Endobronşiyal Ultrasonografi

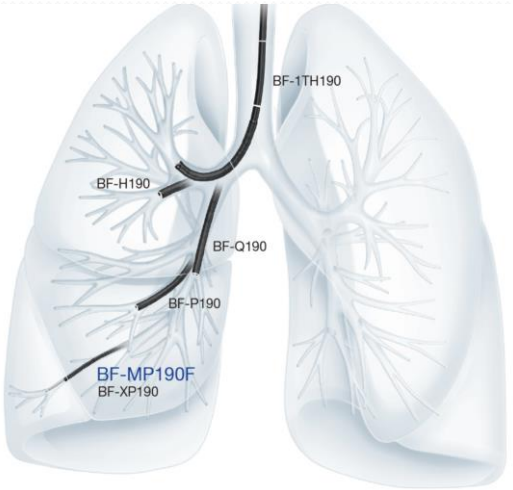
Dr.Aydın Çiledağ
Ankara Üniversitesi Tıp Fakültesi Göğüs Hastalıkları ABD

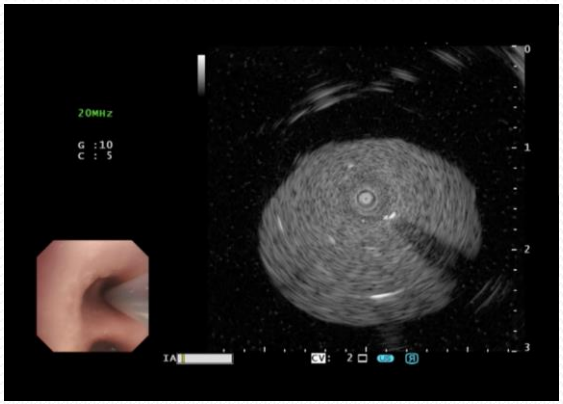
Endosonografi

- İlk uygulamalar (1980'lerde) gastroenteroloji (özefagus, mide, kolon-rektum karsinomlarında evreleme amaçlı)
- İlk EBUS probları 1992'da (radyal prob)
- 2002'de Konveks prob EBUS

Radal prob EBUS

- FOB çalışma kanalından uygulanır
- 1.7-2.6 mm çap



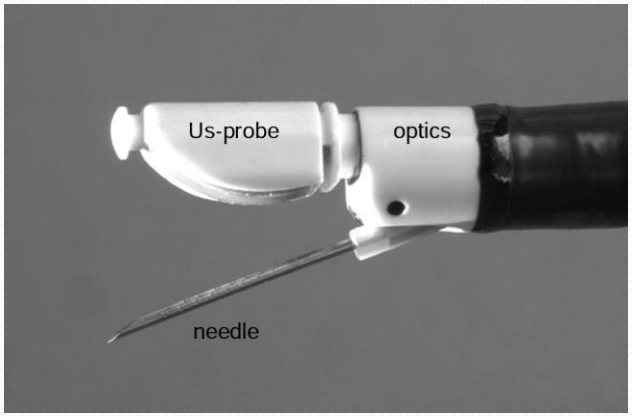


Radyal Prob Endikasyonları

- Hiler-mediastinal lenfadenopatilerin tanısı ve akciğer kanserli hastalarda mediastinal evreleme
- Erken akciğer kanseri (tanı-tedavi)
- Tümörün trakeobronşiyal duvar ve mediastene invazyonu
- Periferik akciğer lezyonları (soliter/diffüz)

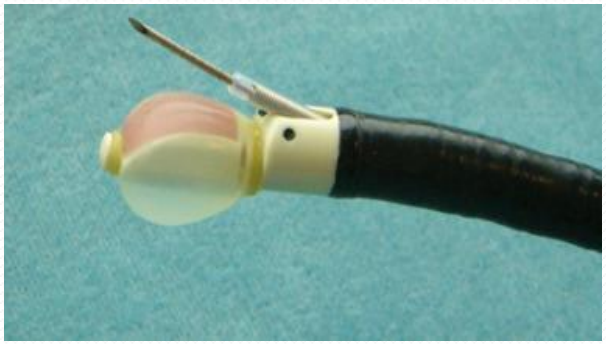
Konveks Prob EBUS (CP-EBUS)

Bronkoskobun ucunda konveks olarak yerleştirilmiş ultrason probu



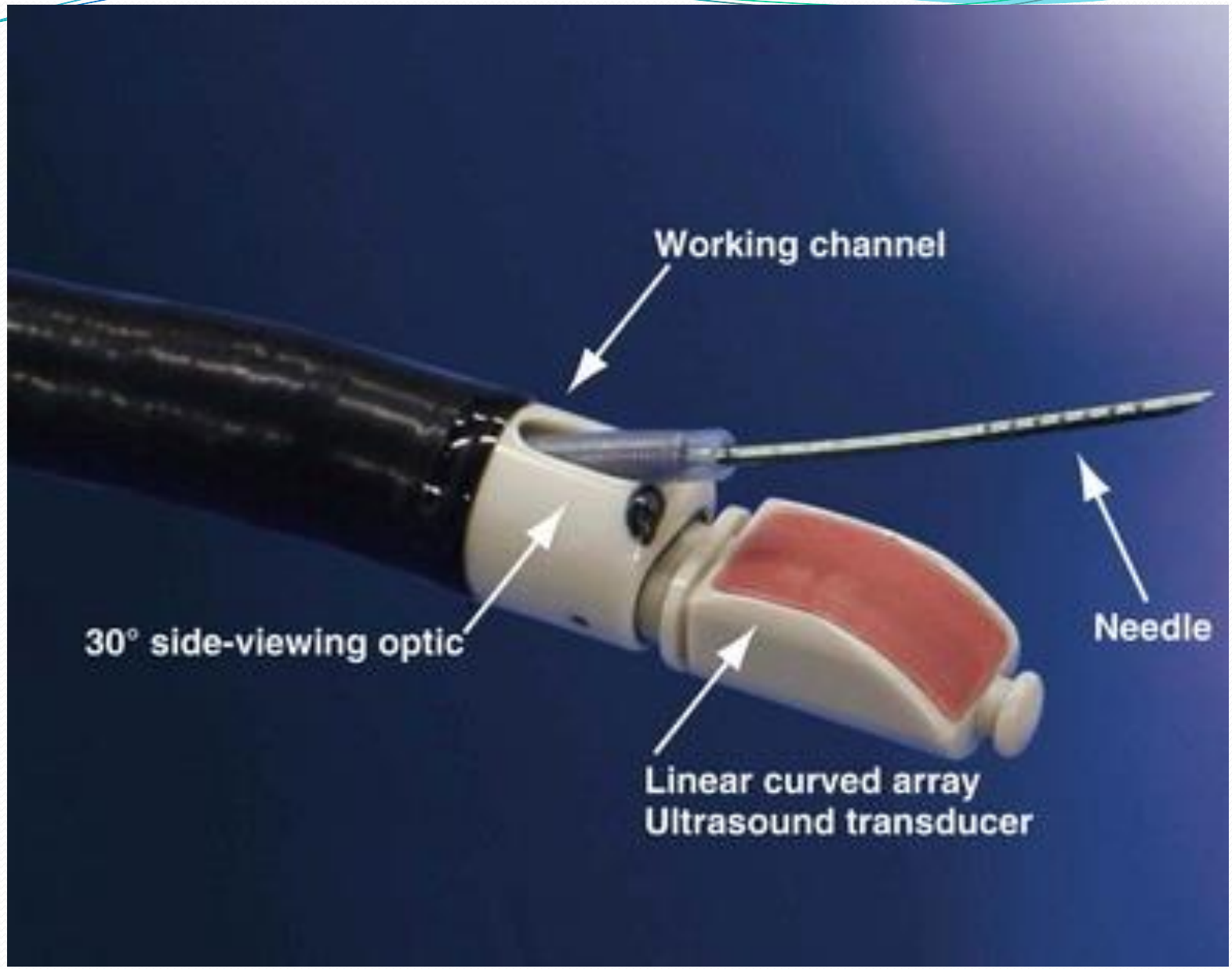
Mediastinal ve hiler alanlara komşu yapıların sadece görüntülemesini değil, gerçek zamanlı örneklenmesine de kılavuzluk sağlar

Renkli doppler özelliği



CP-EBUS Endikasyonları

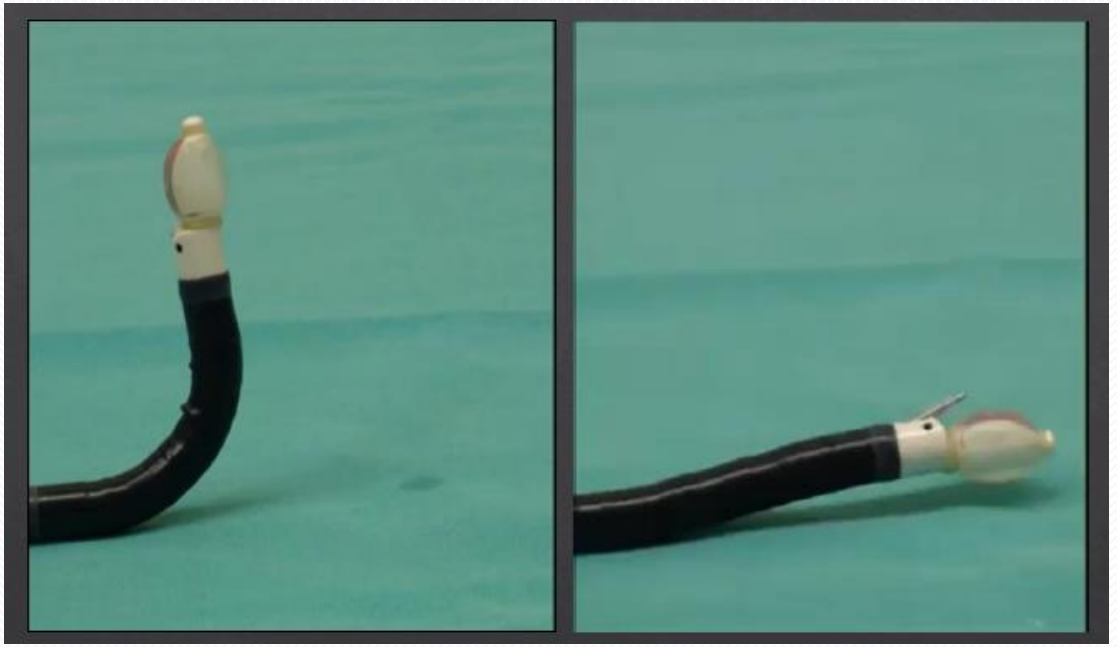
- Akciğer ca tanısı (primer/metastatik)
  (mediastinal LAP ve peribronşiyal/paratrakeal kitle)
- Akciğer ca evreleme/yeniden evreleme
- Akciğer kanserinde moleküler analiz
- Mediastinal-hiler LAP (benign etyolojiler)
  (Sarkoidoz/Tüberküloz/Silikozis/Fungal infeksiyonlar...)
- Diğer benign patolojiler (benign tümörler, mediastinal kist, pulmoner emboli, nontrombotik endovasküler lezyonlar...)


Working channel
30° side-viewing optic
Needle
Linear curved array
Ultrasound transducer

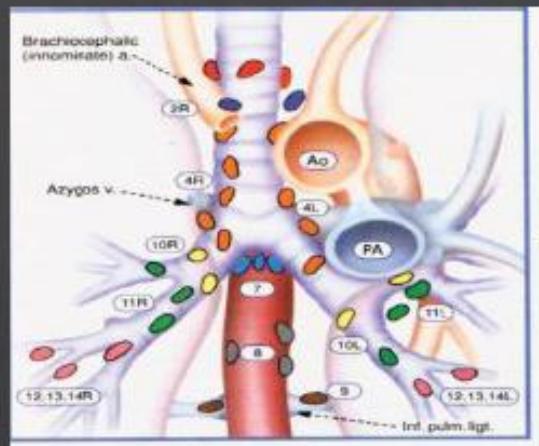

İĞNE
Baglantı parcası
İğne ayar apareyi
Aspirasyon portu
Skala
Kılıf ayar düğmesi
İğne ayar düğmesi
Stilet

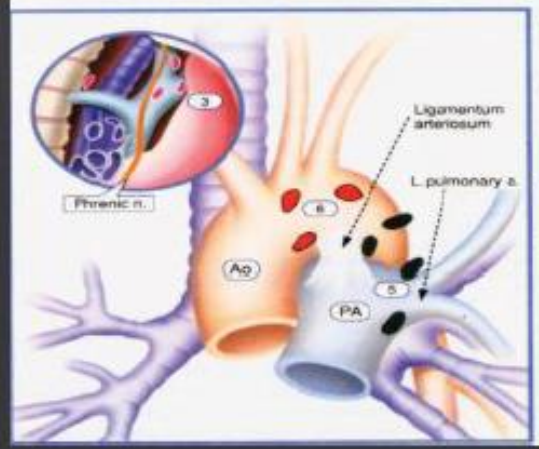

MERIT
VACLOK

BALON



IASLC Lenf Nodu Haritası





Superior Mediastinal Nodes

- 1 Highest Mediastinal
- 2 Upper Paratracheal
- 3 Pre-vascular and Retrotracheal
- 4 Lower Paratracheal (including Azygos Nodes)

