



Uluslararası Katılımlı

AKCİĞER SAĞLIĞI KONGRESİ

Sizin Sesiniz, Sizin Kongreniz...

9-12 Nisan 2025
Sueno Deluxe Hotel,
Belek/Antalya



EBUS

Yeni Yöntemler ve Yeni Yaklaşımlar

Dr Ersin Günay
Ankara Etlik Şehir Hastanesi
Göğüs Hastalıkları Kliniği





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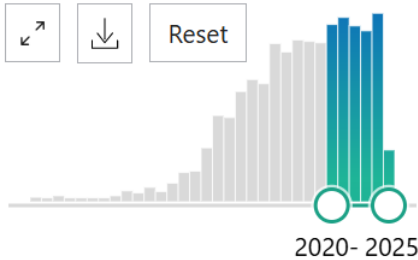
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Çıkar çatışması

- Sandoz İlaç
- Abdi İbrahim İlaç



Konveks Prob EBUS Yeni Yöntemler ve Yaklaşımlar

- Tanısal işlemlerde gelişmeler
- Transvasküler uygulamalar
- İntratümöral uygulamalar
- EUS-B-FNA ve CUS-B-NA



- Örneklerin hazırlanması
- Yeni iğneler
- İntranodal biyopsi
- Kryobiyopsi

Acquisition and Handling of Endobronchial Ultrasound Transbronchial Needle Samples

An American College of Chest Physicians Clinical Practice Guideline

Christopher R. Gilbert, DO; Claire Dust, MSPH; A. Christine Argento, MD; David Feller-Kopman, MD; Anne V. Gonzalez, MD; Felix Herth, MD; Jonathan M. Iaccarino, MD; Peter Illei, MD; Kevin O'Neil, MD, MHA; Nicholas Pastis, MD; M. Patricia Rivera, MD; Lynette Sholl, MD; Gerard A. Silvestri, MD; Jeffrey Thiboutot, MD; Momen M. Wahidi, MD; Kazuhiro Yasafuku, MD; and Lonny B. Yarmus, DO



BACKGROUND: Endobronchial ultrasound-guided transbronchial aspiration (EBUS-TBNA) has become the standard for initial lung cancer diagnosis and staging. Previous guidelines have generally focused on the “when” and “how” of EBUS-TBNA; however, little guidance is available on handling and processing specimens during and after acquisition to help optimize both diagnostic yield and tissue integrity for ancillary studies. This document examines the available literature on EBUS-TBNA specimen processing and handling.

STUDY DESIGN AND METHODS: Rigorous methodology was applied to provide a trustworthy evidence-based guideline and expert panel report. Panelists developed key clinical questions using the Population, Intervention, Comparator, and Outcome format, addressing specific topics in EBUS-TBNA specimen processing. MEDLINE (via PubMed) and the Cochrane Library were systematically searched to identify relevant literature, supplemented by manual searches. References were screened for inclusion with document evaluation tools to assess the quality of included studies, extract meaningful data, and grade the level of evidence to support each recommendation or suggestion.

RESULTS: Our systematic review and critical analysis of the literature of the nine Population, Intervention, Comparator, and Outcome questions related to handling and processing EBUS-TBNA specimens resulted in nine evidence-based statements.

INTERPRETATION: Evidence of the handling and processing of EBUS-TBNA specimens varies in strength but is satisfactory in some areas to guide clinicians in certain aspects of specimen handling. Additional research in many aspects of specimen handling and processing is needed to help improve our knowledge base.

CHEST 2025; 167(3):899-909

TABLE 1] PICO Questions

Question 1	In patients undergoing EBUS-TBNA, should alternative methods of specimen expulsion from the EBUS-TBNA needle be used compared to clinical practice?
Question 2	In patients being evaluated for malignancy undergoing EBUS-TBNA, should alternative collection media be used compared to clinical practice?
Question 3	In patients being evaluated for malignancy undergoing EBUS-TBNA, should rapid on-site evaluation be used?
Question 4	In patients being evaluated for malignancy undergoing EBUS-TBNA, should a larger or smaller needle be used?
Question 5	In patients being evaluated for malignancy undergoing EBUS-TBNA, should biopsy include four or more needle passes or three or less needle passes?
Question 6	In patients being evaluated for nonmalignant disease undergoing EBUS-TBNA, should alternative collection media be used compared to clinical practice?
Question 7	In patients being evaluated for nonmalignant disease undergoing EBUS-TBNA, should rapid on-site evaluation be used?
Question 8	In patients being evaluated for nonmalignant disease undergoing EBUS-TBNA, should a larger or smaller needle be used?
Question 9	In patients being evaluated for nonmalignant disease undergoing EBUS-TBNA, should biopsy include four or more needle passes or three or less needle passes?

EBUS-TBNA = endobronchial ultrasound transbronchial needle aspiration; PICO = Population, Intervention, Comparator, and Outcome.



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1. EBUS-TBNA yapılan hastalarda, numunelerin iğneden çıkarılması için hem standart klinik uygulama (stillet, hava) hem de alternatif yöntemlerin (iğne yıkama) kullanılması önerilmekte (Koşullu Öneri, çok düşük kanıt güveni)
2. **Malignite şüphesi** olan ve EBUS-TBNA yapılan hastalarda, alternatif koleksiyon ortamlarının (formalin, RPMI, salin, fosfat tamponlu salin) veya mevcut klinik uygulamanın (standart alkol bazlı hazırlıklar) kullanılması önerilmekte (Koşullu Öneri, çok düşük kanıt güveni).
3. **Malignite şüphesi** olan ve EBUS-TBNA yapılan hastalarda, **ROSE yönteminin kullanılması öneriliyor** (Koşullu Öneri, çok düşük kanıt güveni).
 - ROSE ile daha az kez örnekleme yapılarak daha yüksek tanı, komplikasyonda azalma, işlem süresinde azalma, ancak moleküler çalışma için daha az örnek miktarı
4. **Malign hastalık şüphesi** olan ve EBUS-TBNA yapılan hastalarda, daha kalın bir iğneye (19 gauge) göre daha **küçük bir iğne (21 gauge veya 22 gauge) kullanılması öneriliyor** (Koşullu Öneri, çok düşük kanıt güveni).

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5. Malign hastalık şüphesi olan ve EBUS-TBNA yapılan hastalarda, üç veya daha az iğne geçişine kıyasla **dört veya daha fazla iğne geçişi** yapılmasını öneriliyor (Güçlü Öneri, çok düşük kanıt güveni).
6. Benign hastalık şüphesi olan ve EBUS-TBNA yapılan hastalarda, alternatif koleksiyon ortamlarının (salin, fosfat tamponlu salin) veya mevcut klinik uygulamanın (standart alkol bazlı hazırlıklar) kullanılması öneriliyor (Koşullu Öneri, çok düşük kanıt güveni).
7. Benign hastalık şüphesi olan ve EBUS-TBNA yapılan hastalarda, **ROSE yönteminin, alışılmış bakım yöntemine göre kullanılmasını öneriyoruz** (Koşullu Öneri, çok düşük kanıt güveni).
8. Benign hastalık şüphesi olan ve EBUS-TBNA yapılan hastalarda, **daha küçük (21 G veya 22 G) veya daha büyük (19 G) bir iğne kullanılmasını öneriyoruz** (Koşullu Öneri, çok düşük kanıt güveni).
9. Benign hastalık şüphesi olan ve EBUS-TBNA yapılan hastalarda, üç veya daha az iğne geçişine kıyasla **dört veya daha fazla iğne geçişi** yapılmasını öneriyoruz (Koşullu Öneri, çok düşük kanıt güveni).

Guidelines for endobronchial ultrasound-transbronchial needle aspiration (EBUS-TBNA): Joint Indian Chest Society (ICS)/Indian Association for Bronchology (IAB) recommendations

Lung India • Volume 40 • Issue 4 • July-August 2023

NUMBER OF NEEDLE PASSES

- *At least 3 passes per lymph node sampled should be obtained for all patients during EBUS-TBNA. (UPP)*
- *At least 3 passes per lymph node station sampled should be done for staging of NSCLC using EBUS-TBNA. (2A)*
- *At least 4 passes are advised for diagnostic testing and molecular profiling in patients suspected of having lung cancer. (2A)*
- *In patient suspected to have granulomatous mediastinal lymphadenopathy, additional samples should be sent for microbiological molecular analysis. (UPP)*

NUMBER OF NEEDLE AGITATIONS

- *At least 10 agitations per pass should be performed for obtaining adequate samples. (UPP)*

RAPID ON-SITE EVALUATION (ROSE)

- *EBUS-TBNA can be performed irrespective of availability of ROSE. (1A)*
- *ROSE should be performed where available. (2A)*
- *Pulmonologist adequately trained in cytopathology, may perform ROSE when ROSE by pathologist is not feasible. (3A)*

NEEDLE CHARACTERISTICS

- *In patients undergoing EBUS-TBNA, we recommend that either 21G or 22G may be used. (1A)*
- *The group did not make any recommendation for or against the use of 19G, 25G, ProCore and Franseen tip needles. The choice of the needle is based upon the operator's discretion. (UPP)*
- *In patients undergoing EBUS-TBNA, the use of a new needle is preferable. (3A)*



EBUS

Yeni İğneler



- Core or Franseen TBNA
- Procore TBNA
- Menghini type TBNA

EBUS Yeni İğneler



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Review Article

Evolution of transbronchial needle aspiration needles: Over the last half century

Yin Zhu^{a,b}, Hui Shen^{a,b}, Andrew D Lerner^c, Qin Li^{a,b}, Si Chen^d, Lingxiao Zhou^{a,b}, Jiaqi Zhou^{a,b}, Yang Xia^{a,b,**}, Kopen Wang^{c,*}



Table 2
Overview of mainstream EBUS-TBNA needles.

Manufacturer	Name	Size	Inner diameter	Material	Tip design	Design for safety	Design for flexibility	Design for visualization
Olympus (Tokyo, Japan)	ViziShot	21G/22G	0.61 mm/NA	Stainless steel	Normal	Safety lock	NA	Echogenic dimpled pattern
	ViziShot2	19G	NA	Stainless steel	Normal	Double safety locks	Spiral laser cuts	Spiral echogenic markings
	FLEX	21G/22G	NA	Stainless steel	Normal	Green-colored sheath	NA	Echogenic dimpled pattern
	ViziShot2	21G/22G	NA	Stainless steel	Normal	Green-colored sheath	NA	Echogenic dimpled pattern
Boston Scientific (Marlborough, MA, USA)	EZ Shot 3 Plus	19G/22G/25G	NA	Nitinol in 19G and 22G, stainless steel in 25G	Menghini bevel	Safety lock ring	Coil metal sheath	Echogenic dimpled pattern
	Expect	22G/25G	0.55 mm/NA	Cobalt chromium	Sharp needle tip grind	Safety lock ring	NA	Echogenic pattern
	Acquire FNB	22G/25G	NA	Cobalt chromium	Three symmetrical cutting surfaces with formed heels	Safety lock ring	NA	Echogenic pattern
	eXcelon	19G/20G/21G	NA	Stainless steel	Normal	Button lock system	Distal coil	NA
Cook Medical (Bloomington, IN, USA)	EchoTip Ultra	22G/25G	NA	Stainless steel	Normal	Safety lock ring	Coiled sheath	Echogenic dimpled pattern
	EchoTip ProCore	22G/25G	NA	Stainless steel	Menghini bevel and a core trap below	Safety lock ring	Coiled sheath	Echogenic dimpled pattern

Copilot

EBUS-TBNA: Endobronchial ultrasound-guided transbronchial needle aspiration; FNB: Fine needle biopsy; NA: Not applicable.

EBUS Yeni İğneler



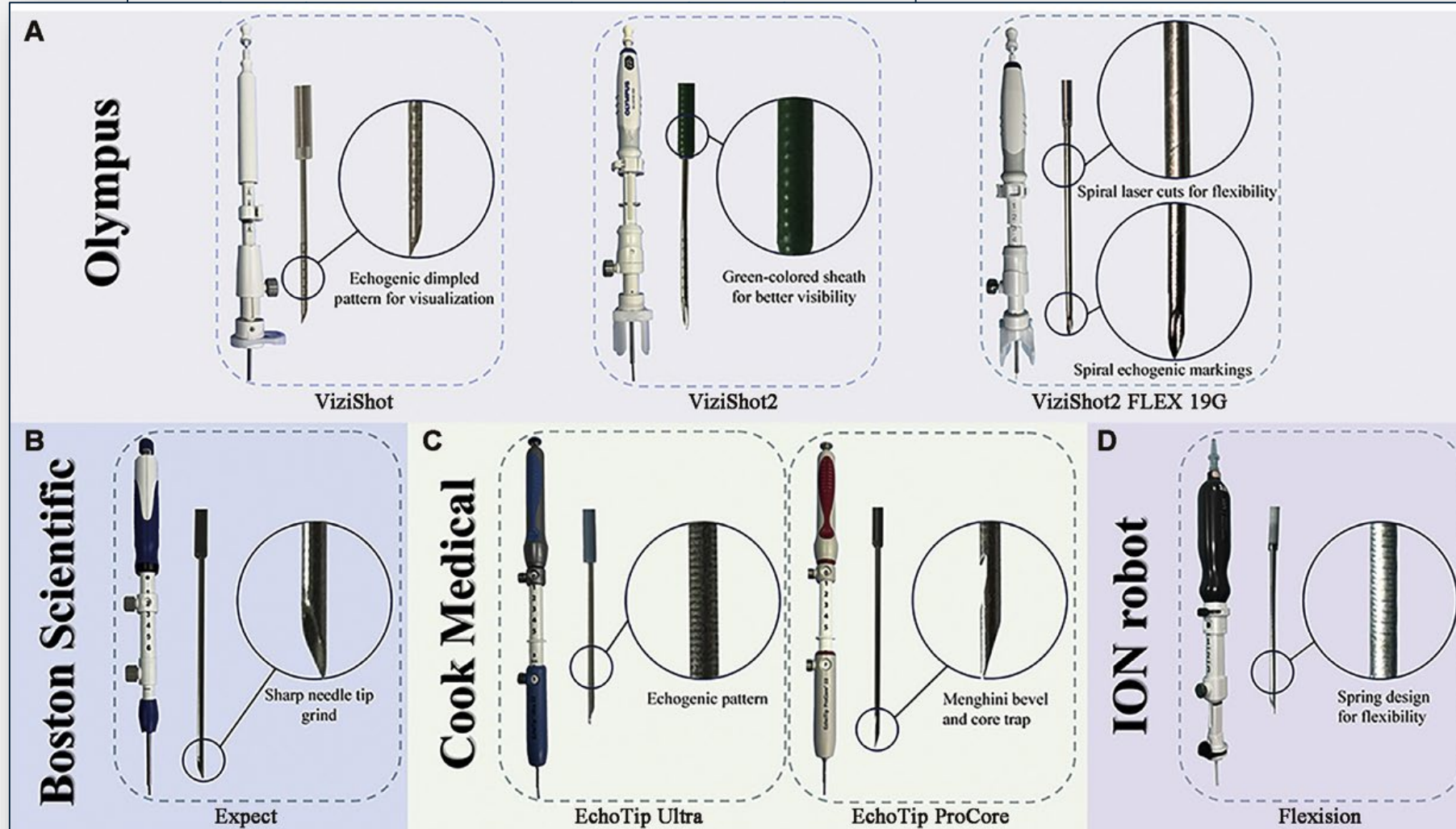
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Review Article

