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Επεμβατικές Τεχνικές Διάσωσης Πνευμονικού Παρεγχύματος

Lung sparing surgery
Lung preservation surgery

Δρ Αθανάσιος Κλέωντας
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Best Treatment

Surgery remains the best curative option in patients with early stage lung cancer (stage I and II).

Surgery remains an essential step in the multimodality therapy of selected patients with advanced-stage lung cancer (stage III and IV).

Loïc Lang-Lazdunski

European Respiratory Review 2013 22: 382-404; **DOI:** 10.1183/09059180.00003913

Surgical resection remains the standard of care for functionally operable early-stage non-small-cell lung cancer (NSCLC) and resectable stage IIIA disease.

Paul E. Van Schil,* Bram Balduyck, Michèle De Waele, Jeroen M. Hendriks, Marjan Hertoghs, and Patrick Lauwers

EJC Suppl. 2013 Sep; 11(2): 110–122.

Surgery remains the primary treatment for early-stage lung cancer, and most commonly that means a procedure called lobectomy, which removes about one-third to one-half of the lung with the tumor.

November 16, 2017 by Sai Yendamuri, Roswell Park Cancer Institute

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Best Treatment

'Aggressive' surgery is best treatment option for early stage lung cancer

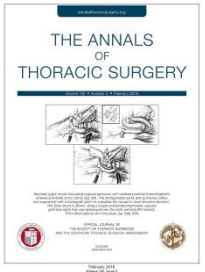
Patients who undergo lobectomy for the disease live longer

"Our data suggest that the more aggressively we treat early lung cancer, the better the outcome," said lead author Alex Bryant, BS, of the School of Medicine at the University of California, San Diego. "This study is one of the best-powered and detailed analyses to date and suggests that lobectomy is still the preferred treatment of this disease for most patients."

Alex K. Bryant, BS, Robert C. Mundt, HSDG, Ajay P. Sandhu, MD, James J. Urbanic, MD, Andrew B. Sharabi, MD, PhD, Samir Gupta, MD, Megan E. Daly, MD, James D. Murphy, MD, MS

THE ANNALS OF THORACIC SURGERY

February 2018 Volume 105, Issue 2, Pages 425–431



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PreOp Check

Best Treatment

PreOp Check

Lung sparing Surgery

Sublobar

Lobectomy Vs Sublobar

Updated Guidelines

Conclusions

Current Cancer Concepts

The Criteria for Operability and Resectability in Lung Cancer

Eugene E. Clifton, MD

The establishment of criteria for treatment of carcinoma of the lung, especially operability and resectability, is particularly difficult because of the rapid progress in the field of thoracic and cardiovascular surgery and anesthesia. What would have been well accepted criteria of inoperability 15 to 20 years ago no longer hold, and those of today may be in doubt in a few years. Criteria also vary from group to group, among individual surgeons, and, indeed, for the same surgeon from time to time depending on his recent experience. Everyone has seen cases refused surgery at one institution or even within the same institution patients operated on by another surgeon, resected, and apparently cured at least for the accepted five or ten years. The reverse is equally true of the patient who is in good health, who seems to have an early lesion that is almost certainly resectable, and who is found to have an extensive spread of the disease at operation.[2] The primary lesion may be resectable and sometimes is resected for palliation, although it is called unresectable because of extension or distant metastases.

Everyone would agree that distant metastases make a lung carcinoma incurable and therefore unresectable except for palliation. Most surgeons agree that a pleural effusion containing cancer cells is a sign of unresectability, though there are those who suggest that pleuropneumonectomy be attempted. I have not seen or known of a long-term survival from such a procedure.[3]

Operability means only that the patient can be expected to survive the operative procedure planned or likely to be necessary. Age as a criterion of operability has gradually advanced from 60 years to the present 80 years. Serious cardiac or liver disease, kidney failure, and/or serious pulmonary dysfunction are the major general contraindications to resectional pulmonary surgery. It serves no useful purpose to resect a lung and leave the patient a pulmonary cripple to die of cor pulmonale one year later.

Preoperative criteria of resectability should not be rigid either for or against surgery. The pathology, if known, must be considered in reaching a final decision in any group. In our experience, oat-cell carcinoma[4,5] is considered a contraindication to excisional surgery even in apparently early lesions, because of its almost universally poor prognosis. Anaplastic carcinoma is such an indistinct entity that little dependence can be placed on it for prognosis. Epidermoid, adenocarcinoma, and localized terminal bronchiolar carcinoma appear to be most suitable for resection.

Classification

With these special considerations in mind, the following classification or staging is considered useful as a framework for discussion. X-ray examination, bronchoscopy, pleural fluid cytology, and biopsies of lymph nodes and pleura are all important. Angiocardiography and other special procedures, where indicated, may also be very helpful in determining the extent of the disease. Scalene-node or mediastinal-node biopsy is used only where there is evidence of enlarged nodes or in patients considered poor risks.

Stage I.—The lesion is probably resectable, with a good chance for cure.

1. Discrete tumor in the lung periphery not in contact with chest wall, mediastinum, or hilum.
2. No suggestion of mediastinal adenopathy.
3. Atelectasis limited to a segment or a lobe.

Note: Size is not of great importance, but if previous films are available, the rate of growth may be very significant. There is no justification for long delay in surgery in order to establish the diagnosis or signs of growth in patients considered good risks.

Stage II.—The lesion is operable and possibly resectable. Hope of cure exists.

1. Roentgenologically discrete tumor merging with the peripheral chest wall, mediastinum, or hilum or with a secondary mass in the hilum.
2. Mediastinal lymphadenopathy as demonstrated by x-ray examination, bronchoscopy, esophagram, or mediastinoscopy (not proven positive for malignancy by pathology).
3. A main stem bronchial lesion more than 1 cm from the carina.
4. A definitely widened carina (not positive for malignancy by bronchoscopic biopsy).
5. Chest wall invasion by the tumor, away from the spine or mediastinum.
6. Atelectasis of an entire lung.

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The Criteria for Operability and Resectability in Lung Cancer
Eugene E. Clifton, MD
JAMA. 1966;195(12):1031-1032

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PreOp Check

Εξαιρεσιμότητα

Η δυνατότητα πλήρους εξαίρεσης του όγκου που συμπαρασύρει και την αντίστοιχη λειτουργική ικανότητα του συναφαιρούμενου ανατομικού ιστοτεμαχίου, ανάλογα με την τοπογραφία και το στάδιο της νόσου, ώστε τελικά να επιτευχτεί πλήρης εκτομή (R0).

Εγχειρησιμότητα

Η αξιολόγηση της λειτουργικής επάρκειας του ασθενούς, να υποστεί τη φυσική καταπόνηση της διεγχειρητικής διαδικασίας, ώστε τα προϋπολογιζόμενα ποσοστά νοσηρότητας και θνητότητας, να είναι εντός αποδεκτών ορίων.

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PNEUMON

Εγχειρησιμότητα και εξαιρεσιμότητα στον καρκίνο του πνεύμονα
Κ. Αναστασιάδης, Χ. Παπακωνσταντίνου
Πνεύμων 2004: Volume 17, Issue 3

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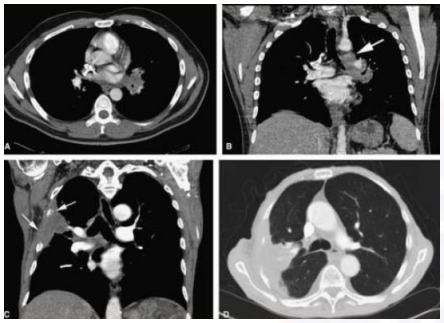
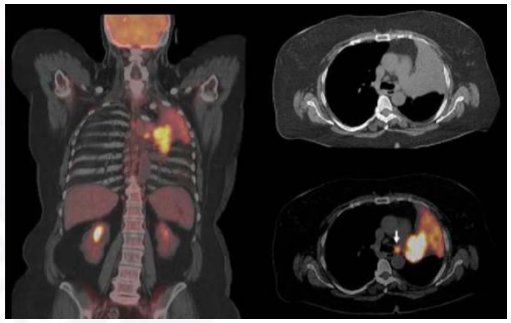
Εξαιρεσιμότητα



CT

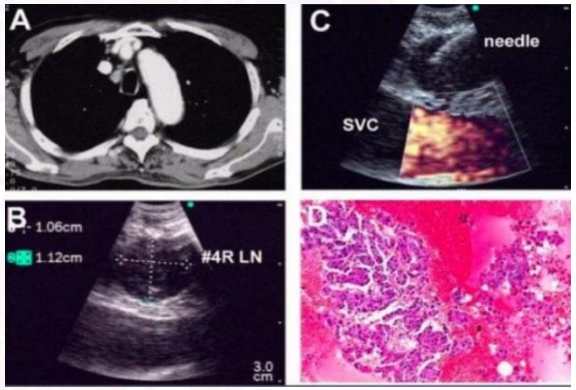
MRI



PET-CT

Resectability

Bronchoscopy



EBUS

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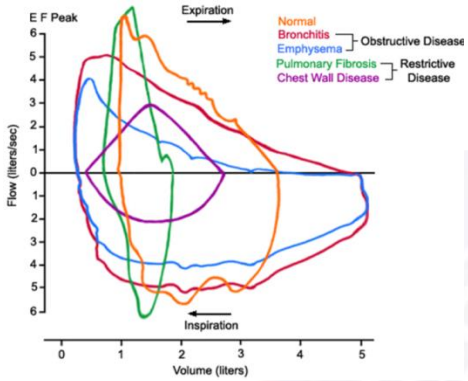
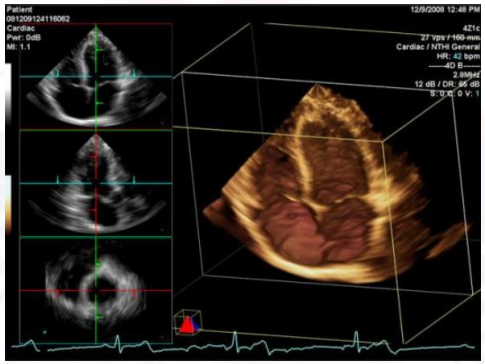
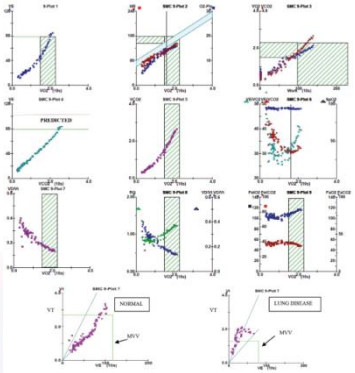


PFT



Cardiac Echo



CPET

Operability

Comorbidities

Personal Opinion

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Physiologic Evaluation of the Patient With Lung Cancer Being Considered for Resectional Surgery

Alessandro Brunelli, Anthony W. Kim, Kenneth I. Berger, Doreen J. Addrizzo-Harris

CHEST / 143 / 5 / MAY 2013 SUPPLEMENT

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Scores

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Thoracoscore (The Thoracic Surgery Scoring System)

Variables (help)	Values (all values are mandatory)	Beta
Age (years)		0
Sex		0
ASA Classification		0
Performance Status Classification		0
Dyspnea score		0
Priority of surgery		0
Procedure class		0
Diagnosis group		0
Comorbidity Score		0

Clear

Thoracoscore: 0

Logit = -7.3737 + Sum (beta)
Predicted death Rate = $e^{(Logit)} / (1 + e^{(Logit)})$

Reference

- Falcoz P.E. et al. The Thoracic Surgery Scoring System (Thoracoscore): Risk model for in-hospital death in 15,183 patients requiring thoracic surgery
  J Thorac Cardiovasc Surg 2007; 133: 325-32

Lung Resection Score

Variables (help)	Values
Age (years)	
$ppoFEV_1$ (%)	
Cardiac Comorbidity	0

Predicted Mortality: 0

Compute

Logit = -6.97+0.095Xage-0.042ppoFEV
Predicted Mortality = $1/ (1 + e^{-Logit}) e$

Predicted Morbidity: 0

Clear

Logit = -2.4 +0.03Xage-0.02ppoFEV + 0.6Xcardiac comorbidity
Predicted Morbidity = $1/ (1 + e^{-Logit}) e$

Reference

Brunelli A. et al. Risk-adjusted morbidity and mortality models to compare the performance of two units after major lung resections. *J Thorac Cardiovasc Surg* 2007;133:88-96

Table 1 Eurolung 1—distribution of complications according to the Eurolung 1 aggregate morbidity score (1)

Eurolung 1 score	Morbidity rate (%)
0–1	5.2
2–4	8.2
5–7	14.3
8–11	21.6
12–16	32.4
17–19	43.1

Eurolung 1 scoring—chronic kidney disease: 1 point; coronary artery disease: 2 points; cerebrovascular disease: 2 points; age over 65: 3 points; male sex: 3 points; thoracotomy: 3 points; extended resection: 3 points; $ppoFEV_1$ less than 70%: 3 points.

ThRCRI Risk Factor	Weighted Score	%	n
Renal comorbidity[a]	1	1.7	76
Ischemic heart disease	1.5	8.8	403
Cerebrovascular disease	1.5	7.0	323
Pneumonectomy	1.5	6.4	298

View Table in HTML

ThRCRI = Thoracic Revised Cardiac Risk Index.

[a] Preoperative serum creatinine >2 mg/dL.

Table 3

Distribution of Patients Within ThRCRI Risk Classes and Rate of Major Cardiac Complications (N = 4,625)

ThRCRI Score	ThRCRI Risk Class	%	n	Cardiac Complication Rate (n)[a]
0	A	78	3,637	1.4% (49)
1.0–1.5	B	19	882	2.7% (24)
2.0–2.5	C	0.5	22	9.1% (2)
>2.5	D	1.8	84	3.6% (3)

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Risk Stratification in Lung Resection
Michele Salati, Alessandro Brunelli
Curr Surg Rep (2016) 4:37

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Κριτήρια αποκλεισμού εφαρμογής χειρουργικής θεραπείας

Προβλεπόμενη μετεγχειρητική FEV_1
predicted postoperative forced expiratory volume in 1 second (FEV_1)
< 30%

Προβλεπόμενη μετεγχειρητική DLCO
predicted postoperative carbon monoxide lung diffusion capacity (DLCO)
<30%

Μέγιστη κατανάλωση οξυγόνου
peak oxygen consumption (peak VO_2)
< 10 mL · kg^{-1} · min^{-1}

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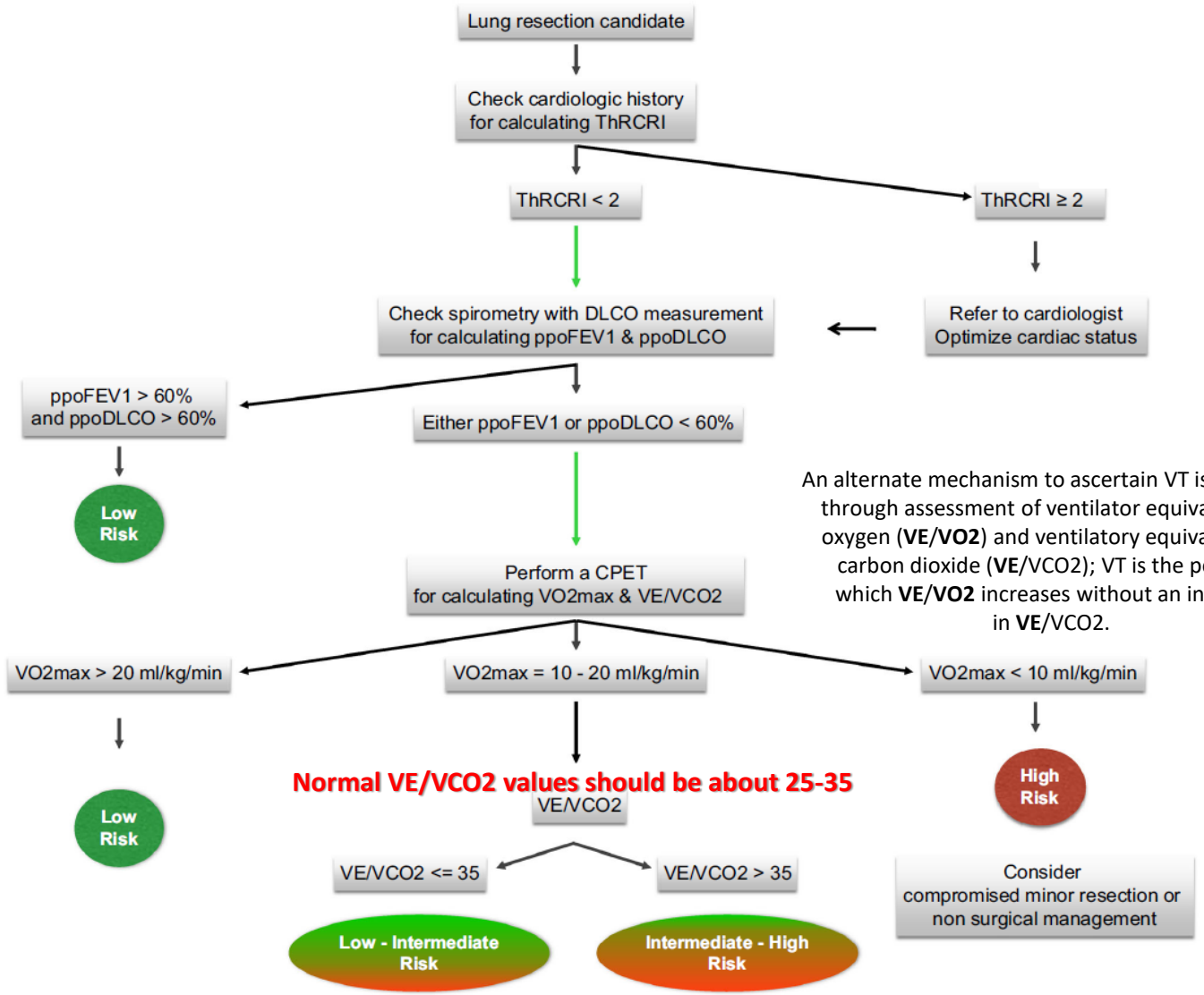
Operability



An alternate mechanism to ascertain VT is achieved through assessment of ventilator equivalent for oxygen (**VE**/**VO2**) and ventilatory equivalent for carbon dioxide (**VE**/VCO2); VT is the point at which **VE**/**VO2** increases without an increase in **VE**/VCO2.

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Risk Stratification in Lung Resection
Michele Salati, Alessandro Brunelli
Curr Surg Rep (2016) 4:37

Operability

Προβλεπόμενη μετεγχειρητική FEV_1
predicted postoperative forced expiratory volume in 1 second (FEV_1)

$30\% < ppoFEV_1 < 60\%$

Προβλεπόμενη μετεγχειρητική DLCO
predicted postoperative carbon monoxide lung diffusion capacity (DLCO)

$30\% < DLCO < 60\%$

Lung sparing surgery
Lung preservation surgery

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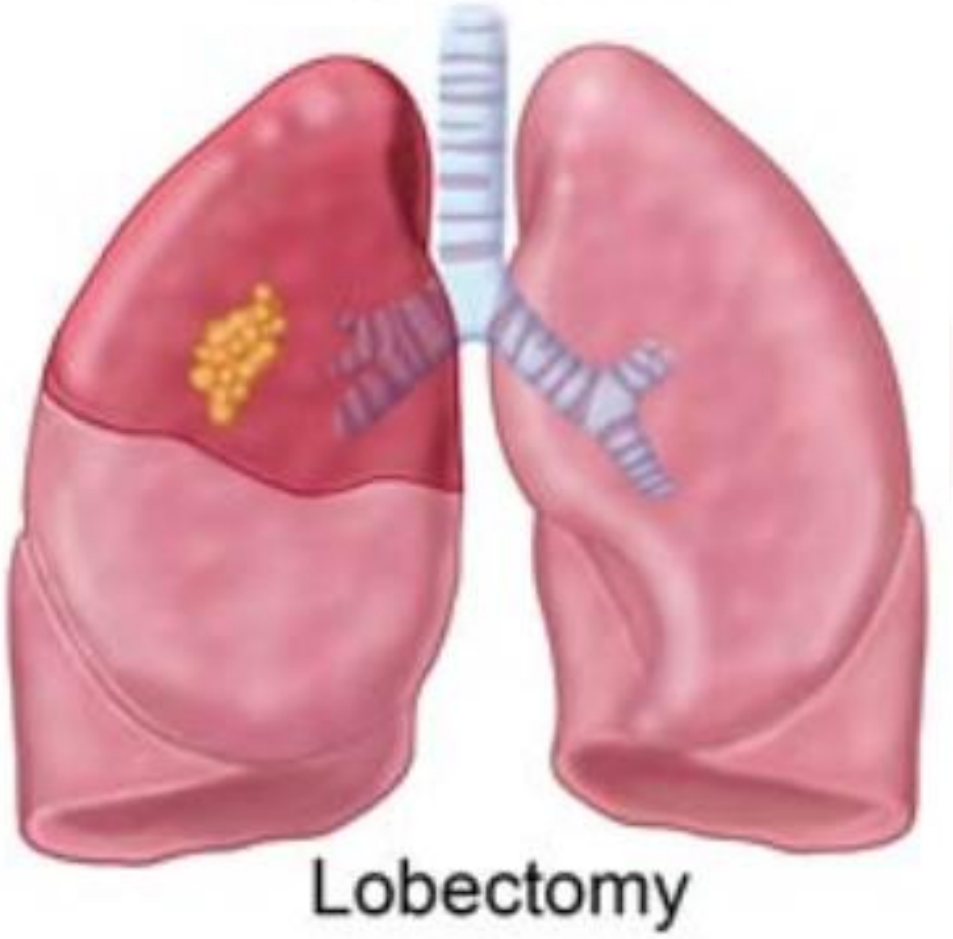
Lung sparing surgery

R0 resection



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https://www.valleyhealthcancercenter.com/cancer-services/lung/surgery-and-single-port-vats

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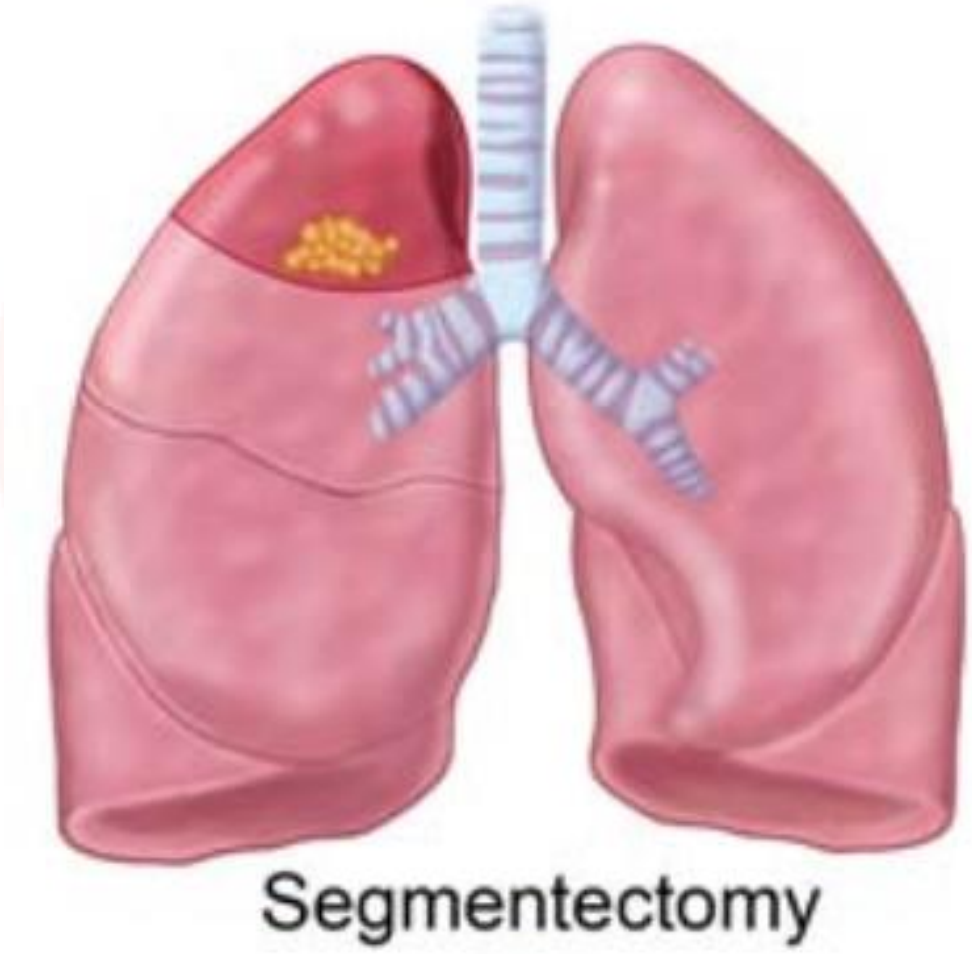
Lung sparing surgery

