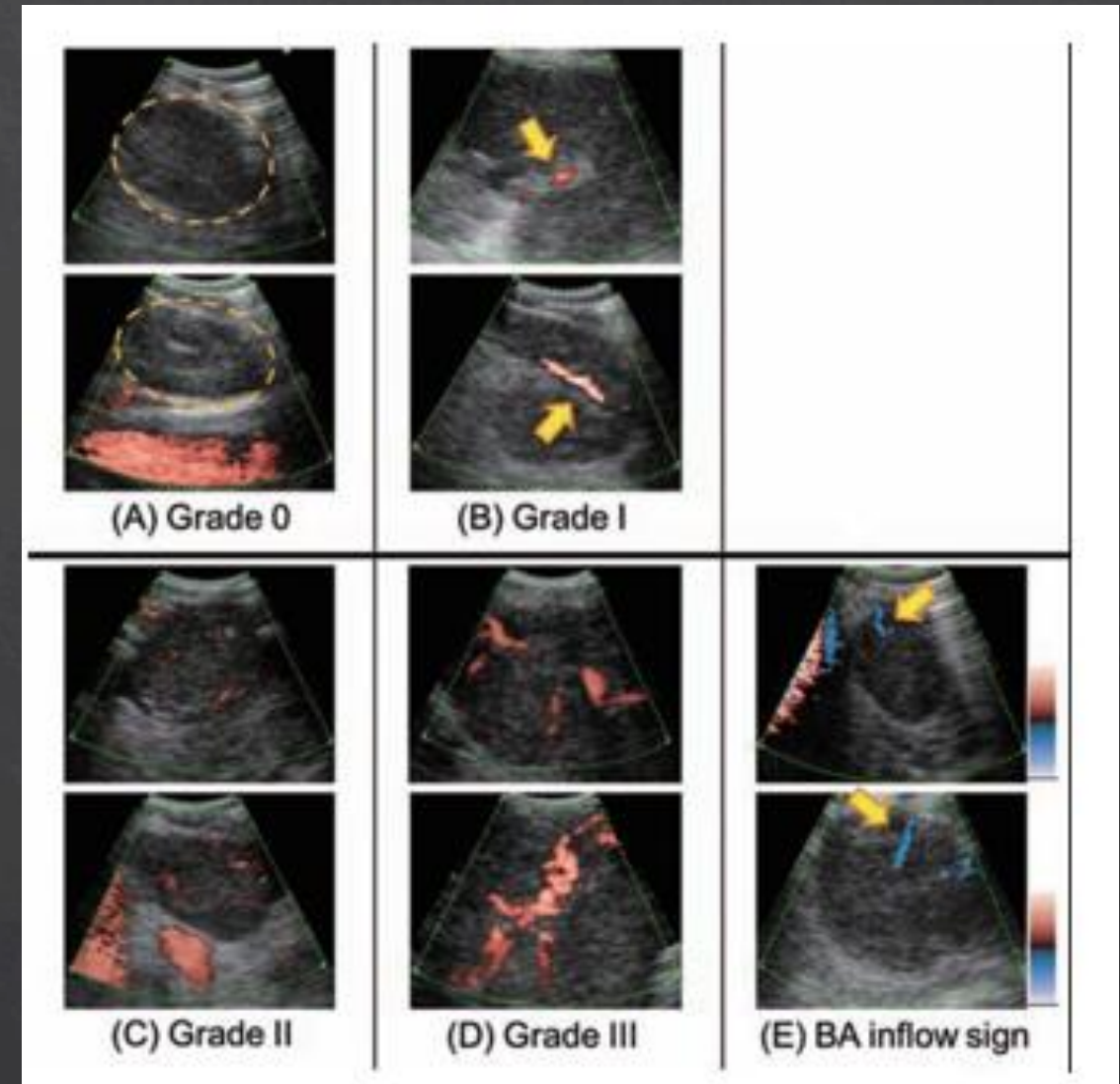
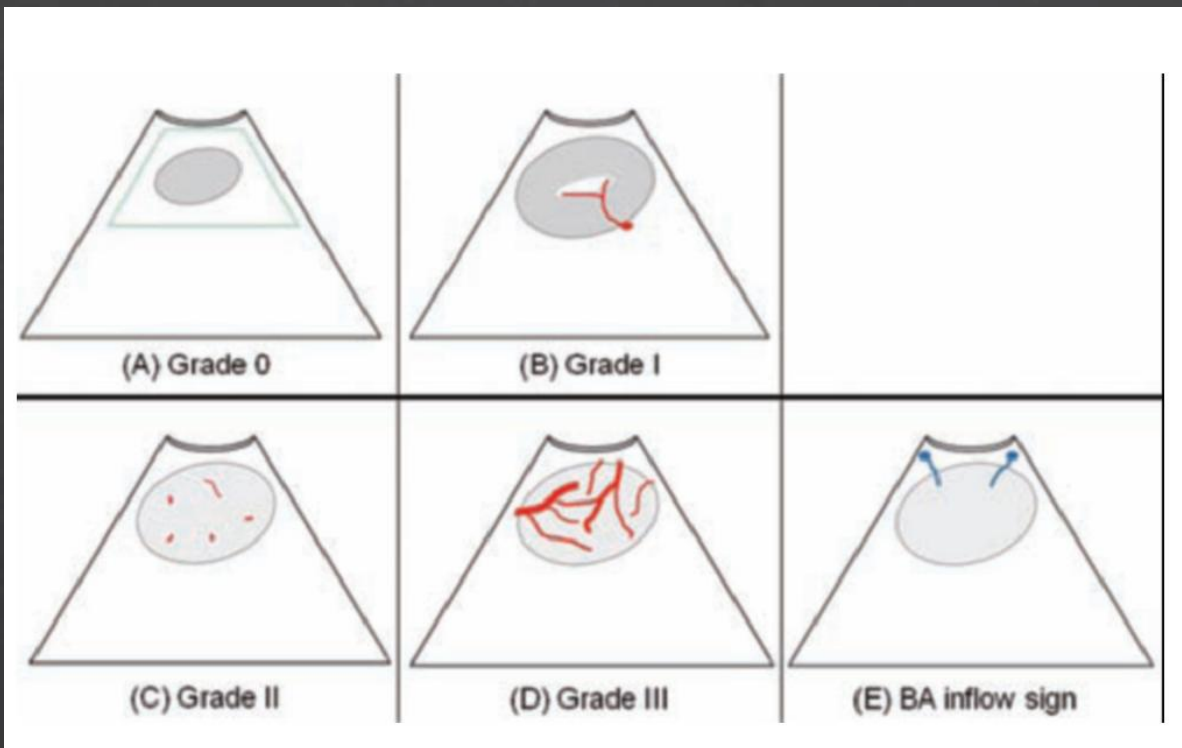
# PATOLOJİK TANI ÖNCESİ BENİGN ve MALİGN AYRIMI MÜMKÜN MÜ?

