

Εκπαιδευτικό Σεμινάριο Hands on Training
«Εισαγωγή στη Βρογχοσκόπηση»

**Διαγνωστική βρογχοσκόπηση σε
νεοπλασματικές βλάβες σε κεντρικούς και
περιφερικούς αεραγωγούς.
Μέθοδοι, αποτελεσματικότητα και περιορισμοί**

Ελένη Καρέτση

Πνευμονολόγος, MD, PhD

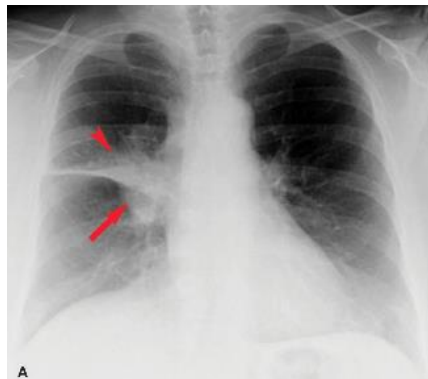
Επιμελήτρια Α΄

Πνευμονολογική Κλινική

Πανεπιστημίου Θεσσαλίας

Απεικονιστικά ευρήματα

- Ατελεκτασία
- Κεντρικής εντόπισης μάζα ή όζος
- Μάζα ή λεμφαδενοπάθεια μεσοθωρακίου
- Περιφερικής εντόπισης μάζα ή όζος





"Nurse, get on the internet, go to scroll down and click on the 'Are you totally lost?' icon."

Διαγνωστική βρογχοσκόπηση σε νεοπλασματικές βλάβες σε κεντρικούς αεραγωγούς



Διαγνωστική προσπάθεια κεντρικών ενδοβρογχικών βλαβών



“Tissue is the Issue”



- Εξωφυτική ανάπτυξη σε κεντρικό αεραγωγό-απόφραξη
- Υποβλεννογόνια διήθηση
- Βλεννογόνια διήθηση
- Νέκρωση
- Νεόπλαστα αγγεία (πιθανή αιμορραγική διάθεση στη βιοψία)

Βρογχοσκοπικές τεχνικές

Bronchial washing

Brushing

Βιοψία βρόγχου

Διαβρογχική βιοψία

EBNA (EndoBronchial Needle Aspiration)

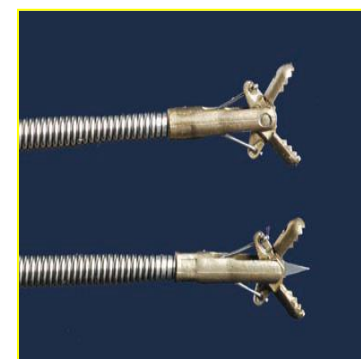
Κρυοβιοψία

Ευαισθησία εύκαμπτης

βρογχοσκόπησης για την

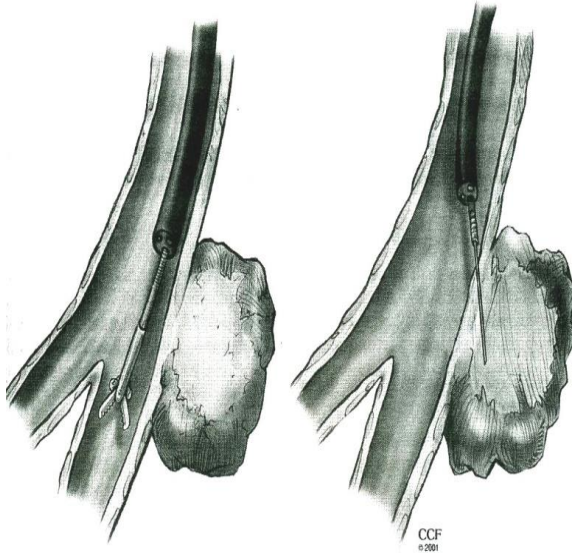
διάγνωση καρκίνου πνεύμονα με κεντρική εντόπιση

Η λήψη βιοπτικού υλικού (3-6 τεμάχια) από ορατή ενδοβρογχική βλάβη αποδίδει ευαισθησία ≈80%. Η προσθήκη brushing και washing προσθέτει περαιτέρω σε ευαισθησία.



35 First Author Year No. of Patients ^a			Sensitivity (%)				
			All Methods	Endobr Biopsy	Brush	Wash	EBNA/TBNA
Buccheri ⁹⁶	1991	708	-	80	35	31	-
Jones ¹²⁷	2001	514	89	72	72	48	-
Oswald ⁷⁷	1971	434	-	61	-	-	-
Lam ¹⁰²	1983	329	94	82	74	76	-
Pilotti ⁷³	1982	286	-	-	78	-	-
Gellert ¹⁰⁴	1982	218	-	78	-	-	-
Zavala ¹⁰⁹	1975	193	94	97	93	-	-
Govert ⁹⁴	1996	177	85	81	48	43	-
Mak ⁹⁸	1990	125	87	76	52	50	-
Saita ¹⁰⁰	1989	105	-	48	30	-	-
Popp ⁹⁷	1991	99	-	93	79	-	-
Karahalli ¹²⁶	2001	98	90	83	68	32	69
Chaudhary ⁷⁴	1978	95	-	76	53	78	-
Schenk ⁷²	1987	91	71	56	40	29	45
Utz ⁵	1993	88	-	-	-	-	36
Win ¹²⁴	2003	78	85	61	27	45	42
Stringfield ¹⁰⁷	1977	78	-	85	-	-	-
Wagner ⁷¹	1989	72	67	58	39	35	36
McLean ⁹²	1998	71	-	82	-	-	-
Kvale ¹⁰⁸	1976	71	-	71	77	63	-
Bilaceroglu ⁹³	1997	68	96	-	66	-	90
Govert ⁹¹	1999	57	95	74	-	63	82
Sing ⁷⁰	1997	53	-	-	64	-	-
Gay ⁹⁹	1989	53	-	-	-	-	23
Chopra ⁷⁵	1977	51	-	66	72	51	-
Zisholtz ¹⁰³	1983	51	73	67	65	44	-
Gaber ¹²⁵	2002	39	90	79	74	54	-
Castella ⁹⁵	1995	39	-	-	-	-	87
Cox ¹⁰¹	1984	33	94	84	83	76	-
Dasgupta ⁹⁰	1999	32	97	-	-	-	78
Hsu ¹²³	2004	24	-	-	-	-	71
Bungay ⁸⁹	2000	24	92	-	-	-	-
Baaklini ⁸⁸	2000	22	82	-	-	-	-
McDougall ¹⁰⁵	1981	16	-	50	23	-	-
Radke ¹⁰⁶	1979	15	87	-	-	-	-
Summary		4,507	88	74	61	47	56

Υποβλεννογόνιες βλάβες-EBNA (EndoBronchial Needle Aspiration)



- Η διαγνωστική ακρίβεια βιοψιών-ψήκτρας είναι μεγαλύτερη για τις εξωφυτικές βλάβες ενώ για τις υποβλεννογόνιες μπορεί να βελτιωθεί με τη χρήση (E)-TBNA {ευαισθησία 80% (68-91%).
- 55 ασθενείς - αύξηση της διαγνωστικής ευαισθησίας τους από το 76% στο 96% με την προσθήκη EBNA ενώ σε 20% ήταν η μόνη διαγνωστική εξέταση.

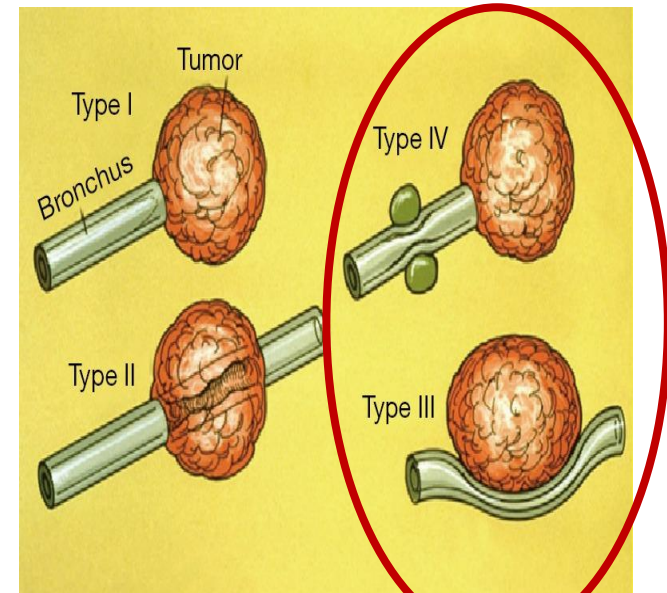


Ενδείξεις EBNA

Χρήση EBNA σε ενδοβρογχική βλάβη όταν υπάρχει:

- Υποβλεννογόνια διήθηση
- Νεκρωτικός ιστός
- Αυξημένος κίνδυνος αιμορραγίας (καρκινοειδές, οριακές τιμές στον πηκτικό έλεγχο)
- Δυσκολία στη λήψη βιοψίας

Βελόνες 22G, 15mm



EBNA σε εξωφυτική βλάβη **έναντι** υποβλεννογόνιας διήθησης

Procedures	Total (n = 125)	EML (n = 52)	SPD (n = 73)	Exclusively diagnostic
EBNA	108 (86)	44 (85)	64 (88)	19 (15)
FB	88 (70)	43 (83)	45 (62)	6 (5)
BB	69 (55)	34 (65)	35 (48)	0 (0)
BW	36 (29)	18 (35)	18 (25)	0 (0)
EBNA + FB	114 (91)	48 (92)	66 (90)	

Values are given as n (%). EML = Exophytic mass lesion; SPD = submucosal/peribronchial disease.

EBNA revealed a significantly higher sensitivity than every other conventional sampling method ($p < 0.001$)

Προσθήκη ROSE ?

Procedures	Total	p value
CDM	45/62 (73%)	0.016
CDM + cEBNA	52/62 (84%)	
CDM	50/63 (79%)	<0.001
CDM + ROSE-EBNA	62/63 (98%)	
CDM + cEBNA	52/62 (84%)	0.004
CDM + ROSE-EBNA	62/63 (98%)	

CDM = Conventional diagnostic methods.

In both randomization groups, by **adding needle aspiration to conventional methods** we observed an **increase in the sensitivity of bronchoscopy**.

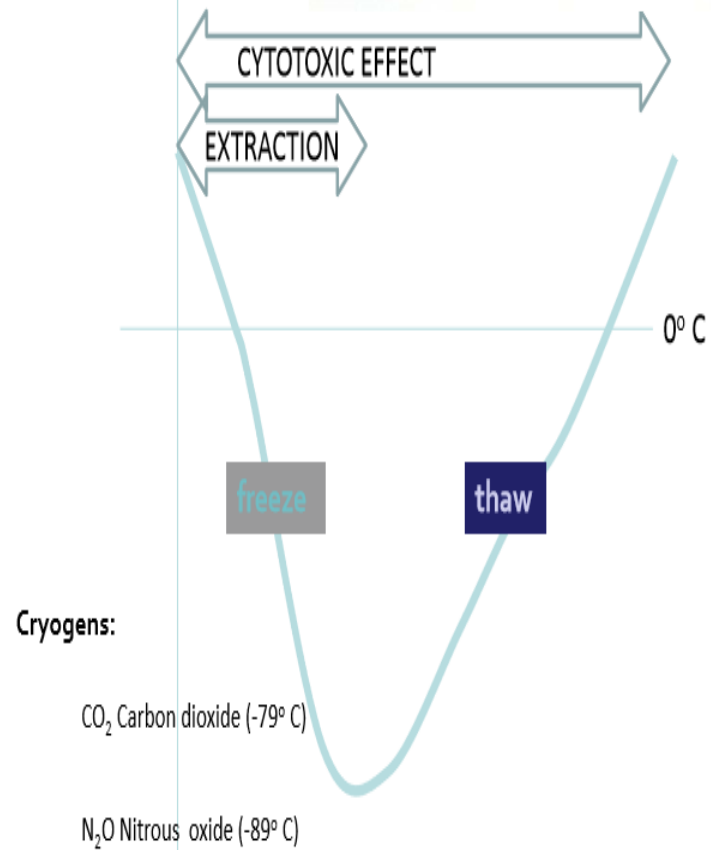
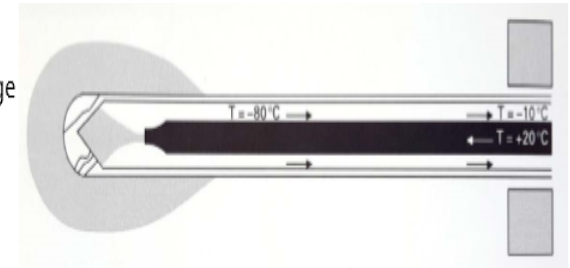
Moreover, **the rate of improvement in sensitivity was significantly higher in the ROSE-EBNA arm**, suggesting the importance of ROSE in elevating the sensitivity of EBNA.