R0 resection



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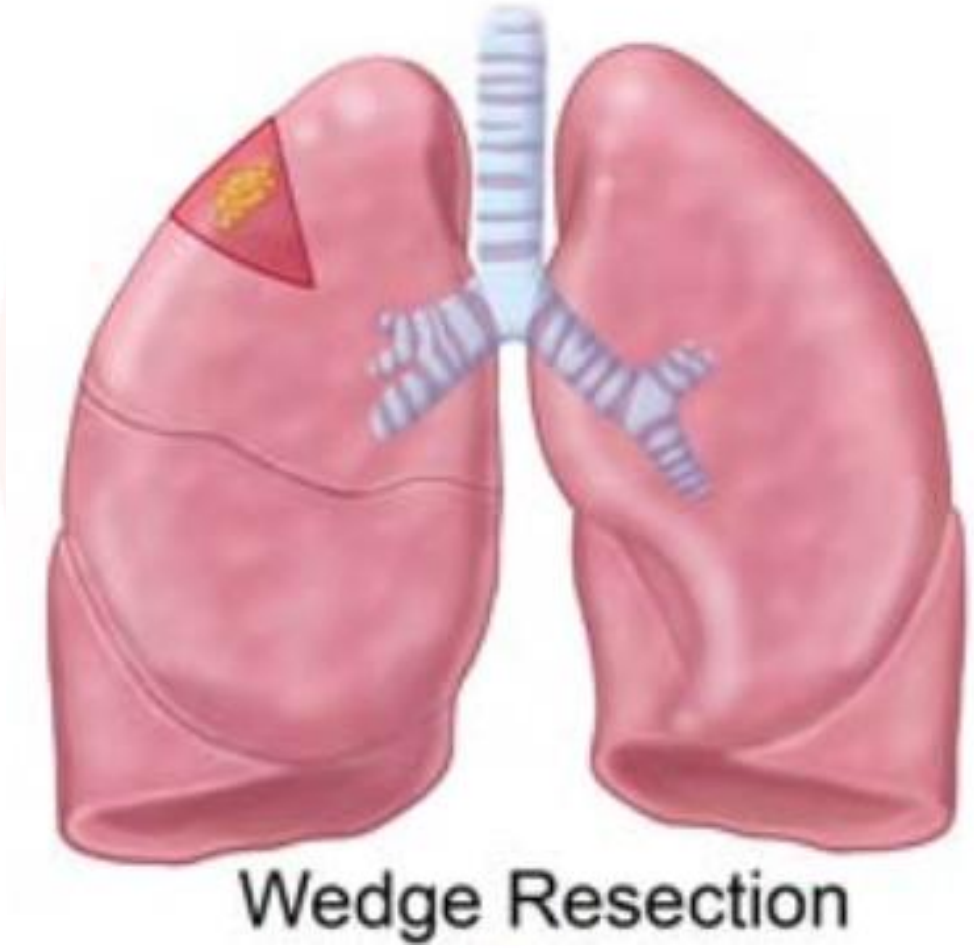
Lung sparing surgery

R0 resection



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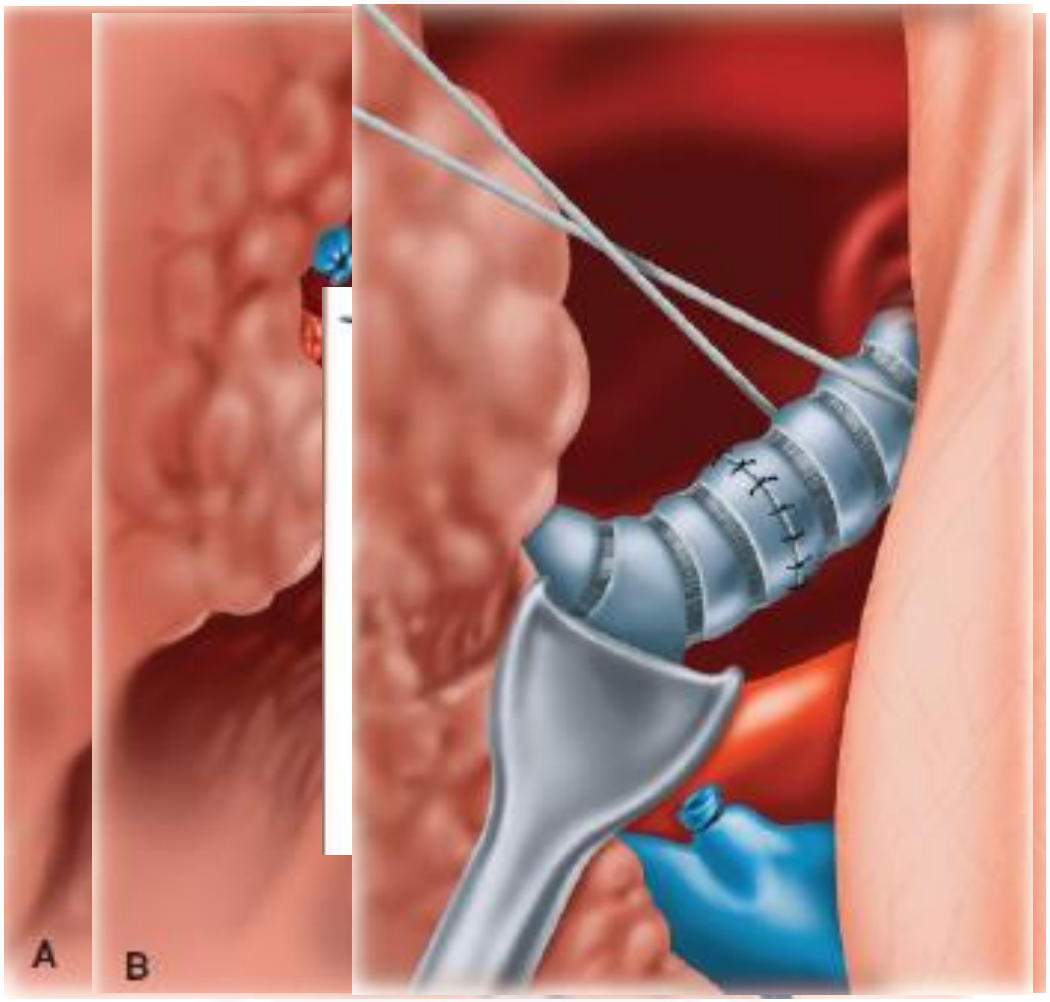
Sleeve RUL Lobectomy



Best Treatment

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Shields' General Thoracic Surgery
J. Locicero, R. Feins, Y. Colson, G. Rocco
2019 8th edition Wolters Kluwer

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Sleeve RUL Lobectomy

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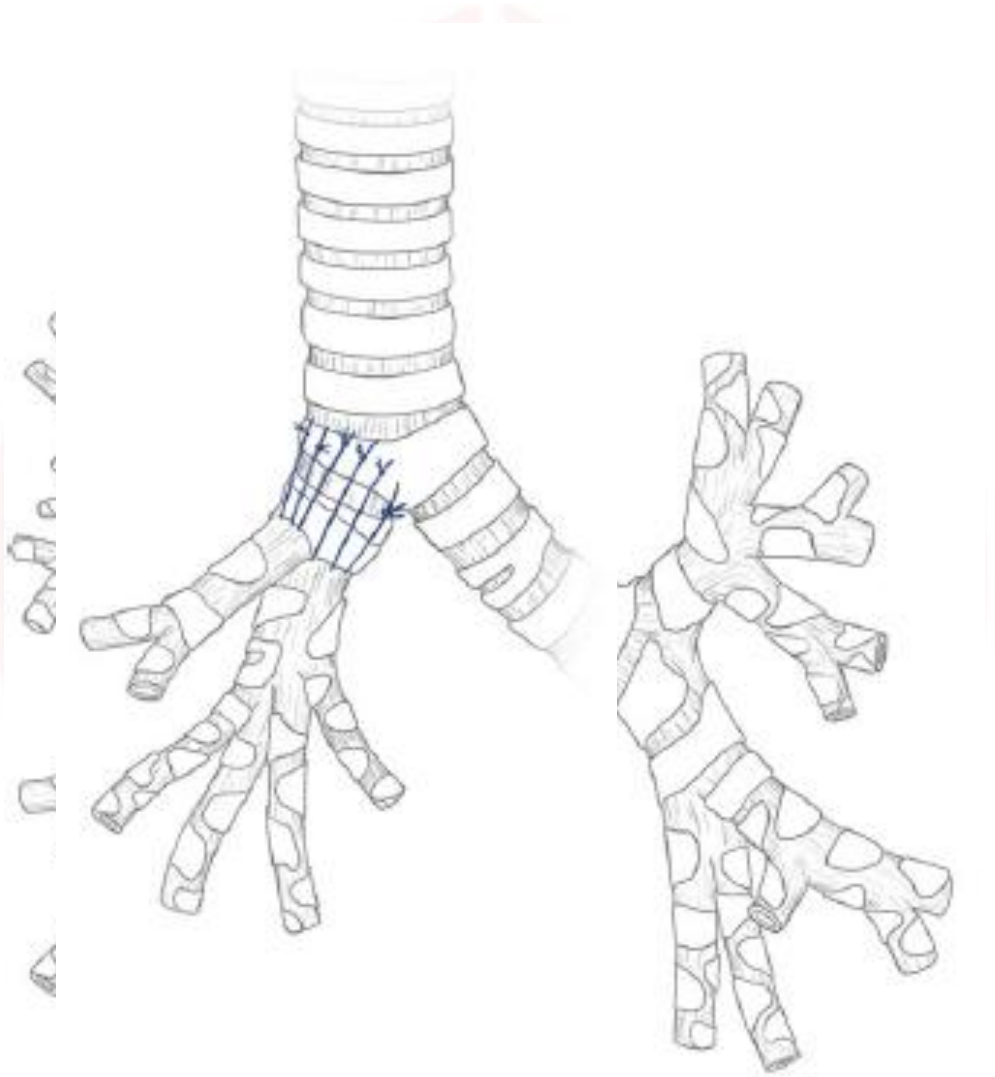

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H. Dienemann, H. Hoffmann, F. Detterbeck
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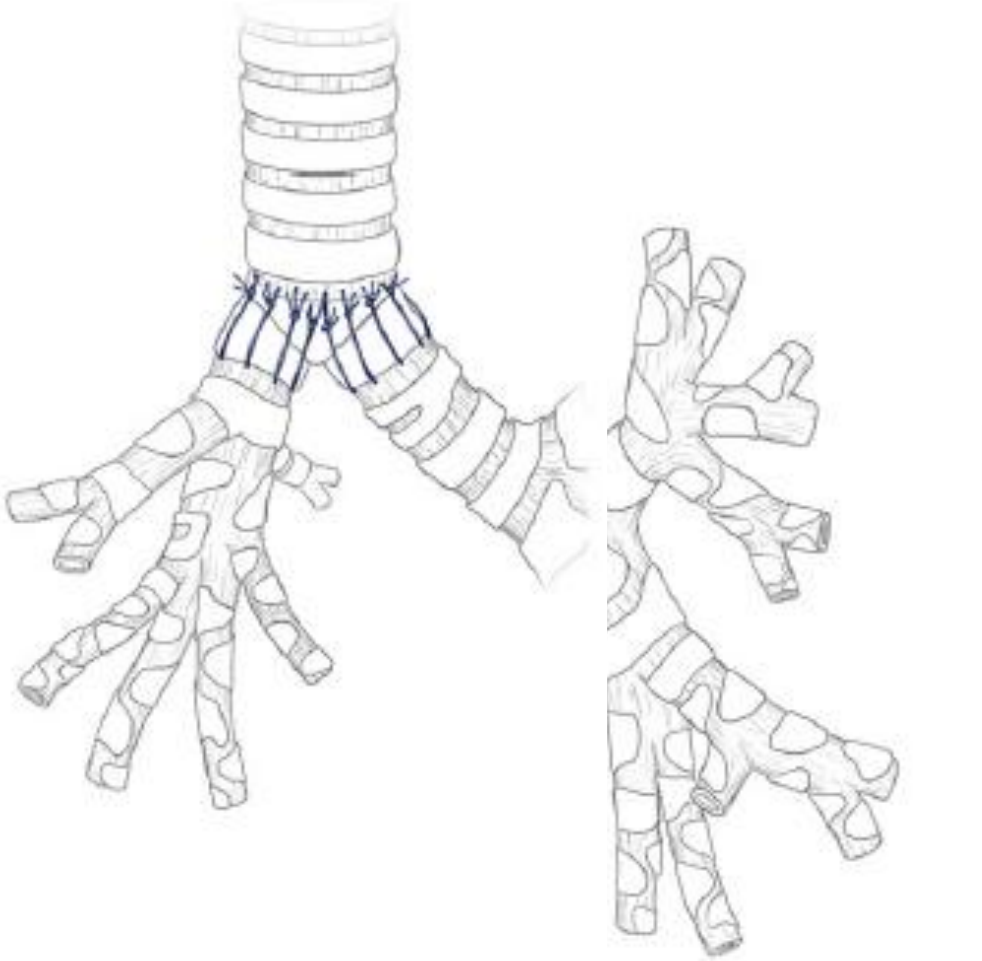
Sleeve RUL Lobectomy
Carina Resection



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Sleeve RML Lobectomy

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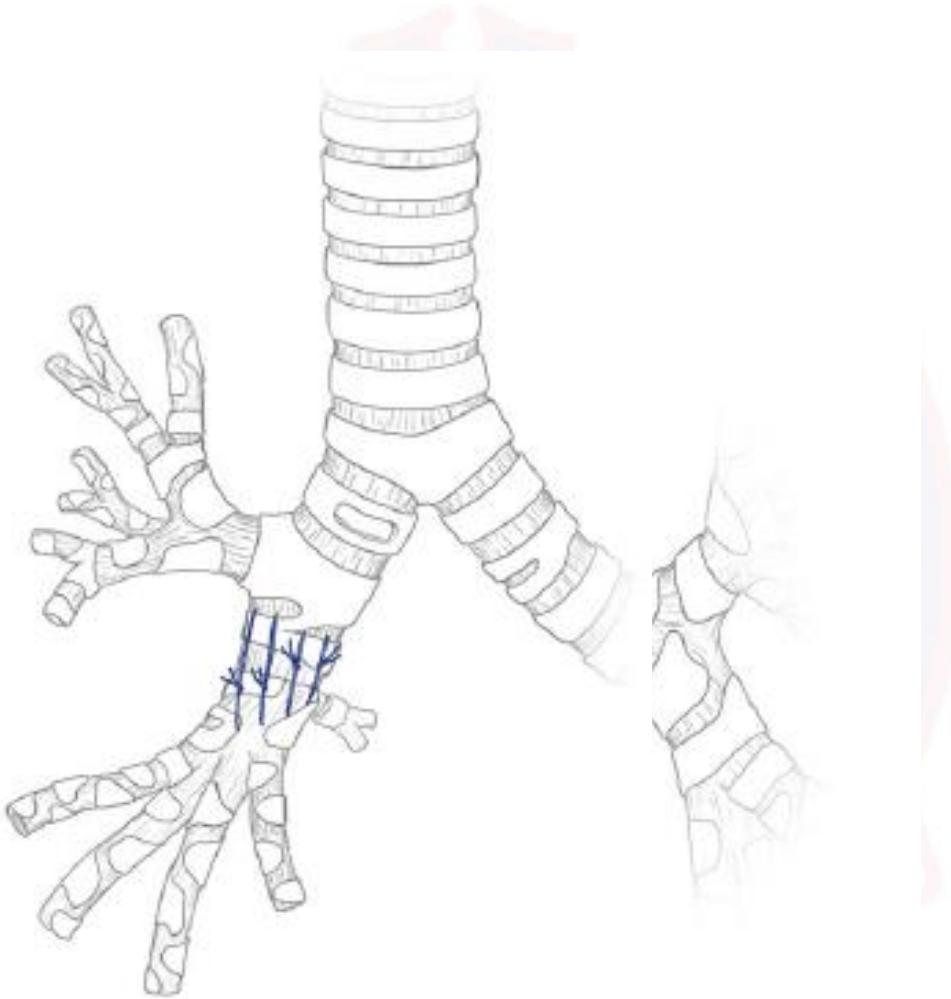

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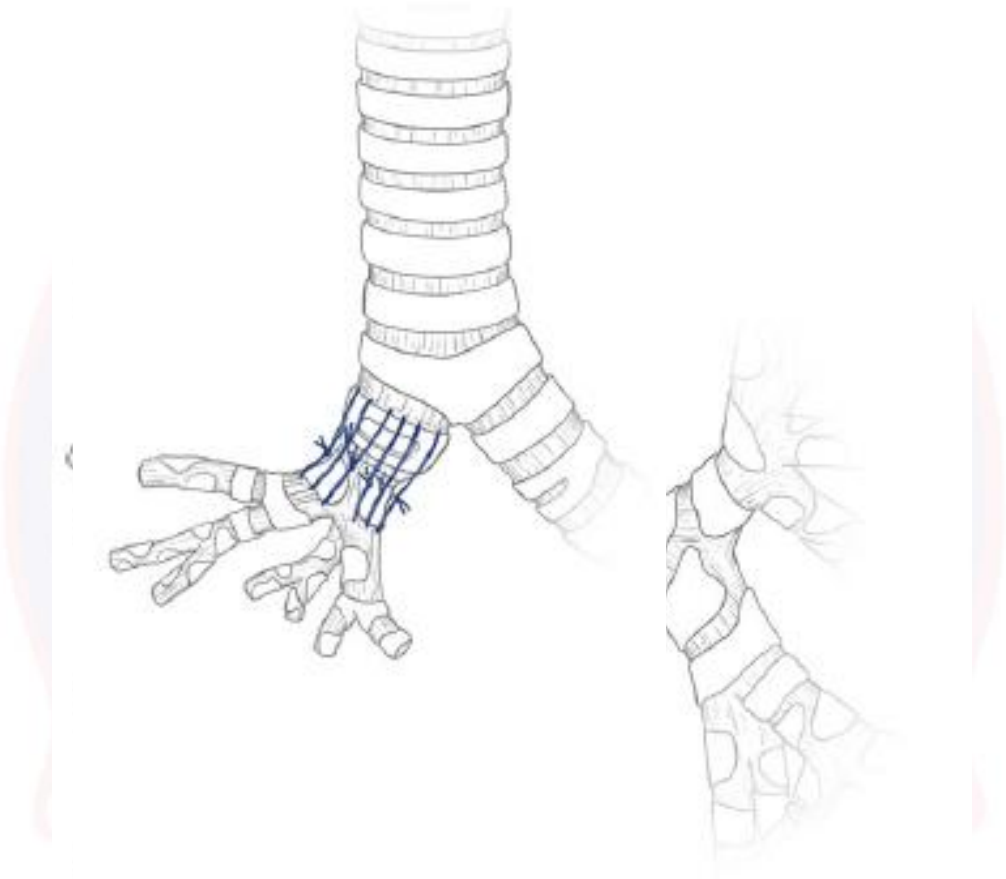
Sleeve RML+RLL Bilobectomy



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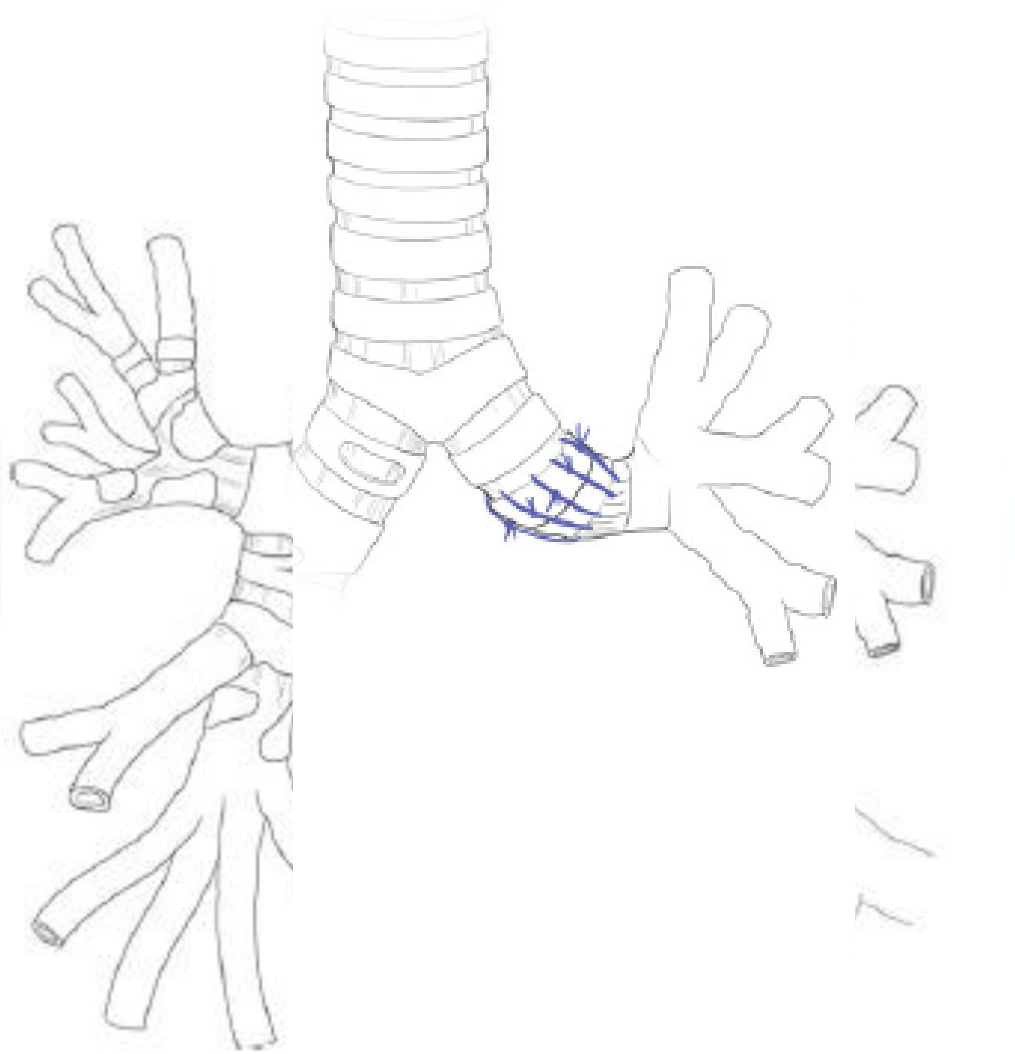