- ◆ Lezyonun Ultrasonografik özellikleri
- ◆ Vasküler özellikler

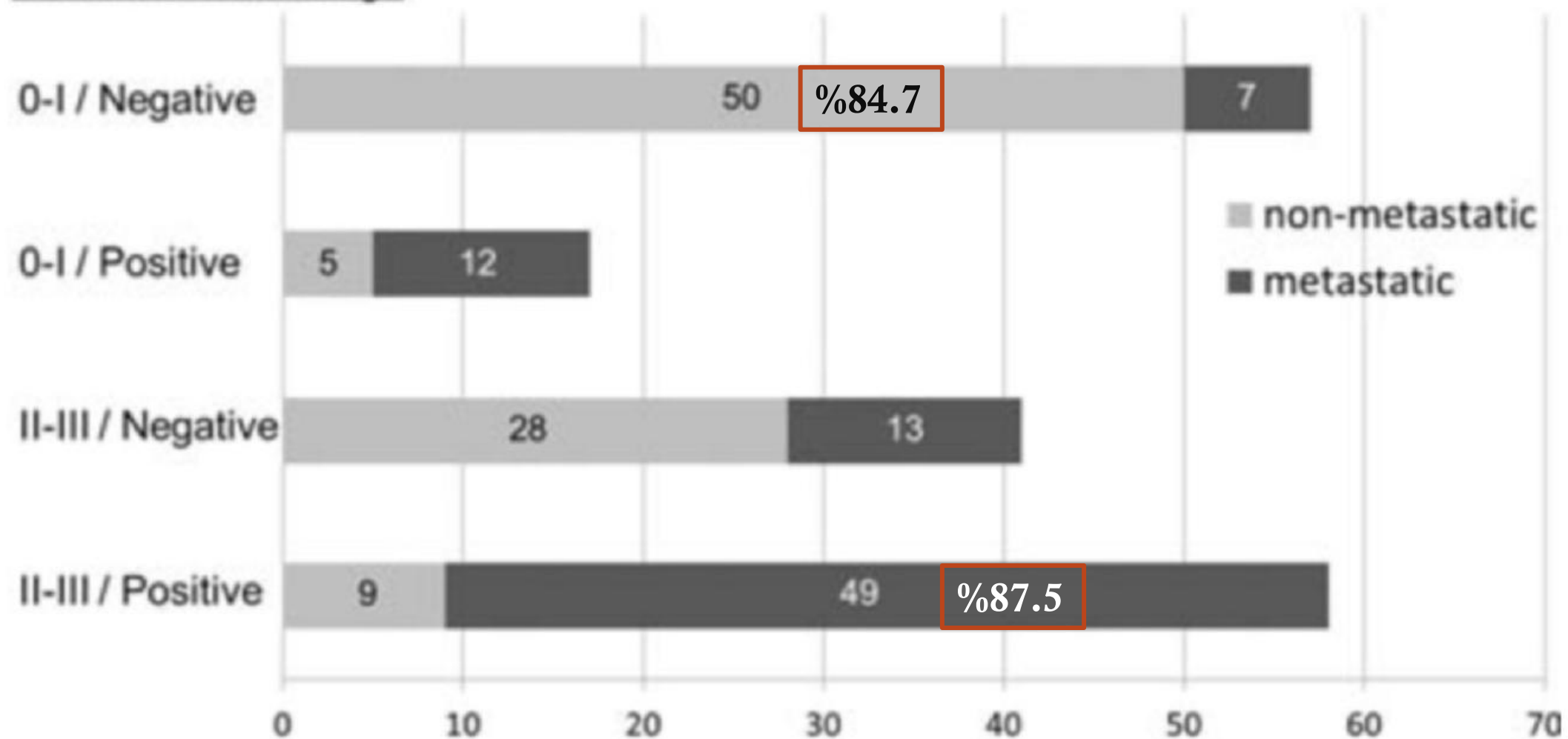


# Vascular Image Patterns of Lymph Nodes for the Prediction of Metastatic Disease During EBUS-TBNA for Mediastinal Staging of Lung Cancer

Takahiro Nakajima, MD, PhD,\*†‡ Takashi Anayama, MD, PhD,\* Masato Shingyoji, MD, PhD,†  
Hideki Kimura, MD, PhD,† Ichiro Yoshino, MD, PhD,‡ and Kazuhiro Yasufuku, MD, PhD\*



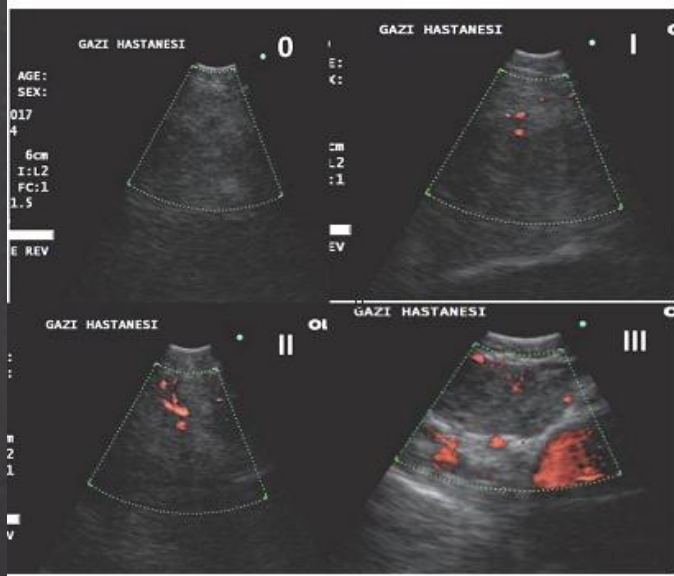
Grade / Ba inflow sign



**EBUS-TBİA ESNASINDA DOPPLER MOD İLE  
DEĞERLENDİRİLEN VASKÜLER İMAJ PATERİNİNİN  
BENİGN VE MALİGN LENF NODU AYIRIMINDAKİ DEĞERİ**

THE VALUE OF THE VASCULAR IMAGING PATTERN ASSESSED  
BY THE DOPPLER MODE DURING EBUS-TBNA IN DIFFERENTIATING  
BETWEEN BENIGN AND MALIGNANT LYMPH NODES

**Nilgün YILMAZ DEMİRCİ, Can ÖZTÜRK**



**Tablo 2.** Vasküler yapı derecelendirmesi/değerlendirmesi

Vasküler yapı derecesi	Grade 0-1	Grade 2-3
İstasyon 10	6	18
İstasyon 11	11	21
İstasyon 2R	5	9
İstasyon 4R	25	49
İstasyon 4L	8	13
İstasyon 7	21	43
Küçük hücreli karsinom	7	29
Skvamöz hücreli karsinom	16	23
Adenokarsinom	24	48
Küçük hücreli dışı karsinom(NOS)	7	9
Benign/Negatif LN	22	13