Cryobiopsy Equipment

1. Console and gas cylinder
2. Transfer line (connects the console to the probe)
3. Cryoprobe (flexible :1.9 mm/2.4 mm and rigid: 3.0 mm)
4. Pedal

Principle of Joule-Thomson: change in temperature of a fluid as it flows from a region of high pressure to a region of low pressure.





Cryobiopsy increases the diagnostic yield of endobronchial biopsy: a multicentre trial

J. Hetzel, R. Eberhardt, F.J.F. Herth, C. Petermann, G. Reichle, L. Freitag, I. Dobbertin, K.J. Franke, F. Stanzel, T. Beyer, P. Möller, P. Fritz, G. Ott, P.A. Schnabel, H. Kastendieck, W. Lang, A.T. Morresi-Hauf, M.N. Szyrach, R. Mücke, P.L. Shah, A. Babiak and M. Hetzel



281pt : endobronchial biopsies forceps

282 pt: biopsies performed using a flexible cryoprobe

TABLE 2

Diagnostic and nondiagnostic biopsies for each biopsy technique in patients with malignancy

	Forceps	Cryoprobe	p-value
Overall			
Diagnostic	239 (85.1)	268 (95.0)	<0.001
Nondiagnostic	42 (14.9)	14 (5.0)	
Exophytic tumour			
Diagnostic	170 (89.5)	178 (97.3)	0.003
Nondiagnostic	20 (10.5)	5 (2.7)	
Submucosal tumour			
Diagnostic	69 (75.8)	90 (90.9)	0.005
Nondiagnostic	22 (24.2)	9 (9.1)	

Data are presented as n (%), unless otherwise stated. Biopsies are shown in

Endobronchial cryobiopsy is a safe technique with superior diagnostic yield in comparison with conventional forceps biopsy

Efficacy and safety of cryobiopsy versus forceps biopsy for interstitial lung diseases and lung tumours: A systematic review and meta-analysis

OORMILA GANGANAH, Shu Liang GUO, Manu CHINIAH AND Yi Shi LI

Table 1 Characteristics of included studies

First author	Year	Number of subjects	Disease involved	Type of study
Babiak	2009	41—all subjects FB and CB	ILDs	Retrospective
Schumann C.	2010	First 55—all subjects, FB and CB	Lung tumours	Randomized cohort
Aktas A.	2010	41—all subjects CB and FB	Lung tumours	Prospective clinical trial
Griff	2011	33—15, CB; 18 FB	ILDs	Prospective clinical Trial
Hetzel J.	2012	563—282, CB; 281, FB	Lung tumours	Randomized single blinded multicentre
Schubmann M.	2013	31—all subjects CB and FB	Peripheral solitaryLung tumours	Randomized clinical trial
Chou C.L.	2013	75—all subjects CB and FB	ILDs	Retrospective
Pajares	2014	77	ILDs	Randomized trial

CB, cryobiopsy; FB, forceps biopsy; ILDs, interstitial lung diseases.

Efficacy and safety of cryobiopsy versus forceps biopsy for interstitial lung diseases and lung tumours: A systematic review and meta-analysis

OORMILA GANGANAH, Shu Liang GUO, Manu CHINIAH AND Yi Shi LI

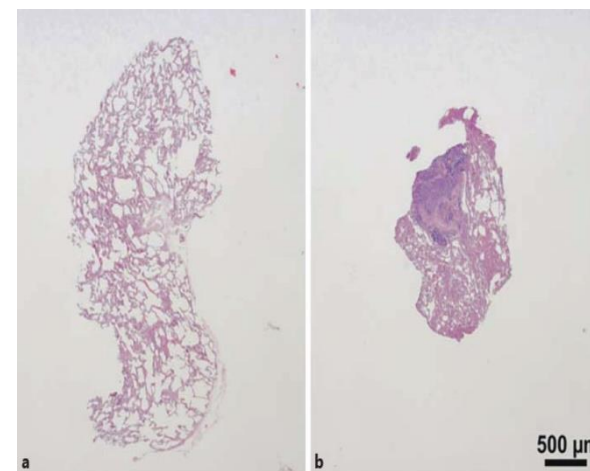
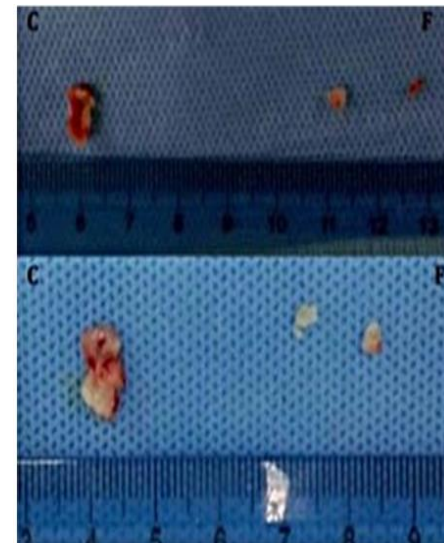
Table 1 Characteristics of included studies

First author	Year	Number of subjects	Disease involved	Type of study	Specimen size	
					CB	FB
Babiak	2009	41—all subjects, FB and CB	ILDs	Retrospective	15.11 mm ² (2.15–54.15 mm ²)	5.82 mm ² (0.58–20.88 mm ²)
Schumann C.	2010	First 55—all subjects, FB and CB	Lung tumours	Randomized cohort	10.4 mm ²	5.2 mm ²
Aktas A.	2010	41—all subjects, CB and FB	Lung tumours	Prospective clinical trial	0.8 cm (0.3–4.0 cm)	0.2 cm (0.1–1.0 cm)
Griff	2011	33—15, CB; 18, FB	ILDs	Prospective clinical Trial	17.1 ± 10.7 mm ²	3.8 ± 4.0 mm ²
Hetzel J.	2012	563—282, CB; 281, FB	Lung tumours	Randomized single blinded multicentre		
Schuhmann M.	2013	31—all subjects, CB and FB	Peripheral solitary Lung tumours	Randomized clinical trial	11.17 mm ²	4.69 mm ²
Chou C.L.	2013	75—all subjects, CB and FB	ILDs	Retrospective	13.8 ± 3.8 mm	1.9 ± 0.6 mm
Pajares	2014	77	ILDs	Randomized trial	14.7 ± 11 mm ²	3.3 ± 4.1 mm ²

CB, cryobiopsy; FB, forceps biopsy; ILDs, interstitial lung diseases.



x 2-3



Respirology (2016)

Efficacy and safety of cryobiopsy versus forceps biopsy for interstitial lung diseases and lung tumours: A systematic review and meta-analysis

OORMILA GANGANAH, Shu Liang GUO, Manu CHINIAH AND Yi Shi LI

Table 1 Characteristics of included studies

First author	Year	Number of subjects	Disease involved	Type of study	Specimen size		Diagnostic rate (%)	
					CB	FB	CB	FB
Babiak	2009	41—all subjects, FB and CB	ILDs	Retrospective	15.11 mm ² (2.15–54.15 mm ²)	5.82 mm ² (0.58–20.88 mm ²)	95.12	> 58.53
Schumann C.	2010	First 55—all subjects, FB and CB	Lung tumours	Randomized cohort	10.4 mm ²	5.2 mm ²	89.1	> 65.5
Aktas A.	2010	41—all subjects, CB and FB	Lung tumours	Prospective clinical trial	0.8 cm (0.3–4.0 cm)	0.2 cm (0.1–1.0 cm)	92.7	> 78
Griff	2011	33—15, CB; 18, FB	ILDs	Prospective clinical Trial	17.1 ± 10.7 mm ²	3.8 ± 4.0 mm ²		
Hetzel J.	2012	563—282, CB; 281, FB	Lung tumours	Randomized single blinded multicentre			95	> 85.1
Schuhmann M.	2013	31—all subjects, CB and FB	Peripheral solitaryLung tumours	Randomized clinical trial	11.17 mm ²	4.69 mm ²	61.2	> 48.4
Chou C.L.	2013	75—all subjects, CB and FB	ILDs	Retrospective	13.8 ± 3.8 mm	1.9 ± 0.6 mm	100	> 69.3
Pajares	2014	77	ILDs	Randomized trial	14.7 ± 11 mm ²	3.3 ± 4.1 mm ²	74.4	> 34.1

CB, cryobiopsy; FB, forceps biopsy; ILDs, interstitial lung diseases.

Αιμορραγικός κίνδυνος;;;

Respirology (2016)

Ενδοβρογχική βλάβη με εκτεταμένη νέκρωση



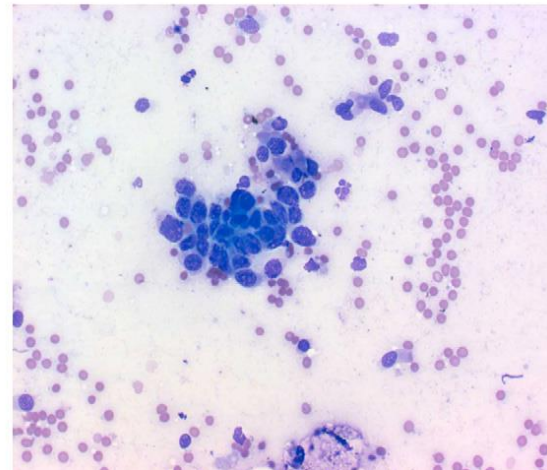
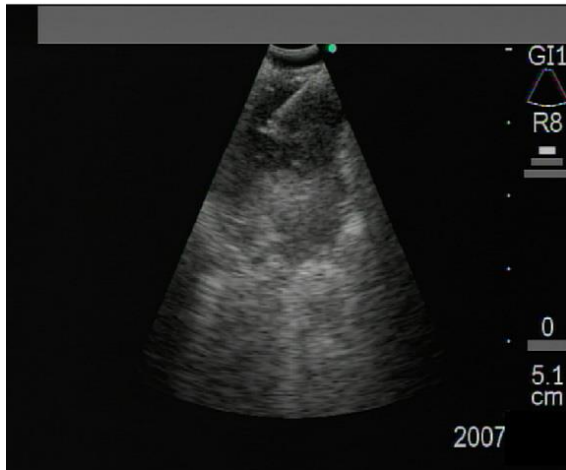
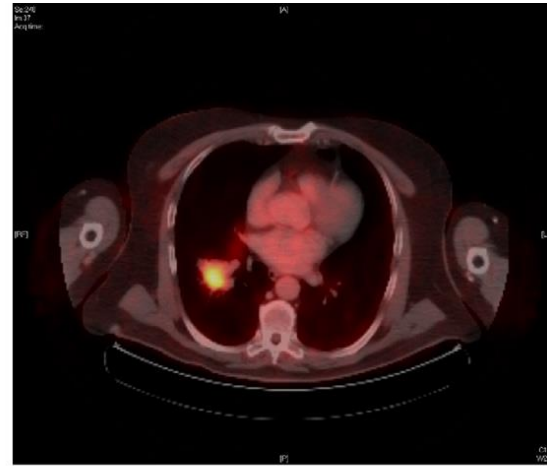
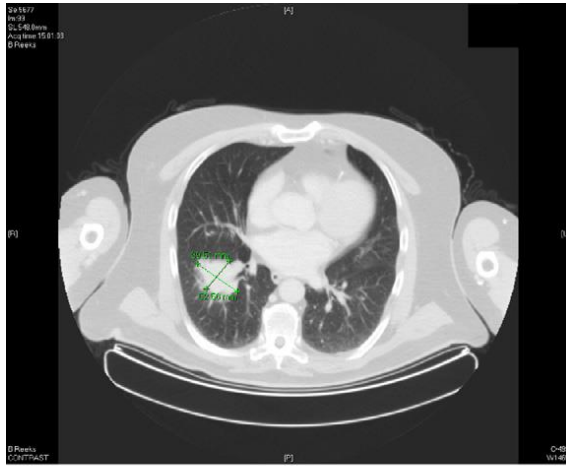
- Πολλαπλές βιοψίες από την ίδια περιοχή
- EBNA
- Κρυοβιοψία

Combined endobronchial and esophageal endosonography for the diagnosis and staging of lung cancer: European Society of Gastrointestinal Endoscopy (ESGE) Guideline, in cooperation with the European Respiratory Society (ERS) and the European Society of Thoracic Surgeons (ESTS)



7. For diagnostic purposes, in patients with a centrally located lung tumor that is not visible at conventional bronchoscopy, endosonography is suggested, provided the tumor is located immediately adjacent to the larger airways (EBUS) or esophagus (EUS-(B)) (Recommendation grade D).