→ Upper zone (R)

N_1 = single digit, ipsilateral
N_2 = single digit, contralateral or supraclavicular

Aortic Nodes

- 5 Subaortic (A-P window)
- 6 Para-aortic (ascending aorta or phrenic)

→ AP zone (L)

Inferior Mediastinal Nodes

- 7 Subcarinal → Subcarinal zone
- 8 Paraesophageal (below carina)
- 9 Pulmonary Ligament

→ Lower zone

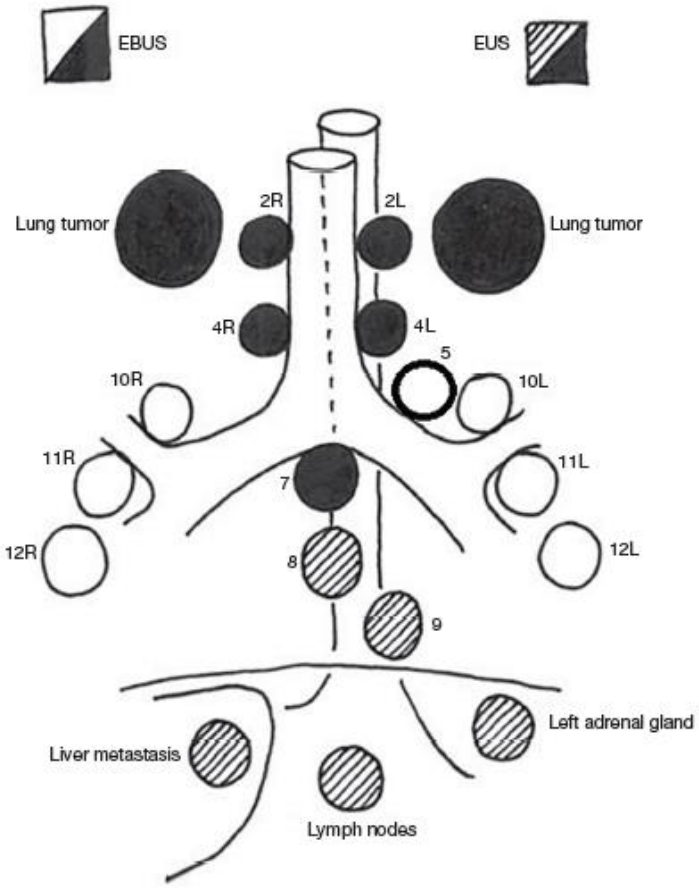
N_1 Nodes

- 10 Hilar
- 11 Interlobar

→ Hilar zone

- 12 Lobar
- 13 Segmental
- 14 Subsegmental

→ Peripheral zone

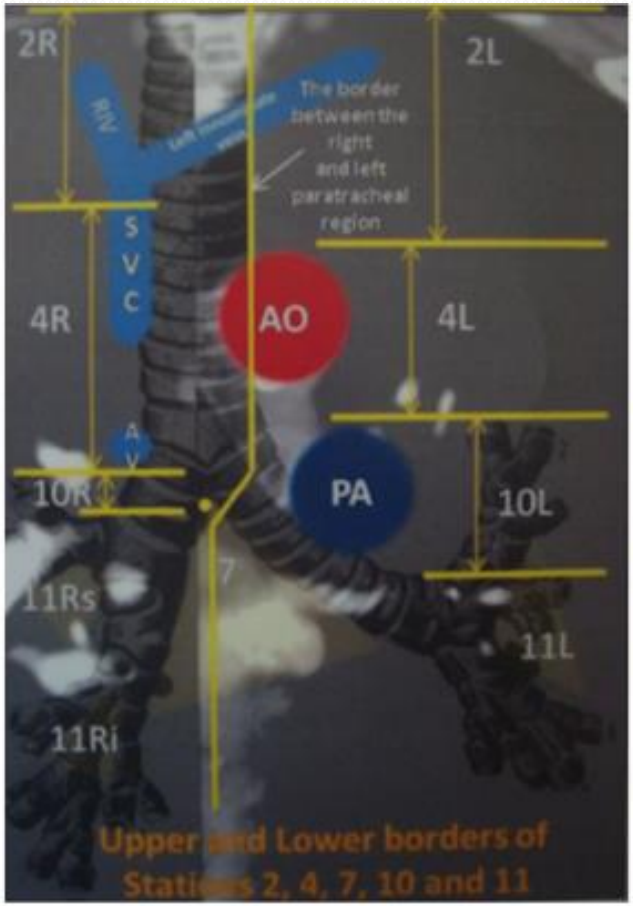


Procedures	2R	2L	3a	3p	4R	4L	5	6	7	8	9	10R	10L	11R	11L
Cervical mediastinoscopy	+	+	−	−	+	+	−	−	+	−	−	+	−	−	−
Extended mediastinoscopy	+	+	−	−	+	+	+	+	+	−	−	−	−	−	−
Left VATS	−	−	−	−	−	+/−	+	+	+	+	+	−	+	−	+
Right VATS	+	−	+	+	+	−	−	−	+	+	+	+	−	+	−
VAMLA	+	+	−	−	+	+	−	−	+	+	−	−	−	−	−
TEMLA	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−

Üst Paratrakeal Lenf Nodları

2R;
Alt sınır: İnnominant ven alt kenarı

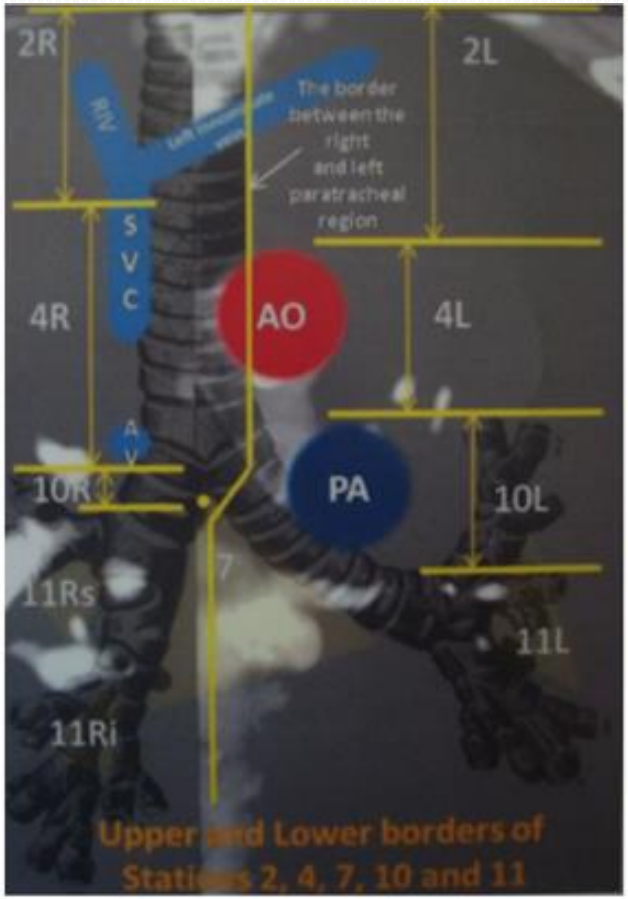
2L;
Alt sınır: Arkus aortanın üst kenarı



Alt Paratrakeal Lenf Nodları

4R;
Üst sınır: İnnominant ven alt kenarı
Alt sınır: Azigos venin alt kenarı

4L;
Üst sınır: Arkus aortanın üst kenarı
Alt sınır: Sol ana pulmoner arterin üst kenarı



Subkarinal Lenf Nodu

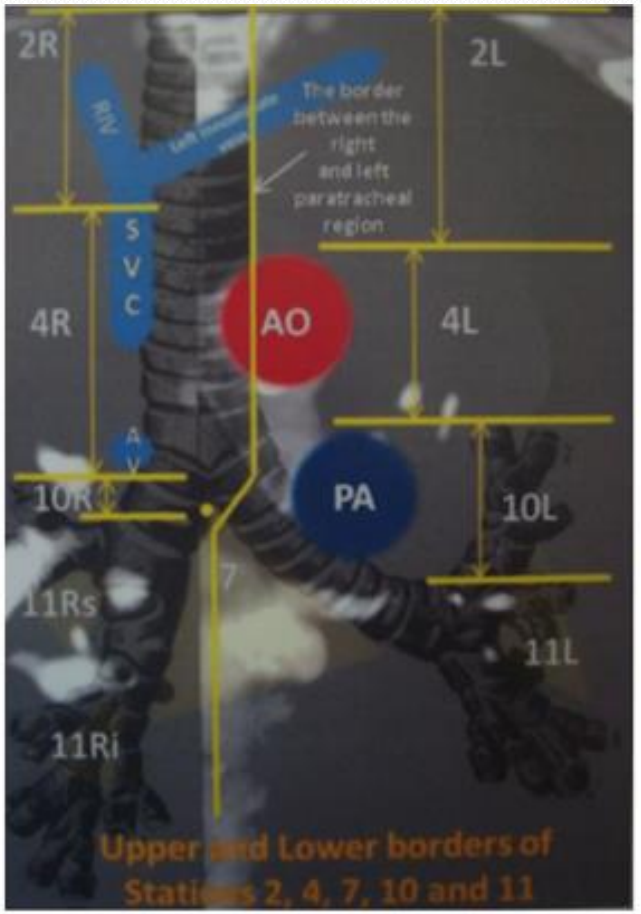
7;

Üst sınır: ana karina

Alt sınır:

Solda alt lob bronşun üst kenarı

Sağda ara bronşun alt kenarı



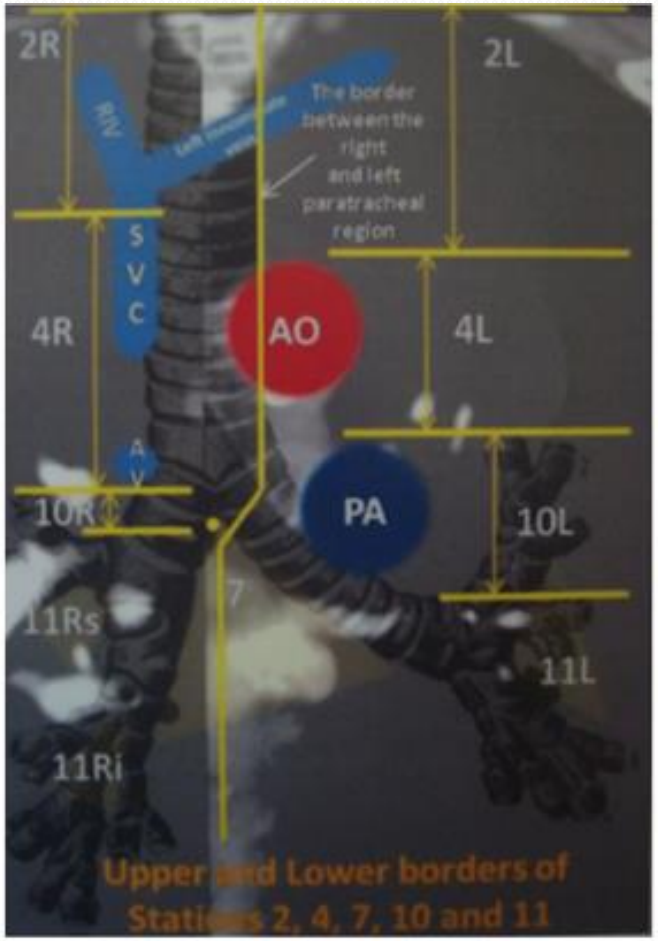
Hiler Lenf Nodları (10)

10R;

Sağ ana bronşta azigos venin alt kenarı ve interlober alanın üzerinde

10L;

Sol ana bronşta saat 10 pozisyonunda pulmoner arter üst kenarı ile interlober alan arasında

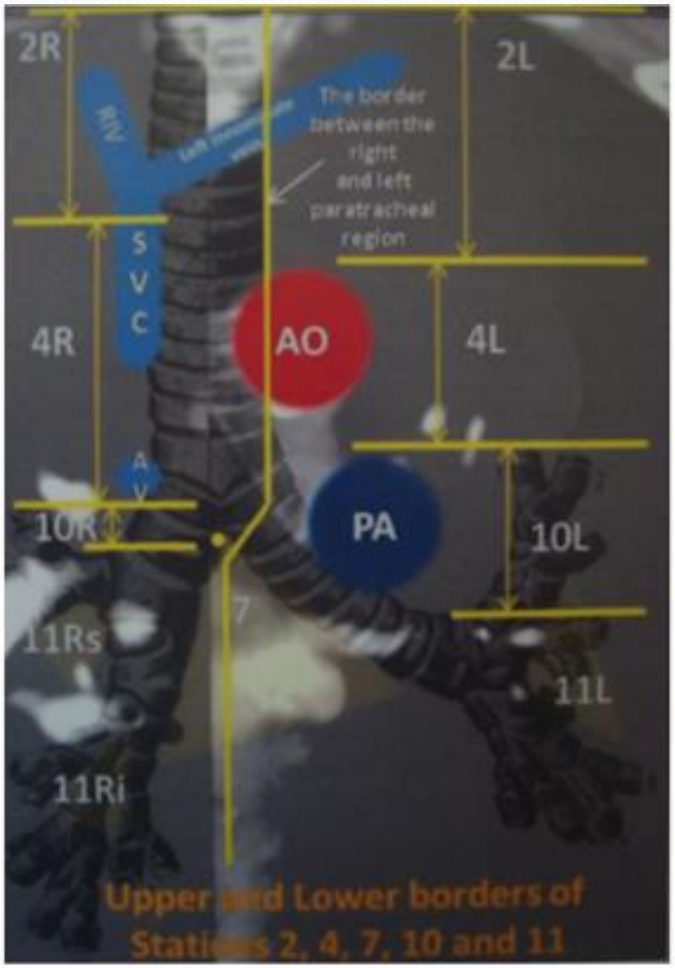


İnterlober Lenf Nodları (11)

11Rs;
Sağ lateral duvarda üst lob bronşu ile ara bronş arasında

11Ri;
Orta ile alt lob bronşu arasında

11L;
Solda interlober alanda alt lob proksimal kısımda



EBUS

- **Sedasyon**

*Orta derecede sedasyon

*Derin sedasyon

*Genel anestezi

Sedasyon

Technical Aspects of Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration

CHEST Guideline and Expert Panel Report

CHEST 2016; 149(3):816-835

In patients undergoing EBUS-TBNA, we suggest that either moderate or deep sedation is an acceptable approach (Grade 2C).

