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EUROPEAN LUNG CANCER CONFERENCE

Geneva, Switzerland
13-16 APRIL 2016

Technical Aspects of Sublobar Resection and Oncological Indications

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TOKYO 2020
APPLICANT CITY

IASLC
18th World Conference on Lung Cancer
2017, Yokohama, Japan

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Technical Aspects of Sublobar Resection and Oncological Indications

Disclosures:

Lecture fee from (greater than 5,000 USD)

1. **Johnson and Johnson, Co.**
2. **Covidien Japan, Co.**

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Evolution of Lung Cancer Surgery

No Surgical Indication


Evarts A. Graham

Pneumonectomy

30 Years

Lobectomy

- **Nissen: First successful left-sided pneumonectomy as a two-stage procedure (1930)**
- **Graham and Singer: First successful en bloc left pneumonectomy for lung cancer (1933)**
- **Overholt: First successful en bloc right pneumonectomy for carcinoid tumor (1935)**

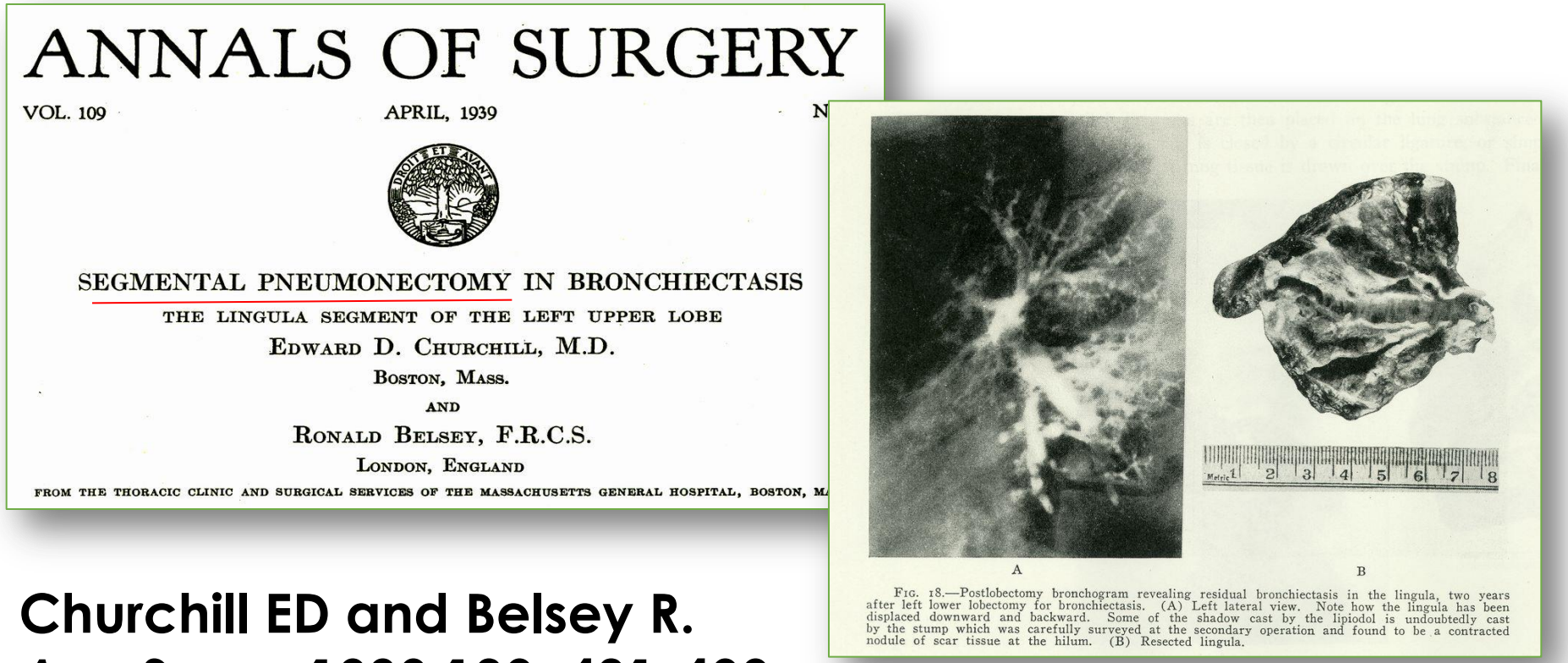
Cahan W. “Radical lobectomy” (1962)

30 Years

Limited resection

Lung Cancer Study Group (Ginsberg RJ). Randomized trial of lobectomy versus limited resection for T1N0 non-small cell lung cancer. (1995)

History of Segmentectomy: "Segmental pneumonectomy" by Churchill



ANNALS OF SURGERY

VOL. 109 APRIL, 1939 N

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, MA

A B

FIG. 18.—Postlobectomy bronchogram revealing residual bronchiectasis in the lingula, two years after left lower lobectomy for bronchiectasis. (A) Left lateral view. Note how the lingula has been displaced downward and backward. Some of the shadow cast by the lipiodol is undoubtedly cast by the stump which was carefully surveyed at the secondary operation and found to be a contracted nodule of scar tissue at the hilum. (B) Resected lingula.

Churchill ED and Belsey R.
***Ann Surg* 1939;109: 481-499**

A report on 86 patients who underwent lingular segmentectomy for bronchiectasis at MGH.

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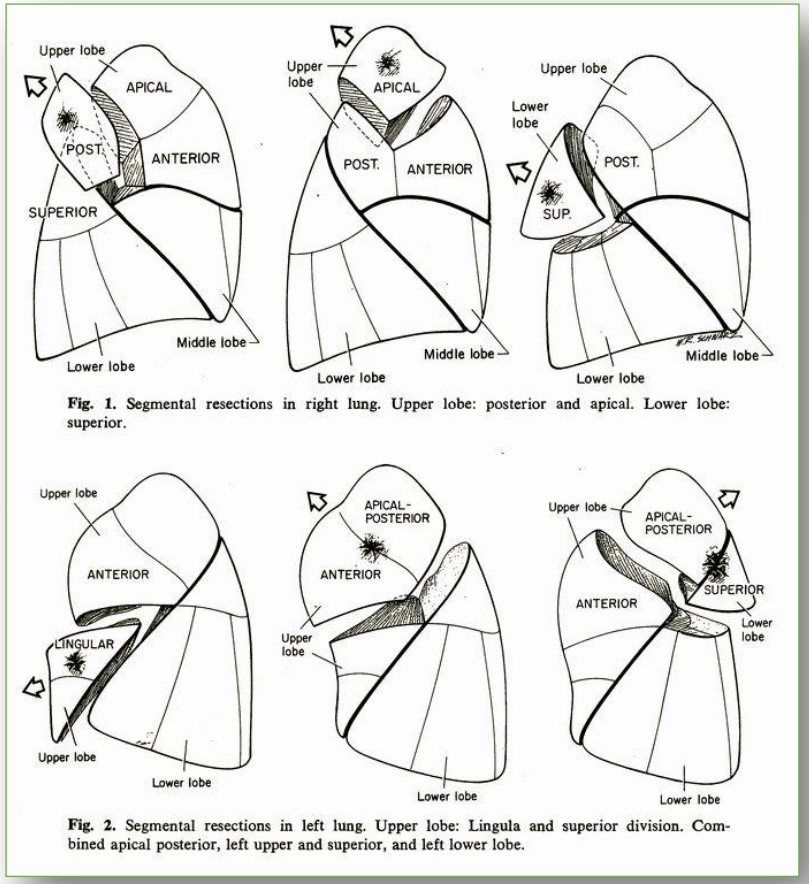
History of Segmentectomy: Segmentectomy for Lung Cancer by Jensik



Segmental resection for lung cancer

A fifteen-year experience

Robert J. Jensik, M.D., L. Penfield Faber, M.D., Frank J. Milloy, M.D. (by invitation), and David O. Monson, M.D. (by invitation), Chicago, Ill.

Jensik RJ. *J Thorac Cardiovasc Surg* 1973; 66: 563-572

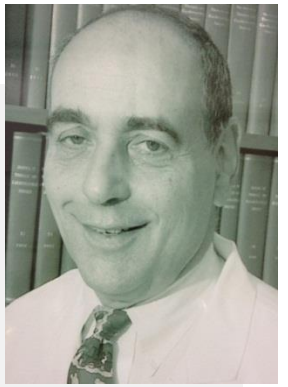
Results:

5YSR: 56%

Local recurrence rate: 10%

Randomized trial of Lobectomy versus Limited Resection for T1N0 Non-small Cell Lung Cancer

Ginsberg RJ, et al. Ann Thorac Surg 1995;60: 615-23

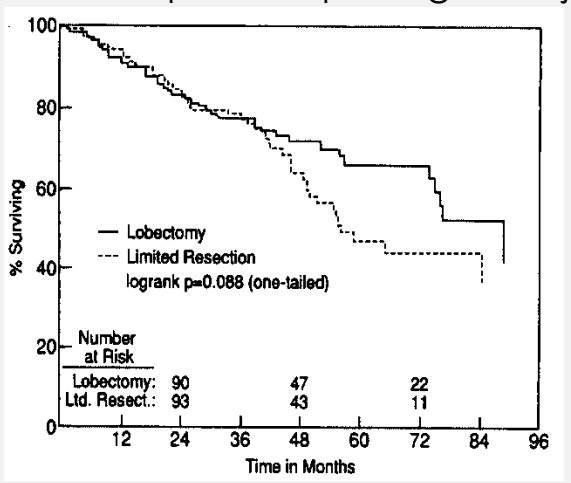


Study cohort: Total 276 pts., 247 pts. eligible for analysis.

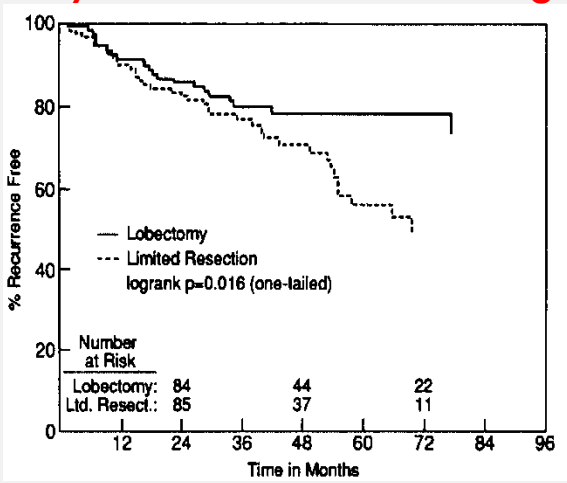
Lob (125), Lim (122, Seg 82, WWR 40)

Results:

- **75% increase in rec rates** (P=0.02), 3 fold increase in local rec rate for Lim (P=0.008).
- **30% increase in overall death rate** (P=0.08), 50% increase in death with cancer rate for Limited.
- Pulmonary function: Follow-up and reporting were judged to **be not totally reliable because funding terminated early.**



Time to Death (p=0.088)



Time to Recurrence (p=0.016)

Conclusions:

(1) Lim does not confer improved perioperative morbidity/mortality/late postoperative pulmonary function.