Ενδειξη: Διερεύνηση μάζας ΔΕ πνεύμονα με κεντρική εντόπιση και αρνητική βρογχοσκόπηση



Πρώιμη διάγνωση καρκίνου πνεύμονα

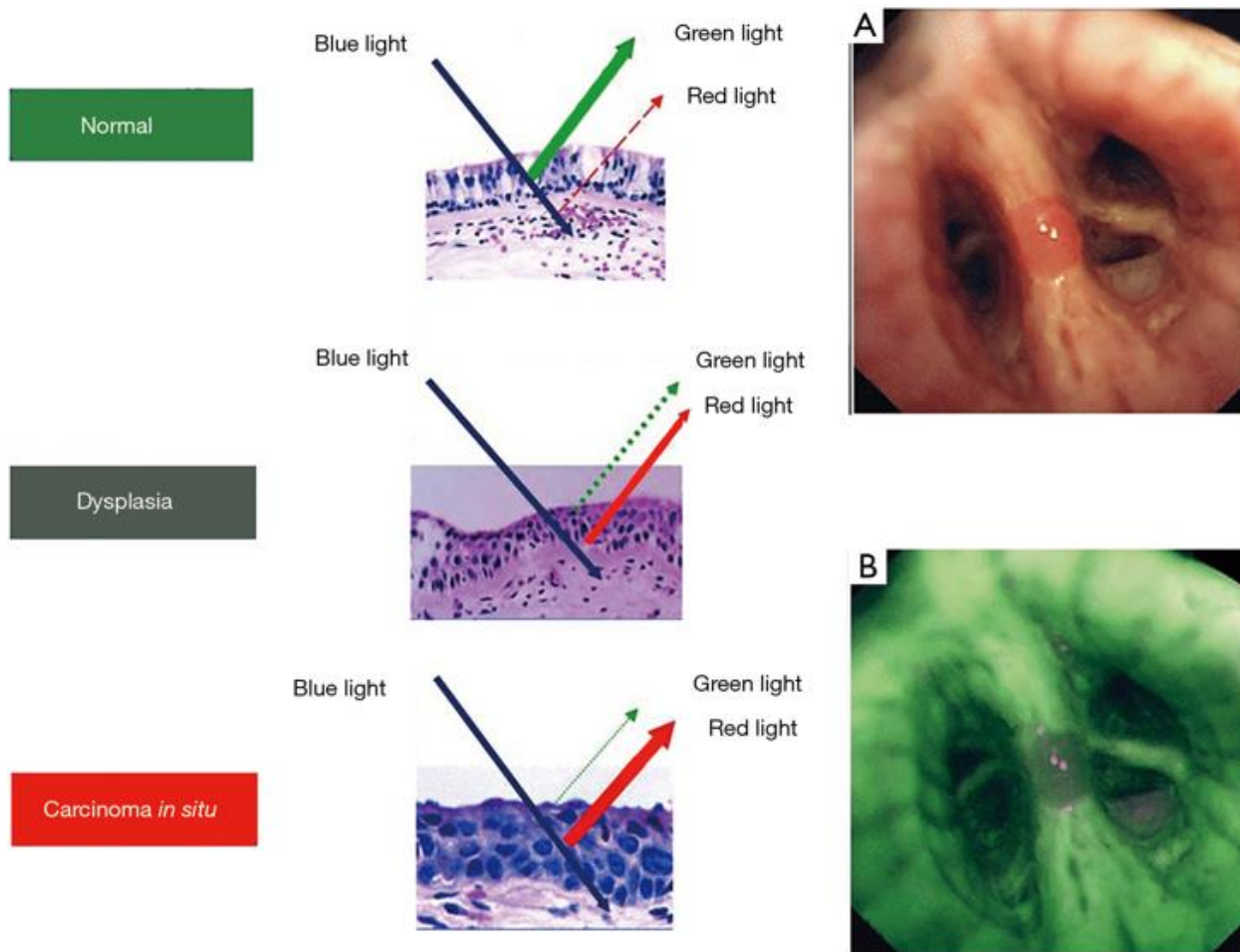
Αναγνώριση προκαρκινωματικών βλαβών

- *White light bronchoscopy*
- *Αυτοφθορισμός*
- *Narrow Band Imaging-NBI*
- *High magnification bronchovideoscopy (HMB)*

Εκτίμηση βάθους διήθησης

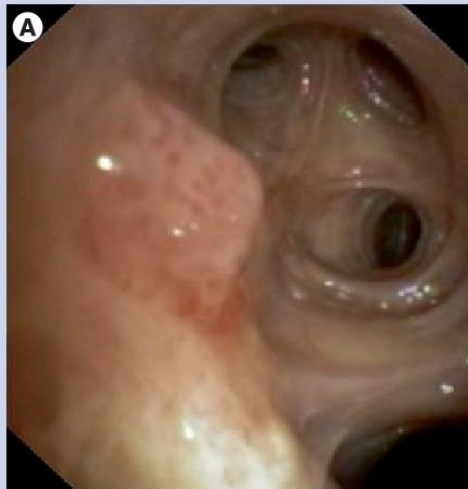
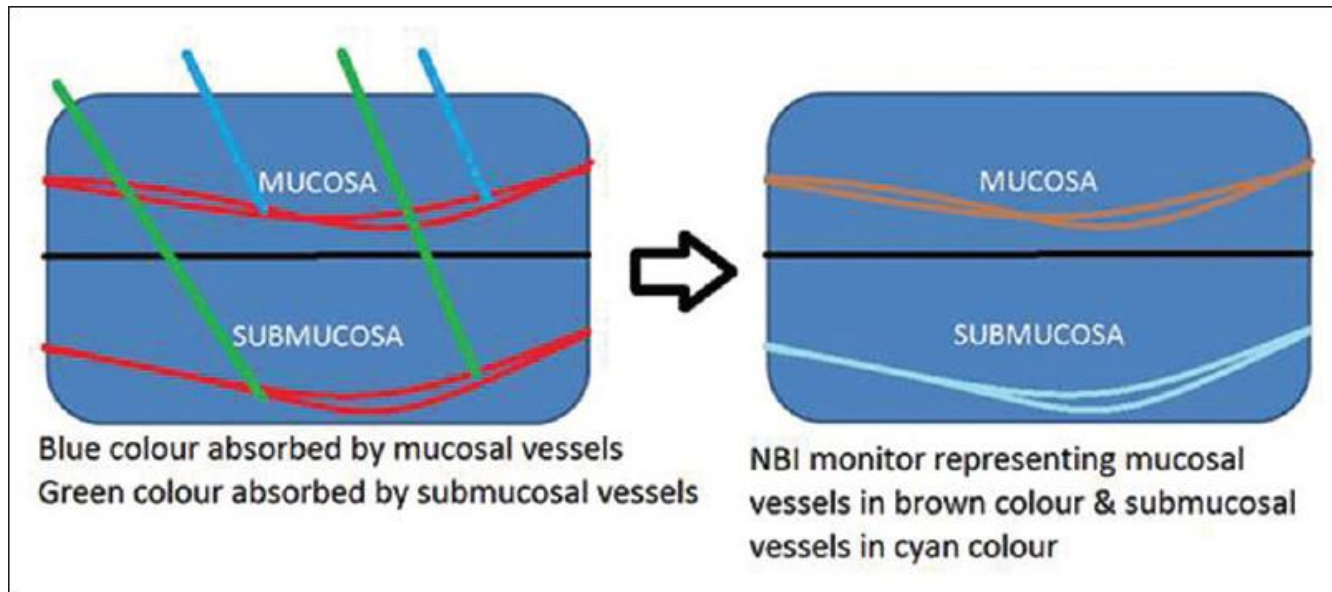
- *Radial EBUS*
- *Optical coherence tomography (OCT)*
- *Confocal laser endomicroscopy (CLE)*
- *Laser Raman spectroscopy (LRS)*

Αυτοφθορισμός



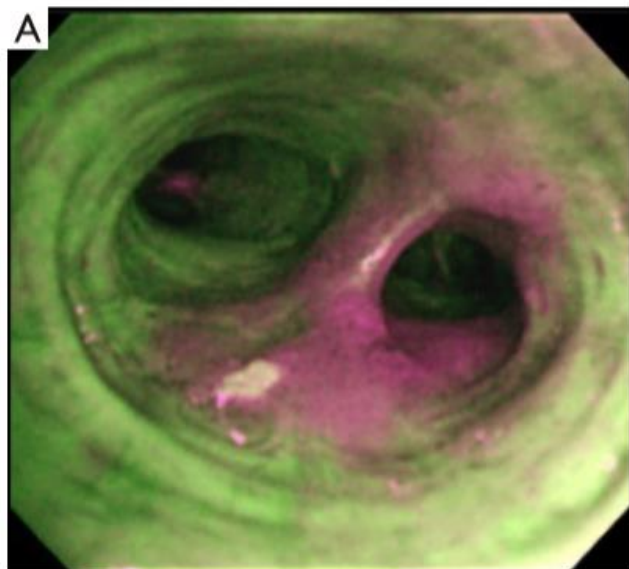
Όταν μία μονοχρωματική ακτίνα φωτός των 442nm (μπλε φως) οδηγείται πάνω στον βλεννογόνο των βρόγχων, οι ενδογενείς φθορίζουσες ουσίες της υποβλεννογόνιας στοιβάδας διεγείρονται, αντανακλούν και φθορίζουν σε μεγαλύτερο μήκος κύματος φωτός 500nm που αντιστοιχεί στο πράσινο.

Narrow Band Imaging-NBI

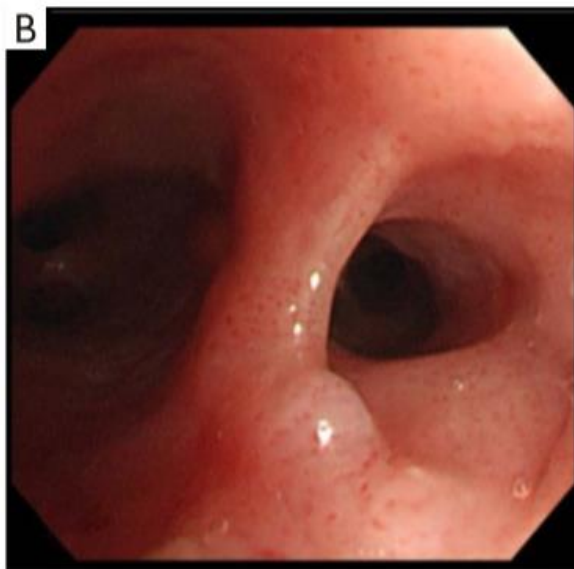


Features of pathological vessels (NBI):

