



TOP

THORACIC
ONCOLOGY
PADOVA

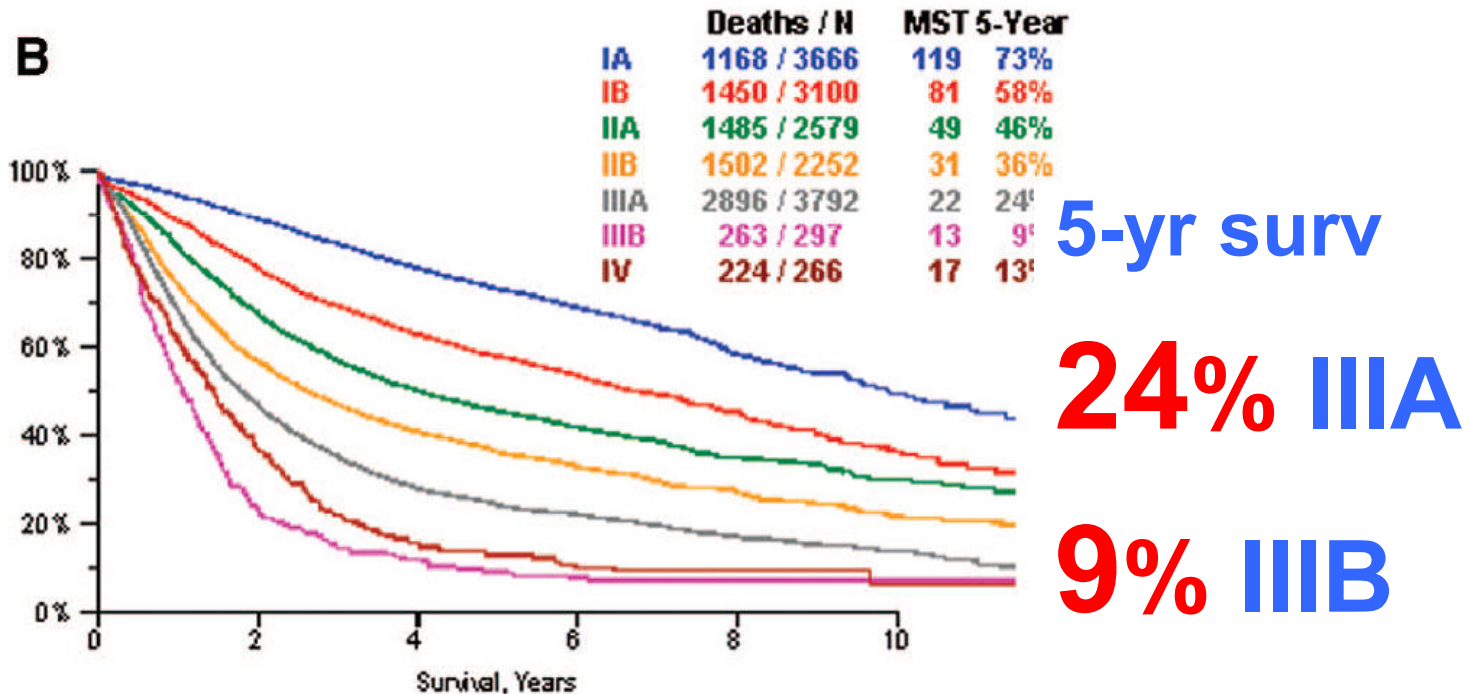
NON-SMALL CELL LUNG CANCER:
FOCUS ON OLIGOMETASTATIC
DISEASE AND 2017 UPDATE

locally advanced NSCLC update on surgical approach

Ugo Pastorino, Thoracic Surgery, Istituto Nazionale Tumori, Milan

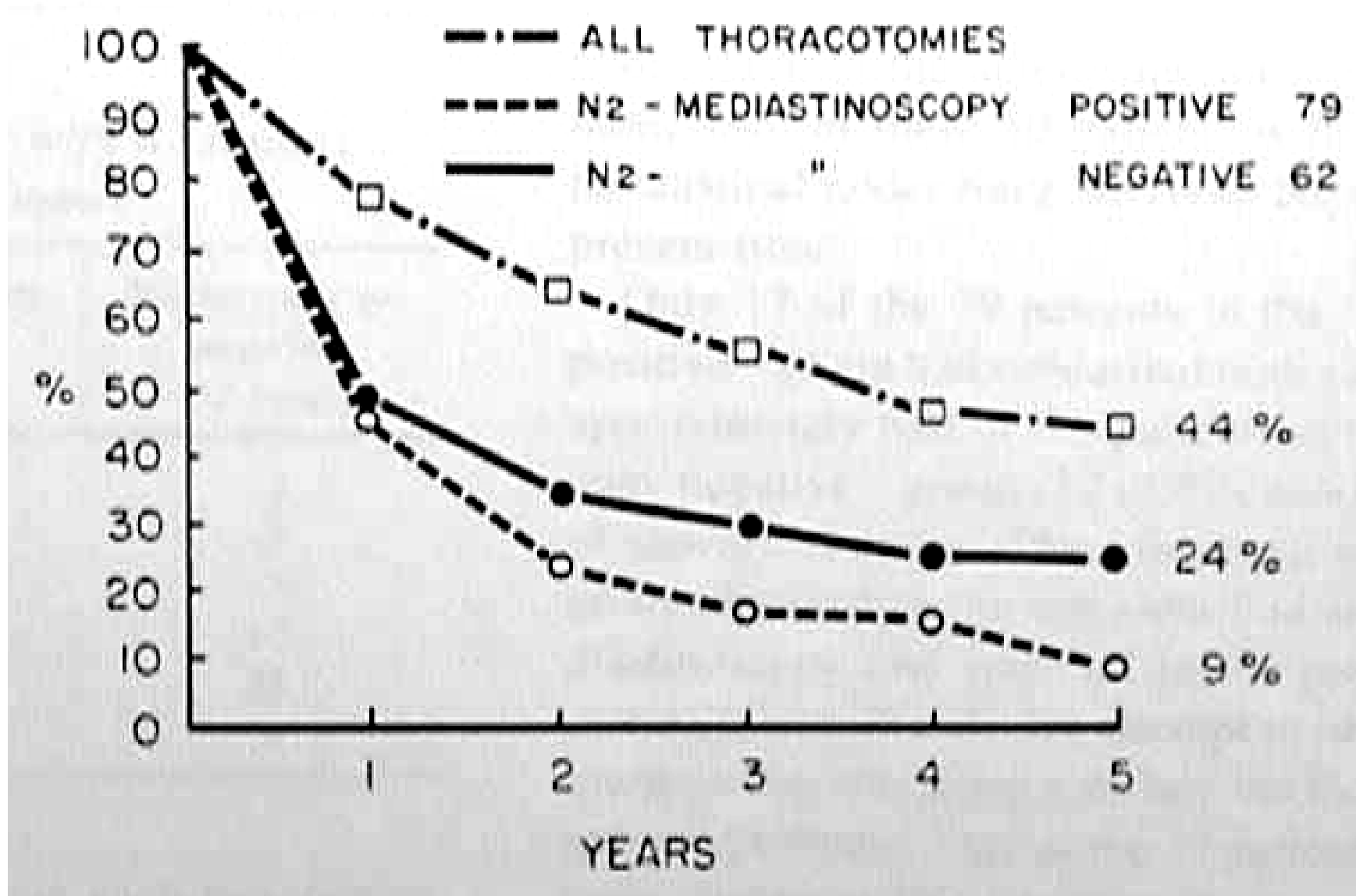
LUNG CANCER SURGERY: STAGE AND OUTCOME