NOS: not otherwise specified, LN: Lenf nodu

Tanısal doğruluk: %74

Duyarlılık: %83.2

Özgüllük: %66.7

NPV: %69.7

PPV: %82.3



# PATOLOJİK TANI ÖNCESİ BENİGN ve MALİGN AYRIMI MÜMKÜN MÜ?

- ◆ Lezyonun Ultrasonografik özellikleri
- ◆ Vasküler özellikler
- ◆ Elastografi

# ELASTOGRAFI

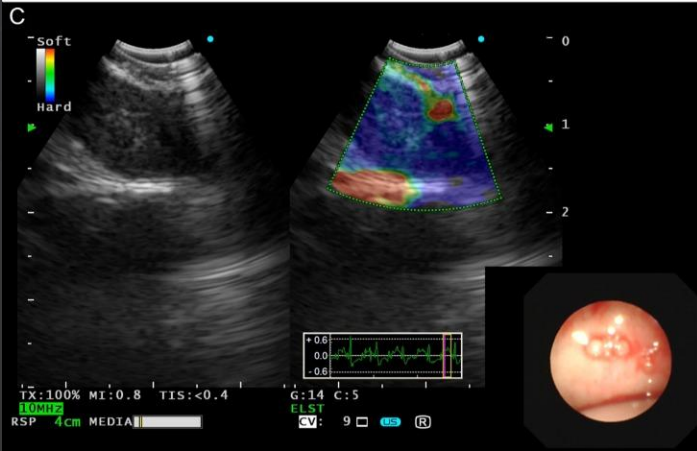
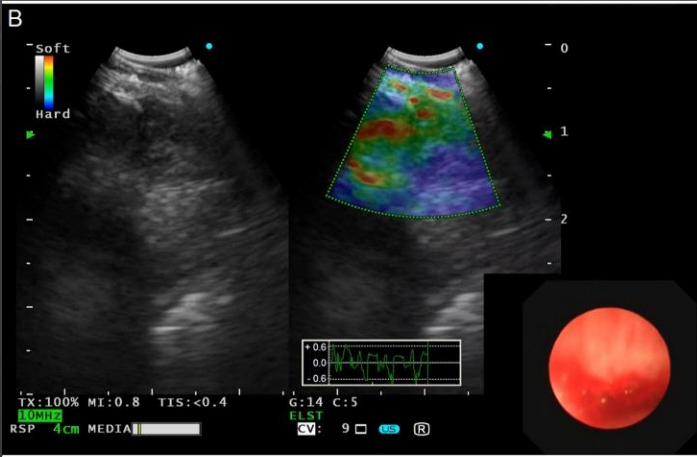
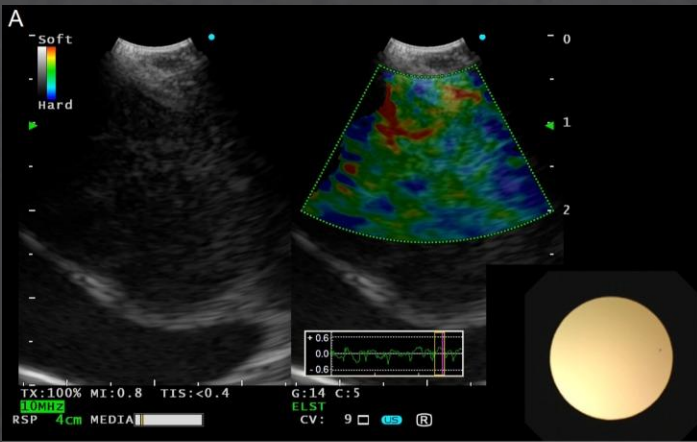
- Lezyonun yumuşaklığı

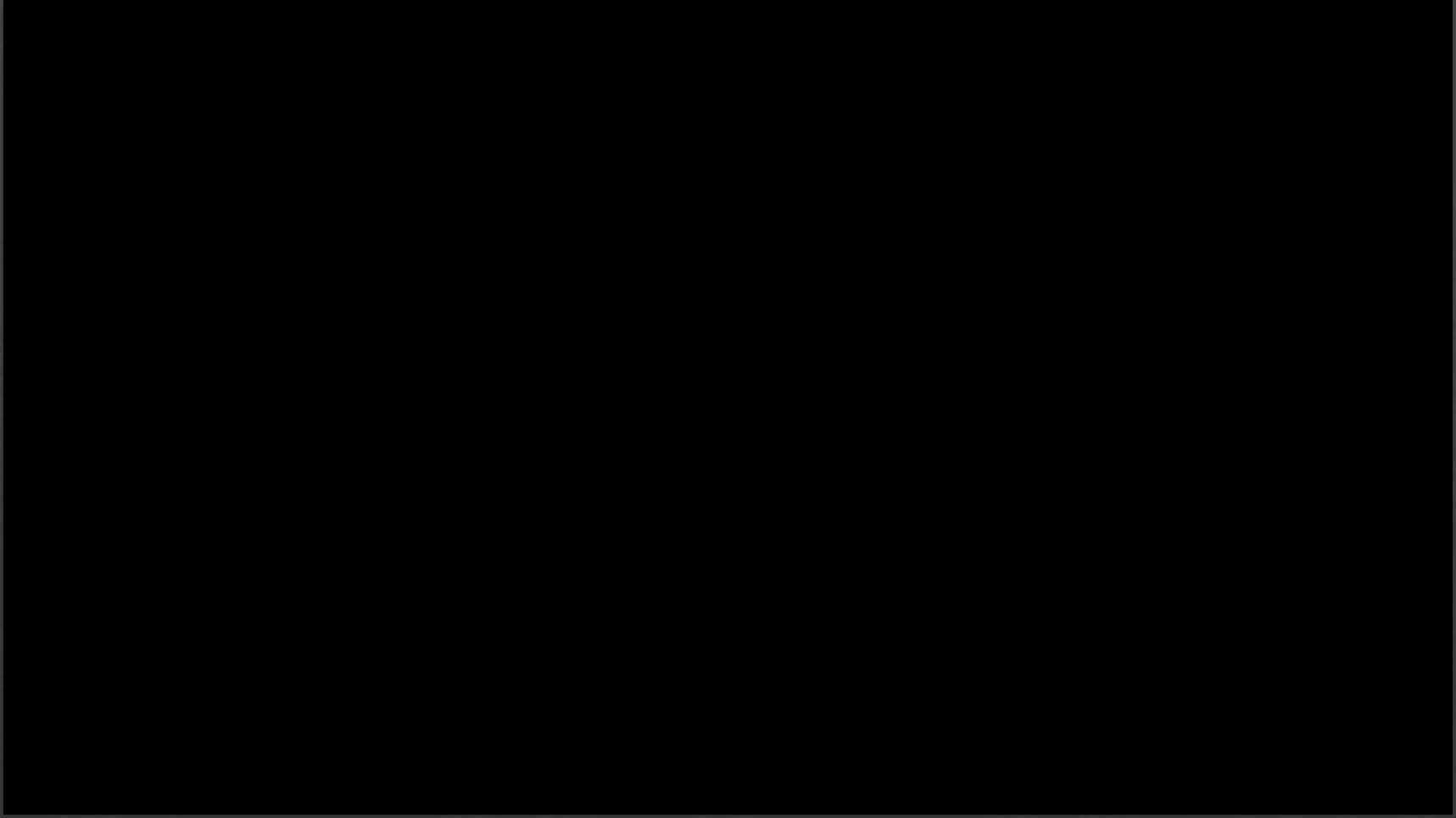
- 3 elastografik tip (*Izumo et al.*);

