CHIRURGIE THOACIQUE ET ONCOLOGIE PULMONAIRE

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Directeur du programme de résidence

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CHUM

PLAN DE LA PRESENTATION:

- Epidémiologie
- Présentation clinique et staging
- Principes de chirurgie oncologique
- Traitement selon stade du cancer
- Segmentectomie
- Traitements néoadjuvants et adjuvant
- Résultats et pronostic

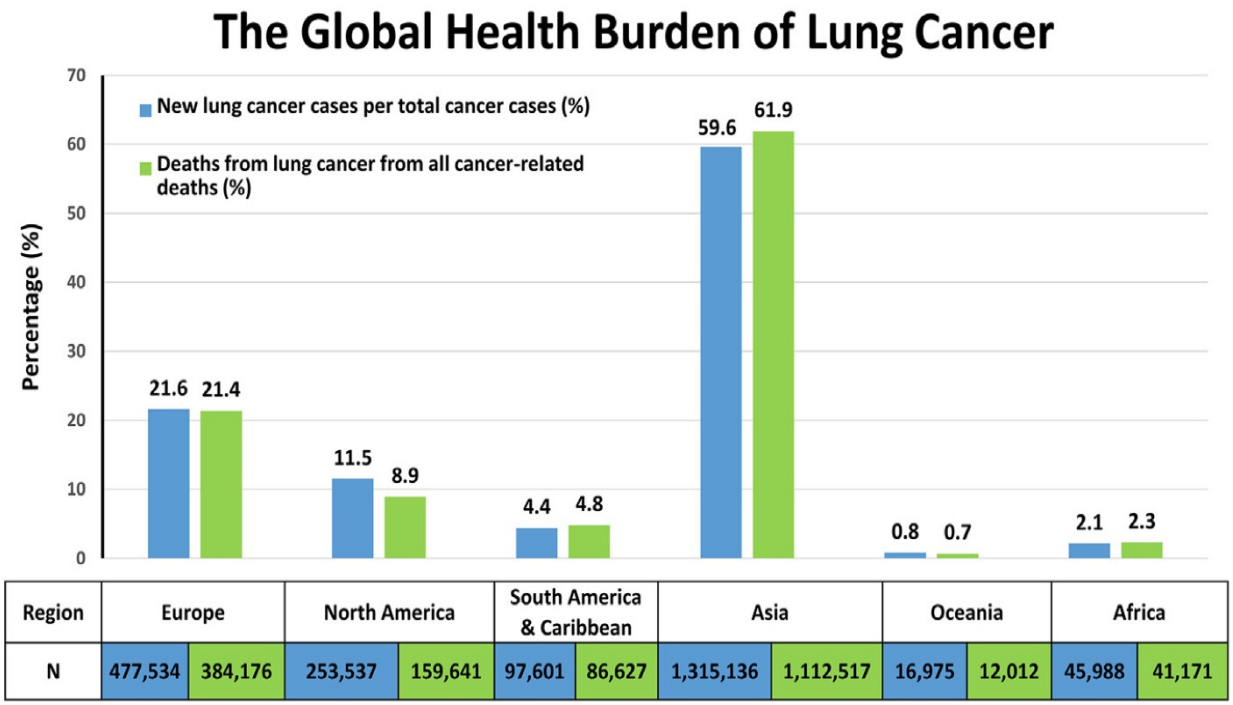


Figure 1. The global health burden of lung cancer. Data by region reported by the World Health Organization Global Cancer Observatory (GLOBOCAN, 2020).[1]

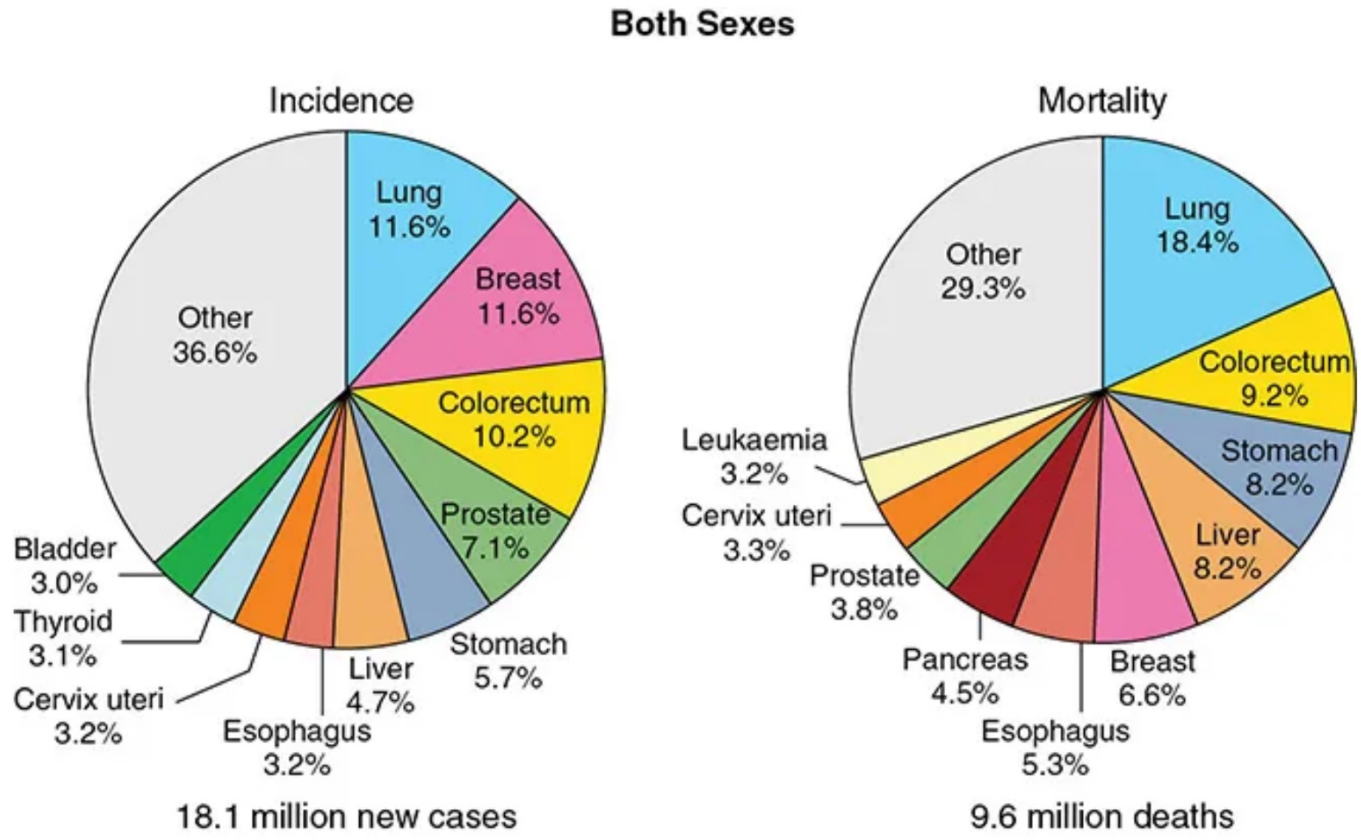
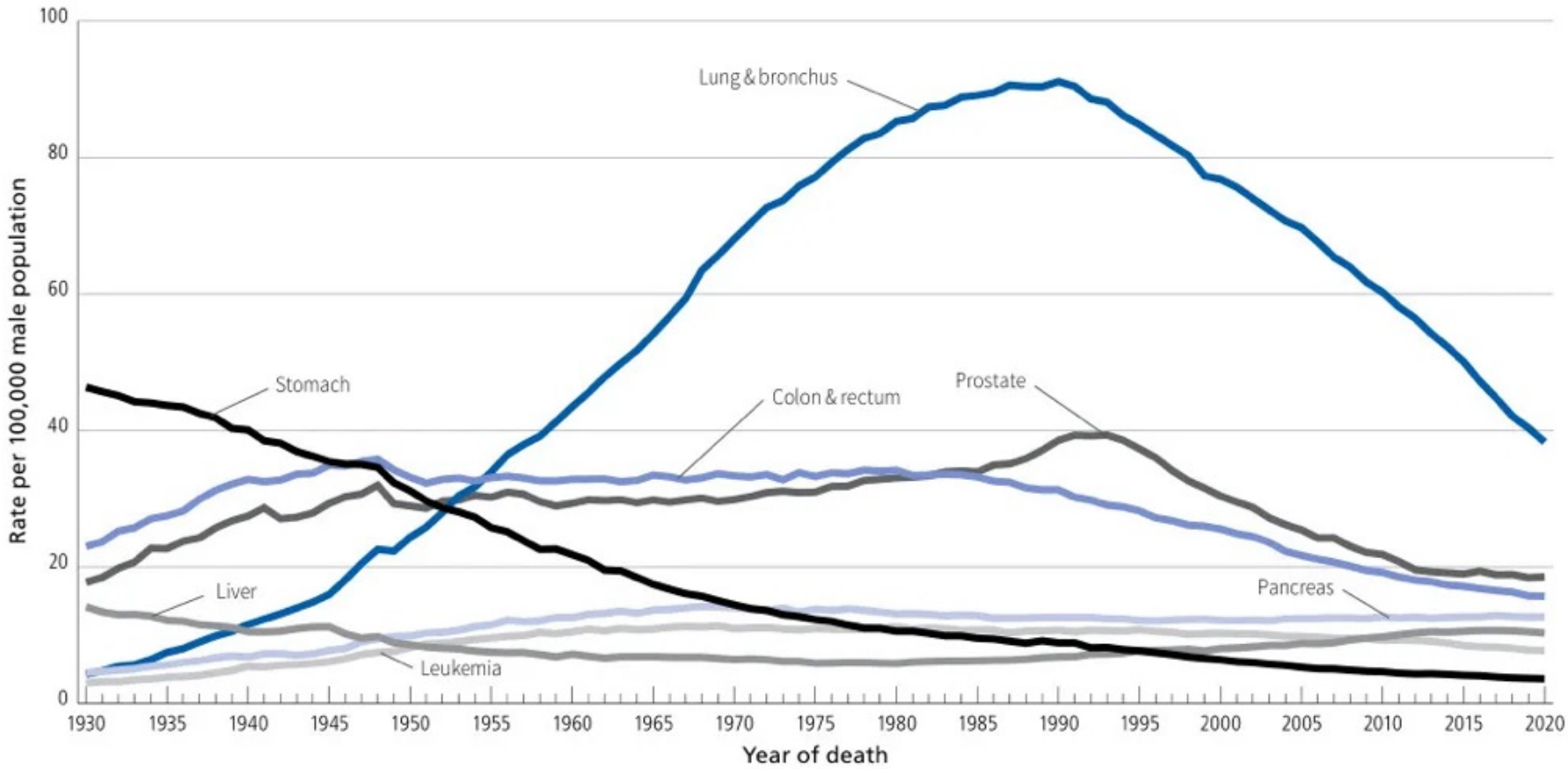


Figure 2-1. Estimated new cancer cases and deaths worldwide. (Reproduced with permission from Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018;68(6):394-424. © 2018 American Cancer Society.)

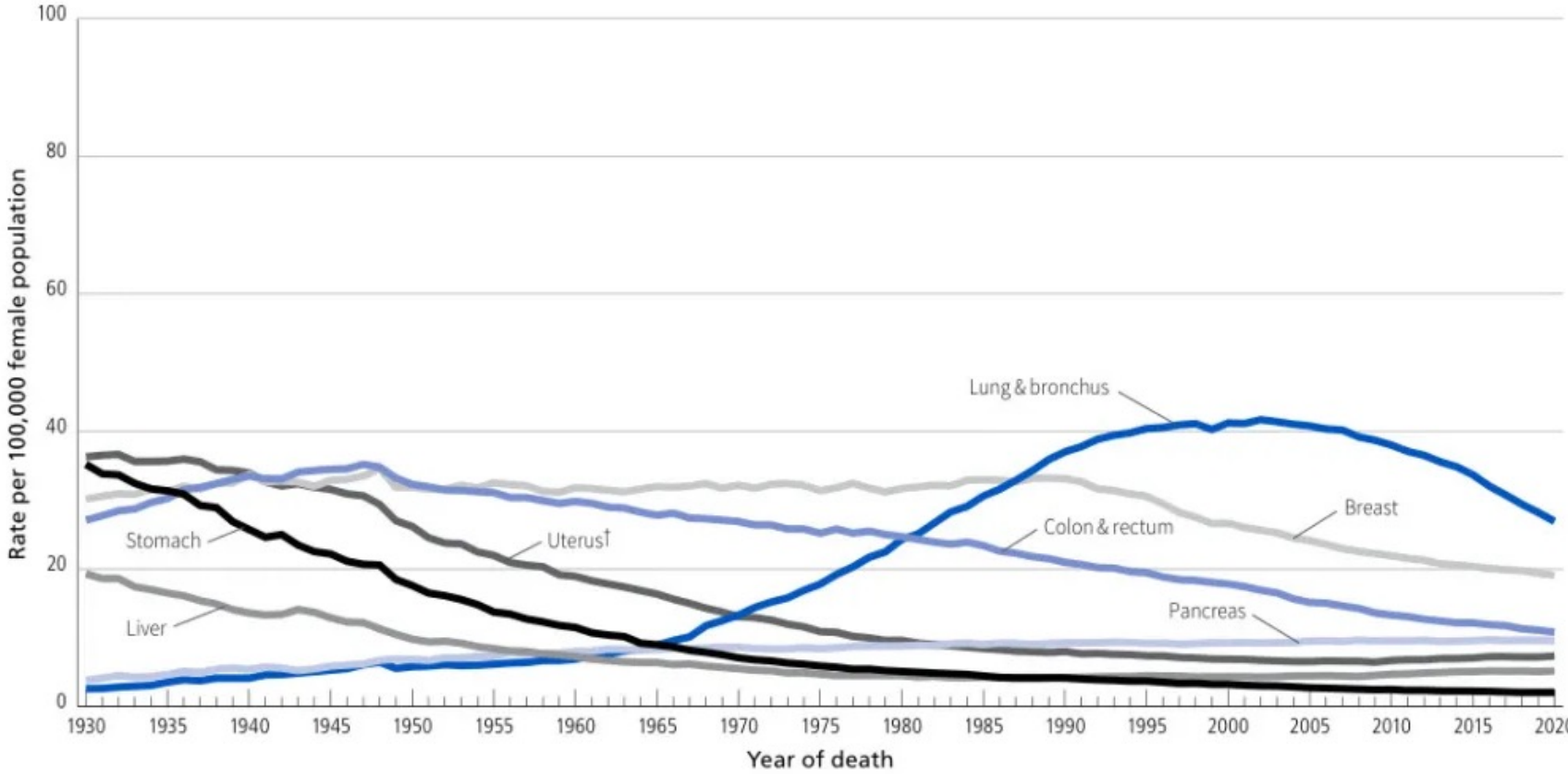
Figure 1. Trends in Age-adjusted Cancer Death Rates* by Site, Males, US, 1930-2020



*Age adjusted to the 2000 US standard population. Rates exclude deaths in Puerto Rico and other US territories. Note: Due to changes in ICD coding, numerator information has changed over time for cancers of the liver, lung and bronchus, and colon and rectum.

Source: US Mortality Volumes 1930 to 1959, US Mortality Data 1960 to 2020, National Center for Health Statistics, Centers for Disease Control and Prevention.

Figure 2. Trends in Age-adjusted Cancer Death Rates* by Site, Females, US, 1930-2020



*Age adjusted to the 2000 US standard population. Rates exclude deaths in Puerto Rico and other US territories. †Uterus refers to uterine cervix and uterine corpus combined. Note: Due to changes in ICD coding, numerator information has changed over time for cancers of the liver, lung and bronchus, colon and rectum, and uterus.

Source: US Mortality Volumes 1930 to 1959, US Mortality Data 1960 to 2020, National Center for Health Statistics, Centers for Disease Control and Prevention.

CANCER DU POUMON: FACTEURS DE RISQUE

- Tabagisme
- Risque occupationnel (amiante, goudron, nickel, chrome, radon, rayons-X …)
- Facteurs diététiques
- Facteurs génétiques

CHUM

CANCER DU POUMON: EPIDEMIOLOGIE

- Taux annuel de décès

  non fumeur : 10 / 100,000 popul

  fumeur : 127 / 100,000 popul
- Risque relative : 12.7 X
- Fumée passive RR : 1.8 - 3.4 X
- 80 - 90% des cancers chez les fumeurs