Teknik

- İğne???
- Lenf nodu örnekleme sırası ???
- Örnekleme sayısı???
- ROSE???

İğne

- 22 Gauge
- 21 Gauge
- 19 Gauge
- 25 Gauge

Review > Diagnostics (Basel). 2021 Dec 10;11(12):2331. doi: 10.3390/diagnostics11122331.

Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration (EBUS-TBNA): Technical Updates and Pathological Yield

Intervention	Type of Study and Number of Patients/LN (*n*)	Overall Findings
Needle size 21 vs. 22 G	• Retrospective study (*n* = 1235 patients) • Systematic review	• No statistically significant difference in diagnostic yield
Needle size 22 vs. 25 G	• Prospective randomized crossover study (*n* = 102 patients) • Retrospective propensity-matched study (*n* = 158 LN)	• No statistically significant difference in diagnostic yield
Needle size 21 vs. 25 G	• * Prospective study (*n* = 50 patients)	• No statistically significant difference in diagnostic yield
Needle size 22 vs. 19 G	• * Single-center prospective study (*n* = 27) • Randomized controlled trial (*n* = 78) • Prospective randomized trial (*n* = 107 patients)	• No statistically significant difference in diagnostic yield • More bloody passes and lower sample adequacy were observed with the 19 G needle aspirates • More cellular material in the cell block obtained with the 19 G
Needle size 21 vs. 19 G	• * Prospective study (*n* = 47 patients) [13]	• No statistically significant difference in diagnostic yield • More cellular material in the cell block obtained with the 19 G
Needle size 19 vs. 21 vs. 22 G	• Retrospective study (*n* = 300 patients) [15]	• A higher proportion of lymphoma and benign disease found in LN sampled with the 19 G compared with 21 G and 22 G

İğne

Technical Aspects of Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration

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CHEST 2016; 149(3):816-835

In patients undergoing EBUS-TBNA, we recommend that the use of either a 21- or 22-gauge needle is an acceptable option (Grade 1C).

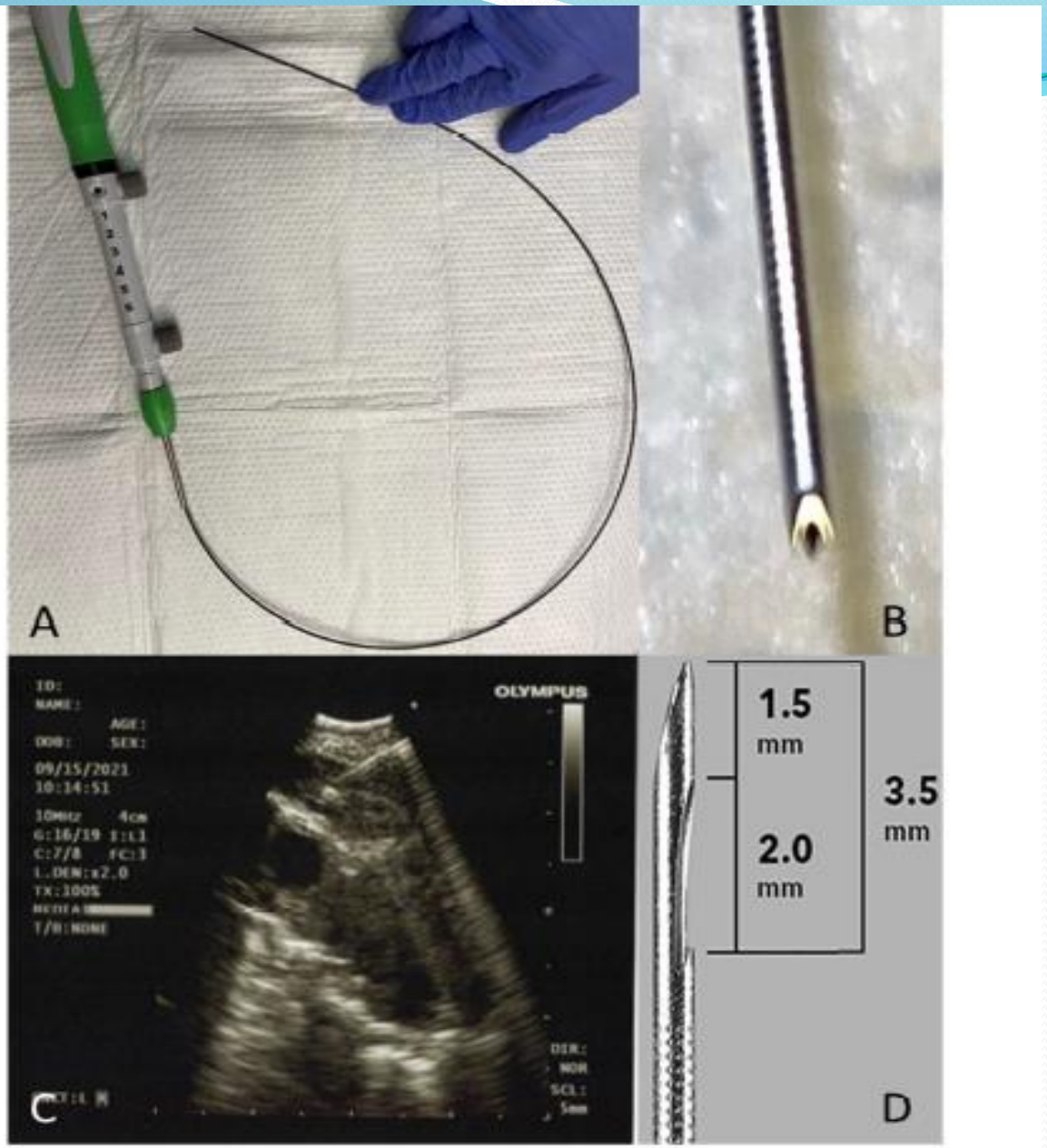


Figure 1. Core biopsy needle. (**A**) Acquire® 22 G FNB needle. (**B**) Acquire Franseen needle tip. (**C**) EBUS-FNB of a hilar lymph node. (**D**) ProCore® needle with reverse bevel (image obtained with permission from John Wiley & Sons, Inc., Hoboken, NJ, USA) [24].

Figure 2. Mini-biopsy forceps. (**A**) Boston Scientific CoreDxTM Pulmonary Mini-Forceps. (**B**) Tip of the CoreDxTM Pulmonary Mini-Forceps. (**C**) Hole (arrow) created in the mucosa by TBNA needle. (**D**) Mini-forceps passed through the hole for biopsy of mediastinal structures.

Review > Diagnostics (Basel). 2021 Dec 10;11(12):2331. doi: 10.3390/diagnostics11122331.

Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration (EBUS-TBNA): Technical Updates and Pathological Yield

Core needle versus 22 G	• Retrospective study (n = 235 patients) [25]	• Core needle biopsy had higher overall sensitivity compared with standard EBUS-TBNA. • Additional biopsy tests such as mediastinoscopy and CT-guided FNA were obtained in fewer patients who underwent EBUS core biopsy.
Mini-forceps vs. TBNA	• * Prospective study evaluating 22 G, 19 G, and mini-forceps biopsy (n = 75) [27] • * Prospective study (n = 50 patients) [28]	• Mini-forceps resulted in a higher diagnostic yield in sarcoidosis and lymphoma
Lymph node cryobiopsy vs. TBNA	• * Randomized controlled trial (n = 197 patients) [33]	• Cryobiopsy had a higher sensitivity in benign but not in malignant lymphadenopathy

Lenf nodu örnekleme sırası

- **Boyut;**

  >5 mm, ulaşılabilir lenf nodları

- **Örnekleme sırası;**

  N3, N2, N1

ROSE

Technical Aspects of Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration

CHEST Guideline and Expert Panel Report

CHEST 2016; 149(3):816-835

In patients undergoing EBUS-TBNA for diagnostic evaluation, we recommend that tissue sampling can be performed with or without rapid on-site evaluation (Grade 1C).

Örnekleme sayısı

Technical Aspects of Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration

CHEST Guideline and Expert Panel Report

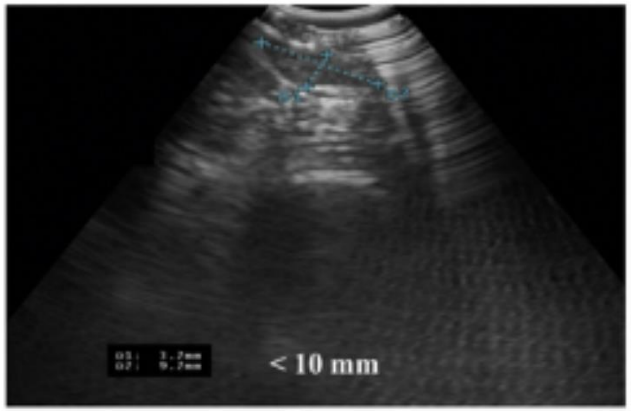
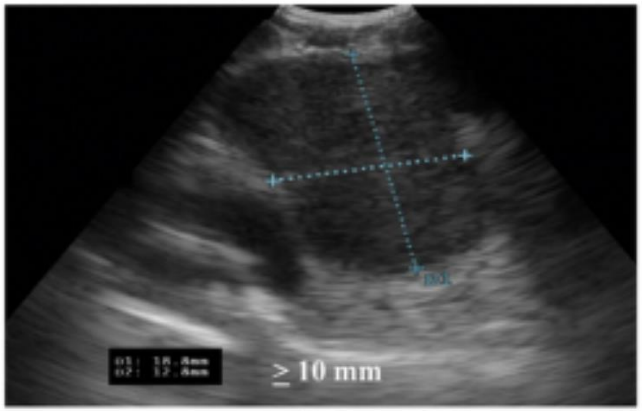
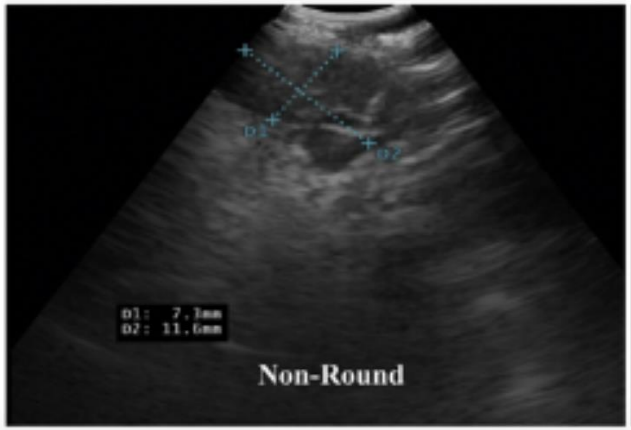
CHEST 2016; 149(3):816-835

In the absence of rapid on-site evaluation (ROSE) in patients suspected of having lung cancer and undergoing EBUS-TBNA for diagnosis, we suggest that a minimum of 3 separate needle passes be performed per sampling site (Ungraded Consensus-Based Statement).