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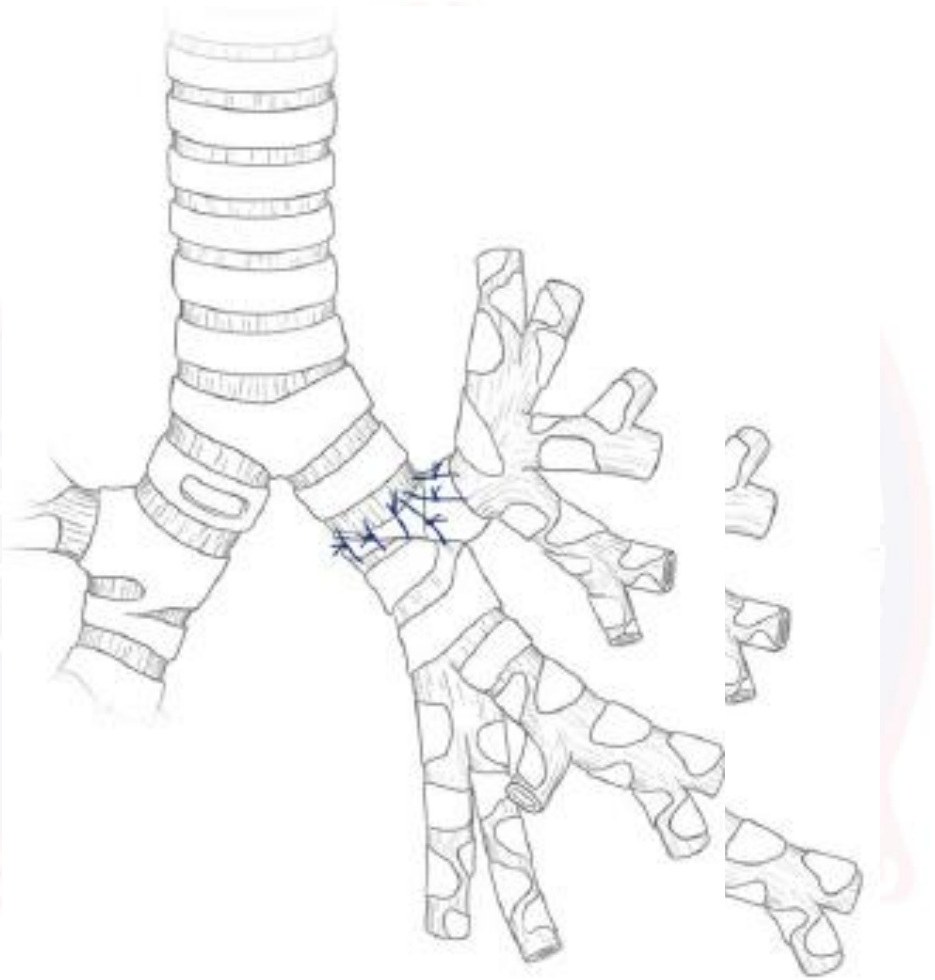
Sleeve LM Bronchectomy



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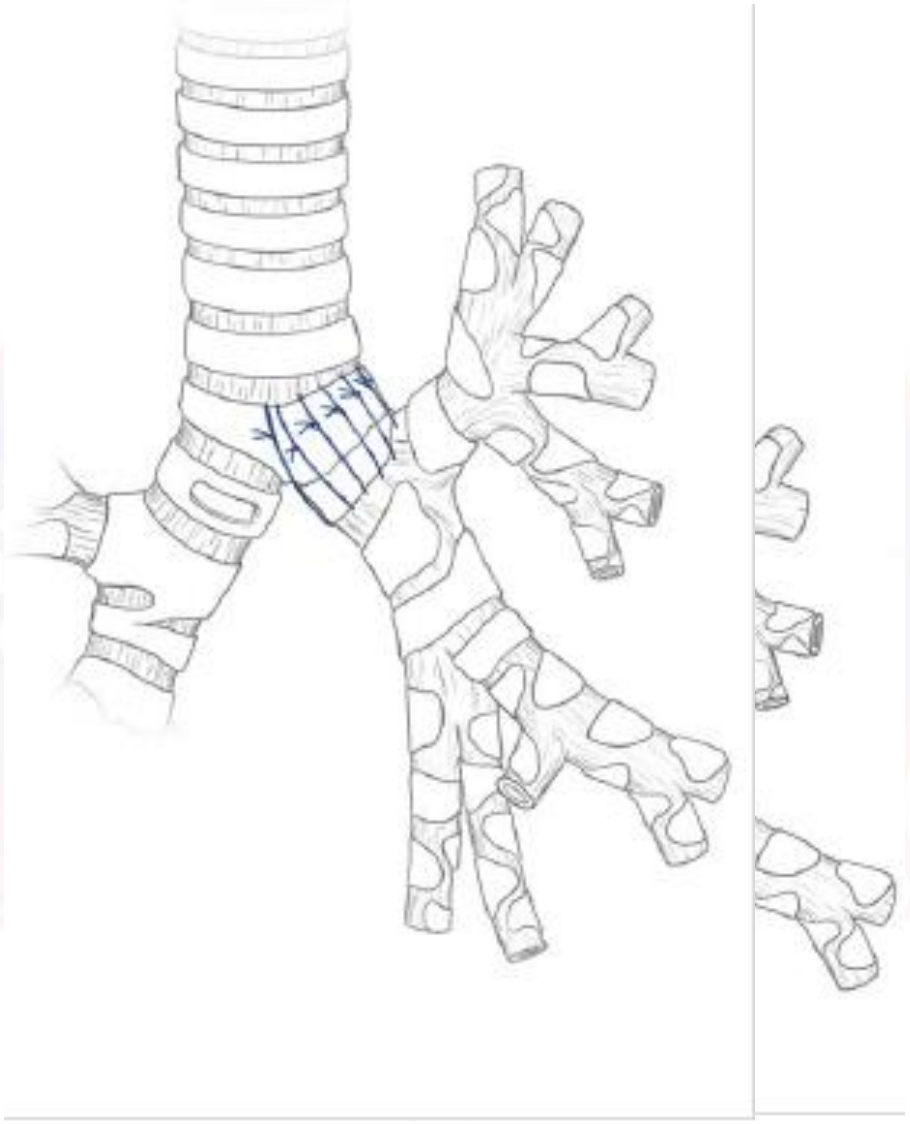
Sleeve LM Bronchectomy



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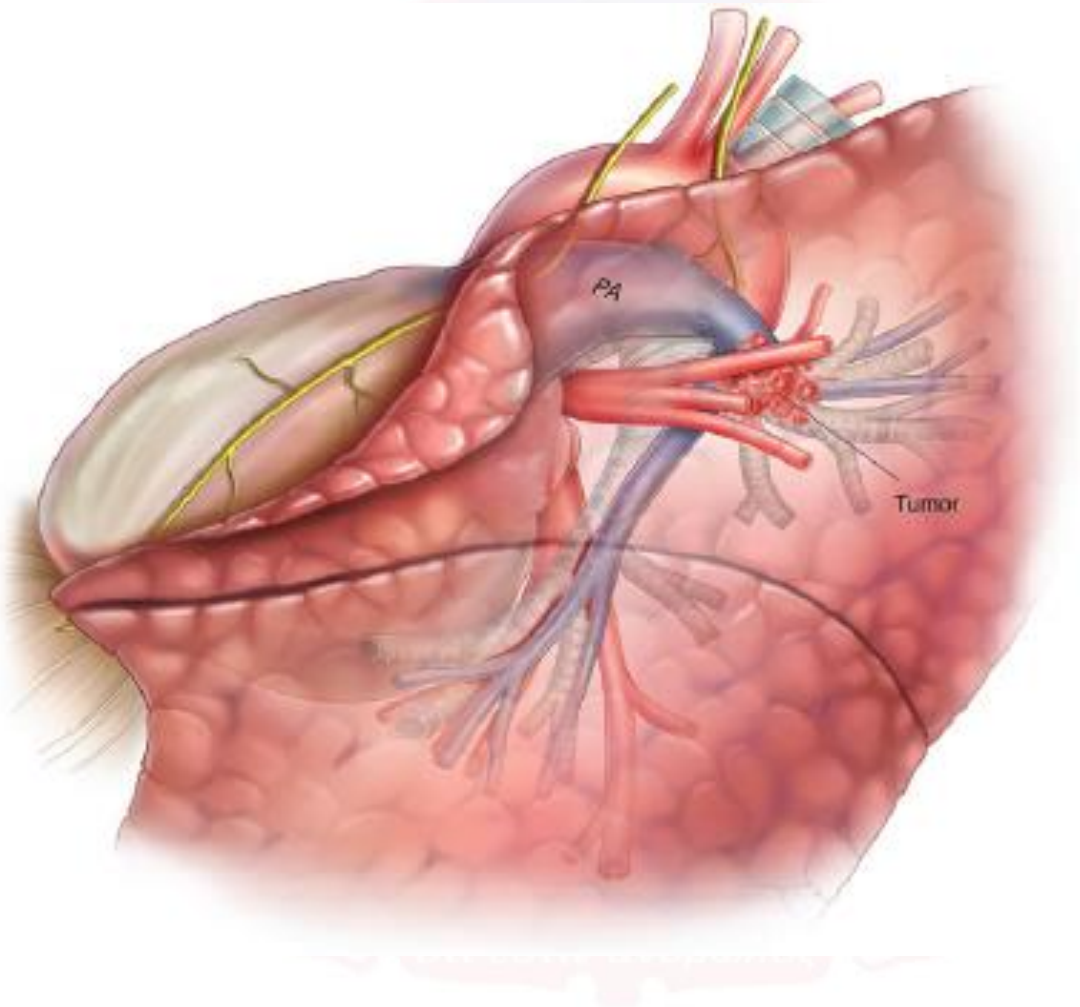
Double sleeve LUL Lobectomy



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PA patch reconstruction

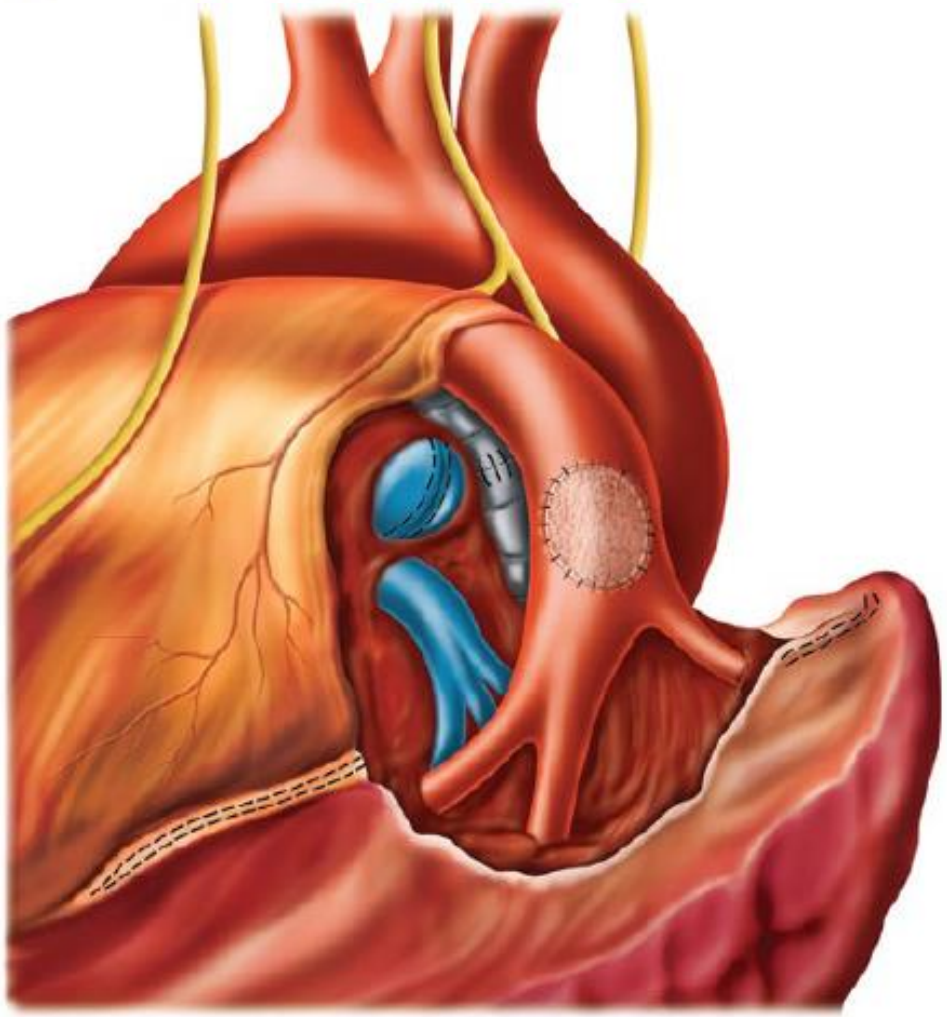

FIGURE 30.20 The patch reconstruction is completed. he anastomosis is performed with 5.0 or 6.0 Prolene.

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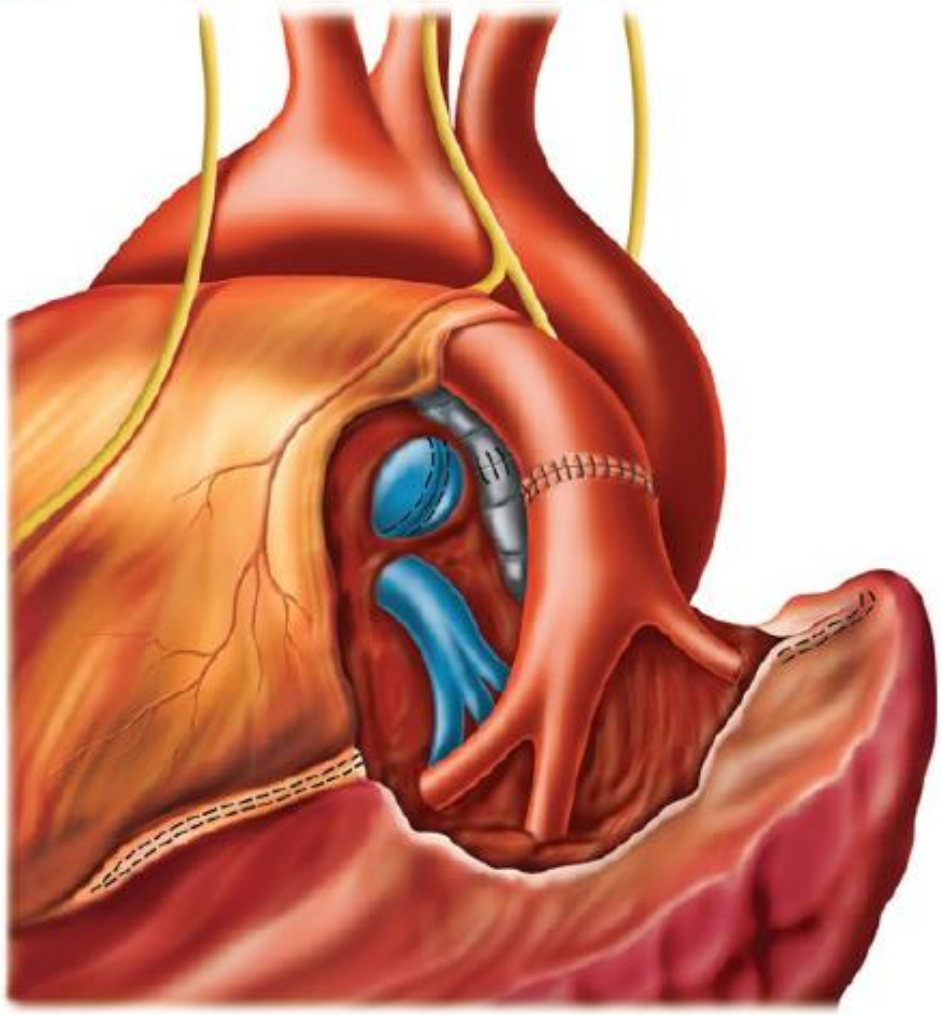

FIGURE 30.23 The anastomosis is completed. bable monofilament suture.

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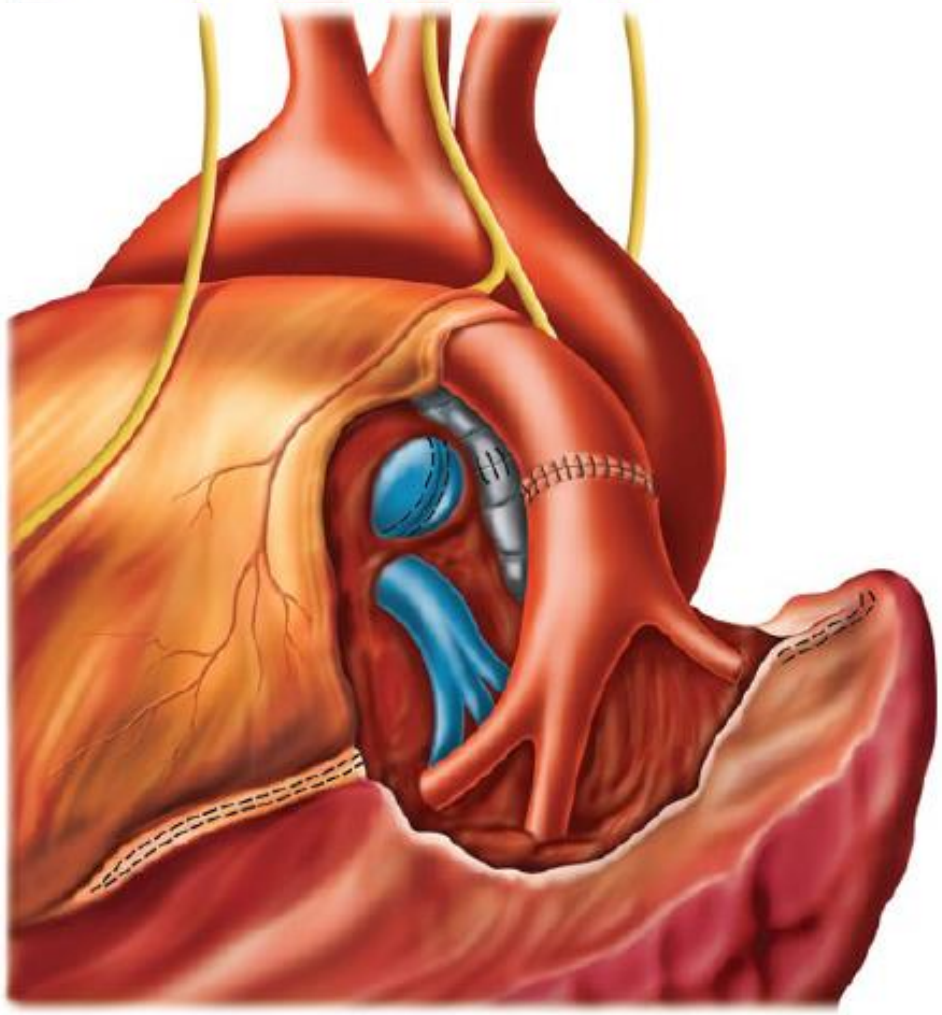

FIGURE 30.23 The anastomosis is completed. bable monofilament suture.

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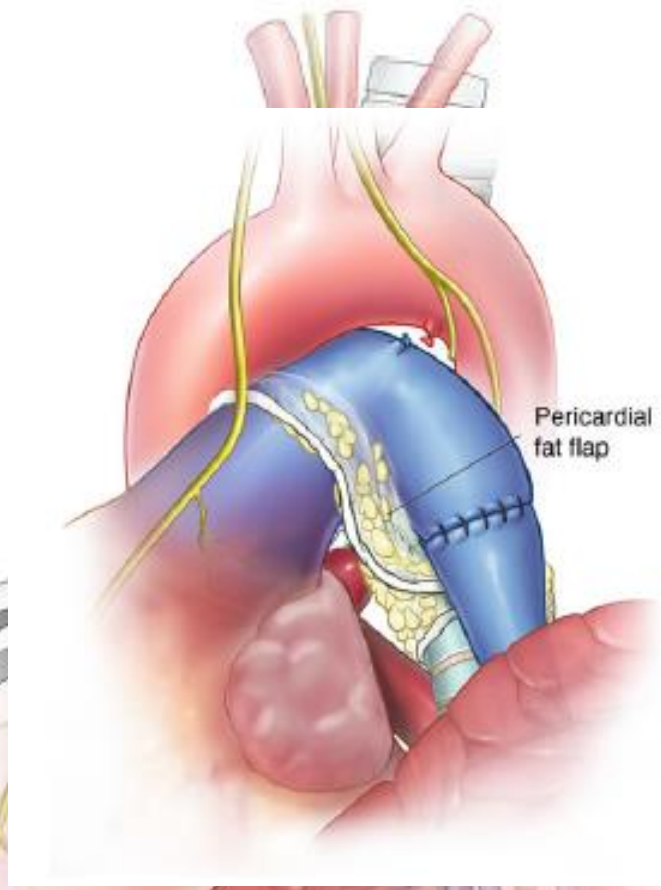

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TABLE 30.1 Postoperative Mortality, Morbidity, and Long-Term Survival After Sleeve Resection (Literature Data Since 2000)

Study	Year	No. of Patients	Postoperative Mortality (%)	Early Anastomotic Complications (%)	5-Year Survival Rate (%)	Locoregional Recurrence (%)
Tronc and colleagues[22]	2000	184	1.6	1	52	22
Rendina and colleagues[23]	2000	145	1.4	1.4	37.9	NR
Terzi and colleagues[20]	2002	160	11.2	7.5	NR	NR
De Leyn and colleagues[24]	2003	77	3.9	2.6	45.6	16.8
Ludwig and colleagues[25]	2005	116	4.3	6.9	39	NR
Kim and colleagues[26]	2005	49	6.1	2	53.7	32.6
Yildizeli and colleagues[10]	2007	218	4.1	6.4	53	14.4
Rea and colleagues[27]	2008	199	4.5	5.3	39.7	11.6
Deslauriers and colleagues[18]	2004	184	1.3	1.6	58	22
Yamamoto and colleagues[28]	2008	201	1.4	3.3	57.8	12.9
Merritt and colleagues[29]	2009	196	2	2	44	17.9
Konstantinou and colleagues[30]	2009	45	2	0	57 (4-y)	NR
Storelli and colleagues[15]	2012	103	2.9	1	63	7.8

NR, not reported.

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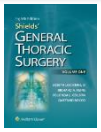

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TABLE 30.2 Results of Studies Reporting PA Reconstruction

Author (y)	Patients	Morbidity (%)	Mortality (%)	5-Year Survival (%)
Rendina and colleagues[33]	52	13.4	0	38.3
Shrager and colleagues[34]	33[a]	45	0	46.7
Lausberg and colleagues[35]	67	NA	1.5	42.9[b]
Nagayasu and colleagues[36]	29	27.6	17.2	24.2[b]
Cerfolio and Bryant[37]	42	26	2.3	60
Alifano and colleagues[38]	93[c]	29	5.4	39.4
Venuta and colleagues[39]	105	28.5	0.95	44
Mean	60.14	28.25	3.91	42.21

[a]Only tangential resections.