TNM 2009

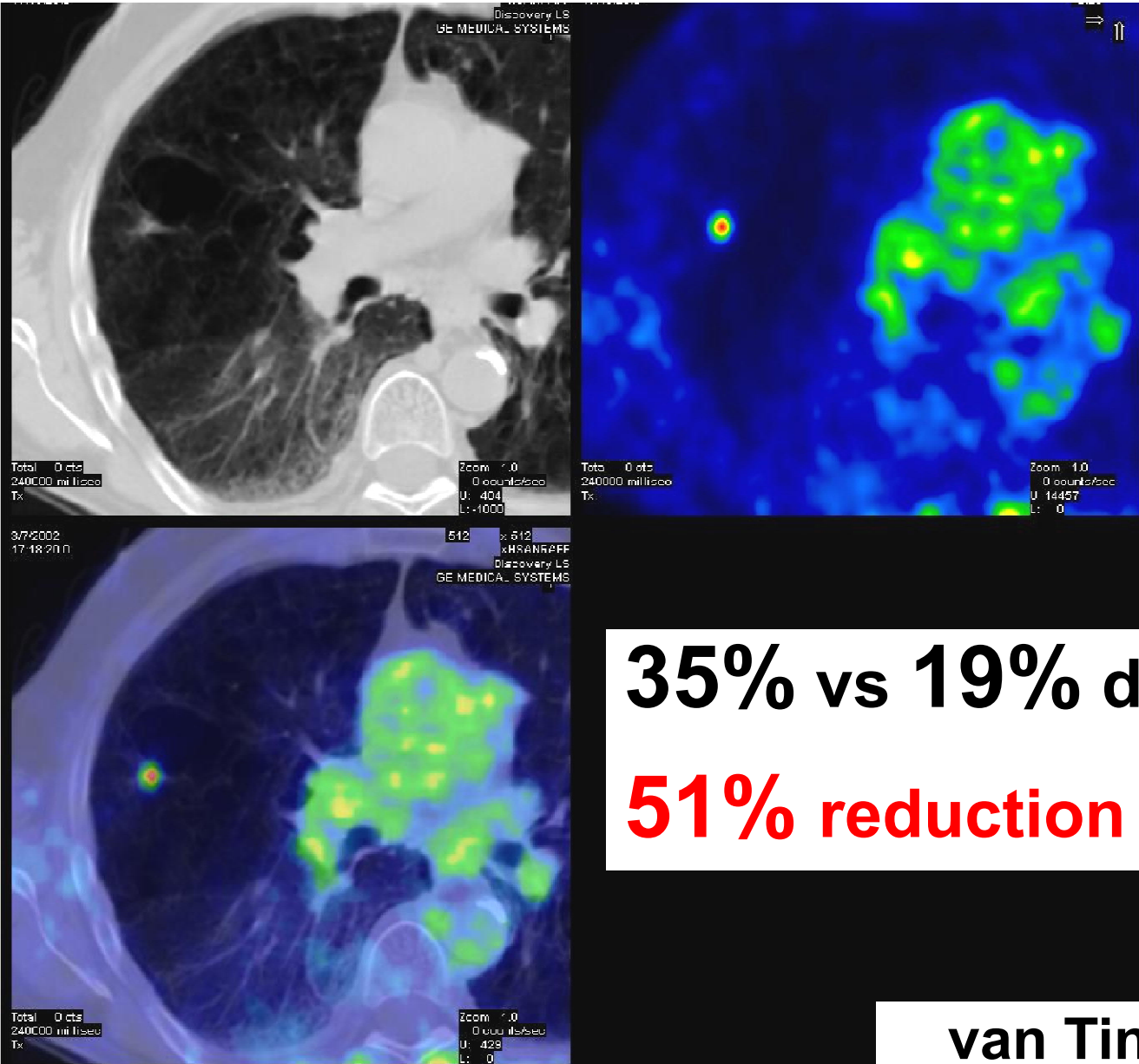


Peter Goldstraw, FRCS
Executive Editor

LUNG CANCER STAGING: SURGERY FOR MED + USELESS



LUNG CANCER STAGING: CT/PET MANDATORY



PLUS trial

188 LC patients

randomised to

preop PET + CV vs CV

35% vs 19% distant mets detected

51% reduction of futile thoracotomies

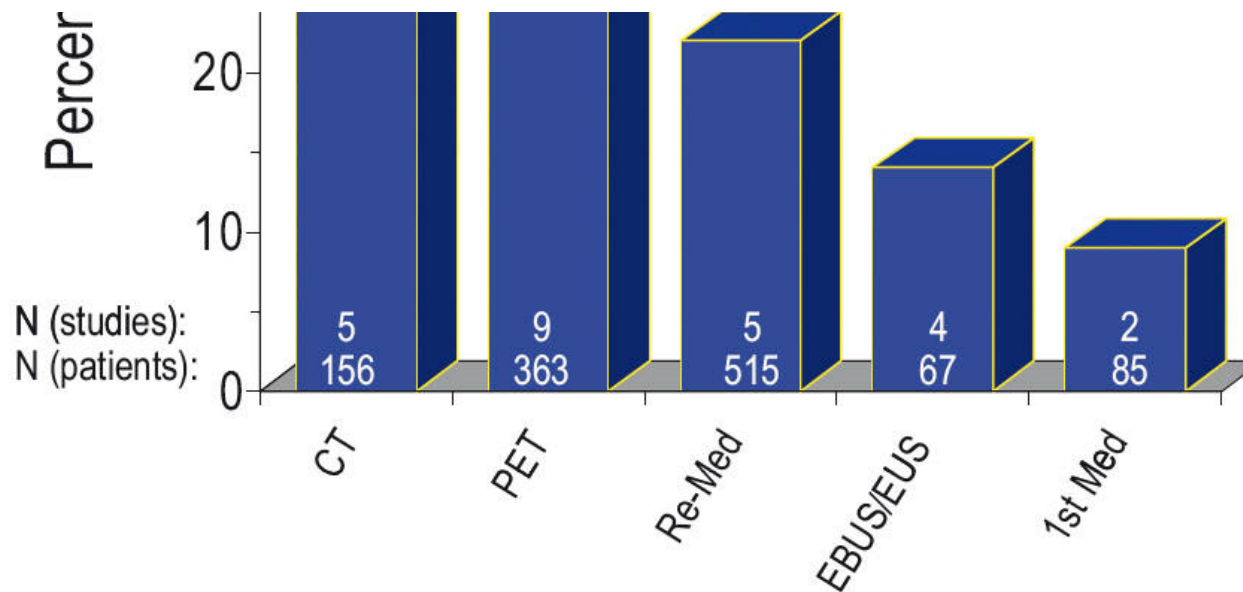