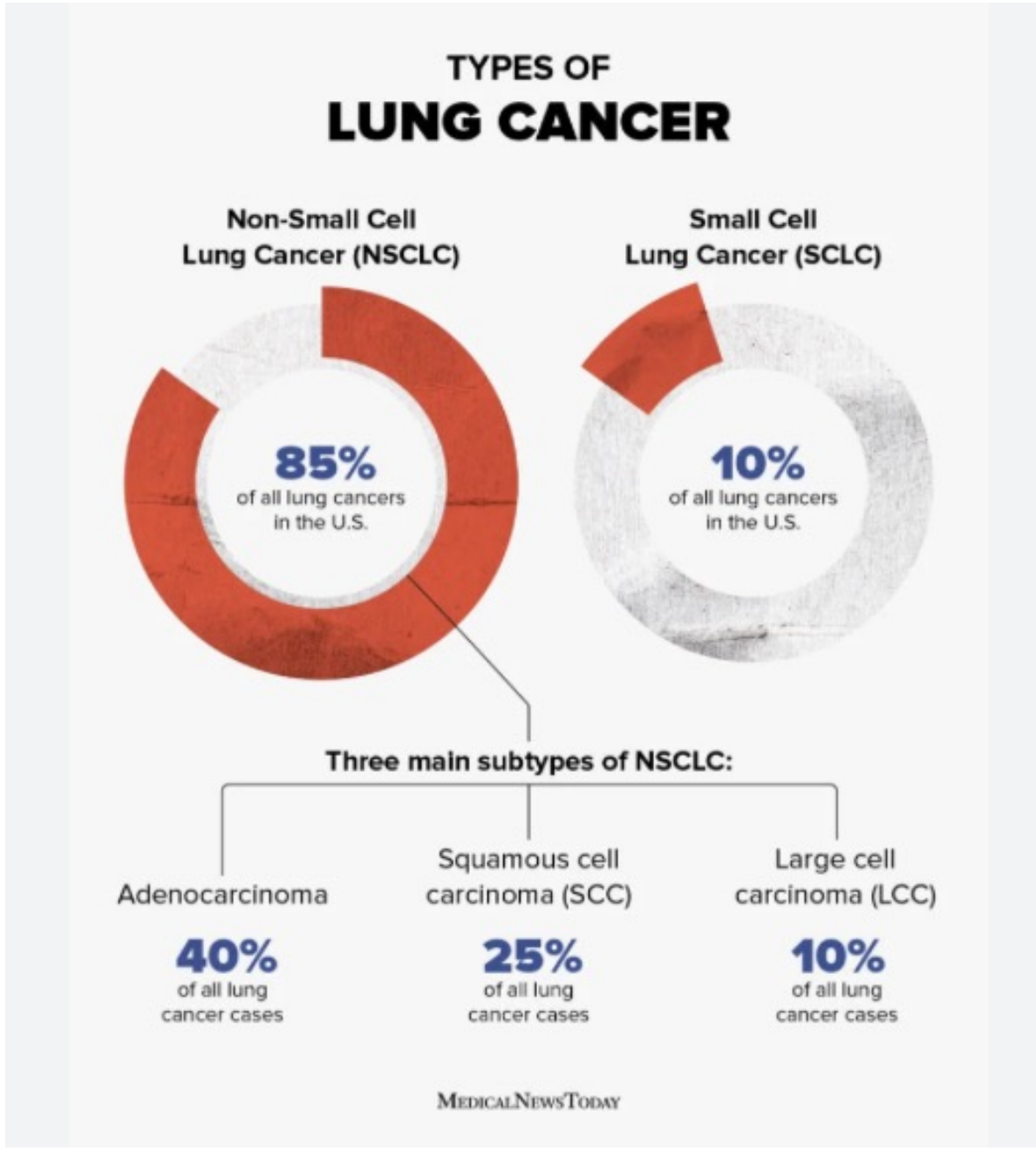
CHUM

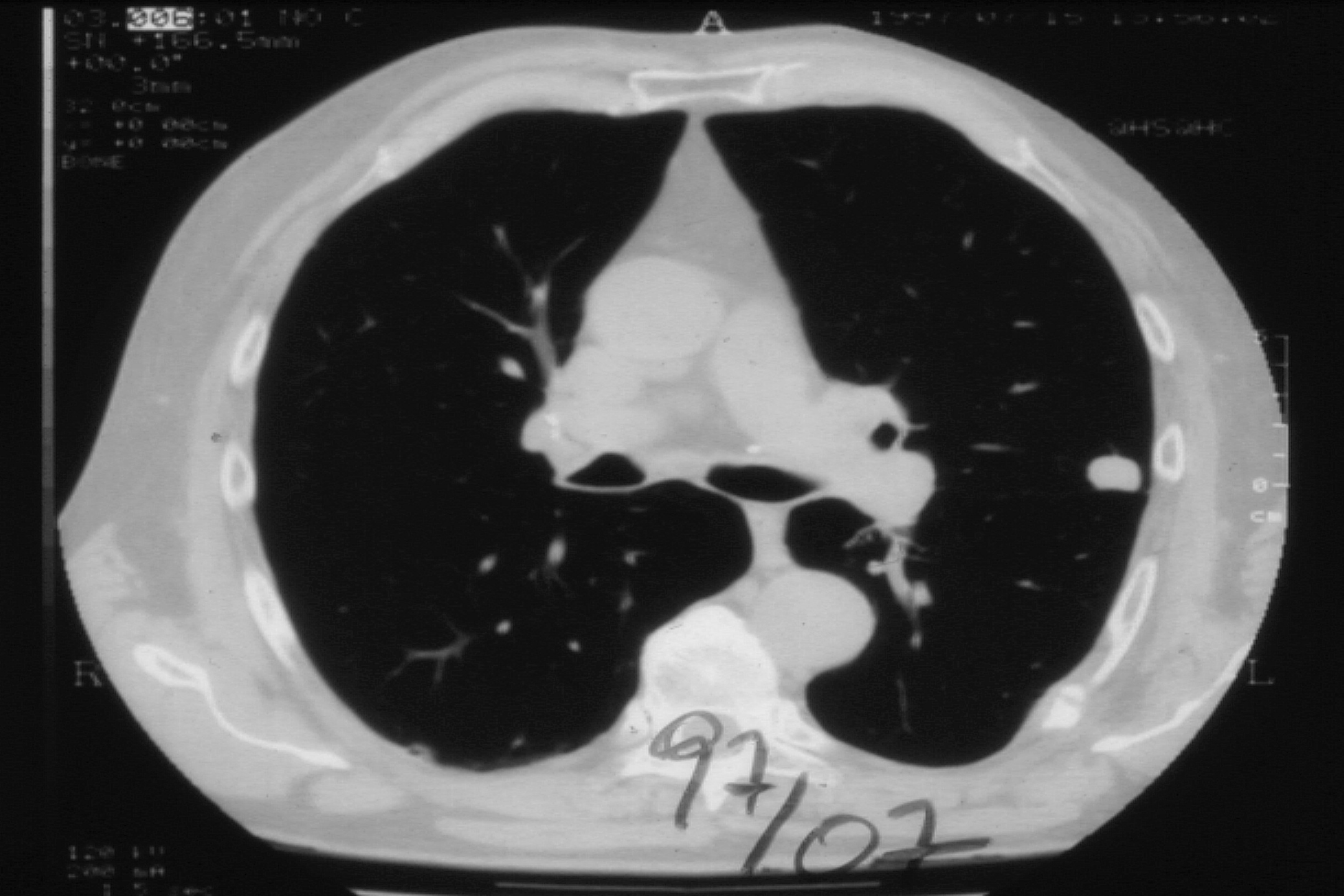
BILAN D'INVESTIGATION

- Histoire et examen physique
- RX pulmonaire et CT scan thorax

- Pet scan
- CT vs IRM cérébral

- TFR
- ECG


TYPES OF
LUNG CANCER
Non-Small Cell Lung Cancer (NSCLC)
85%
of all lung cancers in the U.S.
Small Cell Lung Cancer (SCLC)
10%
of all lung cancers in the U.S.
Three main subtypes of NSCLC:
Adenocarcinoma
40%
of all lung cancer cases
Squamous cell carcinoma (SCC)
25%
of all lung cancer cases
Large cell carcinoma (LCC)
10%
of all lung cancer cases
MEDICALNEWSTODAY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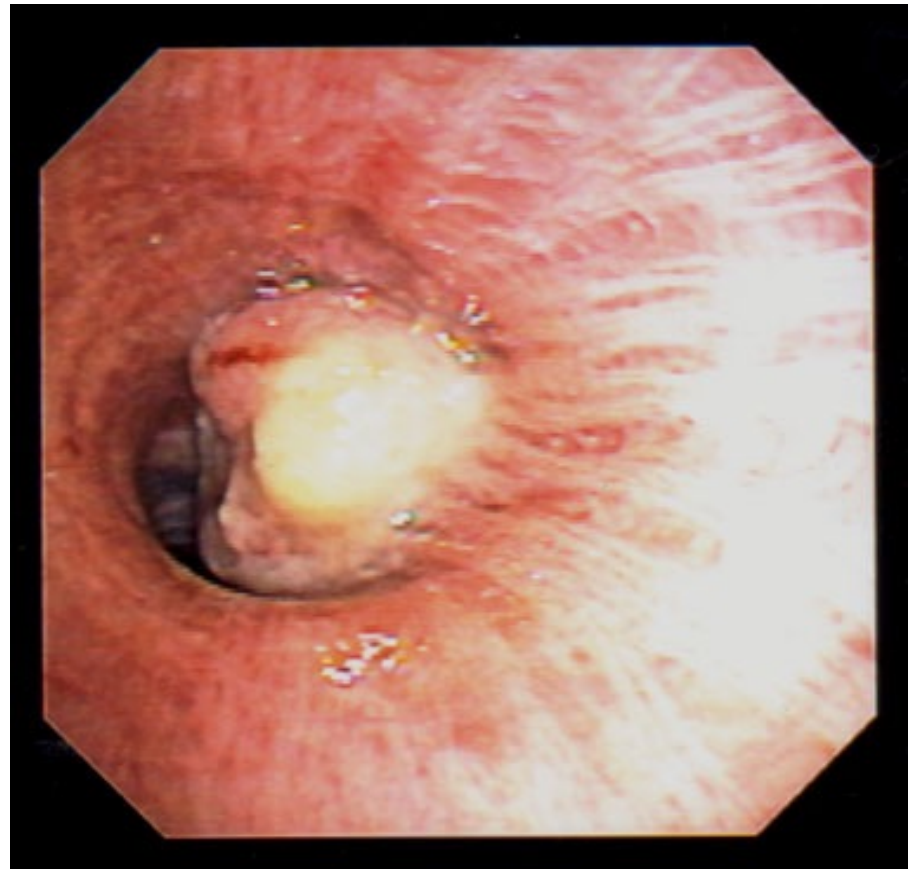
CANCER DU POUMON: BRONCHOSCOPIE

- Diagnostic et staging
- Rendement variable de 10 - 90%
- Exclure présence de cancer synchrone
- Localiser tumeur et plannifier chirurgie



CHUM

CANCER DU POUMON:
BIOPSIE TRANS-THORACIQUE (BTT)

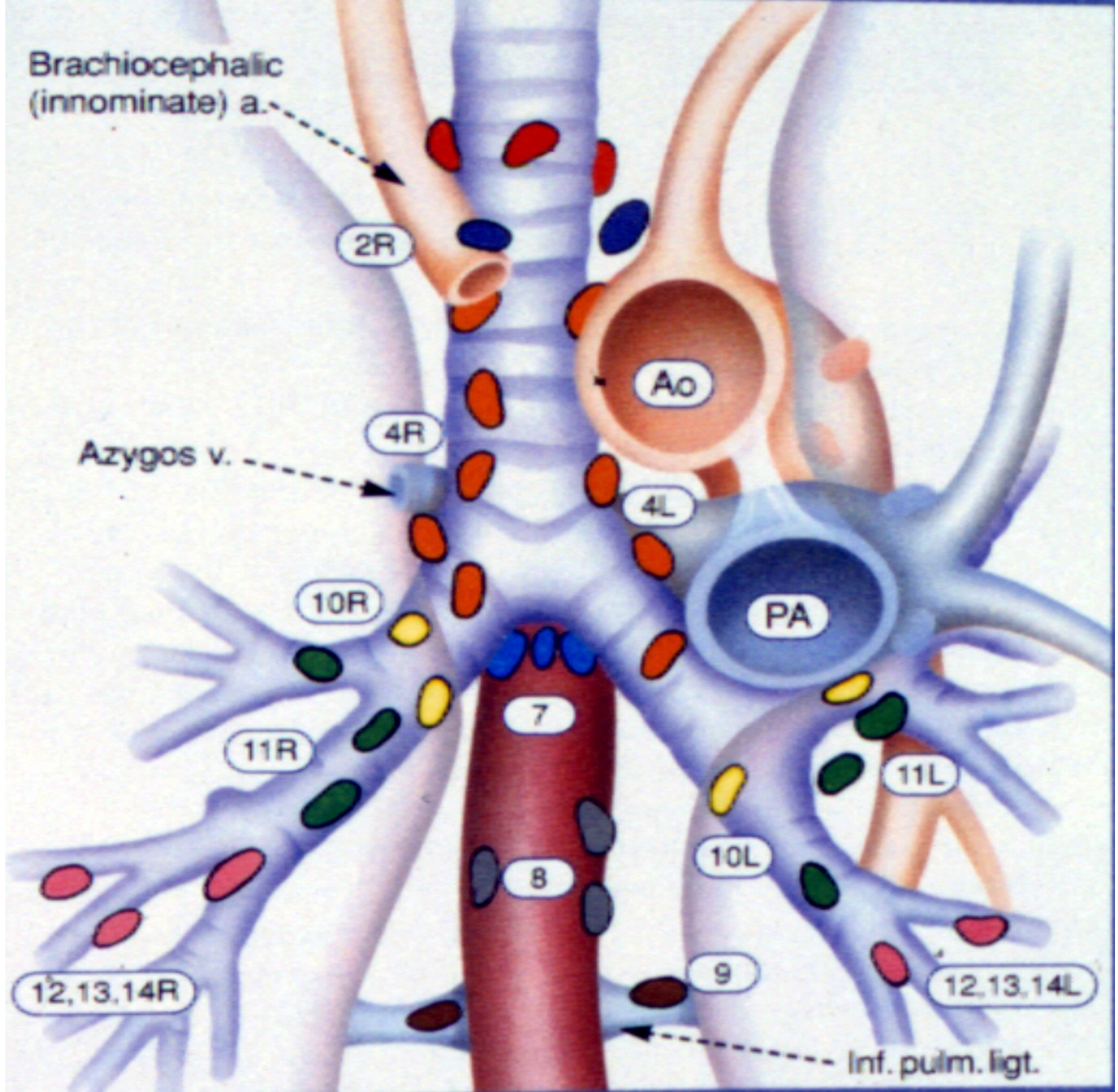
- Pour lésion de nature indéterminée
- Taux de faux négatif : 15 - 25%
- Pneumothorax : 5 - 30%
- Indications : lésion non-réséquable
  patient inopérable
  patient refuse chirurgie

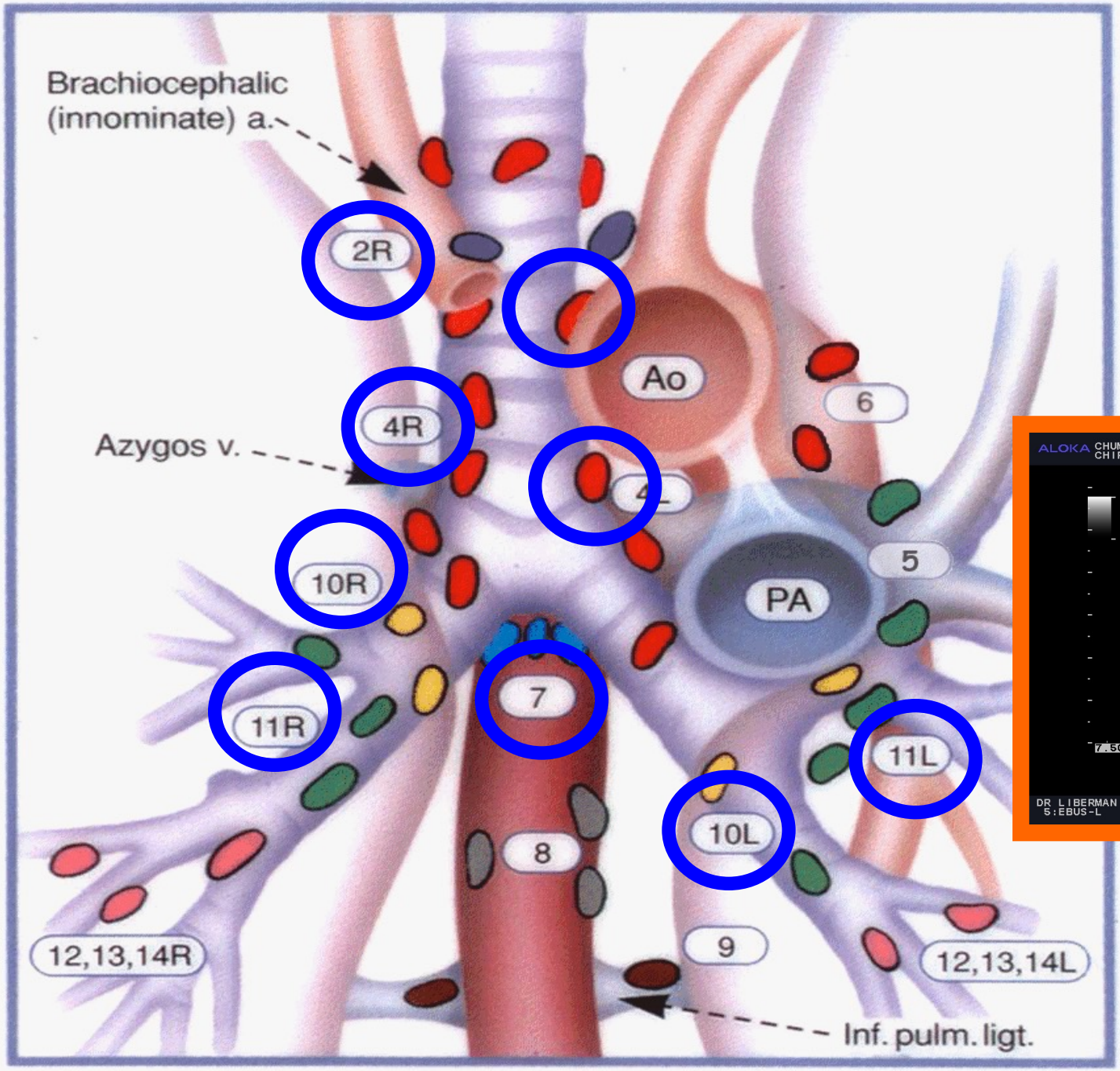
CHUM

STAGING DU MEDIASTIN
MEDIASTINOSCOPIE / EBUS-EUS

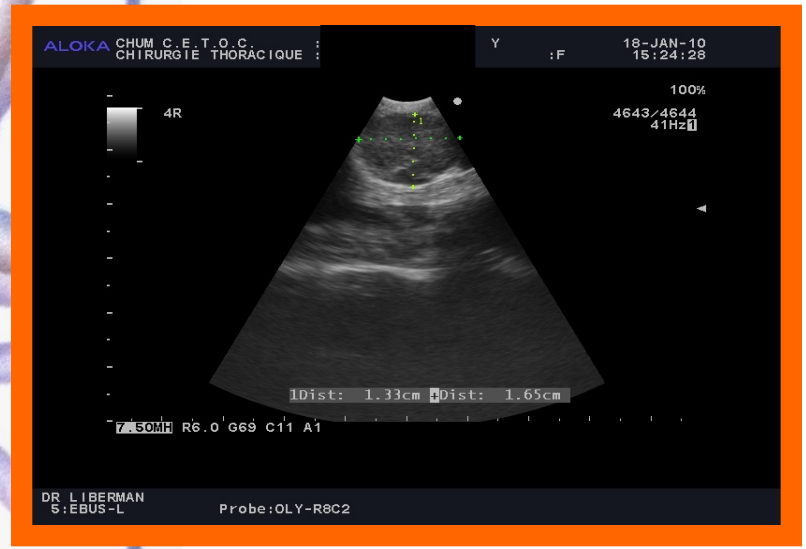
- Technique pour évaluer ganglions du hile et du médiastin
- Utilisation sélective selon résultats du CT scan et du PET scan
- Pour patient à risque élevé, lésion hilaire, lésion bilatérale, T3, T4 …

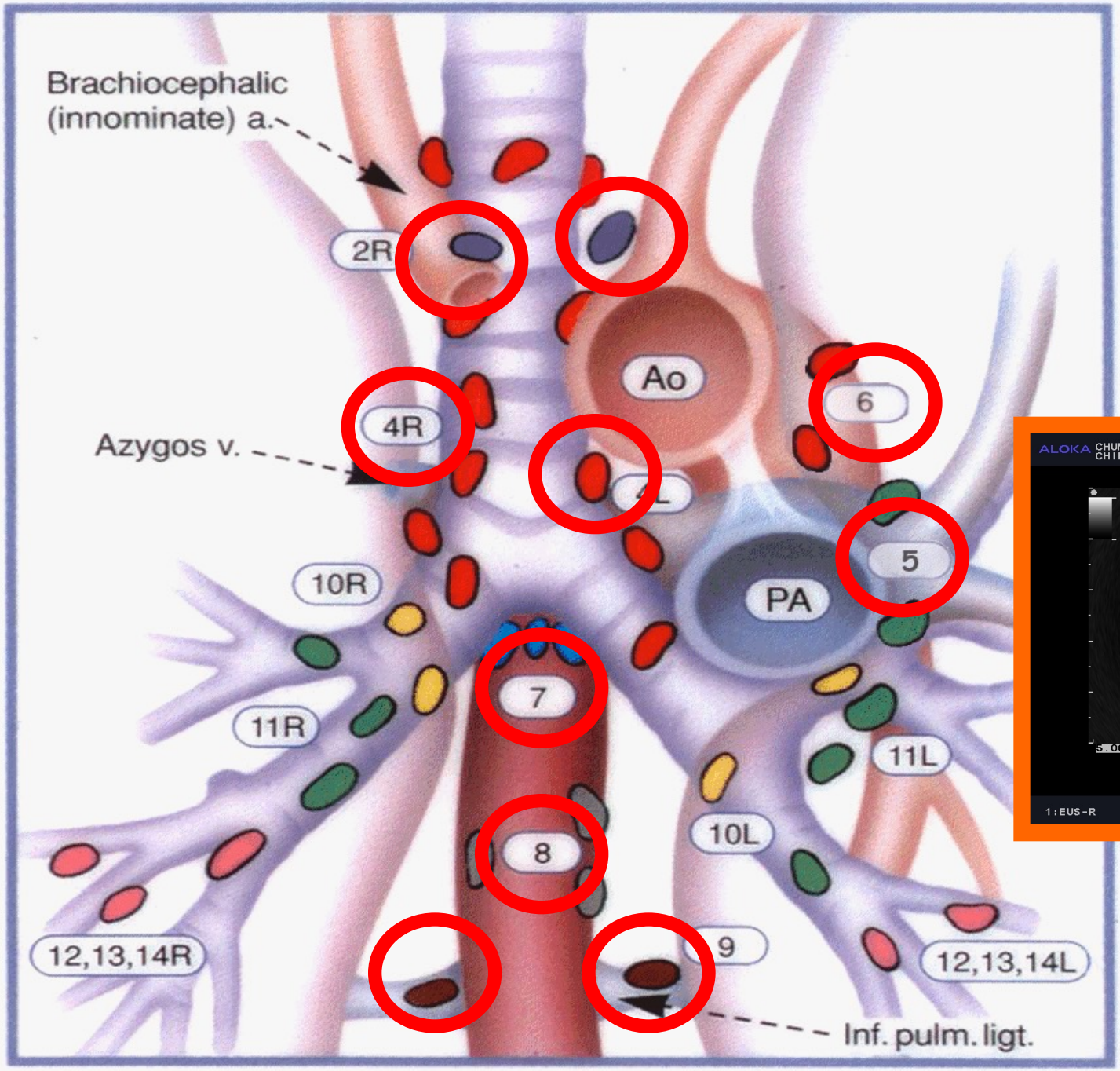
CHUM


Brachiocephalic
(innominate) a.
2R
Ao
4R
Azygos v.
4L
10R
PA
7
11R
11L
10L
8
9
12,13,14R
12,13,14L
Inf. pulm. ligt.

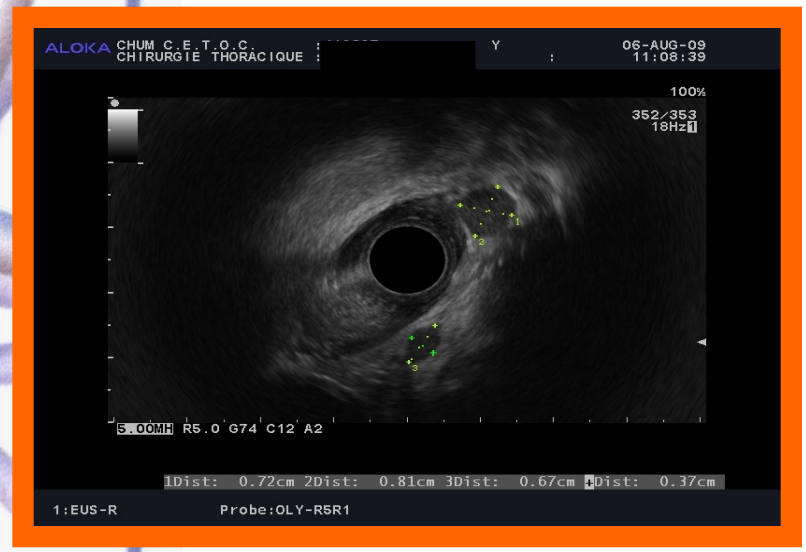

Brachiocephalic (innominate) a.
2R
Azygos v.
4R
10R
11R
12,13,14R
Ao
6
4
5
PA
7
8
10L
9
11L
12,13,14L
Inf. pulm. ligt.