[b]Overall survival for combined bronchovascular reconstruction.

[c]Tangential resections (n = 88).

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NA, not available.

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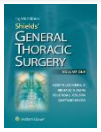

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TABLE 34.2

		Patient Number		Mortality (%)		Morbidity (%)		5-year Survival (%)	
Author	Year	Sleeve	Pneumonectomy	Sleeve	Pneumonectomy	Sleeve	Pneumonectomy	Sleeve	Pneumonectomy
Suen et al.	1999	58	142	5.2	4.9	N/A	N/A	37.5	35.8
Deslauriers et al.	2004	184	1046	1.6	5.3	N/A	N/A	52	31
Began et al.	2005	66	151	4.5	12.6	N/A	N/A	72.5	53.2
Ludwig et al.	2005	116	194	4.3	4.6	38	25.7	39	27
Park et al.	2010	105[a]	105[a]	1	8.6	33.4	29.5	58.4	32.1

[a]Propensity matched groups.

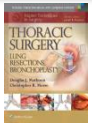

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TABLE 35.1 Survival Following Sleeve Resection Versus Pneumonectomy

Publication	Study Design	N	Patients	Outcome	Sleeve (%)	Pneumonectomy (%)	*P*-value
Gaissert, 1996	Retrospective review	128	Primary lung cancer	5-y OS	42	44	NS
Yoshino, 1997	Retrospective review	58	Primary lung cancer	3-y DFS	66	59	NS
Suen, 1999	Retrospective review	200	NSCLC, low-grade malignancies	5-y OS	38	36	NS
Okada, 2000	Paired case control	120	NSCLC	5-y OS	48	28	0.005
Deslauriers, 2004	Retrospective review	1,230	NSCLC	5-y OS	52	31	<0.0001
Ma, 2007	Meta-analysis	2,984	NSCLC	5-y OS	50	31	—

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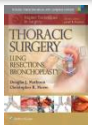

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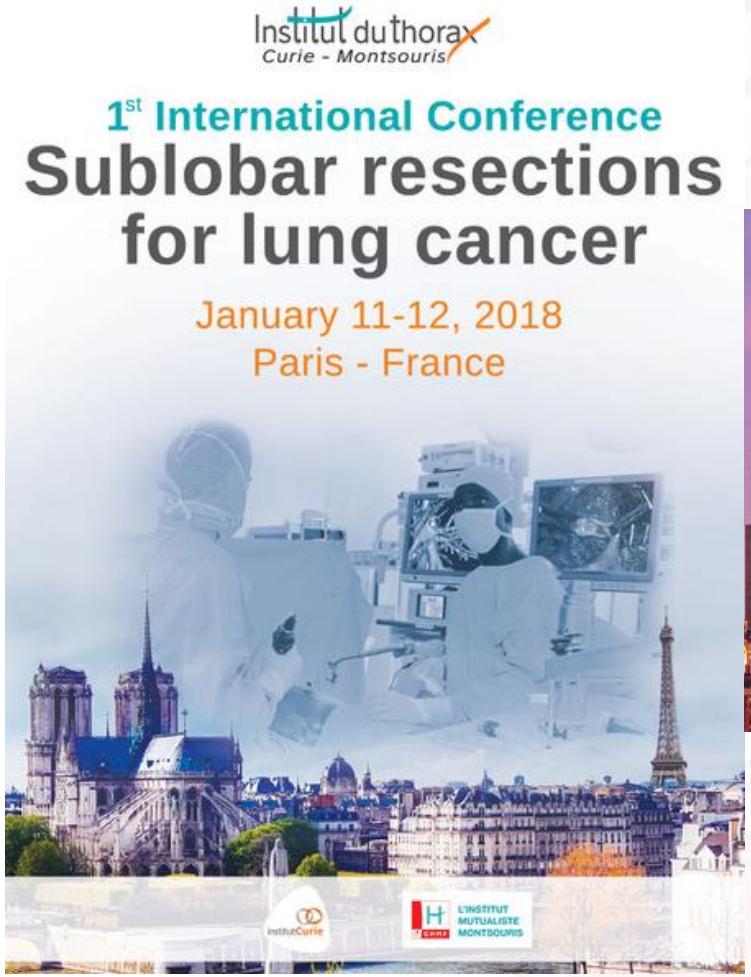

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ANNALS OF SURGERY

VOL. 109 APRIL, 1939 No. 4

SEGMENTAL PNEUMONECTOMY IN BRONCHIECTASIS

THE LINGULA SEGMENT OF THE LEFT UPPER LOBE

EDWARD D. CHURCHILL, M.D.
BOSTON, MASS.
AND
RONALD BELSEY, F.R.C.S.
LONDON, ENGLAND
FROM THE THORACIC CLINIC AND SURGICAL SERVICES OF THE MASSACHUSETTS GENERAL HOSPITAL, BOSTON, MASS.

SUMMARY

The anatomy of the lingula segment of the left upper lobe is considered. The lingula bronchus and blood vessels are described.

The bronchogram of this particular segment is illustrated.

Indications for surgical removal of the lingula are discussed and operative technics described.

More general applications of the principle of segmental pneumonectomy are indicated, particularly with reference to the lower lobes.

It is suggested that the bronchopulmonary segment may replace the lobe as the surgical unit of the lung.

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Ann Surg. 1939 Apr; 109(4): 481–499.

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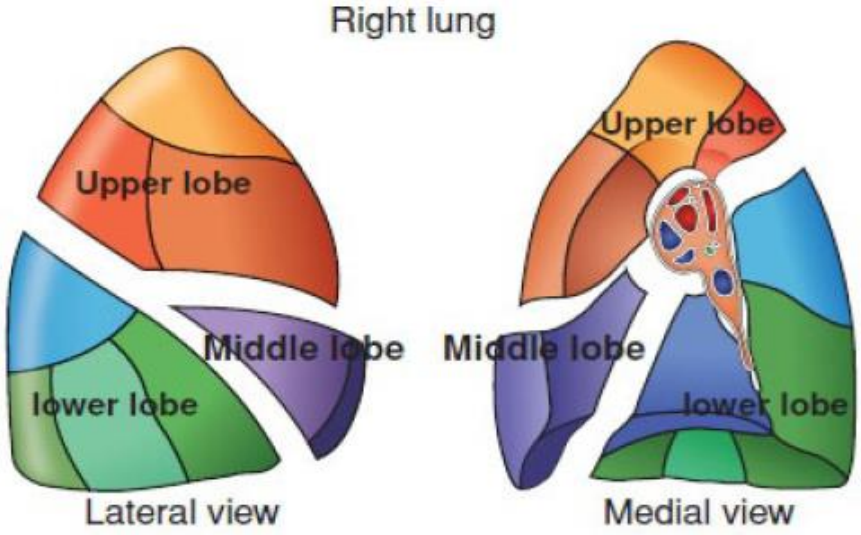

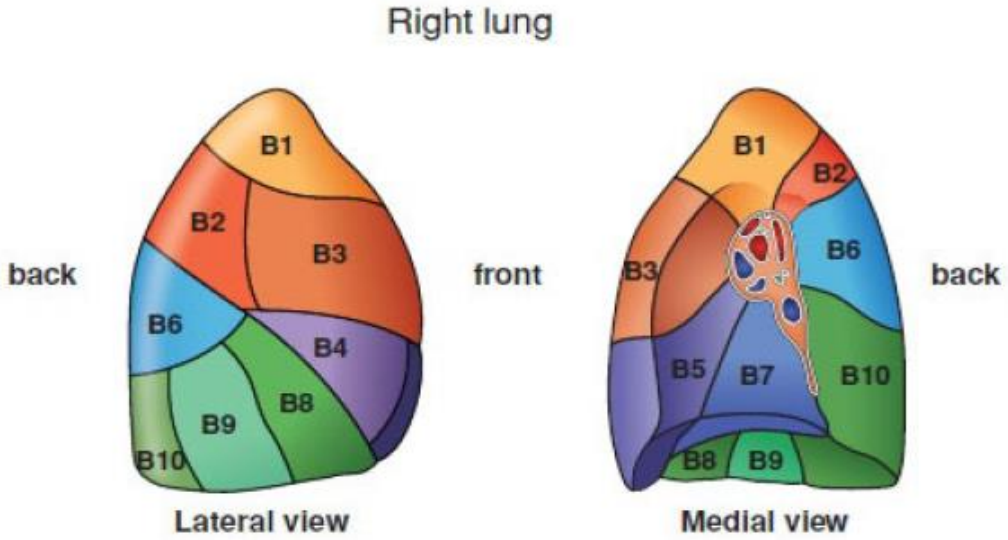

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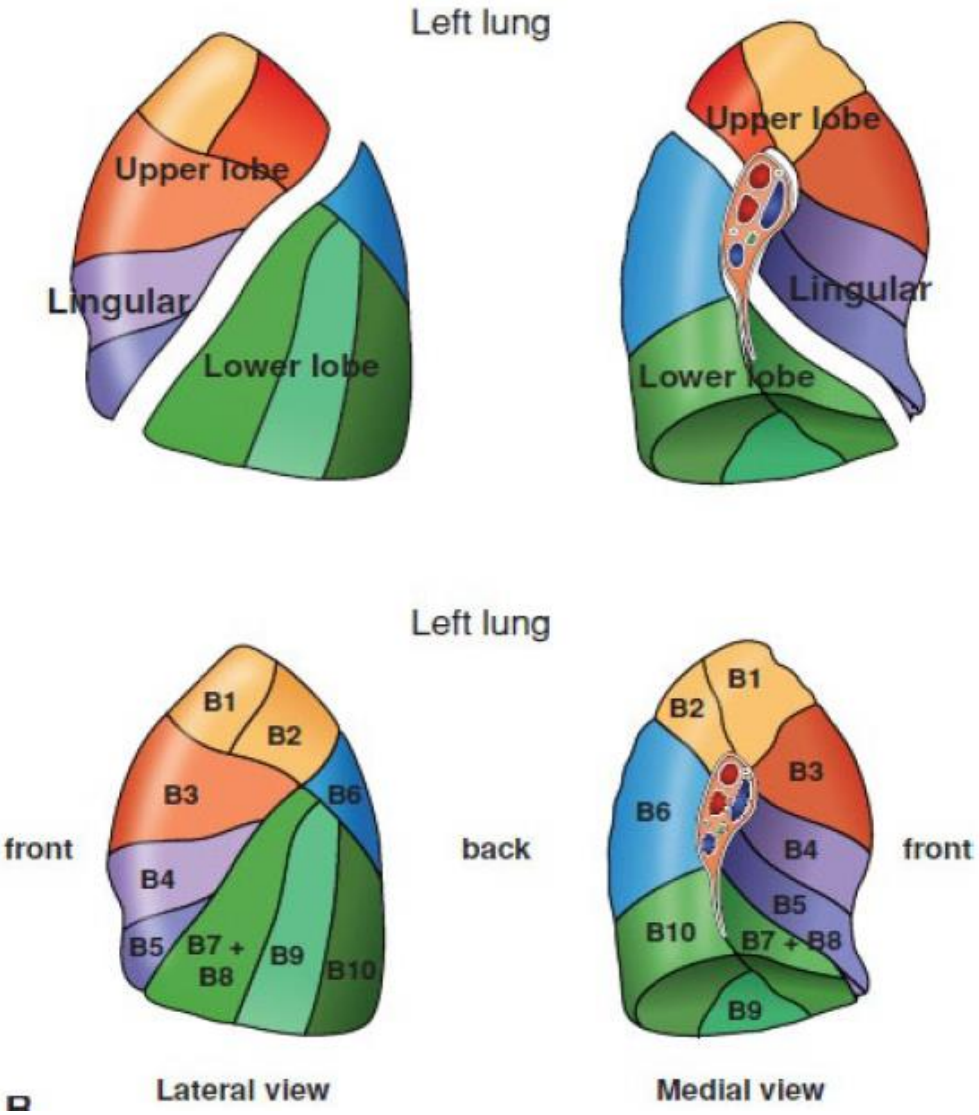

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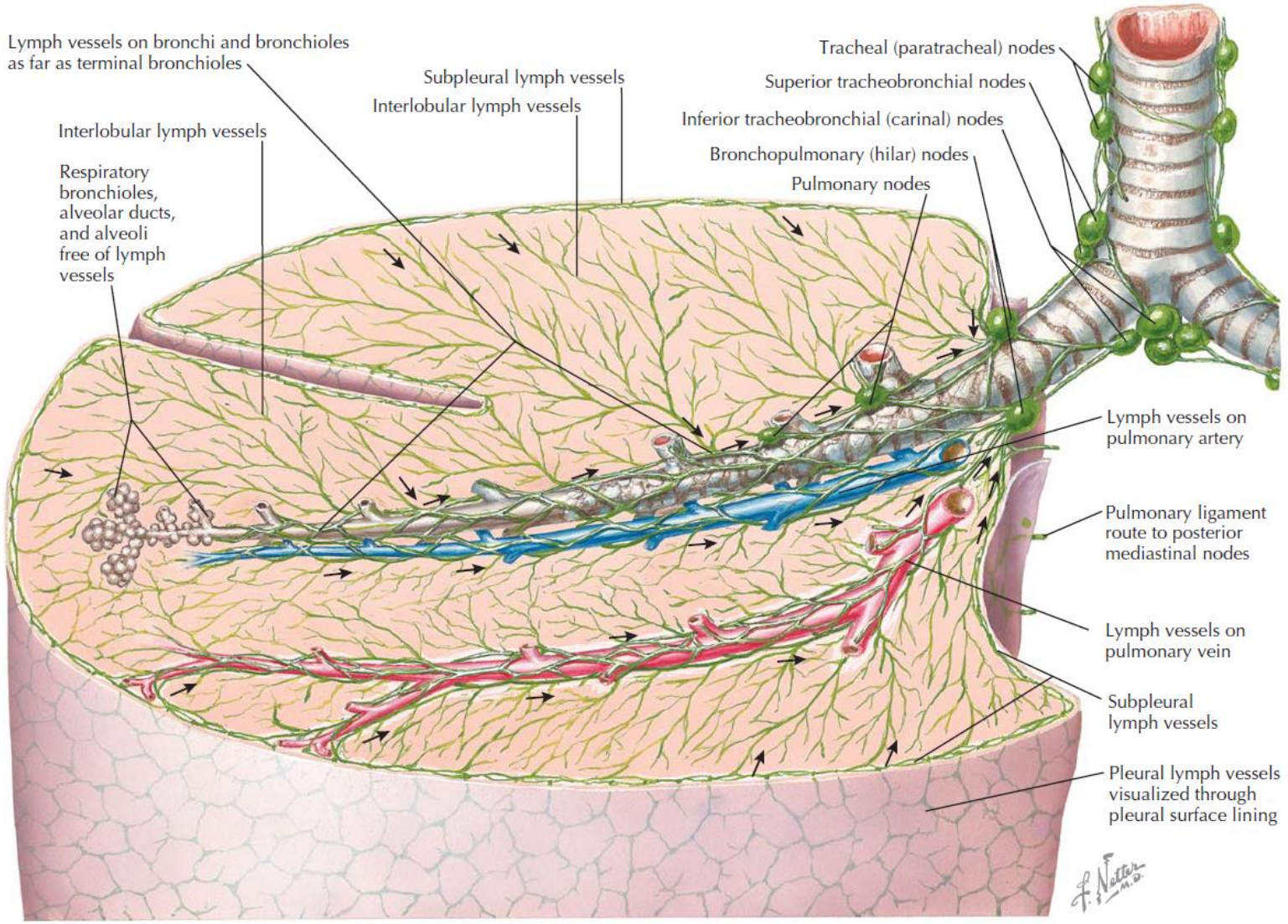

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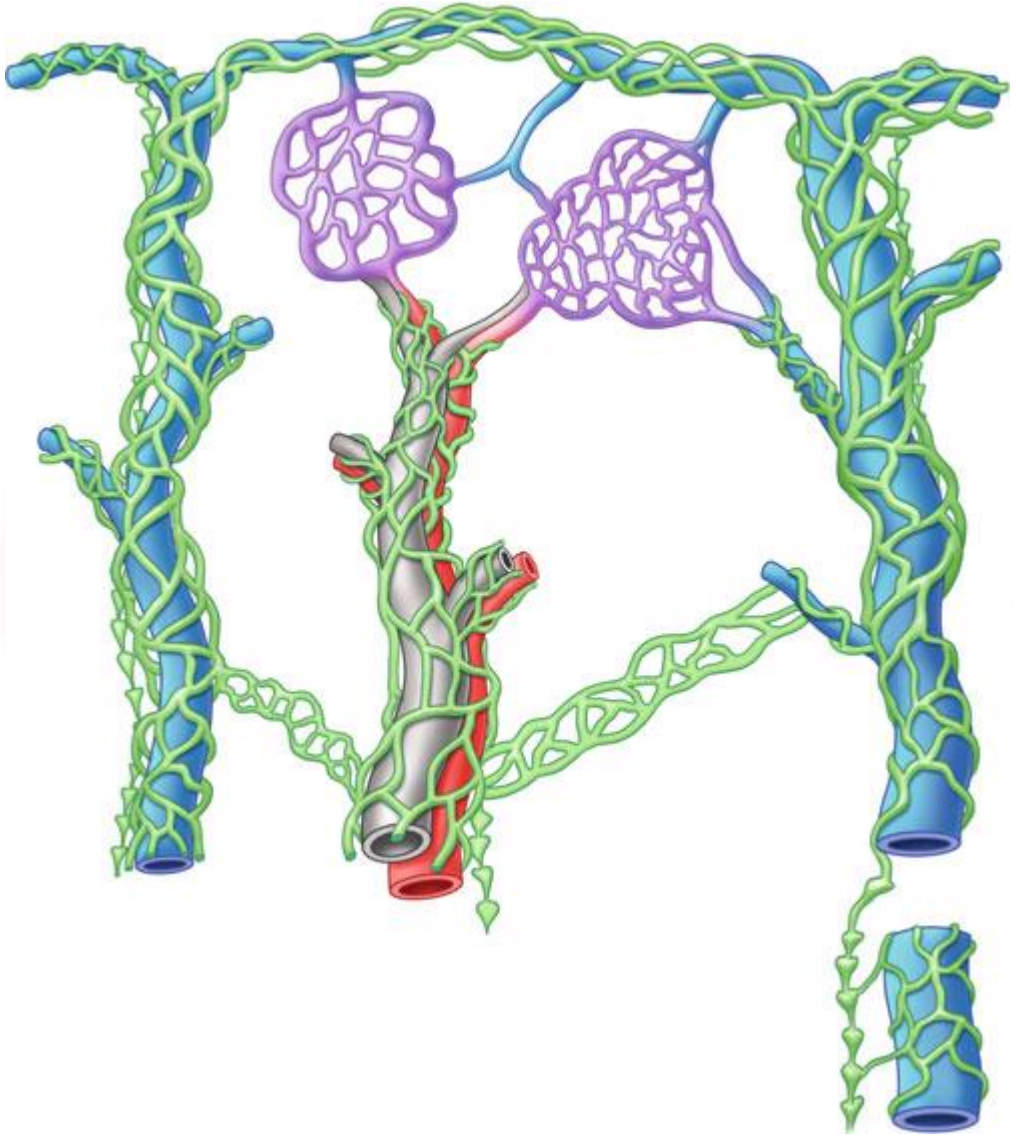

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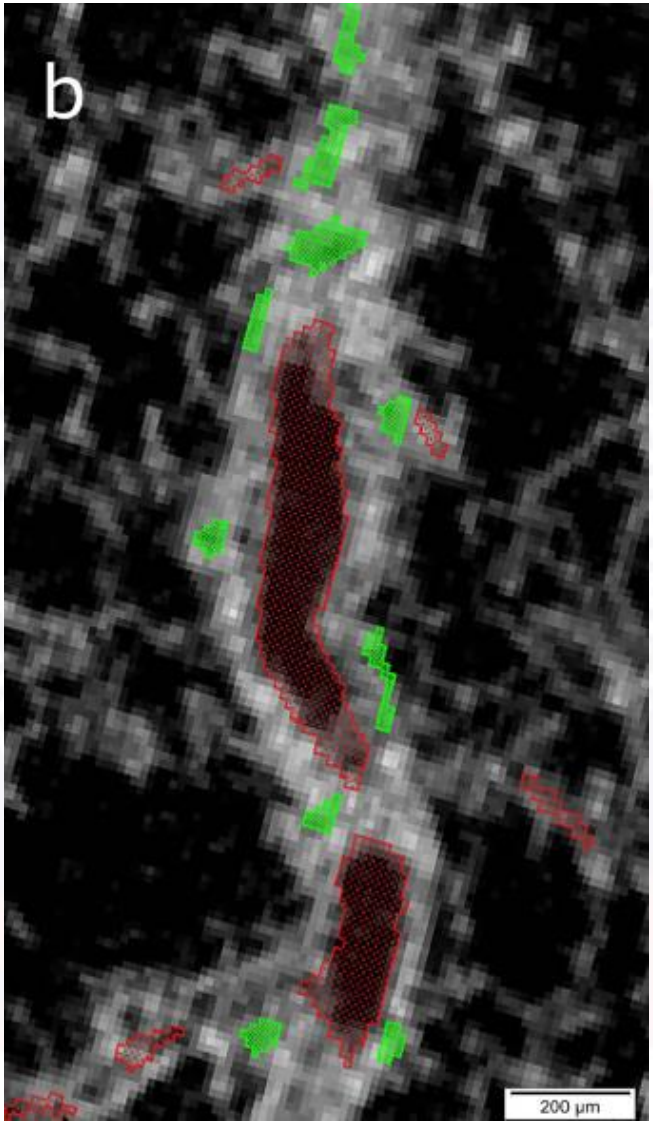

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Correlative 3D Imaging and Microfluidic Modelling of Human Pulmonary Lymphatics using Immunohistochemistry and Highresolution μCT
Stephanie K. Robinson, Jonathan J. Ramsden, Jane Warner, Peter M. Lackie, Tiina Roose
Nature (2019) 9:6415 (IM:41.1)

