

INCONTRO  
E ASSEMBLEA

**VATS GROUP**

UPDATE DI TECNICA  
E TECNOLOGIA NELLE  
RESEZIONI ANATOMICHE  
TORACOSCOPICHE

30 MARZO 2017

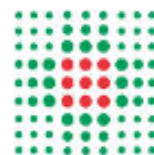
**PADOVA**

Palazzo del Bò, Aula Nievo

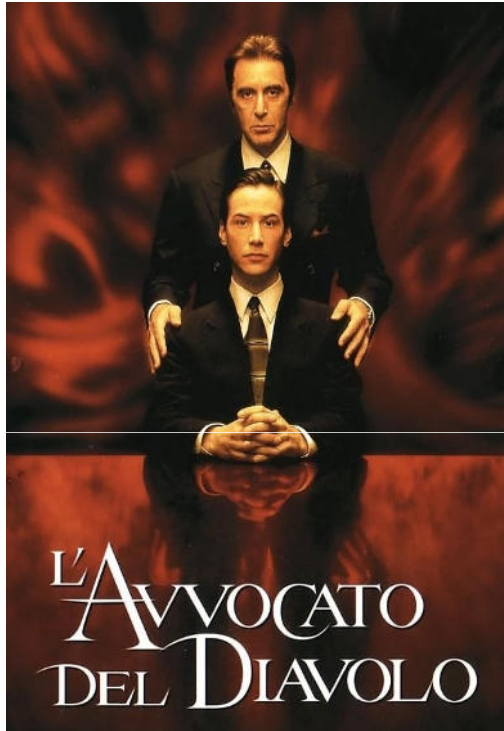
# VATS segmentectomy PROS & CONS

**E. Rendina, P. Solli**

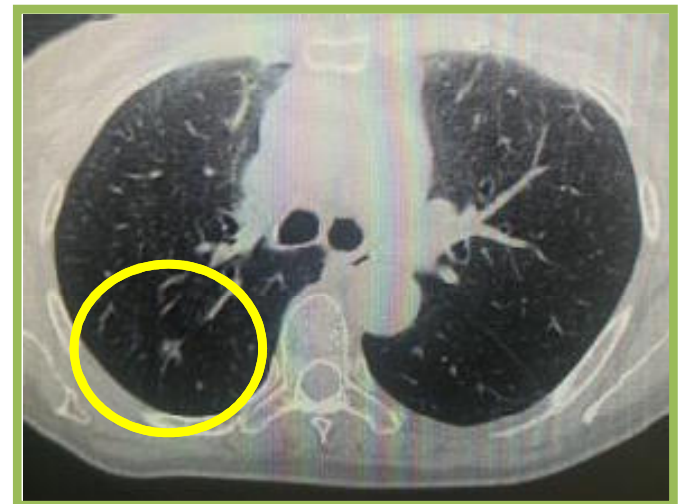
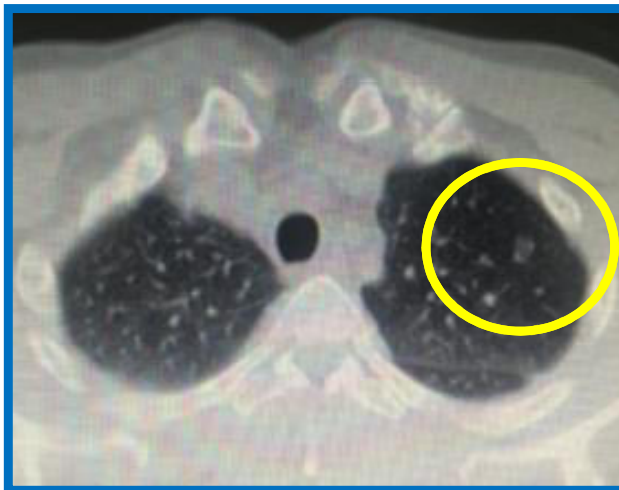
**Piergiorgio Solli**  
SC Chirurgia Toracica  
AUSL Area Vasta Romagna



SERVIZIO SANITARIO REGIONALE  
EMILIA-ROMAGNA  
Azienda Unità Sanitaria Locale della Romagna



"Persona che controbatte a un'argomentazione non perché intimamente convinta, ma piuttosto per alimentare un dibattito  
Processo utilizzato per verificare la genuinità dell'argomento originale o identificarne debolezze nella sua formulazione"



## FACTS & FIGURES

### DEFINITION OF SEGMENTECTOMY

**anatomical** resection of lung parenchyma involving dissection identification and **individual** division of segmental arteries, veins & bronchi

### TUMOUR SIZE

critical factor for feasibility & safety of limited resection CUT-OFF 2CM (?)

### TUMOUR LOCATION

peripheral within the outer 1/3 of lung, not crossing intersegmental planes

HISTOLOGICAL CLASSIFICATION (squamous cell, adenocarcinoma, ex-BAC)

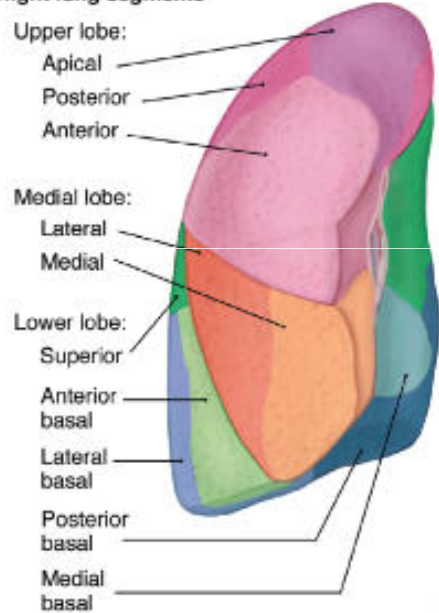
LIMITED PULM RESERVE ?