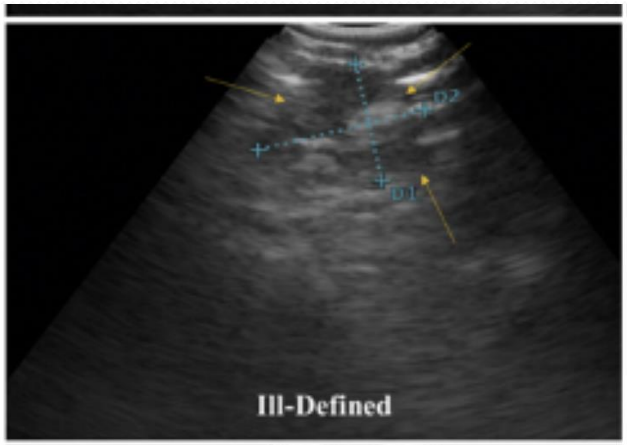
EBUS

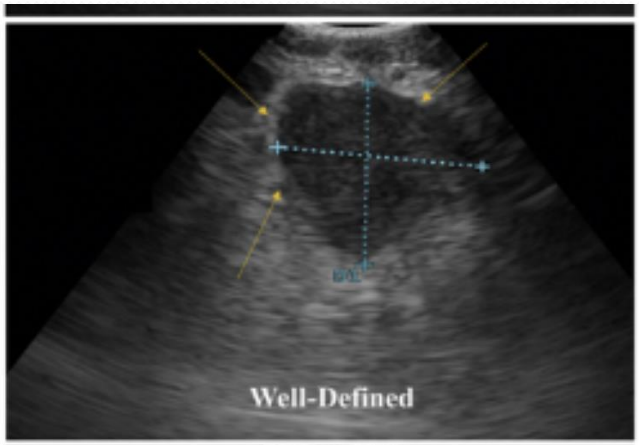
- **Lenf nodunun ultrason özellikleri;**

*Boyut
*Şekil
*Kenar düzeni
*Ekojenite
*Santral hiler yapı
*Koagülasyon nekrozu

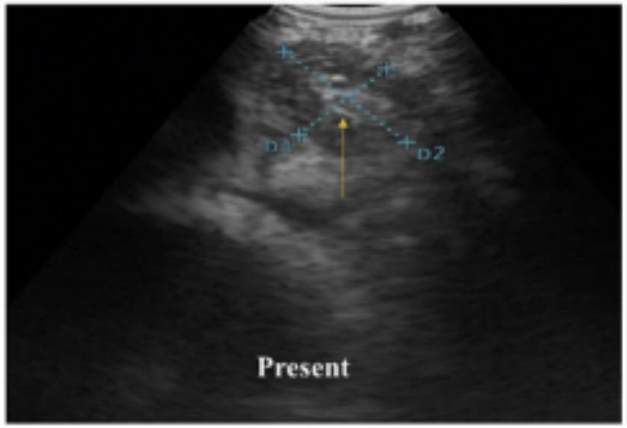
	Benign Features	Malignant Features
Small Axis Length	 < 10 mm	 ≥ 10 mm
Shape	 Non-Round	 Round

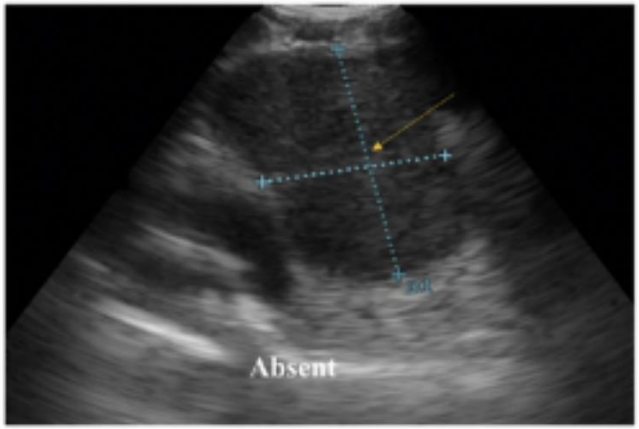
Margin



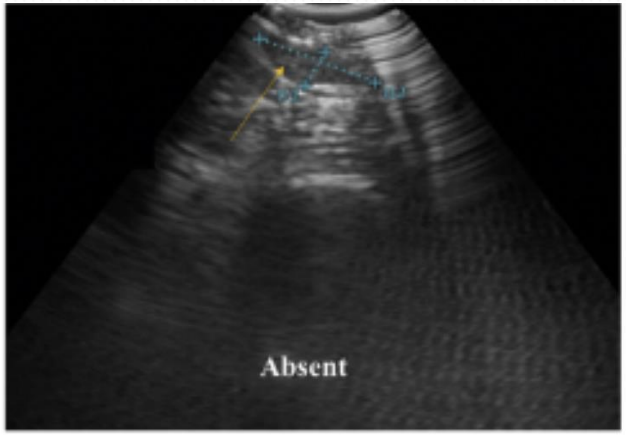


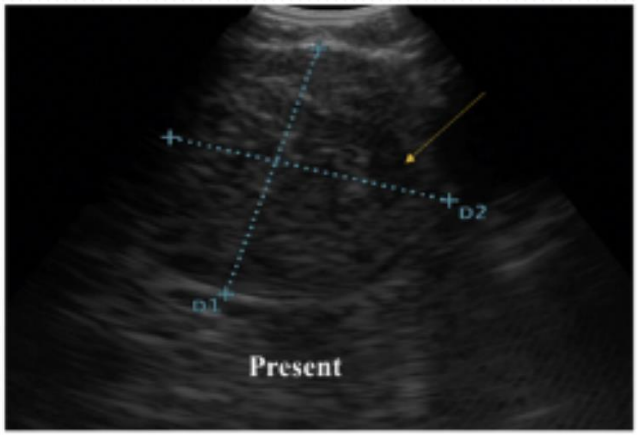
Central Hilar Structure



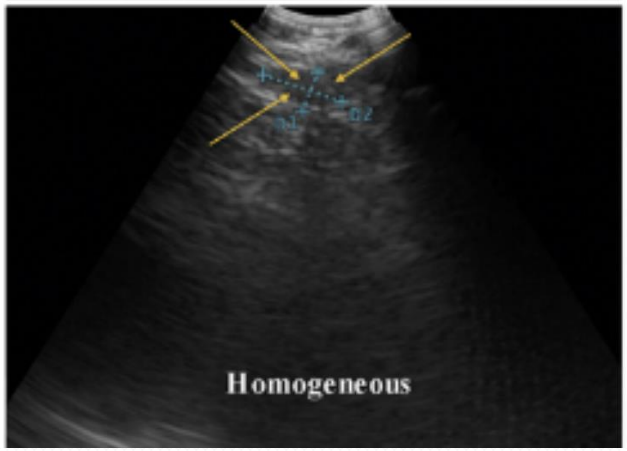


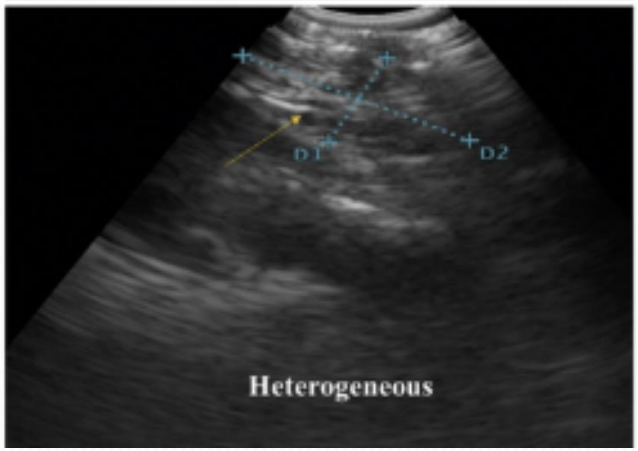
Central Necrosis





Echogenicity





ELASTOGRAFİ

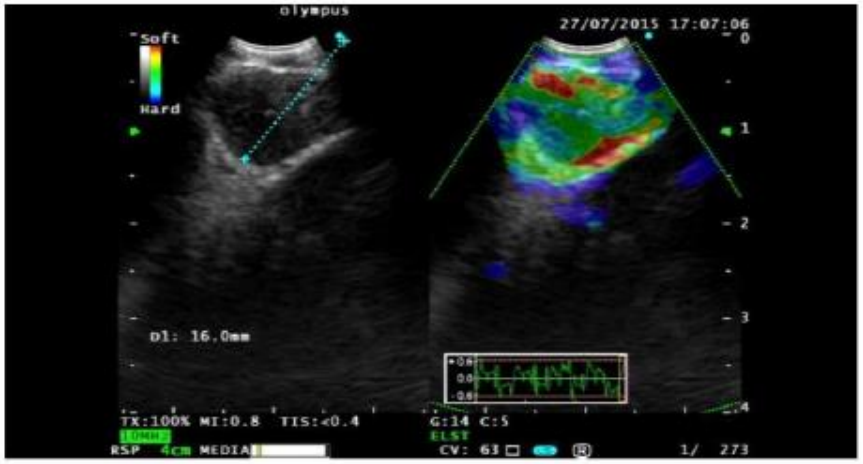
- Lezyonun yumuşaklığı
- 3 elastografik tip *(Izumo et al.)*;

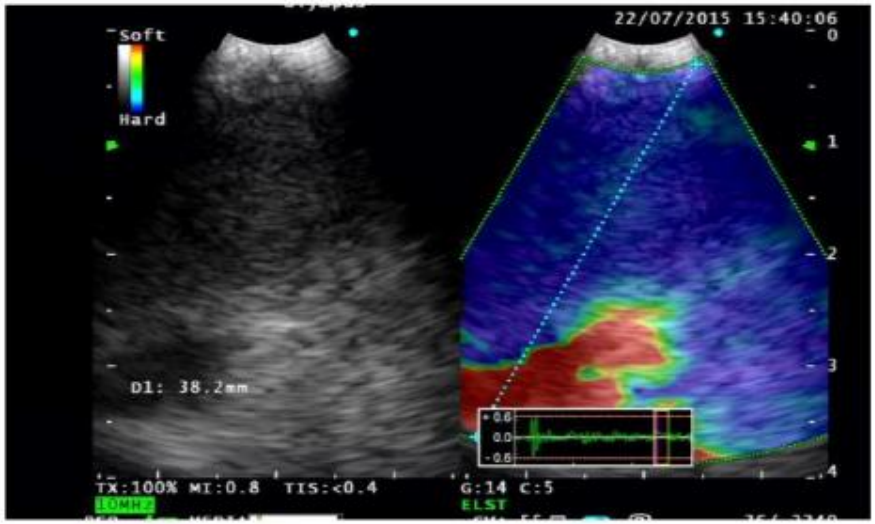
  Tip 1, predominant non-blue (green, yellow, and red)

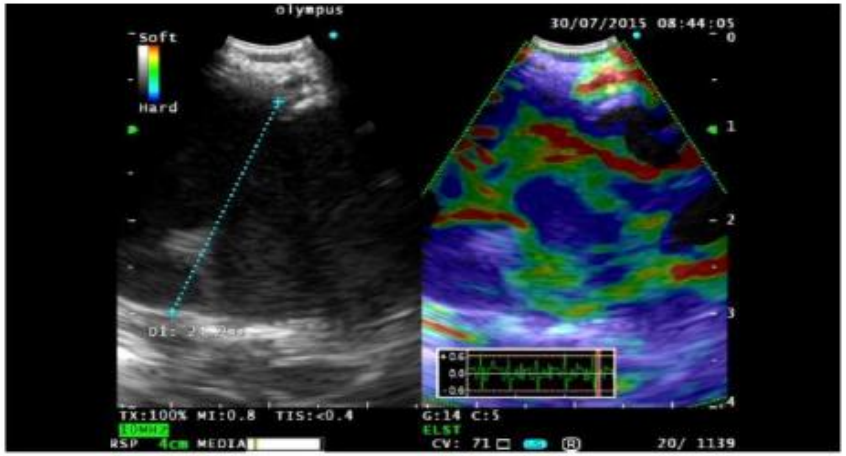
  Tip 2, part blue, part non-blue (green, yellow, and red)

  Tip 3, predominant blue

Elastography. (**A**) Type 1; predominantly non-blue (green, yellow, and red). (**B**) Type 2; part blue, part non-blue (green, yellow, and red). (**C**) Type 3 predominantly blue







EBUS-elastografi

Technical Aspects of Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration

CHEST Guideline and Expert Panel Report

CHEST 2016; 149(3):816-835

In patients undergoing EBUS-TBNA, we suggest that ultrasonographic features can be used to predict malignant and benign diagnoses, but tissue samples should still be obtained to confirm a diagnosis (Ungraded Consensus-Based Statement).

CP-EBUS Endikasyonları

- Akciğer ca tanısı (primer/metastatik)
  (mediastinal LAP ve peribronşiyal/paratrakeal kitle)
- Akciğer ca evreleme/yeniden evreleme
- Akciğer kanserinde moleküler analiz
- Mediastinal-hiler LAP (benign etyolojiler)
  (Sarkoidoz/Tüberküloz/Silikozis/Fungal infeksiyonlar…)
- Diğer benign patolojiler (mediastinal kist, benign tümörler, pulmoner emboli, nontrombotik endovasküler lezyonlar…)

Evreleme

Review > Respir Care. 2015 Jul;60(7):1040-50. doi: 10.4187/respcare.03779. Epub 2015 Mar 10.

Utility and Safety of Endoscopic Ultrasound With Bronchoscope-Guided Fine-Needle Aspiration in Mediastinal Lymph Node Sampling: Systematic Review and Meta-Analysis

- 10 çalışma, 1081 hasta
- EBSU-TBNA ➔ Sensitivite: %80

Review > Lung. 2015 Oct;193(5):757-66. doi: 10.1007/s00408-015-9761-3. Epub 2015 Jul 18.