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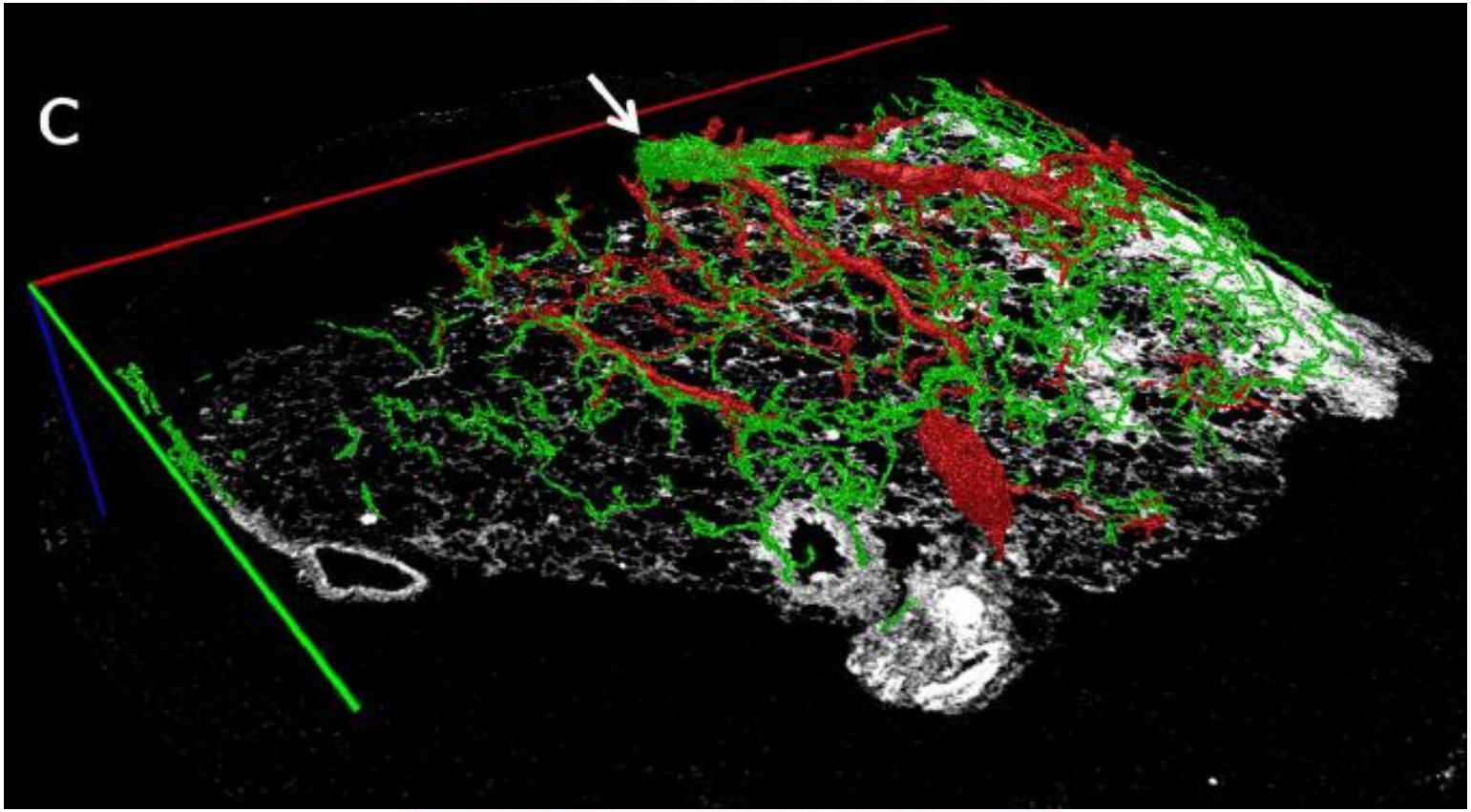

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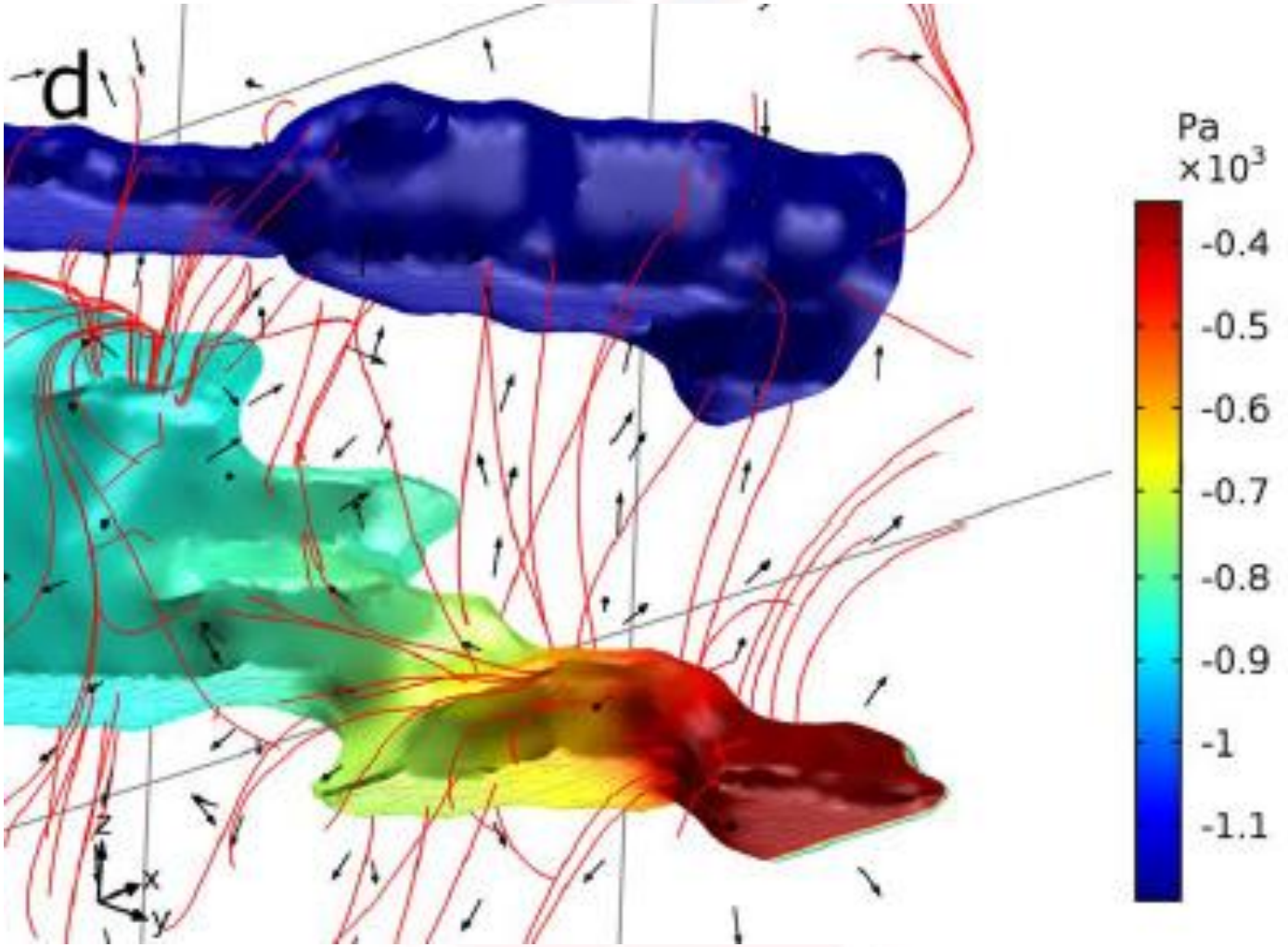

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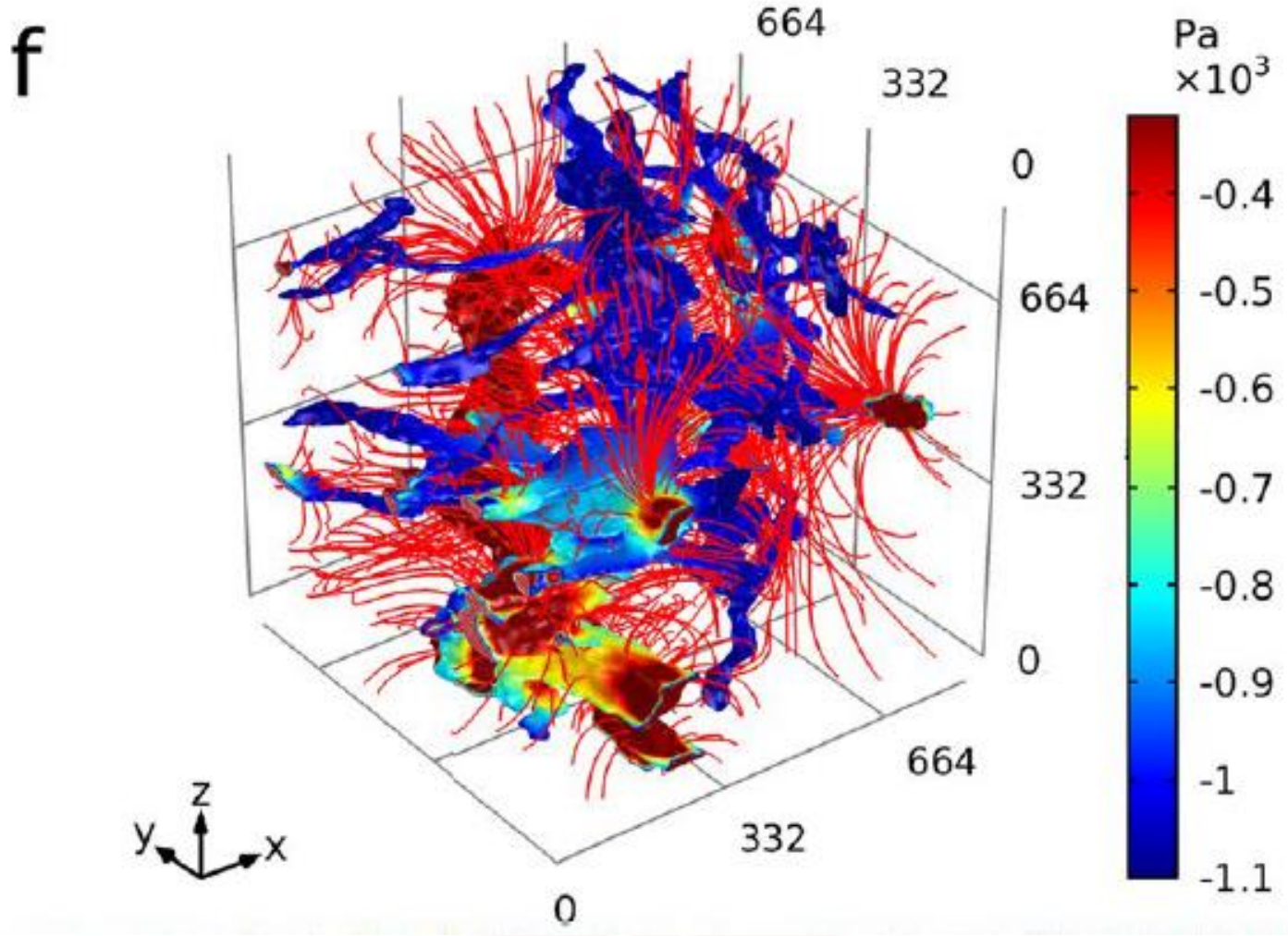

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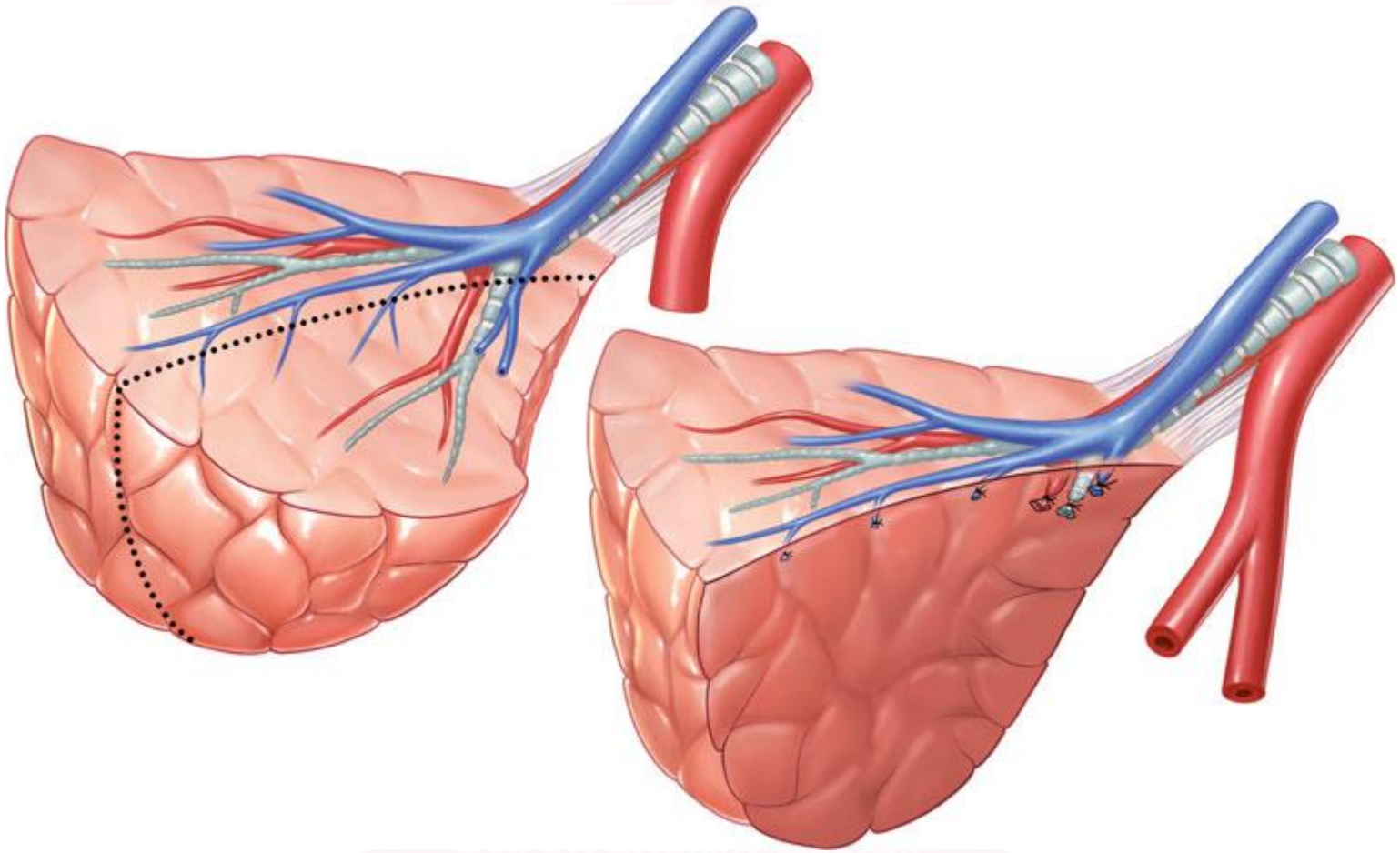

Concept of 'classic (conventional)' segmental resection (segmentectomy)

According to the classic (conventional) concept of segmental resection, the segmental artery and bronchus, which run parallel, are both divided at the pulmonary hilum, while the intersegmental vein, which runs on the intersegmental plane, is carefully preserved only by cutting the branches to the resected segment.

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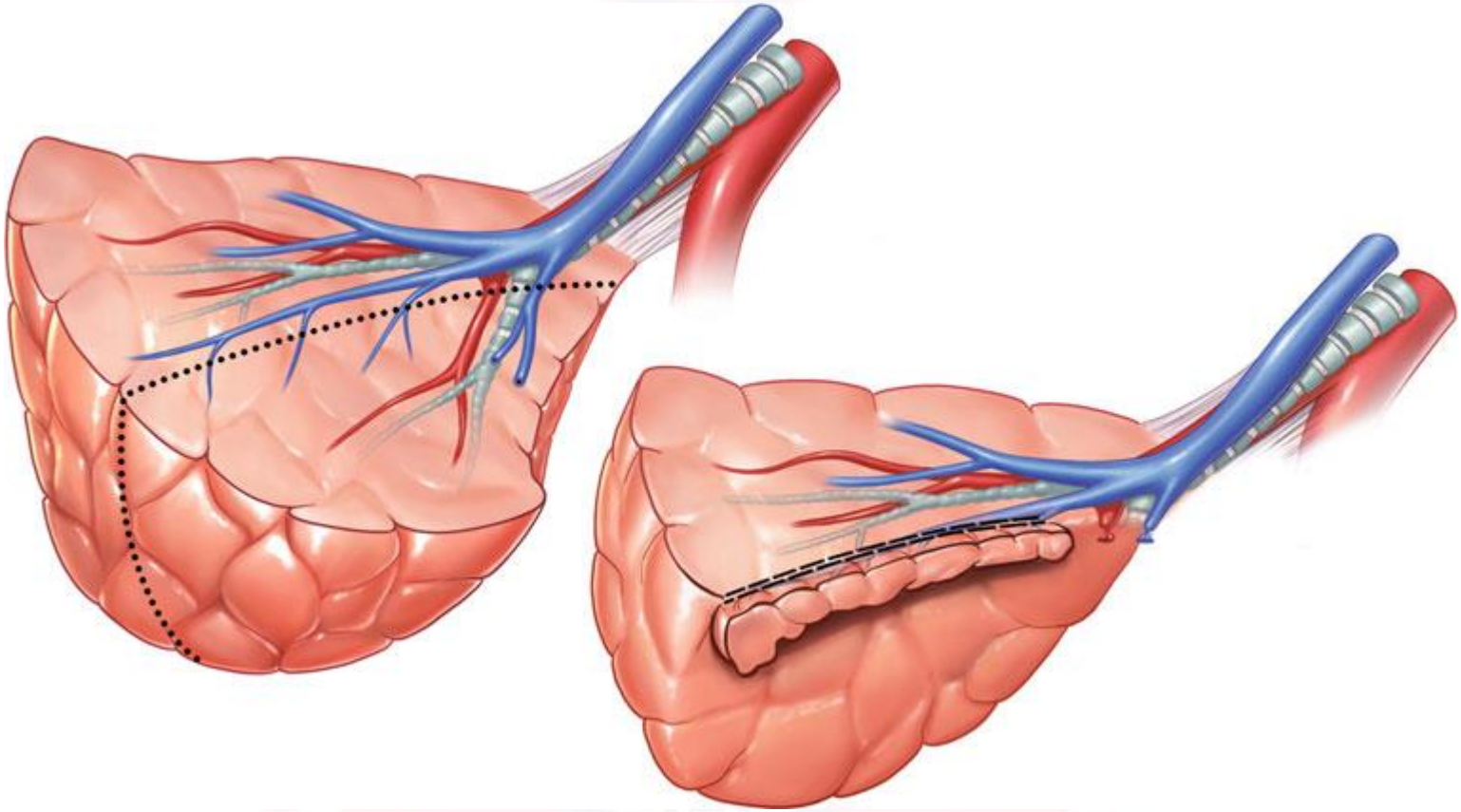

Concept of "modified (easy)" segmental resection (segmentectomy)

In the modified concept of segmental resection, the entire segmental artery, vein, and bronchus are divided at the hilum. In this case, it is not necessary to expose the intersegmental vein on the intersegmental plane; therefore, it becomes easier to maneuver with staplers in dividing the intersegmental parenchyma. This modified technique may be justified not only because of the easy maneuverability but also because of the anatomic considerations with regard to the lymphatics in the lung parenchyma, especially in malignant cases.

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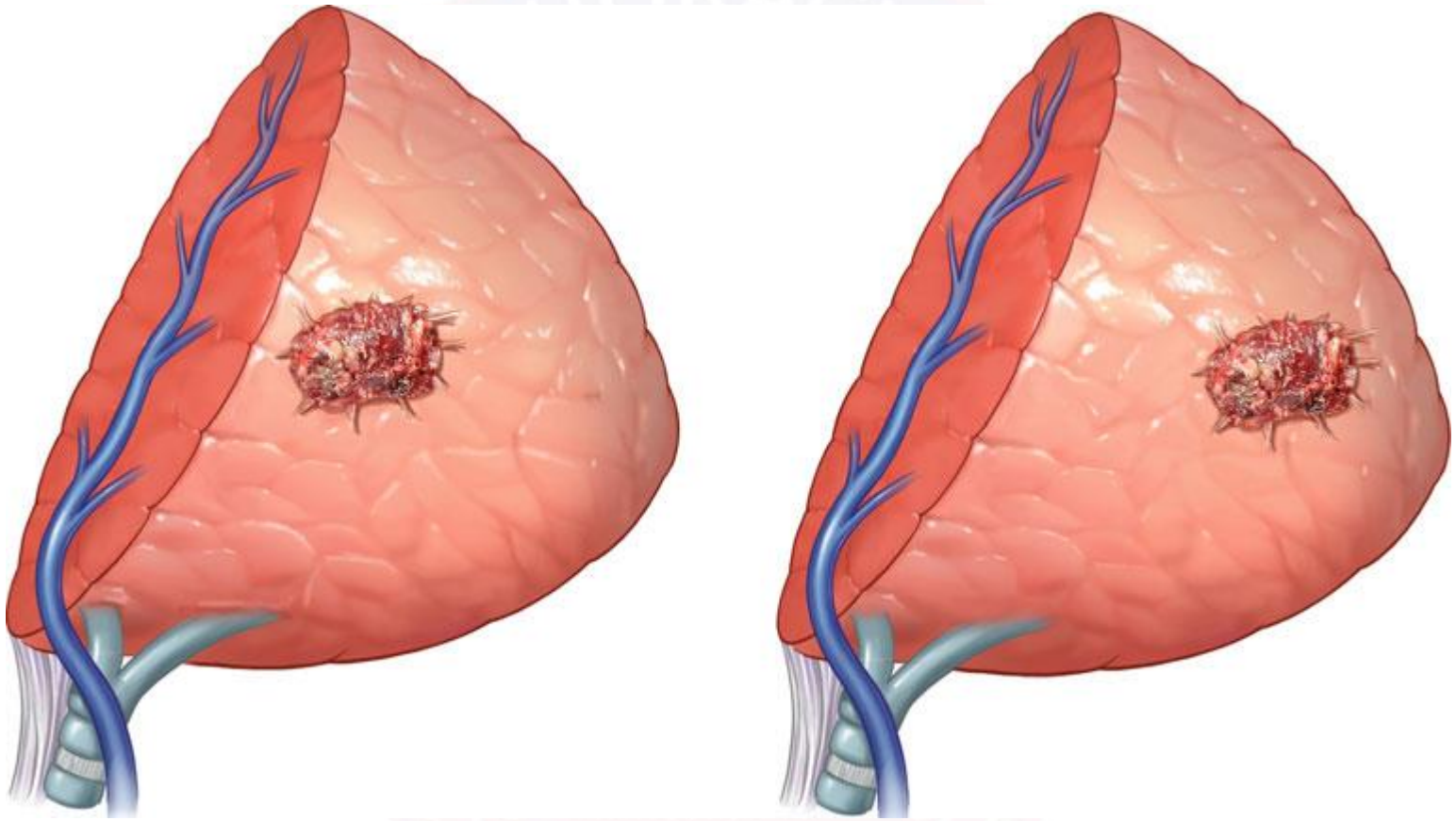
Pulmonary lymph vessels



Best Treatment

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Lung sparing Surgery

Sublobar

Lobectomy Vs Sublobar

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Δρ Αθανάσιος Κλέωντας
BSc MD MSc BTS PhD

Chest Surgery
Hendrik C. Dienemann, Hans Hoffmann, Frank C. Detterbeck
ISBN 978-3-642-12043-5 © Springer-Verlag Berlin Heidelberg 2015

Principles of Thoracic Oncology

Επίτευξη R0 εκτομής

- Εκτομή του όγκου μετά των ενδοπνευμονικών λεμφαγγείων και κυρίως των λεμφαδένων της λεμφικής δεξαμενής του πνεύμονα (lymphatic shump), στο διατμηματικό ή διαμεσολόβιο πλάνο
- Διατήρηση όσο το δυνατόν περισσότερου λειτουργικού πνευμονικού παρεγχύματος
- Συστηματικό λεμφαδενικό καθαρισμό του μεσοθωρακίου
  - για ριζική εκτομή της νόσου
  - για ακριβή σταδιοποίηση

“Lobectomy is the gold standard treatment”.