Evolution of transbronchial needle aspiration needles: Over the last half century



ity	Design for visualization
	Echogenic dimpled pattern
	Spiral echogenic markings
	Echogenic dimpled pattern
	Echogenic dimpled pattern
	Echogenic pattern
	Echogenic pattern
	NA
	Echogenic dimpled pattern
	Echogenic dimpled pattern



Original Article

Does needle-type increase the diagnostic yield of malignancies in endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA)?—a prospective comparative study

Piotr Skrzypczak^{1*}, Łukasz Gąsiorowski^{2*}, Magdalena Sielewicz^{1^}, Magdalena Roszak^{3^}, Mikołaj Kamiński^{1^}, Cezary Piwkowski¹



- N=363 hasta
- Standard (N=312) vs Procore iğne (N=51)
- 306 hastaya tanı konulmuş (%84.3)
- Procore iğne ile %92.2 vs. Standard iğne(%83.0)

Table 3 Comparison of the ProCore[®] needle and standard needle by the percentage of proper diagnosis, sensitivity, specificity, PPV and NPV

Type of needle	Proper diagnosis, n (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Proper diagnosis (P value)
ProCore [®]	47 (92.2)	89.2	100.0	100.0	77.8	0.14
Standard	259 (83.0)	79.3	95.7	98.5	57.3	
All	306 (84.3)	80.6	96.4	98.7	60.0	

PPV, positive predictive value; NPV, negative predictive value.

The needles commonly used in EBUS-TBNA have high diagnostic efficacy and can be successfully used to diagnose mediastinal pathologies. The ProCore[®] needle had no significant advantage over other standard needle types.

ORIGINAL RESEARCH

Diagnostic yield and safety of the ProCore versus the standard EBUS-TBNA needle in subjects with suspected sarcoidosis

Sahajal Dhoooria^a, Inderpaul Singh Sehgal^a, Kuruswamy Thurai Prasad^a, Valliappan Muthu^a, Nalini Gupta^{a,b}, Amanjit Bal^c, Babu Ram^a, Ashutosh Nath Aggarwal^a and Ritesh Agarwal^a

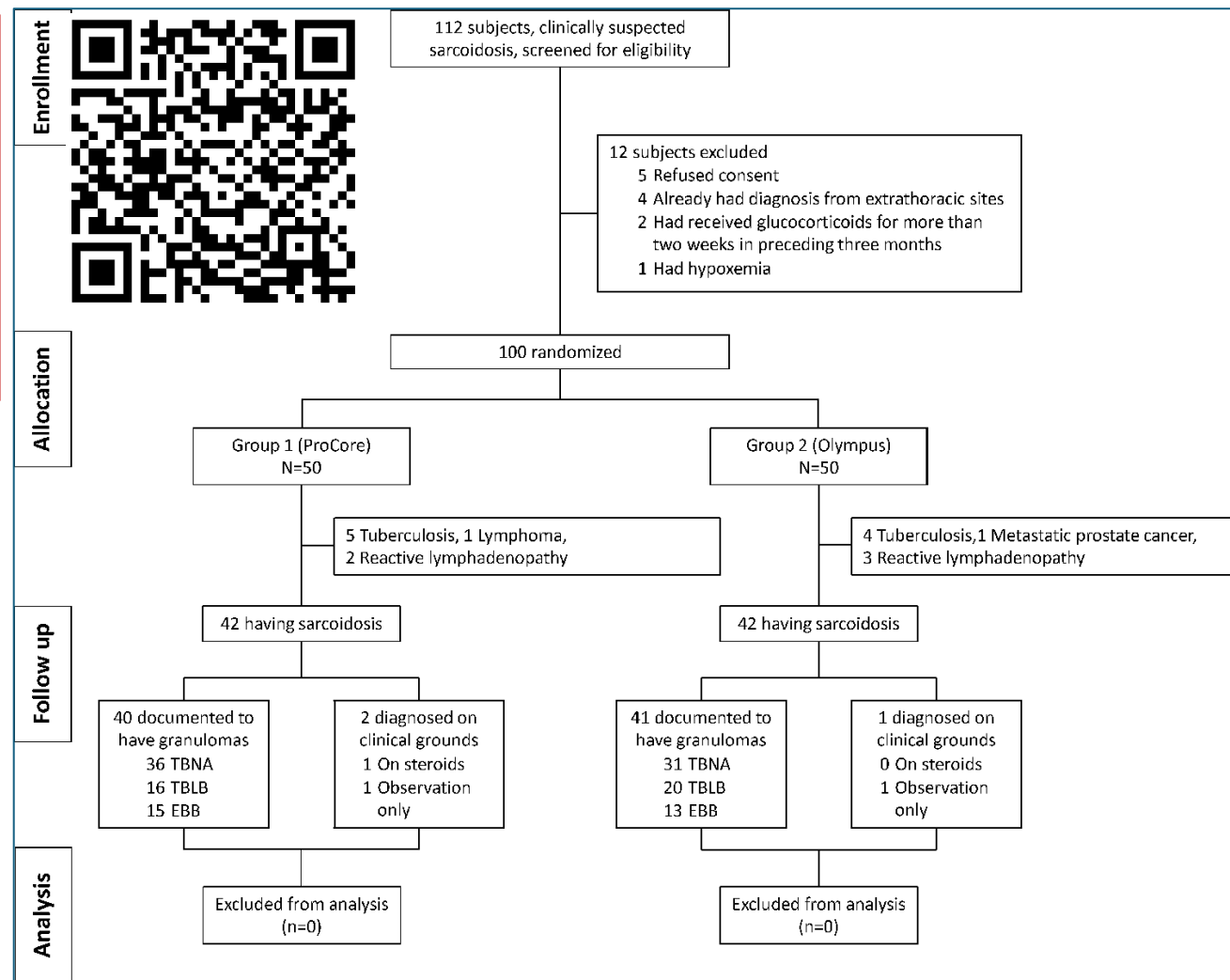
- 100 sarkoidoz hastasının
- 42 hastaya standart TBNA iğnesi
- 42 hastaya procore iğne
- Procore ile 36 hastaya (85.7%)
- Standard iğne ile 31 hastaya (73.8) ($p = 0.18$) TBNA ile tanı konuldu

Table 2. Study outcomes in subjects with a final diagnosis of sarcoidosis.

	ProCore group (n = 42)	Standard needle group (n = 42)	Effect size (95% CI)	P-value
Primary outcome				
Diagnostic yield	36 (85.7)	31 (73.8)	−11.9 (−28.6, 5.5)	0.18
Secondary outcomes				
Adequacy of specimen	40 (95.2)	38 (90.5)	−4.7 (−17.7, 7.7)	0.68
Adverse events*				
Hypoxemia	1	1	-	1.00

All values are presented as number (percentage). CI- confidence intervals

*Adverse events are reported for all the 100 subjects enrolled



5. Conclusions

The standard Olympus and the ProCore (Cook Medical) needles were comparable in their diagnostic yield, adequacy of the specimen, and procedural safety when used for performing EBUS-TBNA in subjects with sarcoidosis. More extensive studies are required to confirm our findings.

First Asia-Pacific experience of trans-bronchial core biopsy with a Franseen needle

Michael V. Brown^{1,2*^}, Katherine Lavrencic^{1,2*^}, Arash Badiei^{1,2^}, Hubertus Jersmann^{1,2^}, Andrew Fon^{2,3^}, Sean Chang⁴, Phan Nguyen^{1,2^}



- Boston Franseen **Acquire Core** biyopsi iğnesinin (N=193) tanısal etkinliği araştırılmış (vs. Olympus Vizishot2 (N=101 hasta)).
- Tanı verimliliği ve moleküler incelemedeki başarısı incelenmiş

Sonuç olarak;

- Boston Scientific Acquire Core iğnesinin mediastinal lezyonlardan örnekleme yapmak için **güvenli** bir yöntem olduğu,
- **Genel tanısal verimlilik**, hem Olympus Vizishot hem de Acquire iğnesi ile benzer
- EBUS-TBNB için **tanısal verimlilik**, **benign granümatöz hastalıklar ve alışılmadık maligniteler** açısından da olumlu olmuştur.
- Akciğer kanseri için, ilk prosedürde **PD-L1** ve ek testler için genellikle yeterli doku elde edilmiştir.

Table 3 Olympus VizishotTM and Boston AcquireTM yields

Outcome	Acquire TM	Vizishot TM	P value
Overall diagnostic yield	174/189 (92.1%)	86/101 (85.1%)	0.07
Malignant diagnoses	98/189 (51.9%)	31/101 (30.7%)	0.006
Benign diagnoses	76/189 (40.2%)	55/101 (54.5%)	0.02
Reported core samples	146/189 (77.2%)	25/101 (24.8%)	<0.0001
PD-L1 testing sufficient	45/49 (91.8%)	11/16 (68.8%), (12 adenocarcinoma, 2 NSCLC-NOS, 2 SCC)	0.02
EGFR/ALK/ROS ancillary testing sufficient	32/36 (88.9%)	10/14 (71.4%) (12 adenocarcinoma, 2 NSCLC-NOS)	0.13

PD-L1, programmed cell death-ligand 1; NSCLC-NOS, non-small cell lung carcinoma-not otherwise specified; SCC, squamous cell carcinoma; EGFR, epidermal growth factor receptor; ALK, anaplastic lymphoma kinase; ROS, ROS proto-oncogene 1.

Endobronchial ultrasound-guided lymph node biopsy with transbronchial needle forceps: a pilot study

F.J.F. Herth*, H. Schuler*, D. Gompelmann*, N. Kahn*, S. Gasparini#, A. Ernst*,
M. Schuhmann* and R. Eberhardt*

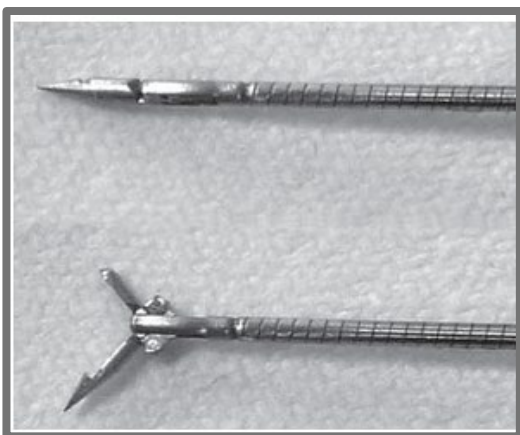
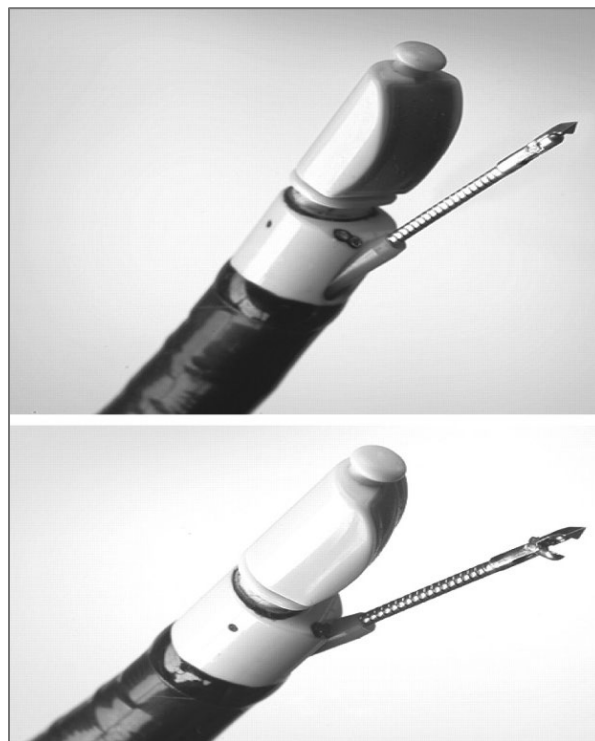


ABSTRACT: One limitation of endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is the size of the available needles, frequently yielding only cells for cytological examination. The aim of this pilot study was to evaluate the efficacy and safety of newly developed needle forceps to obtain tissue for the histological diagnosis of enlarged mediastinal lymph nodes.

Patients with enlarged, positron emission tomography (PET)-positive lymph nodes were included. The transbronchial needle forceps (TBNF), a sampling instrument combining the characteristics of a needle (bevelled tip for penetrating through the bronchial wall) with forceps (two serrated jaws for grasping tissue) was used through the working channel of the EBUS-TBNA scope. Efficacy and safety was assessed.

50 patients (36 males and 14 females; mean age 51 yrs) with enlarged or PET-positive lymph nodes were included in this pilot study. In 48 (96%) patients penetration of the bronchial wall was possible and in 45 patients tissue for histological diagnosis was obtained. In three patients TBNF provided inadequate material. For patients in whom the material was adequate for a histological examination, a specific diagnosis was established in 43 (86%) out of 50 patients (nonsmall cell lung cancer: n=24; small cell lung cancer: n=7; sarcoidosis: n=4; Hodgkin's lymphoma: n=4; tuberculosis: n=2; and non-Hodgkin's lymphoma: n=2). No clinically significant procedure-related complications were encountered.