MULTIPLE / BILATERAL LESIONS

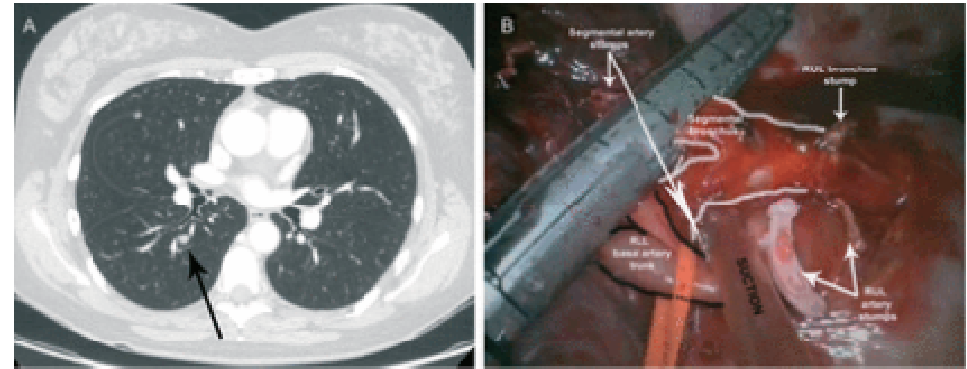
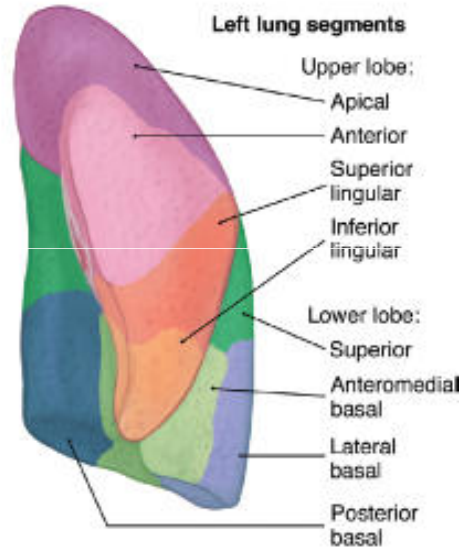
SCREENING DETECTED TUMOURS

# TECHICAL DEMANDING

## Right lung segments



## Left lung segments



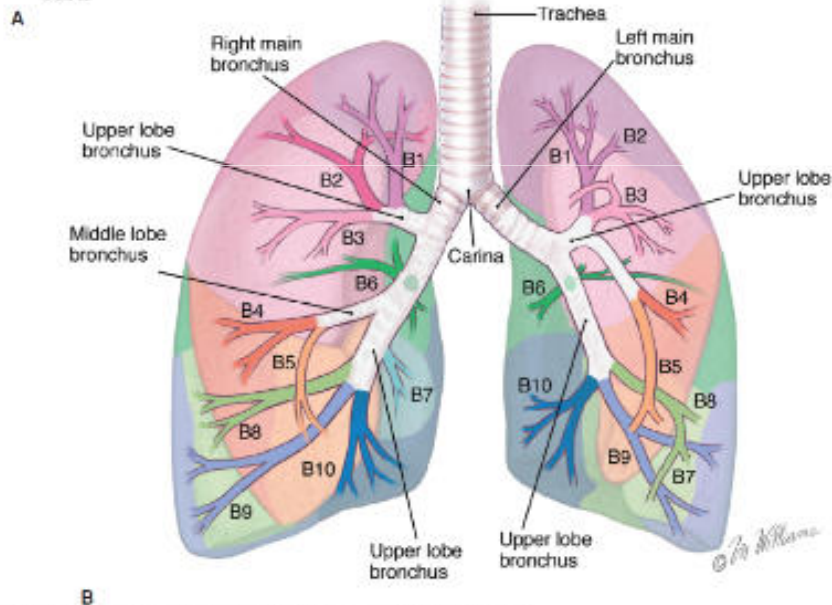
**ANATOMICAL VARIATIONS**

**NON PALPABLE LESIONS**

**SMALL VESSELS**

**INNER PART OF LOBE AND FISSURE**

**NOT CLEAR LANDMARKS**



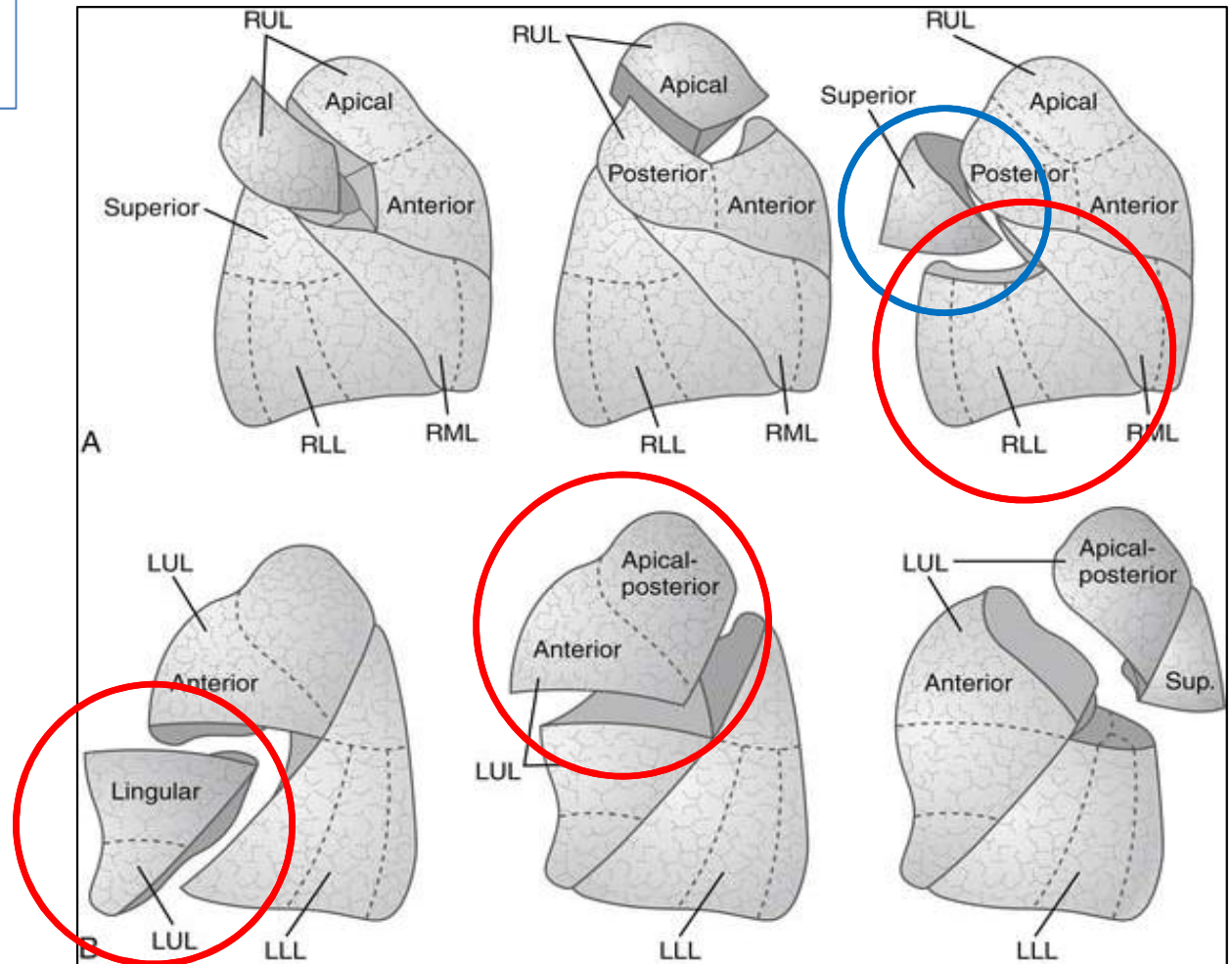
# NOT ALL SEGMENTS

**Culmen (Trisegmentectomy)**

**Lingula**

**Superior Segment**

**Common Basal**



***CS Sihi et Al. Uniportal Segmentectomy for T1a NSCLC / JTD 2016***

Traditional vs Atypical Segmentectomy

≈ 70% traditional

atypical segmentectomies included apicoposterior segmentectomy of LUL, R apical segmentectomy, posterior segmentectomy of RUL, apical segmentectomy RUL, R segment 8+9 bisegmentectomy, R segment 7+8 bisegmentectomy, R segment 9+10 bisegmentectomy