(2) Because of the higher death rate and locoregional rec rate associated with Lim, Lob still must be considered the surgical procedure of choice for pts. with peripheral T1N0 NSCLC.

Survival after Sublobar Resection versus Lobectomy for Clinical Stage IA Lung Cancer. An analysis from the Natioma; Cancer Data Base

Khullar OV, et al. J Thorac Oncol 2015;10: 1625-33

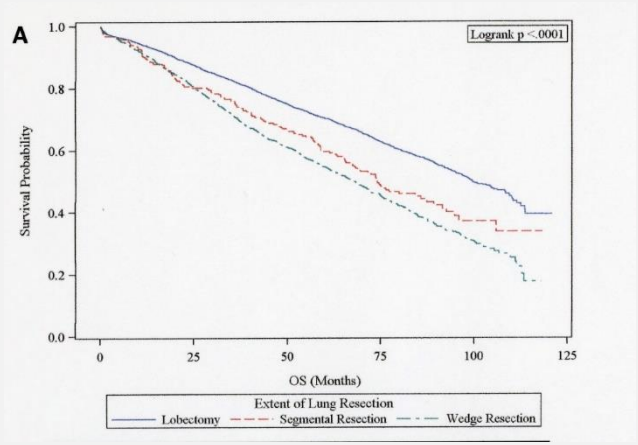
Study cohort:

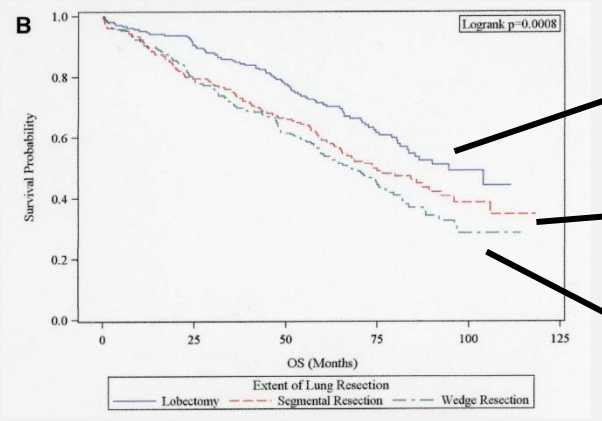
Stage I lung cancer: LOB N=19,718, Wedge resection N=7297, SEG N=1226

Propensity score matched 987 patients each From total 13,606 pts., from National Cancer Data Base (2003-2011).

Results:

- **Significantly worse OS for SEG (HR=1.45) and WR (HR=1.70), both p<0.001**
- **No difference in 30-day mortality**
- **Median OS: 100 (LOB), 74 (SEG), 68 (WR) months (p<0.001).**
- **Sublobar resection was significantly associated with increased likelihood of positive surgical margins, lower likelihood of having more than three LNs examined, and significantly lower rates of nodal upstaging.**





LOB

SEG

WWR

Conclusions:

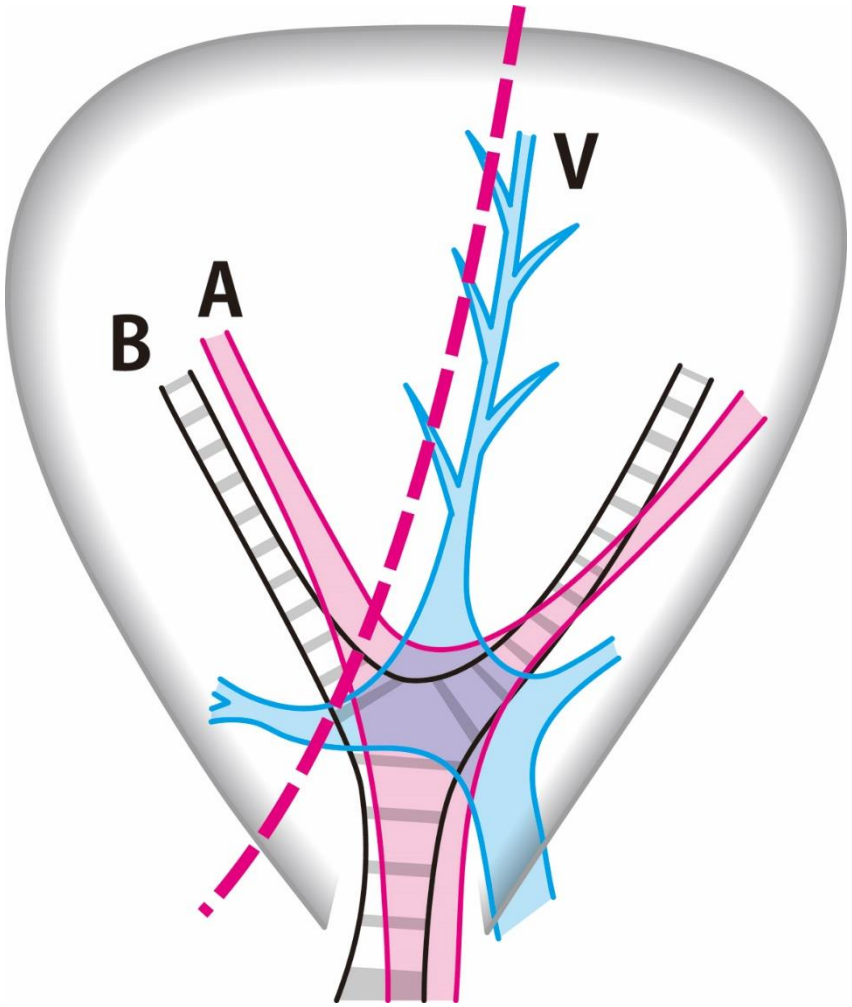
- **Sublobar resection had significantly worse OS for compared with LOB.**
- **Sublobar resections were associated with inadequate Lobectomy and positive surgical margins.**

State of the Art 2016: Surgery

Standard mode of pulmonary resection for lung cancer in 2014

1) At least LOBECTOMY
+
2) Hilar and mediastinal LNS/LND by Open/VATS approach

Anatomical Basis of Segmental Resection

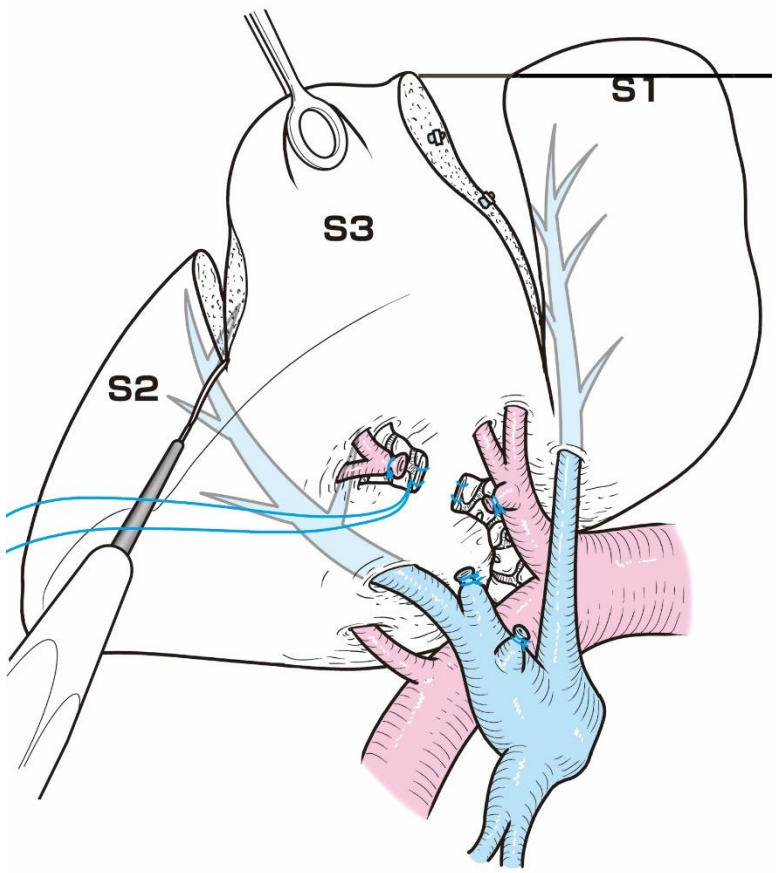


Asamura's Operative Thoracic Surgery

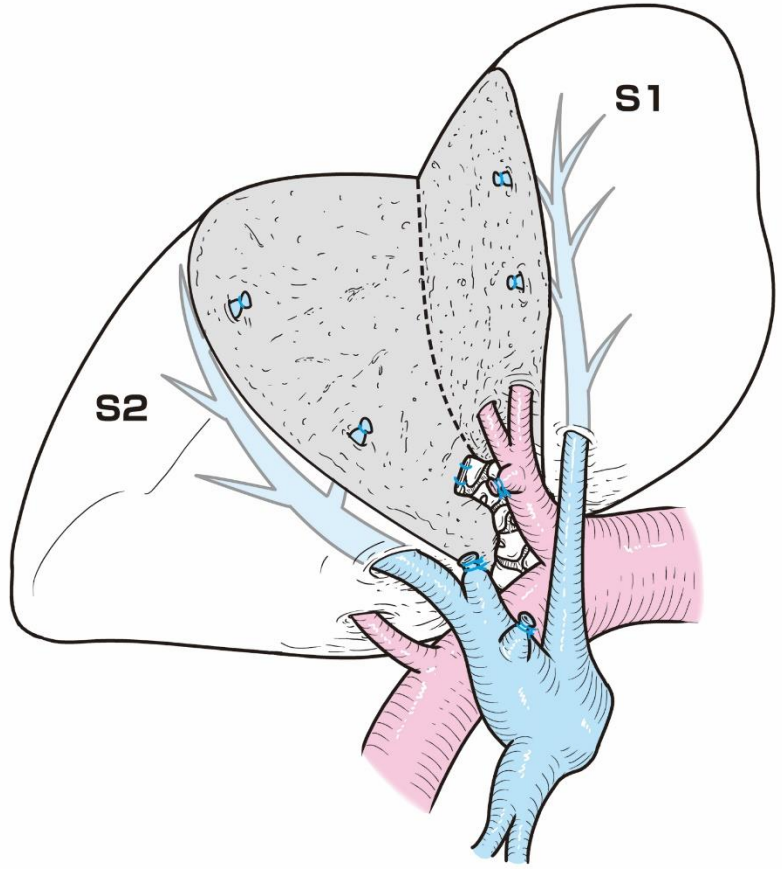
Technique for Segmentectomy :

- **Anatomical** sublobar resection
- Division of bronchus, pulmonary vessels at the **hilum** (not periphery)
- Several technical variations

Anterior Segmentectomy of the Right Upper Lobe



Division on intersegmental plane



After segmental resection

Asamura's Operative Thoracic Surgery

“Intersegmental plane”