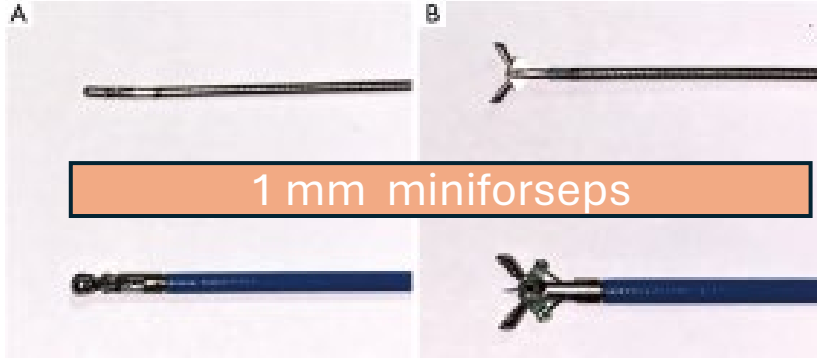
This study demonstrated that EBUS-TBNF is a safe procedure and provides diagnostic histological specimens of mediastinal lymph nodes.





Endobronchial ultrasound-guided intranodal forceps biopsy (EBUS-IFB)—technical review

George Cheng¹, Amit Mahajan², Scott Oh³, Sadia Benzaquen⁴, Alexander Chen⁵



• Prosedür

- **Color Doppler rehberliğinde** TBNA iğnesi ile (19 ,21 veya 22 G) mukozadan lenf noduna yol açılır. Bu yol için **4-5 kez iğne mukozaya saplanır**
- EBUS skobu sabit iken iğne kanaldan çıkarılır ve **miniforseps işlem kanalından ilerletilir.**
- **Forseps** mukozada oluşturulan defektten EBUS ile **real-time görüntü eşliğinde ilerletilir**
- Bu esnadan forsepsin doğru şekilde nodüle girmesi için operatör EBUS rotasyondan kaçınmak için probu ileri-geri, sağa sola hareket ettirmemelidir.
- Forseps içeride iken açılıp kapatılarak işlem sonlandırılır ve forseps geri çekilir.
- Kanama açısından orifis kontrol edilir.



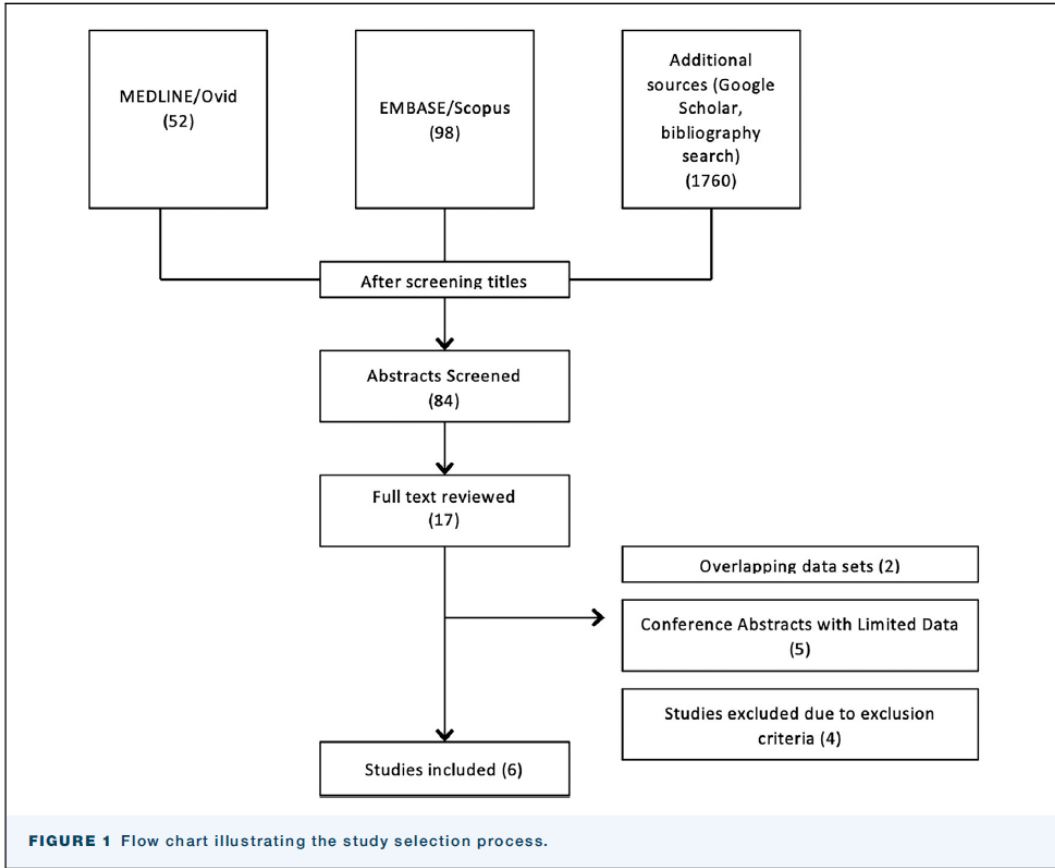
<https://www.asvide.com/watch/32949>



Combined EBUS-IFB and EBUS-TBNA vs EBUS-TBNA Alone for Intrathoracic Adenopathy: A Meta-Analysis

Abhinav Agrawal, MD, Uzair Ghori, MD, Udit Chaddha, MBBS, and Septimiu Murgu, MD, FCCP

Ann Thorac Surg 2022;114:340-8



- GoogleScholar, Scopus ve Medline/Ovid
- "endobronchial ultrasound" OR "EBUS" AND "forceps" OR "intranodal forceps" OR "miniforceps" OR "mini-forceps" OR "transbronchial needle forceps" kelimeleri ile başlık ve özetler taranmış
- Sonuçta; kriterler uygun 6 çalışma

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TABLE 3 Materials and Methods Used Across Individual Studies (Type of Transbronchial Needle Aspiration Needle, Type and Size of Intranodal Forceps Biopsy Forceps)

Study (First Author, y, Reference)	Technique and Type of TBNA	Number of TBNA Passes at Each LN Station	Type of Intranodal Forceps Used	Size of Intranodal Forceps Used (mm)	Technique of Intranodal Forceps Biopsy	Number of IFB Passes at Each LN station
Herth, 2008 ¹⁹	19- and 22-gauge Olympus TBNA needle ^a	3-4	Miniforceps (Olympus, Shinjiku, Japan)	1.15	Forceps through puncture site of EBUS-TBNA	3-5 (with the aim of obtaining 3 biopsy specimens)
Chrissian, 2011 ²⁰	22-gauge Olympus TBNA needle	4-6	Miniforceps (Boston Scientific, Marlborough, MA)	1.0	Forceps through puncture site of EBUS-TBNA	Minimum 3 biopsy specimens
Franke, 2012 ¹⁵	22-gauge (SonoTip II EBUS; Medi-Globe, Achenmühle, Germany).	3	21-gauge biopsy forceps (outside diameter, 0.8 mm; long oval cups; Endo-Passion, Durbheim, Germany)	0.8	Forceps through puncture site of EBUS-TBNA	2
Darwiche, 2012 ²¹	22-gauge Olympus TBNA needle	3	Puncture biopsy forceps (MTW-Endoskopie, Wesel, Germany)	1.1	The puncture biopsy forceps uses a 19-gauge needle tip for puncture through which the forceps can be inserted	3
Ray, 2020 ²²	22- or 21-gauge Olympus needle ^b	3	Spiked fenestrated alligator forceps (Olympus FB- 241K)	1.9	An electrocautery knife (Olympus KD- 31C-1) using Erbe (Tubingen, Germany) VIO 300D-40W was used to make incisions and then forceps advanced through them	3
Radchenko, 2019 ²³	22-gauge Olympus needle	Mean number, 6.74 (SD 1.42)	Spybite (Boston Scientific))	1.0	Forceps through puncture site of EBUS-TBNA	6.09 (SD -1.44)

^aWe used data on the basis of the yield of the 22-gauge Olympus needle to maintain consistency across various studies; ^bOccasionally, the 19-gauge Olympus needle was used, but not reported separately. EBUS, endobronchial ultrasound; IFB, intranodal forceps biopsy; LN, lymph node; TBNA, transbronchial needle aspiration.

Combined EBUS-IFB and EBUS-TBNA vs EBUS-TBNA Alone for Intrathoracic Adenopathy: A Meta-Analysis

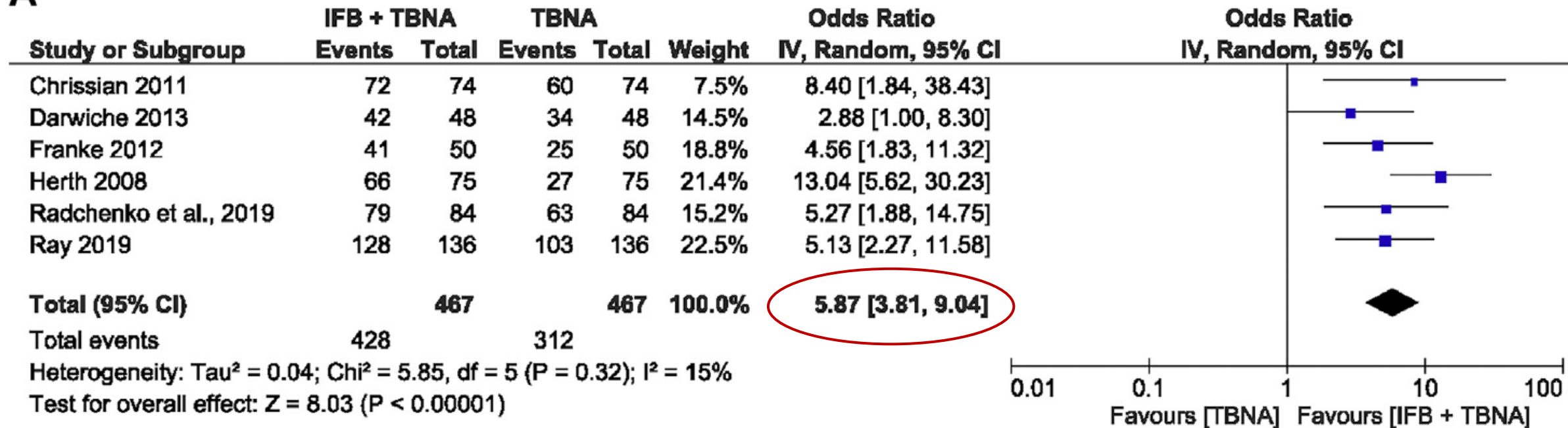
Abhinav Agrawal, MD, Uzair Ghori, MD, Udit Chaddha, MBBS, and
Septimiu Murgu, MD, FCCP

Ann Thorac Surg 2022;114:340-8



- Genel başarı oranı
 - EBUS-TBNA için %67 (312/467)
 - Kombine yöntem için %92 (428/467)
- OR= 5.87 (95% CI, 3.81 to 9.04; P < .00001)
- I² (heterogeneity index) of 15%.

A



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Ann Thorac Surg 2022;114:340-8



TABLE 2 Summary of Included Studies													
Study (First Author, y, Reference)	Study Design	Age (Mean/Range), y	Selection Criteria	Total Events (Patients/Lymph Nodes)	Overall EBUS-TBNA Yield	Overall EBUS-TBNA + IFB Yield	EBUS-TBNA Yield for Sarcoidosis		EBUS-TBNA + IFB Yield for Sarcoidosis	EBUS-TBNA Yield for Lymphoma		EBUS-TBNA + IFB Yield for Lymphoma	Gold Standard
Herth, 2008 ¹⁹	Prospective case series	53 (27-71)	Subcarinal lymph node (>25mm)	75	27/75	66/75	6/25		22/25	3/26		21/26	Surgical biopsy (mediastinoscopy or VATS)
Chrissian, 2011 ²⁰	Prospective case series	NA	Subcarinal: 17; paratracheal: 21; hilar: 36 (mean size, 28 mm)	Patients, 50; lymph nodes, 74.	60/74	72/74	29/33		33/33	0/4		4/4	Mediastinoscopy
Franke, 2012 ¹⁵	Prospective case series	57.7 (± 13.9)	Lymph node stations (4, 7, 10, 11, 12) (mean size, 18.7 mm)	50	25/50	41/50	4/8		7/8	0/2		1/2	Surgical biopsy (mediastinoscopy or VATS) or CT follow-up
Darwiche, 2012 ²¹	Prospective case series	54 (19-79)	Lymph node >10 mm	48	34/48	42/48	11/18		17/18	NA		NA	Surgical biopsy (mediastinoscopy or VATS) or CT follow-up
Ray, 2020 ²²	Retrospective observational	Patients with malignancy, 67.5 (± 10.5) Patients with sarcoidosis, 53.1 (± 14.6) Patients with lymphoma, 49.2 (± 19.5)	Mediastinal or hilar lymph nodes	136	103/136	128/136	37/59		56/59	10/16		15/16	NA
Radchenko, 2019 ²³	Retrospective observational	59.2 (21-87)		84	63/84	79/84	6/18		15/18	2/2		2/2	Surgical biopsy (mediastinoscopy) or CT follow-up

CT, computed tomographic; EBUS, endobronchial ultrasound; IFB, intranodal forceps biopsy; NA, not applicable, information not available; TBNA, transbronchial needle aspiration; VATS, video-assisted thoracoscopic surgery.