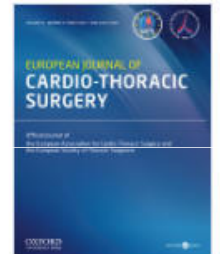
# RISK OF LOCAL RELAPSE

## Locoregional recurrence after segmentectomy for clinical-T1aN0M0 radiologically solid non-small-cell lung carcinoma†

Aritoshi Hattori; Takeshi Matsunaga; Kazuya Takamochi; Shiaki Oh; Kenji Suzuki ✉

Eur J Cardiothorac Surg (2017) 51 (3): 518-525.

DOI: <https://doi.org/10.1093/ejcts/ezw336>



Volume 51, Issue 3  
March 2017

METHODS: 353 patients

270 (77%) Lobectomy vs 83 (23%) Segmentectomy

pure-solid CT appearance and tumour size were significant predictors of regional recurrence (P = 0.0106, 0.0408)

among cT1a radiologically pure-solid NSCLCs, locoregional recurrence was 20.7% in the segmentectomy arm vs. 8.2% in the lobectomy arm

CONCLUSIONS: segmentectomy should be applied with great caution especially for a radiological pure-solid NSCLC due to their high incidence of loco-regional recurrence

## RISK OF LOCAL RELAPSE

### Re-Assessment of Intentional Extended Segmentectomy for Clinical T1aNo Non-Small Cell Lung Cancer

[Wataru Nishio, MD](#), [Masahiro Yoshimura, MD](#), [Yoshimasa Maniwa, MD](#), [Yoshitaka Kitamura, MD](#), [Kenta Tane, MD](#), [Daisuke Takenaka, MD](#), [Shuji Adachi, MD](#)

*Ann Thorac Surg 2016*

segmentectomies only independent risk factor for regional recurrence ( $p=0.020$ )

#### Subset analysis

- a) LUL segmentectomies and superior segmentectomies have significantly less regional recurrence ( $p=0.029$ ) and comparable prognosis to lobectomies
- b) Segmentectomies in the RUL and of basal segments showed significantly higher local recurrence ( $p=0.001$ )
- c) Basal segmentectomies showed significantly poor prognosis versus lower lobectomies ( $p=0.005$ )

#### Conclusions

- 1) strict inclusion criteria needed
- 2) **prognosis equivalent NOT for all segments**

# ACCURATE PREOPERATIVE STUDY

## **Three-dimensional computed tomography bronchography and angiography in the preoperative evaluation of thoracoscopic segmentectomy and subsegmentectomy**

Wei-Bing Wu, Xin-Feng Xu, Wei Wen, Jing Xu, Quan Zhu, Xiang-Long Pan, Yang Xia, Liang Chen

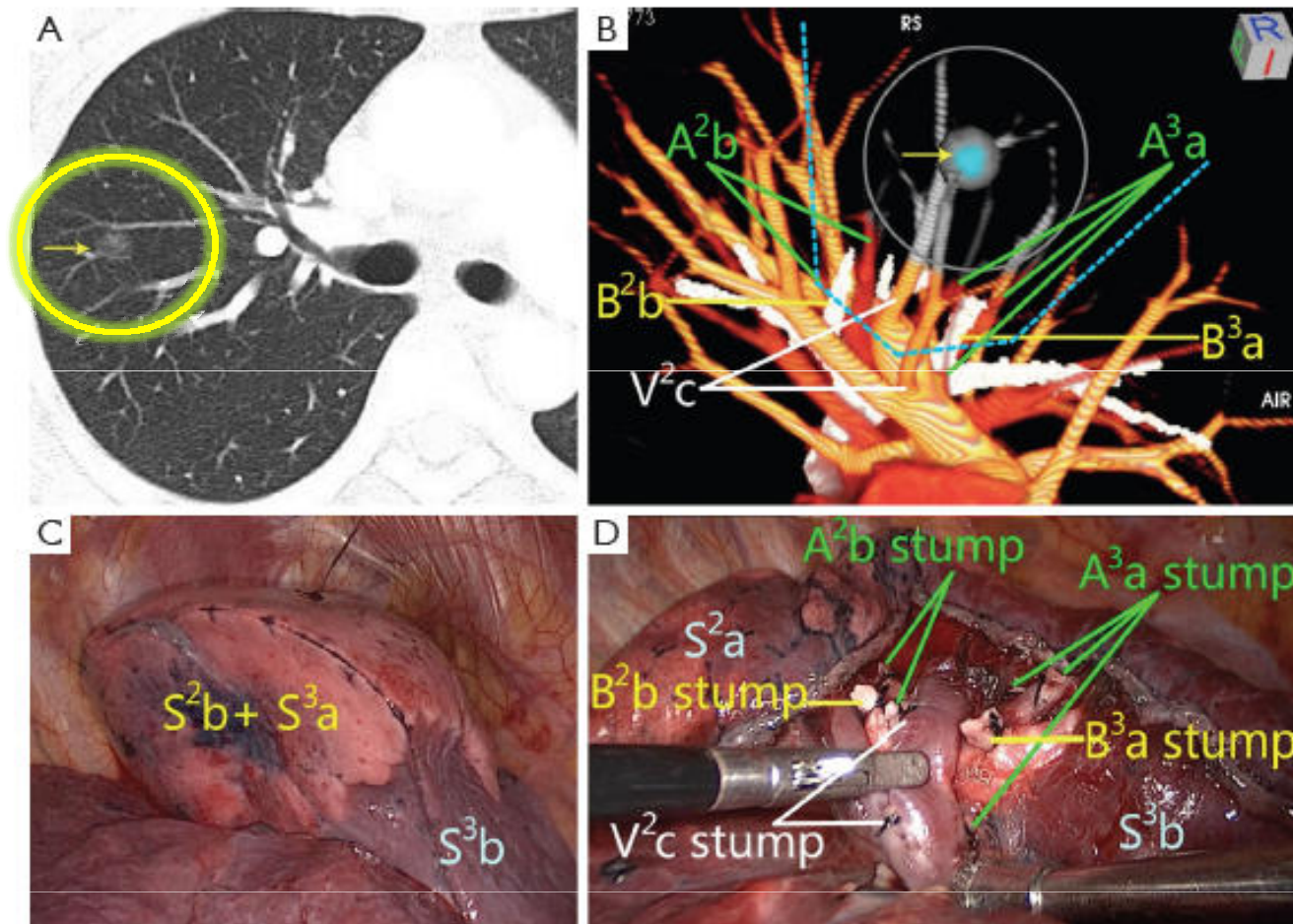
*J Thorac Dis* 2016;8(Suppl 9):S710-S715