EBUS


ALOKA
CHUM C.E.T.O.C.
CHIRURGIE THORACIQUE
18-JAN-10
15:24:28
100%
4R
4643/4644
41Hz
1Dist: 1.33cm +Dist: 1.65cm
7.5OMH R6.0 G69 C11 A1
DR LIBERMAN
5:EBUS-L
Probe:OLY-R8C2


Brachiocephalic
(innominate) a.
2R
4R
Azygos v.
Ao
6
5
10R
PA
7
11R
11L
10L
8
9
12,13,14R
12,13,14L
Inf. pulm. ligt.

EUS


ALOKA CHUM C.E.T.O.C. CHIRURGIE THORACIQUE
06-AUG-09
11:08:39
100%
352/353
18Hz
5.0CMH R5.0 G74 C12 A2
1Dist: 0.72cm 2Dist: 0.81cm 3Dist: 0.67cm 4Dist: 0.37cm
1:EUS-R
Probe:OLY-R5R1

T – Primary Tumour		
Tx		Primary tumour cannot be assessed
T0		No evidence of primary tumour
T1		Tumour 3 cm or less in greatest diameter surrounded by lung or visceral pleura, without evidence of main bronchus
	T1a(mi)	Mininally invasive adenocarcinoma
	T1a	Tumour 1 cm or less in greatest diameter
	T1b	Tumour more than 1 cm but not more than 2 cm
	T1c	Tumour more than 2 cm but not more than 3 cm
T2		Tumour more than 3 cm but not more than 5 cm; or tumour with any of the following features: Involves main bronchus (without involving the carina), invades visceral pleura, associated with atelectasis or obstructive pneumonitis that extends to the hilar region
	T2a	Tumour more than 3 cm but not more than 4 cm
	T2b	Tumour more than 4 cm but not more than 5 cm
T3		Tumour more than 5 cm but not more than 7 cm or one tha directly invades any of the following: chest wall, phrenic nerve, parietal pericardium, or associated separate tumour nodule(s) in the same lobe as the primary
T4		Tumours more than 7 cm or one that invades any of the following: diaphragm, mediastinum, heart, great vessels, trachea, recurrent laryngeal nerve, oesophagus, vertebral body, carina; separate tumour nodule(s) in a different ipsilateral lobe to that of the primary

AJCC 8th edition, 2018

N – Regional Lymph Nodes		
Nx		Regional lymph nodes cannot be assessed
N0		No regional lymph node metastasis
N1		Metastasis in ipsilateral peribronchial and/or ipsilateral hilar lymph nodes and intrapulmonary nodes, including involvement by direct extension
N2		Metastasis in ipsilateral mediastinal and/or subcarinal lymph node(s)
N3		Metastasis in contralateral mediastinal, contralateral hilar, ipsilateral or contralateral scalene or supraclavicular lymph node(s)

M – Distant Metastasis		
M0		No distant metastasis
M1		Distant metastasis
	M1a	Separate tumour nodule(s) in a contralateral lobe; tumour with pleaural or pericardial nodules or malignant pleural or pericardial effusion
	M1b	Single extrathoracic metastasis in a single organ
	M1c	Multiple extrathoracic metastases in one or several organs

AJCC 8th edition, 2018

	N0	N1	N2	N3
T1	IA	IIB	IIIA	IIIB
T2a	IB	IIB	IIIA	IIIB
T2b	IIA	IIB	IIIA	IIIB
T3	IIB	IIIA	IIIB	IIIC
T4	IIIA	IIIA	IIIB	IIIC
M1a	IVA	IVA	IVA	IVA
M1b	IVA	IVA	IVA	IVA
M1c	IVB	IVB	IVB	IVB

Stages of lung cancer adapted from the 8th Edition of TNM in Lung Cancer

EVOLUTION DE LA CHIRURGIE POUR LE CANCER PULMONAIRE

Heidenhain 1903 : résection non anatomique
Davies 1912 : lobectomie avec dissection hile
Graham 1933 : pneumonectomie (en bloc, single stage)
Churchill et Belsey 1939 : segmentectomie anatomique
Allison 1952 : lobectomie avec bronchoplastie
Roviaro 1992 : VATS lobectomie

Étendue (stade) du cancer et non pas l'étendue de la résection détermine survie du patient
(Shimkin JTCVS 1962)

TABLE 95.1 Historical Mortality Trends for Resectable NSCLC

Authors	Date	Surgical Approach	Resection Number	Mortality (%)
Graham et al.[6]	1930s	Pneumomectomy	70	31.4
Ochsner et al.[327]	1944	Pneumonectomy	117	25.6
Churchill et al.[16]	1950	Pneumonectomy Lobectomy	114 57	22.8 14.0
Weiss et al.[328]	1974	Pneumonectomy Lobectomy	212 149	17.0 10.1
Ginsberg et al.[329]	1983	Pneumonectomy Lobectomy	569 1,058	6.2 2.9
Romano et al.[330]	1992	Pneumonectomy Lobectomy	1,529 6,569	11.6 4.2
Ginsberg et al.[331]	1995	Lobectomy Sublobar Resection	125 122	1.6 0.8
Wada et al.[332]	1998	Pneumonectomy Lobectomy	586 5,609	3.2 1.2
Harpole et al.[333]	1999	Pneumonectomy Lobectomy	567 2,949	11.5 4.0
Allen et al.[334]	2006	Pneumonectomy Lobectomy Segmentctomy	42 766 70	0 1.3 2.9

(Shields' General Thoracic Surgery, 8th Edition, 2019)

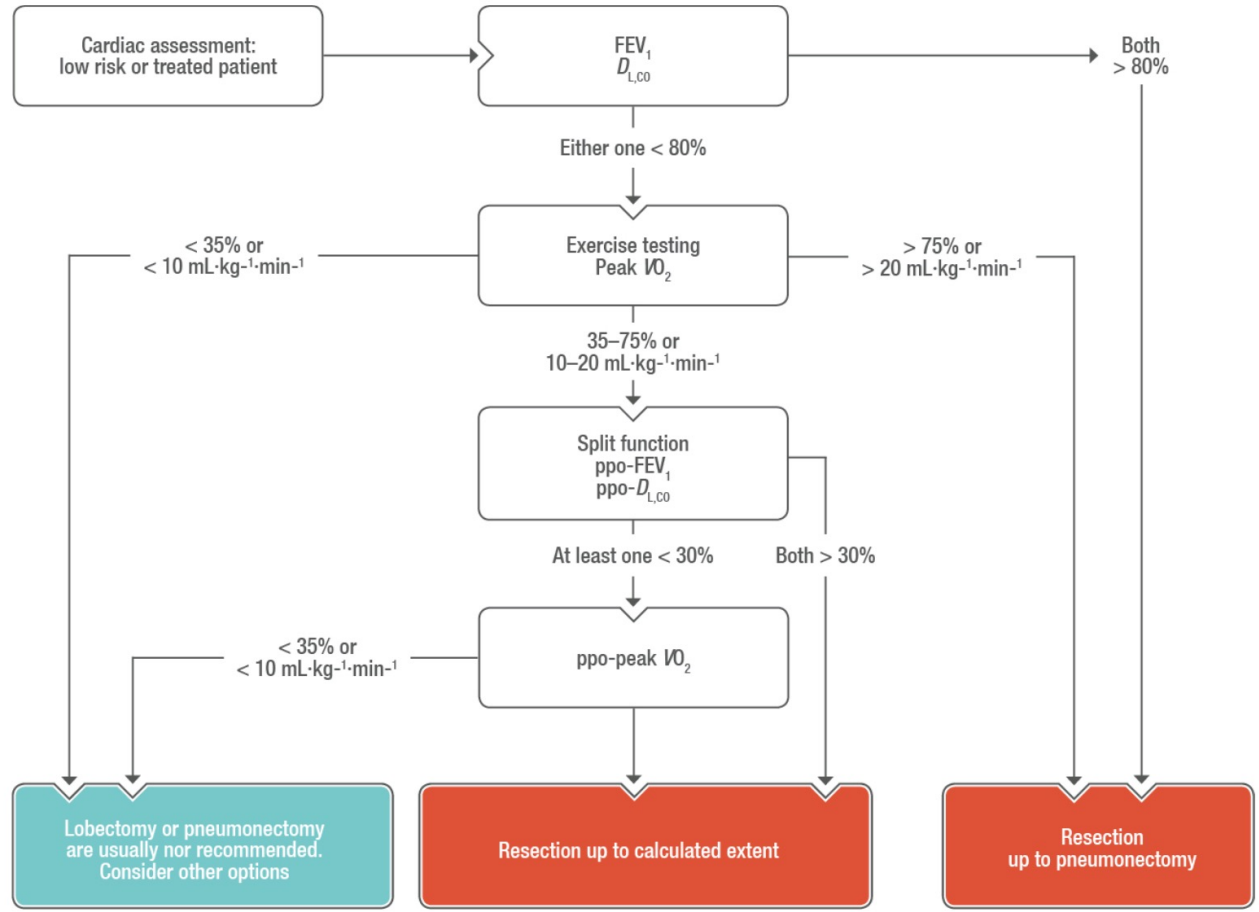
ÉVALUATION PRÉOPÉRATOIRE : RÉSÉQUABILITÉ VS OPÉRABILITÉ VS RISQUE CHIRURGICAL

RÉSÉQUABILITÉ	OPÉRABILITÉ
Selon stade:	**Selon réserve cardiorespiratoire:**
CT thorax	TFR (PPO)
Pet scan	VO_2 max
CT cérébral	Scinti V/Q
Staging gg	ECG
Tx neo-adjuvant	Mibi, echo

CLINICAL PRACTICE GUIDELINES

Staging and risk assessment

Preoperative respiratory evaluation



Brunelli A et al. Eur Respir J 2009;34:17–41.

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ESMO

TABLE 95.3 Commonly Encountered Complications During Anatomic Lung Resection

Major Complications	Minor Complications
Respiratory (40%)	**Respiratory (25%)**
Atelectasis requiring intervention	Minor Atelectasis
Pneumonia	Prolonged Air Leak
Respiratory Failure	**Cardiovascular (50%)**
Pleural (25%)	Arrhythmia
Empyema	**Pleural (25%)**
Bronchopleural Fistula	Pneumothorax
Cardiovascular (10%)	Effusion
Myocardial Infarction	
Pulmonary Embolism/DVT	
Heart Failure	
Stroke	
Others (25%)	
Post-Op Hemorrhage	
Chylothorax	
Miscellaneous	

Adapted from Ginsberg RJ. Lung Cancer Surgery: Acceptable Morbidity and Mortality, Expected Results and Quality Control. *Surg Onc* 2002;11:263–266.

(Shields' General Thoracic Surgery, 8th Edition, 2019)

TABLE 95.2 Perioperative Morbidity and Mortality for Lobectomy

Author	Year	N	Overall Morbidity (%)	Mortality (%)
Watanabe et al.[336]	2004	3,270	NR	1.6
Mckenna et al.[53]	2006	1,100	15.3	0.8
Allen et al.[334]	2006	1,023	38.2	1.4
Paul et al.[56]	2010	2,562	30.4	1%
Kozower et al.[337]	2010	18,800	7.9	2.2
Paul et al.[31]	2013	41,039	49.5	2.1
Paul et al.[338]	2014	6,008	53.1	3
Seder et al.[339]	2016	44,429	NR	1.6

(Shields' General Thoracic Surgery, 8th Edition, 2019)

TABLE 95.4 Comparison of Wedge Resection Versus Segmentectomy Versus Lobectomy for NSCLC

Author	Year	LOS			Morbidity			Mortality		
		Wedge	Segment	Lobe	Wedge	Segment	Lobe	Wedge	Segment	Lobe
El-Sherif et al.[96]	2006	6		6	NR		NR	1.4		2.6
Shapiro et al.[340]	2009	NR	4	4	NR	25.8	26.6	NR	0	0.9
De Giacomo et al.[341]	2009	NR	5	10	NR	22.2	29.3	NR	0	1.7
Yamashita et al.[342]	2012	NR	12.2	11.6	NR	19	23	NR	0	0
Zhong et al.[343]	2012	NR	6.1	6.3	NR	12.8	12.3	NR	0	0
Soukiasian et al.[344]	2012	NR	3.8	5.5	NR	37	17	NR	0	0
Schuchert et al.[121]	2012	NR	6	6	NR	35.7	45.7	NR	1.3	2.2
Zhang et al.[345]	2013	NR	7.2	10.4	NR	23.1	28.6	NR	0	0
Zhao et al.[346]	2013	NR	6.2	6.5	NR	8.3	2.2	NR	0	0
McGuire et al.[347]	2013	6.8	NR	7.7	7	NR	12	2.8	NR	1.1
Linden et al.[348]	2014	NR	NR		10.6	21.5		1.2	1.9	
Hwang et al.[349]	2015	NR	6.2	7.1	NR	10.6	17.2	NR	2.10	1.1
Seder et al.[339]	2016	4.0	6.2	7.0	NR	NR	NR	1.2	1.1	1.6

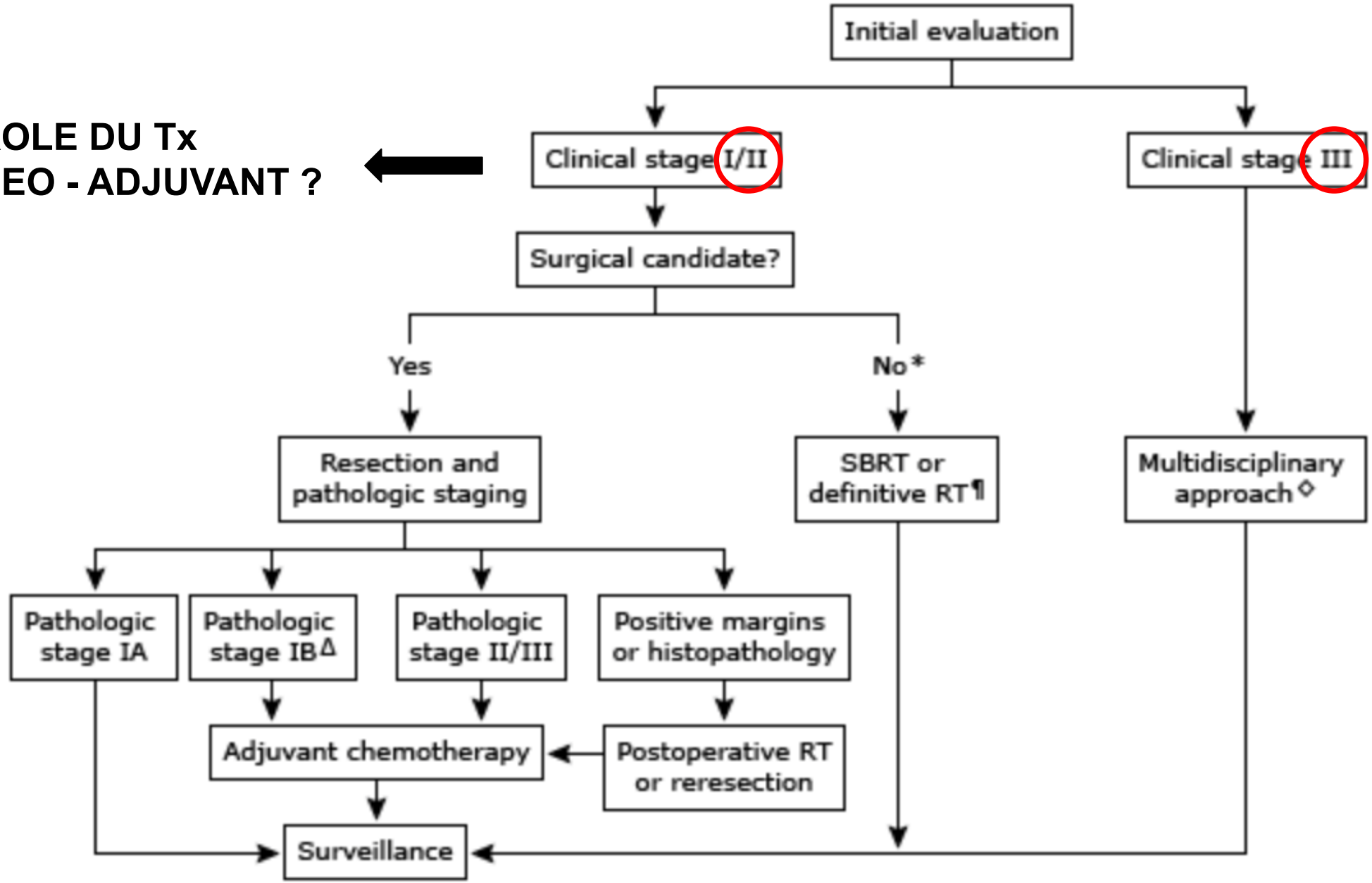
(Shields' General Thoracic Surgery, 8th Edition, 2019)

PRINCIPES DE CHIRURGIE ONCOLOGIQUE :

- VATS vs thoracotomie vs RATS
- Exploration / inspection cavité pleurale
  - plèvre, diaphragme, médiastin, poumon
- Palpation du poumon
  - tumeur, autres lobes
- Staging ganglionnaire
- Résection chirurgicale complète
  - wedge vs segment vs lobectomie …
- Congélation per-op
- Analgésie

Treatment of potentially resectable non-small cell lung cancer

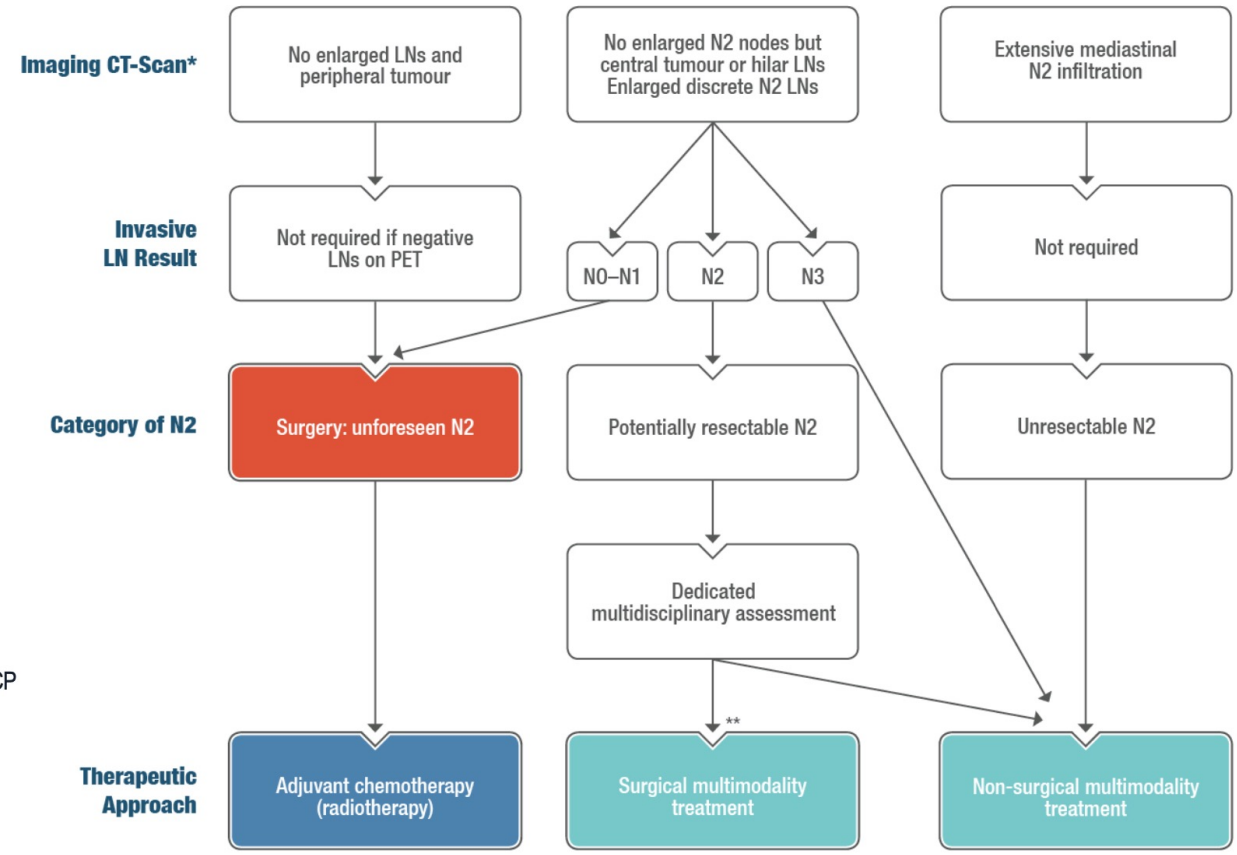
ROLE DU Tx
NEO - ADJUVANT ?