Combined EBUS-IFB and EBUS-TBNA vs EBUS-TBNA Alone for Intrathoracic Adenopathy: A Meta-Analysis

Abhinav Agrawal, MD, Uzair Ghori, MD, Udit Chaddha, MBBS, and Septimiu Murgu, MD, FCCP

Ann Thorac Surg 2022;114:340-8



- Komplikasyonlar incelendiğinde
 - Pnömomediastinum %1 (5 hasta)
 - Kanama %0.8 (4 hasta)
 - Pnömotoraks %1 (5 hasta) (Hastalara ayrıca parankim bx yapılmış)
 - Ölüm 1 kişi (Kritik aortik stenozu olan bir hasta)

TABLE 4 Complications in Patients Undergoing Endobronchial Ultrasound–Guided Intranodal Forceps Biopsy and Endobronchial Ultrasound–Guided Transbronchial Needle Aspiration

Study (First Author, y, Reference)	Total Patients Undergoing IFB	Pneumomediastinum	Bleeding	Respiratory Failure	Pneumothorax	Other Complications
Herth, 2008 ¹⁹	75	0	0	0	0	0
Chrissian, 2011 ²⁰	50	0	0	0	0	0
Franke, 2012 ¹⁵	50	1	3 ^a	0	0	0
Darwiche, 2013 ²¹	48	0	0	0	0	0
Ray, 2019 ²²	136	4	1 (hemoptysis within 10 days)	1	4 ^b	1 (pneumonia within 10 days)
Radchenko, 2019 ²³	84	0	0	2	1 [#]	1 death ^c
Total	443	5 (1%)	4 (0.9%)	3 (0.7%)	5 (1%) ^b	2

Guidelines for endobronchial ultrasound-transbronchial
needle aspiration (EBUS-TBNA): Joint Indian Chest
Society (ICS)/Indian Association for Bronchology (IAB)
recommendations

Lung India • Volume 40 • Issue 4 • July-August 2023



ENDOBRONCHIAL ULTRASOUND-GUIDED INTRA-NODAL FORCEPS BIOPSY (EBUS-IFB)

- *EBUS- IFB may be performed only by an experienced operator as an additional modality for patients with negative rapid-on-site evaluation (ROSE) or in situations when tissue biopsy is required for definitive diagnosis (e.g. lymphoma). (2B)*
- *EBUS-IFB may also be considered in patients with prior non-diagnostic EBUS-TBNA. (UPP)*



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EBUS
KRYOBİYOPSİ



Transbronchial mediastinal cryobiopsy in the diagnosis of mediastinal lesions: a randomised trial

Jing Zhang¹, Jie-Ru Guo¹, Zan-Sheng Huang¹, Wan-Lei Fu², Xian-Li Wu¹, Na Wu³, Wolfgang M. Kuebler⁴, Felix J.F. Herth^{5,6,7} and Ye Fan^{1,7}



Pulmonology

Volume 30, Issue 5, September–October 2024, Pages 459–465



Original article

EBUS-guided cryobiopsy in the diagnosis of thoracic disorders

V. Poletti^{a b c}  , S. Petrarulo^a, S. Piciucchi^d, A. Dubini^e, A.J. De Grauw^a, F. Sultani^a, S. Martinello^a, H.K. Gonunguntla^f, C. Ravaglia^{a b}



BMJ Open
Respiratory
Research

Ultrasound-guided transbronchial cryobiopsy of mediastinal and hilar lesions: a multicenter pragmatic cohort study with real-world evidence

Melanie Scarlett Mangold^a ,¹ Daniel P Franzen,² Jürgen Hetzel,^{3,4} Tsogyal D Latshang,⁵ Maurice Roeder,¹ Silvan M Vesenbeck,¹ Silvia Ulrich,¹ Thomas Gaisl^a ,¹ Carolin Steinack^a ¹

Thoracic surgery

ORIGINAL ARTICLE

WILEY

Mediastinal “deep freeze”—transcarinal lymph node cryobiopsy

Evgeni Gershman^{1,2}  | Alon Amram Ikan^{2,3} | Barak Pertzov^{1,2}  |

SéAP-IAP

REVISTA ESPAÑOLA DE
Patología
Spanish Journal of Pathology

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ORIGINAL

EBUS-TBNA and CryoEBUS of the mediastinal lymph node. One hundred seventy-eight cases. Validation of the WHO Reporting System for Lymph Node Cytopathology. Proposed CryoEBUS diagnostic flow



Proposal for a standardized methodology for performing endobronchial ultrasound-guided mediastinal cryobiopsy: a four-step approach

Miguel Angel Ariza Prota^{1^}, Javier Pérez Pallarés², Emanuela Barisione³, Sammy Onyancha⁴,
Pulmonology 30 (2024) 466–474



PULMONOLOGY

www.journalpulmonology.org



ORIGINAL ARTICLE

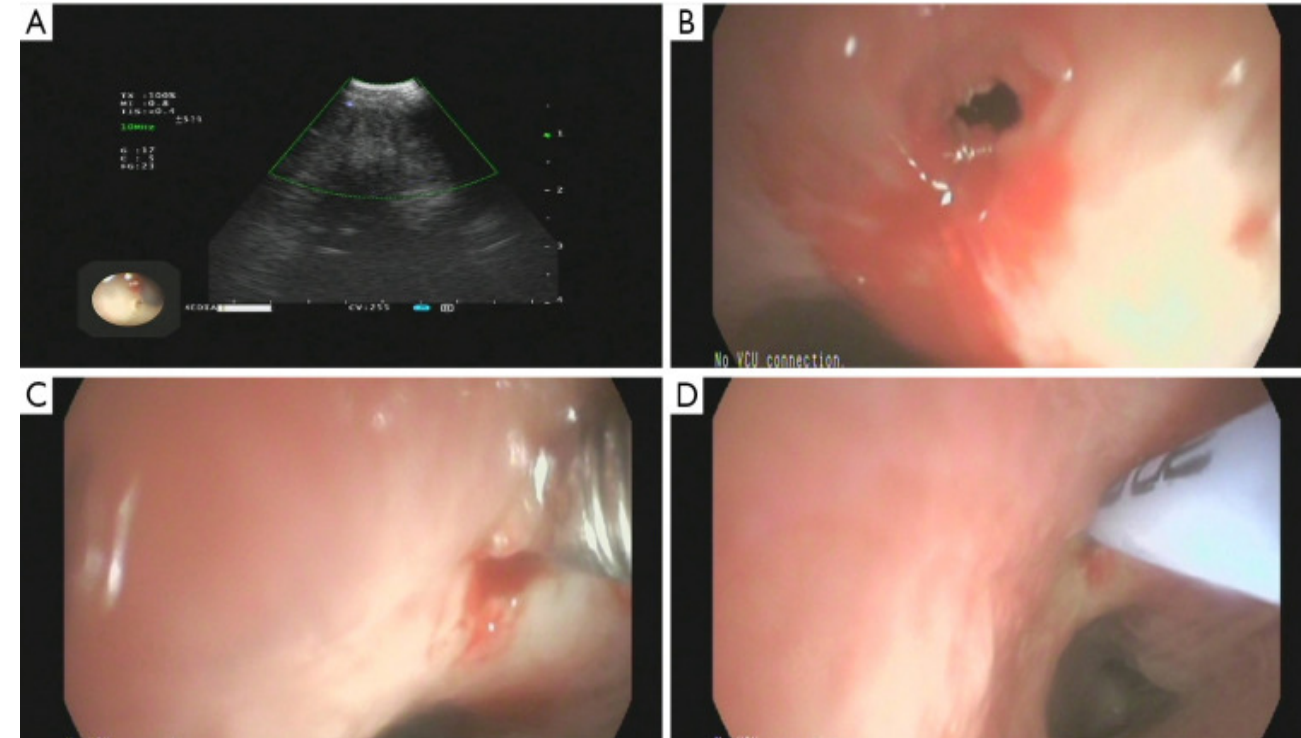
Comparison of cryobiopsy and forceps biopsy for the diagnosis of mediastinal lesions: A randomised clinical trial



T.-L. Cheng^a, Z.-S. Huang^a, J. Zhang^a, J. Wang^a, J. Zhao^a, K. Kontogianni^c, W.-L. Fu^e, N. Wu^d, W.M. Kuebler^b, F.J. Herth^c, Y. Fan^{a,*}

Nasıl uygulanıyor?

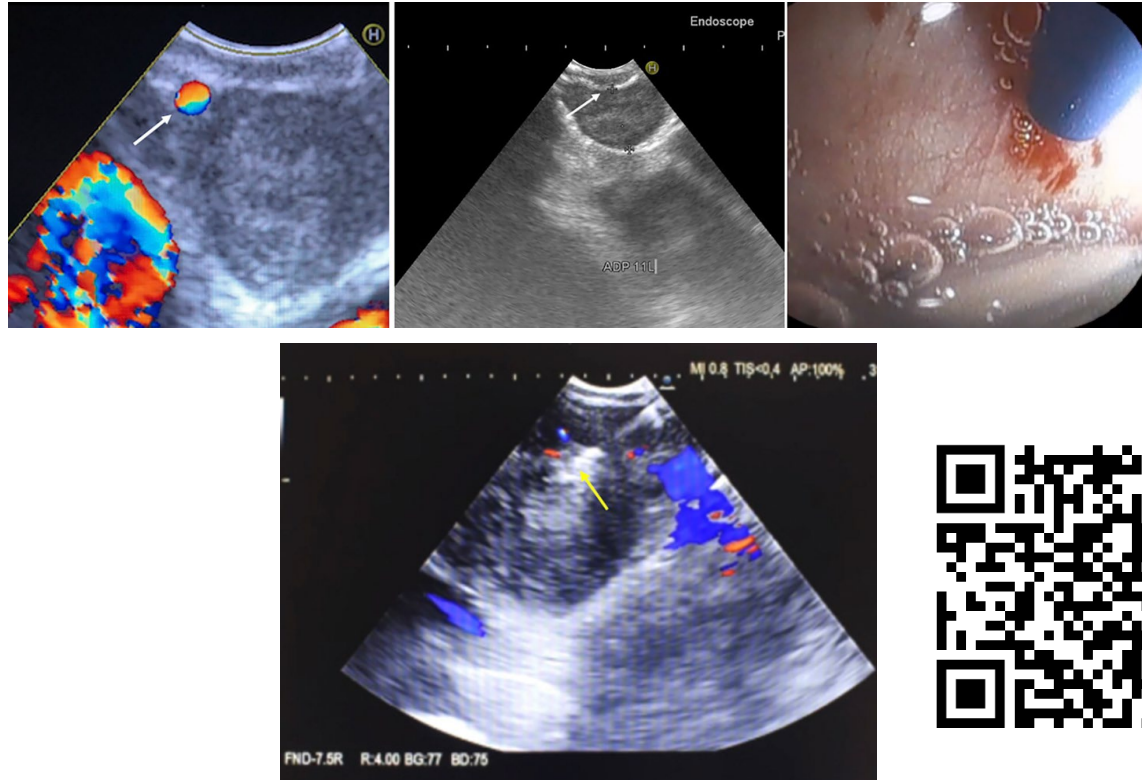
- 1.1 mm kryoproba ihtiyacı var
 - 19 G TBNA iğnesi
 - veya
 - Elektrokoter bıçağı ile
- kryoprob girişı için orifis açılıyor.



Proposal for a standardized methodology for performing endobronchial ultrasound-guided mediastinal cryobiopsy: a four-step approach

Miguel Angel Ariza Prota^{1^}, Javier Pérez Pallarés², Emanuela Barisione³, Sammy Onyancha⁴, Nadia Corcione⁵, Hector Enrique Torres Rivas⁶, Luis Fernández Fernández⁶, Marta García Clemente¹, Francisco Julián López González¹

Mediastinum 2024;8:30 | <https://dx.doi.org/10.21037/med-23-65>



Dört Aşamalı Yaklaşım

1. Planlama

- Örneklemeye yapılacak lenf nodunun tespiti
- Toraks BT // PET-BT dikkatle değerlendirilmeli

2. Delme (puncture)

- Uygun sedasyon altında işlem önerilmekte
- **Doppler-Mode** vasküler yapılardan uzakta kalmak için
- İnce mukoza ve kapsülün olduğu, kıkırdak dokunun olmadığı nokta seçilmeli
- **19G iğne ile** 8-12 defa iğne hareket ettirilmeli

3. Tünel açma

- Tünel açma için iğne ile aynı noktadan birkaç kez ponksiyon yapılmalı

4. Kryobiyopsi

- Tünelden **1.1 mm kryoprob** ile lenf noduna girilir.
- Kryoprob 3-5 sn dondurulur ve prob sonra EBUS cihazı ile geri çekilir.
- Lezyonda her seferinde farklı noktalardan örnek alınır

Proposal for a standardized methodology for performing endobronchial ultrasound-guided mediastinal cryobiopsy: a four-step approach

Miguel Angel Ariza Prota^{1^}, Javier Pérez Pallarés², Emanuela Barisione³, Sammy Onyancha⁴, Nadia Corcione⁵, Hector Enrique Torres Rivas⁶, Luis Fernández Fernández⁶, Marta García Clemente¹, Francisco Julián López González¹

• Endikasyonlar:

- Lenfoproliferatif hastalık şüphesi
- Granülomatöz hastalık şüphesi
- Ekstrapulmoner nadir tümör metastazı
- Tanısal olmayan EBUS-TBNA
- Nekrotik lenf nodu/lezyon varlığı
- Evre 3-4 KHDAK (moleküler analiz veya İHK boyama)
- İndüksiyon KT/RT sonrası re-staging

• Kontrendikasyonlar:

- Tekrarlayan veya mevcut olan AMI
- Ciddi hipoksemi
- Hemodinamik instabilite
- Ciddi PHT
- Güçlükle kontrol altına alınan kalp yetmezliği
- KOAH/astım alevlenmesi
- Yaşamı tehdit eden disritmi
- Antikoagulan/antiplatelet ilaç kullanımı
- Pıhtılaşma sorunları
- Sedasyon veya anesteziye intolerans
- Vasküler pattern Grade III-IV hasta