Preoperative 3D simulation image is helpful for surgery planning

nodule location, identification of the targeted vessels, bronchus and surgical margin, revealing of anatomical variations and planning of surgical approach

With 3D navigation assistance during surgical procedure all targeted structures could be divided accurately, intersegmental veins could be preserved, surgical margins could be ensured





**Figure 1** Illustration of a combined subsegmentectomy (CSS) of right  $S^{2b} + S^3a$  under the guidance of 3D-CTBA images. (A) CT image revealed a mixed ground glass nodule (yellow arrow), 10 mm in diameter, in the right upper lobe; (B) 3D image from the right posterior inferior view revealed the primary lesion (yellow arrow) located in between  $S^{2b}$  and  $S^3a$ . The grey area denotes the safety margin. A simulated operation on a 3D image demonstrated that a CSS with sufficient margin was possible. The cone-shaped blue dotted line represented the intersubsegmental demarcation of the CSS. There were two targeted bronchi ( $B^{2b}$  and  $B^3a$ ), five targeted arteries ( $A^{2b}$  and  $A^3a$ ), and two targeted veins ( $V^{2c}$ ); (C) the intersubsegmental demarcation was identified by the modified inflated-deflated line and divided using electrocautery and endoscopic staplers; (D) view of the hilum after  $S^{2b} + S^3a$  removal showed the stumps of targeted bronchi and vessels. Postoperative pathological findings confirmed the diagnosis of minimally invasive adenocarcinoma (MIA). The surgical margin width was greater than 20 mm.

# TUMOUR LOCALIZATION

## Intrathoracoscopic localization techniques

2006; 20: 1341-

### Review of literature

D. Sortini, C. Feo, K. Maravegias, P. Carcoforo, E. Pozza, A. Liboni, A. Sortini

Department of Surgical, Anaesthesiological, and Radiological Sciences, University of Ferrara, C.so Giovecca 203, 44100 Ferrara, Italy



**Table 2.** Advantages and disadvantages of pulmonary nodules localization techniques

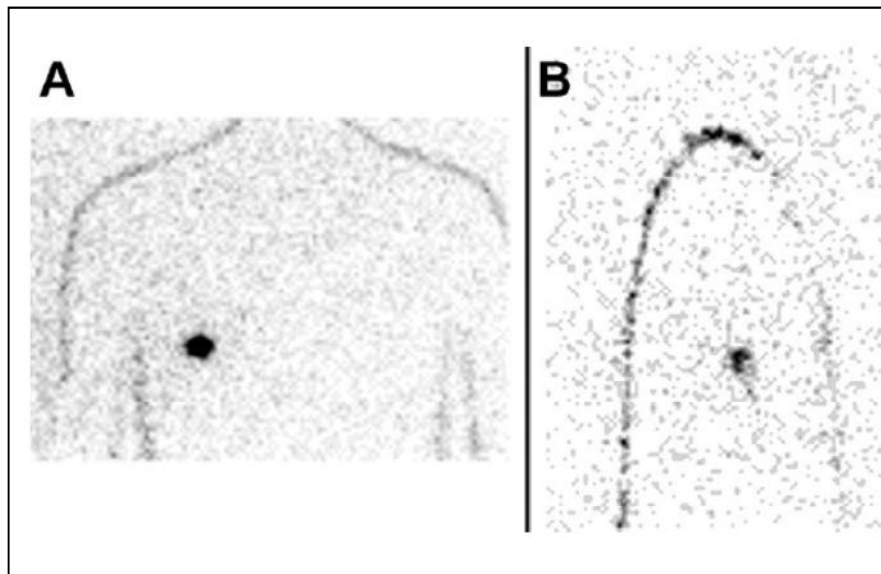
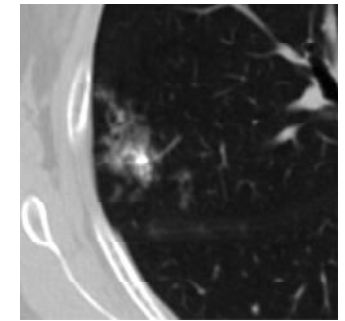
Localization technique	Advantages	Disadvantages
Ultrasound	No complications Scans the lung Drives resection Helps to define pathology No additional procedure required	Strongly operator dependent Not widely used
Endofinger	No complications No additional procedure required	Unable to locate deep and tender nodules Not widely used
Finger palpation, wait and watch	No complications No additional procedure required Widely used	Subjective relief Needs complete lung deflation
Radioguided	Locates pulmonary nodules and sentinel node	Complications Contrast medium migration Difficulty locating deep and posterior nodules
Vital dye	Easy to perform Widely used	Complications Contrast medium migration
Agar marking	Low cost Easy to perform	Subjective relief Invasive (thoracotomy)
Needle wire	Widely used	Complications Needle dislodgement

# Computed Tomography-Guided Preoperative Radiotracer Localization of Nonpalpable Lung Nodules

Massimo Bellomi, MD, Giulia Veronesi, MD, Giuseppe Trifirò, MD, Sarah Brambilla, MD, Luke Bonello, MD, Lorenzo Preda, MD, Monica Casiraghi, MD, Alessandro Borri, MD, Giovanni Paganelli, MD, and Lorenzo Spaggiari, MD

Departments of Radiology, Thoracic Surgery, and Nuclear Medicine, European Institute of Oncology, Milan; and School of Medicine, University of Milan, Milan, Italy