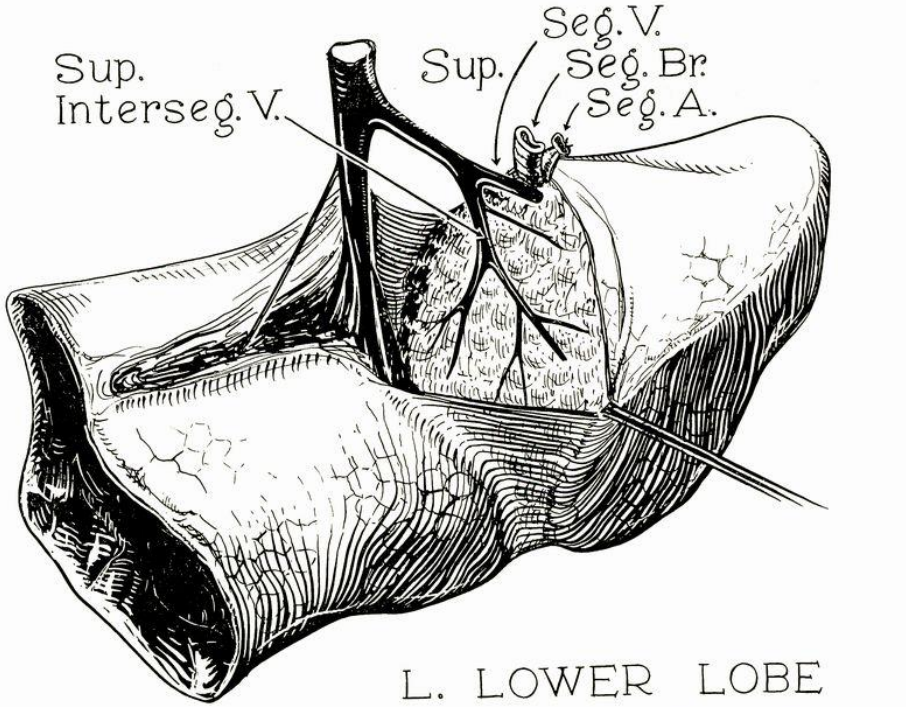


Fig. 3.—This is an anatomic drawing of a dissected specimen illustrating the intersegmental anatomy of a superior segmental resection. The segmental artery and bronchus have been divided. The superior division of the inferior pulmonary vein is shown dividing into a segmental and an intersegmental branch. The intersegmental branch and its tributaries have been followed into the intersegmental plane separating the superior division from the basal segments. Just the pleura remains undivided between the two portions. The vein labeled "Segmental Vein" is the common trunk formed by the branches draining the three subsegments of the superior segment. These branches are both intersegmental and segmental.

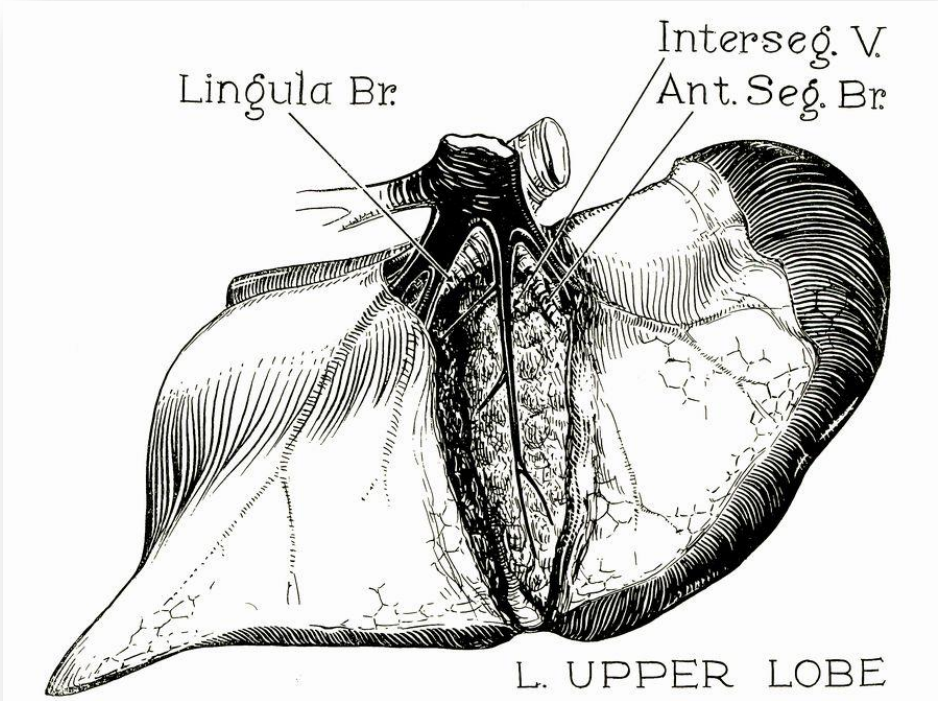
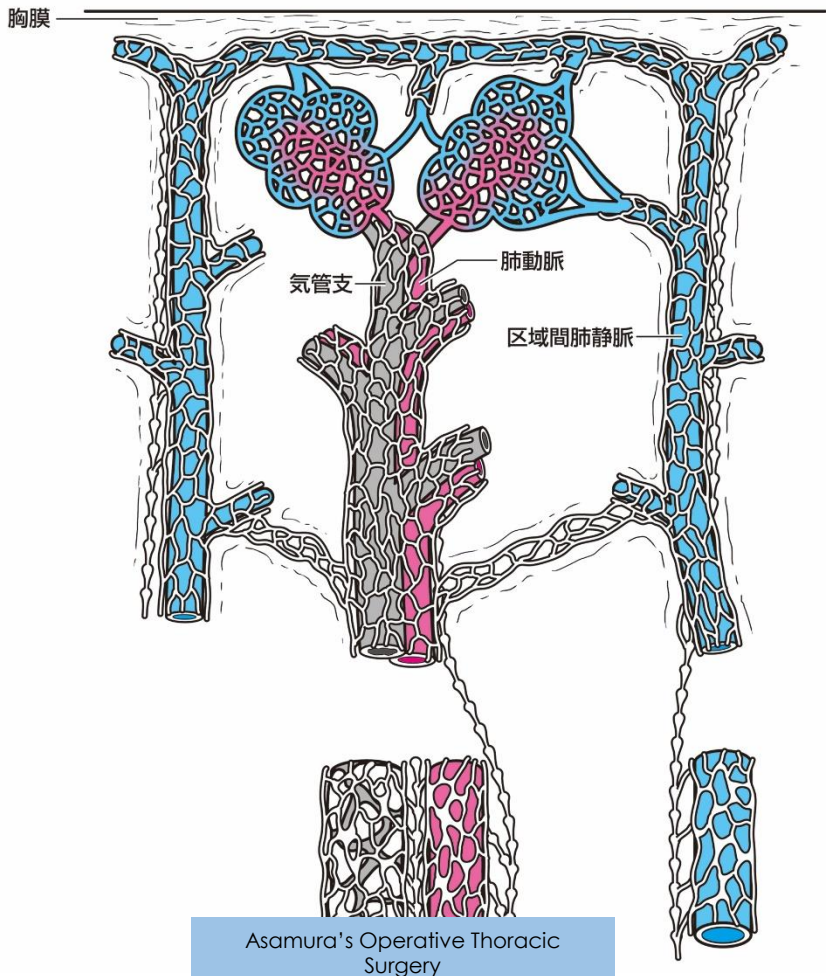


Fig. 4.—This drawing of a dissected specimen demonstrates the intersegmental vein which delineates the plane of dissection between the lingula and the anterior segment. The bronchi of the lingula and of the anterior segment can be seen on either side. Several subpleural veins are illustrated.

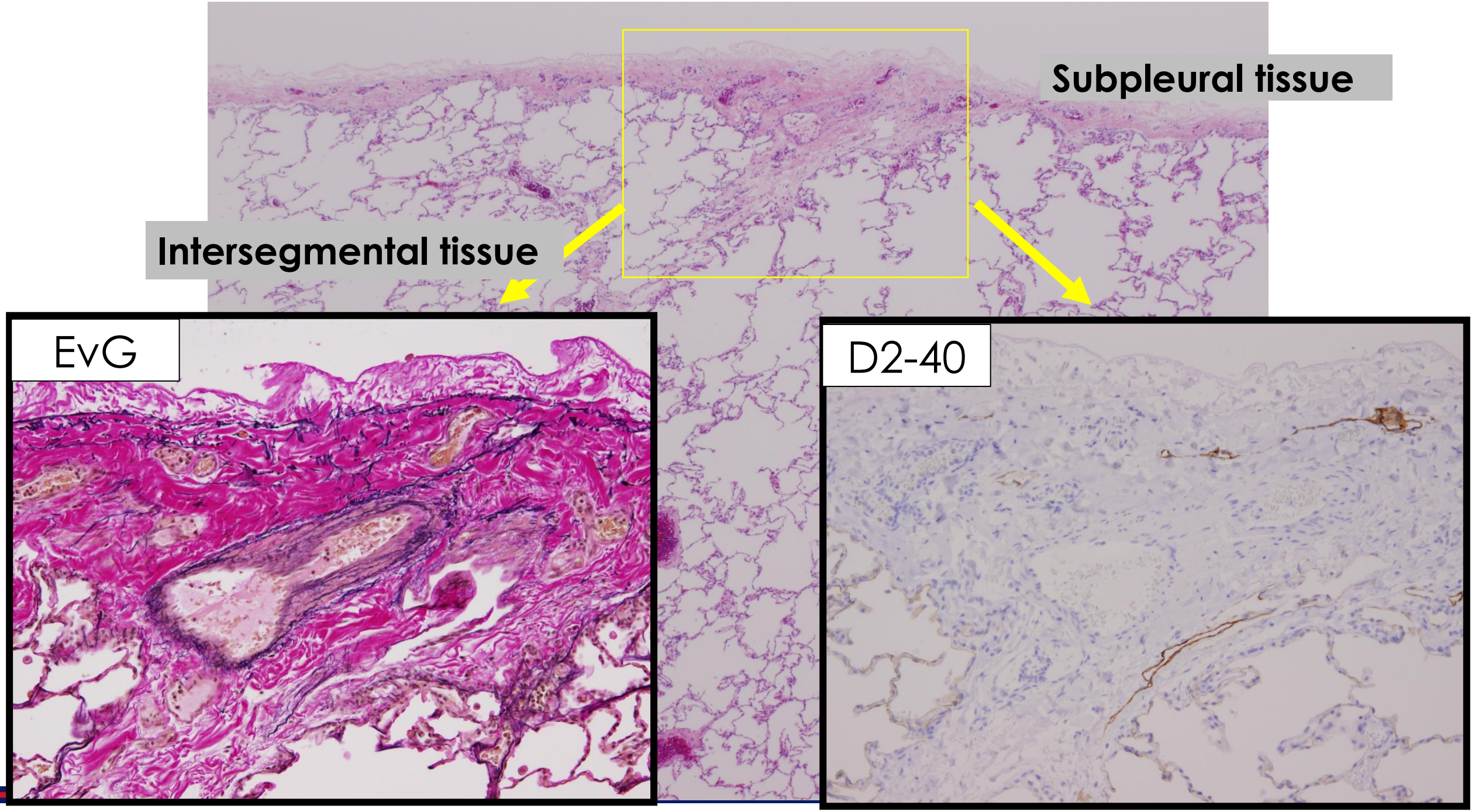
Ramsay BH. The anatomic guide to the intersegmental plane. *Surgery* 1948: 533-538