Konveks Prob EBUS Yeni Yöntemler ve Yaklaşımlar

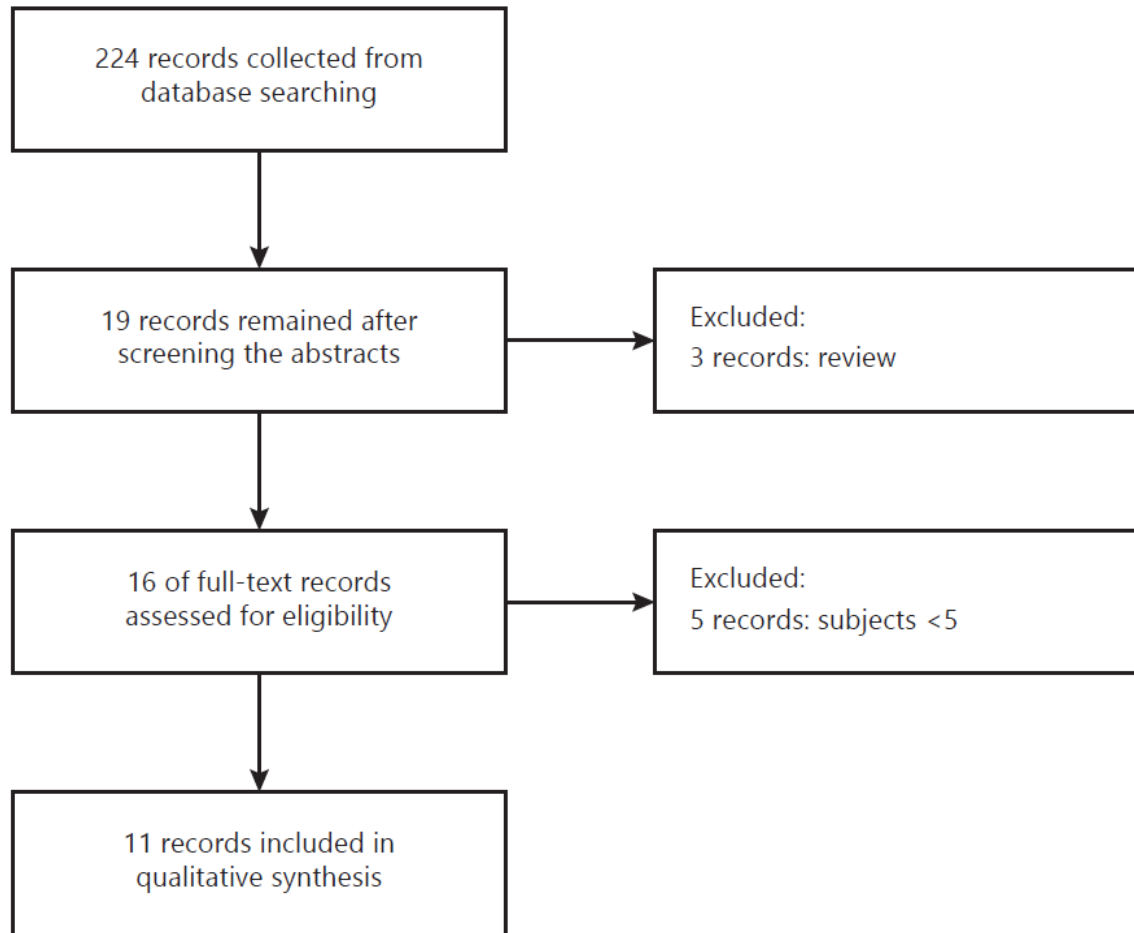
- Tanısal işlemlerde gelişmeler
- Transvasküler uygulamalar
- İntratümöral uygulamalar
- EUS-B-FNA ve CUS-B-NA



EBUS-TVNA



Feasibility and Safety of Endosonography-Guided Transvascular Needle Aspiration in the Diagnosis of Thoracic and Abdominal Lesions: A Meta-Analysis



Abstract

Background: Endoscopic techniques, including endobronchial ultrasound (EBUS) and endoscopic ultrasound (EUS), are used as the initial approach for the diagnosis and staging of lung cancer and the diagnosis of thoracic and abdominal lesions. Historically, the transvascular approach has been avoided because of concerns about bleeding. **Objectives:** This article is a systematic review of studies evaluating the feasibility and safety of transvascular needle aspiration (TVNA) under the guidance of EBUS or EUS in the diagnosis of thoracic and abdominal lesions. **Methods:** We performed a systematic search of the MEDLINE, Embase, and Cochrane databases to identify studies evaluating the application of EBUS/EUS-guided TVNA (EBUS/EUS-TVNA) for lesions located at the contralateral side of the vessel for which the transvascular approach was the best puncture path. We performed a meta-analysis of diagnostic yield estimations. We also reviewed the complications related to the procedure. **Results:** Eleven observational studies were included in the final analysis. Meta-analysis yielded a pooled overall diagnostic yield of 82.10% (95% confidence interval, 0.74–0.89) for TVNA, with an I^2 value of 52%. No publication bias was detected by Egger's test ($p = 0.8528$). The overall complications included minor bleeding, minor hematoma, pseudoaneurysm of the aorta, hemoptysis, acute hypoxic respiratory failure, and moderate bleeding. The major complication rate was 2.71%. **Conclusions:** EBUS/EUS-TVNA is feasible and probably safe when performed by experienced endoscopists in carefully selected patients. In view of the potential risks associated with the transvascular approach, especially the development of hematoma and pseudoaneurysm, the fanning technique was avoided, and the area of aspiration should be assessed by EUS for 3 min after each aspiration. Most importantly, EBUS/EUS-TVNA should only be performed if the results will impact the clinical management.

Feasibility and Safety of Transvascular Needle Access of Thoracic and Abdominal Lesions: A Meta-Analysis

Table 1. Basic characteristics, diagnostic yield, and complications of studies

Study/Year	Study design	Total EBUS performed, <i>n</i>	Needle type	Vessel traversed, <i>n</i>	Number of passes, <i>n</i>	Overall yield, <i>n</i> (%)	Sedation	EBUS-TBNA-induced complications
von Bartheld et al. (2009) [9]	Retrospective	14	22G	Aorta (14)	N/A	9/14 (64.29)	Moderate sedation	2 small para-aortic hematoma
Panchabhai et al. (2015) [10]	Retrospective	10	N/A	Pulmonary artery (10)	2–8	9/10 (90.00)	General anesthesia	10 minor bleeding
Folch et al. (2016) [11]	Retrospective	10	21G/22G	Pulmonary artery (10)	1–2	9/10 (90.00)	Moderate sedation	None
Kazakow et al. (2017) [12]	Retrospective	33	21G/22G	Aorta (19) Pulmonary artery (14)	1–5	24/33 (72.73)	Moderate sedation/ general anesthesia	N/A
Ravaglia et al. (2018) [13]	Retrospective	11	21G/22G	Aorta (11)	N/A	5/11 (45.45)	Deep sedation	None
Metha et al. (2018) [14]	Retrospective	10	22G	Pulmonary artery (10)	Maximum 3	9/10 (90.00)		
Wang et al. (2019) [15]	Retrospective	26	22G	Portal vein (2) Superior mesenteric vein (24)	1–4	24/26 (92.31)	Moderate sedation	None
Molina et al. (2020) [16]	Retrospective	100	21G/22G	Aorta (58) Pulmonary artery (32) Subclavian artery (6) Portal vein (2) Jugular vein (1) Innominate vein (1)	1–4	73/100 (73.00)	Moderate sedation	1 pseudoaneurysm of the aorta
Garcia et al. (2020) [17]	Retrospective	50	22G/25G	Aorta (18) Portal system (12) Superior mesenteric vein (5) Pulmonary artery (4) Splenic artery (3) Superior mesenteric artery (2) Inferior vena cava (2) Hepatic artery (1) Gastroduodenal artery (1) Azygos vein (1) Splenic vein (1)	1–8	45/50 (90.00)	Deep sedation	3 hematomas 1 minor bleeding
Perathur et al. (2021) [18]	Retrospective	8	21G	Pulmonary artery (8)	1–3	7/8 (87.50)	Procedural sedation/ general anesthesia	4 mild bleeding
Naamanet al. (2021) [19]	Retrospective	35	19G/21G/22G/25G	Pulmonary artery (29) Azygos vein (3) Brachiocephalic artery (2) Superior vena cava (1)	At least 3	31/35 (88.57)	General anesthesia	1 hemoptysis 1 moderate bleeding 1 acute hypoxic respiratory failure

Feasibility and Safety of Endosonography-Guided Transvascular Needle Aspiration in the Diagnosis of Thoracic and Abdominal Lesions: A Meta-Analysis

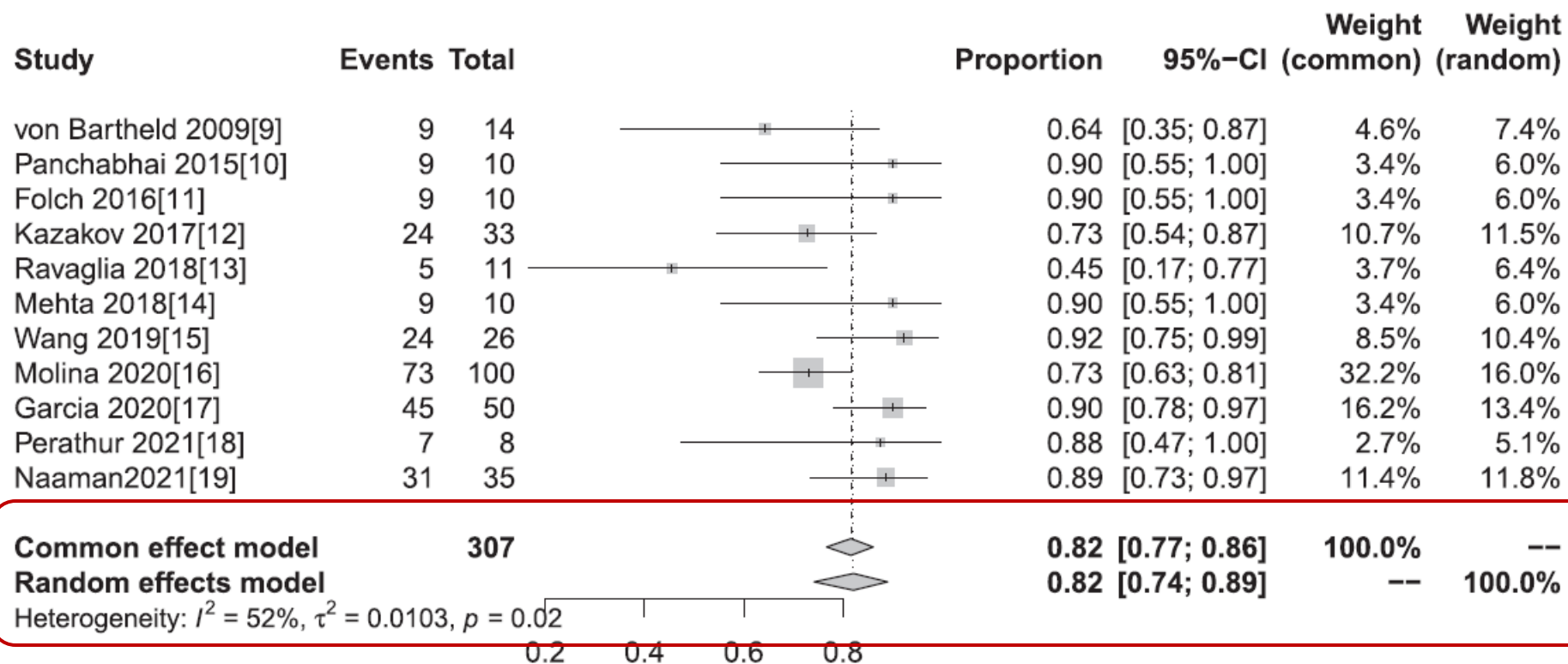
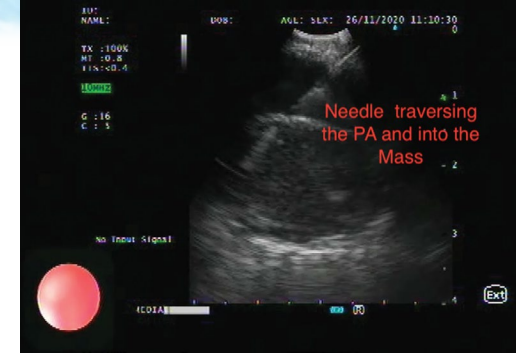


Fig. 3. Forest plot of the overall diagnostic yield of EBUS/EUS-TVNA.



“To do or not to do — that is the question”. Transvascular needle aspiration during EBUS (EBUS-TVNA) with review of the literature

Adv Respir Med. 2021; 89: 386–391



- Sonuçta, eğer vasküler yapı geçilmeden örnekleme mümkün değil ve tanı için transvasküler işlem gerekli ise kanama riski için hastaların detaylı değerlendirilmesi sonrası ve uygun bir protokol ile uygulandığında EBUS-TVNA güvenli tanısal yöntemdir.

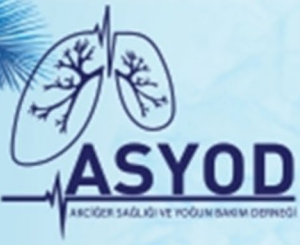
Table 2. Summary of cases series with endobronchial ultrasound with transvascular needle aspiration

Study	Year of publishing	No. of cases	Vessel traversed	Diagnostic yield [%]	Complications
Nuguru <i>et al.</i> [18]	2017	12	MPA/branch	100	None
Naaman <i>et al.</i> [16] (Abstract)	2020	35	MPA/branch, azygous, SVC, brachiocephalic artery	Unclear but 89% of the malignancies diagnosed correctly	1 each of: respiratory failure, atrial fibrillation-related tachycardia, moderate bleeding
Rachid MM [19] (abstract)	2018	24	MPA/branch	90	None
Folch [9]	2016	10	MPA	90	None
Kazakov [8]	2017	33	MPA/branch, aorta	73	None
Panchabhai [11]	2015	10	MPA/branch	90	None
Mehta <i>et al.</i> [12]	2018	10	MPA/intra PA	90	None
Our study	2020	8	MPA/branch	100	None
Boujaoude <i>et al.</i> [10]	2013	2	Branch MPA	100	None
Cetinkaya <i>et al.</i> [20]	2018	4	MPA/branch	100	None

LMPA — main pulmonary artery; PA — pulmonary artery

PERSPECTIVE

Treatments for severe pulmonary embolism include surgery, catheter-based thrombolysis, or systemic thrombolysis. Our bronchoscopic method can rapidly manage large central emboli.



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PULMONER HİPERTANSİYONUN DEĞERLENDİRİLMESİ

THORACIC: LUNG

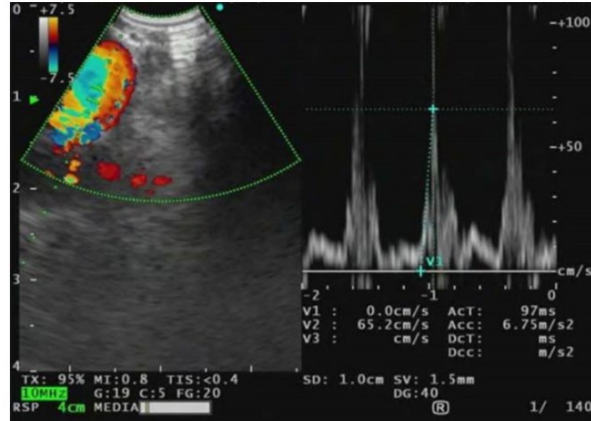
Endobronchial ultrasound: A novel screening test for pulmonary hypertension prior to major pulmonary surgery

Nathaniel Deboever, MD, MSc,^a George A. Eapen, MD,^b Roberto F. Casal, MD,^b Jean-Bernard Durand, MD,^c Michael A. Eisenberg, MD,^a Hope Feldman, MD, MSc,^a Celestino May, MD, MAEd,^a Zohra Ali, APRN, MSc,^a David C. Rice, MB, BCh,^a and Reza J. Mehran, MDCM, MSc^a

JTCVS Tech. 2023 Dec 15;23:146-153



Check for updates



ABSTRACT

Objectives: Pulmonary hypertension (PH) is an important physiologic variable in the assessment of patients undergoing major thoracic operations but all too often neglected because of the need for right heart catheterization (RHC) due to the inaccuracy of transthoracic echocardiography. Patients with lung cancer often require endobronchial ultrasound (EBUS) as part of the staging of the cancer. We sought to investigate whether EBUS can be used to screen these patients for PH.