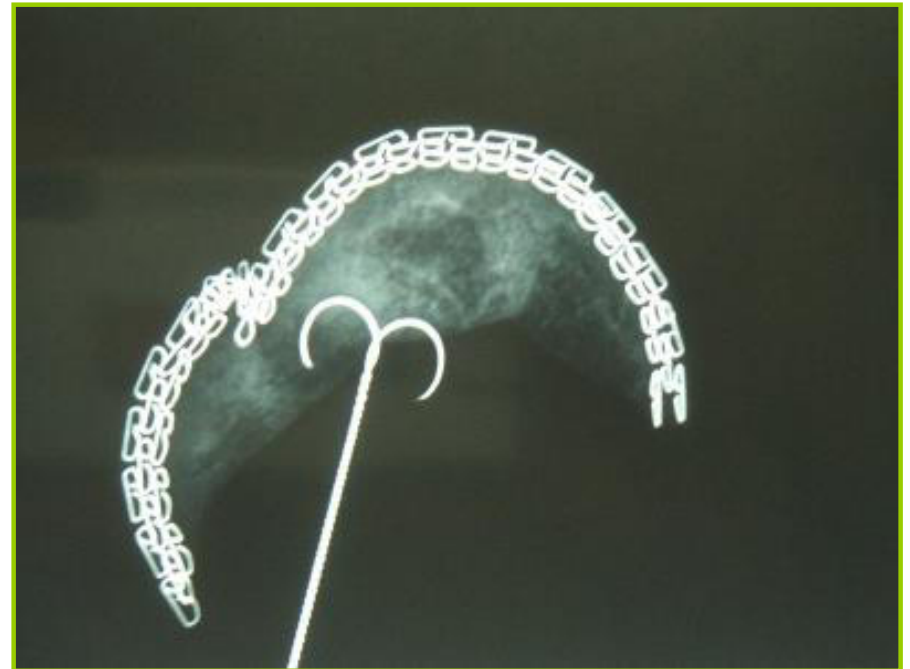
Ann Thorac Surg  
2010;90:1759–65



*Results.* Mean nodule size was 11 mm (range, 5 to 24 mm); 24 nodules were nonsolid, 15 nodules were partially solid, and 8 nodules had a solid morphology. Mean distance from the pleura was 11 mm (range, 0 to 35 mm).

Localization complications included 13 minor asymptomatic pneumothoraces, 9 parenchymal hemorrhage suffusions, 1 mild allergic reaction to contrast medium, and 2 patients with chest pain after the procedure. Nine patients had mild extravasation of radiotracer into the pleura. In 2 cases, there was an extravasation of a significant quantity of radiotracer into the pleural cavity.

Thoracoscopic biopsy was performed in 30 cases, 2 cases were converted to thoracotomy, and 12 patients underwent intentional thoracotomy.



*courtesy Dr A Martin Ucar*

# NO ROBUST DATA IN FAVOUR YET



Nakamura K et al.

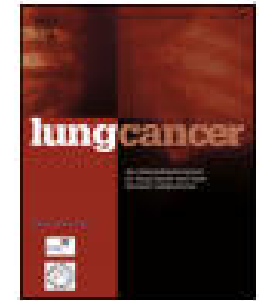
A phase III randomized trial of lobectomy versus limited resection for small-sized peripheral non-small cell lung cancer JCOG0802/WJOG4607L

National Institutes of Health, National Cancer Institute.

Phase III randomized study of lobectomy versus sublobar resection in patients with small peripheral stage IA non-small cell lung cancer  
CALGB-140503

# Could less be more?—A systematic review and meta-analysis of sublobar resections versus lobectomy for non-small cell lung cancer according to patient selection

2015



Christopher Cao<sup>a,b,\*</sup>, David Chandrakumar<sup>a</sup>, Sunil Gupta<sup>a</sup>, Tristan D. Yan<sup>a,c</sup>,  
David H. Tian<sup>a</sup>

First meta-analysis to emphasize patient selection process to compare

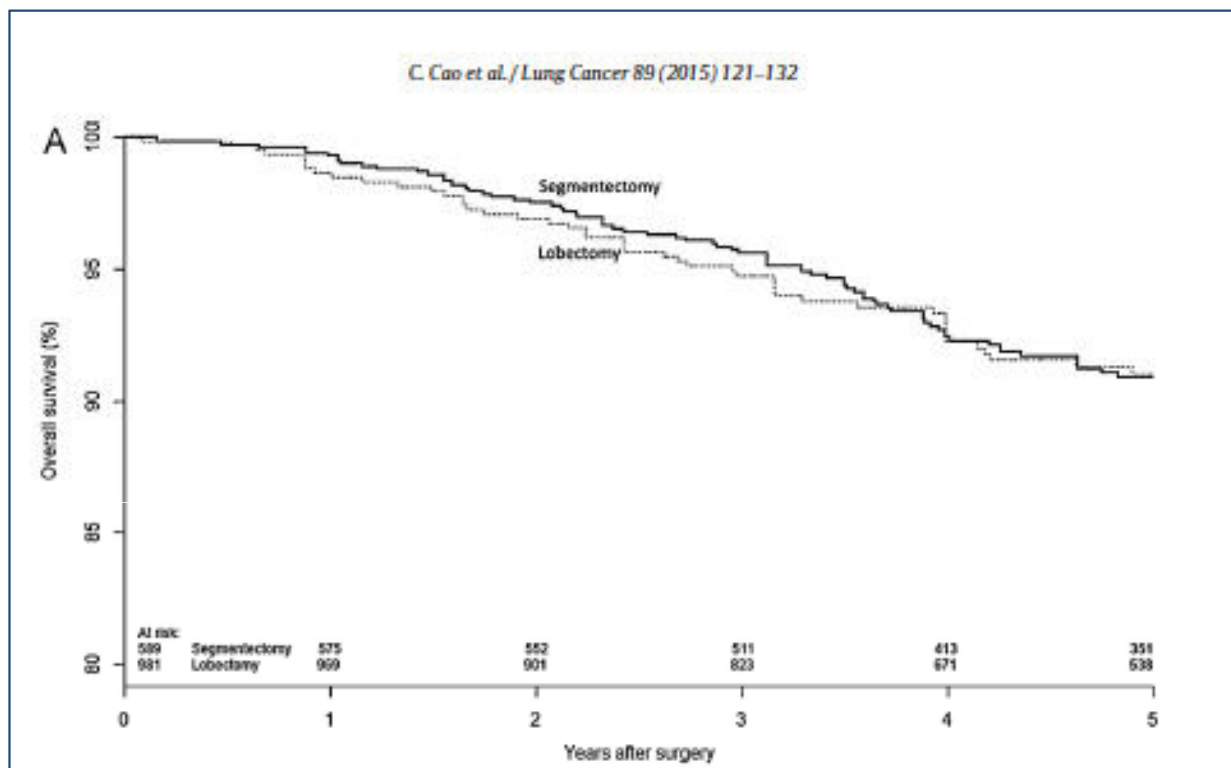
‘INTENTIONALLY SELECTED’ could tolerate either procedure

‘COMPROMISED’ only sublobar resections (comorbidities or poor cardiopulmonary reserve)

Results 54 studies, involving 38,959 patients

Segmentectomies vs Lobectomies, no significant difference in OS in the ‘intentionally selected’, but **significantly worse for segmentectomy in the ‘compromised group’**

Segmentectomies feasible alternative for selected patients who could tolerate either procedure. These patients generally had tumours that were <2 cm, located peripherally, favourable histopathology, GGO opacity on imaging.

