

Possibilities and limitations of endoscopy

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Disclosure

- no conflicts of interest to declare



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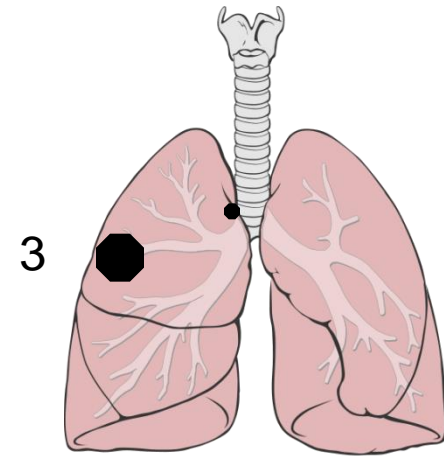
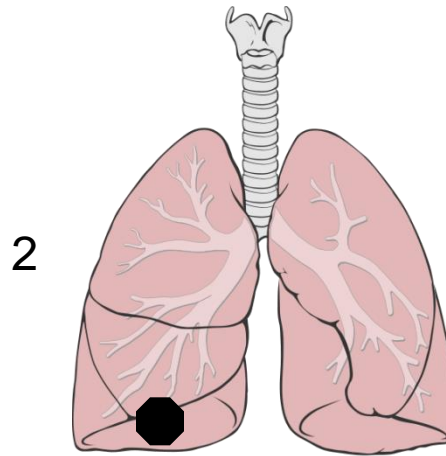
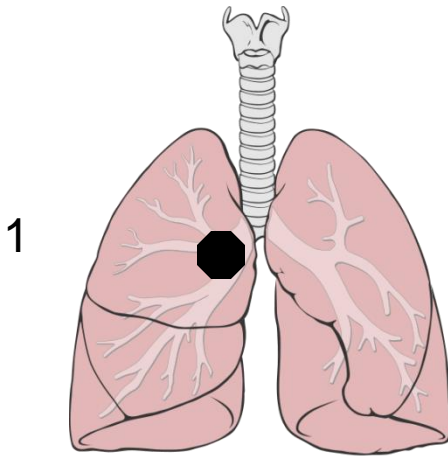


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Endoscopy : presentation at diagnosis

1. Central tumor
2. Peripheral tumor
3. Mediastinal(hilar) lymph nodes, enlarged or PET + with/without peripheral tumor



Peripheral lesions are defined in most studies as lesions that are not visible beyond the visual segmental bronchi

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Flexible bronchoscopy using fluoroscopic guidance



Studies (often guidance using fluoroscopy)	Nb patients	Overall	Sensitivity Biopsy	Brushing	Lavage	TBNA
34 studies	5742	78 % (16 studies)	57 %	54 %	43 %	65 %

sensitivity of 0.45 for one sample and 0.70 for six samples

Sensitivity according to lesion size

Studies	Lesion < 2 cm				Lesion > 2 cm			
	Patients	Pos	Neg	Sens	Patients	Pos	Neg	Sens
10 studies	383	131	252	34 %	984	622	362	63 %