Methods: Patients undergoing a major thoracic operation requiring EBUS for staging were included prospectively in the study. All patients had also a RHC (gold standard). We aimed to compare the pulmonary artery pressure measurements by EBUS with the RHC values.

Results: A total of 20 patients were enrolled in the study. The prevalence of abnormal pulmonary artery pressure was 65% based on RHC. All patients underwent measurement of the pulmonary vascular acceleration time (PVAT) by EBUS with no adverse events. Linear regression analysis comparing PVAT and RHC showed a correlation ($r = -0.059, -0.010$ to $-0.018, P = .007$). A receiver operator characteristic curve (area under the curve = 0.736) was used to find the optimal PVAT threshold (140 milliseconds) to predict PH; this was used to calculate a positive and negative likelihood ratio following a positive diagnosis of 2.154 and 0.538, respectively.

Conclusions: EBUS interrogation of pulmonary artery hemodynamic is safe and feasible. EBUS may be used as a screening test for PH in high-risk individuals. (JTCVS Techniques 2024;23:146-53)

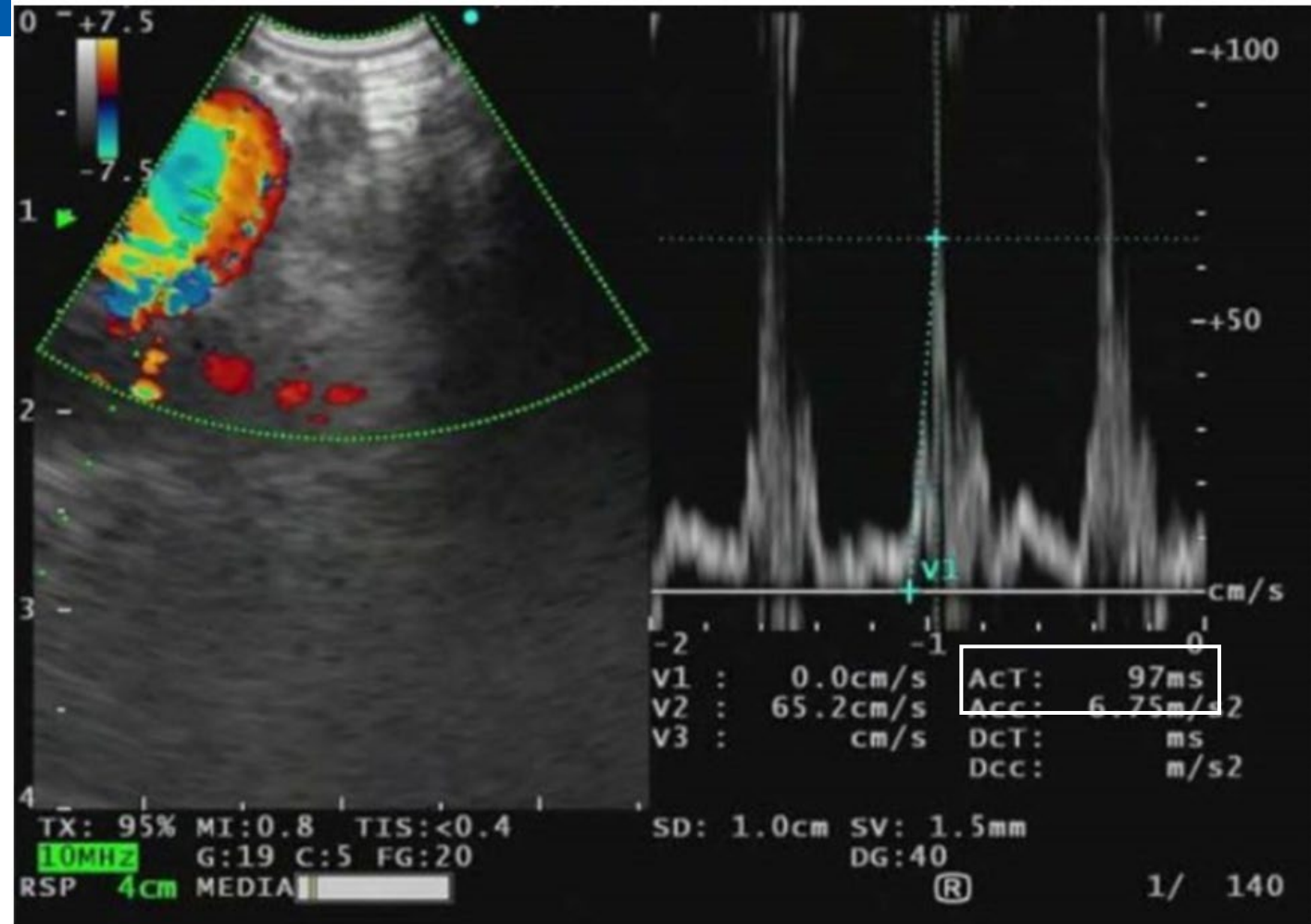
PULMONER HİPERTANSİYONUN DEĞERLENDİRİLMESİ

THORACIC: LUNG

Endobronchial ultrasound: A novel screening test for pulmonary hypertension prior to major pulmonary surgery

Nathaniel Deboever, MD, MSc,^a George A. Eapen, MD,^b Roberto F. Casal, MD,^b Jean-Bernard Durand, MD,^c Michael A. Eisenberg, MD,^a Hope Feldman, MD, MSc,^a Celestino May, MD, MAEd,^a Zohra Ali, APRN, MSc,^a David C. Rice, MB, BCH,^a and Reza J. Mehran, MDCM, MSc^a

ure, peribronchial lymph nodes were evaluated, and tissue samples were obtained when appropriate. The endobronchial evaluation of pulmonary artery pressure was via Doppler interrogation of the pulmonary artery through the right mainstem bronchus, in order to generate a PVAT in milliseconds, across 3 time points, regardless of heart rate.⁸ The 2 measurements with the least variance were used in this analysis. The PVAT was defined as the time required for the pulmonary artery vascular flow to accelerate from minimal velocity to maximal velocity (V1 and V2, respectively, as calculated in Figure 1). This was performed using the EVIS EXERA III ultrasound processor (Olympus Surgical Technologies). Historically, a transthoracic echocardiogram (TTE) Doppler-generated PVAT of less than 105 milliseconds was characterized as being abnormal, in accordance with the British Society of Echocardiography (BSE) guidelines, where the pulmonary arterial systolic pressure has been estimated on echo by using the simplified Bernoulli equation from the peak tricuspid regurgitant velocity in patients with cardiac disease.²³ All measurements were performed by the same interventional pulmonologists (G.A.P., R.F.C.).



PULMONER HİPERTANSİYONUN DEĞERLENDİRİLMESİ

THORACIC: LUNG

Endobronchial ultrasound: A novel screening test for pulmonary hypertension prior to major pulmonary surgery



Nathaniel Deboever, MD, MSc,^a George A. Eapen, MD,^b Roberto F. Casal, MD,^b Jean-Bernard Durand, MD,^c Michael A. Eisenberg, MD,^a Hope Feldman, MD, MSc,^a Celestino May, MD, MAEd,^a Zohra Ali, APRN, MSc,^a David C. Rice, MB, BCh,^a and Reza J. Mehran, MDCM, MSc^a

$$mPAP_{EBUS} = -0.059 * PVAT + 30.46$$

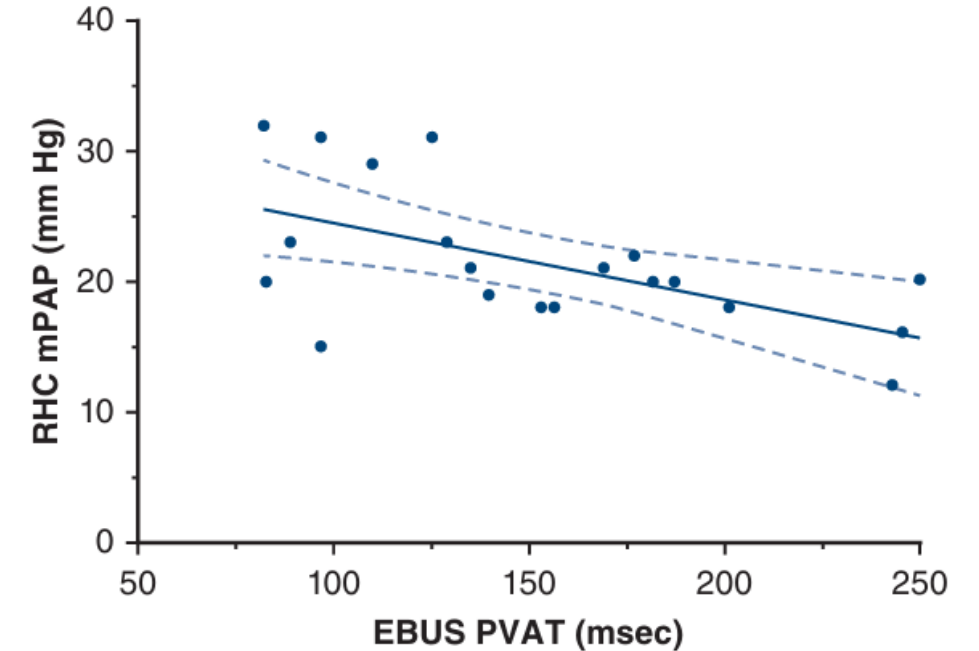


FIGURE 2. Linear regression model with 95% confidence intervals, comparing endobronchial ultrasound–generated pulmonary vascular acceleration time (*EBUS PVAT*) with right heart catheterization–generated median pulmonary artery pressure (*RHC mPAP*).



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Konveks Prob EBUS Yeni Yöntemler ve Yaklaşımlar

- Tanısal işlemlerde gelişmeler
- Transvasküler uygulamalar
- İntratümöral uygulamalar
- EUS-B-FNA ve CUS-B-NA

Akciğer Kanserinde İntratümöral Tedavi

- Kemoterapötikler,
- Hedefe yönelik ve immünoterapiler intratümöral olarak uygulanabilmekte.

Avantajları:

- Lokal ilaç konsantrasyonu 30 kata kadar artar.
- Sistemik toksisite azalır.
- İntratümöral tedavilerde immün check-point direnci gelişimini önleyebileceği düşünülmekte



Bronchoscopic intratumoural therapies for non-small cell lung cancer

Andrew DeMaio and Daniel Stermann

Journal of Cancer 2023, Vol. 14

544



Research Paper

Visualizing intratumoral injections in lung tumors by endobronchial ultrasound

Vitor Mori¹, Emily A. DuComb¹, Sarah Wagner¹, Farrah Khan², Jason H. T. Bates¹ and Kinsey¹

Journal of Cancer 2021, Vol. 12



Research Paper

Intratumoral Treatment with Chemotherapy and Immunotherapy for NSCLC with EBUS-TBNA 19G

Paul Zarogoulidis¹, Wolfgang Hohenforst-Schmidt², Haidong Huang^{3*}, Jun Zhou^{4*}, Qin Wai Wang^{3*}, Ying Xia^{3*}, Yinfeng Ding^{3*}, Chong Bai³, Christoforos Kosmidis¹, Konstantinos Sapi Sardeli⁴, Kosmas Tsakiridis⁵, Bojan Zaric⁶, Tomi Kovacevic⁶, Vladimir Stojic⁶, Tatjana Sarcev⁶, Bursac⁶, Biljana Kukic⁶, Sofia Baka⁷, Evagelia Athanasiou⁸, Dimitrios Hatzibougias⁸, Electra Michalopoulou-Manoloutsou⁸, Savvas Petanidis⁹, Dimitris Drougas¹⁰, Konstantinos Drevelas¹¹, Paliouras¹², Nikolaos Barbetakis¹², Anastasios Vagionas¹³, Lutz Freitag¹⁴, Aimilios Lallas¹⁵, Ioanna Dimitris Petridis¹⁷, Aris Ioannidis¹⁸, Dimitris Matthaios¹⁹, Konstantinos Romanidis²⁰, Chrisant

EBUS-TBNI ile İntratümöral Tedavi

Teknik Avantajlar:

- Endobronşiyal ve mediastinal lezyon doğrudan hedeflenebilir.
- Damarsal ve kritik yapılardan kaçınılabılır.

Kullanım Alanları:

- Kemoterapi ve immünoterapi enjeksiyonları.
- Kortikosteroid, antibiyotik ve traneksamik asit gibi diğer medikal ajanların lokal uygulaması.

Journal of Cancer 2021, Vol. 12



Research Paper

Intratatumoral Treatment with Chemotherapy and Immunotherapy for NSCLC with EBUS-TBNA 19G

Clinical Case Report

EBUS-guided Iodine-125 seed implantation in lymph node as a novel therapy for MCAO

A case report

Huiwen Qian, MD^a, Jianqiang Jin, MD^a, Changguo Wang, MD^a, Yuting Wang, MD^a, Juxiang Ge, BD^a, Jianan Huang, PhD^a, Cheng Ji, PhD^a*

EBUS-TBNI Rehberliğinde Radyoterapi

- Santral torasik kitle ve oligometastatik hastalıkların stereotactic radyoterapi için EBUS eşliğinde *fiducial marker* yerleştirilebilmesi.