van Tinteren, Lancet 2002; 359:1388

LUNG CANCER STAGING: PET + UBUS MORE EFFECTIVE

systematic review of 25 studies and 1186 pts

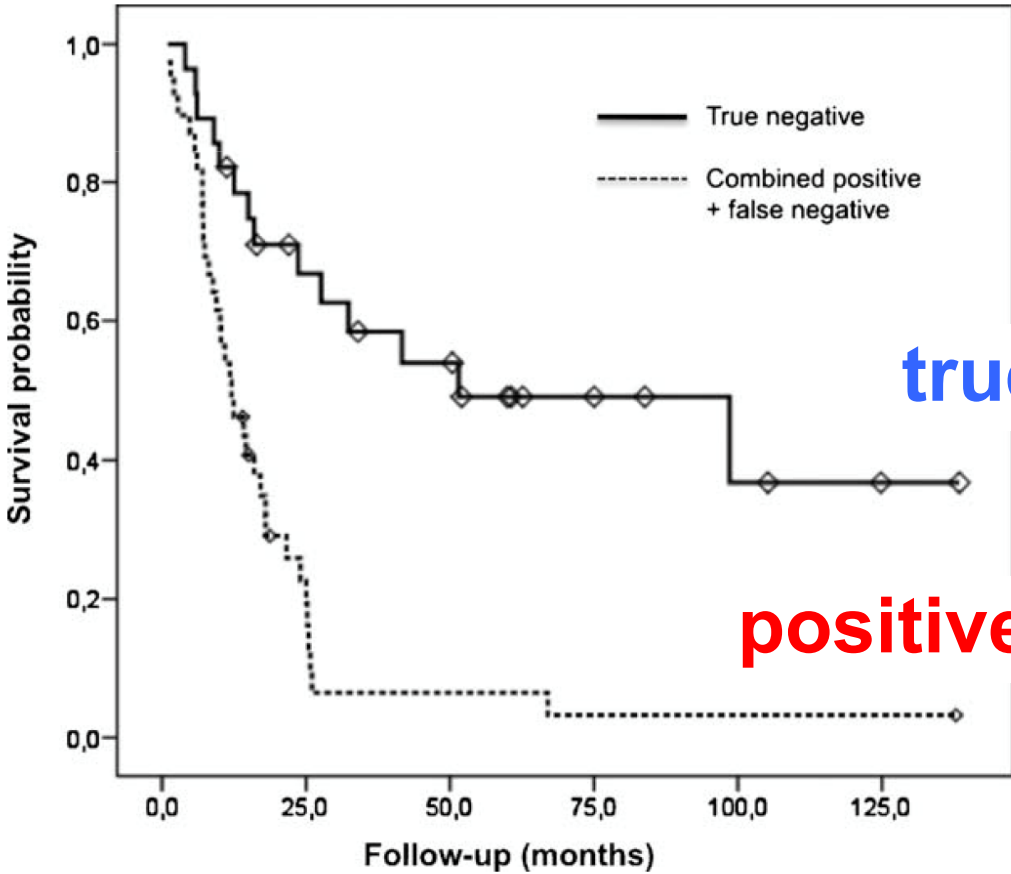
False Negative Rate of Mediastinal Restaging (N0,1 vs. N2,3)

Conclusion: The ability to identify patients who have achieved mediastinal downstaging other than by a careful primary mediastinoscopy is poor.



Repeat mediastinoscopy in all its indications: experience with 96 patients and 101 procedures[☆]

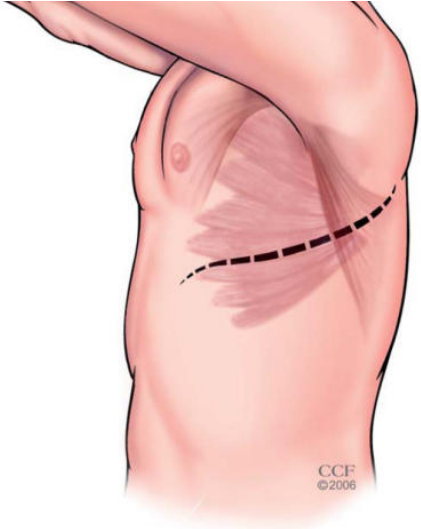
Sergi Call ^{a,*}, Ramon Rami-Porta ^a, Carme Obiols ^a, Mireia Serra-Mitjans ^a,
Guadalupe Gonzalez-Pont ^b, Romà Bastús-Piulats ^c, Salvador Quintana ^d,
Jose Belda-Sanchis ^a