**Table 3**

Summary of meta-analysis results for overall survival and disease-free survival in patients undergoing sublobar resection or lobectomy for early-stage non-small cell lung cancer.

	<i>N</i> studies	<i>N</i> patients	HR (95%CI)	<i>p</i> -Value	<i>I</i> <sup>2</sup>
<b>Sublobar resection vs lobectomy</b>					
Overall survival					
Intentional	5	633 vs 702	0.85 (0.46–1.57)	0.60	75%
Compromise	8	559 vs 1639	1.41 (1.20–1.66)	<0.0001	0%
Non-specified	11	4385 vs 17627	1.40 (1.32–1.48)	<0.00001	0%
Disease-free survival					
Intentional	1	NA	NA	NA	NA
Compromise	2	248 vs 703	1.48 (1.10–1.99)	0.01	25%
Non-specified	2	350 vs 1053	1.46 (1.07–1.99)	0.02	0%
<b>Segmentectomy vs lobectomy</b>					
Overall survival					
Intentional	6	443 vs 941	0.94 (0.52–1.68)	0.83	21%
Compromise	6	330 vs 694	1.56 (1.05–2.32)	0.03	0%
Non-specified	9	644 vs 5651	1.05 (0.83–1.32)	0.70	16%
Disease-free survival					
Intentional	3	345 vs 730	0.80 (0.50–1.30)	0.37	1%
Compromise	3	257 vs 484	1.25 (0.86–1.81)	0.25	25%
Non-specified	2	197 vs 235	1.29 (0.64–2.58)	0.48	0%

# Choice of Surgical Procedure for Patients With Non–Small-Cell Lung Cancer $\leq 1$ cm or $> 1$ to 2 cm Among Lobectomy, Segmentectomy, and Wedge Resection: A Population-Based Study

Chenyang Dai, Jianfei Shen, Yijiu Ren, Shengyi Zhong, Hui Zheng, Jiayi He, Dong Xie, Ke Fei, Wenhua Liang, Gening Jiang, Ping Yang, Rene Horsleben Petersen, Calvin S.H. Ng, Chia-Chuan Liu, Gaetano Rocco, Alessandro Brunelli, Yaxing Shen, Chang Chen, and Jianxing He

15,760 pts with T1aN0M0 NSCLC after surgery from the SEER database

OS favored lobectomy compared with segmentectomy or wedge resection in patients with NSCLC  $< 1$  cm and  $> 1$ -2cm

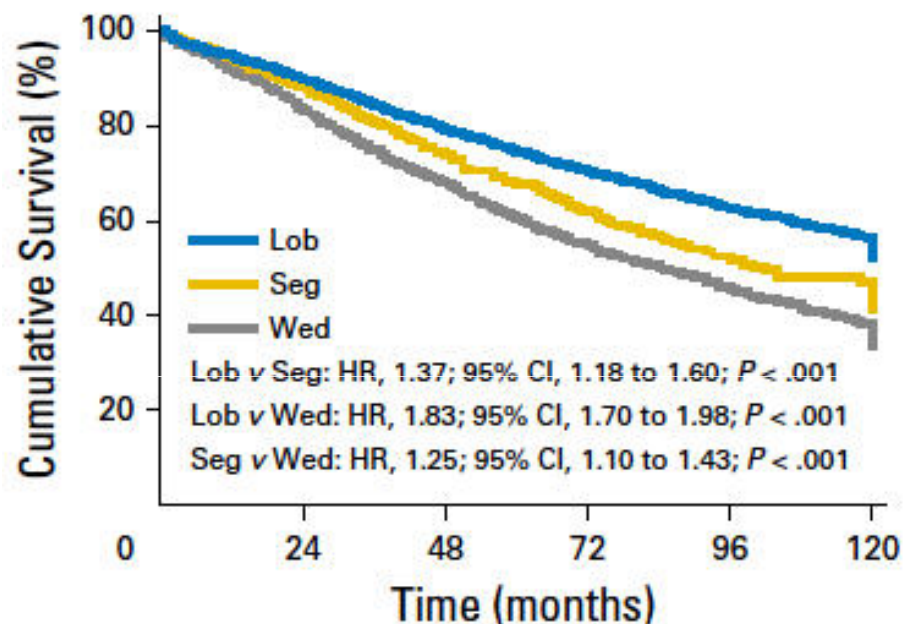
With sublobar resection lower OS emerged for NSCLC  $> 1$ -2cm **after wedge resection, whereas similar survivals were observed for NSCLC  $< 1$ cm**

## Conclusion

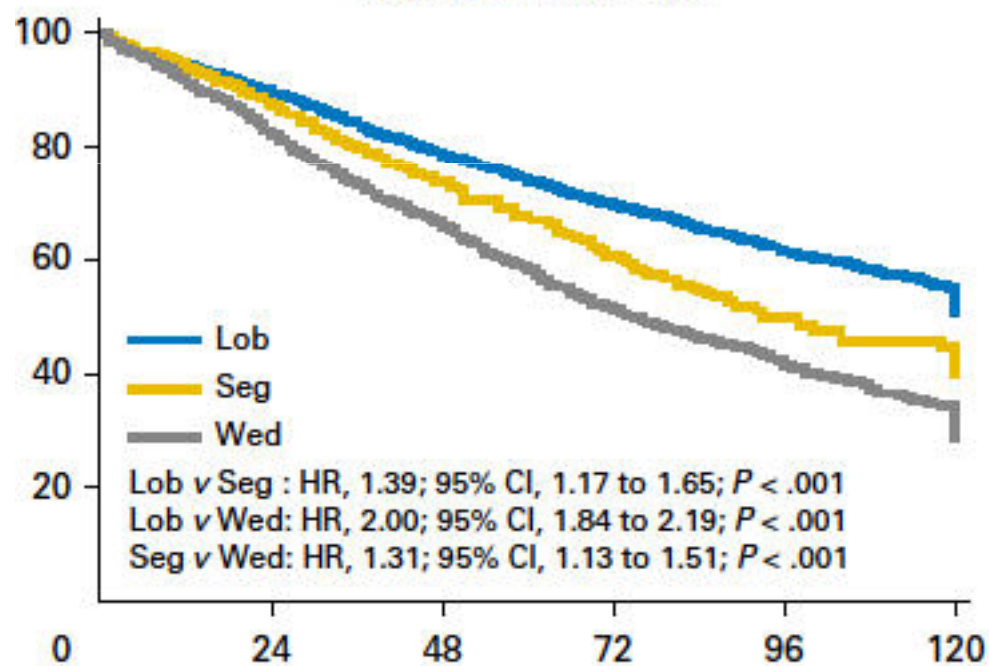
Lobectomy showed better survival than sublobar resection for patients with NSCLC  $\leq 1$  cm and  $> 1$  to 2 cm. For patients in whom lobectomy is unsuitable, segmentectomy should be recommended for NSCLC  $> 1$  to 2 cm, whereas surgeons could rely on surgical skills and the patient profile to decide between segmentectomy and wedge resection for NSCLC  $\leq 1$  cm.