How to Deal with Intersegmental Veins?:

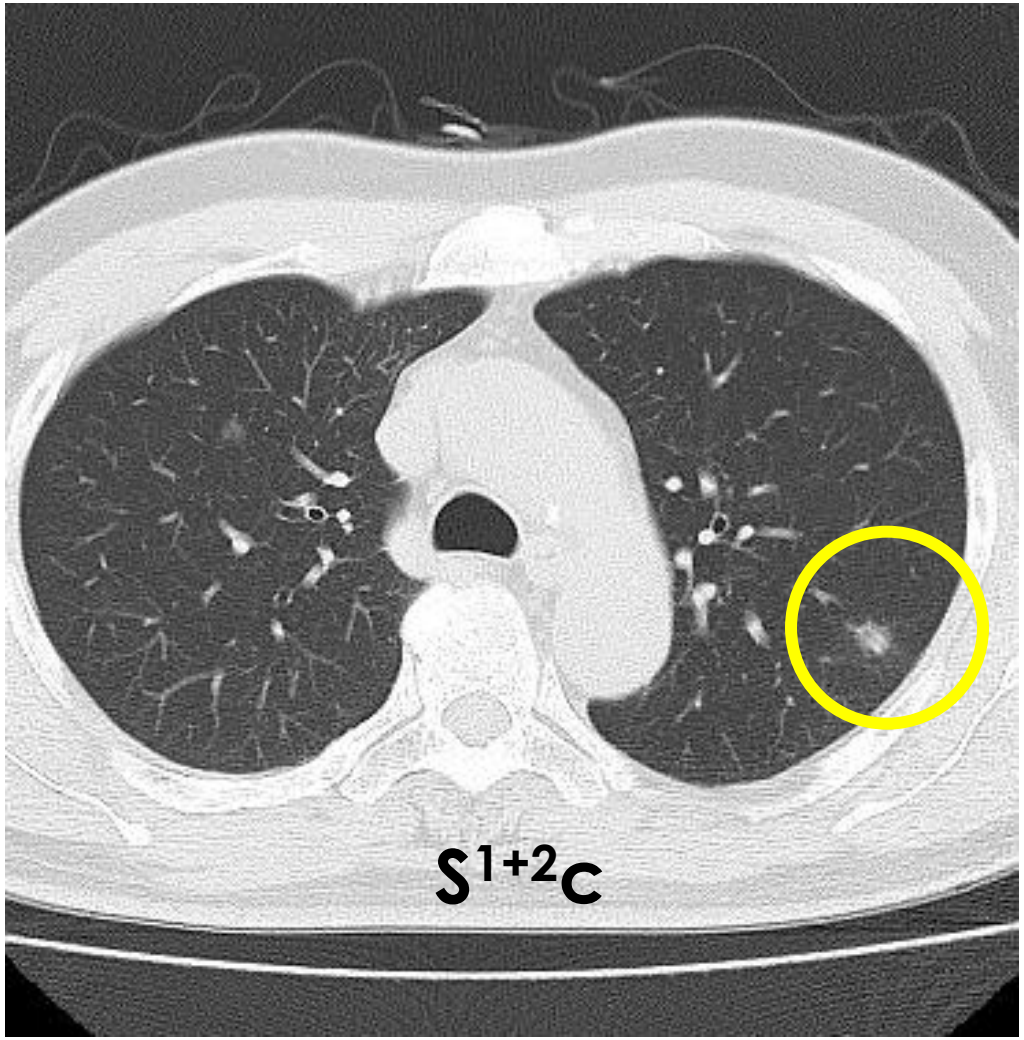
A Cautious Note on Lymphatics in the Lung



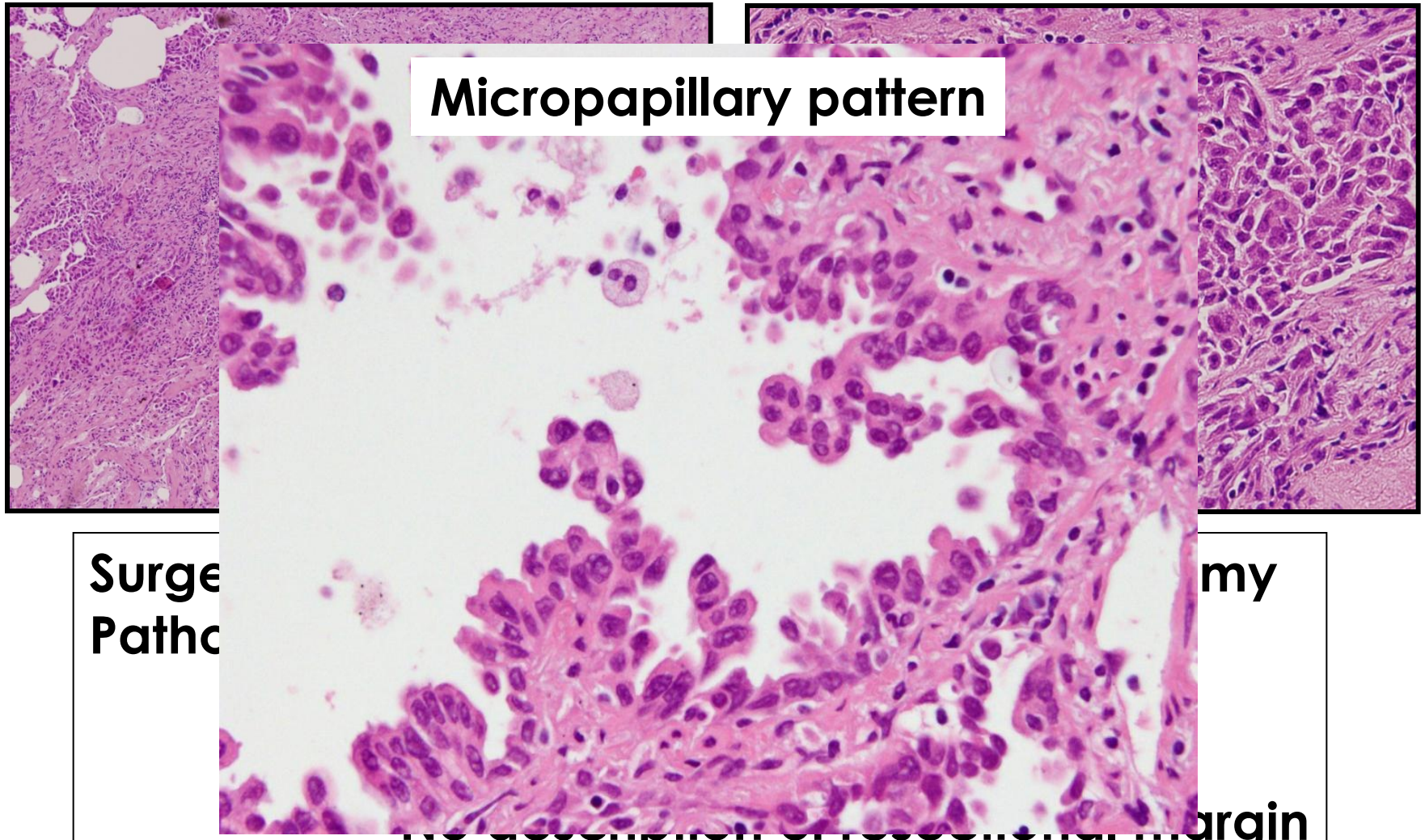
Asamura's Operative Thoracic Surgery


Subpleural tissue
Intersegmental tissue
EvG
D2-40

Worst Scenario after Segmentectomy (First surgery at another hospital)