Comparison of Endobronchial Ultrasound-Guided Fine Needle Aspiration and Video-Assisted Mediastinoscopy for Mediastinal Staging of Lung Cancer

Study	Year	Test type	Consecutive	Study design	QUADAS score	ROSE	Station sampled
Zhang et al. [6]	2012	EBUS	Yes	Prospective	12	No	1, 2, 4, 7, 10, 11
Lee et al. [10]	2008	EBUS	No	ND	11	No	2, 4, 7
Clementsen et al. [14]	2014	EBUS	Yes	Retrospective	11	Yes	At least 2, 4, 7
Hwangbo et al. [12]	2010	EBUS	Yes	Prospective	12	No	1, 2, 3, 4, 7, 8
Hwangbo et al. [15]	2009	EBUS	Yes	Prospective	11	No	2, 4, 7, 8
Lee et al. [9]	2012	EBUS	Yes	Prospective	10	No	2, 4, 7
Oki et al. [11]	2014	EBUS	Yes	Prospective	11	No	2, 3, 4, 7, 10, 11
Kang et al. [13]	2014	EBUS	Yes	Prospective	10	No	ND
Yasufuku et al. [16]	2011	EBUS	No	Prospective	11	YES	2, 4, 7
Yasufuku et al. [17]	2006	EBUS	ND	Prospective	11	Yes	1, 2, 4, 7, 10, 11
Sayar et al. [20]	2011	VAM	No	Retrospective	11	/	2, 4, 7
Kimura et al. [21]	2007	VAM	No	Prospective	11	/	1, 2, 3, 4, 7
Kimura et al. [19]	2003	VAM	No	Prospective	9	/	1, 2, 3, 4, 7
Venissac et al. [22]	2003	VAM	Yes	Retrospective	10	/	2, 4, 7
Anraku et al. [23]	2010	VAM	Yes	Retrospective	11	/	2, 4, 7, 1
Lardinois et al. [18]	2003	VAM	ND	Prospective	11	/	2, 4, 7
Zhang et al. [6]	2012	VAM	Yes	Prospective	11	/	ND

- **EBUS**

  *Sensitivite; %84

- **Mediastinoskopi**

  *Sensitivite; %86

Komplikasyon;

*EBUS: 4 hasta (1 atriyal fibrilasyon, 2 ciddi öksürük, 1 pnömomediasten)

*Mediastinoskopi: 17 hasta (2 ses kısıklığı, 2 pnömotoraks, 4 vasküler hasar, 2 perioperatif kanama, 4 sol rekürren larengeal sinir hasarı, 1 lenf sıvısı kaçağı, 1 özefagus hasarı, 1 yara yeri infeksiyonu)

Review > Front Surg. 2022 May 23;9:890993. doi: 10.3389/fsurg.2022.890993. eCollection 2022.

Mediastinal Nodal Staging Performance of Combined Endobronchial and Esophageal Endosonography in Lung Cancer Cases: A Systematic Review and Meta-Analysis

- 20 çalışma, 2961 hasta
- **EBUS**

  *Sensitivite;%76
  *Spesifite; %97

- **EBUS+EUS**

  *Sensitivite; %86
  *Spesifite; %99

EBUS

- Yeniden evreleme
- Lenfoma
- Moleküler analiz
- Ekstratorasik malignitelerin metastazları

Table 2 Performance of EBUS-TBNA for mediastinal restaging after neoadjuvant chemotherapy or chemo-radiotherapy

Author, year	N° patients	Sampling technique	Sensitivity, %	Specificity, %	PPV, %	NPV, %	Accuracy, %
Herth, 2008 (67)	124	EBUS	76	100	100	20	77
Szlubowski, 2010 (68)	61	EBUS	67	86	91	78	80
Zielinski, 2013 (69)	88	CUS	64	100	100	82	NR
Szlubowski, 2014 (70)	106	CUSb	67	96	95	73	81
Nasir, 2014 (71)	32	EBUS	50	100	100	88	89
Genestreti, 2015 (66)	14	CUS	50	60	33	75	NR
Çetinkaya, 2017 (65)	44	EBUS	82	100	100	76	89
Muthu, 2018 (72)†	574	CUS	67	99	52	33	NR
Jiang, 2020 (73)‡	558	CUS	65	99	NR	35	NR

†, Meta-analysis; pooled results with EUS-FNA; ‡, meta-analysis; results referred to EBUS-TBNA. CUS, combined EBUS and EUS; CUSb, combined EBUS and EUS using a single ultrasound bronchoscope; NPV, negative predictive value; NR, not reported; PPV, positive predictive value; EUS-FNA, endoscopic ultrasound-fine needle aspiration.

EBUS-Lenfoma

Author	Type of study	Patients/procedures included	Reference/comparison test	Diagnostic performance					Complications
				S	Sp	PPV	NPV	Diagnostic Accuracy	
Marshall[7]	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[11]	Prospective	100 patients with denovo or suspected relapsed mediastinal lymphoma	Positive cytology and histology as final diagnoses Mediastinoscopy (*n*=20) Bone marrow biopsy (*n*=4) Excision lung biopsy, liver, buttock and paraspinal masses (*n*=4)	89%	97%	98%	83%	91%	None
Senturk[10]	Retrospective	68 patients with suspected lymphoma on the basis of history of lymphoma or newly isolated mediastinal identified on computed tomography	Positive cytology and histology as final diagnoses Mediastinoscopy (*n*=3) Thoracotomy (*n*=1)	86.7%	100%	100%	96.4%	97%	None
Steinfort[8]	Retrospective	55 patients with isolated mediastinal or hilar lymphyadenopathy and suspected lymphoma	Positive cytology and histology as final diagnoses. Mediastinoscopy (*n*=9)	57%	100%	100%	87%	–	None
Iqbal[9]	Retrospective	65 patients with mediastinal or hilar involvement or both or a combination of other biopsy specimens and positive radiographic criteria	Positive cytology and histology as final diagnoses Mediastinoscopy (*n*=17) Biopsy at other sites (*n*=23)	38%	–	–	–	–	None
Kennedy[6]	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

- 6 çalışma, 346 hasta, derleme
- Sensitivite: %38-91
- NPV: %83-96.4
- Nüks olgularda tanı başarısı daha yüksek

Kheir F, et al. Endosc Ultrasound. ***2016;****5:43-8*

EBUS-Lenfoma

Technical Aspects of Endobronchial Ultrasound-Guided Transbronchial Needle Aspiration

CHEST Guideline and Expert Panel Report

CHEST 2016; 149(3):816-835

In patients with suspected lymphoma, we suggest that EBUS-TBNA is an acceptable initial, minimally invasive diagnostic test (Ungraded Consensus-Based Statement).

J Thorac Dis. 2017 May;9(Suppl 5):S395-S404. doi: 10.21037/jtd.2017.03.158.

Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA)-from morphology to molecular testing.

Righi L[1], Franzi F[2], Montarolo F[1], Gatti G[1], Bongiovanni M[3], Sessa F[4], La Rosa S[3].

Yapılan çalışmalarda moleküler analiz için yeterli doku

örnek sağlamada EBUS➔ %88-98

Scott Med J. 2022 Feb;67(1):18-27. doi: 10.1177/00369330221078995. Epub 2022 Feb 11.

Evaluation of lung cancer biomarkers profile for the decision of targeted therapy in EBUS-TBNA cytological samples

Aslıhan Gürün Kaya [1], Aydın Çiledağ [1], Serhat Erol [1], Miraç Öz [1], Deniz Doğan Mülazımoğlu [1], Özlem Işık [1], Hilal Özakıncı [2], Fatma Çiftçi [1], Elif Şen [1], Koray Ceyhan [2], Akın Kaya [1], Demet Karnak [1], Gökhan Çelik [1], Savaş İsmail [1]

Methods: We retrospectively reviewed patients with NSCLC whose EBUS-TBNA was analysed for EGFR, ALK, ROS-1, BRAF and PD-L1 expression between December 2011 and December 2020.

Results: A total of 394 patients were enrolled in the study. EGFR mutation and ALK fusion were the most common studied biomarkers. EBUS-TBNA adequacy rate for biomarker tests was found 99.0% for EGFR, 99.1 for ALK, 97.2% for ROS1, 100% for BRAF and 99.3% for PD-L1 testing. Multivariate analysis revealed the histological type, history of treatment for NSCL, size, or 18-fluorodeoxyglucose uptake of sampled lesion did not show any association with TBNA adequacy for biomarker testing.

Conclusion: EBUS-TBNA can provide adequate material for biomarker testing for EGFR, ALK, ROS-1, BRAF and PD-L1 expression.

Respirology. 2014 Aug;19(6):834-41. doi: 10.1111/resp.12335. Epub 2014 Jun 17.

Endobronchial ultrasound-guided transbronchial needle biopsy for the diagnosis of intrathoracic lymph node metastases from extrathoracic malignancies: a meta-analysis and systematic review.

Yang B[1], Li F, Shi W, Liu H, Sun S, Zhang G, Jiao S.

Sensitivity analyses by excluding one study at each time

Excluded study	Sensitivity	Specificity	PLR	NLR	DOR
Navani *et al.*, 2011[21]	0.85	0.98	21.34	0.16	139.42
Park *et al.*, 2011[20]	0.86	0.99	24.95	0.16	172.16
Parmaksiz *et al.*, 2012[24]	0.85	0.98	21.96	0.16	148.85
Tournoy *et al.*, 2011[22]	0.85	1.00	39.54	0.16	245.09
Sanz-Santos *et al.*, 2013[23]	0.85	0.98	22.39	0.17	145.85
Song *et al.*, 2011[19]	0.85	0.98	22.57	0.17	146.09

PLR, positive likelihood ratio; NLR, negative likelihood ratio; DOR, diagnostic odds ratios.

Diğer Patolojilerde EBUS

- Mediastinal LAP (Sarkoidoz, tbc, fungal infeksiyonlar, silikozis…)
- Benign tümörler (hamartom, schwannom…)
- Pulmoner emboli
- Pulmoner arterin nontrombotik endovasküler lezyonları (pulmoner arter sarkomu, endovasküler tümörler)
- Mediastinal kist

Diğer Patolojilerde EBUS

- Tiroid patolojileri
- Atriyal miksoma
- Perikardiyal efüzyon ponksiyonu
- Perikardiyal mezotelyoma
- Mediastinal lenfanjiyom drenajı
- Transbronşiyal iğne injeksiyonu

Causes of Mediastinal Lymphadenopathy	
Malignant Causes	**Benign Causes**
Primary Haematological malignancies Lymphoma Myeloma Leukaemia	**Infectious** *Aetiology:* **Bacterial** *Mycobacteria* spp. *F. tularensis* *B. anthracis* **Viral** EBV HIV **Fungal** *H. capsulatum* *Coccidioides* spp. *Cytology:* **Suppurative**: *Streptococcus* spp., *Staphylococcus* spp., *Klebsiella* spp., *Candida* spp., *HIV* **Granulomatous**: see above
Secondary (nodal metastasis) NSCLCs Gastrointestinal tumours Brest cancer Testicle cancer Thyroid cancer	**Inflammatory** Sarcoidosis Rheumatological and autoimmune diseases Cystic fibrosis Pneumoconiosis Hypersensitivity pneumonia Amyloidosis Whipple disease Rosai–Dorfman disease Castleman's disease Silicone breast implant
	Reactive Pneumonia Idiopathic pulmonary fibrosis COPD Pulmonary oedema Pulmonary hypertension Chronic heart failure Hypersensitivity reaction to drugs

Sarkoidoz

Author	EBUS Diagnostic Yield	Population	Type of Study
Tremblay et al. 2009	83.3%	50	Randomized controlled trial
Nakajima et al. 2009	91.4%	35	Randomized controlled trial
Von Bartheld et al. 2010	92% for Scadding stage I, 77% for Scadding stage II	101	Descriptive study
Navani et al. 2011	85% (93% combined with TBB)	39	Descriptive study
von Bartheld et al. 2013	80%	155	Randomized controlled trial
Ortakoylu et al. 2015	83%	159	Descriptive study
Trisolini et al. 2015	79%	2097	Meta-analysis

Review > Diagnostics (Basel). 2022 Feb 16;12(2):512. doi: 10.3390/diagnostics12020512.