CLINICAL PRACTICE GUIDELINES

Staging and risk assessment

Treatment recommendations for patients with locoregional NSCLC, based on imaging, invasive LN staging tests and multidisciplinary assessment



*Category description according to CT imaging as in ACCP staging document (Silvestri GA et al. Chest 2013;143(5 Suppl):e211S–50S)

**Refer to slide 'Treatment: Locally advanced NSCLC (stage III) – Resectable'

ESMO

TUMEUR NSCLC STADE IA

- T1a T1b T1c N0 Mo : tumeur de 0 – 3 cm
- Lobectomie traitement de choix
- Segmentectomie
    - selon taille et fonction pulm
- Dissection ganglionnaire

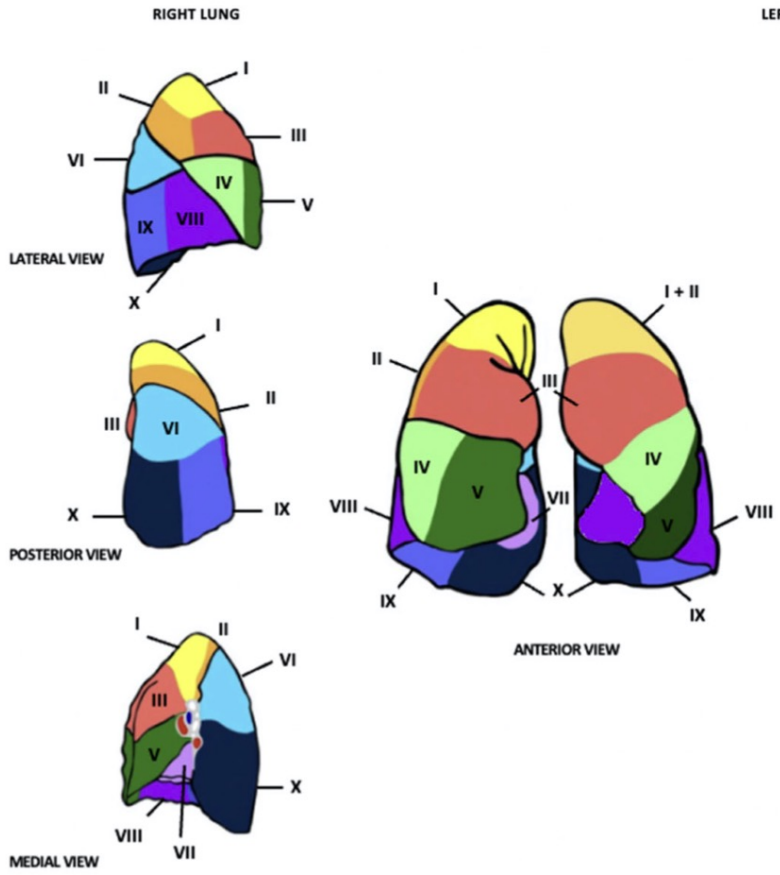
- Pas indication chimio néo-adjuvante / adjuvante
- RadioTx pour marges positives

- SBRT ou RFA : pt inopérable ou refuse chirurgie

SEGMENTECTOMIE

- Approche VATS vs RATS vs thoraco
- Localisation pre-opératoire
    - harpon …
- Résection anatomique :
    - ligature artère, veine et bronche segmentaire
- Dissection plan intersegmentaire
- Dissection ganglionnaire
    - hile et médiastin

ANATOMIE DES SEGMENTS PULMONAIRES :



RIGHT LUNG

Upper Lobe
I Apical
II Posterior
III Anterior

Middle Lobe
IV Lateral
V Medial

Lower Lobe
VI Superior
VII Medial basal
VIII Anterior basal
IX Lateral basal
X Posterior basal

LEFT LUNG

Upper Lobe
I Apical
II Posterior
III Anterior
IV Lingula superior
V Lingula inferior

Inferior Lobe
VI Superior
VIII Anterior basal
IX Lateral basal
X Posterior basal

FIGURE 1
Lung segments by Elisabeth Savonitto.

ANATOMIE BRONCHIQUE

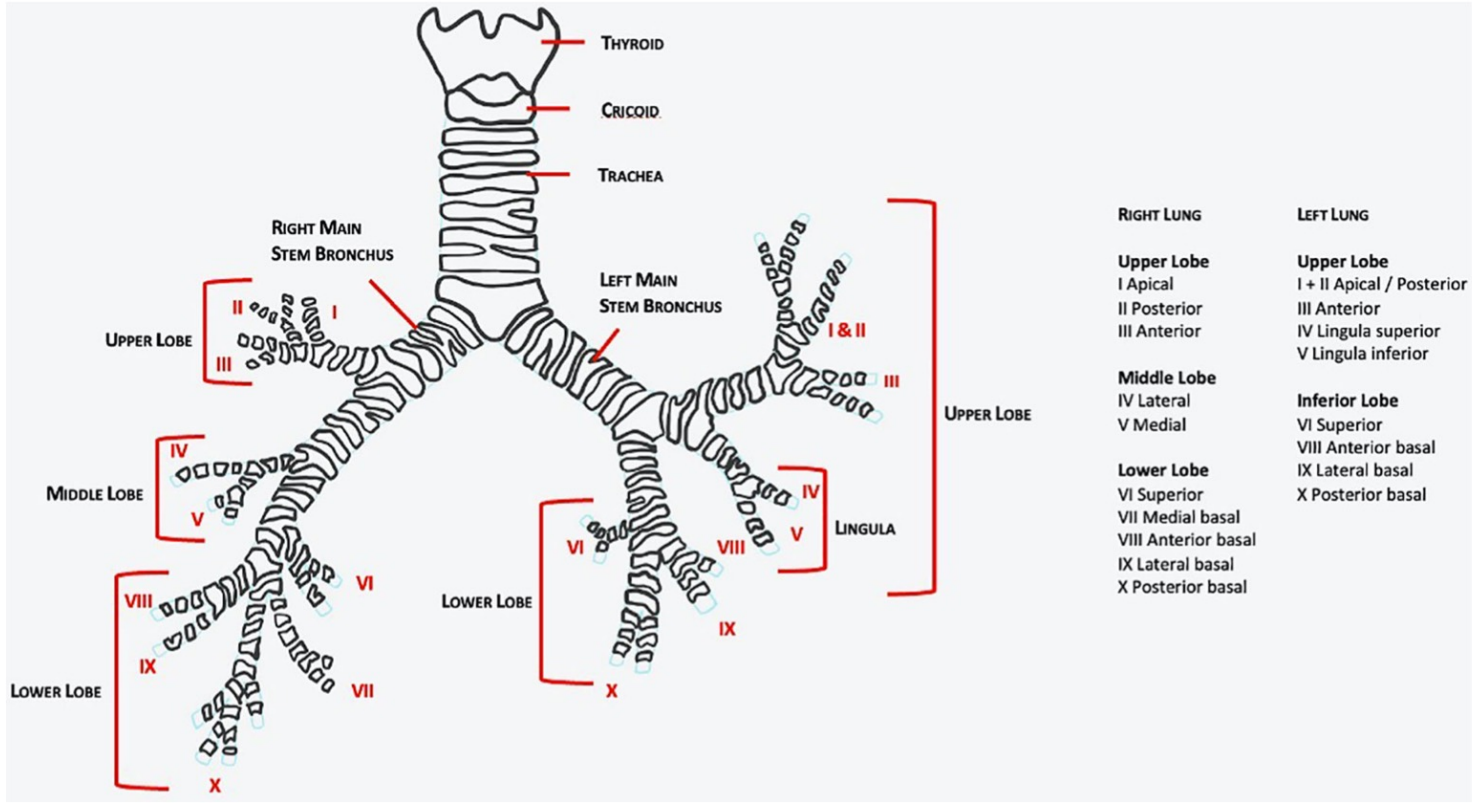


FIGURE 2
Bronchial tree by Elisabeth Savonitto.

SEGMENTECTOMIE

- Lobectomie traitement de choix (1950)
- Jensik et Faber 1973, Shields et Higgins 1974
    - préserver parenchyme et fonction pulm
    - adéquat pour petit cancer péripherique

Randomized Trial of Lobectomy Versus Limited Resection for T1 N0 Non–Small Cell Lung Cancer

Lung Cancer Study Group (Prepared by Robert J. Ginsberg, MD, and Lawrence V. Rubinstein, PhD)

276 pts randomisée T1N0
Segment ou wedge vs lobectomie

Conclusions:

Augmentation 75% taux récidive locale
Augmentation 30% taux mortalité
Pas de différence fonctions pulm long terme

Annals Thor Surg
1995;60:615-23

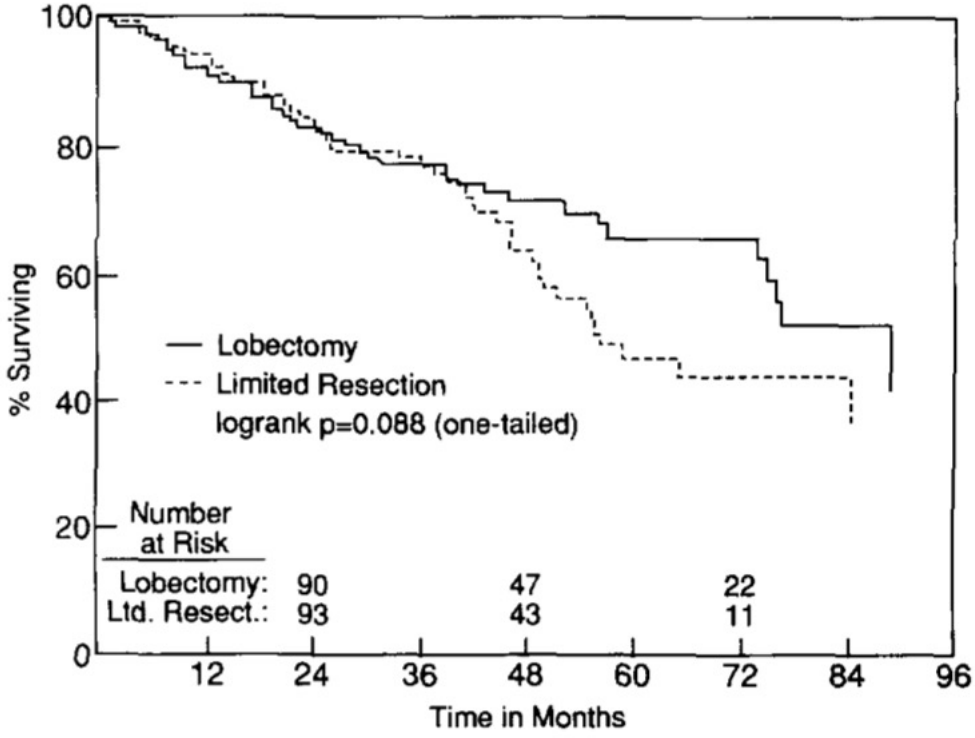


Fig 1. Time to death (from any cause) by treatment for 247 eligible patients.

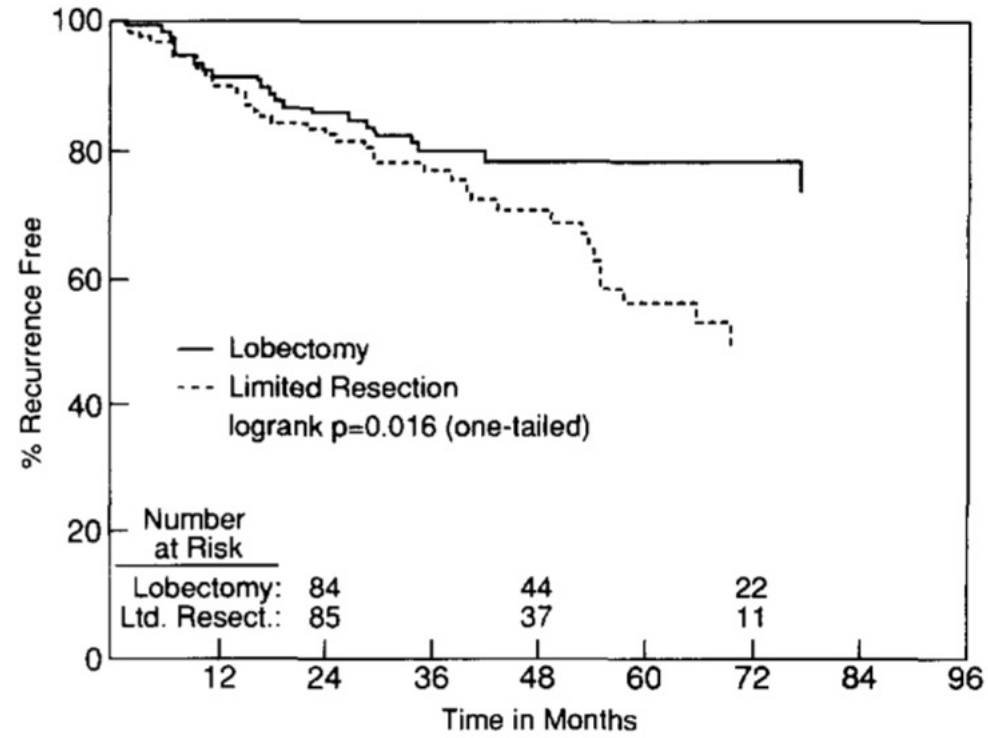


Fig 2. Time to recurrence (excluding second primaries) by treatment for 247 eligible patients.

CRITIQUE DE L'ETUDE LCSG

- Staging suboptimal des pts (absence Pet scan)
- Tumeur ad 3 cm
- Inclusion de résection wedge

Évolution récente:

- Détection de tumeur de < 1 cm
- Meilleur staging (imagerie, EBUS …)
- Développement de VATS et RATS

Ann Surg Oncol (2022) 29:1868–1879
https://doi.org/10.1245/s10434-021-10857-7

Annals of
SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

REVIEW ARTICLE – THORACIC ONCOLOGY

Comparison Between Wedge Resection and Lobectomy/ Segmentectomy for Early-Stage Non-small Cell Lung Cancer: A Bayesian Meta-analysis and Systematic Review

Yucong Shi, MSc[1], Sizhi Wu, PhD[1,2], Shengsuo Ma, MSc[1], Yiwen Lyu, MSc[1], Huachong Xu, PhD[1], Li Deng, PhD[1], and Xiaoyin Chen, PhD[1]

[1]School of Traditional Chinese Medicine, Jinan University, Guangzhou, Guangdong, China; [2]Department of Geriatrics Respiratory Medicine, Guangzhou First People's Hospital, Guangzhou, Guangdong, China

The OS was not significantly different in segment vs lobectomy
The OS was greater with lobectomy vs wedge resection
The DFS and RFS of the three surgical approaches showed no significant difference

Segmentectomy versus lobectomy in small-sized peripheral non-small-cell lung cancer (JCOG0802/WJOG4607L): a multicentre, open-label, phase 3, randomised, controlled, non-inferiority trial

*Hisashi Saji, Morihito Okada, Masahiro Tsuboi, Ryu Nakajima, Kenji Suzuki, Keiju Aokage, Tadashi Aoki, Jiro Okami, Ichiro Yoshino, Hiroyuki Ito, Norihito Okumura, Masafumi Yamaguchi, Norihiko Ikeda, Masashi Wakabayashi, Kenichi Nakamura, Haruhiko Fukuda, Shinichiro Nakamura, Tetsuya Mitsudomi, Shun-Ichi Watanabe, Hisao Asamura, on behalf of the West Japan Oncology Group and Japan Clinical Oncology Group**

- Randomised, controlled, non-inferiority trial at 70 institutions in Japan
- Patients with clinical stage IA NSCLC (tumour diameter ≤2 cm)
- **Primary endpoint** : overall survival for all randomly assigned patients
- **Secondary endpoints** : postoperative respiratory function (6 months and 12 months), relapse-free survival, proportion of local relapse, adverse events …

Lancet 2022;399(10335):1607-1617.

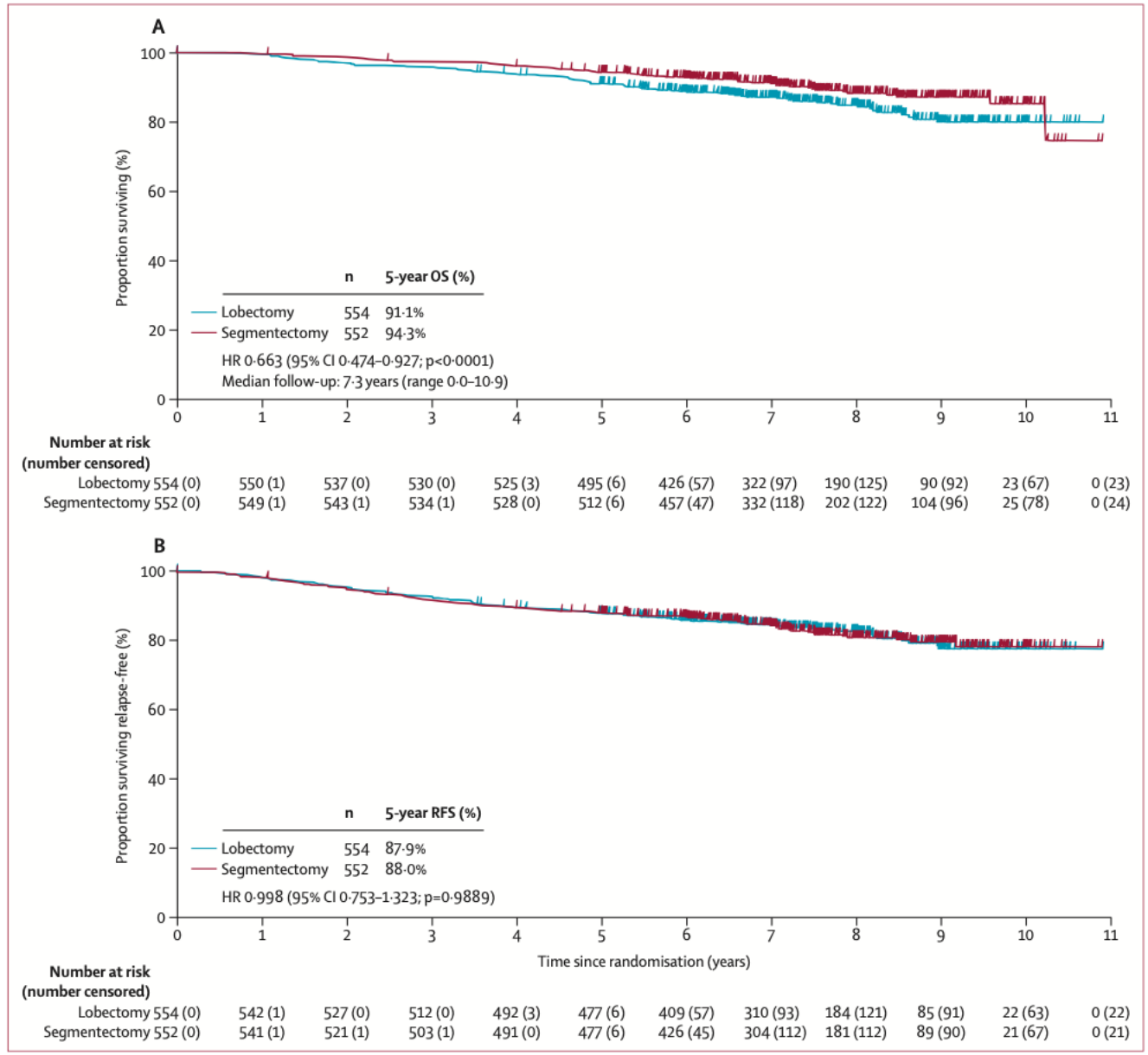


***Figure 2*: Kaplan–Meier estimates of overall survival (A) and relapse-free survival (B)**
HR=hazard ratio. OS=overall survival. RFS=relapse-free survival.

Lancet 2022;399(10335):1607-17

CONCLUSIONS :

- Our study showed segmentectomy to be non-inferior and superior to lobectomy with regards to overall survival
- Segmentectomy should be the standard surgical procedure, rather than lobectomy, for patients with small-size ≤2 cm peripheral NSCLC
- We did not find the expected evidence of superiority in postoperative respiratory function in the segmentectomy group

Lancet 2022;399(10335):1607-17

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 FEBRUARY 9, 2023 VOL. 388 NO. 6

Lobar or Sublobar Resection for Peripheral Stage IA Non–Small-Cell Lung Cancer

Nasser Altorki, M.D., Xiaofei Wang, Ph.D, David Kozono, M.D., Ph.D., Colleen Watt, B.S., Rodney Landrenau, M.D., Dennis Wigle, M.D., Ph.D., Jeffrey Port, M.D., David R. Jones, M.D., Massimo Conti, M.D., Ahmad S. Ashrafi, M.D., Moishe Liberman, M.D., Ph.D., Kazuhiro Yasufuku, M.D., Ph.D., Stephen Yang, M.D., John D. Mitchell, M.D., Harvey Pass, M.D., Robert Keenan, M.D., Thomas Bauer, M.D., Daniel Miller, M.D., Leslie J. Kohman, M.D., Thomas E. Stinchcombe, M.D., and Everett Vokes, M.D.