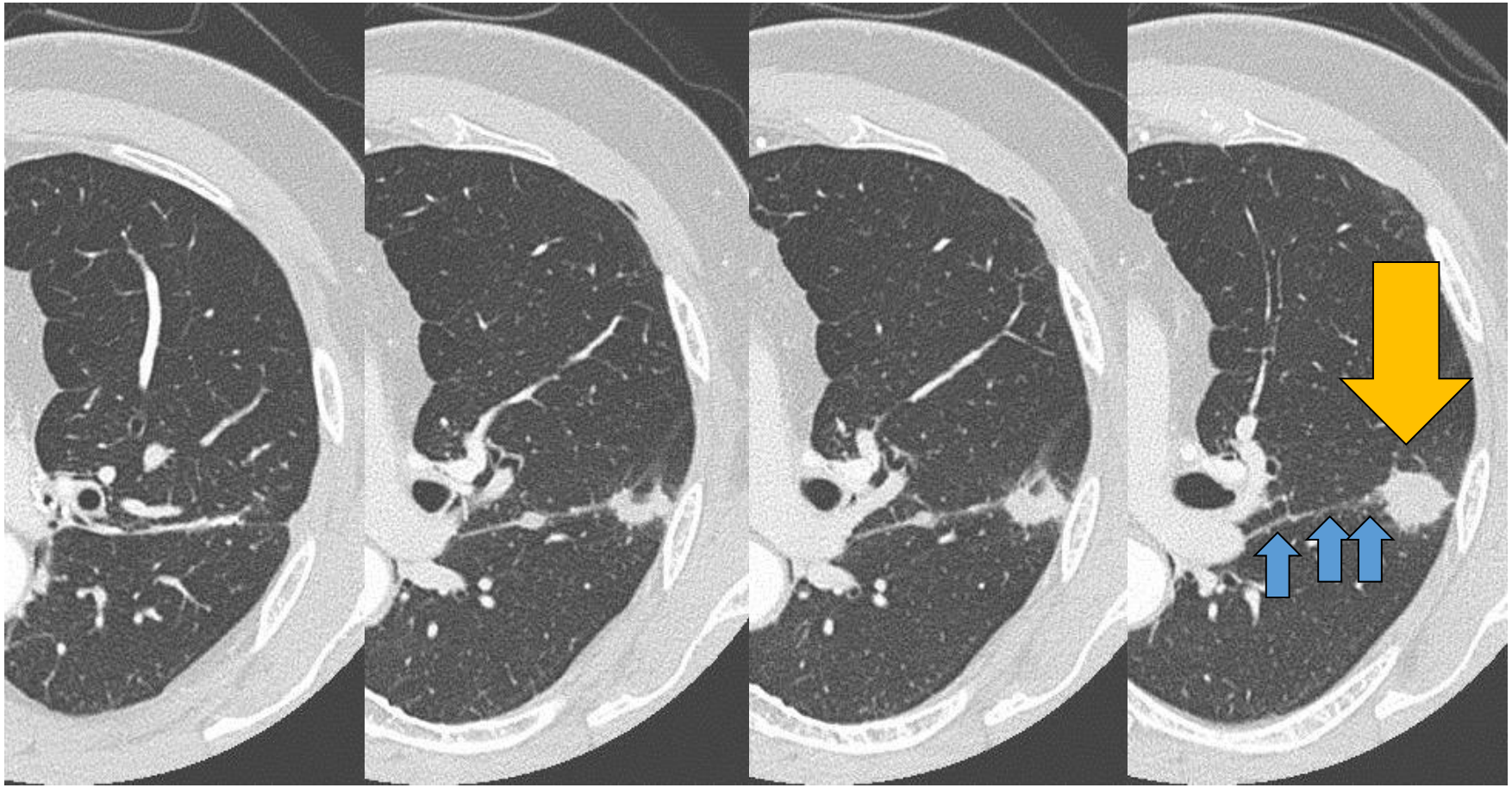
Pathology at Initial Surgery



Surge my
Patho

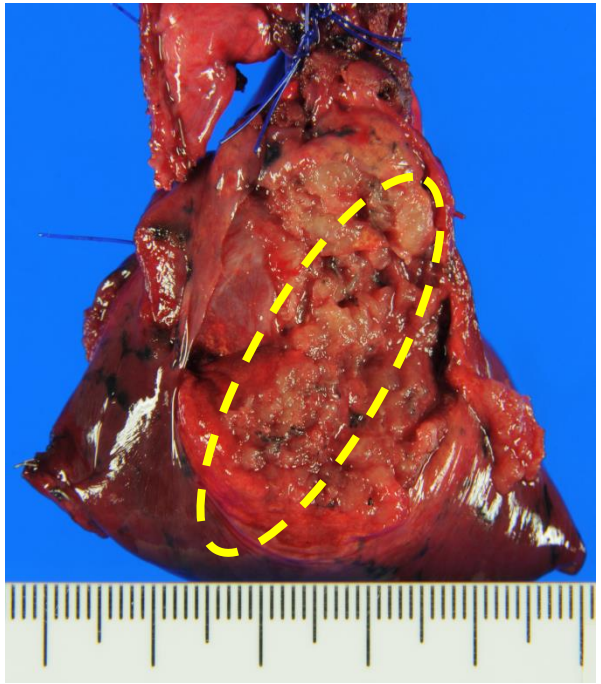
argin

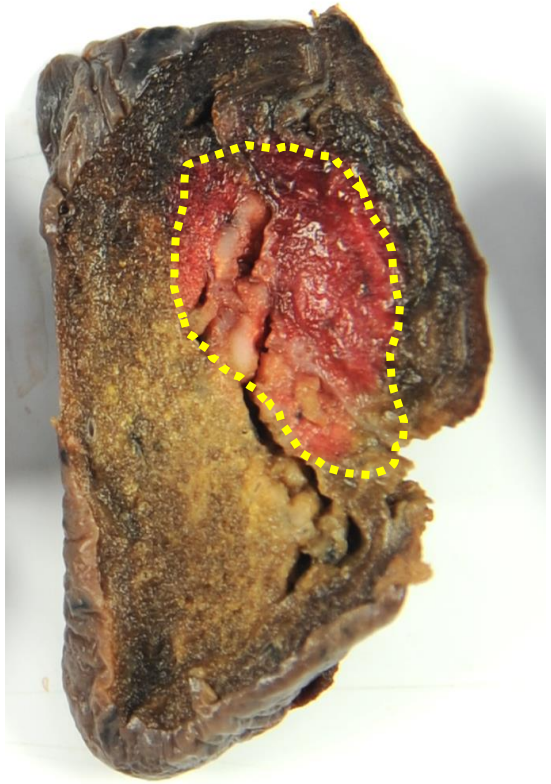
CT Findings 43 Months after Surgery



A new nodule on the staple line

Completion Pneumonectomy





Tumor included surgical staples in the center.

Summary of This Case

- Segmentectomy performed at previous hospital was technically inappropriate, leaving cancer cells behind (incomplete segmentectomy) probably on the staple lines.

- **Penny wise and pound foolish.**

  tight adhesion at the interlobar fissure around pulmonary artery.

- This patient would not have had tumor recurrence, if he had had lobectomy at the first operation.

Pro and Con for Lob & Sub-Lob Resection for T1N0 NCLC

Table 6. Summary of Studies Comparing Sublobar With Lobar Resection for Stage I Non–Small Cell Lung Cancer

Study	Sublobar Resection			Lobar Resection		
	N	5-year Survival (%)	Local Recurrence (%)	N	5-year Survival (%)	Local Recurrence (%)
Pro lobar resection						
LCSG [15]	122	44	17.2[a]	125	65[a]	6.4
Warren [22]	66	43	22.7[a]	103	67[a]	4.9
Miller [23]	25	33	7	75	71[a]	11
Martini [24]	62	59	50[a]	511	77[a]	24
Pro sublobar resection						
Errett [25]	100	69	NA	97	75	NA
Pastorino [26]	61	55	36	411	49	38
Read [27]	113	84	4.4	131	74	11.5
Landreneau [28]	102	62	19[a]	117	70	9
Okada [17]	130	91	NA	132	78	NA
Kodama [29]	46	93	2.2	77	88	1.3
Koike [30]	74	89	2.7	159	90	1.3

[a] Statistically significant.

LCSG = Lung Cancer Study Group; NA = not available.

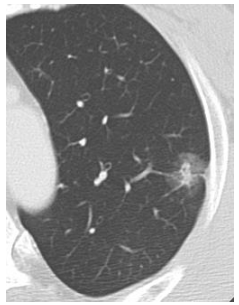
El-Sherif et al. Ann Thorac Surg 2006; 82: 408-16

Worst Scenario

More segmentectomies, more recurrences.

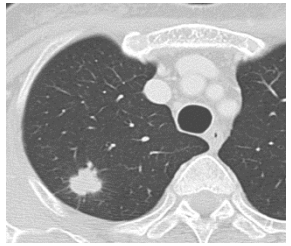
A JCOG Strategy for Small Lung Cancers

JCOG0102 → Radiological study to define noninvasive adenocarcinoma on TSCT



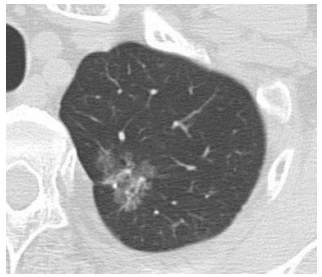
JCOG0804 → One-arm, WWW/Seg (phase II)

T=< 2cm



JCOG0802 → Lob vs. Seg (phase III)

T=< 2cm



JCOG1211 → One-arm, Seg (phase II)

2<T=< 3cm

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A Prospective Radiological Study of Thin-Section Computed Tomography to Predict Pathological Noninvasiveness in Peripheral Clinical IA Lung Cancer (Japan Clinical Oncology Group 0201)

Kenji Suzuki, MD, Teruaki Koike, MD, Takashi Asakawa, BSc, Masahiko Kusumoto, MD, Hisao Asamura, MD, Kanji Nagai, MD, Hirohito Tada, MD, Tetsuya Mitsudomi, MD, Masahiro Tsuboi, MD, Taro Shibata, MSc, Haruhiko Fukuda, MD, and Harubumi Kato, MD, On behalf of the Japan Lung Cancer Surgical Study Group (JCOG LCSSG)

JCOG0102

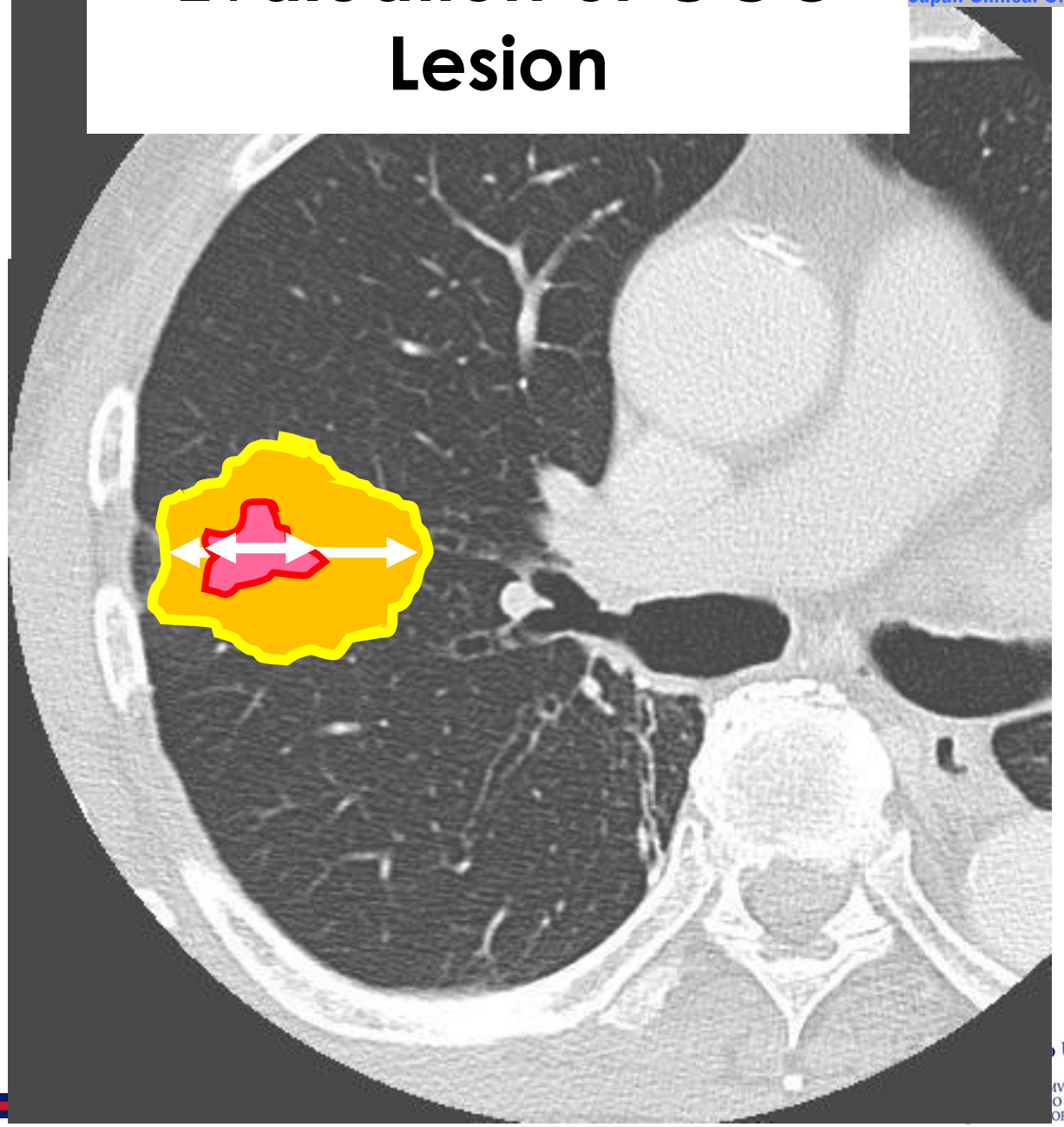
Consolidation/ Tumor ratio (CTR) = C/T

Consolidation (C): Solid part only

Tumor (T): GGO as a whole

Evaluation of GGO Lesion

JCOG
Japan Clinical Oncology Group



University

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Japan Clinical Oncology Group

JCOG0102

Prognostic Determinants for Adenocarcinomas with/without GGO Components

- Tumor size
- Size of "solid part"

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Radiological noninvasive cancer:

- T1a (<2.0 cm)
  - CTR<0.25

Asamura H et al. J Thorac Cardiovasc Surg 2013;146:24-30.