Role of EBUS-TBNA in Non-Neoplastic Mediastinal Lymphadenopathy: Review of Literature

Tbc Lenfadenit

Author (year)	Nodal size by CT (mm)	Anesthesia	Stations examined	Nodal short axis on EBUS (mm)	Aspirations	Roes	Microbiology (smear or culture)	PCR	BAL	Needle gauge
Caglayan (2011)	>10	Conscious sedation	2,4,7,10,11	19.6 (mean)	1.71 (mean)	No	No	No	No	22G
Hu (2011)	NA	General anesthesia	NA	NA	NA	Yes	NA	No	No	22G
Cetinkaya (2011)	>10	Conscious sedation	4,7,10	NA	2.6 (mean)	No	5 (unknown Species)	No	No	22G
Zhao (2012)	>10	General anesthesia	NA	NA	≥3	Yes	No	No	No	22G
Navani (2012)	NA	General anesthesia	2,4,7,10,11	22 (mean)	1.28 (mean)	Yes (only portion)	74/156	No	No	22G or 21G
Navani (2012)	NA	General anesthesia	2,4,7	23 (mean)	4	No	unknown, 11/26	No	No	22G or 21G
Gu (2012)	>10	General anesthesia	2,3,4,7,10,11,12	NA	1.95	Yes	No	No	No	22G
Luo (2013)	NA	Conscious sedation	2,3,4,7,10,11,12	22.1 (mean)	3.5	No	No	No	No	22G
Sun (2013)	>10	Conscious sedation	2,4,7,10,11,12	20.1 (mean)	2.91	No	8/35, 17/32	No	No	22G
Kuo (2013)	>10	Conscious sedation	2,4,7,10,11	Symptomatic (23.8±6.4); asymptomatic (18.9±8.3)	≥3	No	4 (unknown species)	No	Yes	22G
Xie (2013)	≥10	General anesthesia	2,4,7,10,11	18.7 (mean)	3.5	Yes	21/34	Yes (only 9)	No	22G
Ren (2013)	>10	General anesthesia	7,4R	15 (median)	NA	Yes	11/20,17/20	No	Yes	22G
Kaur (2013)	NA	NA	NA	NA	NA	Yes	8/13,5/36	No	Yes	NA
Dhasmana (2014)	NA	General anesthesia	2,4,7,10,11	NA	4–14 (range)	Yes	14/85,84/85	Yes	Yes (only 2)	22G

*Li W, et al. Med Sci Monit; **2015**;21:2064-72.*

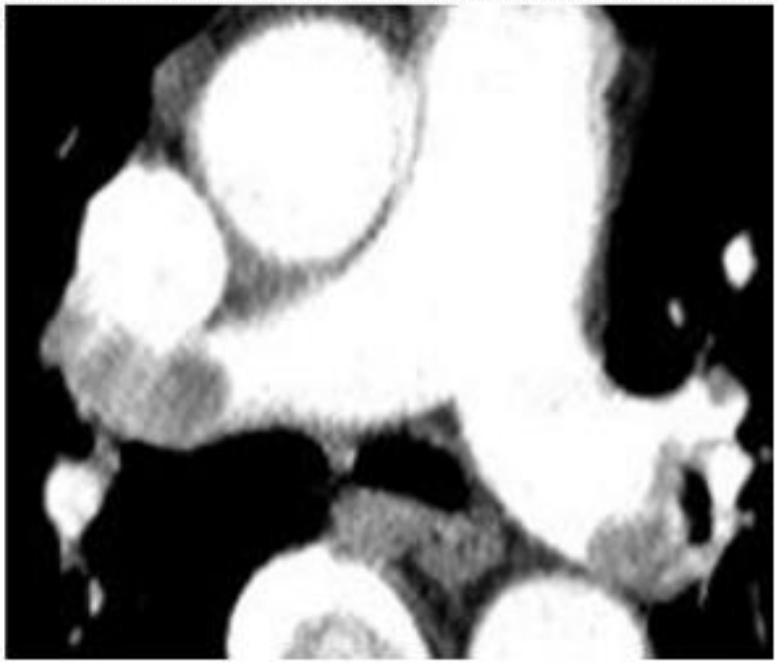
- 14 çalışma, 684 hasta
- EBUS-TBNA tanı başarısı: %80

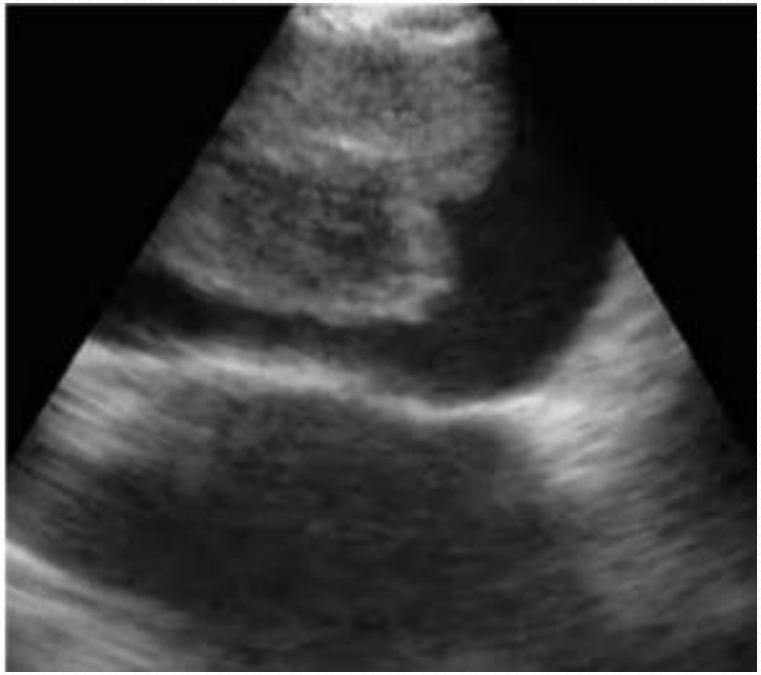
Pulmoner emboli

- BT-anijiografide santral emboli saptanan 32 hasta (101 emboli odağı)
- BT sonrası 24. saatte CP-EBUS
- 101 emboli odağının 97'si EBUS ile de saptanmış
- EBUS ile saptanamayan 4 odak: 1 orta lob, 3'ü sol üst lob pulmoner arter
- Komplikasyon yok

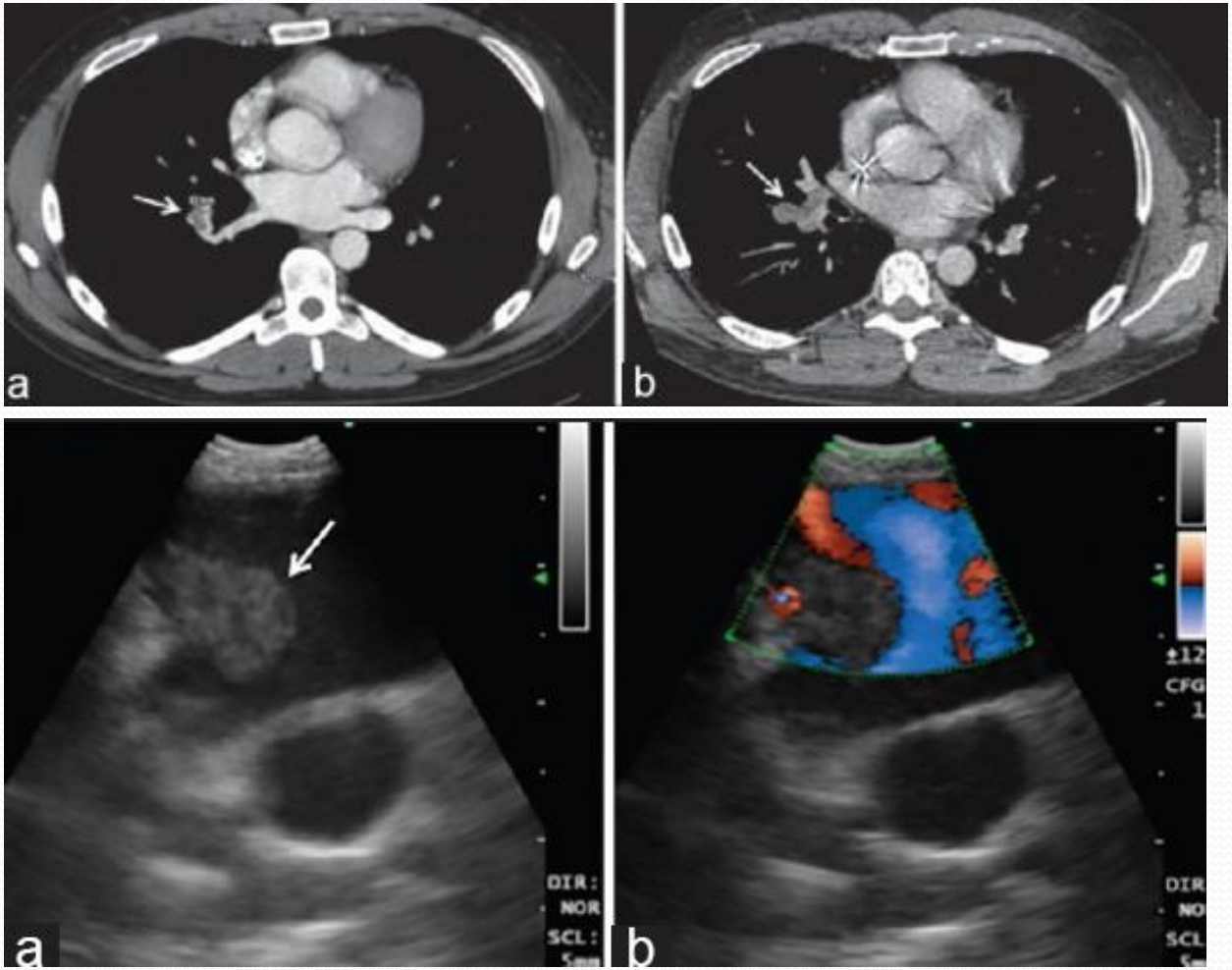
Respiration 2009;77:298-302

Pulmoner emboli



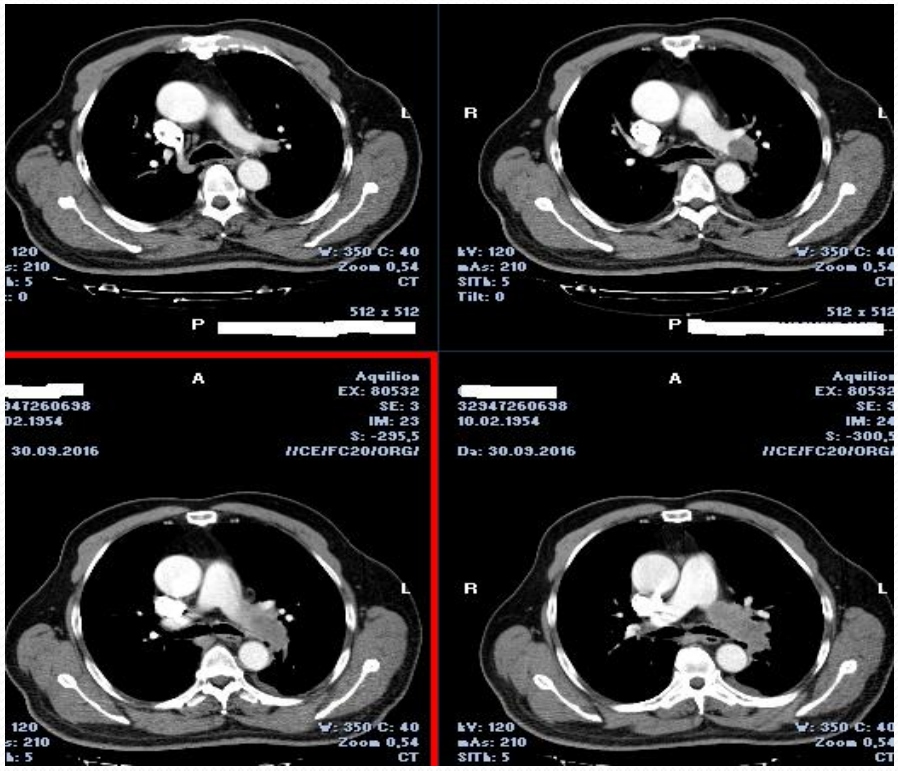


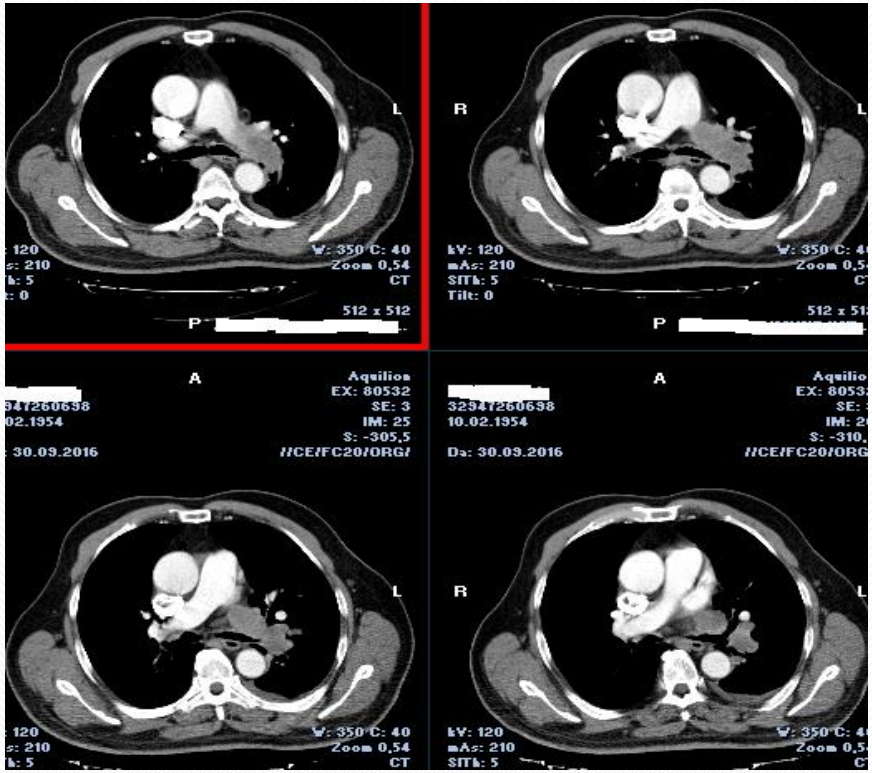
Nontrombotik endovasküler lezyonlar



EBUS-TBNA: Leimyosarkom

Endovasc Ultrasound 2014;3:249-51.