Etude randomisée avec 697 pts

Funded by the National Cancer Institute

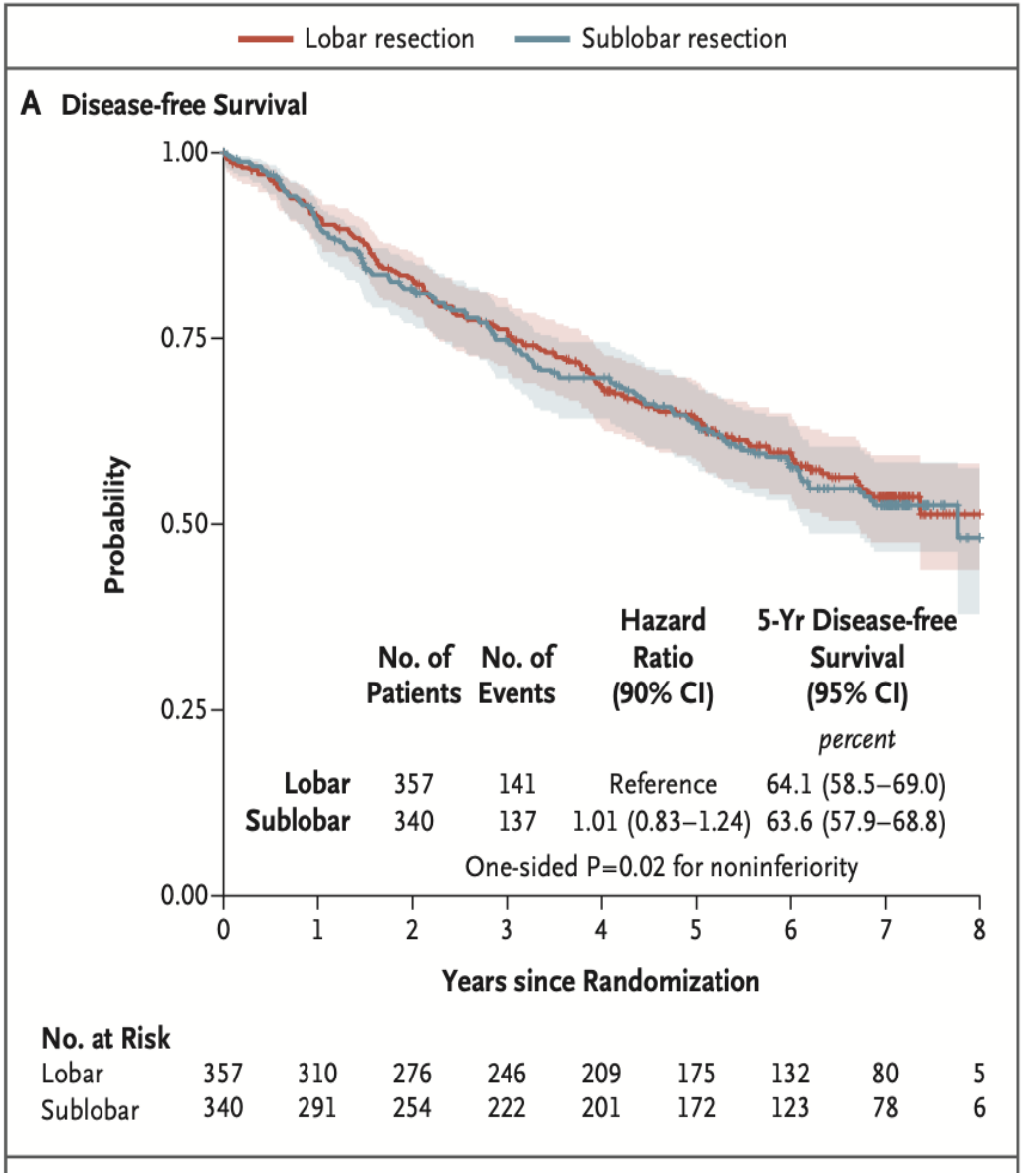
CALGB 140503

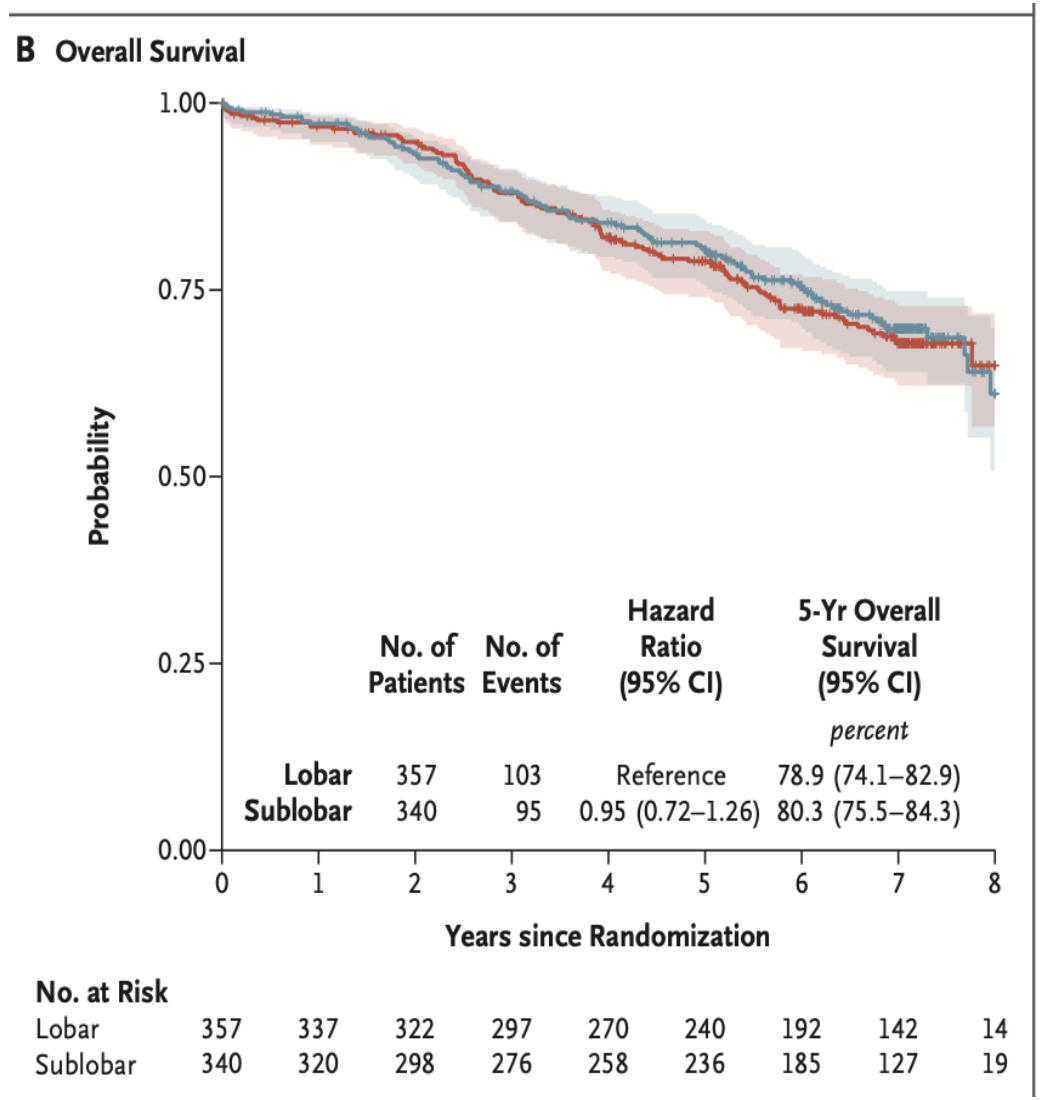
NEJM 388(6)2023:489-98

LOBAR or SUBLOBAR RESECTION

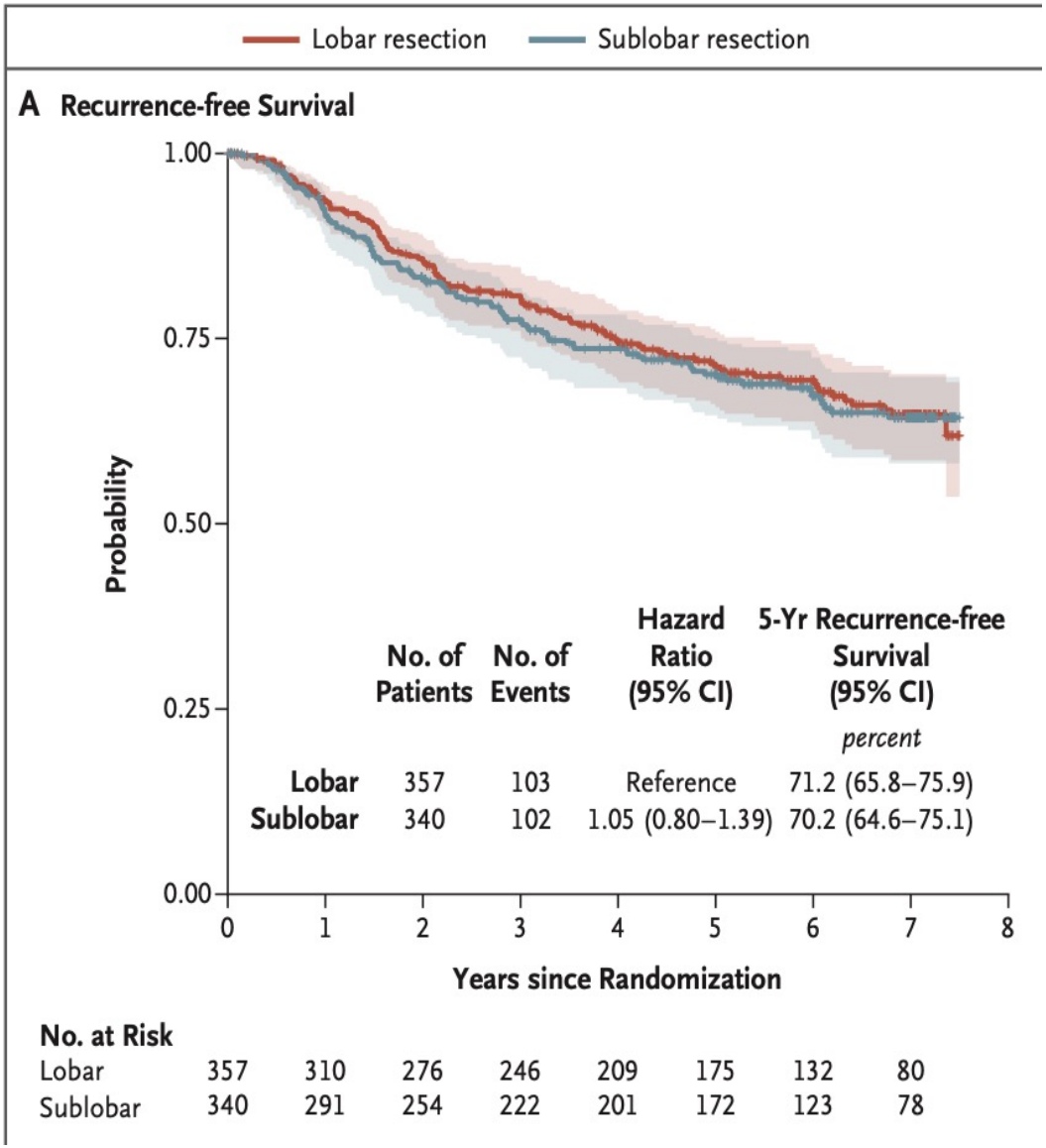
- Multicenter, noninferiority, phase 3 trial
- Patients with NSCLC clinically staged as T1aN0 (tumor size ≤2 cm)
- Randomisation to sublobar resection or lobar resection after intraoperative confirmation of node-negative disease.
- **Primary end point** : disease-free survival, defined as the time between randomization and disease recurrence or death from any cause.
- **Secondary end points** : overall survival, locoregional and systemic recurrence and pulmonary functions.

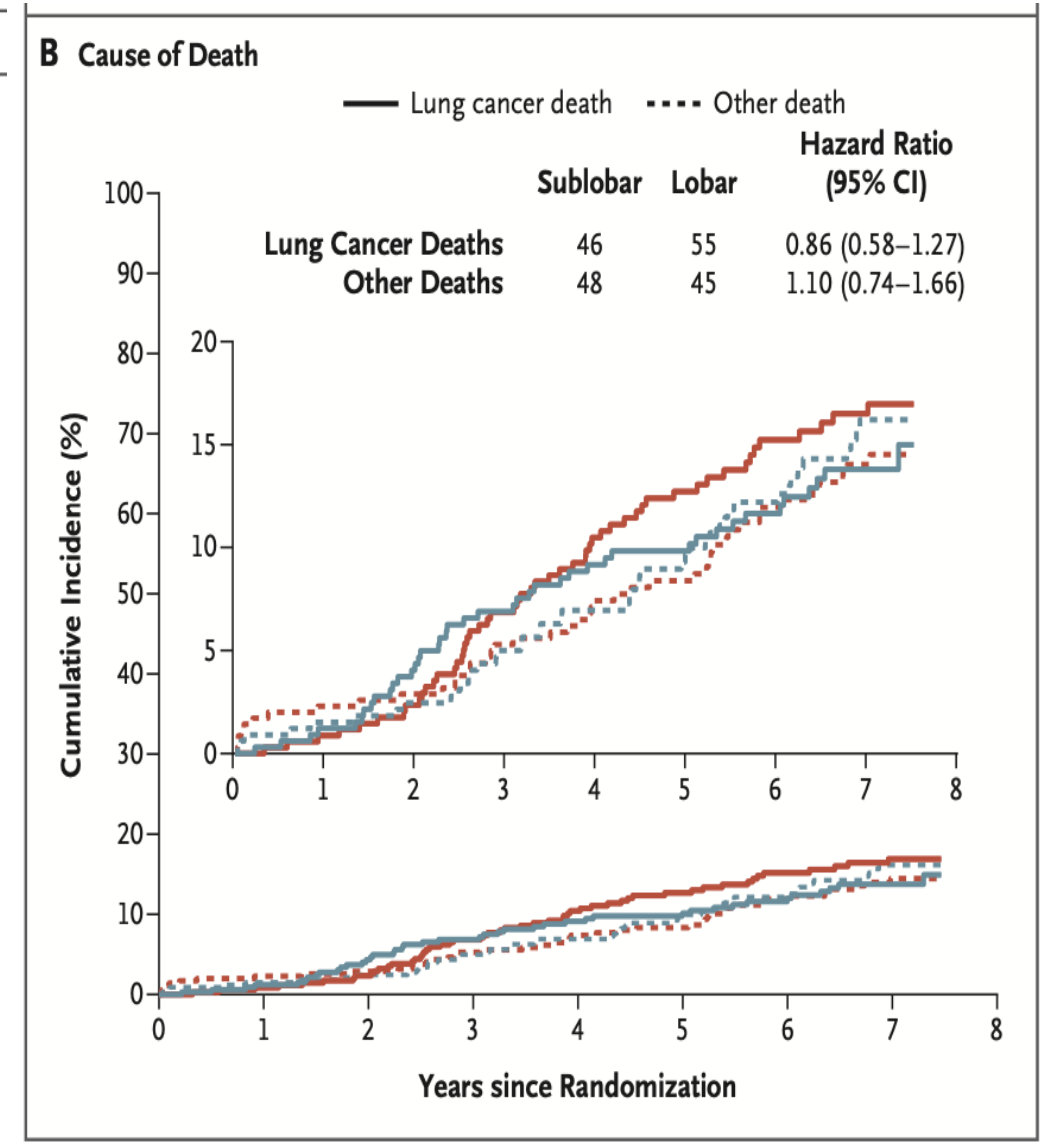
NEJM 388(6)2023:489-98





NEJM 388(6)2023:489-98





NEJM 388(6)2023:489-98

CONCLUSIONS:

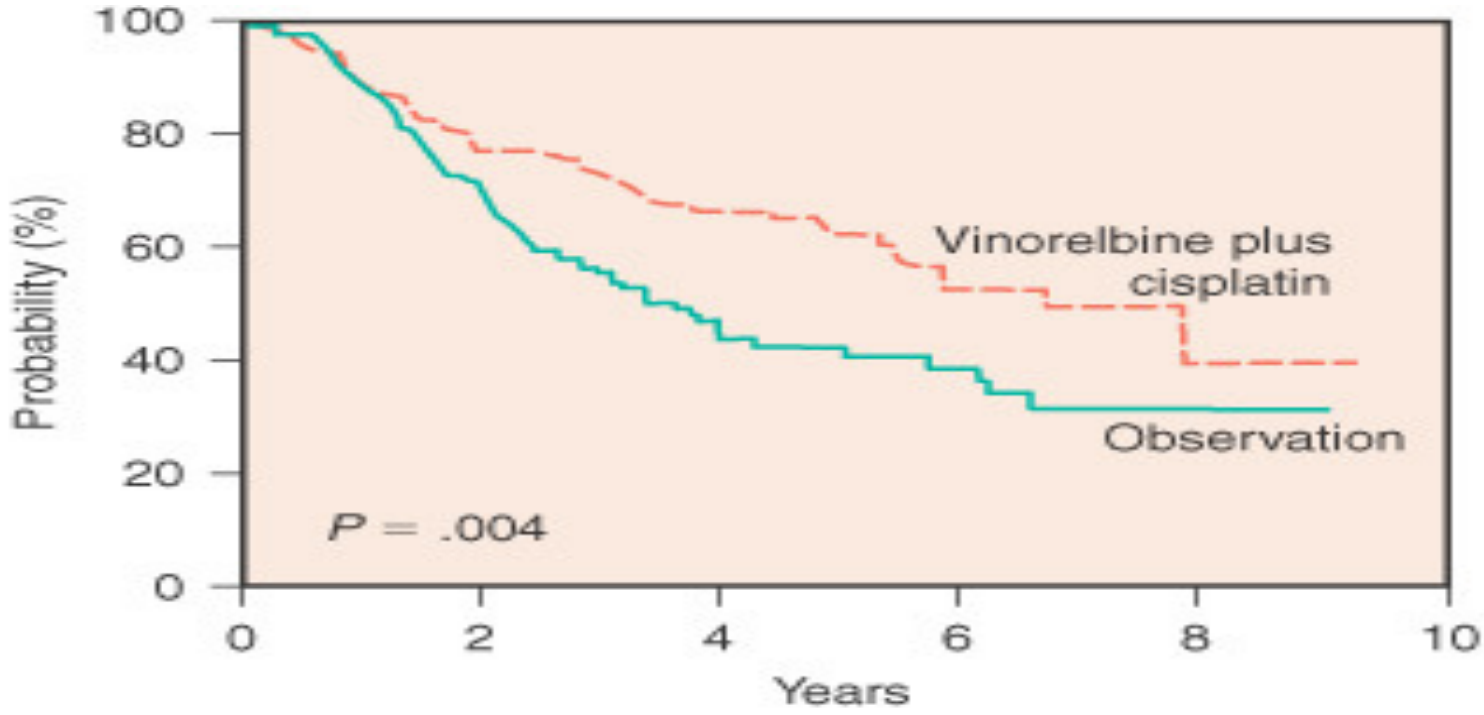
In patients with peripheral NSCLC with a tumor size < 2 cm and pathologically confirmed negative hilar and mediastinal lymph nodes:

Sublobar resection was not inferior to lobectomy with respect to disease-free survival

Overall survival was similar with the two procedures

NEJM 388(6)2023:489-98

TRAITEMENT ADJUVANT POST OPERATOIRE



No. at Risk						
Observation	132	91	37	18	5	0
Vinorelbine plus cisplatin	131	100	56	24	4	0

FIGURE 61-5 Adjuvant chemotherapy improves overall survival for stage II lung cancer.

(FROM WINTON T, ET AL: VINORELBINE PLUS CISPLATIN VS. OBSERVATION IN RESECTED NON-SMALL CELL LUNG CANCER. N ENGL J MED 352:2589, 2005, FIG. 1D.)