Radiotherapy and Oncology 201 (2024) 110547



Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com



Original Article

Feasibility, safety and outcomes of stereotactic radiotherapy for ultra-central thoracic oligometastatic disease guided by linear endobronchial ultrasound-inserted fiducials

Calvin Sidhu^{a,*}, Colin Tang^{a,b}, Alison Scott^b, Hema Yamini Ramamurthy^c, Lokesh Yagnik^c, Sue Morey^c, Martin Phillips^f, Angela Jacques^g, Rajesh Thomas^{c,h,i}

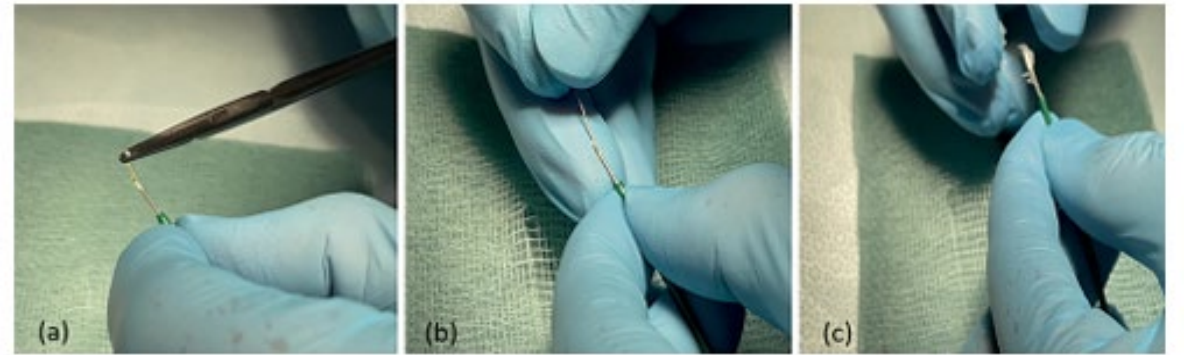


Fig. 1. (a) Gold fiducial marker being front-loaded into tip of TBNA needle using artery forceps (b) Stylet being used to push fiducial marker further inside the needle lumen (c) Paraffin being applied to needle tip.



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9-12 Nisan 2025
Sueno Deluxe Hotel,
Belek/Antalya



Konveks Prob EBUS Yeni Yöntemler ve Yaklaşımlar

- Tanısal işlemlerde gelişmeler
- Transvasküler uygulamalar
- İntratümöral uygulamalar
- EUS-B-FNA ve CUS-B-NA

EUS-B-FNA

Endoscopic Ultrasound with Bronchoscope Guided Fine Needle Aspiration

- EBUS TBNA ile örneklenebilen istasyonlara ek olarak
 - 8, 9 numaralı istasyonlar
 - 5 ve 6 (transvasküler yolla)
 - Karaciğer sol lobu
 - Sol adrenal metastazların değerlendirilmesini sağlar

J Bras Pneumol. 2024;50(3):e20230353
<https://dx.doi.org/10.36416/1806-3756/e20230353>

ORIGINAL ARTICLE



EBUS-TBNA in mediastinal staging of non-small cell lung cancer: comparison with pathological staging

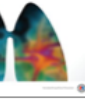
Sara Braga¹, Rita Costa², Adriana Magalhães³, Gabriela Fernal

Lung Cancer 106 (2023) 107391

Contents lists available at ScienceDirect

Lung Cancer

journal homepage: www.elsevier.com/locate/lungcan



Performance of EUS-FNA and EUS-B-FNA for the diagnosis of left adrenal glands metastases in patients with lung cancer: A systematic review and meta-analysis

Antonio Moretti^{a,b}, Bojan Kovacevic^c, Peter Vilman^c, Jouke T. Annema^a, Daniël A. Korevaar^{a,*}

Review Article

Transesophageal endoscopic ultrasound with bronchoscope-guided fine-needle aspiration for diagnostic and staging purposes: a narrative review

Goohyeon Hong¹, Masahide Oki²



EUS-B-FNA vs EBUS-TBNA

- Neden gerekli? EBUS-TBNA'ya karşı avantajı var mı?
 - Tanı başarısı benzer (%68 vs %87)
 - 7 ve 4L EUS-B-FNA'da en sık örneklenen istasyonlar
 - EUS-B-FNA ile
 - Daha az sedasyon, daha kısa işlem süresi,
 - Topikal anestezi ihtiyacı yok,
 - Daha nadir desaturasyon,
 - Daha az öksürük ve dispne hissi,
 - Daha fazla hasta toleransı,
 - Daha fazla bronkoskopist konforu ve tatmin.

Nakashima et al. *BMC Pulmonary Medicine* (2023) 23:206
<https://doi.org/10.1186/s12890-023-02508-2>

BMC Pulmonary Medicine

RESEARCH

Open Access

Safety and utility of Endoscopic Ultrasound with Bronchoscope-guided Fine Needle Aspiration (EUS-B-FNA) in suspected lung cancer patients with poor respiratory or general conditions: a prospective three-center observational study

Koki Nakashima^{1,2*}, Yukihiro Umeda¹, Yoshiki Demura³, Toshihiro Takeda³, Toshihiro Tada³, Masayuki Sato², Norihiro Jikuya³, Kosuke Kurokawa³, Tomoaki Sonoda¹, Makiko Yamaguchi¹, Miho Mitsui¹, Masahiro Oi³, Ryo Chikazawa², Yuko Waseda¹, Masaki Anzai¹, Masaya Akai³ and Tamotsu Ishizuka¹

Guidelines

Guidelines for endobronchial ultrasound-transbronchial needle aspiration (EBUS-TBNA): Joint Indian Chest Society (ICS)/Indian Association for Bronchology (IAB) recommendations

Anant Mohan¹, Karan Madan¹, Vijay Hadda¹, Saurabh Mittal¹, Tejas Suri¹, Irfan Shekh¹, Randeep Guleria¹, Abdul Khader², Prashant Chhajed³, Devasahayam J. Christopher⁴, Rajesh Swarnakar⁵, for the "EBUS Guidelines Working Group"
Working group Members (in alphabetical order by surname)



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CUS-B-NA

Combined Ultrasound with Bronchoscope Needle Aspiration

- Aynı işlemde EBUS-TBNA & EUS-B-FNA uygulanması
- Akciğer kanserinde tam mediasten evrelemesi
- Sarkoidoz tanısında kullanımda
 - Yüksek sensitivite (%91) (vs. tek EBUS-TBNA (%80) veya tek EUS-B-FNA(%85))



Article

Transitioning to Combined EBUS EUS-B FNA for Experienced EBUS Bronchoscopist

Jeffrey Ng ^{1,2,*}, Hiang Ping Chan ^{1,2}, Adrian Kee ^{1,2}, Kay Leong Khoo ^{1,2} and Kay Choong See ^{1,2}

Received: 21 April 2021 | Accepted: 12 October 2021

DOI: 10.1111/resp.14182

ORIGINAL ARTICLE

Official Journal of the Asian Pacific Society of Respirology
Respirology WILEY

EBUS versus EUS-B for diagnosing sarcoidosis: The International Sarcoidosis Assessment (ISA) randomized clinical trial

Laurence M. M. Crombag¹ | Kirsten Mooij-Kalverda¹ | Artur Szlubowski² |
Maciej Gnass³ | Kurt G. Tournoy^{4,5} | Jiayuan Sun⁶ | Masahide Oki⁷ |
Maarten K. Ninaber⁸ | Daniel P. Steinfort⁹ | Barton R. Jennings¹⁰ |
Moishe Liberman¹¹ | Semra Bilaceroglu^{12,13} | Peter I. Bonta¹ | Daniël A. Korevaar¹ |
Rocco Trisolini¹⁴ | Iouke T. Annema¹

Review Article

Transesophageal endoscopic ultrasound with bronchoscope-guided fine-needle aspiration for diagnostic and staging purposes: a narrative review

Goohyeon Hong¹, Masahide Oki²

SONUÇ

EBUS ve EUS-B tek cihaz ile mediasten, sürrenal ve karaciğer metastazlarının tespitinde yardımcı, güvenilir bir yöntemdir

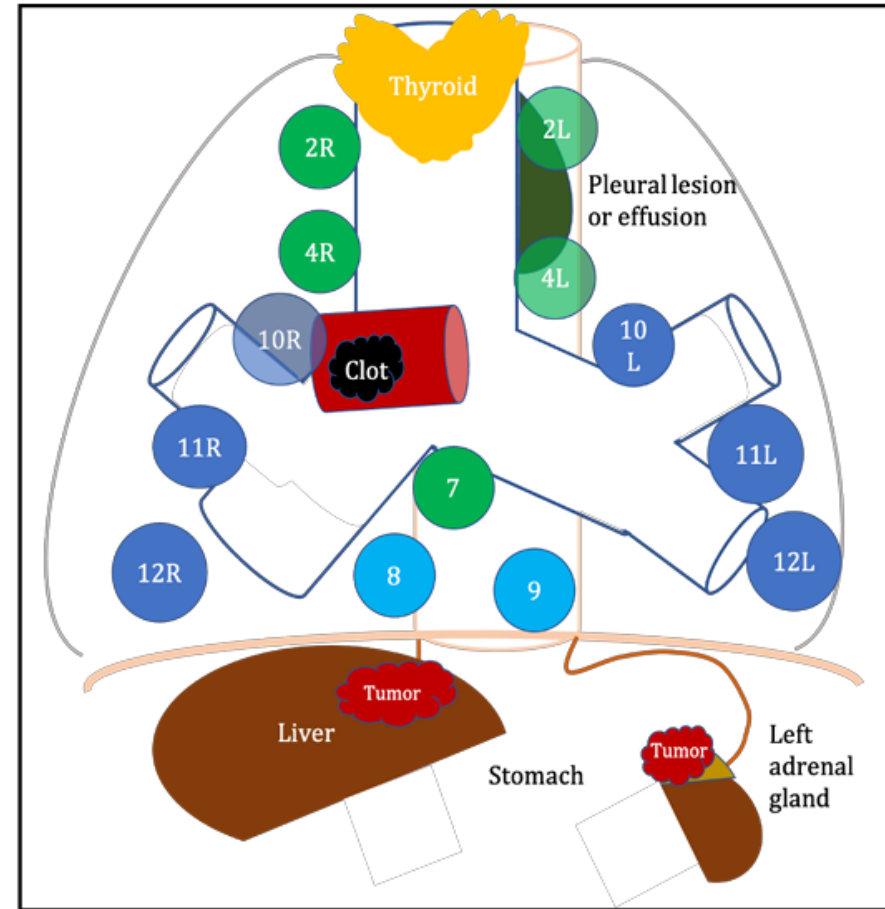


Figure 2. Sites potentially accessible by EBUS scope. Blue circles represent the main mediastinal stations accessible only by EBUS, light blue circles represent lymph node stations accessible only by EUS-B, and green circles represent lymph node stations accessible by both EBUS and EUS-B.



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EBUS & DERİN ÖĞRENME





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Journal of the Formosan Medical Association 124 (2025) 28–37



Contents lists available at [ScienceDirect](#)

Journal of the Formosan Medical Association

journal homepage: www.jfma-online.com

Original Article

TransEBUS: The interpretation of endobronchial ultrasound image using hybrid transformer for differentiating malignant and benign mediastinal lesions

Ching-Kai Lin ^{a,b,c,d}, Shao-Hua Wu ^{d,**}, Yi-Wei Chua ^d, Hung-Jen Fan ^{a,e}, Yun-Chien Cheng ^{d,*}



Original Article

Transl Lung Cancer Res 2022;11(1):14-23

Malignant thoracic lymph node classification with deep convolutional neural networks on real-time endobronchial ultrasound (EBUS) images

Seung Hyun Yong¹, Sang Hoon Lee¹, Sang-II Oh², Ji-Soo Keum², Kyung Nam Kim², Moo Suk Park¹, Yoon Soo Chang², Eun Young Kim^{1,*}



scientific reports

(2022) 12:13710

OPEN

Deep learning-based diagnosis from endobronchial ultrasonography images of pulmonary lesions

Takamasa Hotta, Noriaki Kurimoto, Yohei Shiratsuki, Yoshihiro Amano, Megumi Hamaguchi, Akari Tanino, Yukari Tsubata[✉] & Takeshi Isobe



www.nature.com/scientificreports



Journal of
Imaging



Article

Automatic Segmentation of Mediastinal Lymph Nodes and Blood Vessels in Endobronchial Ultrasound (EBUS) Images Using Deep Learning

Öyvind Ervik ^{1,2,*}, Ingrid Tveten ³, Erlend Fagertun Hofstad ³, Thomas Lango ^{3,4}, Håkon Olav Leira ^{2,5}, Tore Amundsen ^{2,5} and Hanne Sorger ^{1,2}

Original Research

Endoscopic Ultrasound

OPEN

Computed tomography-based radial endobronchial ultrasound image simulation of peripheral pulmonary lesions using deep learning

Chunxi Zhang^{1,2,3}, Yongzheng Zhou^{1,2,3}, Chuanqi Sun⁴, Jilei Zhang⁴, Junxiang Chen^{1,2,3}, Xiaoxuan Zheng^{1,2,3}, Ying Li^{1,2,3}, Xiaoyao Liu⁴, Weiping Liu^{4,*}, Jiayuan Sun^{1,2,3,*}

Volume 103, Issue 12
December 2024

RESEARCH ARTICLES | SEPTEMBER 14 2024

Artificial Intelligence Algorithm Can Predict Lymph Node Malignancy from Endobronchial Ultrasound Transbronchial Needle Aspiration Images for Non-Small Cell Lung Cancer

Subject Area: Pneumology

Yogita S. Patel; Anthony A. Gatti; Forough Farrokhyar; Feng Xie; Waël C. Hanna [✉]

Respiration (2024) 103 (12): 741–751.