Rivera and Mehta. Chest 2007;132:131/Popovich.. Am Respir Dis 1982; 125:521-3

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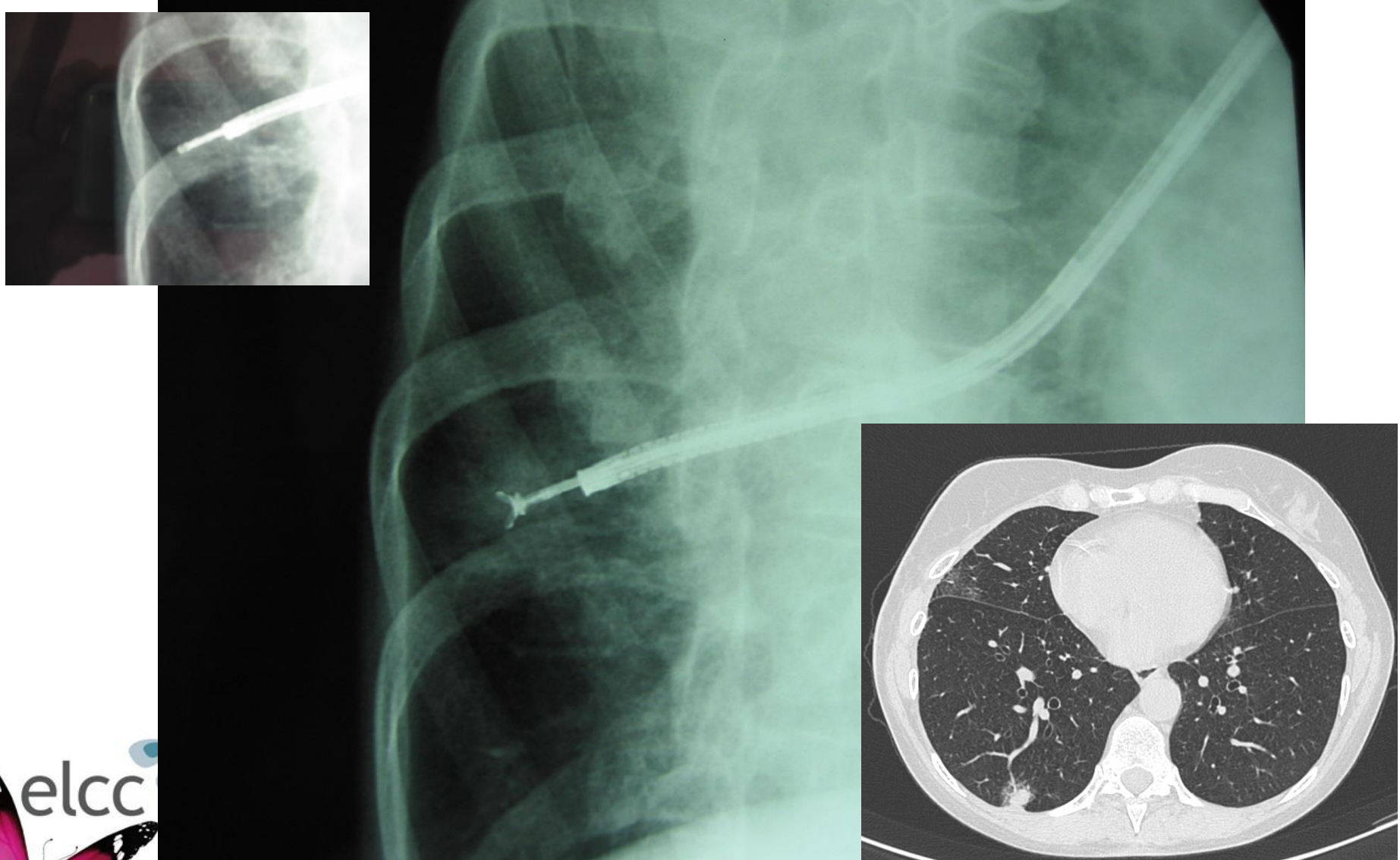
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FB using fluoroscopic guidance



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Standard bronchoscopy using fluoroscopic guidance: factors affecting diagnostic yield

- Size
- Ability to perform all sampling methods
- Location (lower yield for upper lobe apical segment and lower lobe basal segment)
- Character of the border of the lesion (yield better for sharp than fuzzy border)
- Distance from the hilum