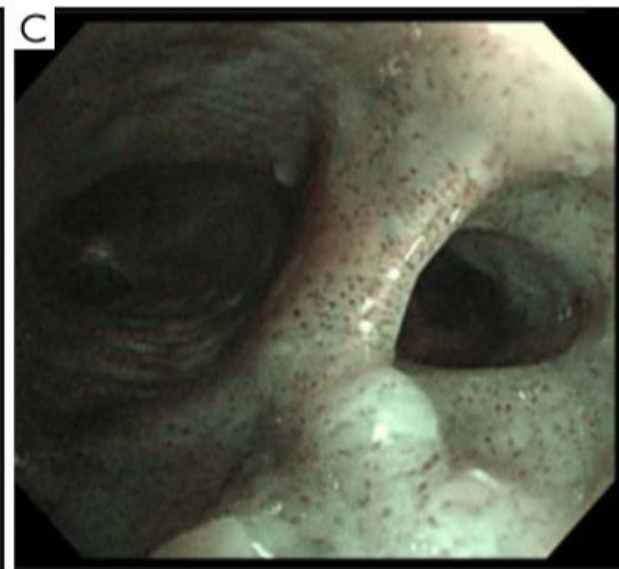
- dotted vessels
- abrupt ending vessels
- loop vessels / tortuous vessels



autofluorescence



white light bronchoscopy



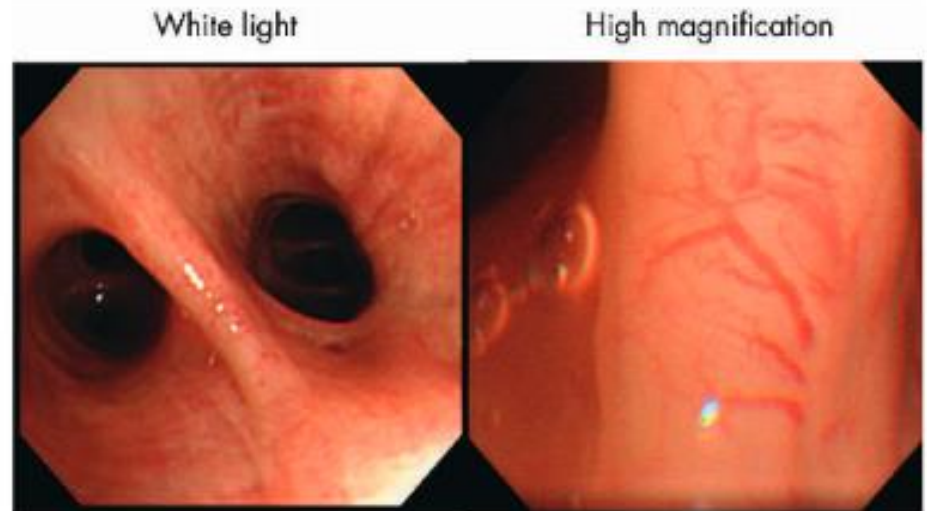
narrow band imaging

NBI vs AFB: παρόμοια ευαισθησία, καλύτερη ειδικότητα

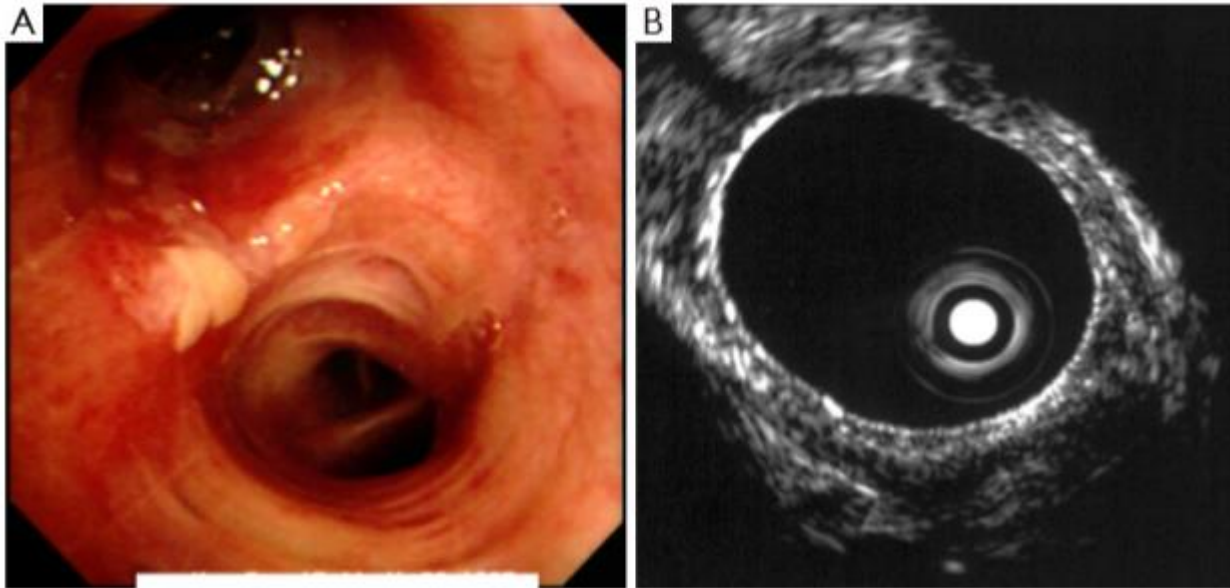
NBI+ AFB : ↑ ευαισθησίας κατά 15%

High magnification bronchovideoscopy (HMB)

- 55-110x η μεγέθυνση στο μόνιτορ
- Σε παθολογικό φθορισμό στην AFB εντοπίζει τη δυσπλασία με ευαισθησία 90% και ειδικότητα 70%



Radial EBUS



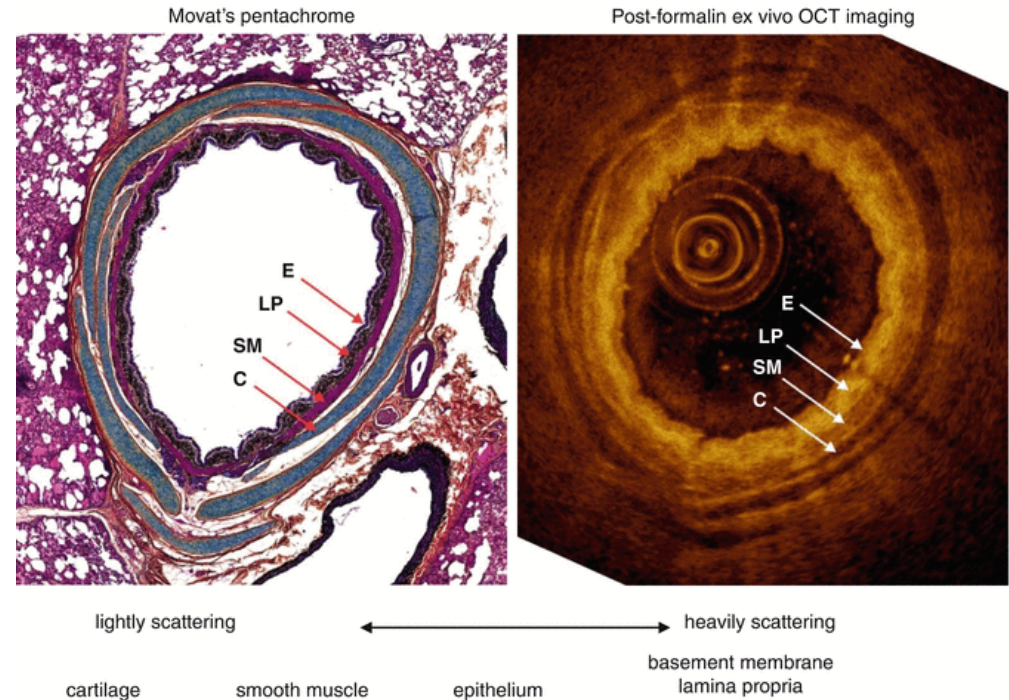
- (A) White light bronchoscopy revealed abnormality at the orifice of the upper division bronchus
(B) Radial probe EBUS showed no invasion of the tumor into the cartilaginous layer

RP-EBUS in evaluating tracheobronchial wall involvement

Sensitivity 88.89%, specificity 100% and accuracy 90%

Optical coherence tomography (OCT)

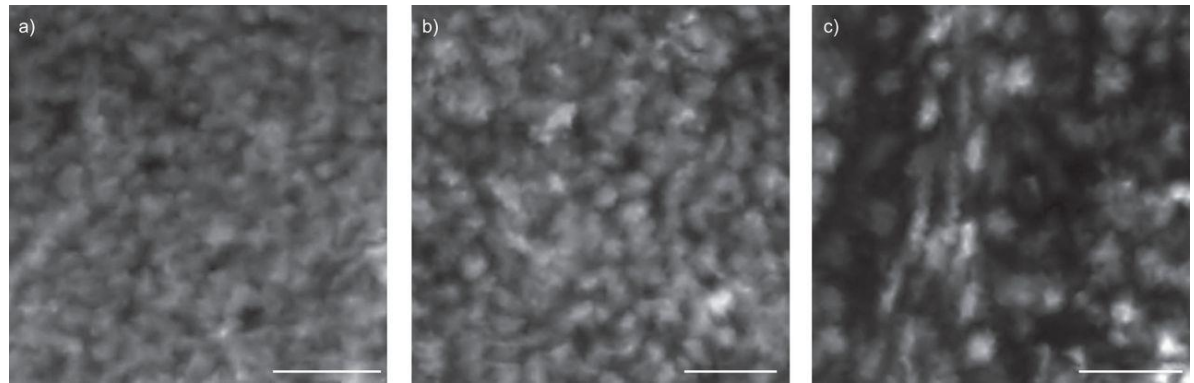
- non-invasive, optical imaging technique
- properties of light waves, with microscopic resolution (1–20 μm)
- penetration depth of maximum 2–3 mm
- high-definition cross-sectional images of the airway luminal wall
- no contact probes



Confocal laser endomicroscopy (CLE)

imaging of living cells in lung tissue *in vivo*

***noninvasive
"optical biopsy"***



a) normal mucosa

b) inflammation generation

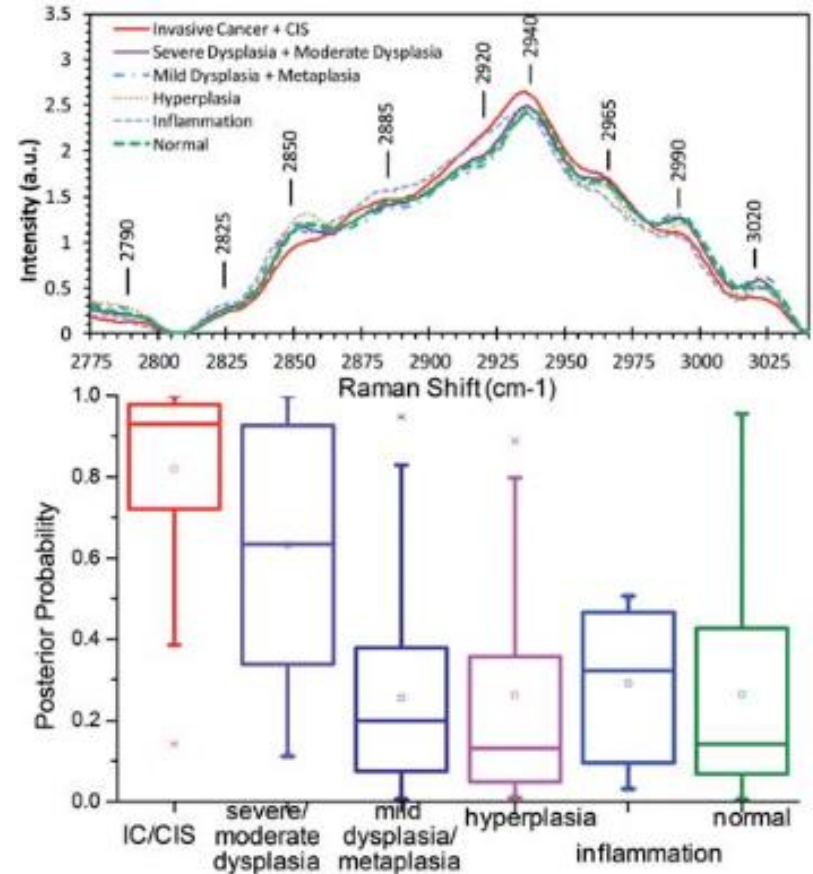
c) neoplastic lesion

CLE showed a sensitivity of 96.0% and a specificity of 87.1% for the detection of malignant lesions

Laser Raman spectroscopy (LRS)

- Experimental probe-system
- real-time in vivo diagnosis
- collecting fingerprint (like spectral bands and light scattered) from tissue with different molecular composition

Molecular fingerprint



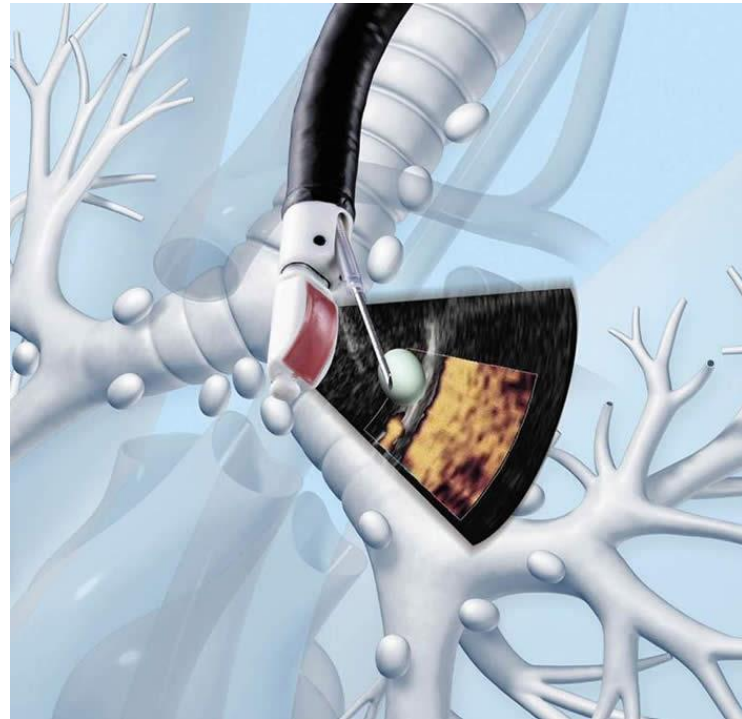
Διαγνωστική βρογχοσκόπηση σε νεοπλασματικές βλάβες σε περιφερικούς αεραγωγούς