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MAY 26, 2022 VOL. 386 NO. 21

Neoadjuvant Nivolumab plus Chemotherapy in Resectable Lung Cancer

P.M. Forde, J. Spicer, S. Lu, M. Provencio, T. Mitsudomi, M.M. Awad, E. Felip, S.R. Broderick, J.R. Brahmer, S.J. Swanson, K. Kerr, C. Wang, T.-E. Ciuleanu, G.B. Saylors, F. Tanaka, H. Ito, K.-N. Chen, M. Liberman, E.E. Vokes, J.M. Taube, C. Dorange, J. Cai, J. Fiore, A. Jarkowski, D. Balli, M. Sausen, D. Pandya, C.Y. Calvet, and N. Girard, for the CheckMate 816 Investigators*

- Open-label, randomised, phase 3 trial
- Patients with stage IB to IIIA resectable NSCLC
- Nivolumab plus platinum-based chemotherapy or platinum based chemotherapy alone, followed by resection
- **Primary end points** : event-free survival and pathological complete response
- **Secondary end point** : overall survival

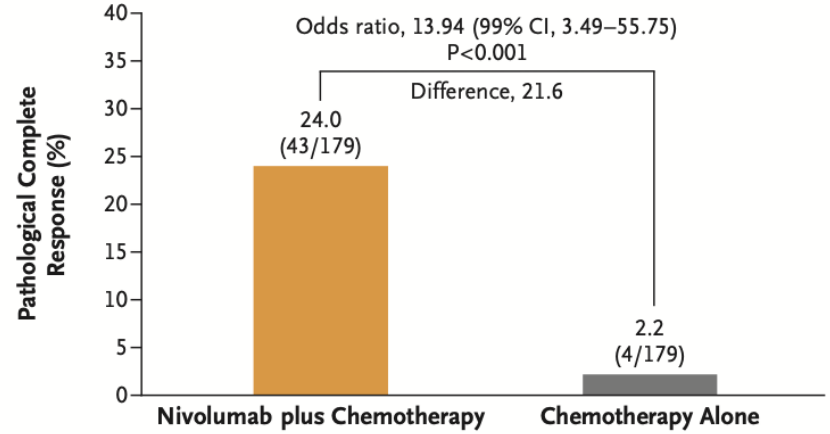
NEJM 386(21)2022:1973-85

Table 2. Adverse Events.*

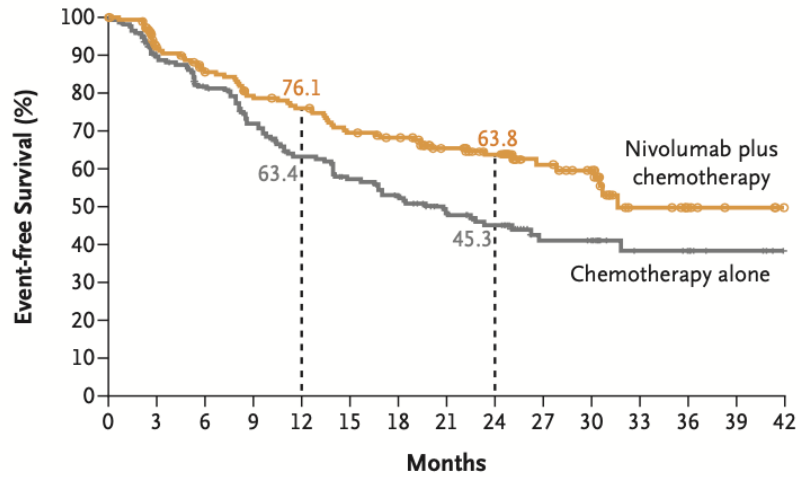
Event	Nivolumab plus Chemotherapy (N=176)		Chemotherapy Alone (N=176)	
	Any Grade	Grade 3 or 4	Any Grade	Grade 3 or 4
Adverse events of any cause — no. (%)†				
All	163 (92.6)	72 (40.9)	171 (97.2)	77 (43.8)
Leading to discontinuation of treatment	18 (10.2)	10 (5.7)	20 (11.4)	7 (4.0)
Serious	30 (17.0)	19 (10.8)	24 (13.6)	17 (9.7)
Treatment-related adverse events — no. (%)†				
All	145 (82.4)	59 (33.5)	156 (88.6)	65 (36.9)
Leading to discontinuation of treatment	18 (10.2)	10 (5.7)	17 (9.7)	6 (3.4)
Serious	21 (11.9)	15 (8.5)	18 (10.2)	14 (8.0)
Death‡	0	—	3 (1.7)	—
Surgery-related adverse events — no./total no. (%)§	62/149 (41.6)	17/149 (11.4)	63/135 (46.7)	20/135 (14.8)

* Adverse events were coded according to the *Medical Dictionary for Regulatory Activities*, version 24.0, and were graded according to the Common Terminology Criteria for Adverse Events, version 4.0.
† Included are events reported between the first neoadjuvant dose and 30 days after the last neoadjuvant dose.
‡ Treatment-related deaths in the chemotherapy-alone group were due to pancytopenia, diarrhea, acute kidney injury (all in one patient), enterocolitis, and pneumonia.
§ The denominators are based on patients who underwent definitive surgery. Included are events reported up to 90 days after definitive surgery. Grade 5 surgery-related adverse events (defined as events that led to death ≤24 hours after the onset of an adverse event) were reported in two patients in the nivolumab-plus-chemotherapy group and were deemed by the investigator to be unrelated to the trial drugs (one each due to pulmonary embolism and aortic rupture).

A



A

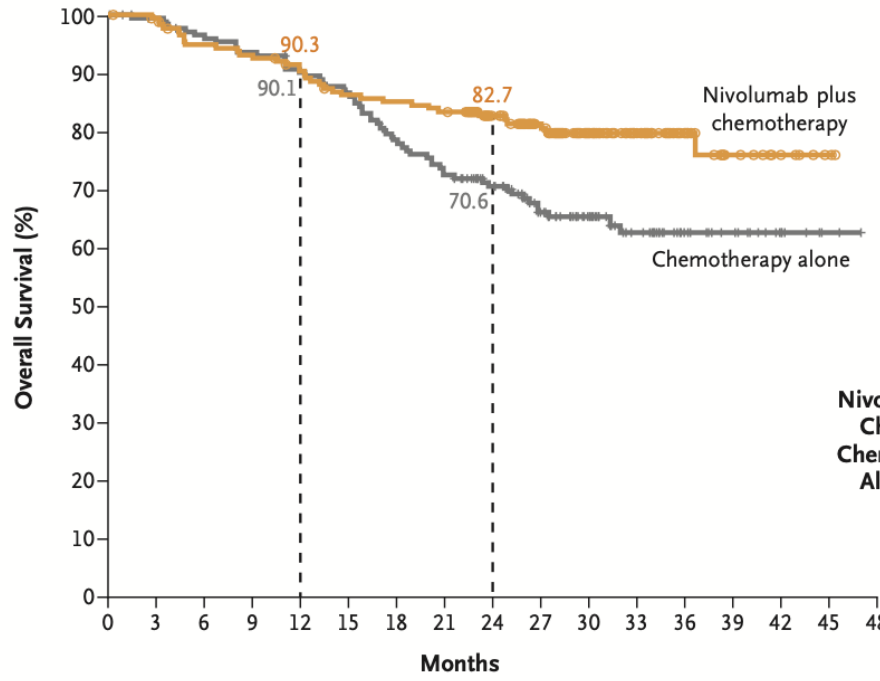


	No. of Patients	Median Event-free Survival (95% CI) *mo*
Nivolumab plus Chemotherapy	179	31.6 (30.2–NR)
Chemotherapy Alone	179	20.8 (14.0–26.7)

Hazard ratio for disease progression, disease recurrence, or death, 0.63 (97.38% CI, 0.43–0.91)
P=0.005

No. at Risk

Nivolumab plus chemotherapy	179	151	136	124	118	107	102	87	74	41	34	13	6	3	0
Chemotherapy alone	179	144	126	109	94	83	75	61	52	26	24	13	11	4	0



	No. of Patients	Median Overall Survival (95% CI) *mo*
Nivolumab plus Chemotherapy	179	NR (NR–NR)
Chemotherapy Alone	179	NR (NR–NR)

Hazard ratio for death, 0.57 (99.67% CI, 0.30–1.07)
P=0.008

No. at Risk

Nivolumab plus chemotherapy	179	176	166	163	156	148	146	143	122	101	72	48	26	16	7	3	0
Chemotherapy alone	179	172	165	161	154	148	133	123	108	80	59	41	24	16	7	2	0

Figure 3. Overall Survival.

The 95% confidence interval of the hazard ratio was 0.38 to 0.87. At this first prespecified interim analysis, the P value for overall survival did not cross the boundary for statistical significance (0.0033).

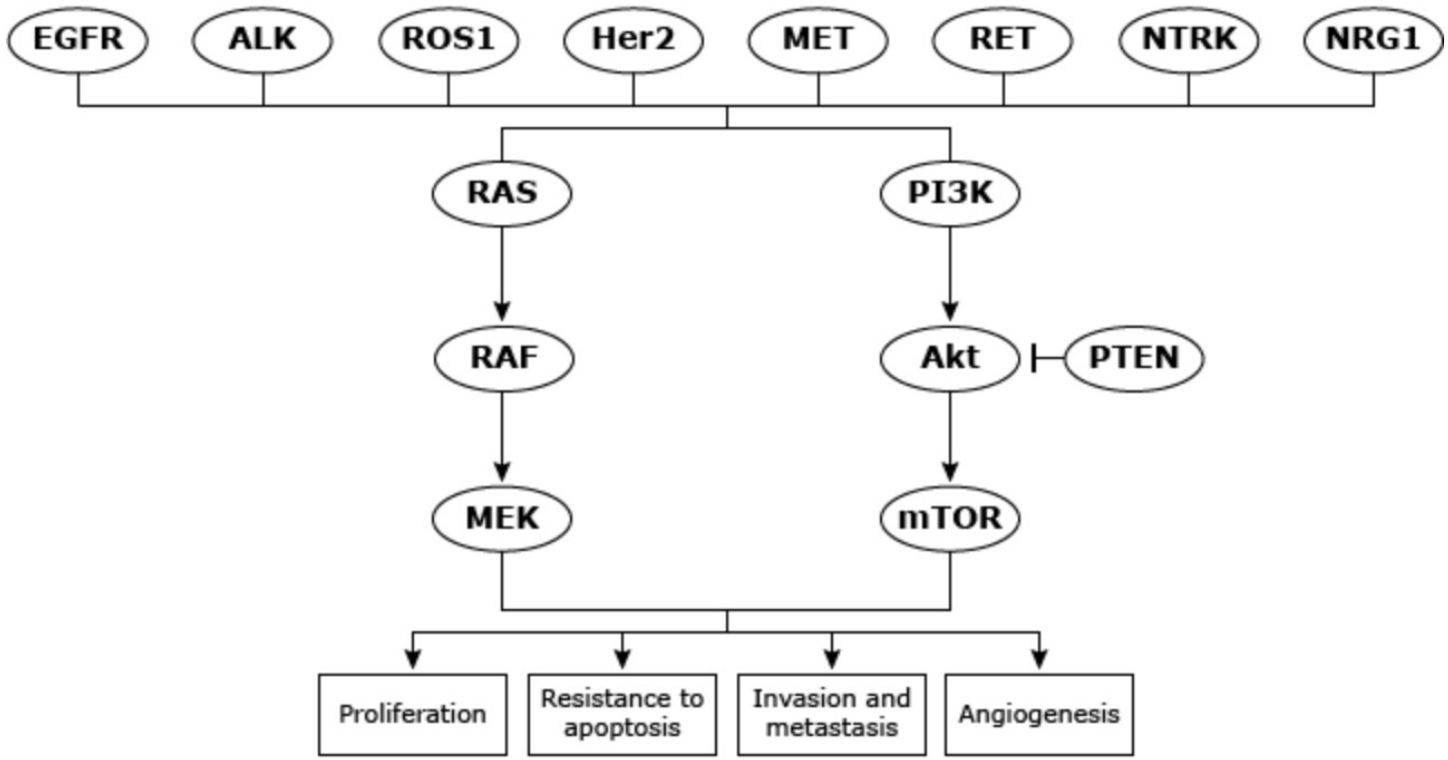
CONCLUSIONS :

- In patients with resectable NSCLC, neoadjuvant nivolumab plus chemotherapy resulted in significantly longer event-free survival and a higher percentage of complete pathological responses than chemotherapy alone.

- The addition of nivolumab to neoadjuvant chemotherapy did not increase the incidence of adverse events or impede the feasibility of surgery.

NEJM 386(21)2022:1973-85

Molecular targets in non-small cell lung cancer



Pathways for molecularly targeted therapy in non-small cell lung cancer.

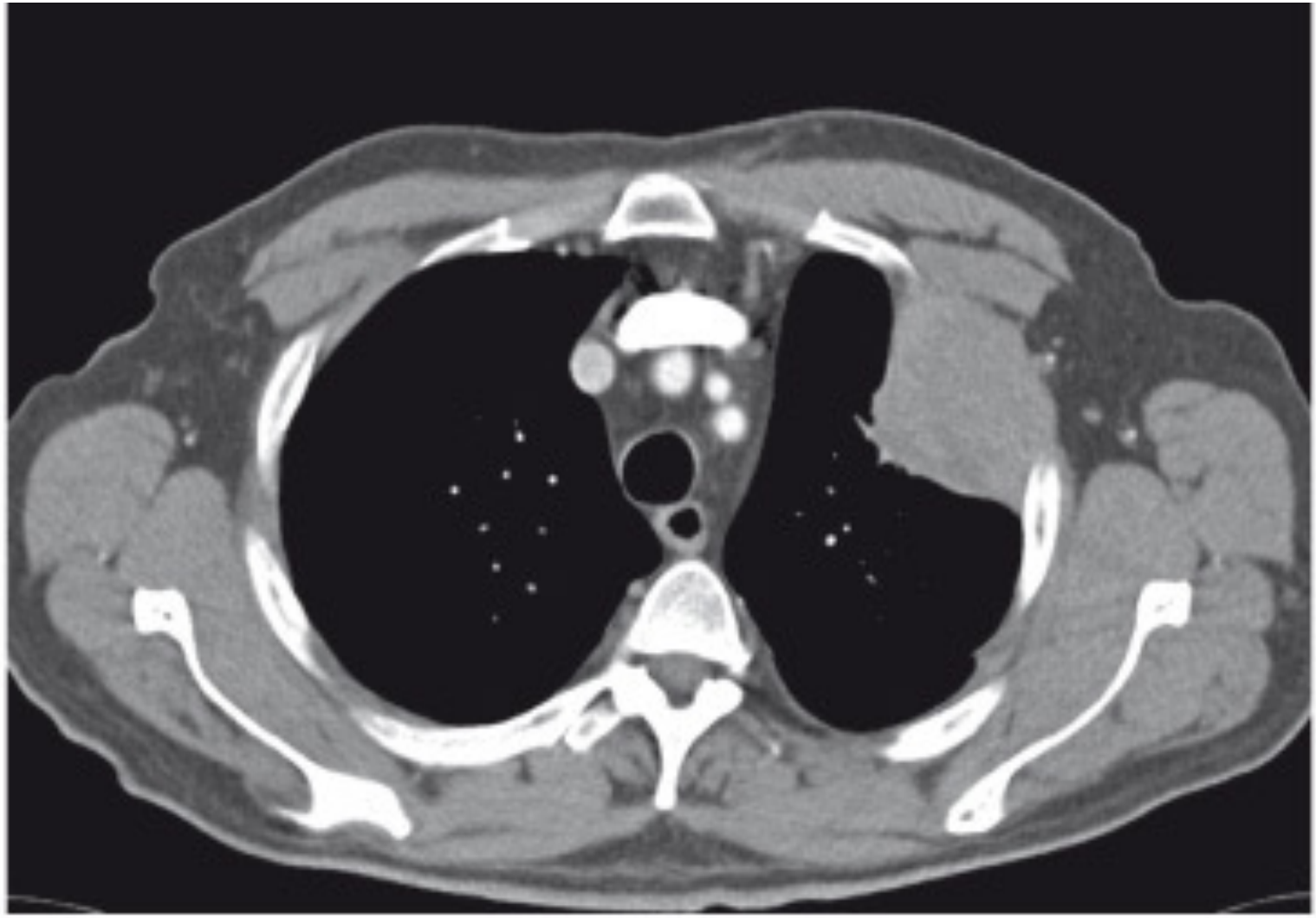
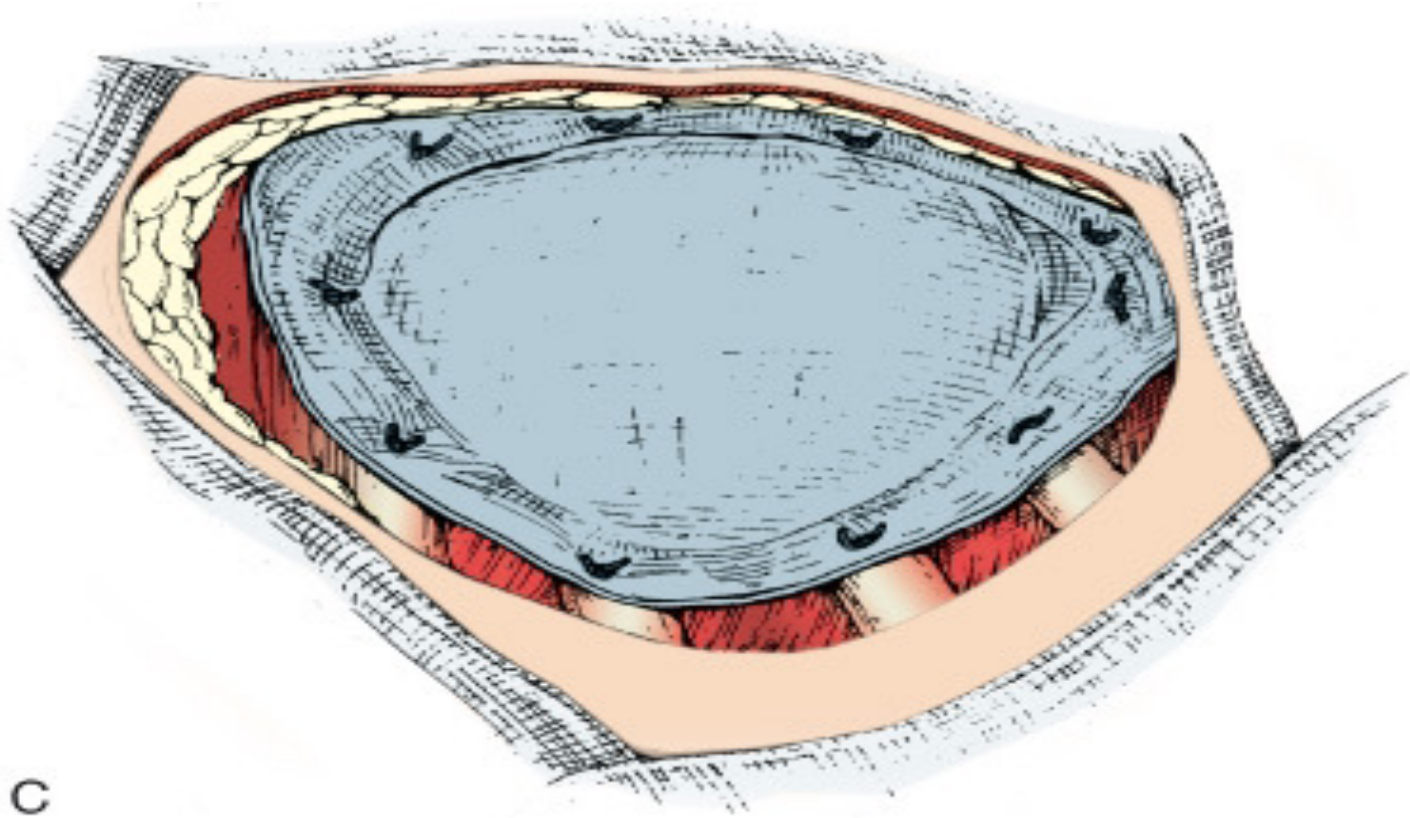


FIGURE 61-6 Chest computed tomographic scan of a T3 N0 left upper lobe non–small cell lung cancer with chest wall invasion.

RECONSTRUCTION DE LA PAROI THORACIQUE



C

FIGURE 78-2C Chest wall reconstruction. **A,** Radiograph of a resected chest wall tumor. **B,** Spreading methylmethacrylate over mesh. **C,** Prosthesis sutured in place. **D,** Omentum sutured over prosthesis. **E,** Myocutaneous flap sutured to skin.

LOBECTOMIE AVEC BRONCHOPLASTIE

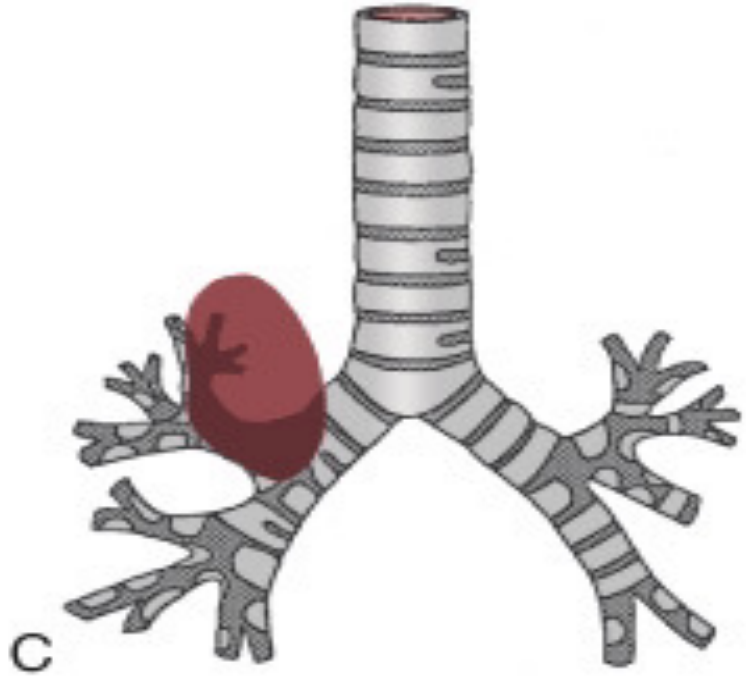


FIGURE 74-10C Possible indications for sleeve resection in patients with bronchogenic carcinomas of the right upper lobe. **A,** Central tumor located at the origin of the right upper lobe where standard lobectomy is not possible. **B,** Peripheral tumor with metastatic nodes at the lobar or hilar level. **C,** Larger tumor with direct contiguous invasion of lobar nodes.