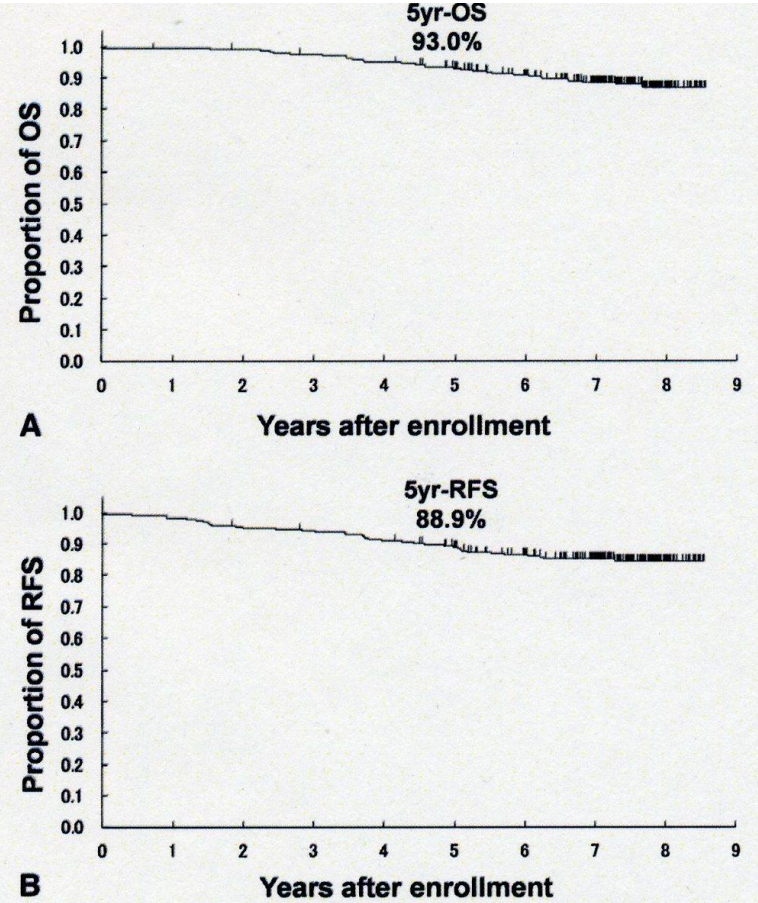

FIGURE 4. Overall (A) and relapse-free (B) survival curves for the cT1a (≤2.0 cm) group (n = 289). *OS*, Overall survival; *RFS*, relapse-free survival.

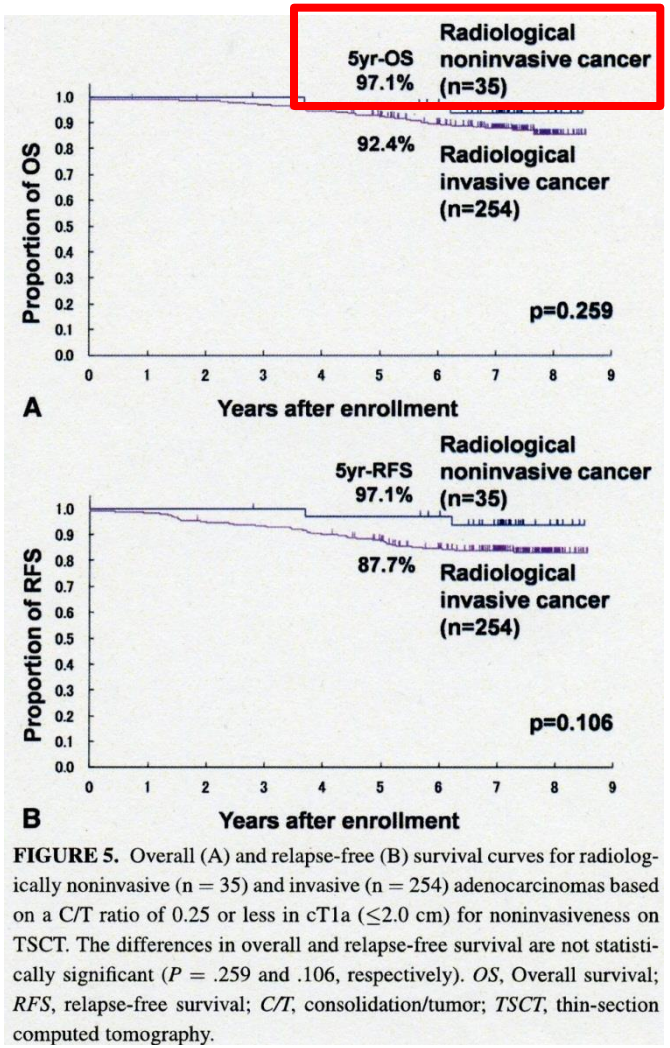

FIGURE 5. Overall (A) and relapse-free (B) survival curves for radiologically noninvasive (n = 35) and invasive (n = 254) adenocarcinomas based on a C/T ratio of 0.25 or less in cT1a (≤2.0 cm) for noninvasiveness on TSCT. The differences in overall and relapse-free survival are not statistically significant (P = .259 and .106, respectively). *OS*, Overall survival; *RFS*, relapse-free survival; *C/T*, consolidation/tumor; *TSCT*, thin-section computed tomography.

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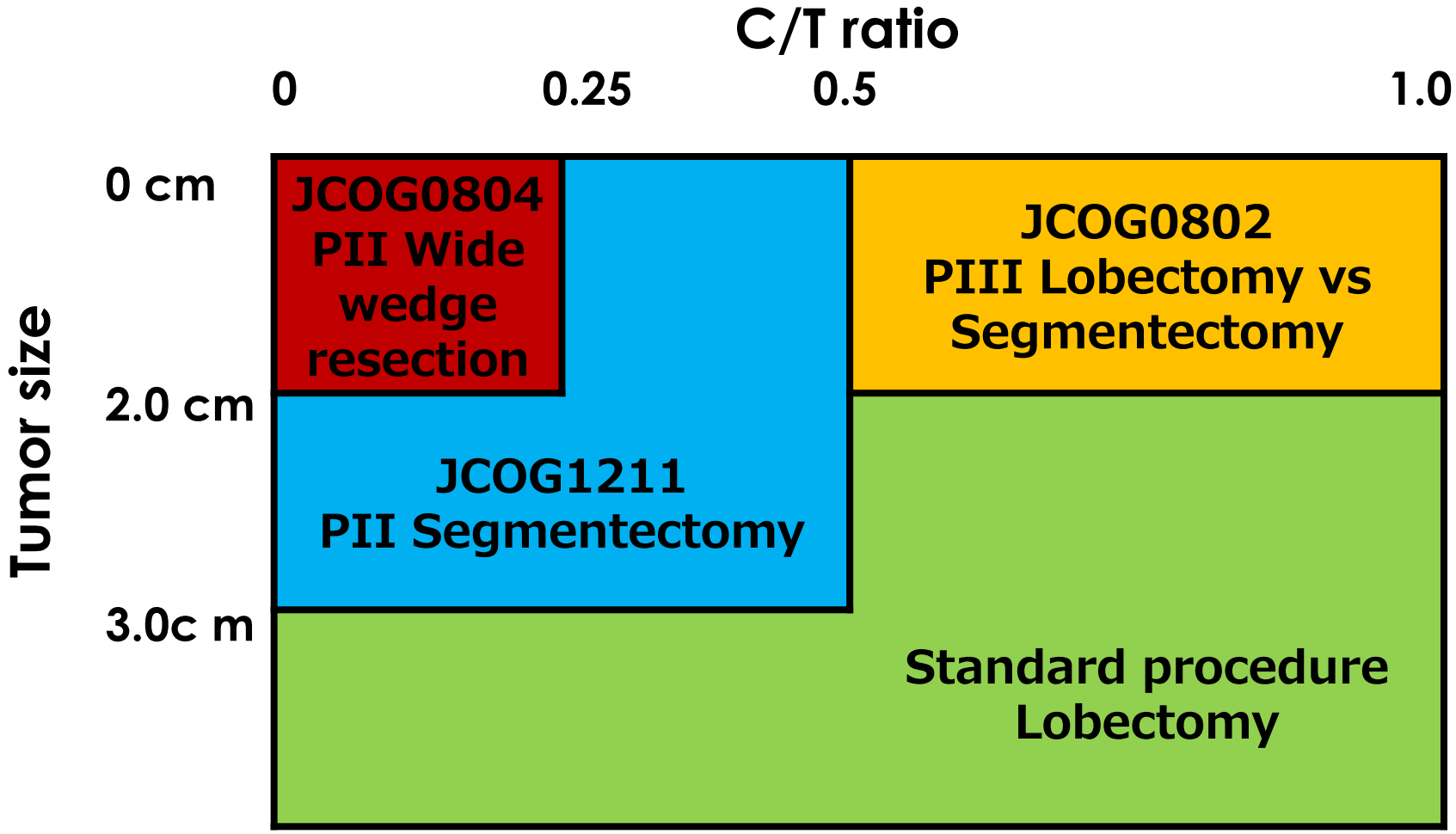

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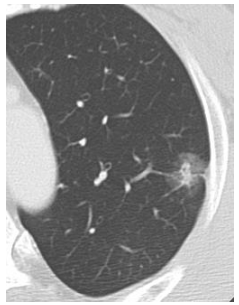
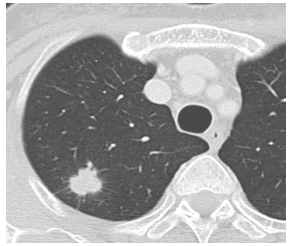
A JCOG Strategy for Small Lung Cancers

JCOG0102 → Radiological study to define noninvasive adenocarcinoma on TSCT



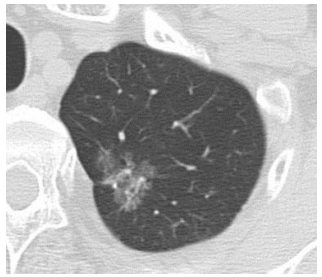
JCOG0804 → One-arm, WWW/Seg (phase II)

T=< 2cm



JCOG0802 → Lob vs. Seg (phase III)

T=< 2cm



JCOG1211 → One-arm, Seg (phase II)