Tip 1, predominant non-blue (green, yellow, and red)

Tip 2, part blue, part non-blue (green, yellow, and red)

Tip 3, predominant blue







# Endobronchial Ultrasound Elastography in the Diagnosis of Mediastinal and Hilar Lymph Nodes

Takehiro Izumo\*, Shinji Sasada, Christine Chavez, Yuji Matsumoto and Takaaki Tsuchida

Elastography type	Number of benign LNs/total number (%)	Number of malignant LNs/total number (%)
Type 1 ( <i>n</i> = 24)	24/24 (100)	0/24 (0)
Type 2 ( <i>n</i> = 14)	6/14 (42.9)	8/14 (57.1)
Type 3 ( <i>n</i> = 37)	2/37 (5.4)	35/37 (94.6)

Jpn J Clin Oncol 2014;44(10)956– 962

- **Izumo et al;**
- Tip 1 lenf nodlarından biyopsi alınmayabilir (%100 benign)
- Tip 3 lenf nodlarından küçük dahi olsa mutlaka alınmalı (%94.6 malign)
- Tip 2 lenf nodlarından özellikle mavi görüntünün olduğu yerlerden USG rehberliğinde biyopsiler alınmalıdır

# Endobronchial Ultrasound Elastography in the Diagnosis of Mediastinal and Hilar Lymph Nodes

Takehiro Izumo\*, Shinji Sasada, Christine Chavez, Yuji Matsumoto and Takaaki Tsuchida

# Effectiveness of the Benign and Malignant Diagnosis of Mediastinal and Hilar Lymph Nodes by Endobronchial Ultrasound Elastography

Haidong Huang<sup>1\*</sup>, Zhiang Huang<sup>2\*</sup>, Qin Wang<sup>1\*</sup>, Xinan Wang<sup>3\*</sup>, Yuchao Dong<sup>1</sup>, Wei Zhang<sup>1</sup>, Paul Zarogoulidis<sup>4</sup>, Yan-Gao Man<sup>5</sup>, Wolfgang Hohenforst Schmidt<sup>6</sup>, Chong Bai<sup>1</sup>

Elastography type	Number of benign LNs/total number (%)	Number of malignant LNs/total number (%)
Type 1 (n = 24)	24/24 (100)	0/24 (0)
Type 2 (n = 14)	6/14 (42.9)	8/14 (57.1)
Type 3 (n = 37)	2/37 (5.4)	35/37 (94.6)

Jpn J Clin Oncol 2014;44(10)956– 962

Elastography type	Number of malignant LNs/total number (%)	Number of benign LNs/total number (%)
Type 1 (n=27)	1/27 (3.7%)	26/27 (96.3%)
Type 2 (n=20)	5/20 (25.0%)	15/20 (75.0%)
Type 3 (n=31)	27/31 (87.1%)	4/31 (12.9%)

Journal of Cancer 2017;8:1843-8

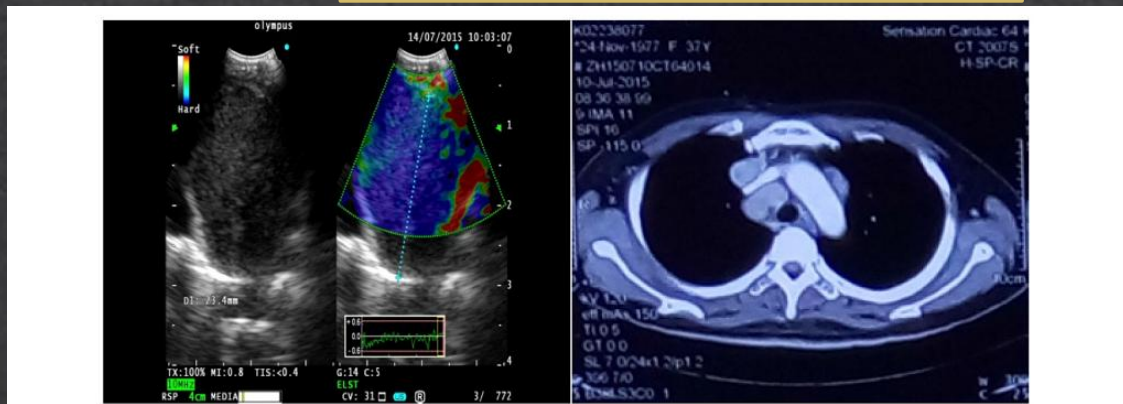


Figure 2: A case of 4R with Type 1 lymph node on EBUS elastography, pathological results show scattered granulomas, did not clear tumor lesions, considering sarcoidosis.