Περιφερικός όζος – μάζα + λεμφαδενοπάθεια μεσοθωρακίου

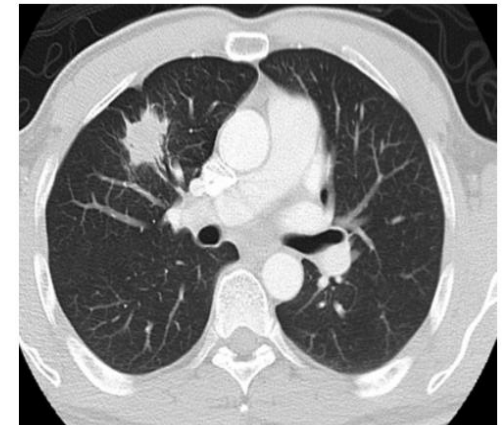
EBUS

EUS-b



Μονήρης πνευμονικός όζος

Όζος >2,5cm : **62%**



Bronchus sign

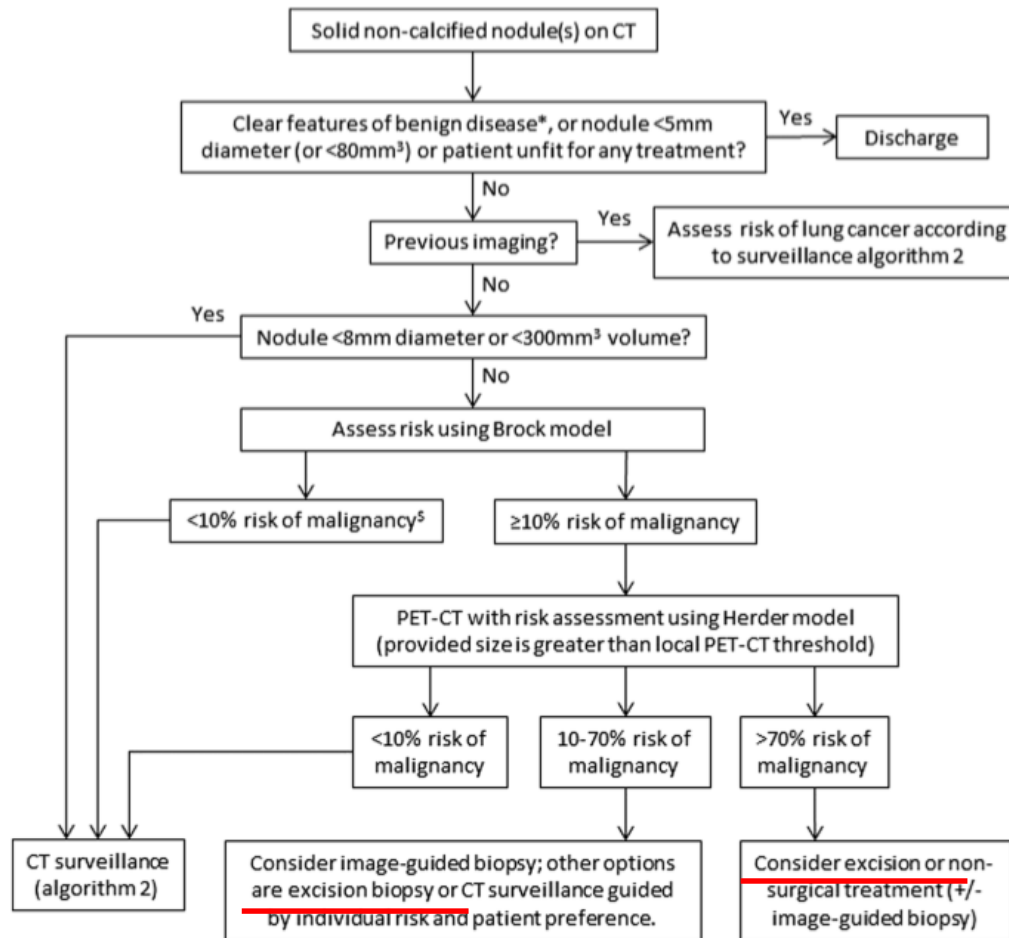


Όζος <2,5cm : **< 40%**



- Πρέπει πάντα να υπάρχει ιστολογική επιβεβαίωση του όζου;;;

Διαγνωστική προσέγγιση συμπαγών όζων



Combined endobronchial and esophageal endosonography for the diagnosis and staging of lung cancer: European Society of Gastrointestinal Endoscopy (ESGE) Guideline, in cooperation with the European Respiratory Society (ERS) and the European Society of Thoracic Surgeons (ESTS)



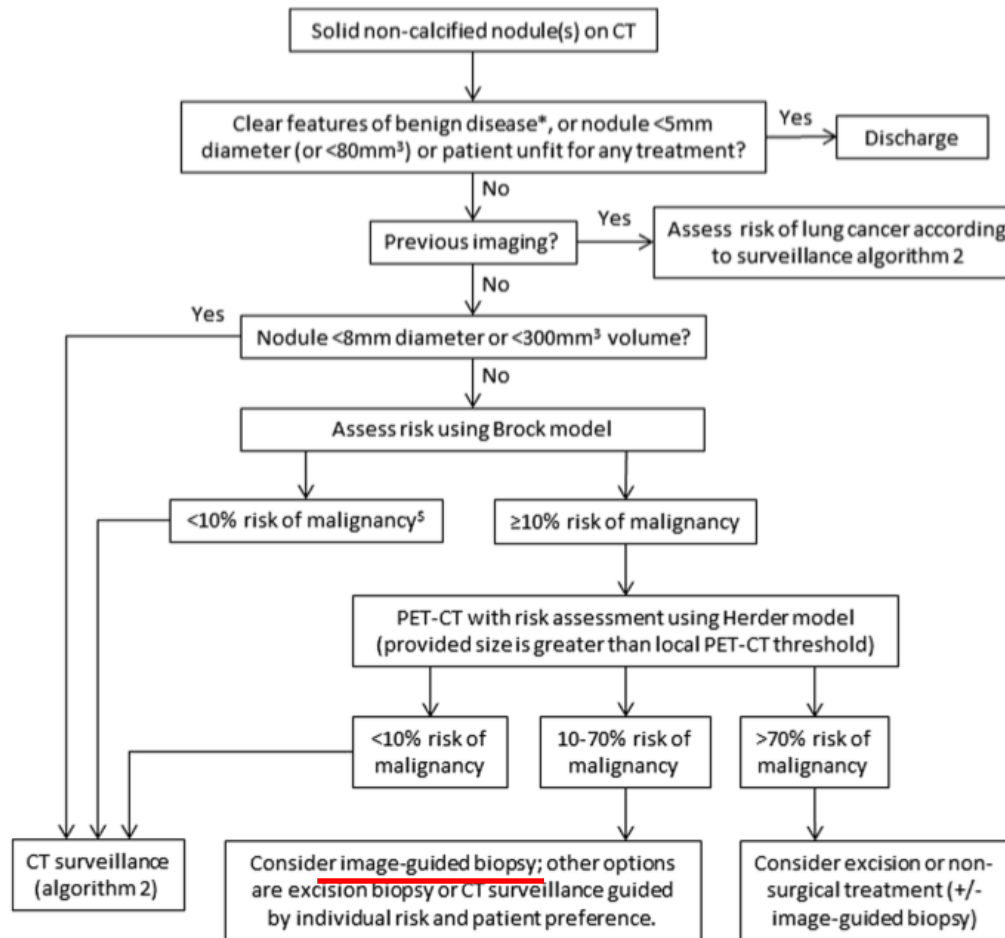
ERS
EUROPEAN
RESPIRATORY
SOCIETY
every breath counts



Imaging negative mediastinum

3. In patients with suspected or proven <3 cm peripheral NSCLC with normal mediastinal and hilar nodes at CT and/or PET, we suggest initiation of therapy without further mediastinal staging (Recommendation grade C).

Διαγνωστική προσέγγιση συμπαγών όζων



The role of conventional bronchoscopy in the workup of suspicious CT scan screen-detected pulmonary nodules

- 308 consecutive patients with a positive CT screen enrolled in the NELSON trial.
- 318 suspicious lesions, with mean diameter of 14.6 mm (only 2.8% were >3 cm).
- **The sensitivity of bronchoscopy was only 13.5% (95% CI 9.0% to 19.6%) with a negative predictive value of 47.6%.**
- **Routine use of bronchoscopy for positive test results in a screening programme is not recommended**

Τεχνικές που αυξάνουν την διαγνωστική απόδοση

Ακτινοσκόπηση

Radial EBUS

Ultrathin Bronchoscopy

Navigation systems

- Electromagnetic navigational bronchoscopy (ENB)
- Virtual Bronchoscopic Navigation (VBN)

34

First Author	Year	No. of Patients ^a	Sensitivity (%)				
			All Methods	TB Biopsy	Brush	BAL	TBNA
Kawaraya ¹²⁸	2003	1372	88	77	57	-	35
Rennard ¹¹⁹	1990	730	-	-	-	47	-
Gasparini ¹¹⁰	1999	480	76	50	-	-	70
Oswald ⁷⁷	1971	435	-	28	-	-	-
Buccheri ⁹⁶	1991	337	-	75	44	33	-
Hattori ⁷⁶	1971	208	-	-	83	-	-
Lam ¹⁰²	1983	155	86	61	52	52	-
Pirozynski ¹¹⁸	1992	145	-	33	30	65	58
Wallace ¹²²	1982	143	-	19	-	-	-
Zavala ¹⁰⁹	1975	137	71	69	70	-	-
McDougall ¹⁰⁵	1981	130	62	48	36	36	-
Baaklini ⁸⁸	2000	129	61	-	-	-	-
Reichenberger ¹¹¹	1999	103	-	39	36	28	47
Bandoh ¹³⁰	2003	97	60	-	-	-	-
Bilaceroglu ¹¹³	1998	92	64	-	-	-	-
Torrington ¹¹⁷	1993	91	-	20	-	-	-
Baba ¹³¹	2002	87	75	53	44	-	67
Popp ⁹⁷	1991	87	-	80	83	-	-
Mori ¹²⁰	1989	85	84	-	84	42	-
Piloti ⁷³	1982	84	-	-	29	-	-
Radke ¹⁰⁶	1979	82	51	-	-	-	-
Naidich ¹²¹	1988	65	48	-	-	-	-
Aristiazabal ¹¹²	1998	64	-	34	-	-	-
Mak ⁹⁸	1990	63	56	37	29	38	-
de Gracia ¹¹⁶	1993	55	-	-	-	33	-
Trkanjec ¹²⁹	2003	50	86	62	16	29	-
Castella ⁹⁵	1995	45	-	-	-	-	69
Debeljak ¹¹⁵	1994	39	-	77	59	36	-
Wongsurakiatl ¹¹⁴	1998	30	50	17	-	47	-
Stringfield ¹⁰⁷	1977	29	-	48	-	-	-
Kvale ¹⁰⁸	1976	29	-	27	21	12	-
Sing ⁷⁹	1997	22	-	-	22	-	-
Cox ¹⁰¹	1984	22	36	29	22	36	-
Gay ⁹⁹	1980	20	-	-	-	-	65
Summary		5,742	78	57	54	43	65