<https://doi.org/10.1159/000541365> Article history



tomography

Tomography 2025, 11, 24



Article

Diagnosis of Lung Cancer Using Endobronchial Ultrasonography Image Based on Multi-Scale Image and Multi-Feature Fusion Framework

Huitao Wang ¹, Takahiro Nakajima ², Kohei Shikano ³, Yukihiro Nomura ⁴ and Toshiya Nakaguchi ^{4,*}



Journal of
Imaging



Article

A New Deep Learning-Based Method for Automated Identification of Thoracic Lymph Node Stations in Endobronchial Ultrasound (EBUS): A Proof-of-Concept Study

Öyvind Ervik ^{1,2,*}, Mia Rodde ³, Erlend Fagertun Hofstad ³, Ingrid Tveten ³, Thomas Lango ^{3,4}, Håkon O. Leira ^{2,4,5}, Tore Amundsen ^{2,5} and Hanne Sorger ^{1,2}



cancers



Article

Prediction of Nodal Metastasis in Lung Cancer Using Deep Learning of Endobronchial Ultrasound Images

Yuki Ito ¹, Takahiro Nakajima ^{2,*}, Terunaga Inage ¹, Takeshi Otsuka ³, Yuki Sata ¹, Kazuhisa Tanaka ¹, Yuichi Sakairi ¹, Hidemi Suzuki ¹ and Ichiro Yoshino ¹



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J. Imaging 2025, 11, 10



Article

A New Deep Learning-Based Method for Automated Identification of Thoracic Lymph Node Stations in Endobronchial Ultrasound (EBUS): A Proof-of-Concept Study

Öyvind Ervik ^{1,2,*}, Mia Rodde ³, Erlend Fagertun Hofstad ³, Ingrid Tveten ³, Thomas Lango ^{3,4}, Håkon O. Leira ^{2,4,5}, Tore Amundsen ^{2,5} and Hanne Sorger ^{1,2}

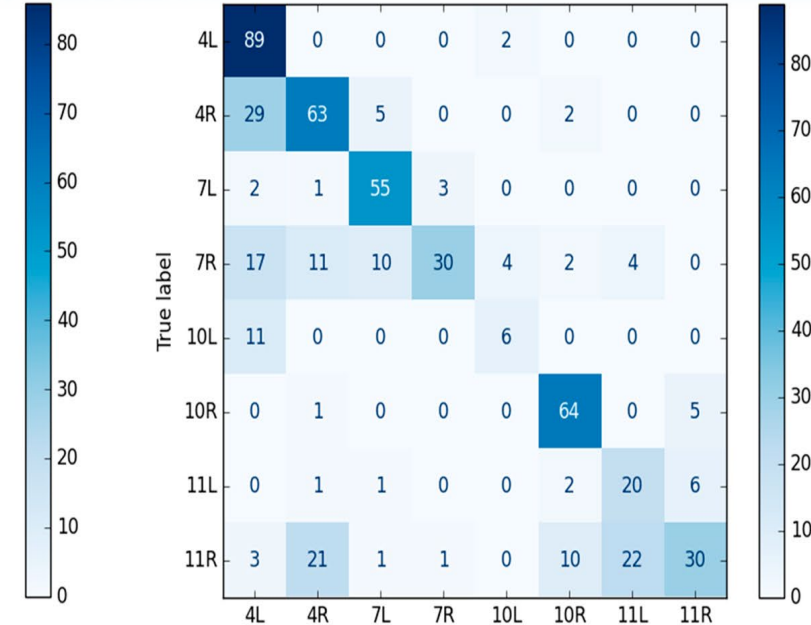
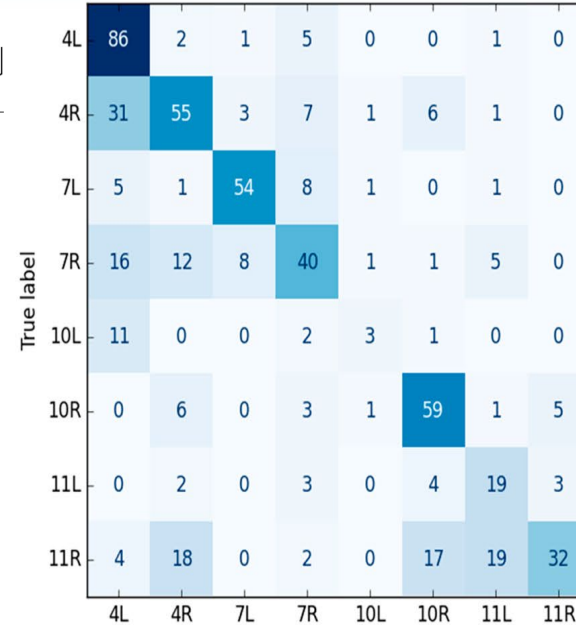
Abstract: Endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) is a cornerstone in minimally invasive thoracic lymph node sampling. In lung cancer staging, precise assessment of lymph node position is crucial for clinical decision-making. This study aimed to demonstrate a new deep learning method to classify thoracic lymph nodes based on their anatomical location using EBUS images. Bronchoscopists labeled lymph node stations in real-time according to the Mountain Dressler nomenclature. EBUS images were then used to train and test a deep neural network (DNN) model, with intraoperative labels as ground truth. In total, 28,134 EBUS images were acquired from 56 patients. The model achieved an overall classification accuracy of $59.5 \pm 5.2\%$. The highest precision, sensitivity, and F1 score were observed in station 4L, $77.6 \pm 13.1\%$, $77.6 \pm 15.4\%$, and $77.6 \pm 15.4\%$, respectively. The lowest precision, sensitivity, and F1 score were observed in station 10L. The average processing and prediction time for a sequence of ten images was 0.65 ± 0.04 s, demonstrating the feasibility of real-time applications. In conclusion, the new DNN-based model could be used to classify lymph node stations from EBUS images. The method performance was promising with a potential for clinical use.

- Mediastinal lenf nodu istasyonunun tanınmasında AI ve derin öğrenmenin yardımı incelemiş
- 56 hastada 28.154 lenf nodu görüntüsü elde edilmiş ve lenf nodları yapay zekaya öğretilmiş.
- Lenf nodlarına ait videolar AI ile incelenmiş. Her istasyon için saniyede 5 kare resim olacak şekilde görüntüler alınmış. Toplam 10 kare (2sn).

A New Deep Learning-Based Method for Automated Identification of Thoracic Lymph Node Stations in Endobronchial Ultrasound (EBUS): A Proof-of-Concept Study

Öyvind Ervik ^{1,2,*}, Mia Rødde ³, Erlend Fagertun Hofstad ³, Ingrid Tveten ³, Thomas Langø ^{3,4}, Håkon O. Leira ^{2,4,5}, Tore Amundsen ^{2,5} and Hanne Sorger ^{1,2}

- Karmaşıklık (Confusion) matrisinde
 - İlk matris stateless diğeri stateful modda
 - İlk tabloda lenf nodlarına ait bu 10 kare ayrı ayrı değerlendiriliyor,
 - İkincisinde akıcı video gibi beraber değerlendiriliyor.
- 4L istasyon çok yüksek oranda doğru olarak bulunuyor. 10L en düşük performansa sahip



Metric	Precision (%)		Sensitivity (%)		F1-Score (%)	
Model	Stateless	Stateful	Stateless	Stateful	Stateless	Stateful
4L	70.8 ± 12.1	77.6 ± 13.1	70.0 ± 15.3	77.6 ± 15.4	69.3 ± 10.6	76.2 ± 10.4
4R	59.5 ± 6.2	65.2 ± 5.1	56.8 ± 7.6	63.5 ± 9.0	57.3 ± 2.1	63.7 ± 3.0
7L	57.7 ± 15.7	57.6 ± 13.9	60.6 ± 12.3	70.7 ± 13.5	57.4 ± 11.2	62.0 ± 11.5
7R	47.3 ± 9.9	61.4 ± 16.1	52.5 ± 4.8	50.0 ± 13.8	49.0 ± 5.5	53.4 ± 9.8
10L	29.8 ± 27.2	32.3 ± 29.1	17.8 ± 21.0	26.3 ± 29.2	18.4 ± 16.5	24.0 ± 20.7
10R	62.1 ± 7.3	68.2 ± 6.6	61.8 ± 12.0	68.7 ± 19.1	61.7 ± 9.3	67.2 ± 13.4
11L	39.6 ± 6.3	40.3 ± 6.0	50.1 ± 14.7	51.5 ± 14.2	43.2 ± 8.0	44.2 ± 7.8
11R	53.0 ± 18.0	54.4 ± 18.3	36.4 ± 7.2	38.9 ± 10.3	41.7 ± 8.1	44.1 ± 10.6

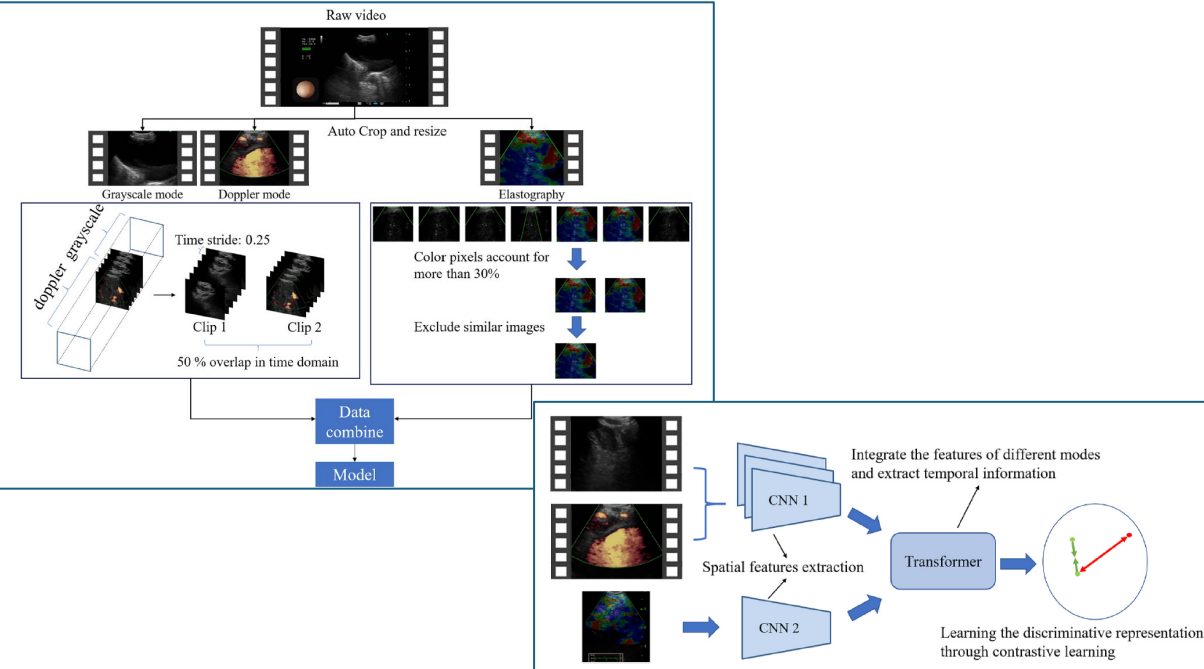
Data are represented as mean ± SD.



Original Article

TransEBUS: The interpretation of endobronchial ultrasound image using hybrid transformer for differentiating malignant and benign mediastinal lesions

Ching-Kai Lin^{a,b,c,d}, Shao-Hua Wu^{d,*}, Yi-Wei Chua^d, Hung-Jen Fan^{a,e}, Yun-Chien Cheng^{d,*}



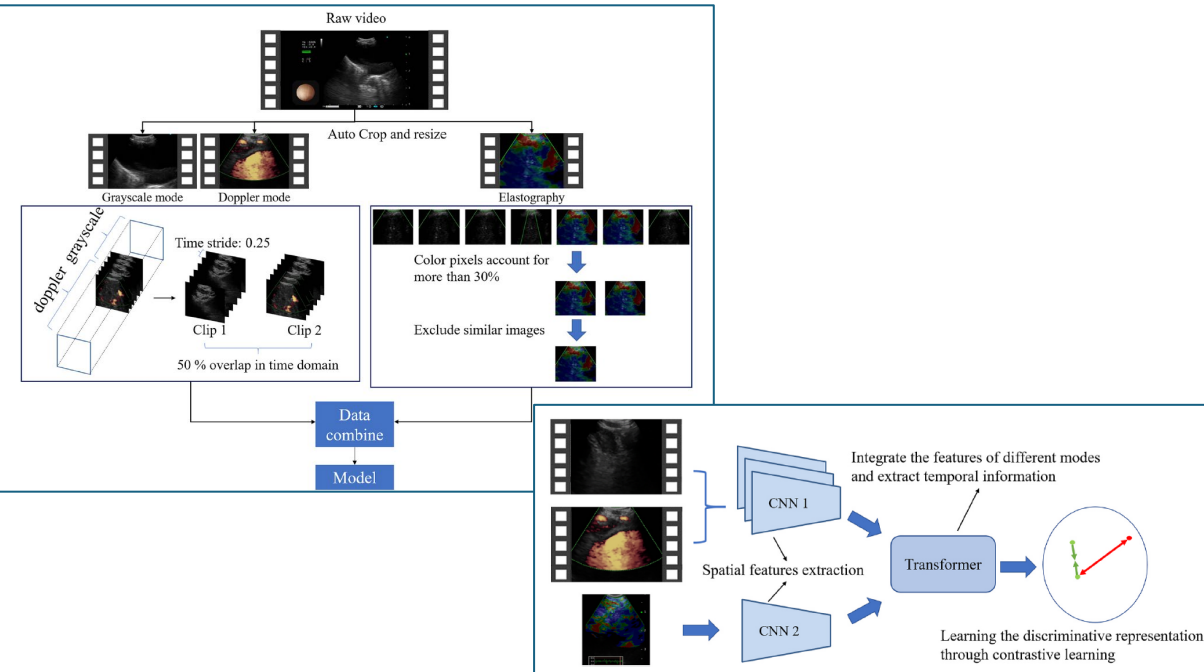
- Endobronşiyal ultrason (EBUS) görüntülerini analiz ederek mediastinal lezyonların iyi huylu (benign) veya kötü huylu (malign) olduğunu ayırt edebilecek bir **otomatik derin öğrenme destekli tanı sistemi** geliştirme hedeflenmiş
- EBUS videoları
 - Gri tonlama görüntüler, Doppler görüntüleri ve Elastografi
- CNN (Convolutional Neural Network) ve Transformer tabanlı **hibrit bir model**
- N= 150 hasta ve 330 görüntü
- %38.5 malign, %61.5 benign



Original Article

TransEBUS: The interpretation of endobronchial ultrasound image using hybrid transformer for differentiating malignant and benign mediastinal lesions

Ching-Kai Lin^{a,b,c,d}, Shao-Hua Wu^{d,*}, Yi-Wei Chua^d, Hung-Jen Fan^{a,e}, Yun-Chien Cheng^{d,*}



- Testte doğruluk: %82 ; **AUC: 0.8812**
- TransEBUS, EBUS görüntülerinden benign/malign ayrımı yapabilen **güçlü ve gerçek zamanlı bir sistemdir.**
- Derin öğrenmenin sunduğu uzamsal ve zamansal analiz kabiliyeti sayesinde, klinik pratikte doktorlara yardımcı olabilir.
- Özellikle karmaşık lezyon örüntülerini anlamada ve yanlış negatifleri azaltmada umut vadetmektedir



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Dinlediğiniz için teşekkürler...



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