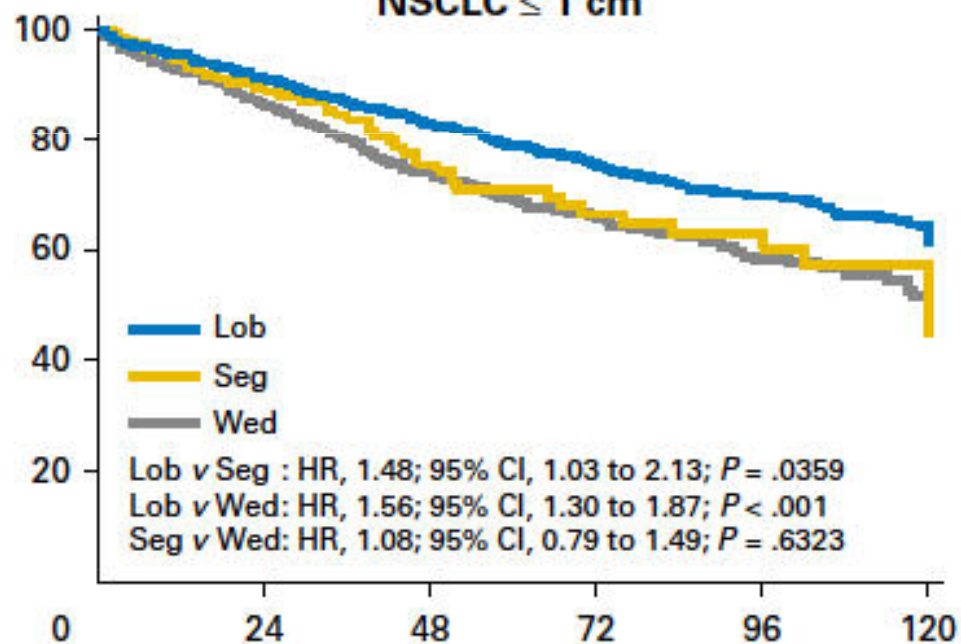
### Overall Survival NSCLC $\leq 2$ cm



### Overall Survival NSCLC $> 1$ to 2 cm



### Overall Survival NSCLC $\leq 1$ cm





[Surgery Today](#)

April 2017, Volume 47, [Issue 4](#), pp 463–469

## Does segmentectomy really preserve the pulmonary function better than lobectomy for patients with early-stage lung cancer?

Authors

[Authors and affiliations](#)

Hidemi Suzuki , Junichi Morimoto, Teruaki Mizobuchi, Taiki Fujiwara, Kaoru Nagato, Takahiro Nakajima, Takekazu Iwata, Shigetoshi Yoshida, Ichiro Yoshino

p-T1aN0M0 NSCLC undergone segmentectomy or lobectomy

FVC, FEV1, radiological lung volume and weight evaluated before and 6 months after surgery, postoperative values compared with predicted values

No statistical differences recognized in trend lines for recovery ratios of FVC, FEV1, radiologic lung volume and weight.

**NO LONG-TERM FUNCTIONAL ADVANTAGE OBSERVED FOR SEGMENTECTOMY**





Chest

Volume 146, Issue 1, July 2014, Pages 175–181



Original Research

## Impact of Histologic Subtyping on Outcome in Lobar vs Sublobar Resections for Lung Cancer : A Pilot Study

Francine R. Dembitzer, MD<sup>a</sup>,  , Raja M. Flores, MD, FCCP<sup>b</sup>, Michael K. Parides, PhD<sup>c</sup>, Mary Beth Beasley, MD<sup>a</sup>

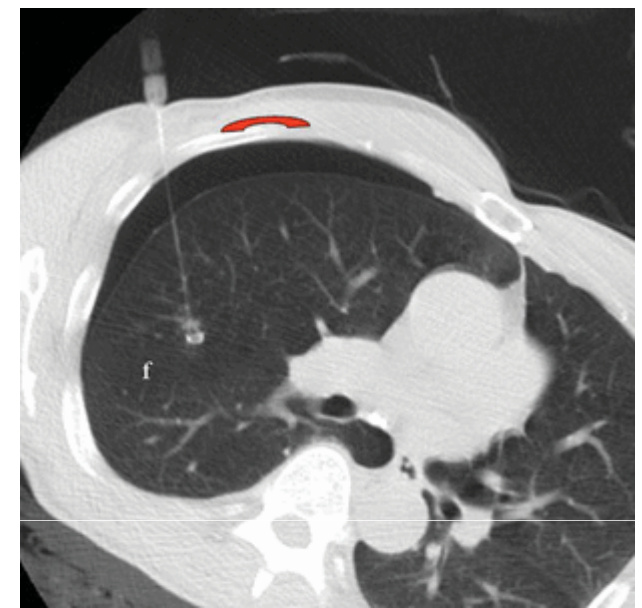
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<http://dx.doi.org/10.1378/chest.13-2506>

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INTRALOBAR SATELLITE TUMOURS

INTRALOBAR LYMP NODES METASTASIS



# FIRST REASON FOR FAILED RANDOMIZATION

*J Thorac Cardiovasc Surg.* 2017 Feb 7. pii: S0022-5223(17)30162-9. doi: 10.1016/j.jtcvs.2016.12.045. [Epub ahead of print]

## **Biopsy first: Lessons learned from Cancer and Leukemia Group B (CALGB) 140503.**

Kohman LJ<sup>1</sup>, Gu L<sup>2</sup>, Altorki N<sup>3</sup>, Scalzetti E<sup>4</sup>, Veit LJ<sup>5</sup>, Wallen JM<sup>5</sup>, Wang X<sup>2</sup>.

### **⊕ Author information**

#### **Abstract**

**OBJECTIVE:** Cancer and Leukemia Group B 140503 is an ongoing, multicenter randomized trial assessing whether sublobar resection is equivalent to lobectomy for the treatment of stage I A non-small cell lung cancer (NSCLC)  $\leq 2$  cm in diameter. The objective of this report is to determine the reasons precluding intraoperative randomization.