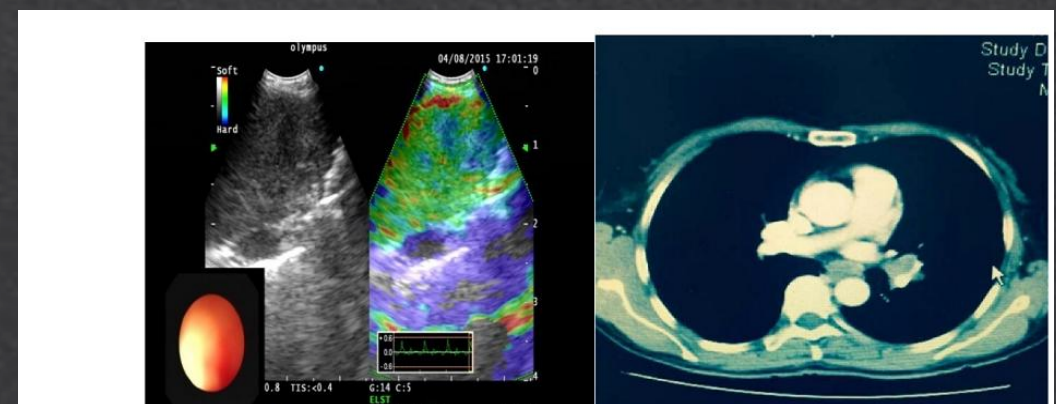
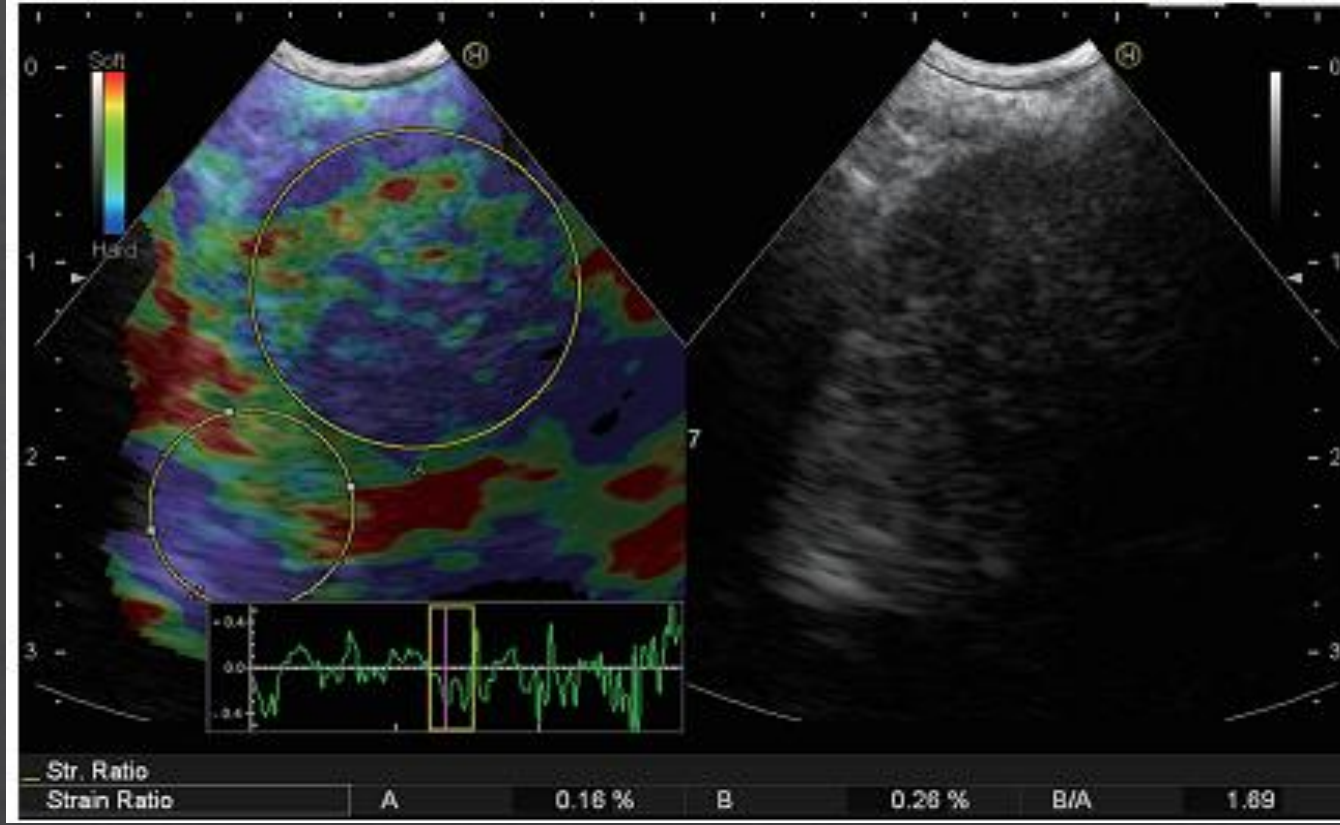


Figure 3: A case of 11L with Type 1 lymph node on EBUS elastography, pathological results show poorly differentiated adenocarcinoma.





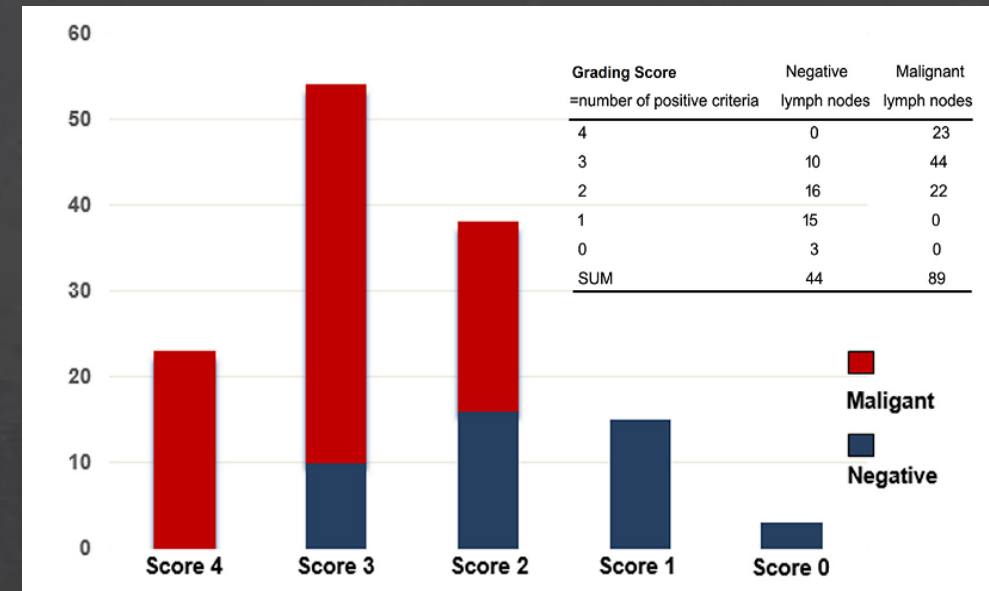
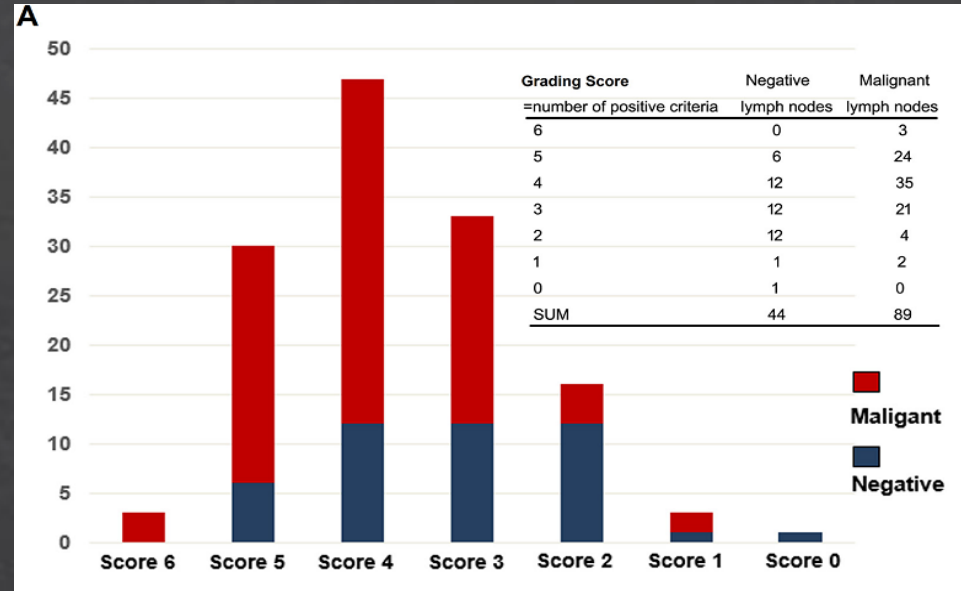
## Strain Ratio ölçümü