Δρ Αθανάσιος Κλέωντας
BSc MD MSc BTS PhD

Lung cancer surgery: an up to date
N.Baltayiannis , M.Chandrinos , D.Anagnostopoulos , P.Zarogoulidis , K.Tsakiridis , A.Mpakas , N.Machairiotis , N.Katsikogiannis4, I.Kougioumtzi , N.Courcoutsakis , K.Zarogoulidis
J Thorac Dis 2013;5(S4):S425-S439.

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Segmentectomies

Types of planned segmentectomies

Planned segmentectomy	N
Right lung	
S1	1
S2	1
S1+2	41
S3	4
S6	23
S7+8	2
S8	1
S9+10	2
S7+8+9+10	23
Total	98

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Thoracoscopic anatomic segmentectomies for lung cancer: technical aspects
Dominique Gossot, Jon Lutz, Madalina Grigoroiu, Emmanuel Brian, and Agathe Seguin-Givelet
J Vis Surg. 2016; 2: 171

Segmentectomies

Types of planned segmentectomies

Planned segmentectomy	N
Left lung	
S2	1
S1+2	18
S1+2+3	39
S4+5	17
S3+4+5	2
S6	34
S8	2
S9+10	5
S8+9+10	18
S6+2	1

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J Vis Surg. 2016; 2: 171

Sublobar

Intraoperative confirmation of nodules

CT-guided marking techniques

percutaneous hook wire placement

dye injection

puncturing the visceral pleura (VP) is an associated hazard that may result in complications such as air embolism

Bronchoscope-guided marking techniques

Bronchoscopic, multi-spot dye markings

intrabronchial injection of methylene blue or indocyanine green (ICG)

systemic injection of ICG using an near infrared imaging system

cone-beam CT

electromagnetic navigation bronchoscopy

Δρ Αθανάσιος Κλέωντας
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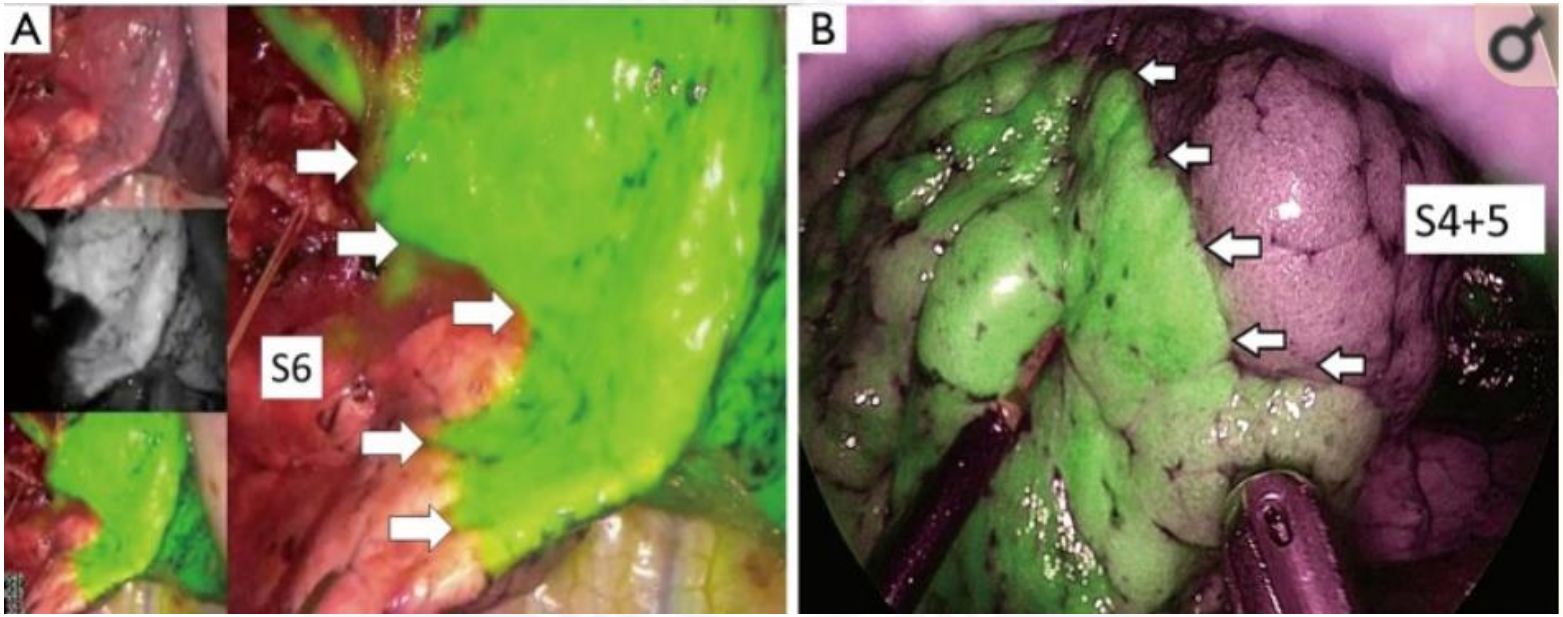
Novel techniques for video-assisted thoracoscopic surgery segmentectomy

Mingyon Mun, Masayuki Nakao, Yosuke Matsuura, Junji Ichinose, Ken Nakagawa, and Sakae Okumura J Thorac Dis. 2018 Jun; 10(Suppl 14): S1671–S1676

Sublobar



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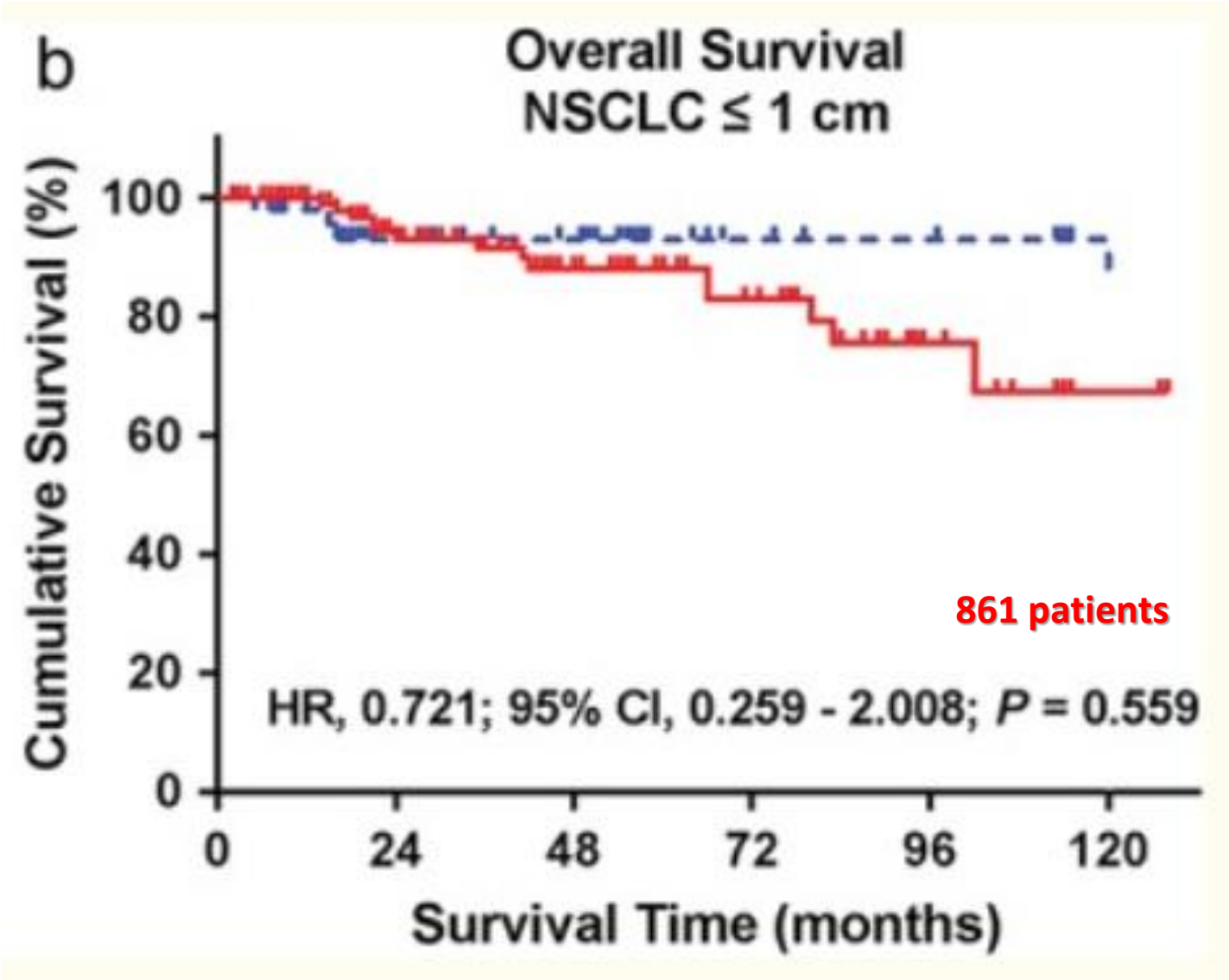
Lobectomy vs Sublobar



Δρ Αθανάσιος Κλέωντας
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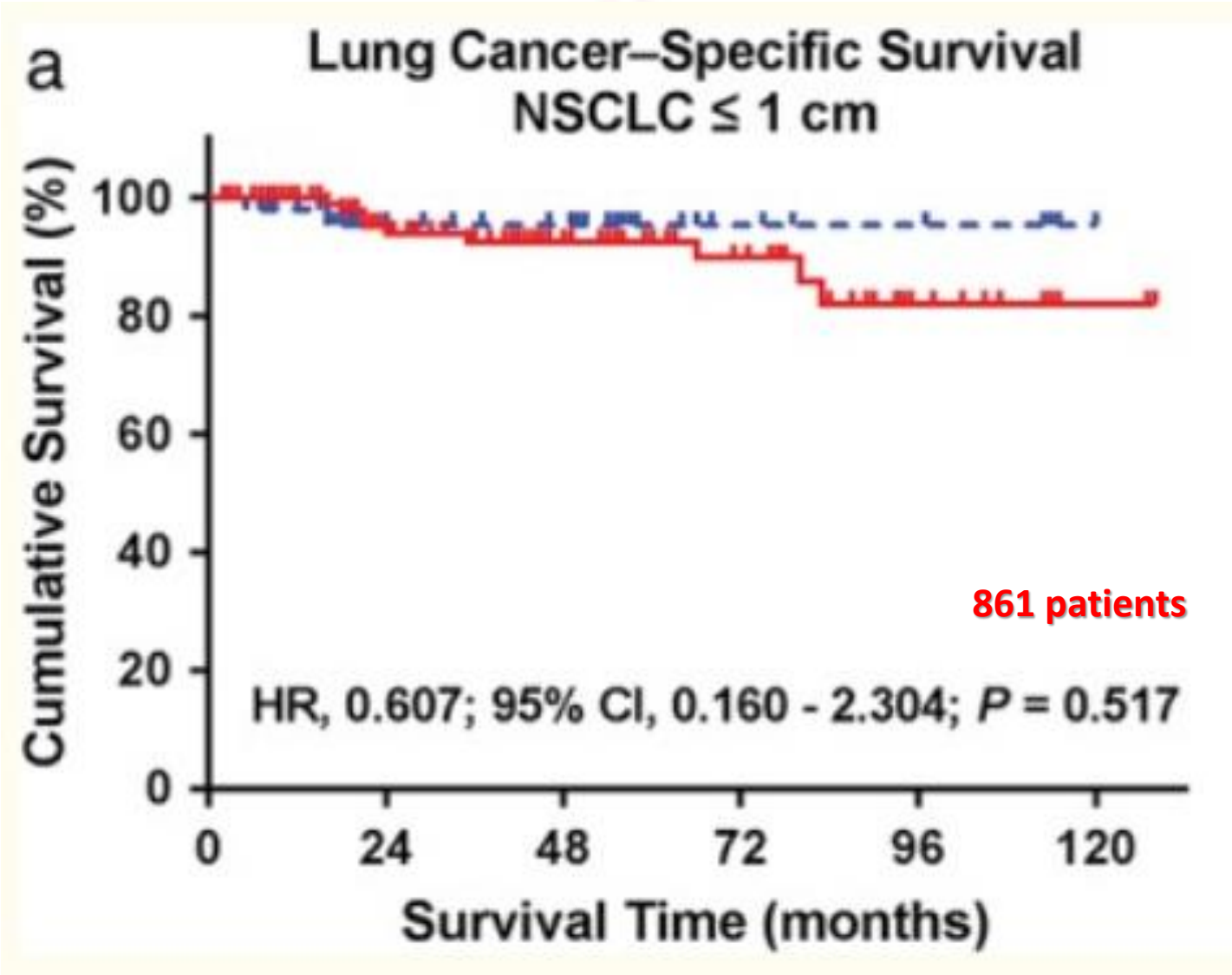
Survival rates after lobectomy versus sublobar resection for early-stage right middle lobe non-small cell lung cancer

Lv X, Cao J, Dai X, Rusidanmu A - Thorac Cancer. 2018 Aug;9(8):1026-1031

Lobectomy vs Sublobar



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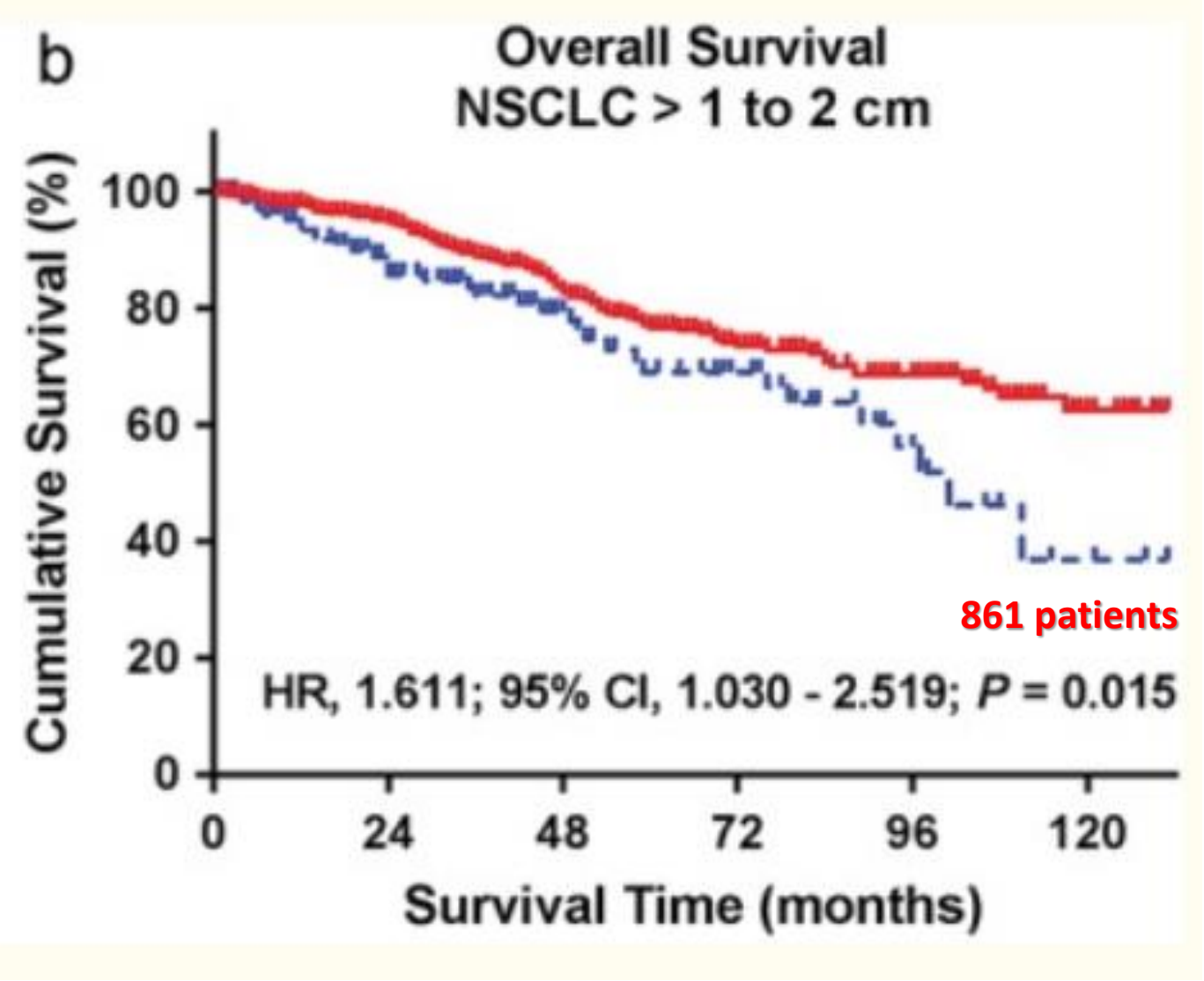

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Lobectomy vs Sublobar

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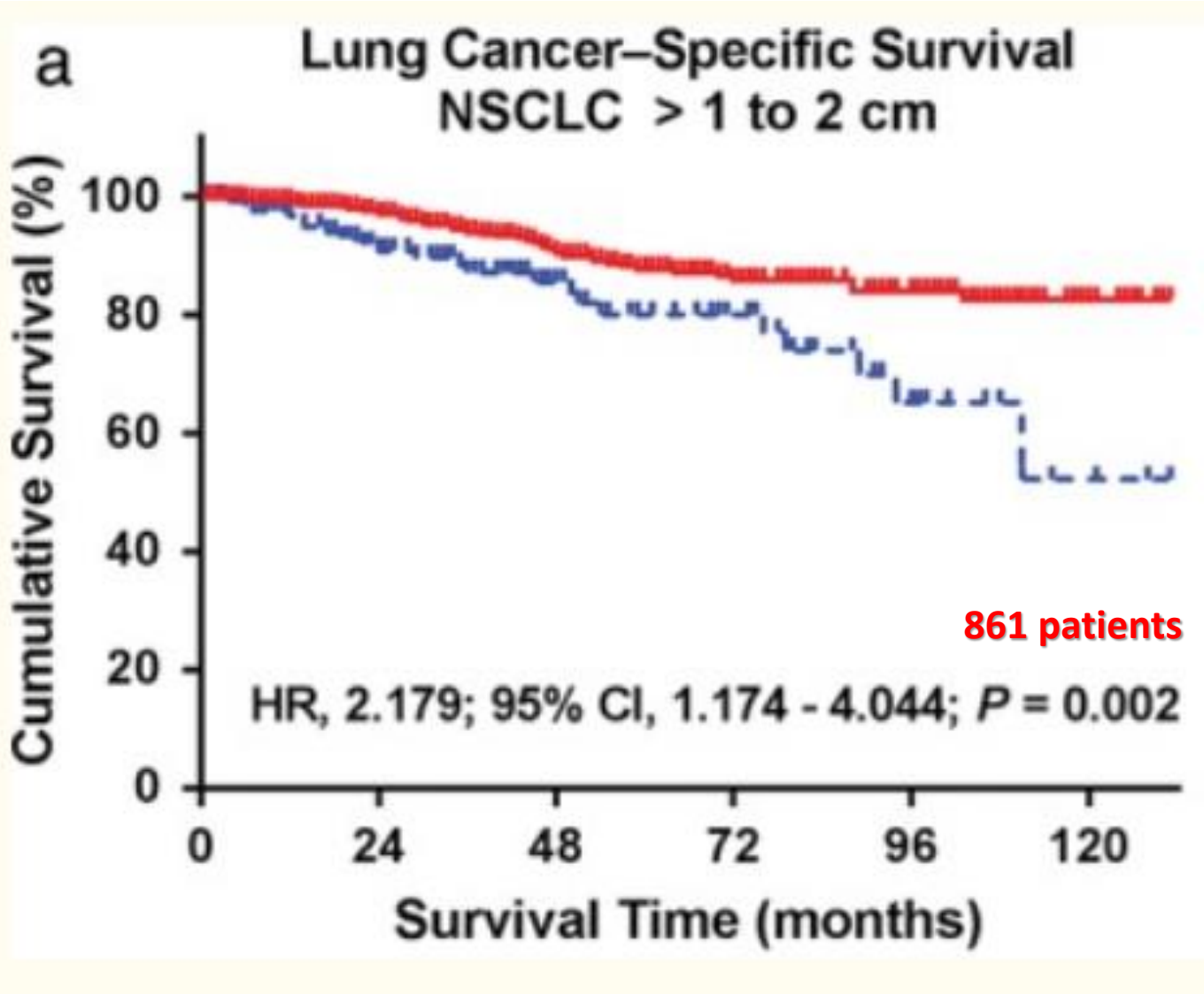

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Trends in time

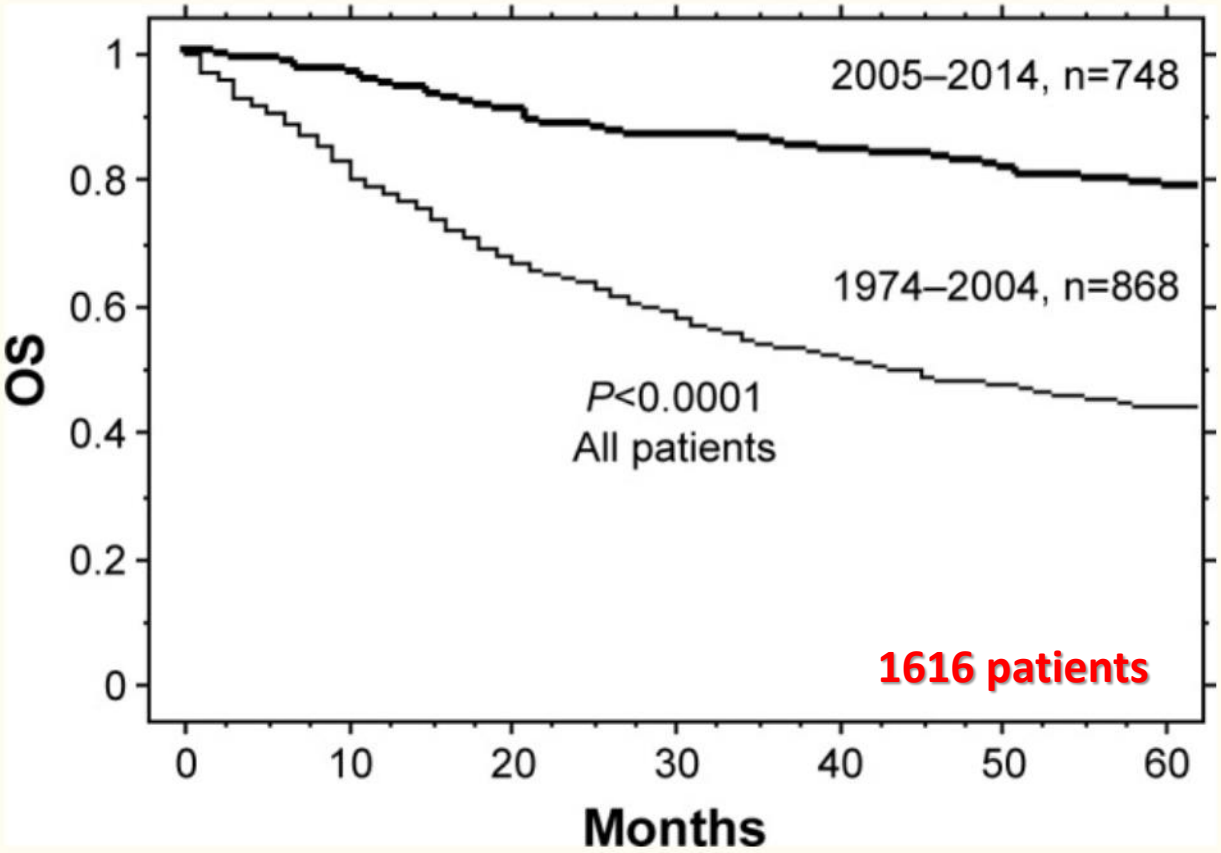

Figure 1

OS curves of all patients who underwent resection for lung cancer show a significant survival difference between patients from 1974 to 2004 (n=868) and those from 2005 to 2014 (n=748; log-rank test, $P<0.0001$).