LOBECTOMIE AVEC BRONCHOPLASTIE

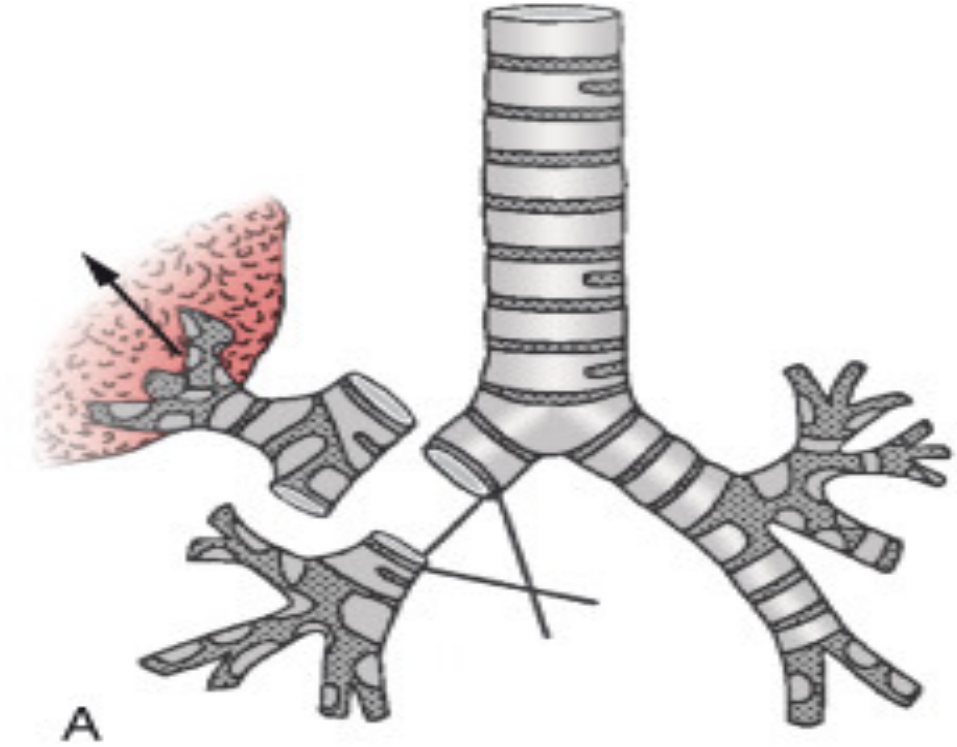


FIGURE 74-11A Sleeve resections of the right lung. **A,** Right upper lobe. **B,** Upper and middle lobe by extending the division of the bronchus intermedius distal to the origin of the middle lobe bronchus. **C,** Upper and middle lobe by separate division of the middle lobe bronchus. **D,** Middle lobectomy with sleeve resection of the bronchus intermedius.

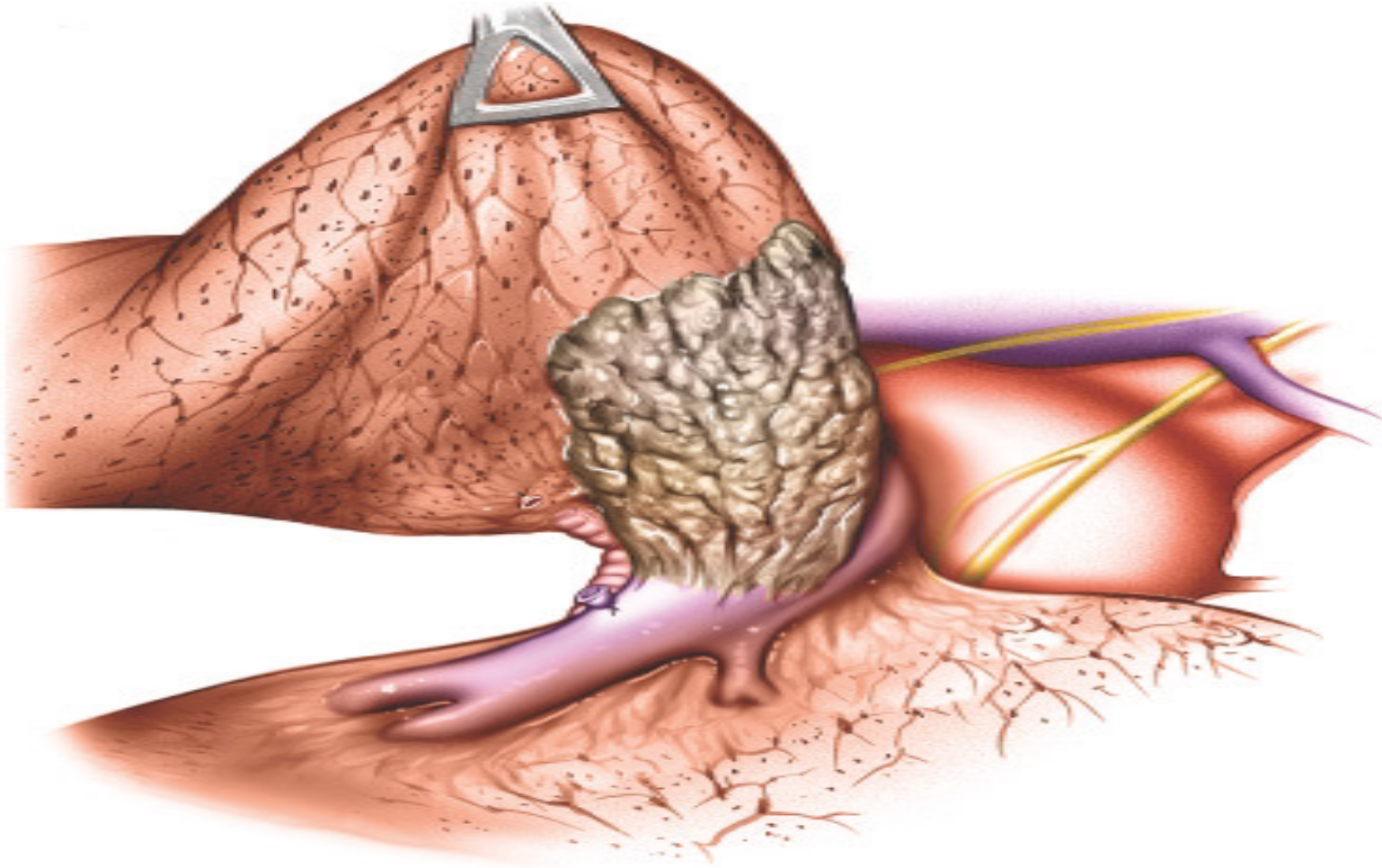


FIGURE 75-6 Typical pattern of a pulmonary artery tumor infiltration requiring pulmonary artery resection and reconstruction. The left upper lobe tumor involves the artery in the interlobar fissure; often, the lingular artery is free of tumor and can be ligated and resected separately, as shown in this figure.

(REDRAWN FROM RENDINA EA, VENUTA F, DE GIACOMO T, ET AL: SAFETY AND EFFICACY OF BRONCHOVASCULAR RECONSTRUCTION AFTER INDUCTION CHEMOTHERAPY FOR LUNG CANCER. J THORAC CARDIOVASC SURG 114:830, 1997.)

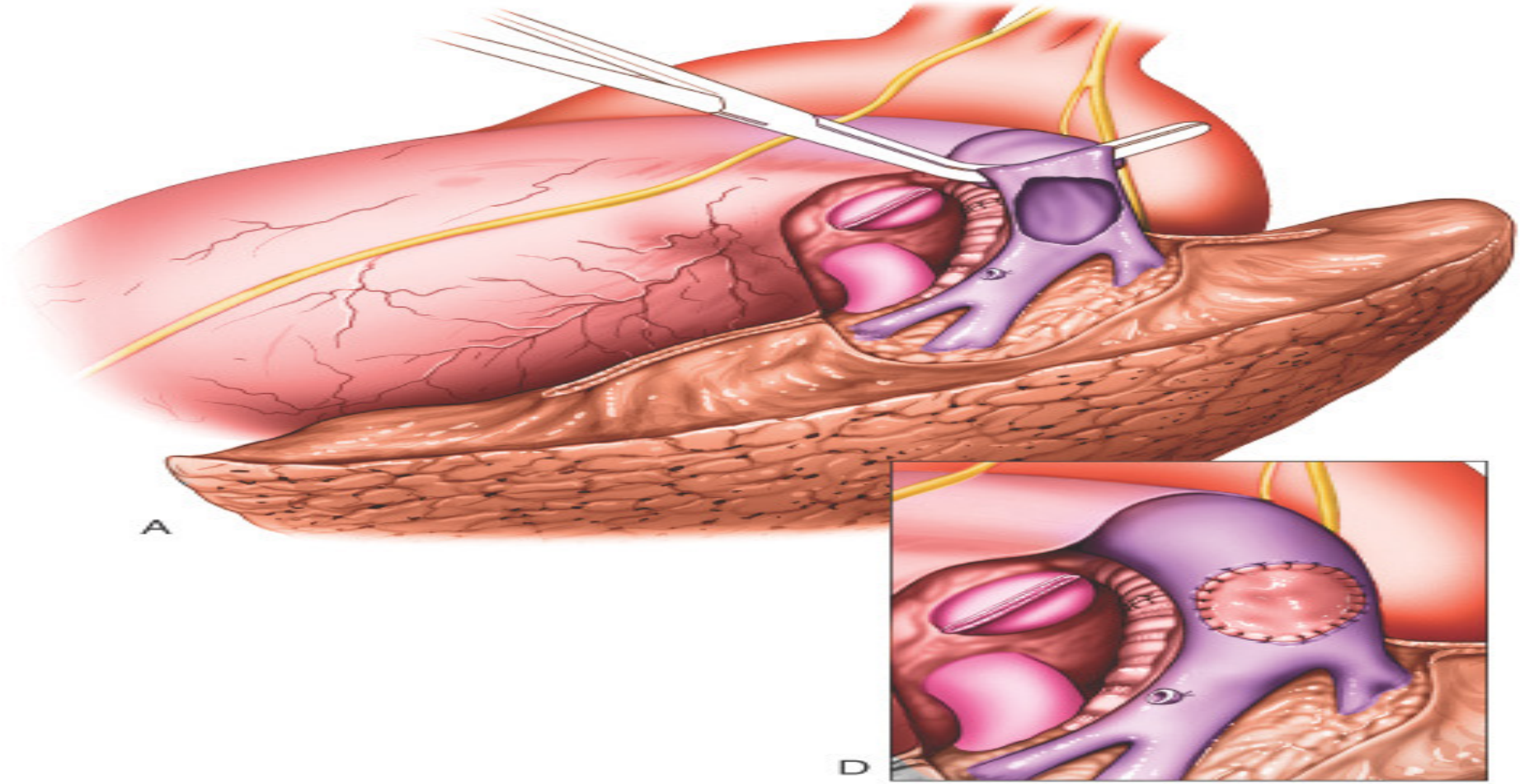
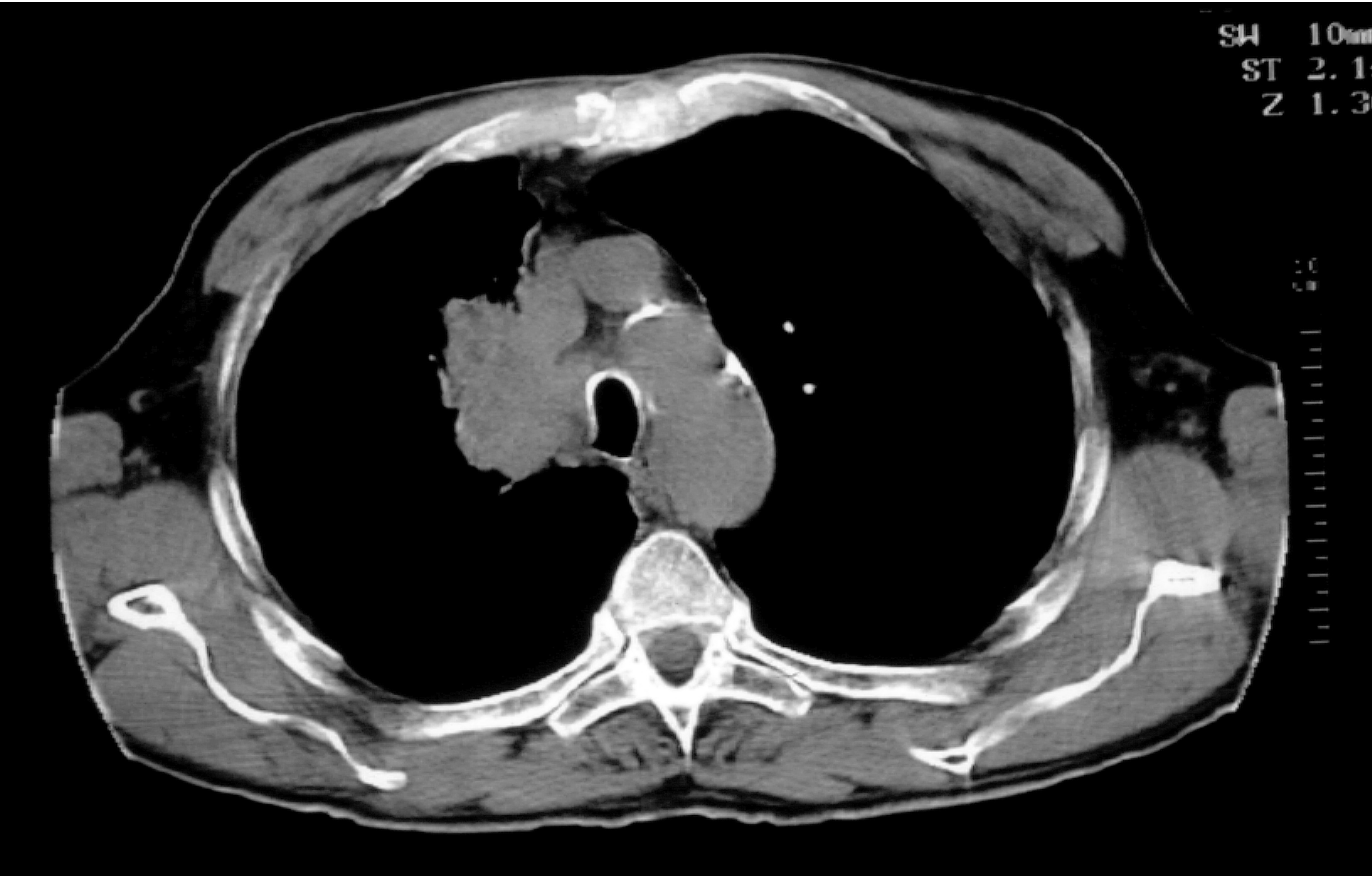
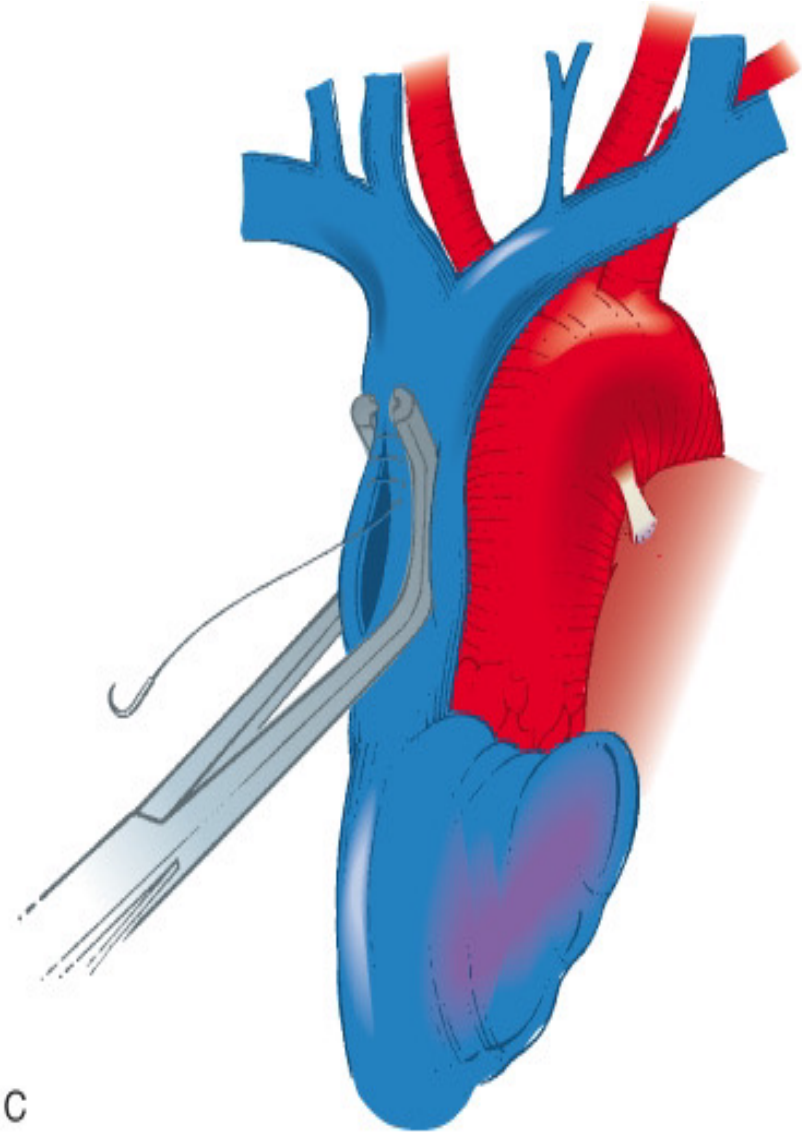


FIGURE 75-14AD Patch reconstruction. **A,** After upper lobectomy and partial resection of the pulmonary artery, an oval defect ensues, caused by the tension applied to the vessel by the lower lobe. **B,** The patch is held in place by two stay sutures. Some degree of tension on the patch is desirable at this stage, to show that the patch is not too long; tension will disappear after declamping. **C,** The lower stay suture is not tied but simply keeps the patch in place. The right-handed surgeon would proceed from top to bottom, "artery first," on the right side and then continue bottom to top, "patch first." **D,** Completed patch reconstruction of the pulmonary artery. The pericardial defect is left open. The ligated stump of the lingular artery can also be seen.

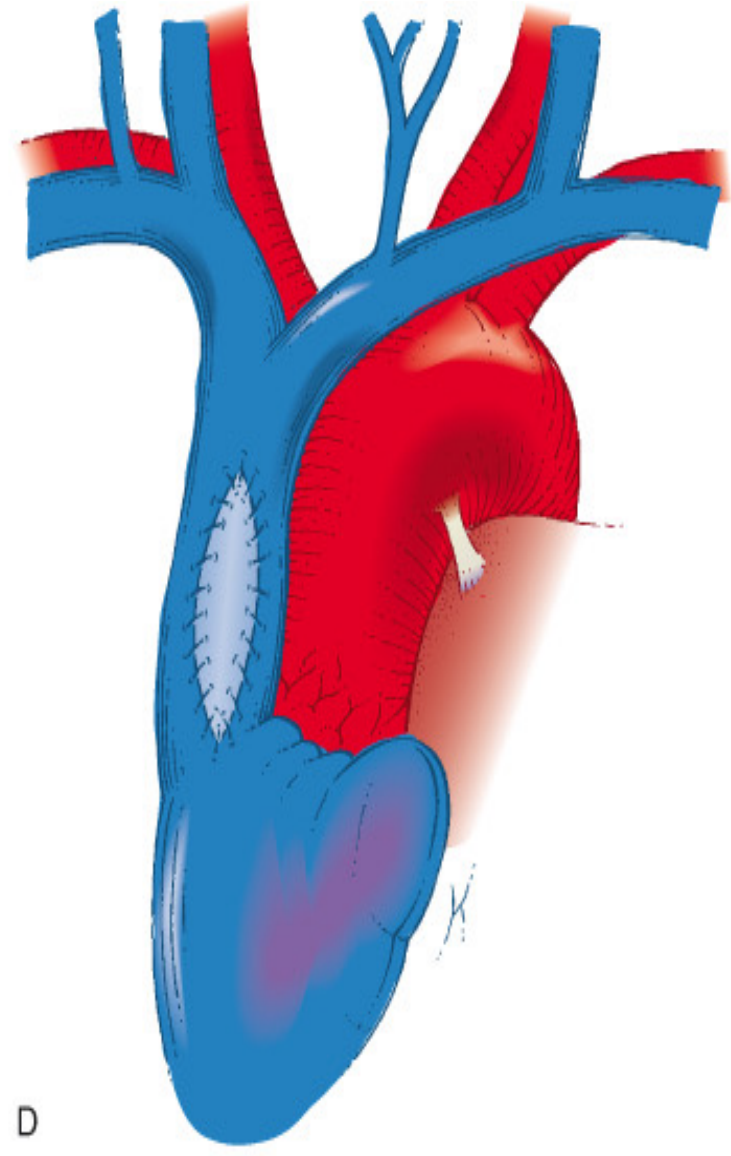
(REDRAWN FROM RENDINA EA, VENUTA F, DE GIACOMO T, ET AL: SAFETY AND EFFICACY OF BRONCHOVASCULAR RECONSTRUCTION AFTER INDUCTION CHEMOTHERAPY FOR LUNG CANCER. J THORAC CARDIOVASC SURG 114:830, 1997.)