- Strain Ratio (B/A) (A: Bölgenin Ortalama Elastik sertliği; B: Normal alan) Ultrason software ile hesaplanabilmektedir (Hitachi'de mevcut).
- Sayısal veri ile malign benign ayrımında kullanılabilir (???)
- Henüz sayısal bir cut-off verisi mevcut değildir.



## The role of endobronchial ultrasound elastography in the diagnosis of mediastinal and hilar lymph nodes

Ye Gu<sup>1,\*</sup>, Hong Shi<sup>2,\*</sup>, Chunxia Su<sup>3</sup>, Xiaoxia Chen<sup>3</sup>, Shijia Zhang<sup>3</sup>, Wei Li<sup>3</sup>, Fengying Wu<sup>3</sup>, Guanghui Gao<sup>3</sup>, Hao Wang<sup>1</sup>, Haiqing Chu<sup>4</sup>, Caicun Zhou<sup>3</sup>, Fei Zhou<sup>3</sup> and Shengxiang Ren<sup>3</sup>



◇ **A:** Boyut, Şekil, Sınır yapısı, Ekojenite (Heterojenite), Santral hiler yapısı, Koagülasyon Nekrozu

◇ **Skor 4-6:** Yüksek riskli malign **OR: 5.99 (%95 CI, 2.09 to 17.19)**

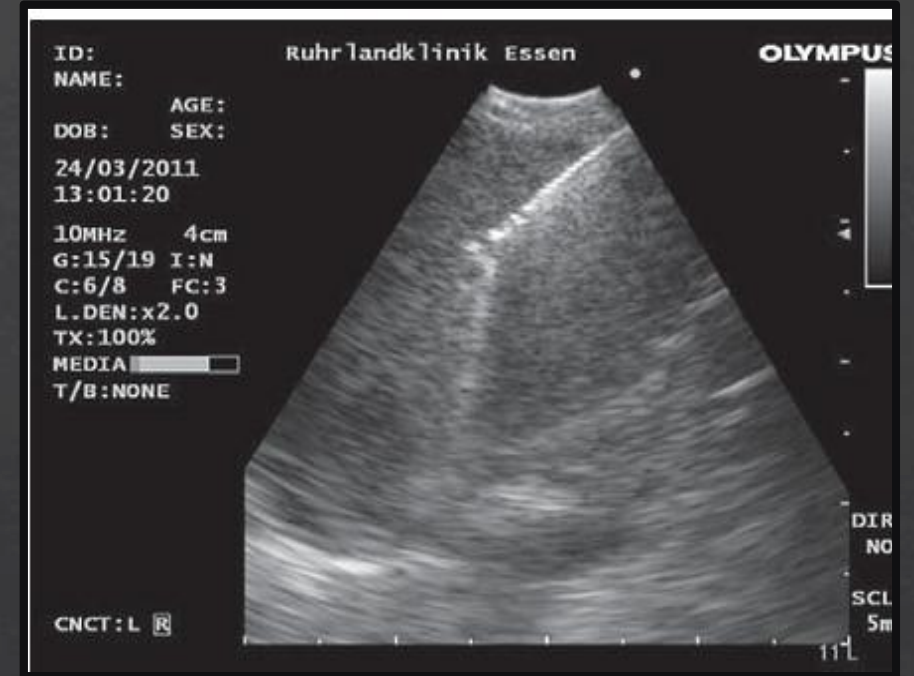
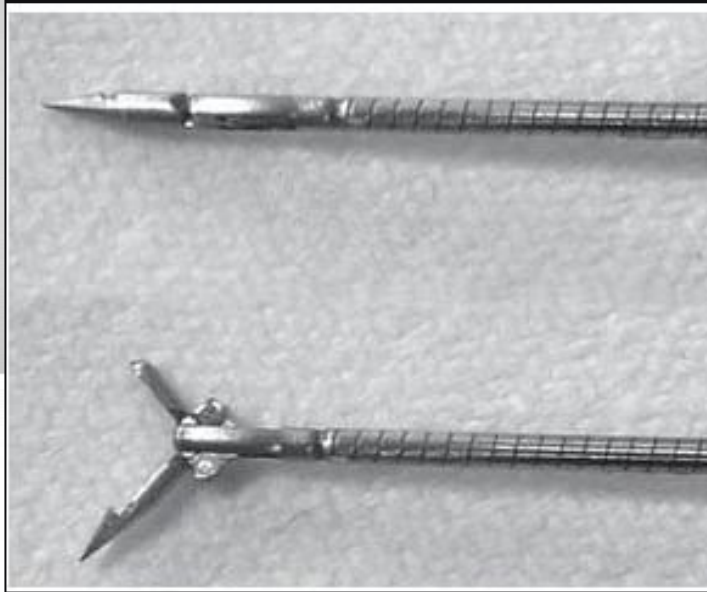
◇ **Skor 1-3:** Düşük riskli malign

◇ **B:** Heterojenite, Boyut, Şekil, Elastografi

◇ **Skor 3-4:** Yüksek riskli malign **OR: 9.44 with a 95% CI 3.99 to 22.32**

◇ **Skor 1-2** Düşük riskli malign

- Mini Forseps/ Lenf nodu forsepsi  
(Trans Bronşiyal Forseps Biyopsisi (TBFB))