Abbreviation: OS, overall survival.

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Δρ Αθανάσιος Κλέωντας
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Chronological changes in lung cancer surgery in a single Japanese institution
Haruhiko Nakamura, Hiroki Sakai, Hiroyuki Kimura, Tomoyuki Miyazawa, Hideki Marushima, Hisashi Saji
Onco Targets Ther. 2017; 10: 1459–1464.

Trends in time

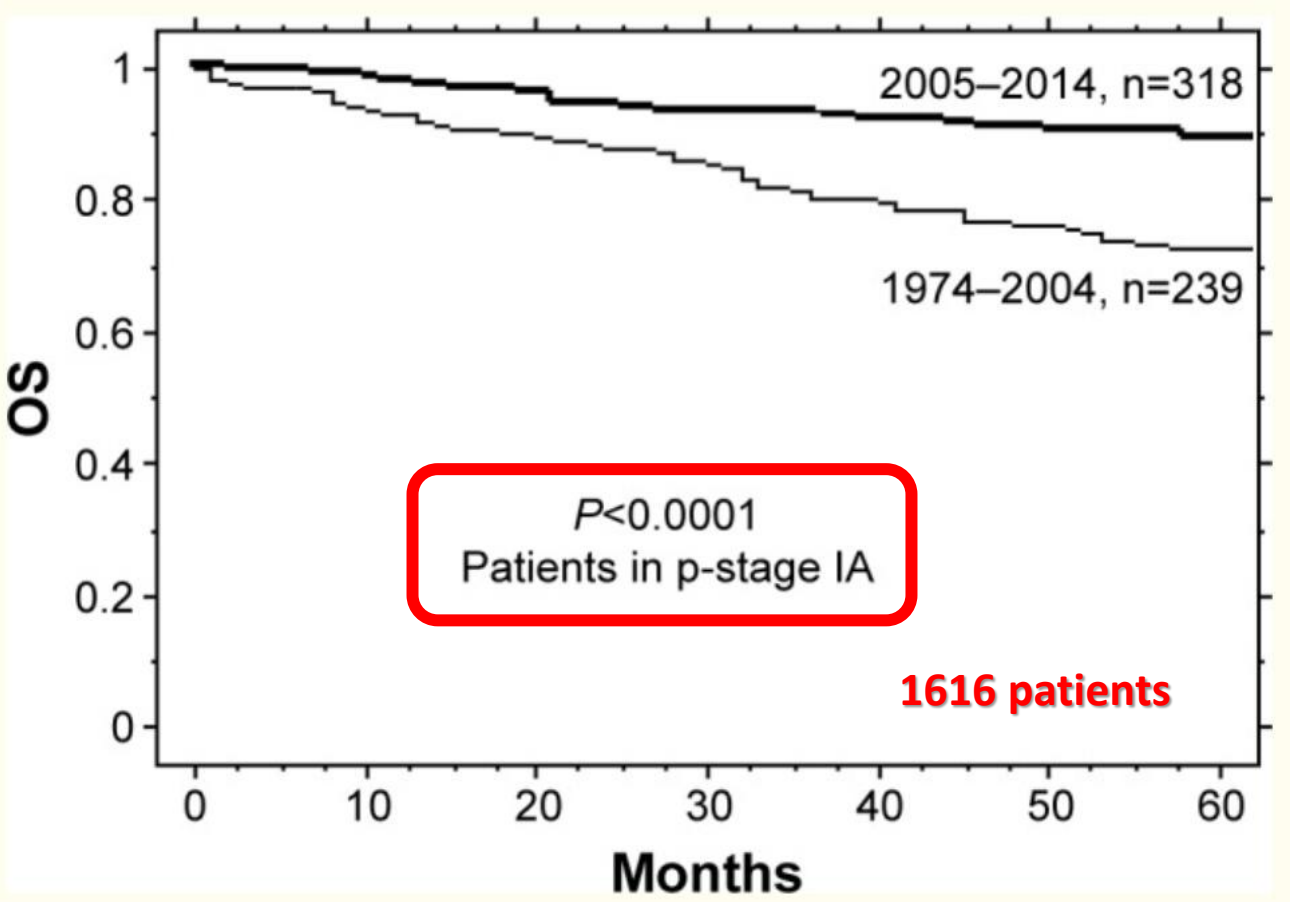

Figure 2

OS curves of p-stage IA patients who underwent resection for lung cancer show a significant survival difference between patients from 1974 to 2004 (n=239) and those from 2005 to 2014 (n=318; log-rank test, $P<0.0001$).

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Abstract

Sublobar resection for lung cancer--whether non-anatomic wedge resection or anatomic segmentectomy--has emerged as a credible alternative to lobectomy for the surgical treatment of selected patients with lung cancer. Sublobar resection promises to cause less pulmonary compromise in such patients.

Emerging evidence suggests that **sublobar resection may offer survival outcomes approaching that of lobectomy** for lung cancer patients whose disease meets the following criteria:

stage IA disease only;
tumor up to 2-3 cm diameter;
peripheral location of tumor in the lung;
and predominantly ground-glass (non-solid) appearance on CT imaging

The best results are obtained with segmentectomy (as opposed to wedge resection) and complete lymph node dissection. Nevertheless, the evidence is currently still limited, and the above criteria are met only in a minority of patients. Large randomized trials are underway to define the clinical role of sublobar resections, and results are eagerly anticipated. Until that time, lobectomy should still be regarded as the mainstay of surgical therapy for patients with early stage lung cancer at present.

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Non-small cell lung cancer: when to offer sublobar resection.
Sihoe AD, Van Schil P
Lung Cancer. 2014 Nov;86(2):115-20.

Lobar vs Sublobar

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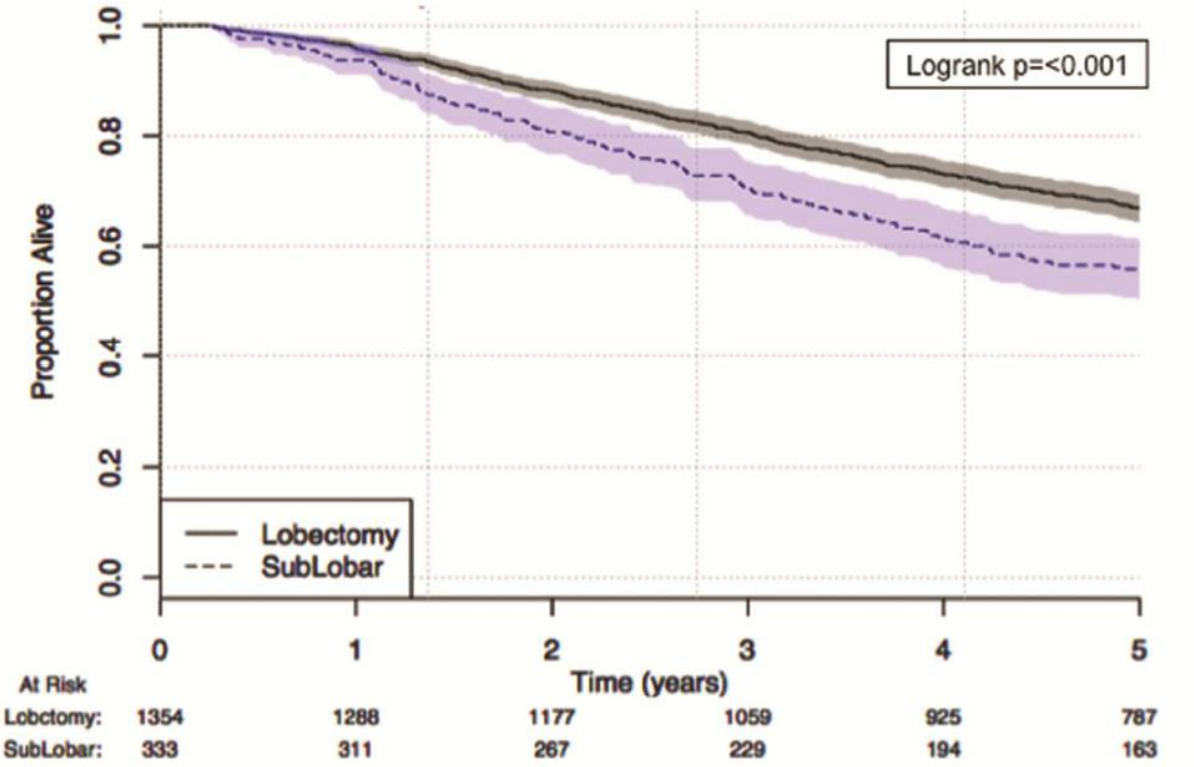

Resection	No. of Subjects	Event	Censored	5-year OS
Lobectomy	1354	434 (32.1%)	920 (67.9%)	66.8% (64.3%, 69.4%)
Sublobar Resection	333	145 (43.5%)	188 (56.5%)	55.5% (50.3%, 61.2%)

Figure 1. Kaplan-Meier curve for OS by extent of surgical resection, unmatched patients.

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Long-Term Results for Clinical Stage IA Lung Cancer- Comparing Lobectomy and Sublobar Resection
Melanie Subramanian, Timothy McMurry, Bryan F. Meyers, Varun Puri, Benjamin D. Kozower
The Annals of Thoracic Surgery (2018)

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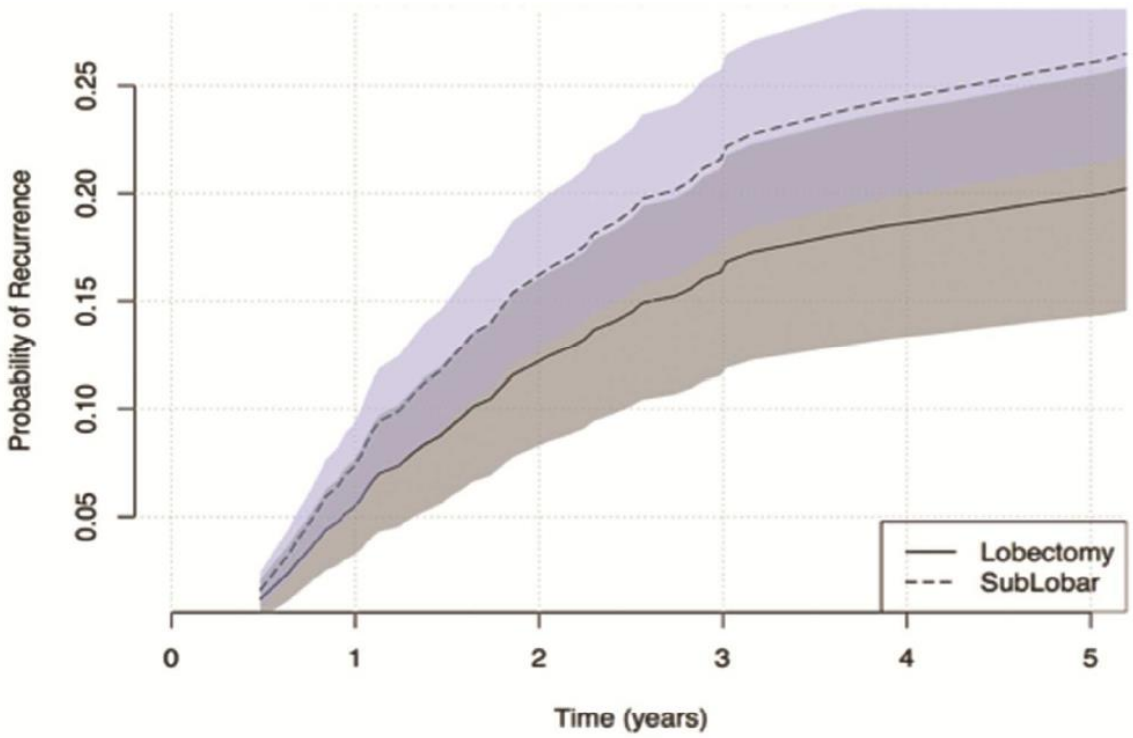
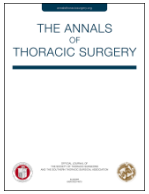
Lobar vs Sublobar



Time elapsed since resection (years)	Recurrence Risk(%)	
	Lobectomy	Sublobar Resection
1	5.5	7.4
2	12.2	15.2
3	16.5	21.8
4	18.6	24.5
5	19.9	25.1

Figure 3. Risk of recurrence estimated for a 67 year old female patient with pathologic stage 1A NSCLC adenocarcinoma, by resection type.



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Lobar vs Sublobar (pathology)

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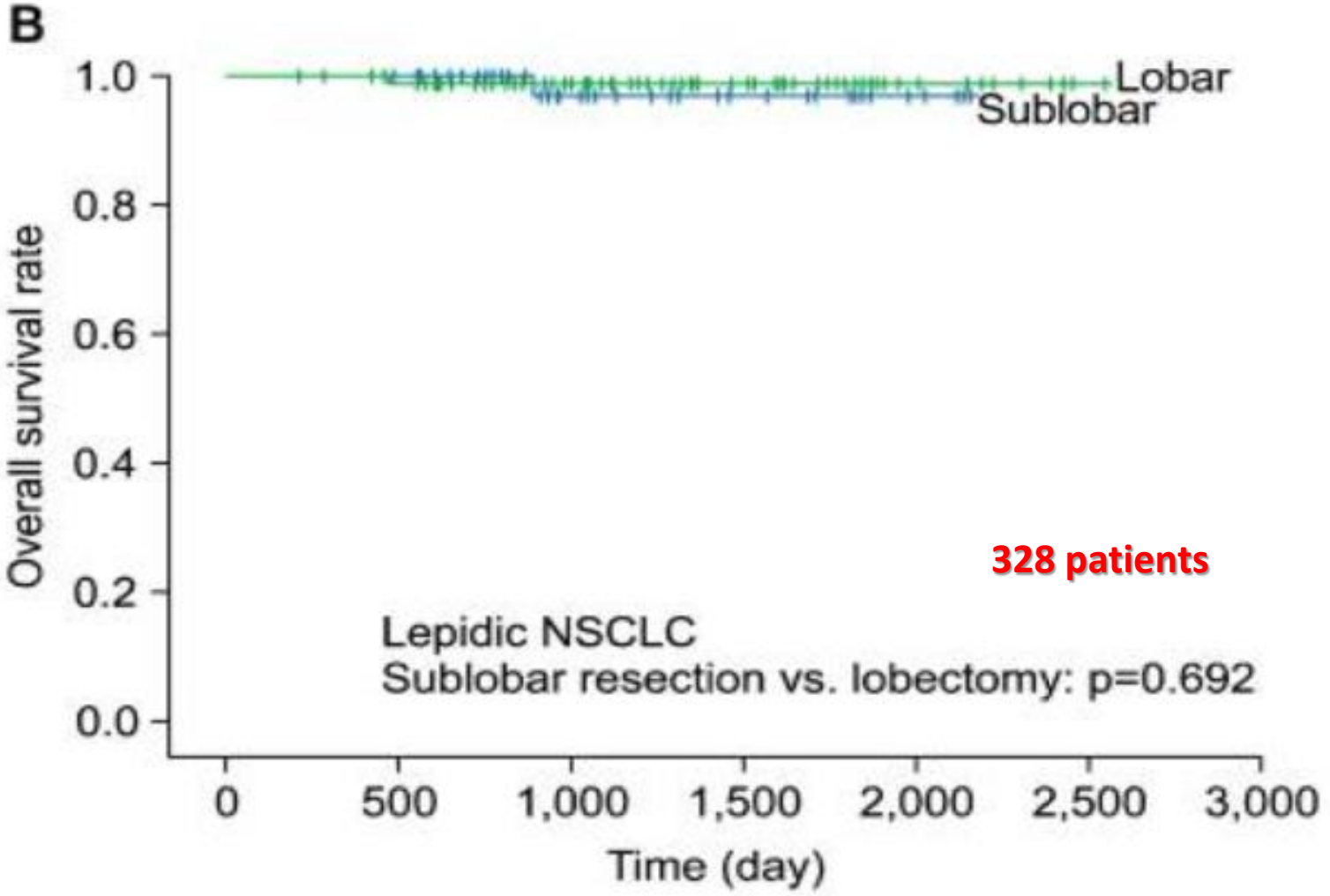

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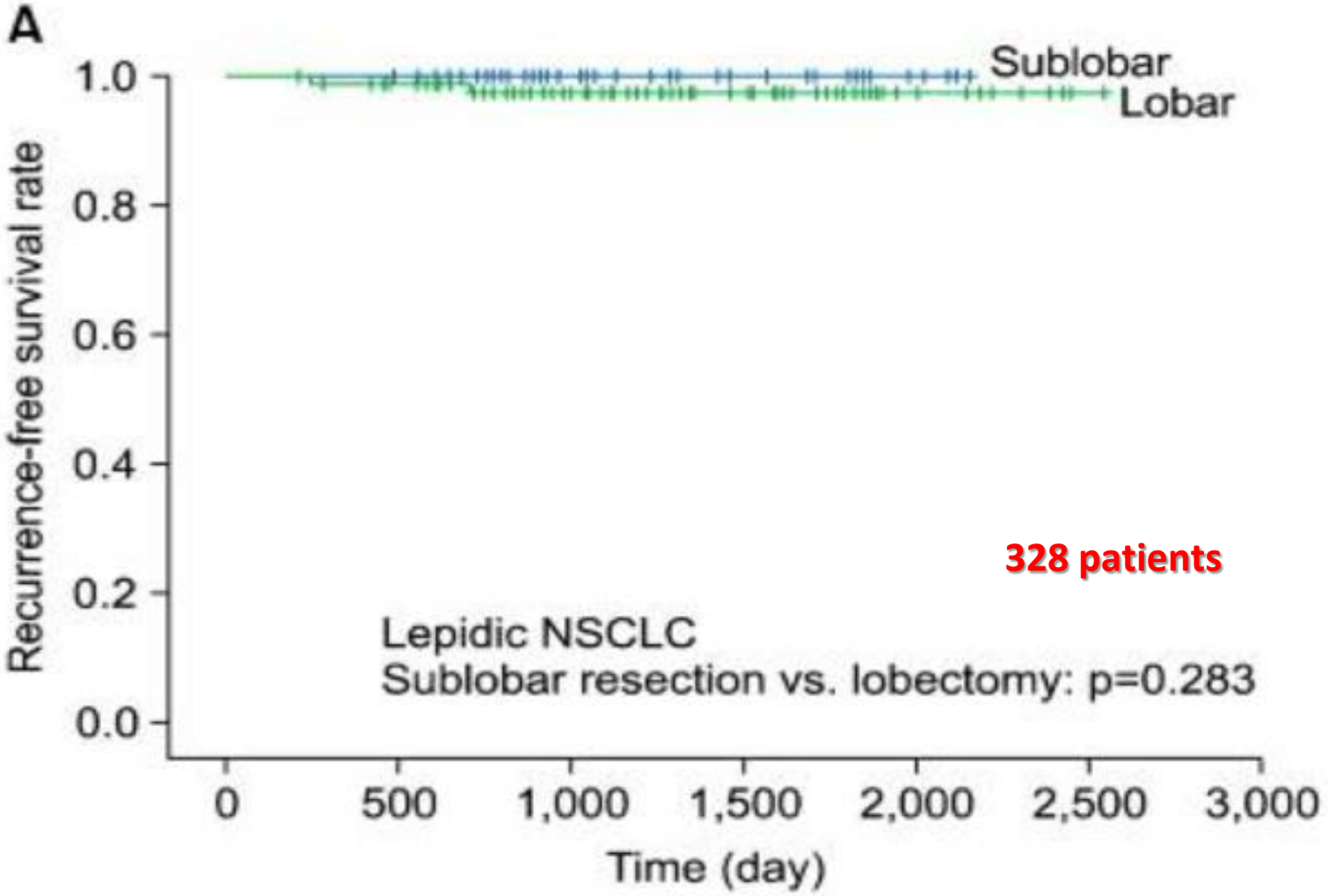
Lobectomy versus Sublobar Resection in Non-Lepidic Small-Sized Non-Small Cell Lung Cancer
Min Namkoong, Youngkyu Moon, Jae Kil Park
Korean J Thorac Cardiovasc Surg. 2017 Dec; 50(6): 415–423.