L
R
L
W: 350 C: 40
Zoom 0,54
CT
512 x 512
P
kV: 120
mAs: 210
SITh: 5
Tilt: 0
A
Aquilion
EX: 80532
SE: 3
IM: 23
S: -295,5
IM: 24
S: -300,5
IM: 25
S: -305,5
30.09.2016
10.02.1954
Da: 30.09.2016
//CE/FC20/ORG/


L
R
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W: 350 C: 40
Zoom 0,54
CT
512 x 512
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kV: 120
mAs: 210
SITh: 5
Tilt: 0
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Aquilion
EX: 80532
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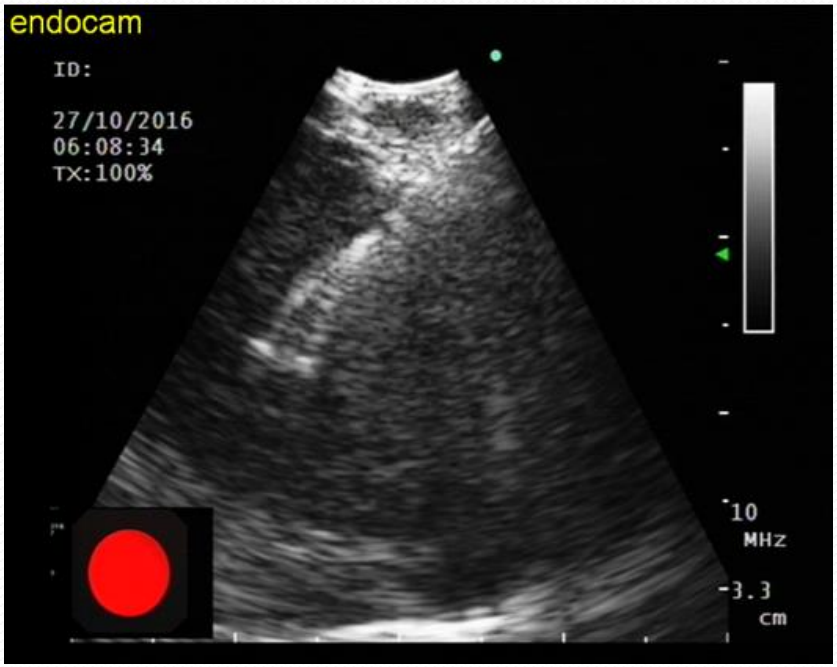
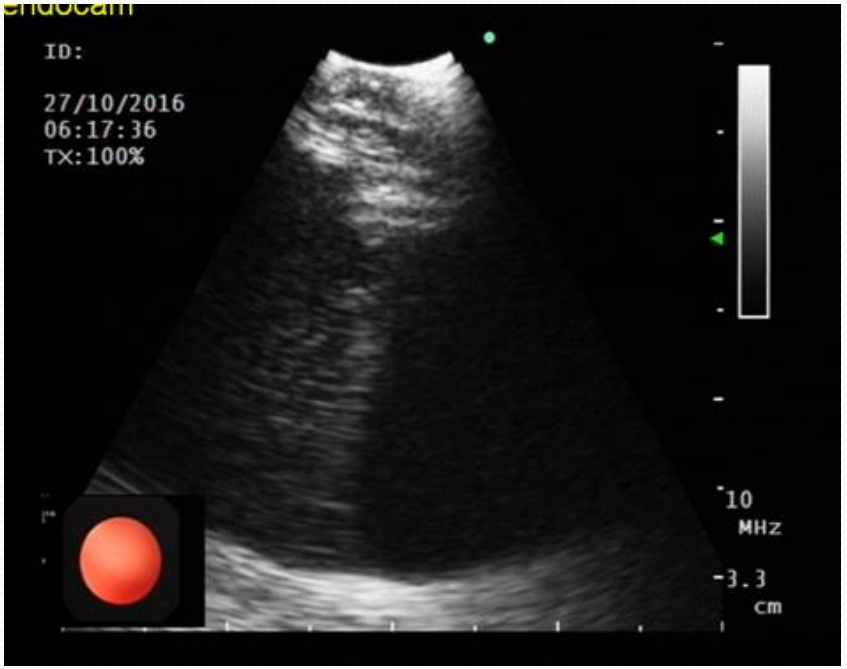




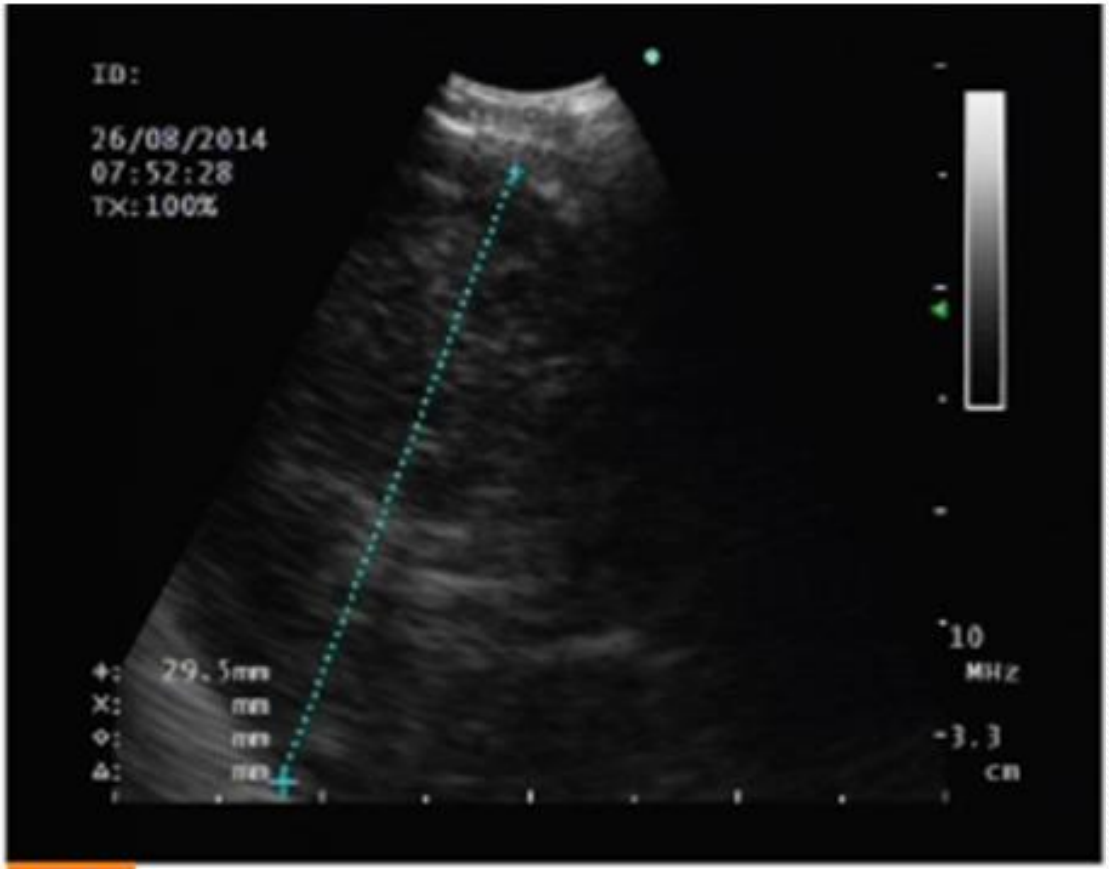
Tanı: Küçük hücreli akciğer kanseri

Case Reports > Clin Respir J. 2017 Nov;11(6):739-742. doi: 10.1111/crj.12410. Epub 2016 Jan 13.

Mediastinal schwannoma with atypical localization diagnosed by endobronchial ultrasound

Fatma Çiftci [1], Aslıhan Gürün Kaya [1], Ebru Karaçay [1], Aydın Çiledağ [1], Koray Ceyhan [2], Akın Kaya [1], Gökhan Çelik [1]

Prekarinal alanda 4.5x4.5x3.5 cm boyutlarında yumuşak doku (LAP?)



001 prekarinal lenf nodu

Histopatolojik Tanı:R: AÇIK BİR MALİGNİTE BULGUSU GÖSTERMEYEN İĞSİ HÜCRELİ MEZENŞİMAL LEZYON BULGULARI, prekarinal lenf nodu EBUS İİAB yaymaları ve hücre bloğu

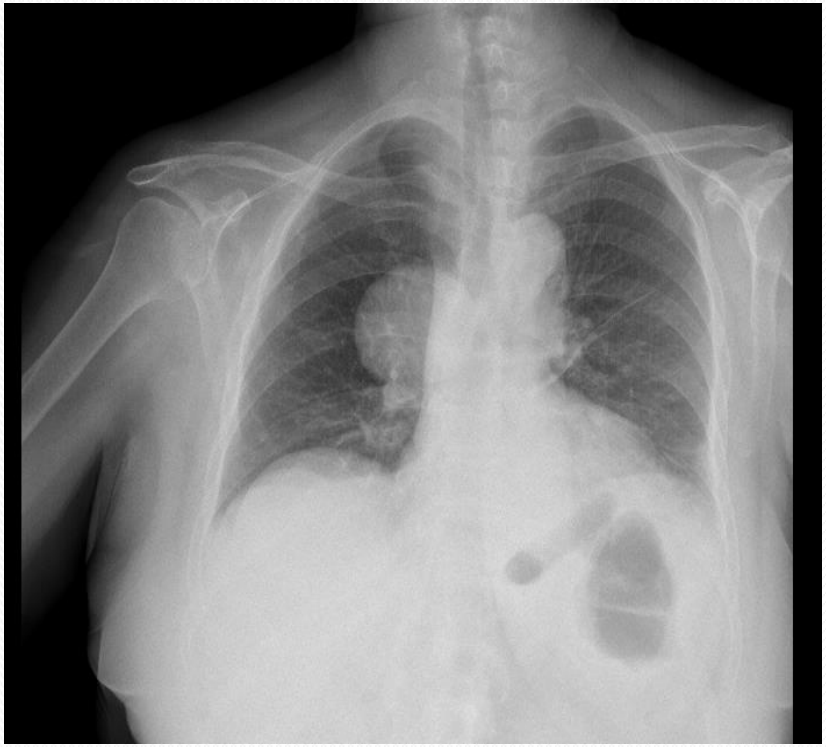
.R: AÇIK BİR MALİGNİTE BULGUSU GÖSTERMEYEN İĞSİ HÜCRELİ MEZENŞİMAL LEZYON BULGULARI, prekarinal lenf nodu EBUS İİAB yaymaları ve hücre bloğu

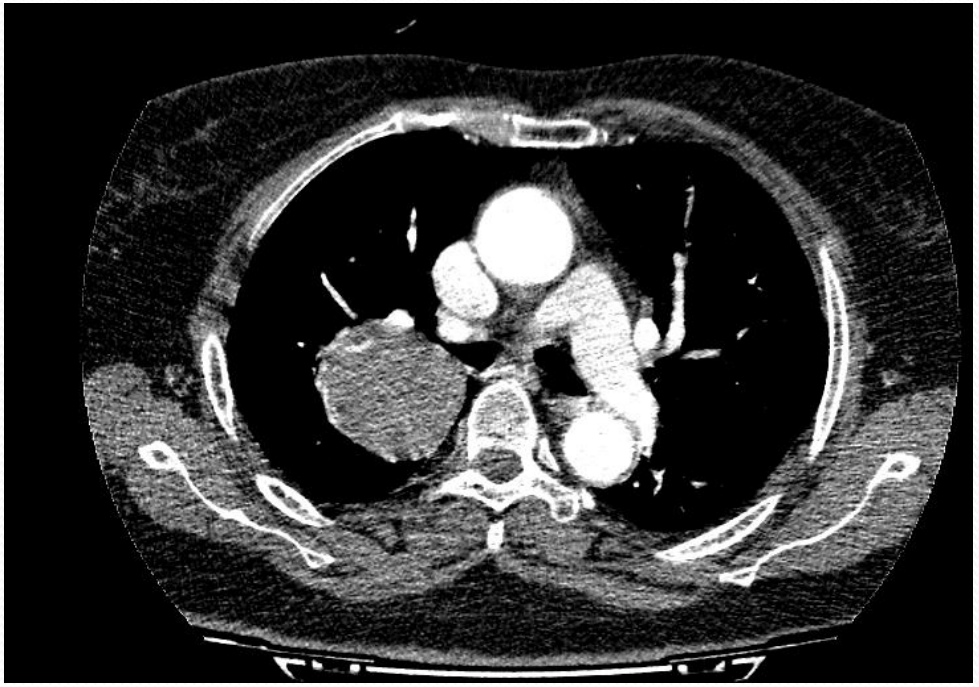
.R: AÇIK BİR MALİGNİTE BULGUSU GÖSTERMEYEN İĞSİ HÜCRELİ MEZENŞİMAL LEZYON BULGULARI, prekarinal lenf nodu EBUS İİAB yaymaları ve hücre bloğu

.

Özel Not:R: .R: .R: .

Yorum:R: Bulgular granülomatöz lezyon/lenfadenitis için karakteristik değildir. Sitomorfolojik özellikler öncelikle benign karakterde iğsi hücreli mezenşimal bir tümörü düşündürmektedir. (Schwannoma ?) Tanının spesifiye edilebilmesi için immünsitokimyasal çalışma planlanmıştır. Sonuç ek bir rapor ile ayrıca bildirilecektir..R: Bulgular granülomatöz lezyon/lenfadenitis için karakteristik değildir. Sitomorfolojik özellikler öncelikle benign karakterde iğsi hücreli mezenşimal bir tümörü düşündürmektedir. (Schwannoma ?) Tanının spesifiye edilebilmesi için immünsitokimyasal çalışma planlanmıştır. Sonuç ek bir rapor ile ayrıca bildirilecektir..