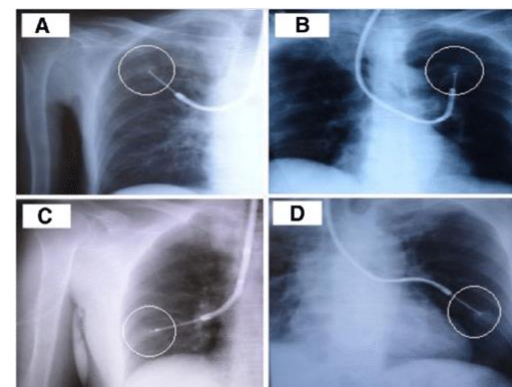
Ευαισθησία βρογχοσκοπικών τεχνικών σε περιφερική εντόπιση βλάβης

size of the lesion

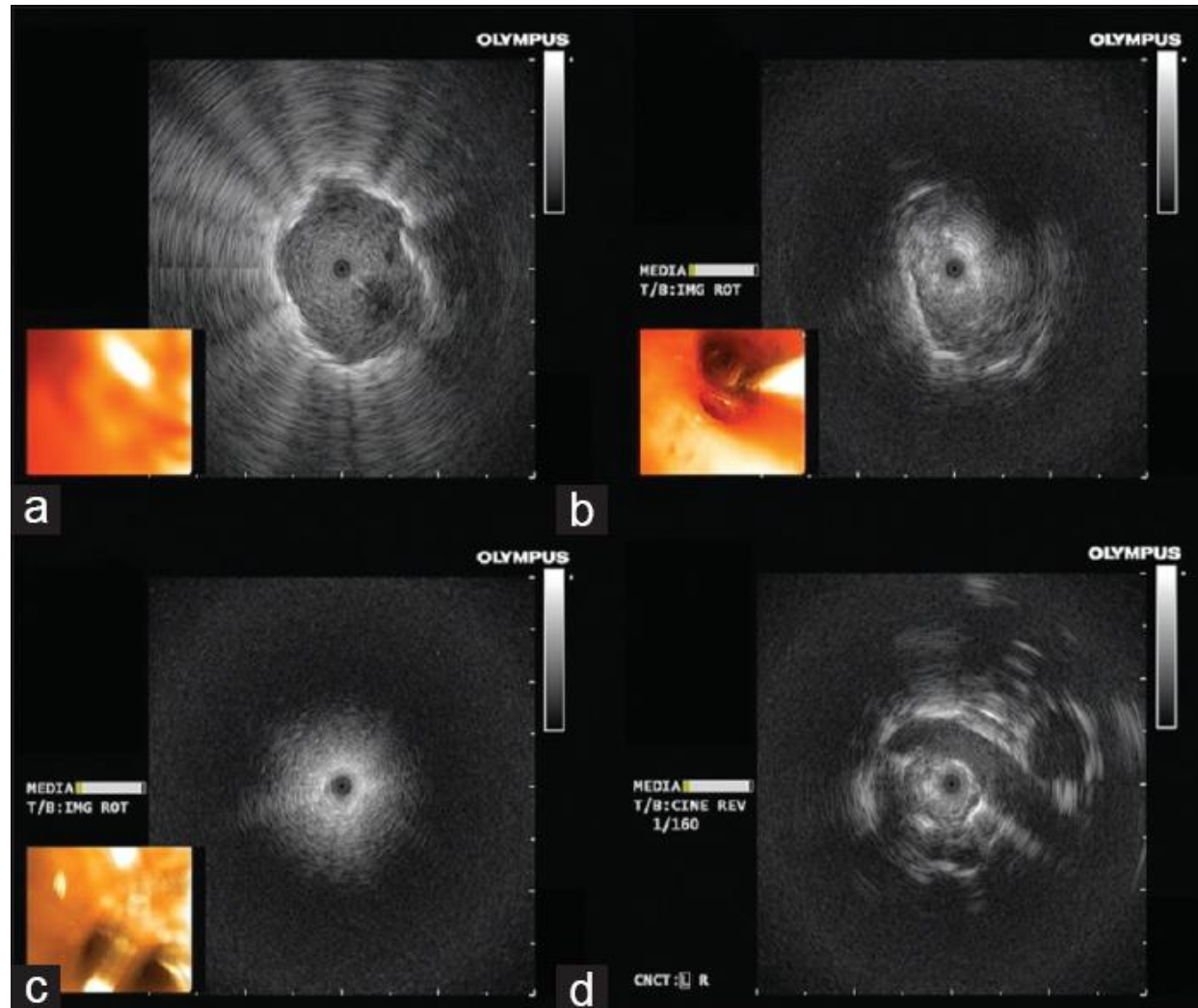
Sensitivity for peripheral lesions :

<2 cm : 34%

> 2 cm : 63%



Radial EBUS



Radial EBUS –GS (guide sheath)

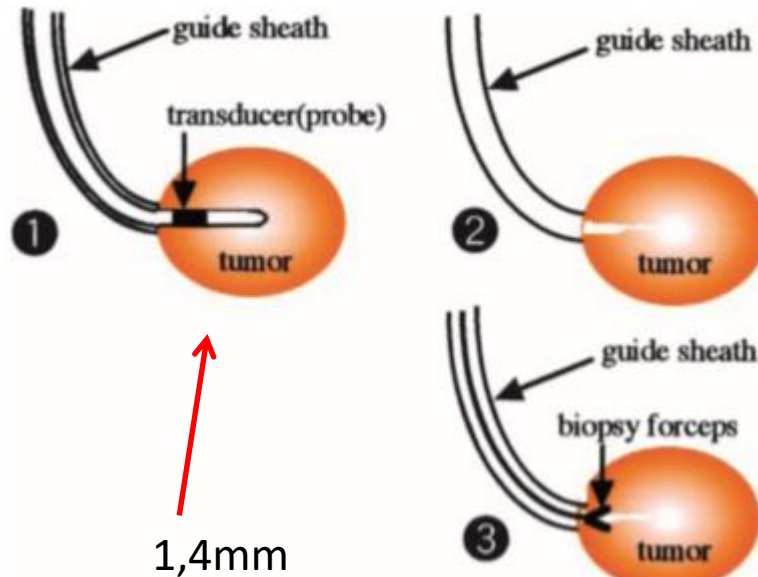


Table 2—Diagnostic Yields From Peripheral Lesions by Brushing and TBB With EBUS-GS*

Variables	Brushing	TBB	Combined
Positive sample	90/150 (60)	89/110 (81)	116/150 (77)
Benign	19/50 (38)	24/35 (69)	34/49 (69)
Malignant	71/100 (71)	65/75 (87)	82/101 (81)

*Data are presented as No./total (%).

Table 3—Effect of Lesion Size on Diagnostic Yield by EBUS-GS of Peripheral Pulmonary Lesions

Lesion Size, mm	No./Total (%)
≤ 10	16/21 (76)
> 10 to ≤ 15	19/25 (76)
> 15 to ≤ 20	24/35 (69)
> 20 to ≤ 30	33/43 (77)
> 30	24/26 (92)

The use of GS has increased the diagnostic yield of transbronchial biopsy, allowing for successful sampling of lesions of less than 10 mm in diameter and fluoroscopically invisible lesions. Moderate bleeding occurred in two patients (1%).

Κρυοβιοψία και radial EBUS

Efficacy and safety of cryobiopsy versus forceps biopsy for interstitial lung diseases and lung tumours: A systematic review and meta-analysis

OORMILA GANGANAH, Shu Liang GUO, Manu CHINIAH AND Yi Shi LI

Table 1 Characteristics of included studies

First author	Year	Number of subjects	Disease involved	Type of study	Specimen size		Diagnostic rate (%)	
					CB	FB	CB	FB
Babiak	2009	41—all subjects, FB and CB	ILDs	Retrospective	15.11 mm ² (2.15–54.15 mm ²)	5.82 mm ² (0.58–20.88 mm ²)	95.12	> 58.53
Schumann C.	2010	First 55—all subjects, FB and CB	Lung tumours	Randomized cohort	10.4 mm ²	5.2 mm ²	89.1	> 65.5
Aktas A.	2010	41—all subjects, CB and FB	Lung tumours	Prospective clinical trial	0.8 cm (0.3–4.0 cm)	0.2 cm (0.1–1.0 cm)	92.7	> 78
Griff	2011	33—15, CB; 18, FB	ILDs	Prospective clinical Trial	17.1 ± 10.7 mm ²	3.8 ± 4.0 mm ²		
Hetzel J.	2012	563—282, CB; 281, FB	Lung tumours	Randomized single blinded multicentre			95	> 85.1
Schuhmann M.	2013	31—all subjects, CB and FB	Peripheral solitary Lung tumours	Randomized clinical trial	11.17 mm ²	4.69 mm ²	61.2	> 48.4
Chou C.L.	2013	75—all subjects, CB and FB	ILDs	Retrospective	13.8 ± 3.8 mm	1.9 ± 0.6 mm	100	> 69.3
Pajares	2014	77	ILDs	Randomized trial	14.7 ± 11 mm ²	3.3 ± 4.1 mm ²	74.4	> 34.1

CB, cryobiopsy; FB, forceps biopsy; ILDs, interstitial lung diseases.

(με radial EBUS- καθοδήγηση)

1 επεισόδιο μέτριας αιμορραγίας

Respirology (2016)

Ultrathin Bronchoscopy

outer diameter < 3.0 mm



- a) Ultrathin bronchoscope (outer diameter, 2.8 mm; model XP-260F, Olympus) with biopsy forceps (outer diameter, 1.0mm; model FB-56-D1, Olympus)
- b) Ultrathin bronchoscope (outer diameter, 3.0 mm; model MP-290; Olympus) with biopsy forceps (outer diameter, 1.5 mm; model FB-233D, Olympus)
- c) Thin bronchoscope (outer diameter, 4.0 mm; model P-260F, Olympus) with biopsy forceps (outer diameter, 1.8 mm; model Radial Jaw 4, Boston Scientific)

Τεχνικές που αυξάνουν την διαγνωστική ακρίβεια

Fluoroscopy

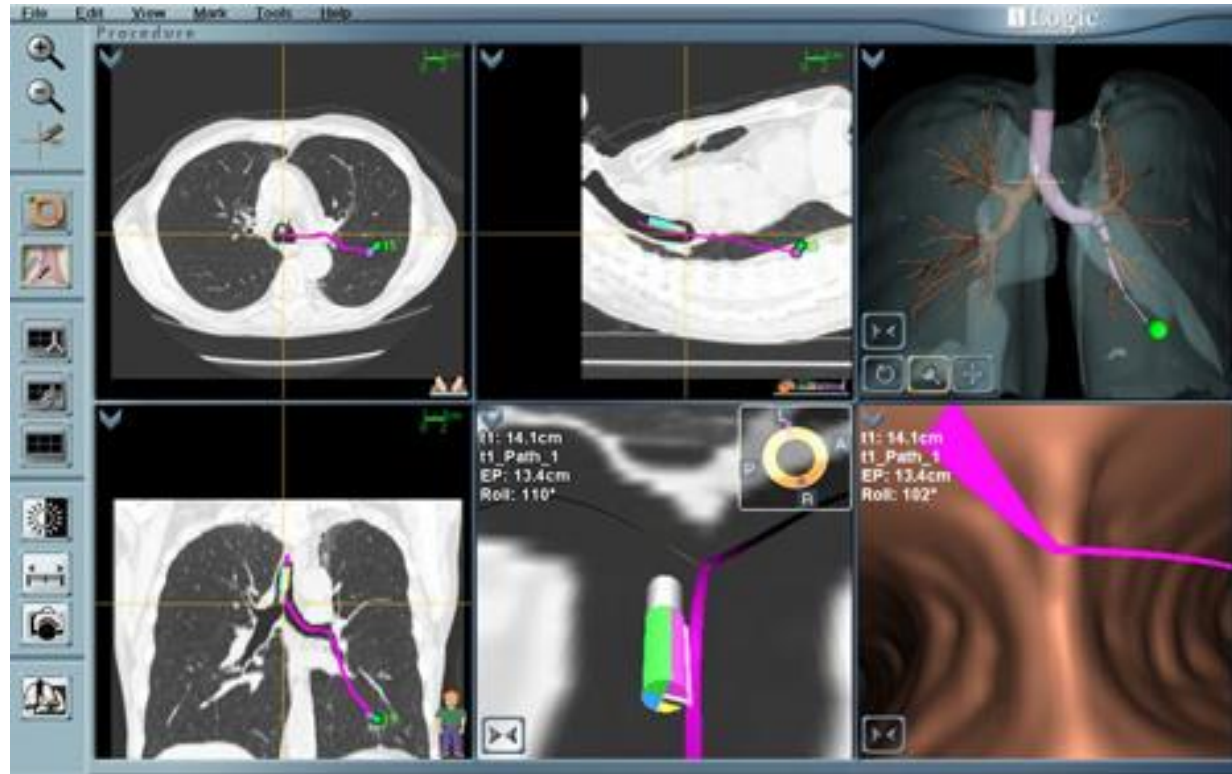
Radial EBUS

Ultrathin Bronchoscopy

Navigation systems (GPS!)

- Electromagnetic navigational bronchoscopy (ENB)
- Virtual Bronchoscopic Navigation (VBN) (Direct Path, Lung Point, Synapse Vincent ...)