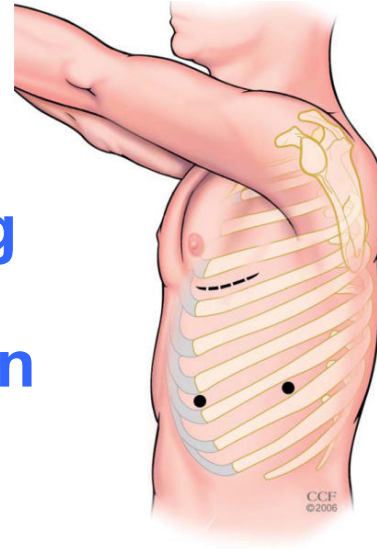
true negative re-MED

positive or false negative re-MED

LUNG CANCER SURGERY: WHICH IS THE BEST ACCESS ?



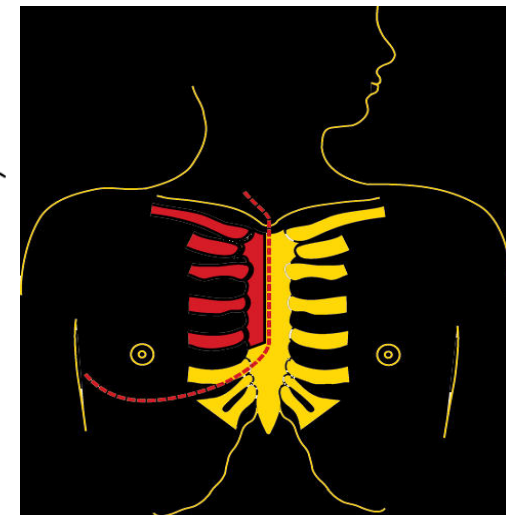
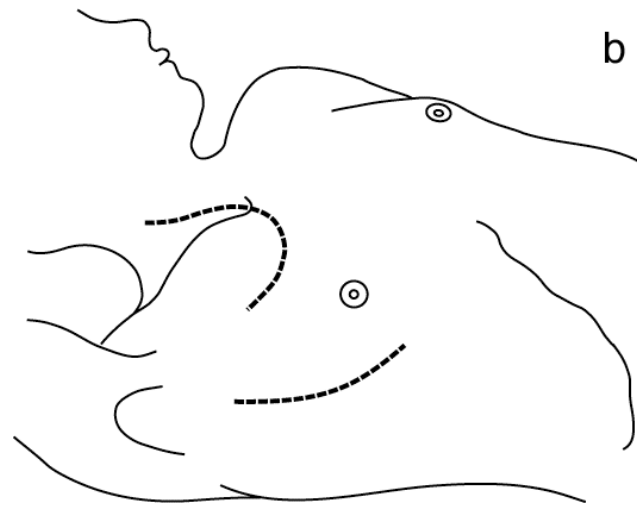
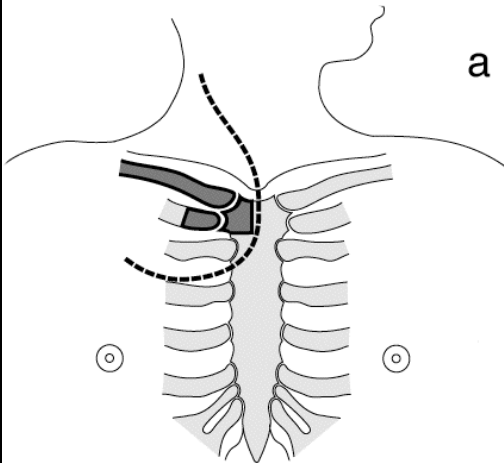
individual modelling
better exposure
function preservation