Histopatolojik Tanı:R: 1- İĞSİ HÜCRELİ (MEZENŞİMAL?) NEOPLAZİYİ TELKİN EDER BULGULAR, Sağ hiler kitle EBUS İİAB yaymaları ve hücre bloğu

2- MALİGNİTE YÖNÜNDEN NEGATİF, Bronş lavajı yaymaları ve hücre bloğu
.1: DÜŞÜK DERECELİ İĞSİ HÜCRELİ MEZENŞİMAL TÜMÖRÜ TELKİN EDER BULGULAR, Sağ hiler kitle EBUS İİAB hücre bloğu
.

Özel Not:R: .1: .

Yorum:R: Bulgular, klinik olarak sorgulanan soliter fibröz tümörü yansıtıyor olabilir. Tanının spesifiye edilebilmesi için immünhistokimyasal çalışma planlanmıştır. Sonuç ek rapor ile bildirilecektir..1: Bulgular, soliter fibröz tümörü öncelikle düşündürmektedir. Olgunun, klinik-radyolojik bulguları ile korele edilmesi önerilir..

EK RAPOR - 1:YORUM
Bulgular, soliter fibröz tümörü öncelikle düşündürmektedir. Olgunun, klinik-radyolojik bulguları ile korele edilmesi önerilir.

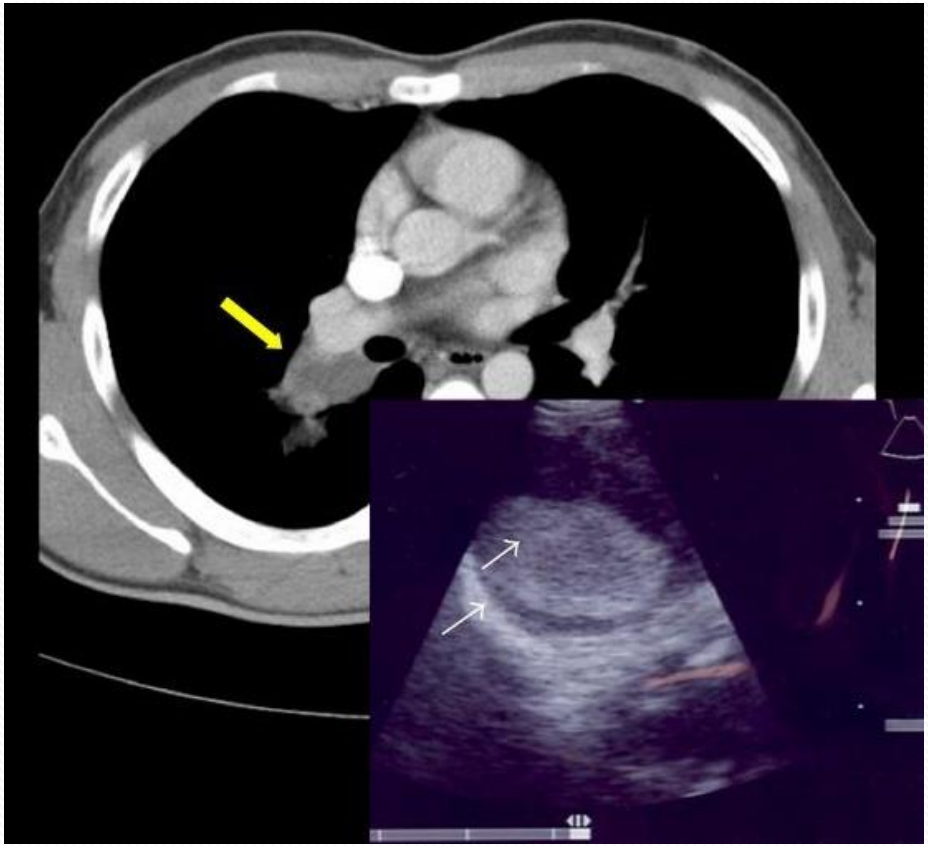
Hastaya sağ torakotomi+kitle enükleasyonu uygulandı.

Histopatolojik Tanı:R: 1-SOLİTER FİBRÖZ TÜMÖR, BAKINIZ YORUM, Kitle kodlu materyal
- TÜMÖR UZUN ÇAPI 8 CM'DİR.
- TÜMÖR AKCİĞER DOKUSUNDAN YAKLAŞIK 50 MİKRONLUK SINIR İLE AYRILMAKTADIR.
2-REAKTİF ANTROKOZLU LENF NODÜLÜ (0/1), 4 nolu lenf nodülü
3-REAKTİF ANTROKOZLU LENF NODÜLÜ (0/1), 10 nolu lenf nodülü.

Özel Not:R: .

Yorum:R: Olguda izlenen yüksek mitotik aktivite, yüksek sellülarite ve alışılmışa oranla daha belirgin olan hücresel atipi agresif biyolojik davranış ile ilişkili olarak değerlendirilen özelliklerdir..

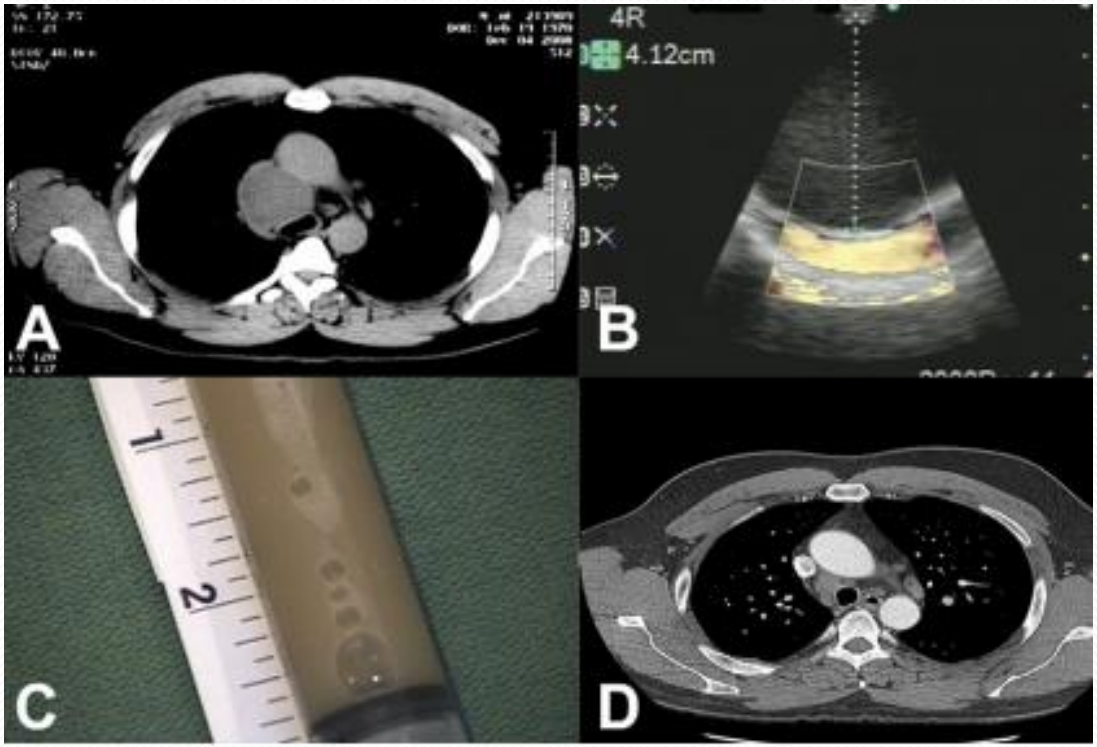
Mediastinal kist-Tanı/Tedavi



Mediastinal kist

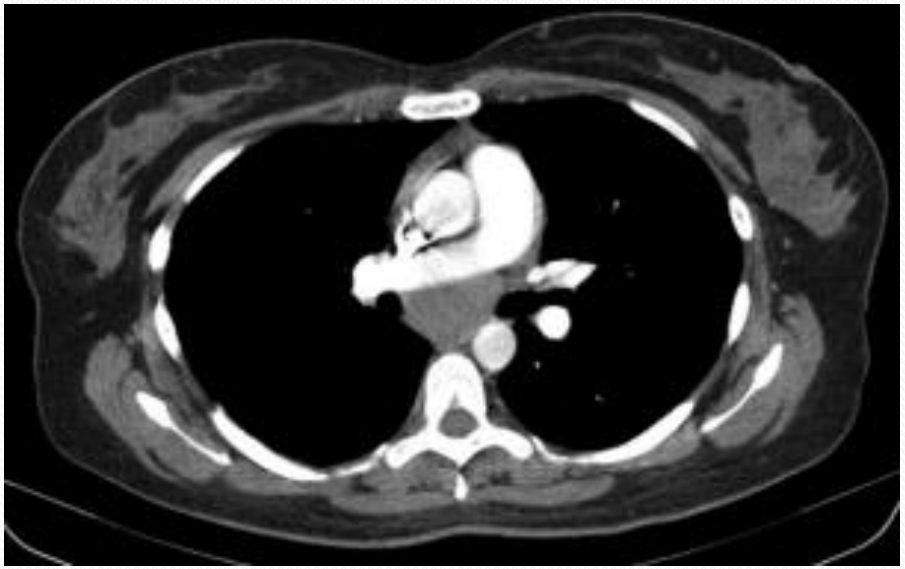
Infected Mediastinal Bronchogenic Cyst Successfully Treated by Endobronchial Ultrasound-Guided Fine-Needle Aspiration

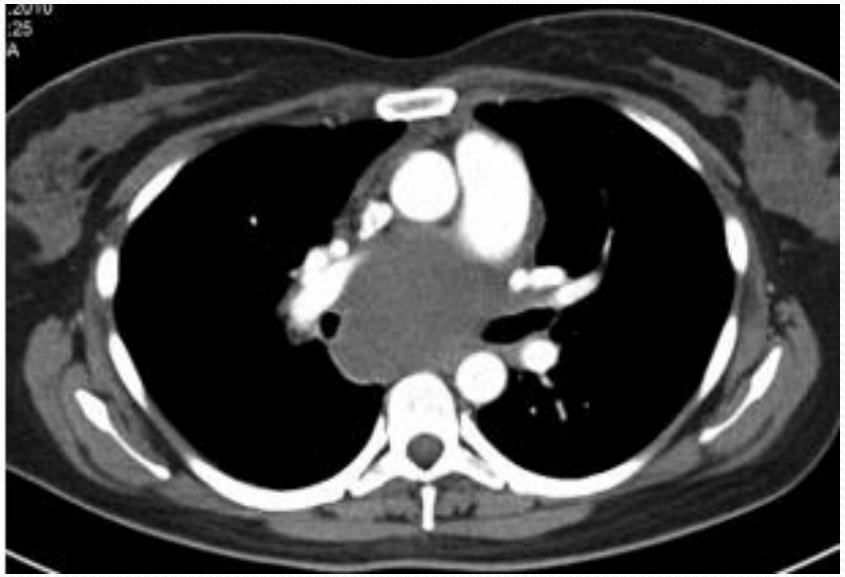
Ann Thorac Surg 2010;90:e52–3)



Infection of a Bronchogenic Cyst After Ultrasonography-Guided Fine Needle Aspiration

Ann Thorac Surg 2013;95:2154–5)





Komplikasyon

Complication Rate of Endosonography (Endobronchial and Endoscopic Ultrasound): A Systematic Review

Respiration 2014;87:343–351

190 çalışma,

16.181 hasta

Olgu serileri çalışma dışında tutulmuş

Komplikasyon

- 35 hastada komplikasyon (%0.22)
- 23 hastada ciddi komplikasyon (%0.14)
- Mortalite yok
- Ciddi komplikasyon EUS ile daha sık (%0.30 vs %0.05)
- En sık komplikasyon: infeksiyon

Overview of SAE following EUS-FNA (n = 6,042) and EBUS-TBNA (n = 9,119) for mediastinal analysis (n = 23)

	EUS (n = 18)	EBUS (n = 5)
Infectious complications (n = 12)	10	2
Mediastinitis	5	0
Mediastinal abscess/abscess formation	2	1
Sepsis	1	1
Pleuropericarditis	1	0
Aspiration pneumonia	1	0
Perforations (n = 4)	4	0
Esophageal perforation/rupture	3	
Sinus piriformis perforation	1	
Pneumothorax (n = 2)	0	2
Hemorrhagic complications (n = 2)	2	0
Mediastinal hematoma	1	
Periesophageal bleeding	1	
Respiratory complications (n = 3)	2	1
Hypoxemia due to airway edema	▪	▪
Apnea under propofol	▪	▪
Required reversal medication	1	0

Gelecekte EBUS

- **Radyal prob EBUS**

Soliter/Diffüz lezyonlarda kılavuz yöntemlerle kombine kullanım

- **CP-EBUS**

Örnekleme aparatları

Küçük çaplı transducer/skoplar

İşlemci gelişimi (Elastografi, ….)

Teşekkür ederim