Electromagnetic navigational bronchoscopy (ENB)



Diagnostic yield 64,9
Pneumothorax rate 3%
Bleeding 0,9%

Diagnostic yield for lower lobes lesions : 29%

Electromagnetic navigational bronchoscopy + radial-EBUS

TABLE 5. DIAGNOSTIC YIELDS BY SIZE, LOCATION, AND DISEASE TYPE, AND PNEUMOTHORAX RATE

	EBUS, n (%)		ENB, n (%)		EBUS and ENB, n (%)	p
Overall diagnostic yield	27/39 (69)		23/39 (59)		35/40 (88)	0.02*
Yield by lesion size						0.02*
≤ 20 mm	7/9 (78)	p = 0.80	3/4 (75)	p = 0.50	9/10 (90)	p = 0.99
20–30 mm	16/23 (70)		11/22 (50)		21/24 (88)	
> 30 mm	4/7 (57)		9/13 (69)		5/6 (83)	
Yield by lobar location						0.01*
Bilateral upper lobes	16/27 (59)	p = 0.18	17/22 (77)	p = 0.01*	17/20 (85)	p = 0.99
Right middle lobe	3/3 (100)		2/3 (67)		2/2 (100)	
Bilateral lower lobes	8/9 (89)		4/11 (29)		16/18 (89)	
Yield for malignant disease						
Sensitivity	23/32 (72)		16/29 (55)		28/31 (90)	0.009*
Specificity	7/7 (100)		10/10 (100)		9/9 (100)	—
Positive predictive value	23/23 (100)		16/16 (100)		28/28 (100)	—
Negative predictive value	7/16 (44)		10/23 (44)		9/12 (75)	0.16
Yield for benign disease						
Sensitivity	4/7 (57)		7/10 (70)		7/9 (78)	0.79
Specificity	32/32 (100)		29/29 (100)		31/31 (100)	—
Positive predictive value	4/4 (100)		7/7 (100)		7/7 (100)	—
Negative predictive value	32/35 (91)		29/32 (91)		31/33 (94)	0.90
Pneumothorax rate	2/39 (5)		2/39 (5)		3/40 (8)	0.99

For definition of abbreviations, see Table 3.

Virtual Bronchoscopic Navigation (VBN)



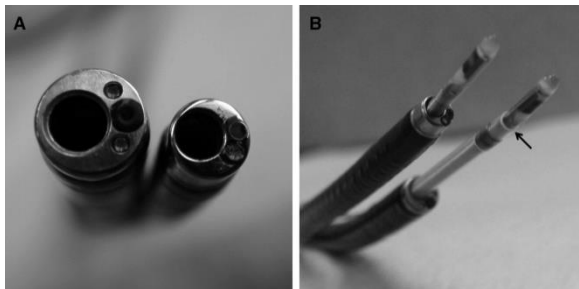
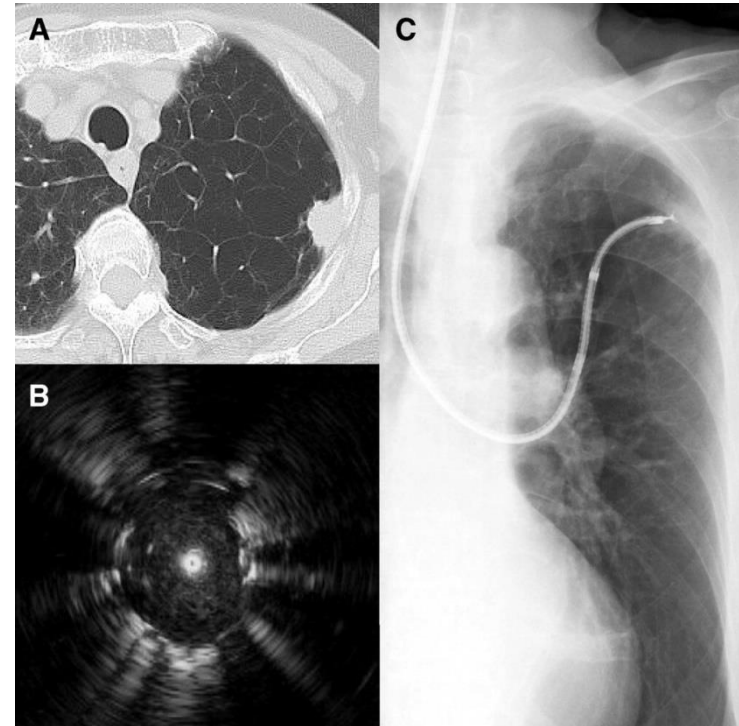
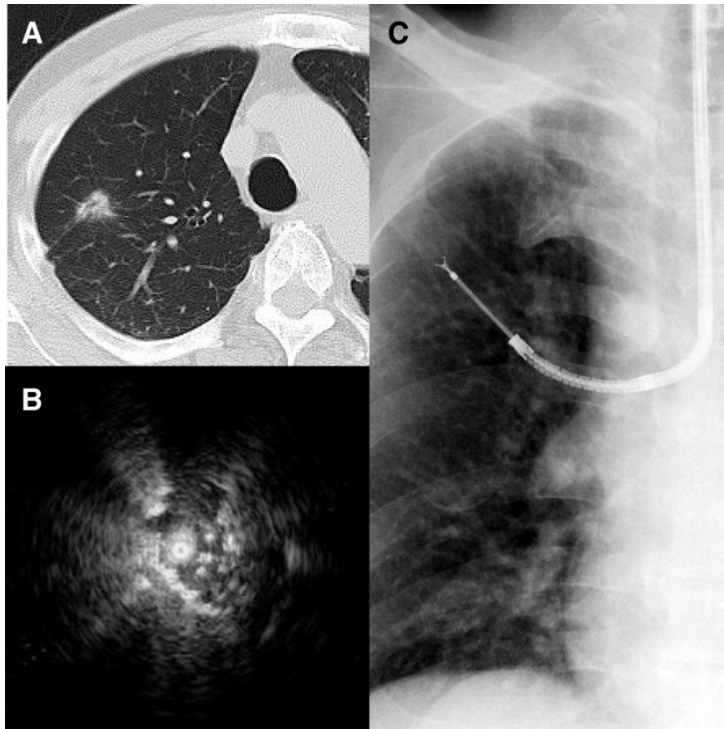
Creating a VB image

Synchronizing VB image with real-time bronchoscopic image

Sampling the PPL by biopsy, brush and lavage.

inability of confirming the location within the lesion

Ultrathin Bronchoscopy with Multimodal Devices for Peripheral Pulmonary Lesions (A Randomized Trial)



Thin=4mm
Ultrathin=3mm

EBUS, VBN, and fluoroscopic guidance
TBBs (10 visible specimens)

Ultrathin Bronchoscopy with Multimodal Devices for Peripheral Pulmonary Lesions (A Randomized Trial)

Variables	UTB Group (n = 150)				TB-GS Group (n = 155)			
	N/Total (%)	95% CI	P Value		N/Total (%)	95% CI	P Value	
Benign								
≤20 mm	5/17 (29)	10–56	0.067	]	5/24 (21)	7–42	0.019	0.529
>20 to ≤30 mm	6/9 (67)	30–93			11/20 (55)	32–77		
Total	11/26 (42)	23–63			16/44 (36)	22–52		
Malignant								
≤20 mm	47/62 (76)	63–88	0.115	]	35/57 (61)	48–74	0.048	0.090
>20 to ≤30 mm	53/61 (87)	76–94			41/52 (79)	65–89		
Total	100/123 (81)	73–88			76/109 (70)	60–78		
Unknown*								
≤20 mm	0/1 (0)				0/1 (0)			
>20 to ≤30 mm					0/1 (0)			
All								
≤20 mm	52/80 (65)	54–75	0.007	]	40/82 (49)	38–60	0.005	0.037
>20 to ≤30 mm	59/70 (84)	74–92			52/73 (71)	59–81		
Total	111/150 (74)	66–81			92/155 (59)	51–67		

Definition of abbreviations: CI = confidence interval; TB-GS = thin bronchoscopy with a guide sheath; UTB = ultrathin bronchoscopy. The 95% CIs are for the percentages.

*Patients who did not return to follow-up.

†Mantel-Haenszel test. Other variables were calculated with Pearson chi-square test.

Pneumothorax

Bleeding

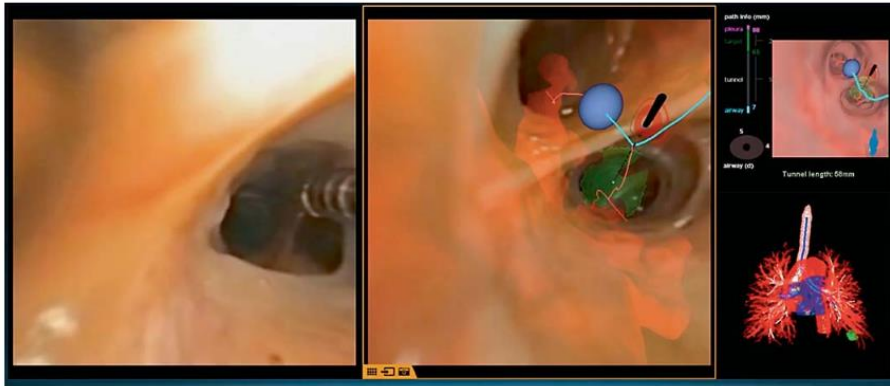
Chest pain

Pneumonia

3%

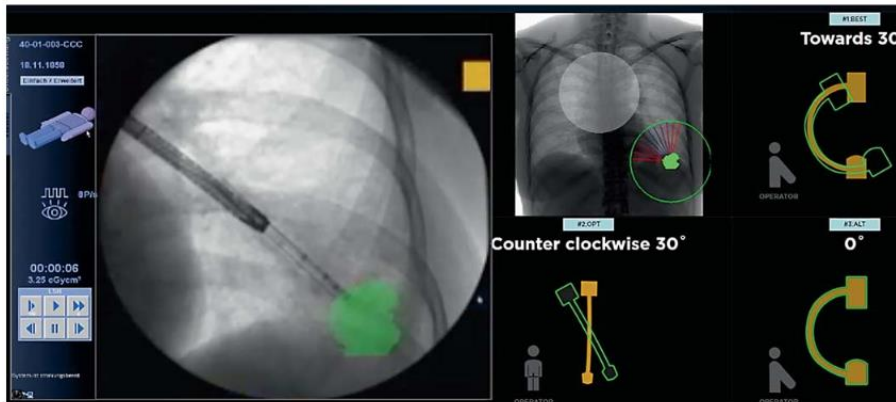
5%

Bronchoscopic Trans-Parenchymal Nodule access (BTPNA)...

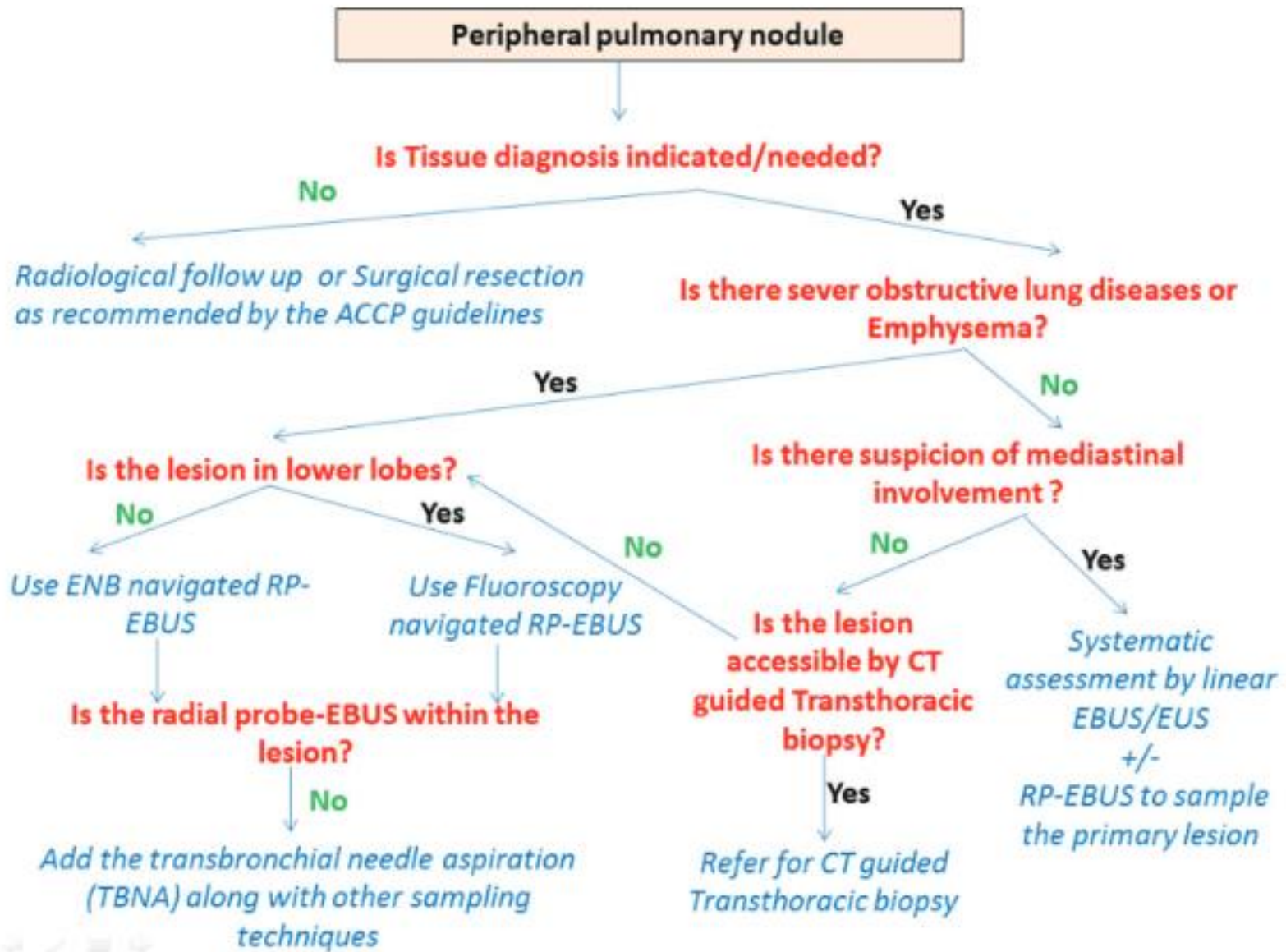


- point of entry (POE) in a central airway
- tunnels were created under fused CT scan/fluoroscopic guidance