2<T=< 3cm

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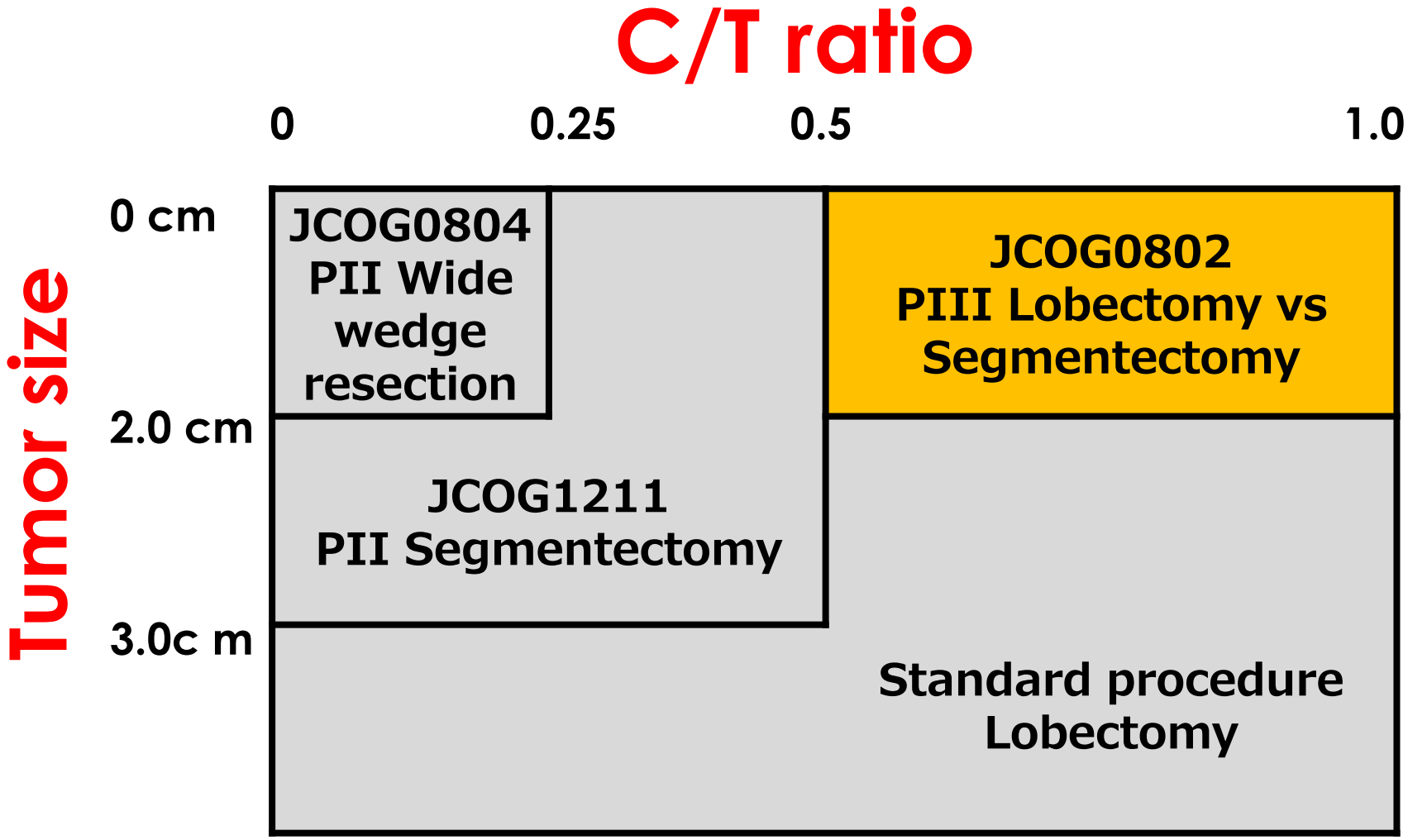
JCOG
Japan Clinical Oncology Group

A JCOG Strategy for Small Lung Cancers



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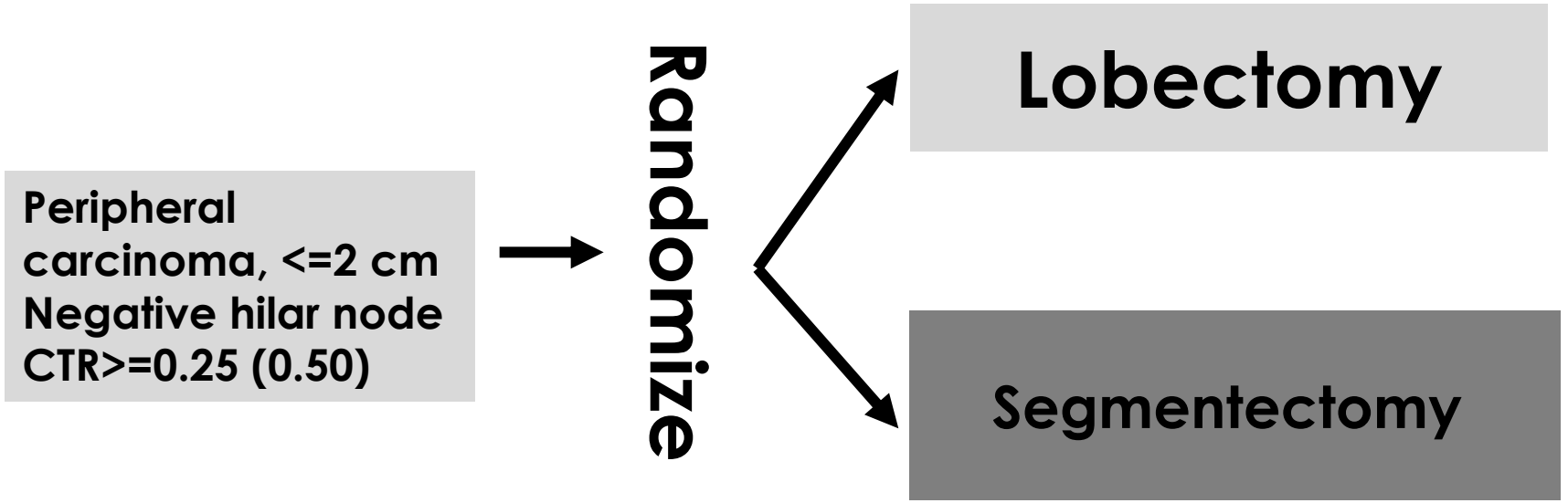
JCOG
Japan Clinical Oncology Group

JCOG0802/WJOG4607: Phase III Randomized Trial between Lobectomy and Limited Resection for Small-sized carcinoma (Part-solid GGO – Solid 2cm or Less)

JCOG0802

Non-inferiority design

PI: Asamura H.



Stratified factors:

- Institute
- Gender
- Histology (Ad vs. Non-ad)
- Solid or non-solid

Endpoints:

Primary: **OS**

Secondary: **pulmonary function**

Sample size: 1,100

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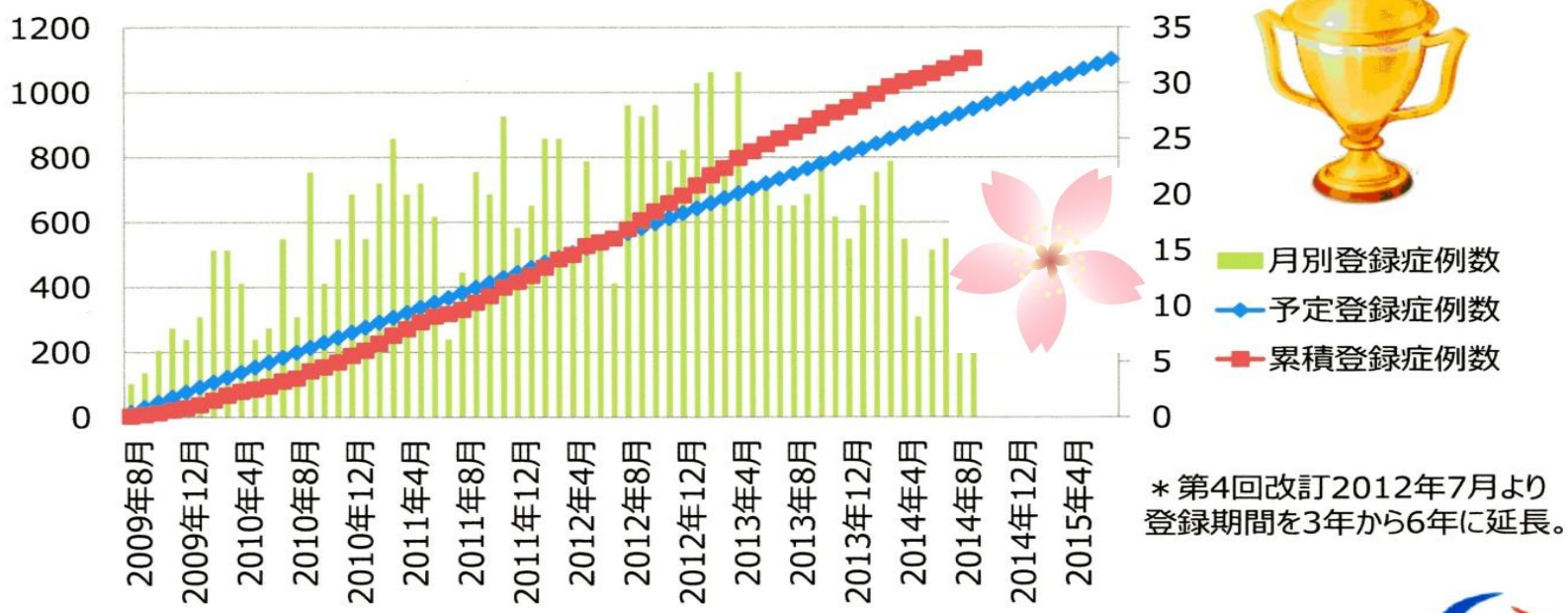
JCOG0802/WJOG4607: Phase III Randomized Trial between Lobectomy and Limited Resection for Small-sized carcinoma (Part-solid GGO – Solid 2cm or Less)