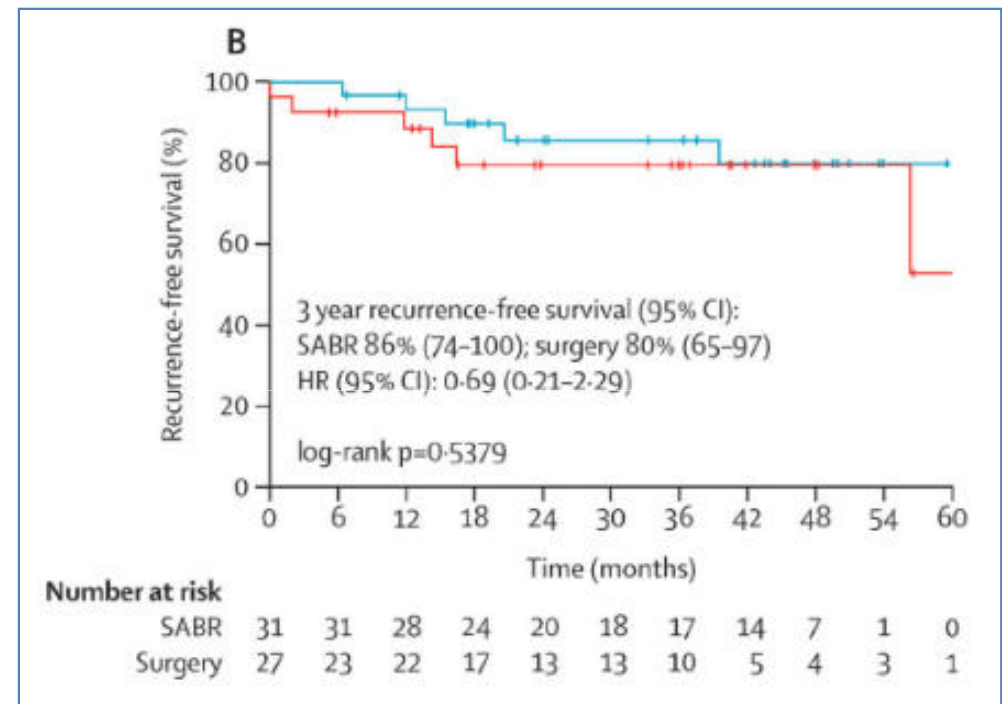
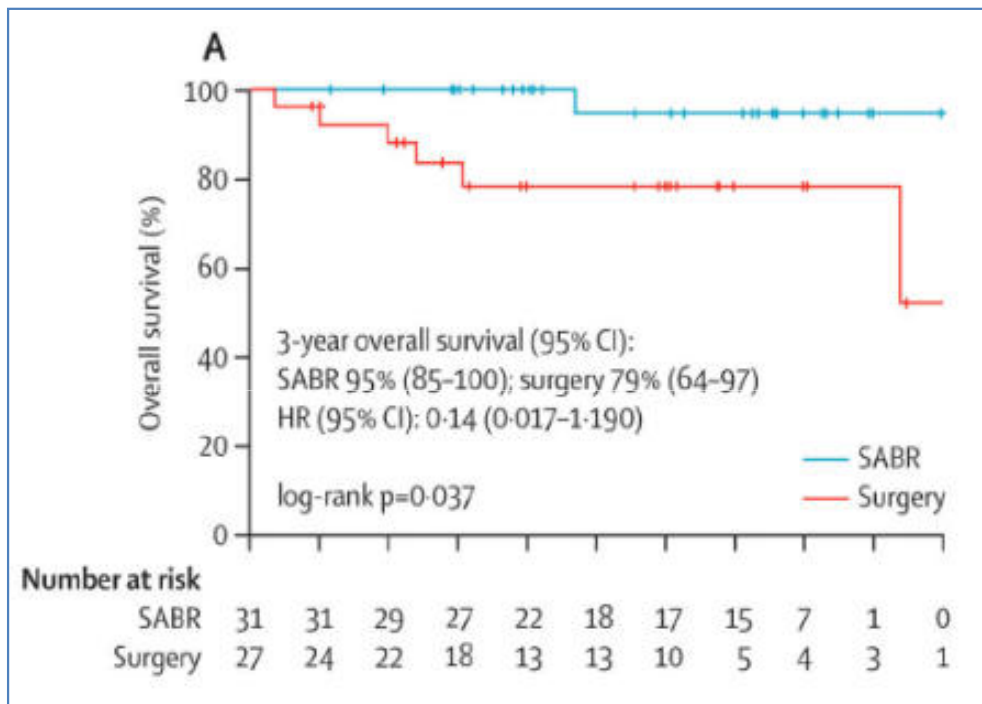
**METHODS:** From June 15, 2007, to March 22, 2013, 637 patients were preregistered to the trial. Three hundred eighty-nine were randomized successfully (61%), and 248 patients were not randomized (39%). We analyzed the reasons for nonrandomization among a subset of the nonrandomized patients (208) for whom additional data were available.

**RESULTS:** Of these 208 patients, undiagnosed benign nodules ( $n = 104$ , 16% of all registered patients) and understaging of NSCLC ( $n = 45$ , 7% of all registered patients) were the dominant reasons precluding randomization. Granulomas represent one-quarter of the benign nodules. The understaged patients had unsuspected nodal metastases ( $n = 28$ ) or other more advanced NSCLC. The rate of randomization was significantly greater in those patients who had a preoperative biopsy ( $P < .001$ ).

**CONCLUSIONS:** In a carefully monitored cohort of patients with suspected small NSCLC  $\leq 2$  cm, a substantial number are misdiagnosed (benign nodules) or understaged. These patients may not have benefited from a thoracic surgical procedure. Preoperative biopsy significantly increased the rate of correct diagnosis. Preoperative biopsy of small suspected NSCLC will reduce the number of nontherapeutic or unnecessary thoracic procedures. Accuracy in preoperative diagnosis is increasingly important as more such small nodules are discovered through lung cancer screening.

# Stereotactic ablative radiotherapy versus lobectomy for operable stage I non-small-cell lung cancer: a pooled analysis of two randomised trials

Chang JY et Al. *Lancet Oncol* 2015 June;16(6): 630-



# CONCLUSIONS

- ✓ LACK OF EVIDENCE
- ✓ SUBSET of patient who might benefit STILL TO BE IDENTIFIED
- ✓ TECHNICALLY DEMANDING
- ✓ VOLUME of RESECTION vs BIOLOGY OF TUMOUR
- ✓ COMPETITIVE ROLE OF SABR AND WEDGE RESECTION?