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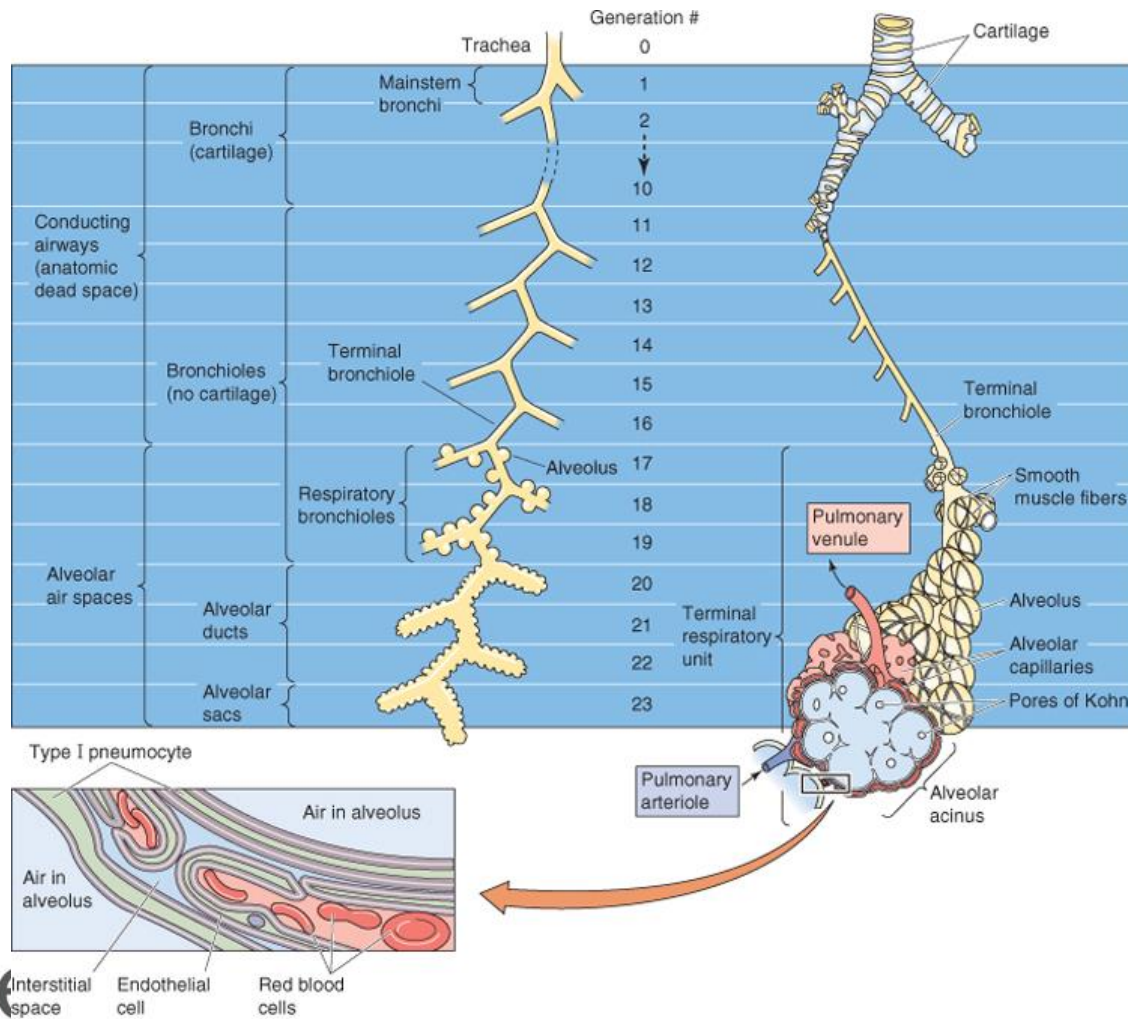


Chechani. Chest 1996; 109:620-25/Cortese. Chest 1979;75:141-5.

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Role of distance from hilum



Reasons for decreased yield of transbronchial biopsy (TBB)

First generations: cartilages

Distally: increasing number of divisions

Boron & Boulpaep: Medical Physiology, 2nd Edition.