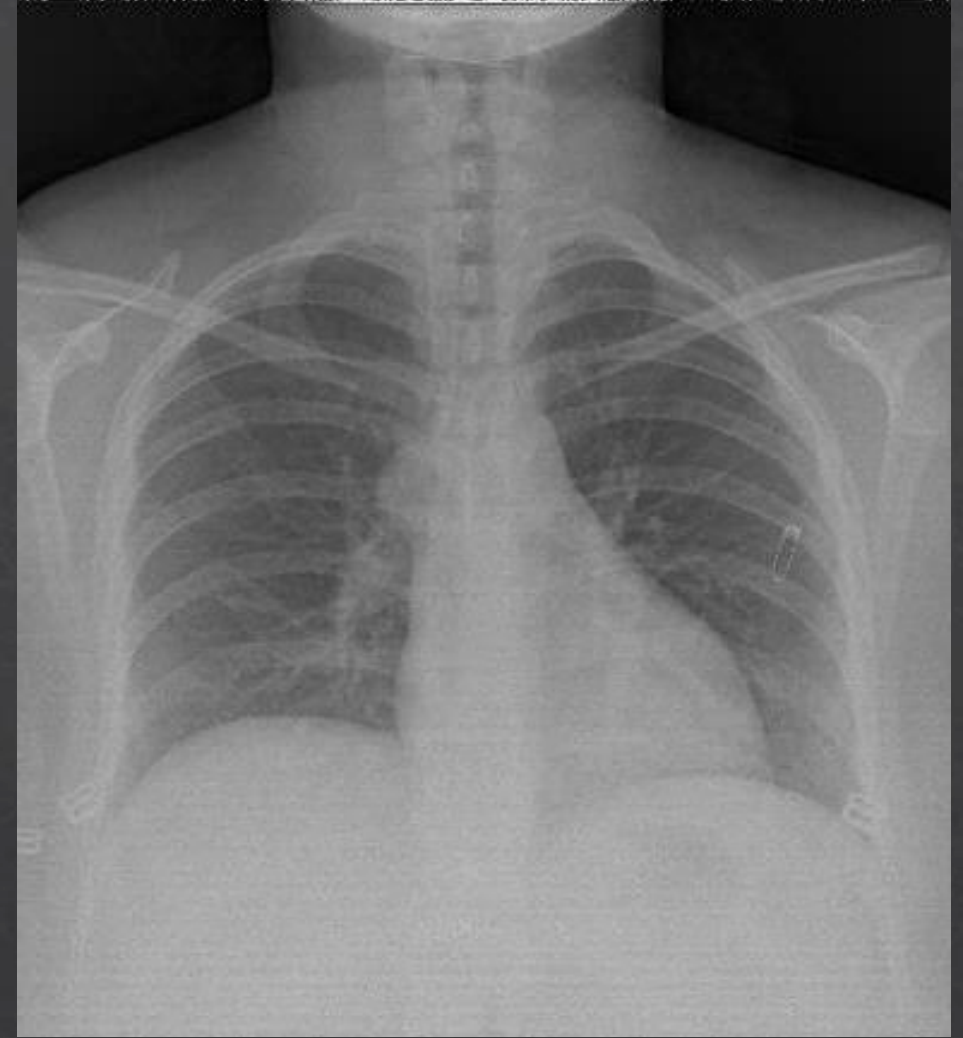
# EBUS için Gelecek Teknolojiler

- Yüksek çözünürlük USG ve daha ince problemler
- 3D teknolojisi
- Harmonik kontrast görüntüleme (HCI)

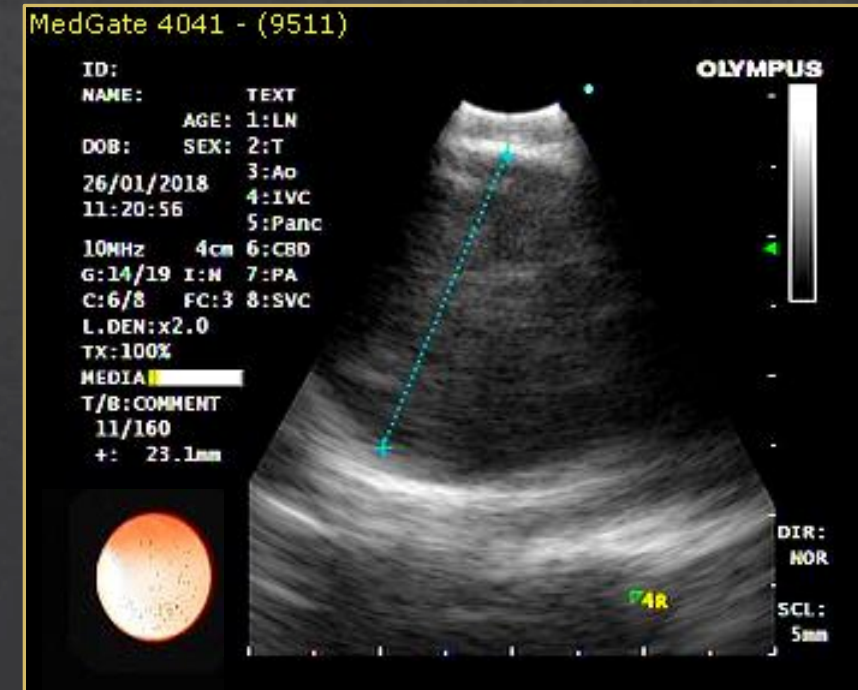
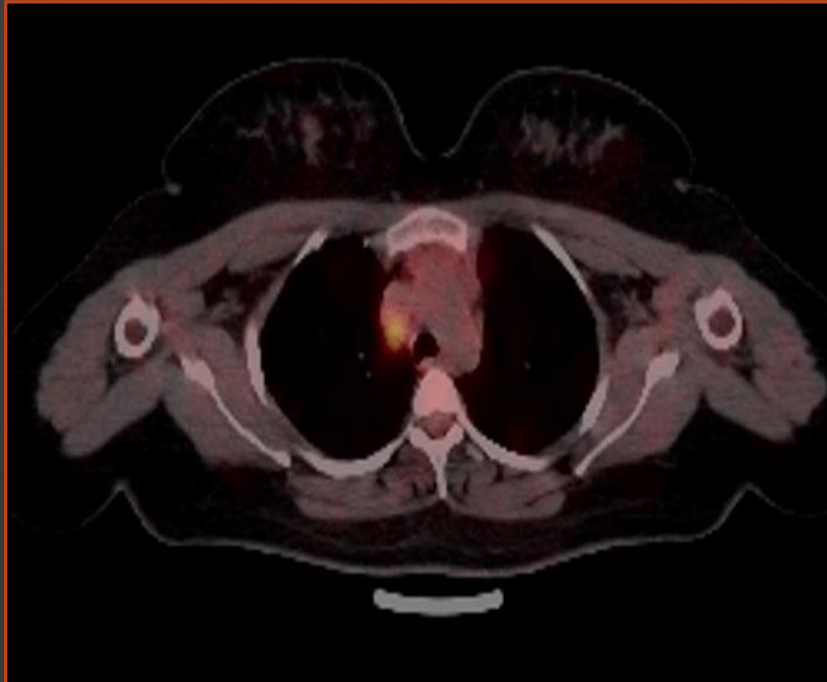
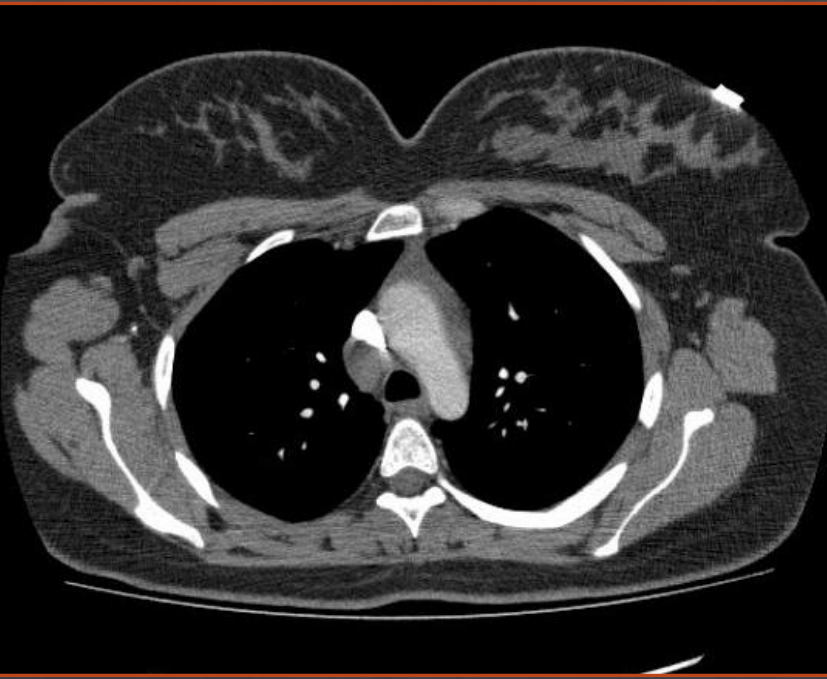