postero-lateral
thoracotomy

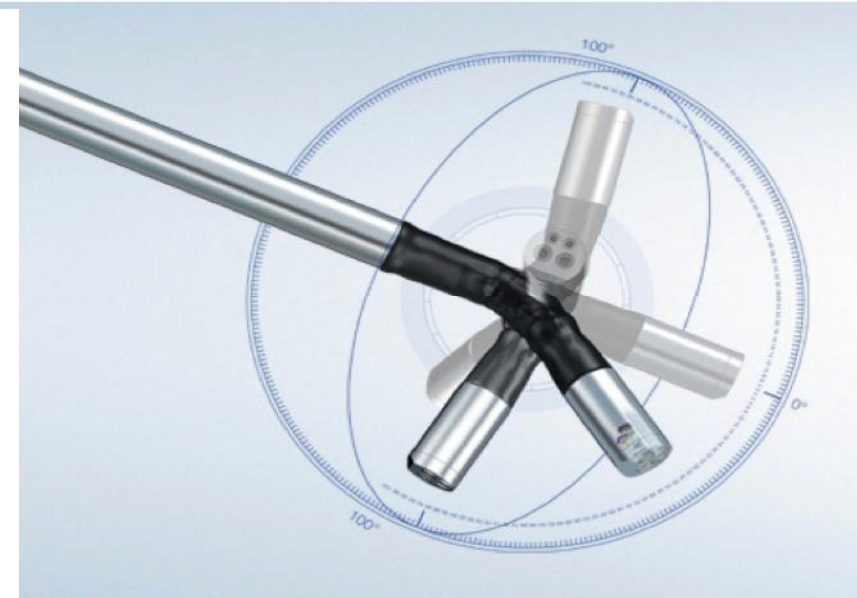


muscle-sparing
VATS
sternotomy
hemi-clamshell
TMA



NSCLC SURGERY: 3D VATS LOBECTOMY

- bi - triportal approach
- VATS lobectomy in > 50% of cases
- 3N1 + 3N2 nodal dissection feasible



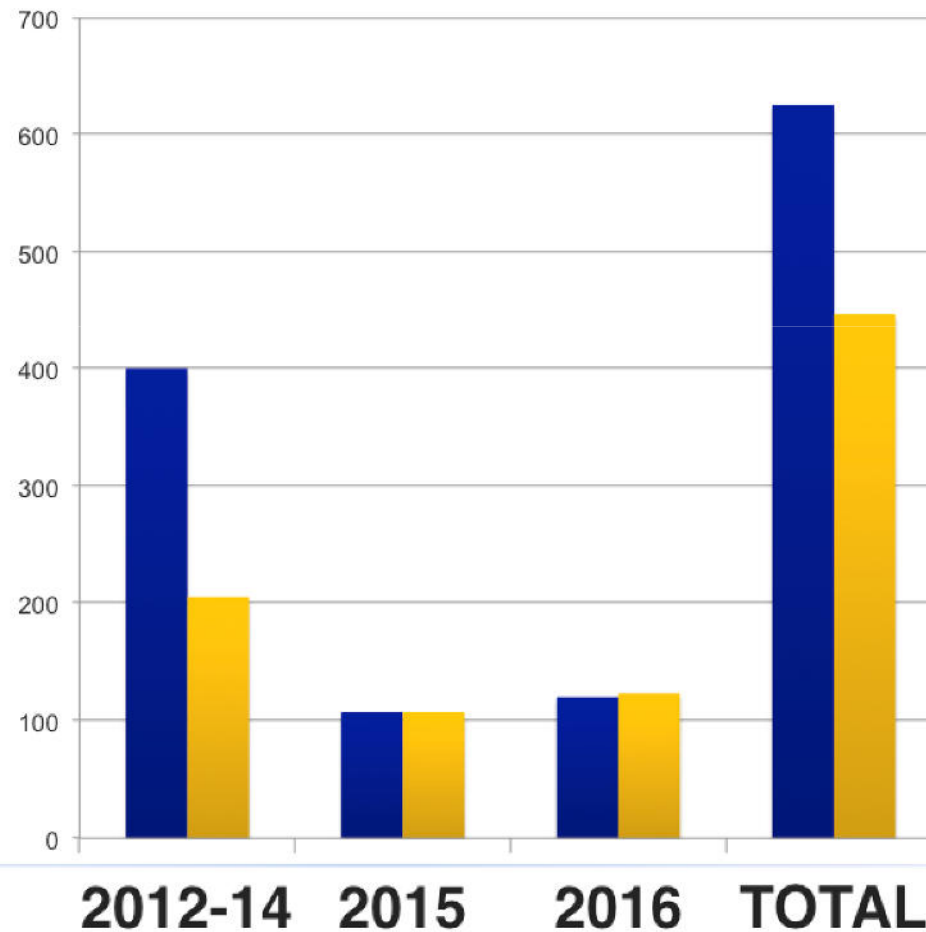
NSCLC SURGERY: 3D VATS LOBECTOMY

ISTITUTO NAZIONALE TUMORI OF MILAN

OPEN vs. VATS

**LOBECTOMY
+ SEGMENT**

**2012 – 2016
1073 cases
448 VATS**



**42% in the
last 5 years**

■ OPEN
■ VATS

LUNG CANCER SURGERY: NODAL DISSECTION USELESS ?