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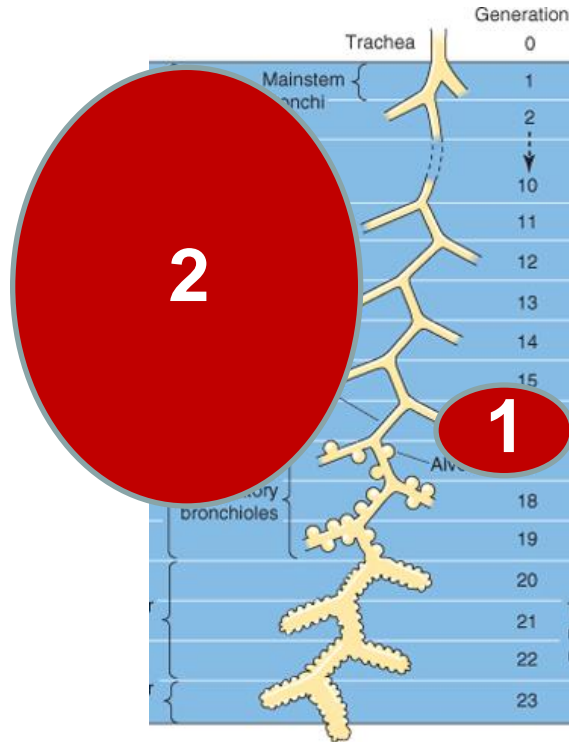
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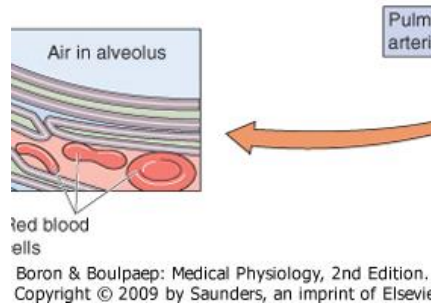
Role of size



Decreased yield of TBB

Small tumor size (1) in comparison with large tumor size (2):

- lower number of bronchi leading to the tumor
- more difficult to see with fluoroscopy



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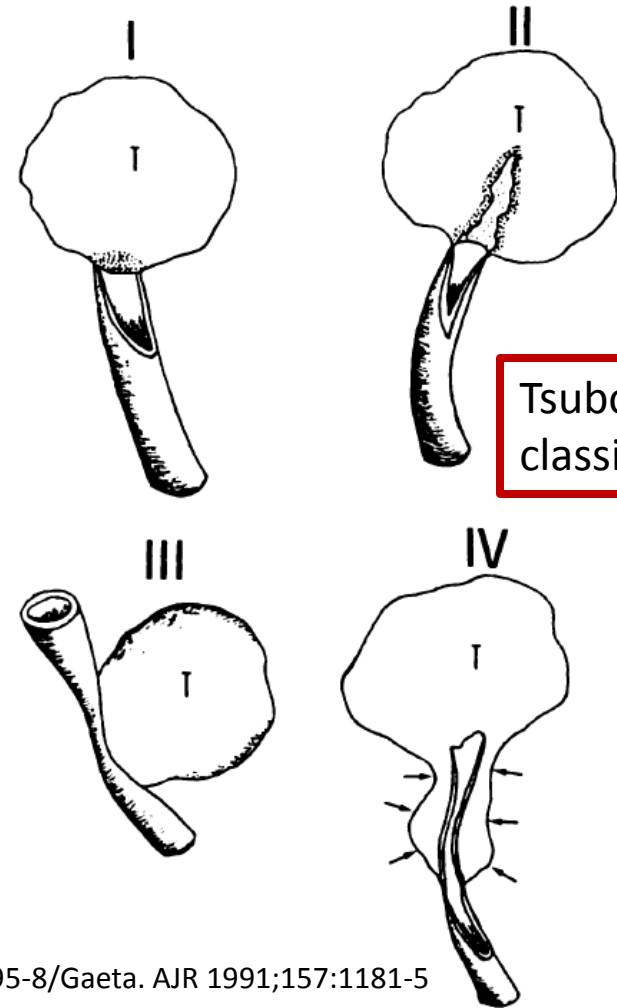
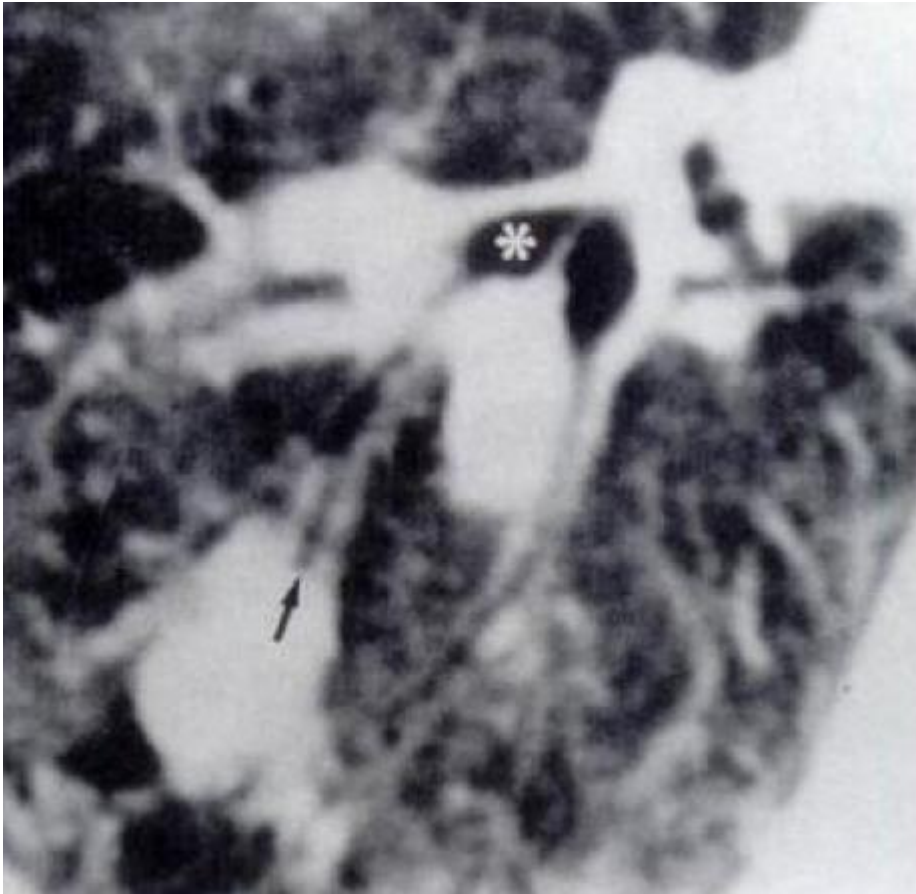
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Bronchus sign predicts results of transbronchial biopsy (TBB)