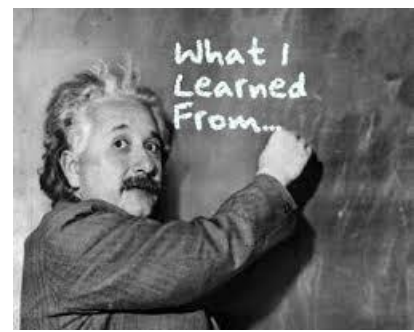
Archimedes Virtual Bronchoscopy Navigation System



6 ασθενείς
5 υποβλήθηκαν σε BTPNA
2 πνευμοθώρακες (1παροχέτευση)



Συμπερασματικά...



- Για τη βρογχοσκοπική διάγνωση κακοήθειας πνεύμονα χρησιμοποιούμε την πιο εύκολη (αποτελεσματική) μέθοδο, που καθορίζεται από τον τύπο της κακοήθειας, τη θέση και το μέγεθος της βλάβης αλλά και από το στάδιο της νόσου.
- Η βιοψία βρόγχου με λαβίδα είναι η μέθοδος εκλογής για ορατές ενδοβρογχικές βλάβες.
- Με την εξέλιξη της τεχνολογίας, η βρογχοσκόπηση υπό καθοδήγηση μπορεί να αποκτήσει παρόμοια διαγνωστική απόδοση με την παρακέντηση υπό αξονικό και να αποτελέσει την μέθοδο εκλογής για τη διάγνωση περιφερικών βλαβών.
- Ο συνδυασμός των διαγνωστικών μεθόδων αυξάνει τη διαγνωστική απόδοση (και για τις κεντρικές και για τις περιφερικές βλάβες)



obrigado

Dank U

Merci

mahalo

Köszí

спасибо

Grazie

Thank
you

mauruuru

Takk

Gracias

Dziękuję

Děkuju

danke

Kiitos

Brock Model

Calculator: Solitary pulmonary nodule malignancy risk in adults (Brock University cancer prediction equation)

$$\text{Logodds} = (0.0287 * (\text{Age} - 62)) + \text{Sex} + \text{FamilyHistoryLungCa} + \text{Emphysema} - (5.3854 * ((\text{NoduleSize}/10)^{-0.5} - 1.58113883)) + \text{NoduleType} + \text{NoduleUpperLung} - (0.0824 * (\text{NoduleCount} - 4)) + \text{Spiculation} - 6.7892$$
$$\text{CancerProbability} = 100 * (e^{\text{Logodds}} / (1 + e^{\text{Logodds}}))$$

Input:

Age years

Sex ☐ Female (0.6011)
☐ Male (0)

Family history of lung cancer ☐ (0.2961)

Emphysema ☐ (0.2953)

Nodule size mm

Nodule type ☐ Nonsolid or ground-glass (-0.1276)
☐ Partially solid (0.377)
☐ Solid (0)

Nodule in upper lung ☐ (0.6581)

Nodule count #

Spiculation ☐ (0.7729)

Results:

Log odds

Cancer probability %

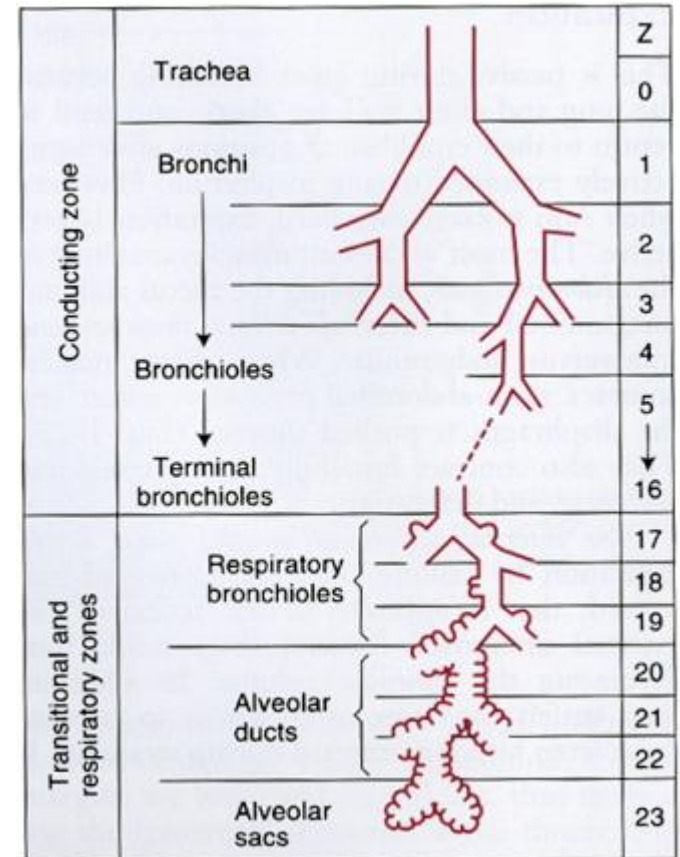
Decimal precision

tes

- This calculator estimates the probability that a lung nodule described above will be diagnosed as cancer within a two- to four-year follow-up period.

Κεντρικοί – περιφερικοί αεραγωγοί

- **Central airways** are all those down to the subsegmental bronchi, i.e. the 4th -5th generation, with a diameter of 4-5 mm and length of 8-10 mm.
- **Small bronchi** down to the 9th generation, diameter of 2-4 mm and a length of 3-6 mm
- **Distal or small airways** diameter <2mm down to a diameter of 0,5mm and representing the 14th to 16th generation



Updated Molecular Testing Guideline for the Selection of Lung Cancer Patients for Treatment with Targeted Tyrosine Kinase Inhibitors

Guideline from the College of American Pathologists, the International Association for the Study of Lung Cancer, and the Association for Molecular Pathology

New Recommendation Statements

Key Question 1: Which new genes should be tested for lung cancer patients?

Strong Recommendation: *ROS1* testing must be performed on all lung adenocarcinoma patients, irrespective of clinical characteristics.

Molecular Testing (Expert Consensus Opinion):

BRAF

RET

ERBB2 (HER2)

KRAS molecular testing

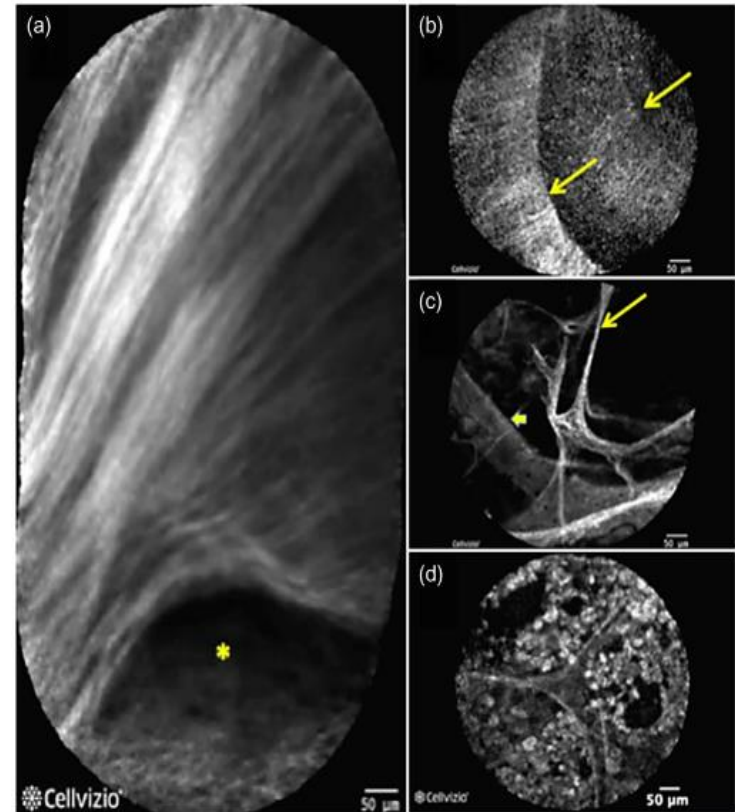
New Recommendation Statements

Key Question 4: What testing is indicated for patients with targetable mutations who have relapsed on targeted therapy?

Strong Recommendation: In lung adenocarcinoma patients who harbor sensitizing *EGFR* mutations and have progressed after treatment with an EGFR-targeted TKI, physicians must use *EGFR* T790M mutational testing when selecting patients for third-generation EGFR-targeted therapy.

Confocal laser endomicroscopy (CLE)

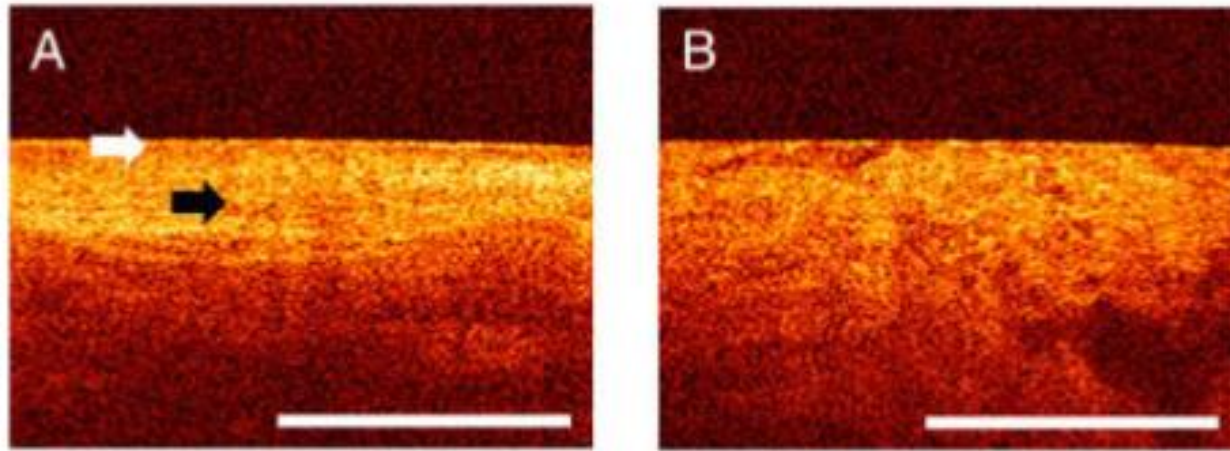
- **Broncho-alveoscopy** (microstructural images of lobular and alveolar lung structures)
- Real-time non-invasive histological imaging, using a laser with a wavelength of 488 nm directed into the alveolar space



- (a) Central airway.
- (b) Terminal bronchiole
- (c) Normal alveoli (non-smoker)
- (d) Normal alveoli (smoker)

Optical coherence tomography (OCT)

noninvasive "optical biopsy"



(A) normal layers of epithelium (white arrow) and lamina propria (black arrow)

(B) loss of identifiable microstructures (tumor area)

BAL

55 patients with a peripheral lung lesion

Diagnostic yield of ~30%

In combination with bronchial washing and post-bronchoscopy sputum, BAL increased the yield to 56%

Semenzato, Lung 1990