SH 10mm
ST 2.1
Z 1.3



C

FIGURE 139-5C Invasions of **(A)** less than 30% of the SVC can be resected and closed directly using a **(B)** mechanical or **(C)** running suture or **(D)** by autologous pericardial or venous patch interposition.



D

FIGURE 139-5D Invasions of **(A)** less than 30% of the SVC can be resected and closed directly using a **(B)** mechanical or **(C)** running suture or **(D)** by autologous pericardial or venous patch interposition.

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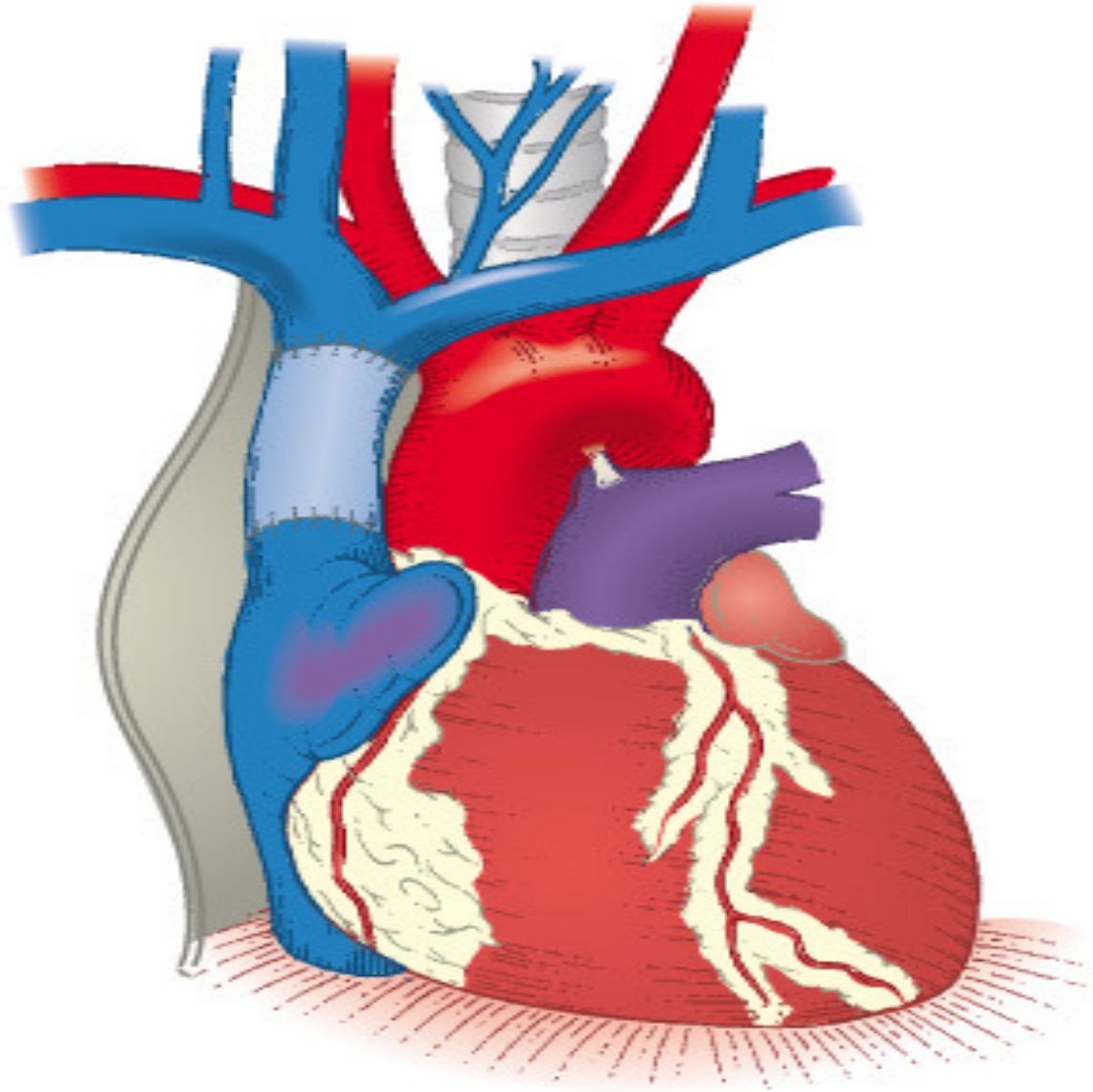

FIGURE 139-6 Trunk SVC revascularization using an unringed synthetic, nontextile polytetrafluoroethylene vascular graft.

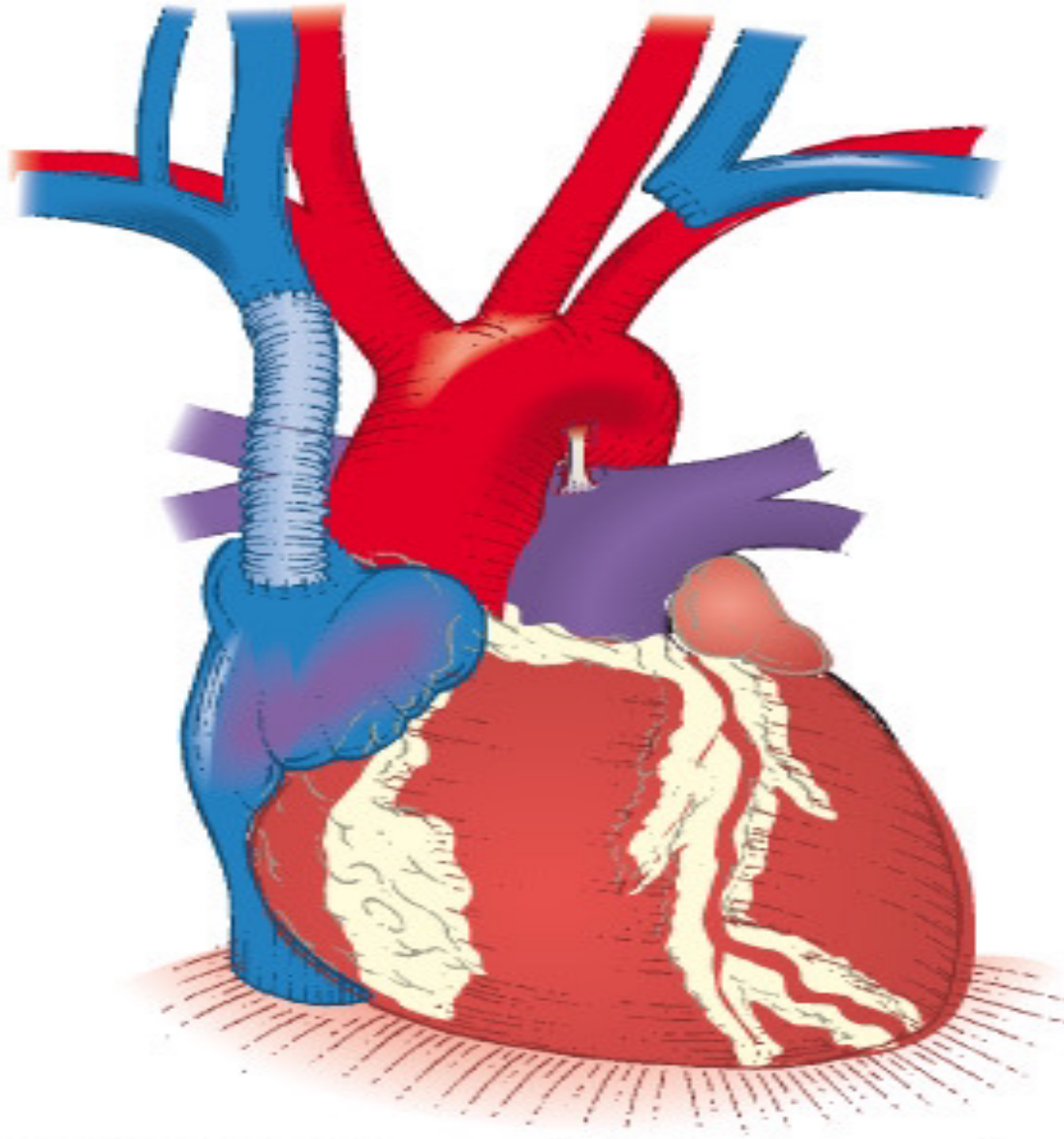

FIGURE 139-8 Revascularization between the right innominate vein and the right atrium using a ringed synthetic, nontextile polytetrafluoroethylene vascular graft.

RESECTION DE CARENE (T4)

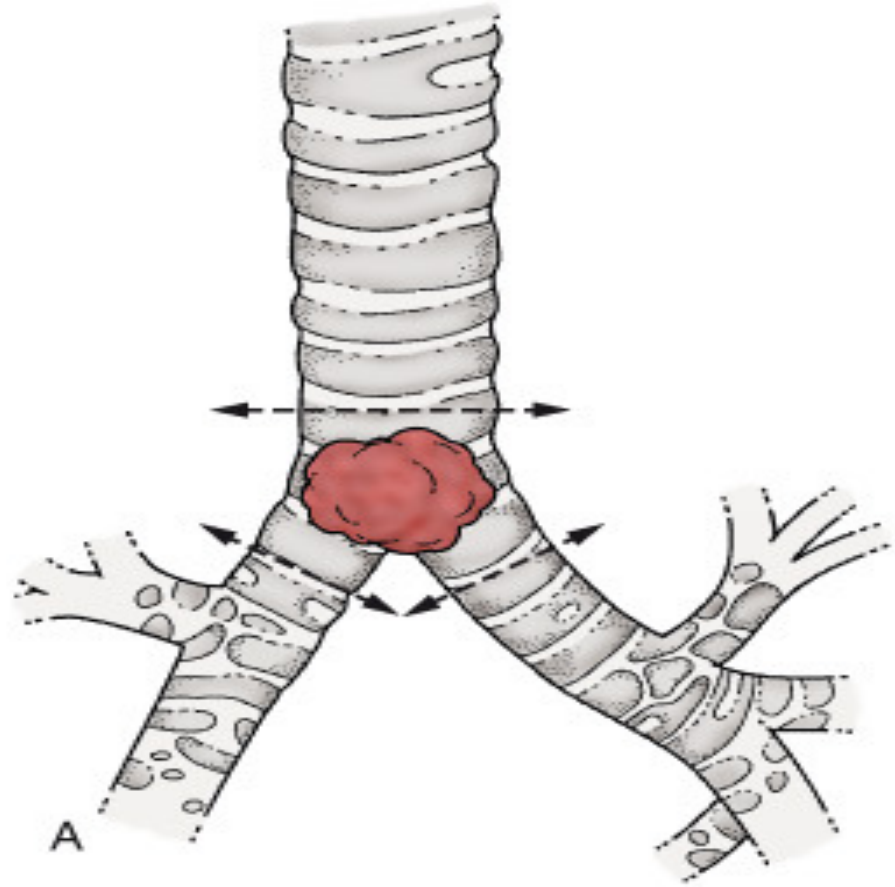

FIGURE 33-3A Carinal resection with creation of a neocarina by anastomosing the right and left main bronchi together.

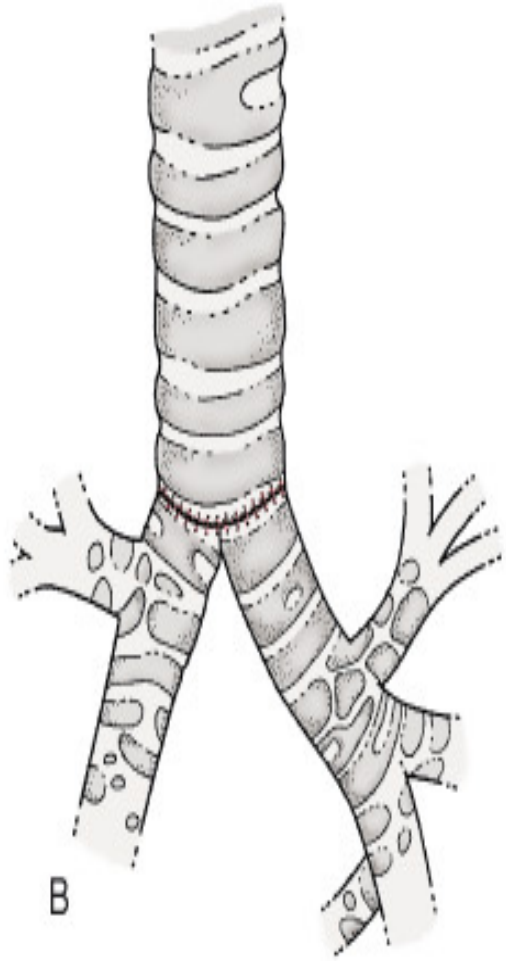

FIGURE 33-3B Carinal resection with creation of a neocarina by anastomosing the right and left main bronchi together.

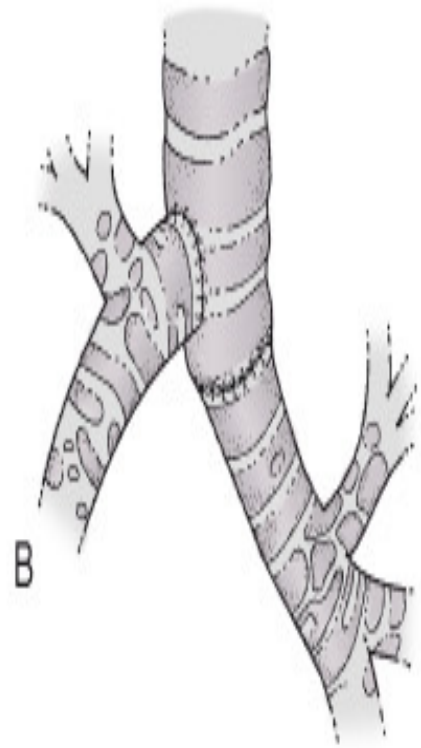

FIGURE 33-4B A, Lines of carinal resection. Techniques of reconstruction can involve end-to-end anastomosis between the trachea and left main bronchus with end-to-side anastomosis of the right main bronchus into the distal trachea **(B)**.

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PNEUMONECTOMIE AVEC RESECTION CARENE

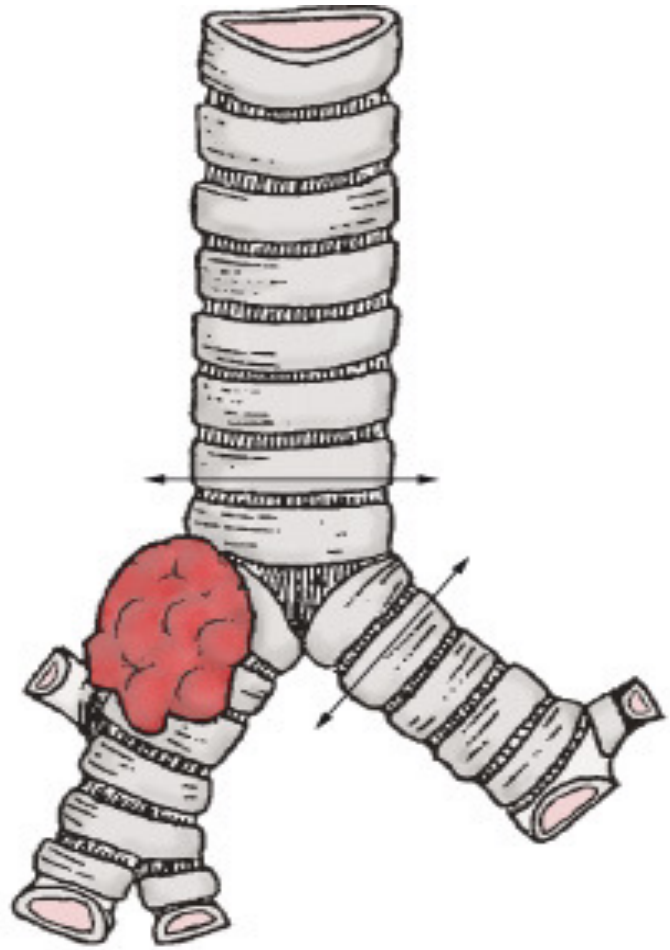
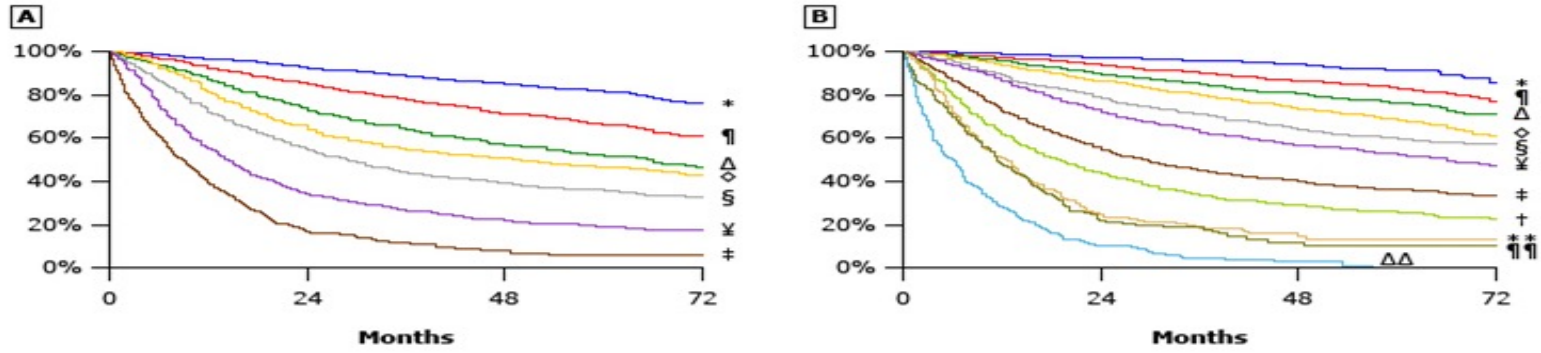


FIGURE 33-6 Right carinal pneumonectomy is the most frequent type of carinal resection for bronchogenic carcinoma.

Overall survival by clinical stage according to the seventh edition (A) and the eighth edition (B) groupings using the entire database available for the eighth edition



7th edition	Events / N	MST	24 month	60 month
* IA	1119 / 6303	NR	93%	82%
¶ IB	768 / 2492	NR	85%	66%
Δ IIA	424 / 1008	66.0	74%	52%
◇ IIB	382 / 824	49.0	64%	47%
§ IIIA	2139 / 3344	29.0	55%	36%
¥ IIIB	2101 / 2624	14.1	34%	19%
‡ IV	664 / 882	8.8	17%	6%

8th edition	Events / N	MST	24 month	60 month
* IA1	68 / 781	NR	97%	92%
¶ IA2	505 / 3105	NR	94%	83%
Δ IA3	546 / 2417	NR	90%	77%
◇ IB	560 / 1928	NR	87%	68%
§ IIA	215 / 585	NR	79%	60%
¥ IIB	605 / 1453	66.0	72%	53%
‡ IIIA	2052 / 3200	29.3	55%	36%
† IIIB	1551 / 2140	19.0	44%	26%
** IIIC	831 / 986	12.6	24%	13%
¶¶ IVA	336 / 484	11.5	23%	10%
ΔΔ IVB	328 / 398	6.0	10%	0%

Overall survival by clinical stage according to the seventh edition (A) and the eighth edition (B) groupings using the entire database available for the eighth edition. Survival is weighted by type of database submission: registry versus other.

N: number of patients; MST: median survival time; NR: not reached.

CONCLUSION :

- Cancer le plus fréquent et le plus mortel
- Chirurgie à visée curative représente le traitement de choix
- Segmentectomie indiquée pour cancer < 2 cm
- Rôle de plus en plus important pour la thérapie néo-adjuvante et adjuvante
- L’avenir repose sur l’immnothérapie et les thérapies ciblées

CENTRE HOSPITALIER DE L'UNIVERSITE DE MONTREAL

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