JCOG0802

JCOG0802/WJOG4607L
(Small NSCLC LB vs SG P3)
10月21日をもって登録完了!!!
2次登録数：1106例



＊第4回改訂2012年7月より
登録期間を3年から6年に延長。

JCOG Japan Clinical Oncology Group

WJOG

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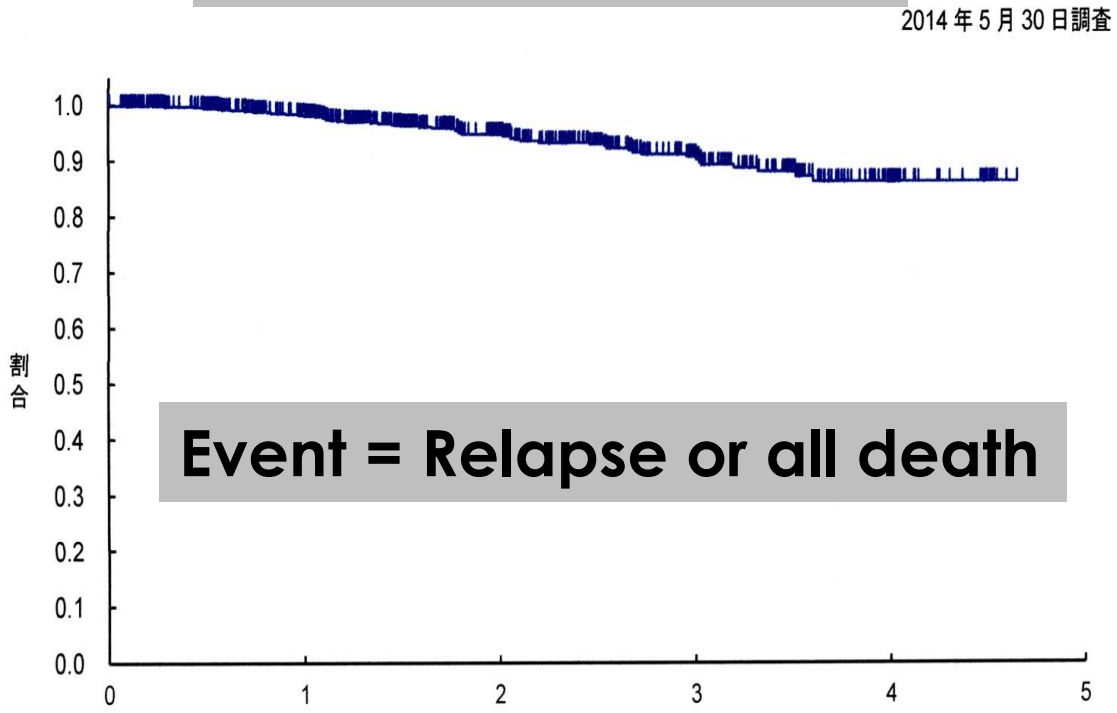
JCOG0802/WJOG4607: Phase III Randomized Trial between Lobectomy and Limited Resection for Small-sized carcinoma (Part-solid GGO – Solid 2cm or Less): INTERIM ANALYSIS AS OF MAY, 2014

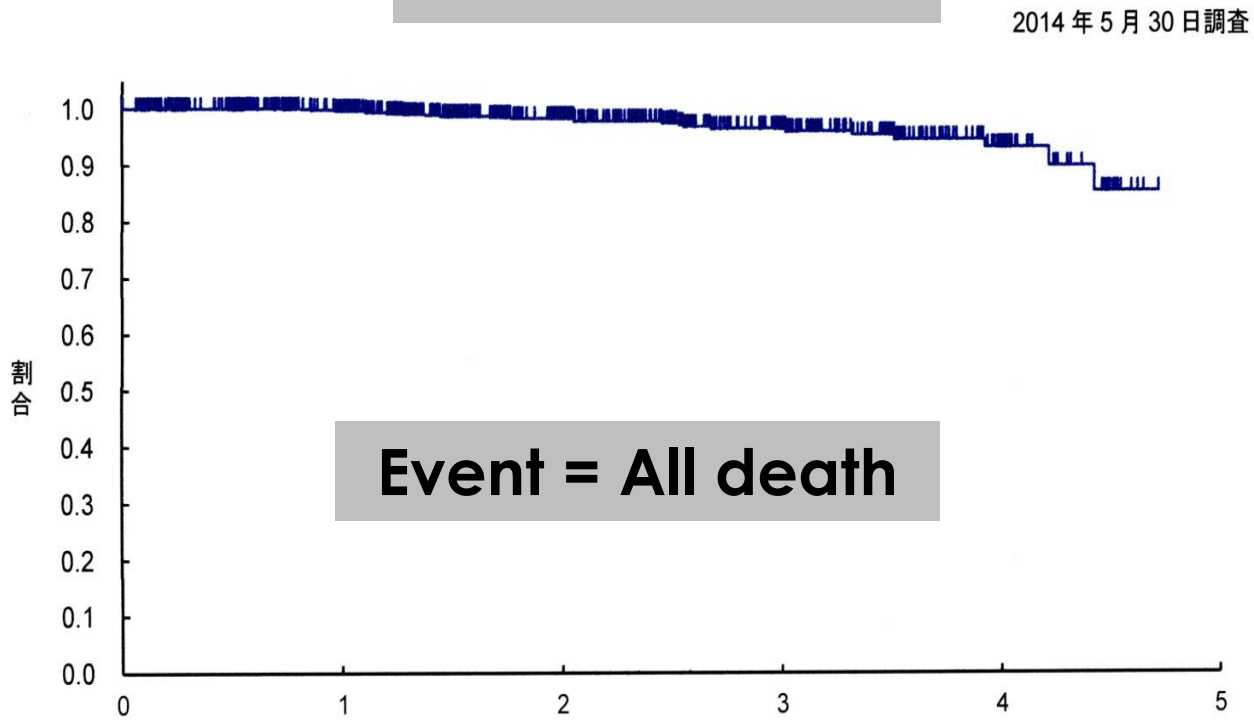
JCOG0802

Relapse free survival



Event = Relapse or all death

Overall survival



Event = All death

Cases analyzed: 888
Event: 53
1 YRFS, 98.2%; 2 YRFS, 94.7%, 3 YRFS, 90.6%; 4 YRFS, 86.0%

Cases analyzed: 888
Event: 23
1 YSR, 99.6%; 2 YSR, 98.1%, 3 YSR, 96.3%; 4 YSR, 92.9%

Logics in Non-inferiority Design for LOB vs. SEG

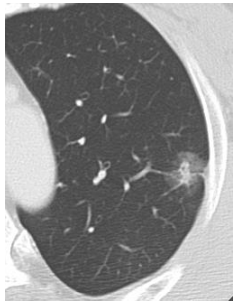
Prognosis	Pulmonary function	Selection (Conclusion)
No difference	SEG better	SEG
No difference	No difference	LOB (Indeterminate)
SEG inferior	SEG better	LOB
SEG inferior	No difference	LOB

SEG wins only when both of two endpoints meet.

A JCOG Strategy for Small Lung Cancers

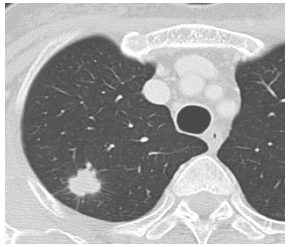
JCOG Japan Clinical Oncology Group

Patient accrual as of 2016



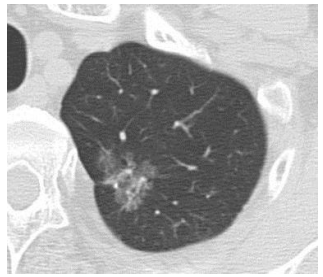
JCOG0804 → One-arm, WWW/Seg (phase II) → Over, full, N=333

T=< 2cm



JCOG0802 → Lob vs. Seg (phase III) → Over, full, N=1,106

T=< 2cm



JCOG1211 → One-arm, Seg (phase II) → Over, full, N=396

2<T=< 3cm

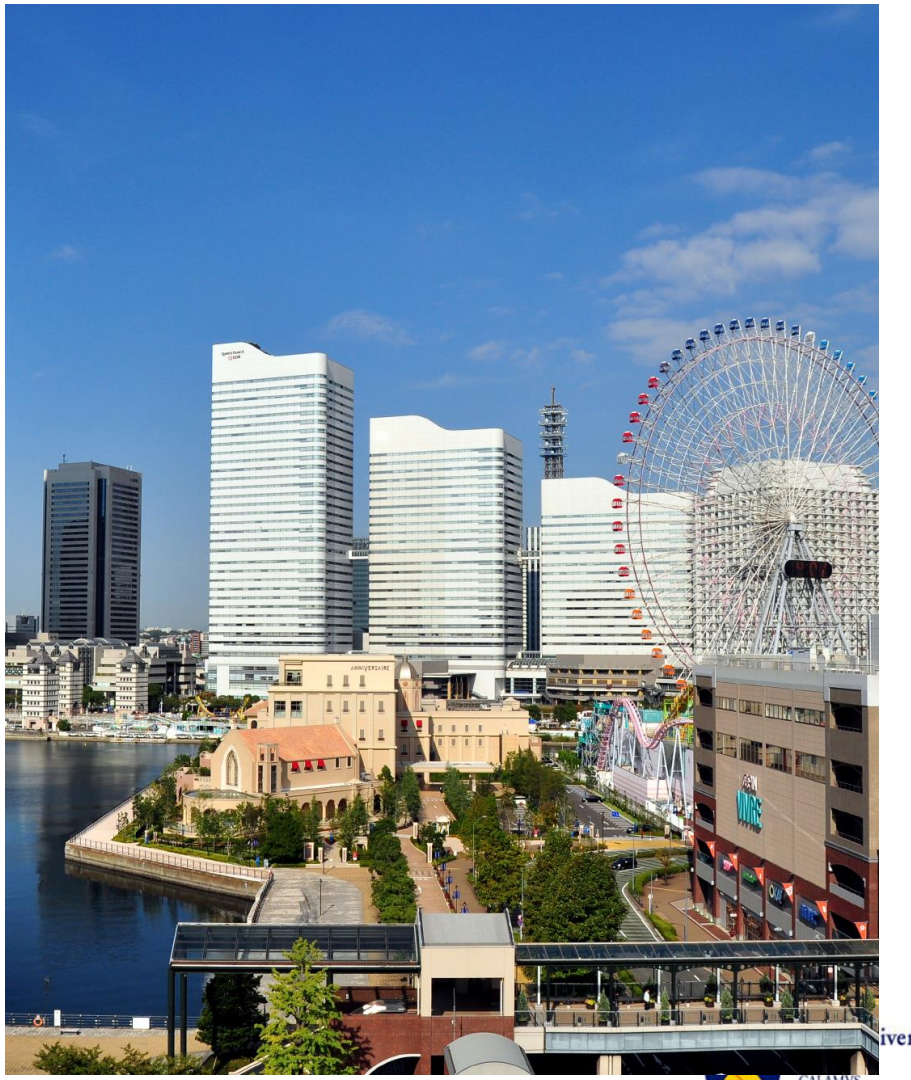
Keio University 1858 CALAMVS GLADIO FORTIOR

Present-day Indication of Limited Resections for Lung Cancer

- Reasonable indication for **compromised patients** with limited pulmonary reserve
- Reasonable indication for **noninvasive carcinomas (GGO-AIS, MIA)**
- Otherwise, better to **stay on LOB** until JCOG/CALGB studies have conclusions for recommendation.

18th World Conference on Lung Cancer (WCLC)

IASLC
18th World Conference
on Lung Cancer
2017, Yokohama, Japan



Pacifico Yokohama, YOKOHAMA, JPN
October 15-18, 2017
Congress Co-Presidents: H. Asamura (J), KC Park (K)

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