Intra-operative mediastinal staging: evidence from RCTs (1)

➤ in order to be suitable for randomization, all patients had to prove node negative at frozen section of four nodal stations:

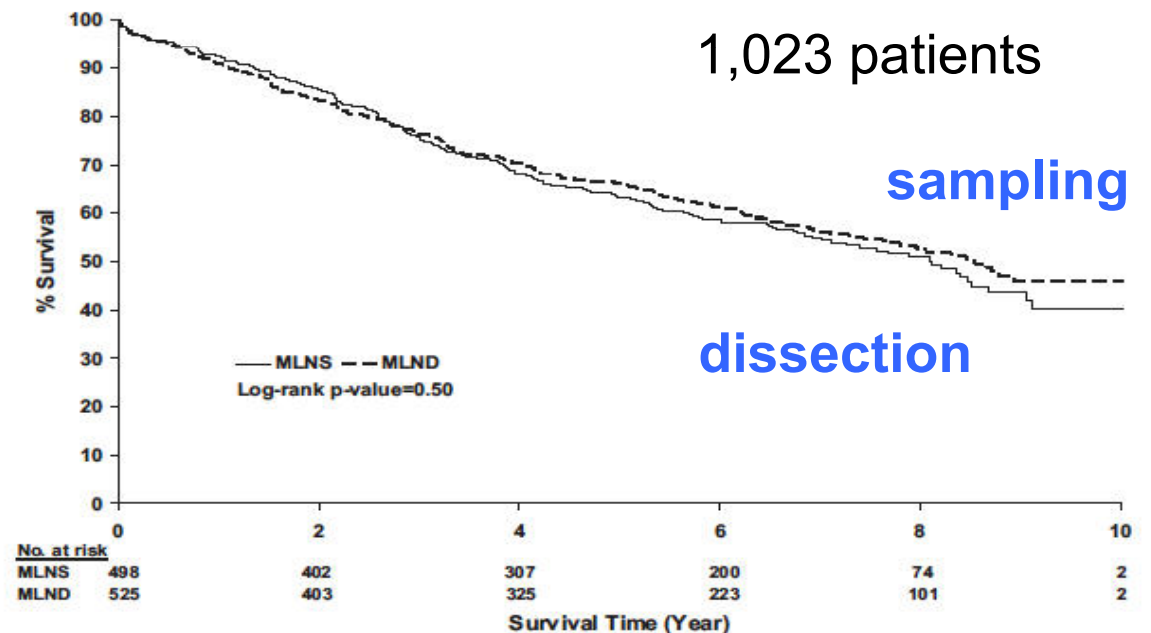
2R, 4R, 7, 10R or 5, 6, 7, 10L

➤ a procedure that far exceeds the level of routine intraoperative mediastinal node investigations in most centers, outside clinical trials

CAUTION !!!

negative results of ACOSOG trial

1,023 patients



Complete Thoracic Mediastinal Lymphadenectomy Leads to a Higher Rate of Pathologically Proven N2 Disease in Patients With Non-Small Cell Lung Cancer

Robert J. Cerfolio, MD, FACS, Ayesha S. Bryant, MSPH, MD, and Douglas J. Minnich, MD, FACS

incidence of pathologic N2 disease in 1,107 patients who underwent **lobectomy** was **10.6%** compared with 9.4% in the 24,896 STS lobectomy patients (p 0.196).

incidence of pathologic N2 disease in 251 patients who underwent **segmentectomy** was **13.0%** compared with 5.3% in the 2,150 STS segmentectomy patients (p < 0.001).