Tsuboi
classification

Tsuboi. Cancer 1967;20:687-98/Naidich. Chest 1988;93:595-8/Gaeta. AJR 1991;157:1181-5

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New guided-bronchoscopy techniques

- Ultrathin bronchoscopy
Yamamoto S. Lung Cancer 2004;46:43-8.
- Virtual bronchoscopy-guided biopsy
Asano F. Chest 2006;130:559-66.
- Radial endobronchial ultrasound-guided biopsy
Herth F. Eur Respir J 2002;20:972-4.
- Electromagnetic navigation-guided biopsy
Eberhardt R. Chest 2007;131:1800-5.
- Combination ultrasound+electromagnetic
Eberhardt R. Am J Respir Crit Care Med 2007;176:36-41.



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New guided-bronchoscopy techniques

- Diagnostic yield better than traditional transbronchial biopsy
 - Meta-analysis of 3052 lesions from 39 studies (2002-2010)
 - **Pooled diagnostic yield 70%** (increase with size)
 - Low side-effect; pneumothorax rate 1.5%

Wang JS et al. Chest 2012;142:385-393



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Inverse weighted diagnostic yield overall and by modality

Technology	Studies, No.	Weighted Proportion, %	95% CI	Q statistic	Q P value
Virtual B	10	72.0	(65.7-78.4)	21.0	.01
ENB	11	67.0	(62.6-71.4)	13.3	.21
Guide sheath	10	73.2	(64.4-81.9)	63.8	<.0001
Ultrathin B	11	70.0	(65.0-75.1)	15.2	.12
Radial EBUS	20	71.1	(66.5-75.7)	84.2	<.0001
All	39	70.0	(67.1-72.9)	119.4	<.0001

ENB: electromagnetic navigation B; EBUS: endobronchial ultrasound

Wang JS et al. Chest 2012;142:385-393



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New techniques: still an effect of size!