Lobar vs Sublobar (pathology)



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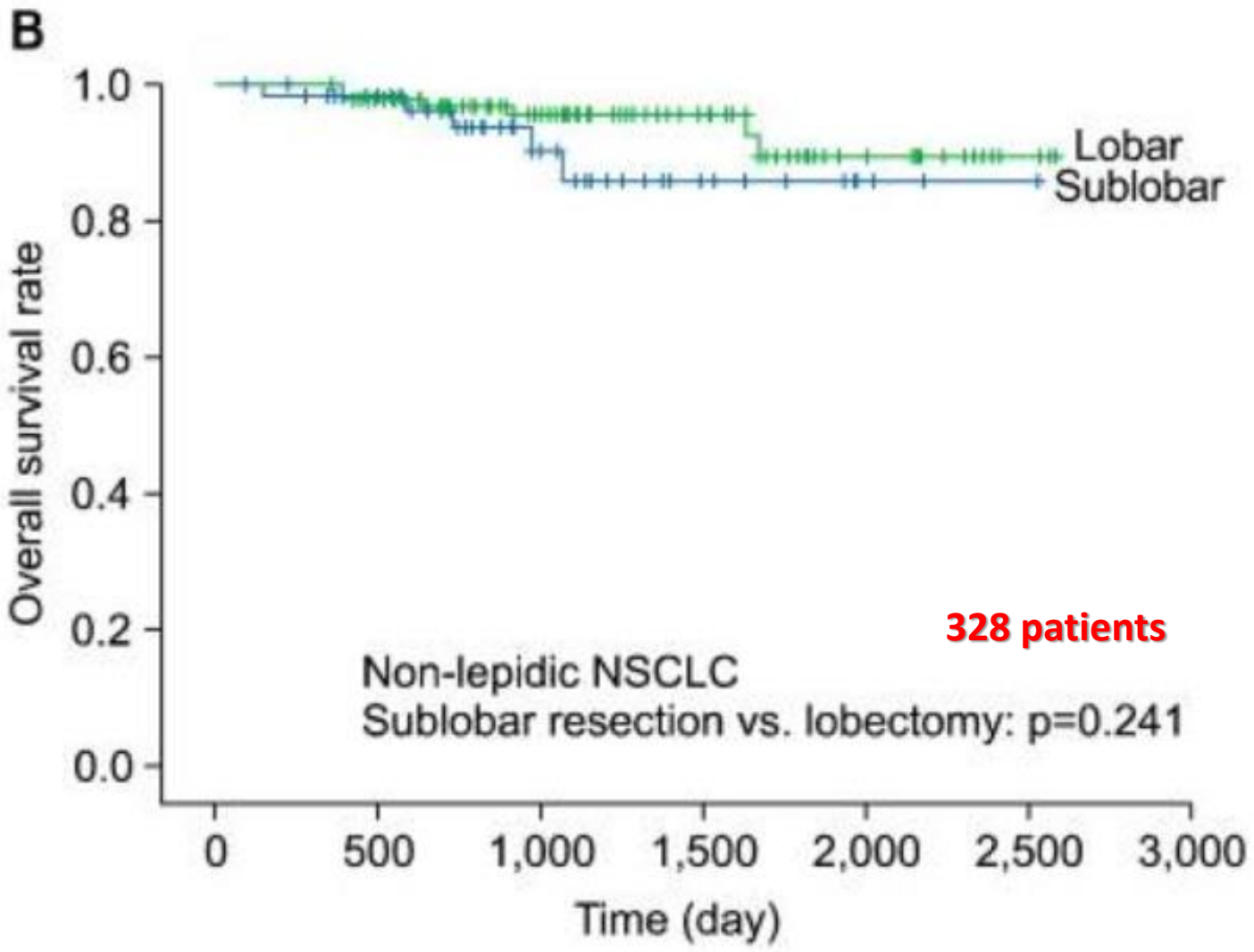

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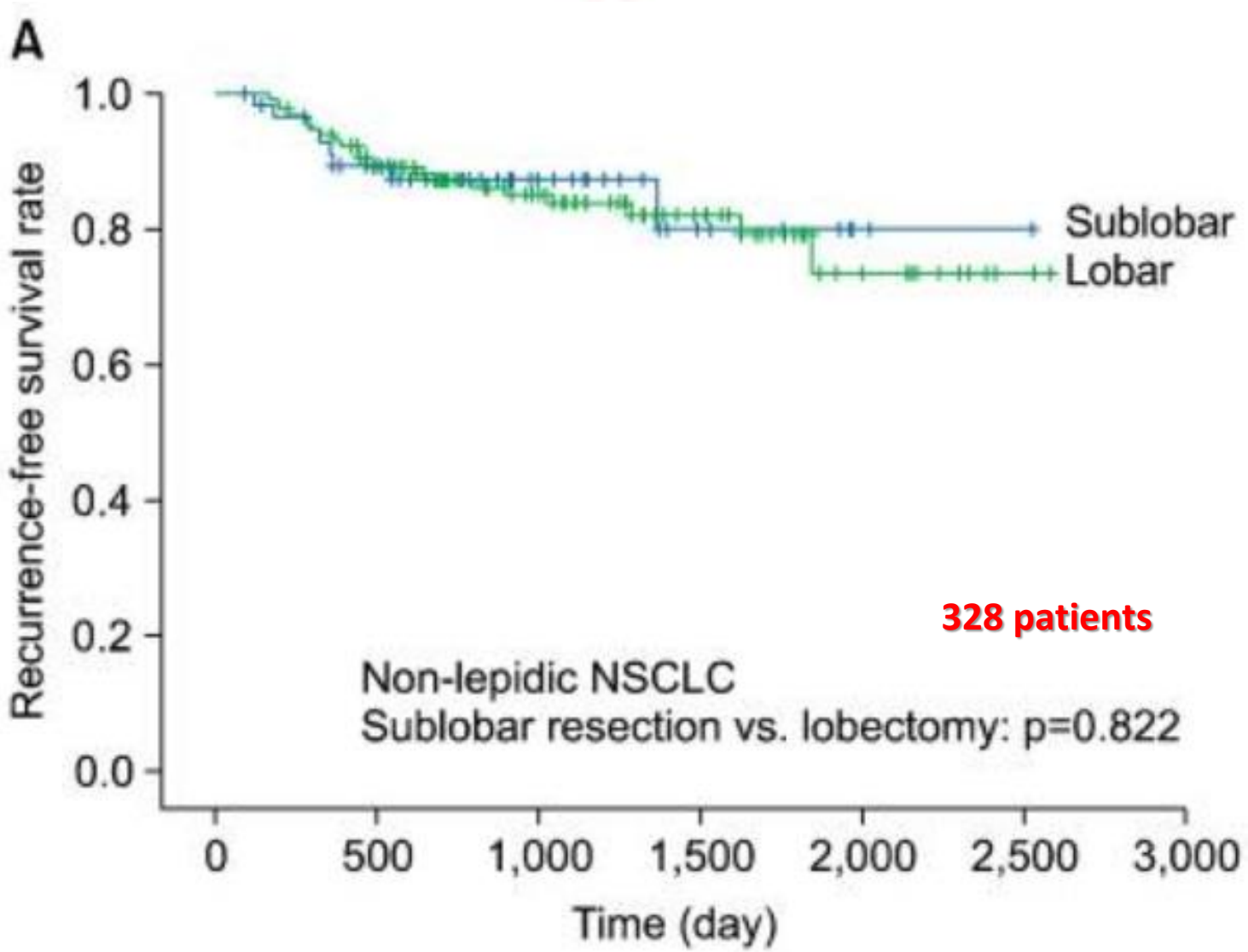

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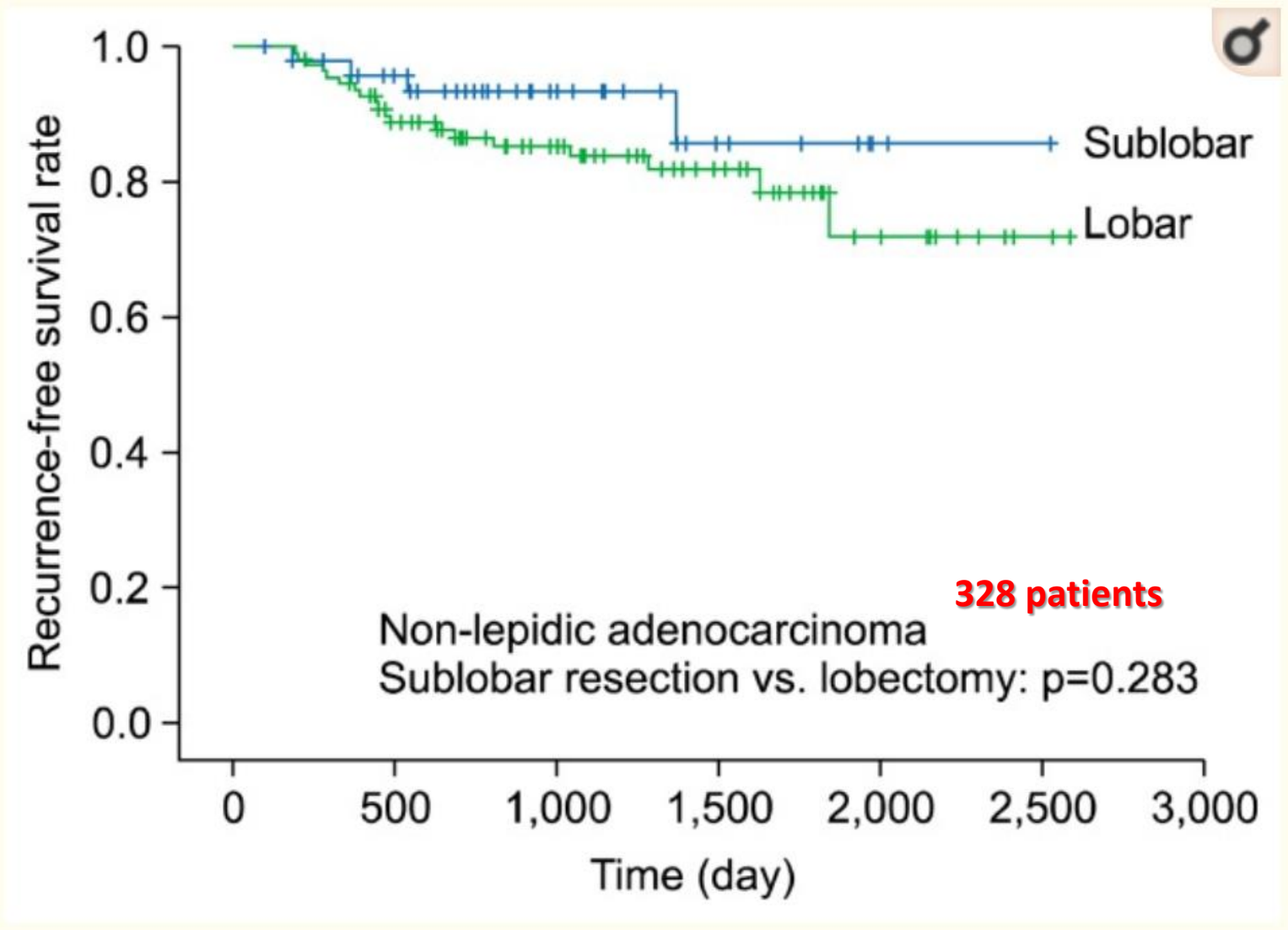

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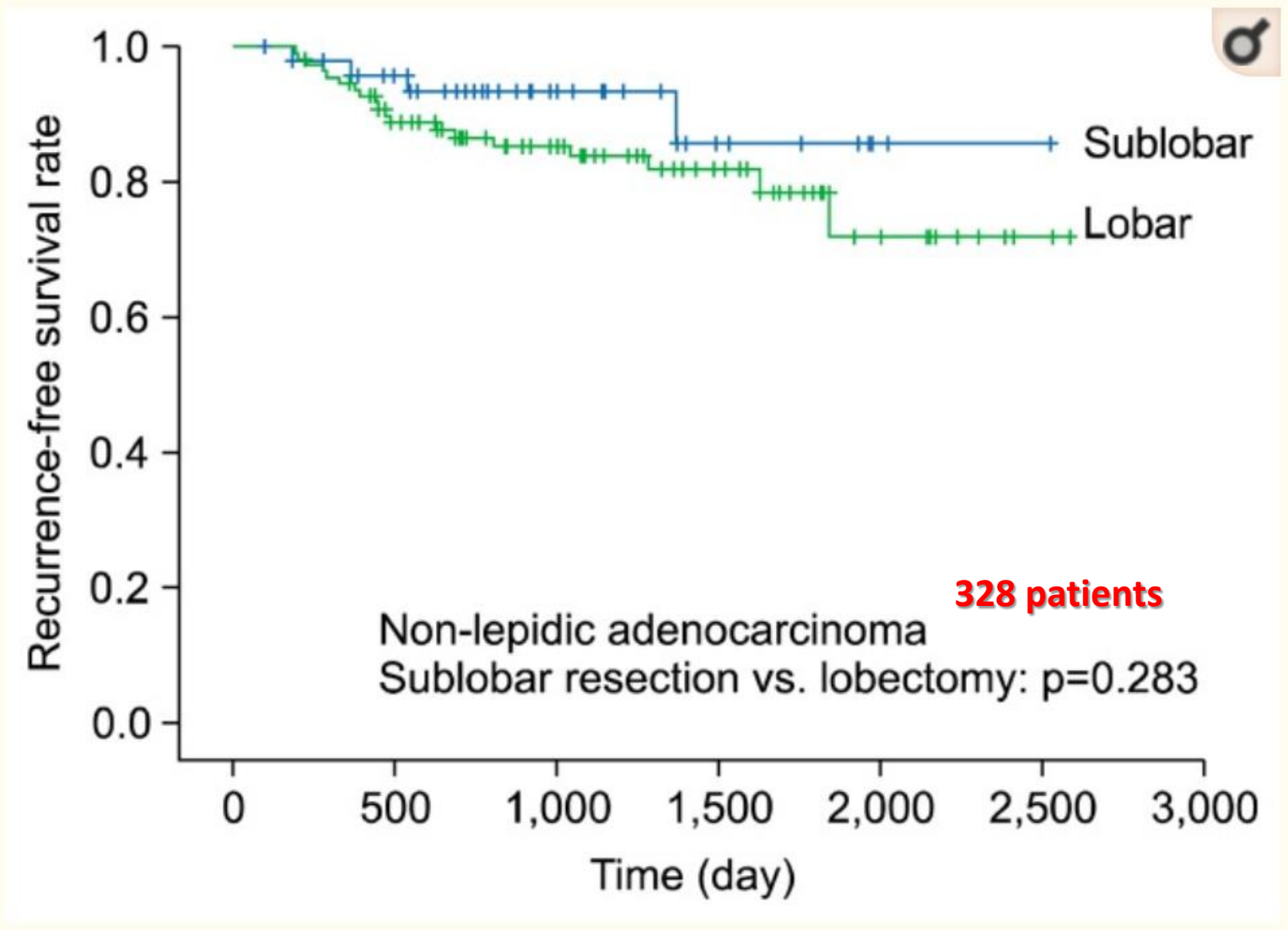

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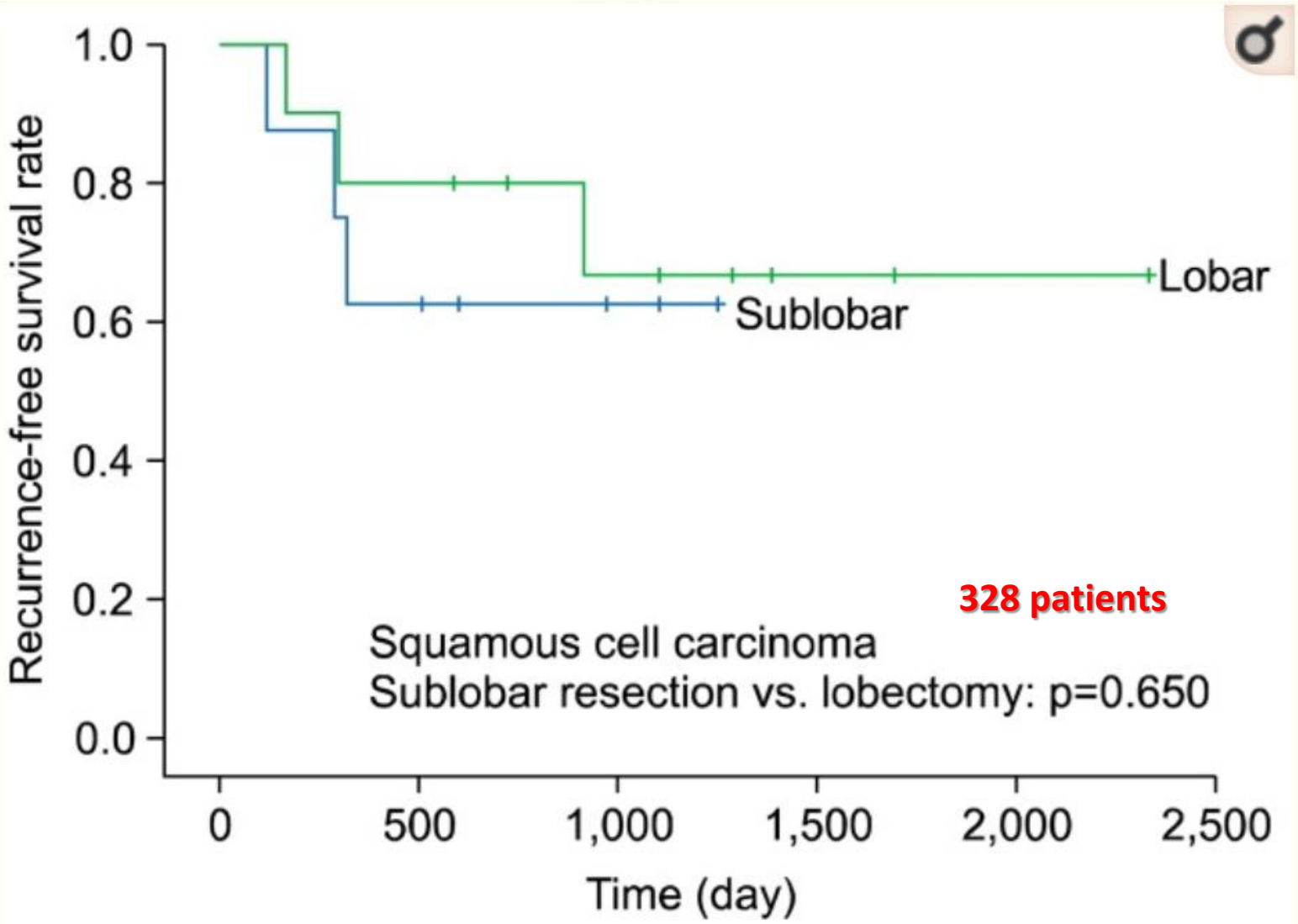

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Lobectomy vs Sublobar (meta-analysis)

Twelve studies

1,078 patients underwent sublobar resection

1,667 patients underwent lobectomy

they found no significant difference in OS or DSF

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Meta-analysis of intentional sublobar resections versus lobectomy for early stage non-small cell lung cancer
Cao C, Gupta S, Chandrakumar D, et al. Ann Cardiothorac Surg 2014;3:134-41.

Lobectomy vs Sublobar

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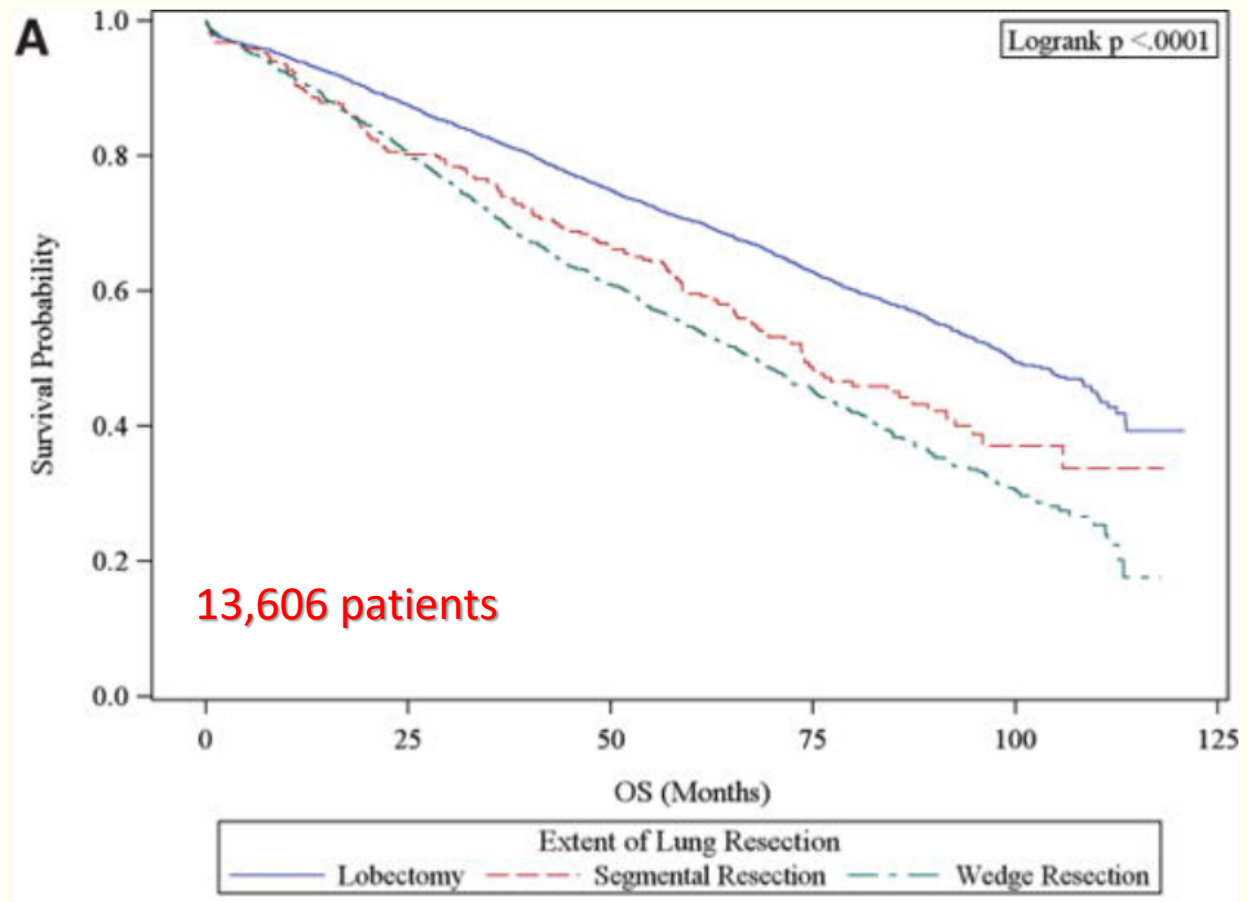

Extent of Lung Resection	No. of Subject	Event	Censored	Median Survival (95% CI)	60 mo Survival
Lobectomy	4857	1847 (38%)	3010 (62%)	99.5 (96.8, 105)	70.4% (69.0%, 71.7%)
Segmental Resection	286	147 (51%)	139 (49%)	74 (65.7, 87.4)	59.6% (53.5%, 65.2%)

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Survival After Sublobar Resection versus Lobectomy for Clinical Stage IA Lung Cancer
An Analysis from the National Cancer Data Base
Onkar V. Khullar et al - J Thorac Oncol. 2015 Nov; 10(11): 1625–1633.

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Ongoing trials

Sublobar resection versus lobectomy in Surgical Treatment of Elderly Patients with early-stage non-small cell lung cancer (STEPS): study protocol for a randomized controlled trial

Fan Yang, Xizhao Sui, Xiuyuan Chen, Lixue Zhang, Xun Wang, Shaodong Wang and Jun Wang

***Trials*201617:191 NCT02360761.**

JCOG1708	III	Sublobar resection versus lobectomy for patients with resectable stage I non-small cell lung cancer with idiopathic pulmonary fibrosis: a phase III study evaluating survival (JCOG1708,SURPRISE trial)

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

Kenichi Nakamura, Hisashi Saji, Ryu Nakajima, Morihito Okada, Hisao Asamura, Taro Shibata, Shinichiro Nakamura, Hirohito Tada, Masahiro Tsuboi

Updated Guidelines

Η ανατομική εκτομή είναι η προτιμότερη για την πλειονότητα των ασθενών με NSCLC.

Η περιορισμένη (sublobar) εκτομή θα πρέπει να επιτυγχάνει όρια εκτομής

- **> 2cm ή**
- **> από την μέγιστη διάμετρο του όγκου.**

Κατά την διενέργεια περιορισμένης (sublobar) εκτομής
θα πρέπει να λαμβάνεται ικανοποιητική δειγματοληψία
λεμφαδενικών σταθμών N1 και N2,
εφόσον αυτό είναι τεχνικά εφικτό,
χωρίς να αυξάνει τον χειρουργικό κίνδυνο.

Η ανατομική τμηματεκτομή (προτιμάται) ή η σφηνοειδής εκτομή
είναι κατάλληλες σε επιλεγμένους ασθενείς για τους ακόλουθους λόγους:

- **φτωχή αναπνευστική επάρκεια ή**
- **σημαντική συνοσηρότητα που αντενδεικνύουν την λοβεκτομή**
- **περιφερικός (στο έξω 1/3μόριο του παρεγχύματος) όζος < 2cm που να συνδυάζει τουλάχιστον ένα από τα παρακάτω:**
  - **αμιγές in situ αδενοκαρκίνωμα**
  - **μορφολογία οζιδίου με > 50% εικόνα θολής υάλου στην CT**
  - **απεικονιστική επιβεβαίωση ότι ο χρόνος διπλασιασμού του όγκου > 400 μέρες**

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Conclusions

In an enhanced national dataset
representative of outcomes for stage IA NSCLC,

sublobar resection was associated
with a 39% increased risk of cancer recurrence.

The majority of patients treated
with sublobar resection
had an inadequate lymph node assessment.

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Conclusions

Lobectomy remains the golden standard of care

Sublobar resections are promising in stage I

Sleeve resections tend to replace pneumonectomies

New techniques like navigation bronchoscopy are coming to improve diagnostic and planning

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