OLGU SUNUMU

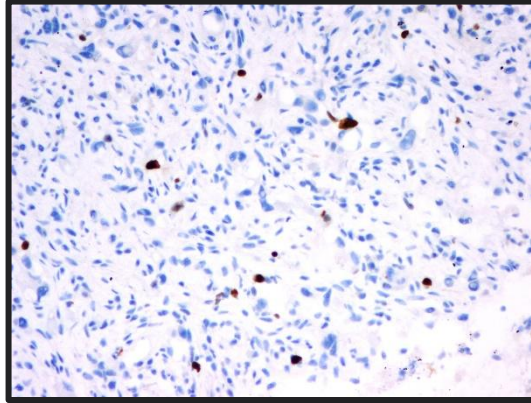
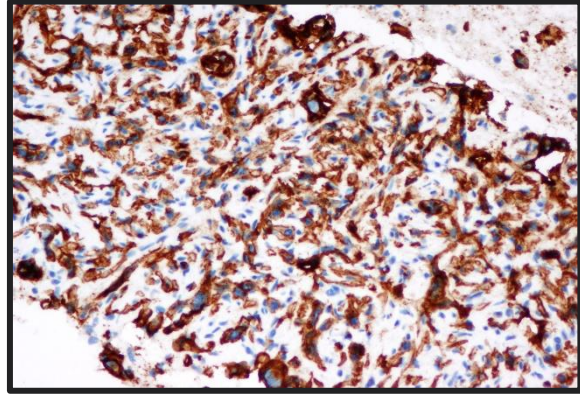
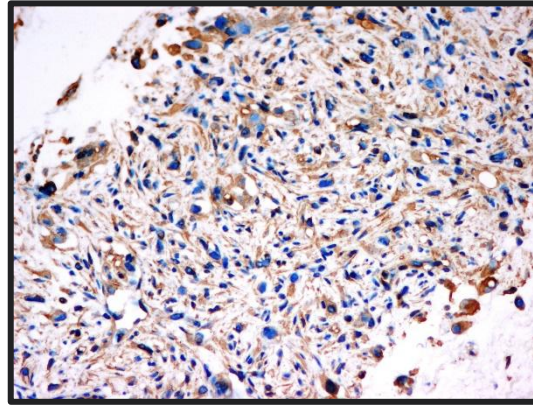
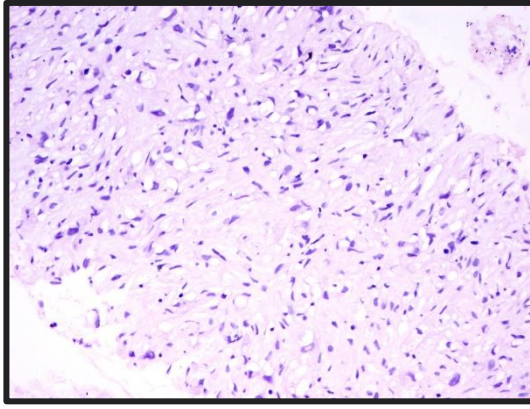
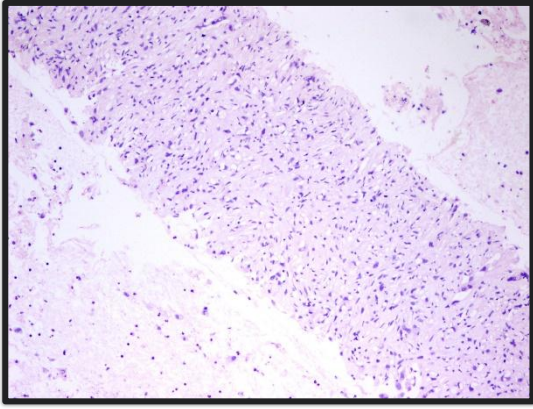
- ◆ 30 yaşında kadın hasta
- ◆ Pnömoni nedeniyle Ocak 2018'de dış merkezde tedavi
- ◆ Kontrol PAAC grf (10 gün sonra)



- ◆ Toraks BT 'de  
4R lokalizasyonunda  
20X15 mm boyutlarında LAP
- ◆ PET-CT: 4R , SUVmax: 8.7
- ◆ EBUS TBNA ile örnekler alındı







Vimentin ve CD34 ile kuvvetli boyanan, Ki67 proliferasyon indeksi %5 olan Mezenkimal Tm  
**«Soliter Fibröz Tümör»**

TEŞEKKÜRLER