- 20 studies reported diagnostic yields for sizes \leq and $>$ 20 mm (629 vs 767 lesions)
- Weighted diagnostic yields: 60.9% (95% CI, 54.0% to 67.7%) and 82.5% (95% CI, 78.6% to 86.4%)
- Weighted difference 19.6% (95% CI, 11.7% to 27.6%, $P < .001$)

Wang JS et al. Chest 2012;142:385-393



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Radial EBUS: factors affecting diagnostic yield

- Retrospective review of 760 lesions (760 patients)
- Mean lesion diameter was 43 ± 2 mm. rEBUS-MP could visualize 83% and a definitive diagnosis was established in 62%
- Multivariate analysis: size >20 mm, distance lesion to carina >40 mm, malignant lesion and segment (1, 3, or 6, respectively)
- Bronchus sign was the only parameter that indirectly influenced the diagnostic yield through enhancing visualization yield



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Dooms. J Thorac Oncol. 2015 Mar;10(3):472-8

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Electromagnetic navigation + EBUS

118 patients randomised between EBUS, ENB and EBUS+ENB

	EBUS	ENB	EBUS+ENB	p
Diagnostic yield	27/39 (69%)	23/39 (59%)	35/40 (88%)	0.02
Yield by lesion size				
≤ 20 mm	7/9 (78%)	3/4 (75%)	9/10 (90%)	
20-30 mm	16/23 (70%)	11/22 (50%)	21/24 (88%)	
> 30 mm	4/7 (57%)	9/13 (69%)	5/16 (83%)	
Pneumothorax	2/39 (5%)	2/39 (5%)	3/40 (8%)	0.99



Eberhardt. Am J Respir Crit Care Med 2007;176:36

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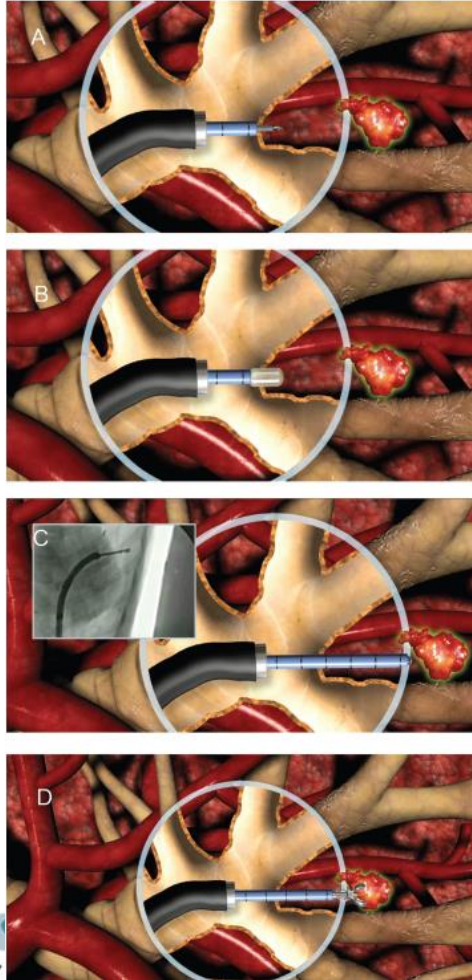
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Bronchoscopic transparenchymal nodule access



First bronchoscopic technique not depending on an airway leading into the nodule

Calculation of an optimal airway wall point of entry and avascular path through lung tissue

Creation of a tunnel tract using catheters and fused fluoroscopic guidance

Feasibility study: 12 patients with 10 cases showing adequate biopsies. No adverse event.

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Herth F. Thorax 2015;70:326-332.

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Conclusions

- Diagnostic yield of new guided-bronchoscopy techniques is better than traditional bronchoscopy but lesion small size remains a limitation
- Combination may improve diagnostic yield to levels comparable to transthoracic needle aspiration (TTNA)
- Side-effect profile is low and lower than the side-effect profile of TTNA



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Conclusions

- Use of bronchoscopy in the evaluation of the solitary pulmonary nodule (SPN) will increase in parallel with increasing data and improved techniques. Additional research is required in the field of combination of techniques and integration of bronchoscopy in the diagnostic algorithm of SPN.



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