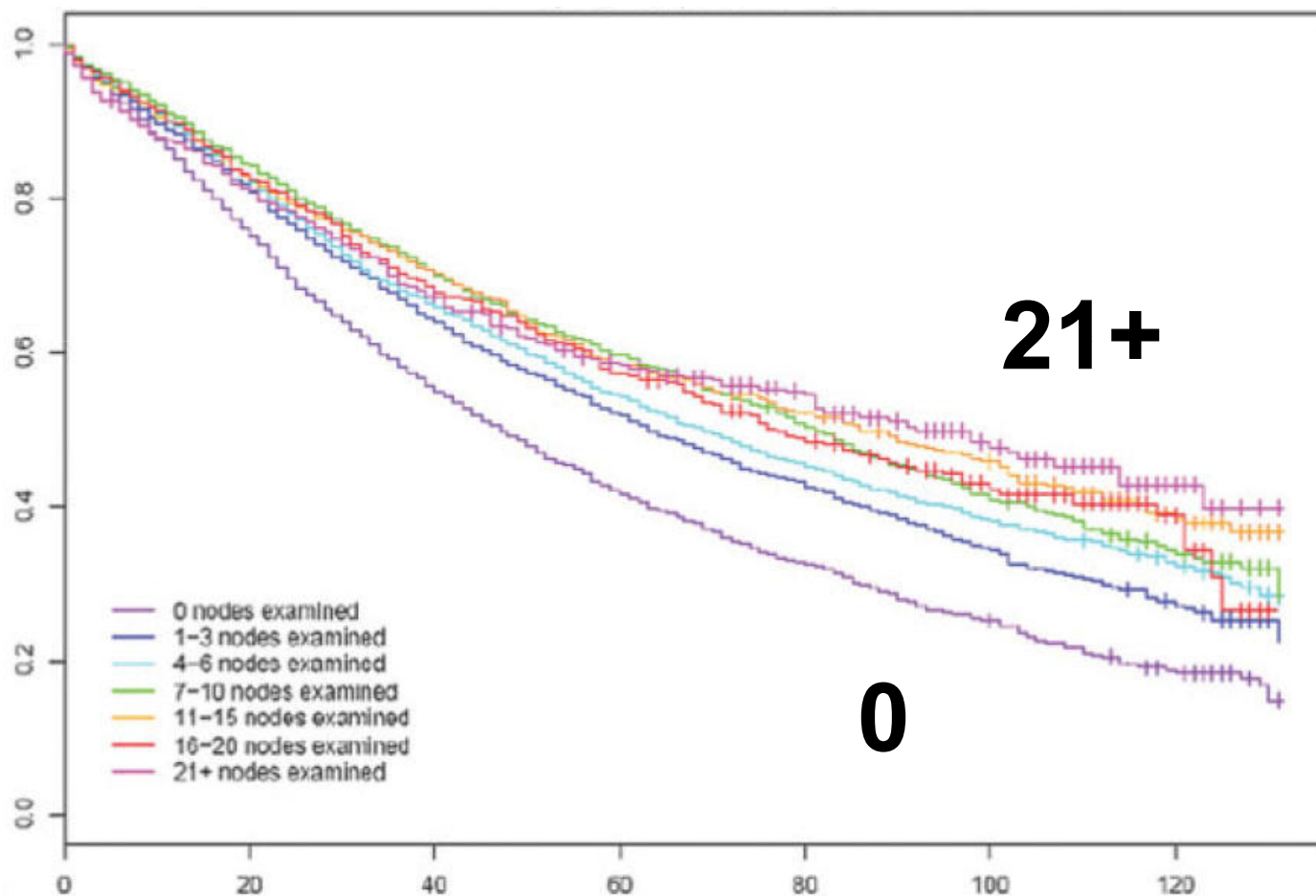
LUNG CANCER SURGERY: NODAL DISSECTION USEFUL

Intra-operative mediastinal staging: SEER data (2)

➤ **24,273 stage I NSCLC**

➤ lymphadenectomy = Increased 5-year overall survival from **41.6%** to **58.4%** ($P < .0001$) and in DFS from 58.0% to 73.09%

➤ with a **two-fold increase of 10-year survival** in patients with **> 21 resected nodes** compared with 0 nodes



Varlotto JM, Cancer 2009;115:851

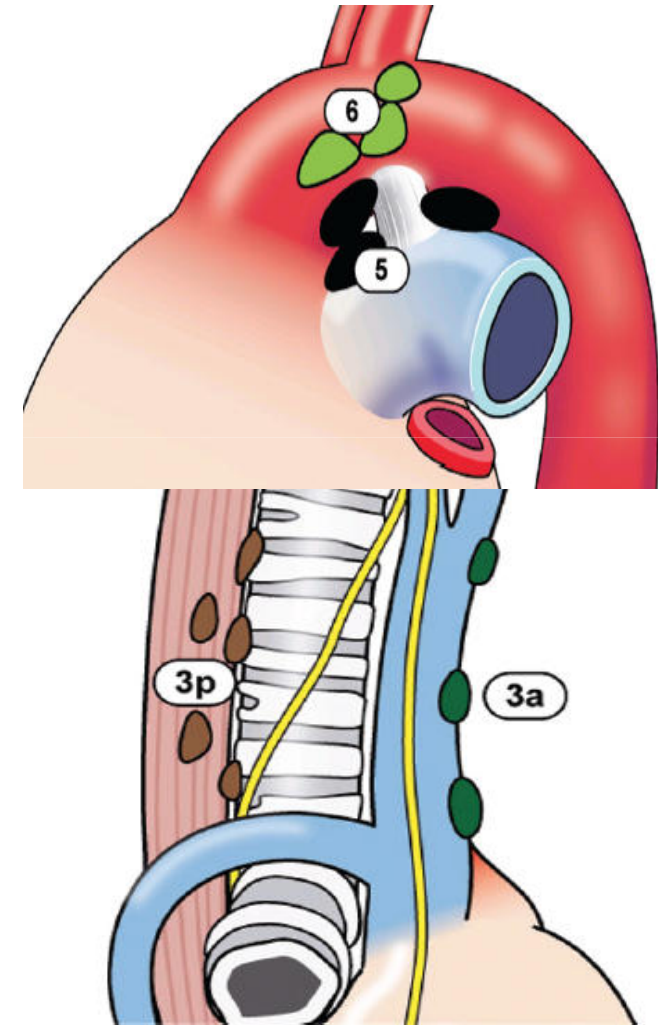
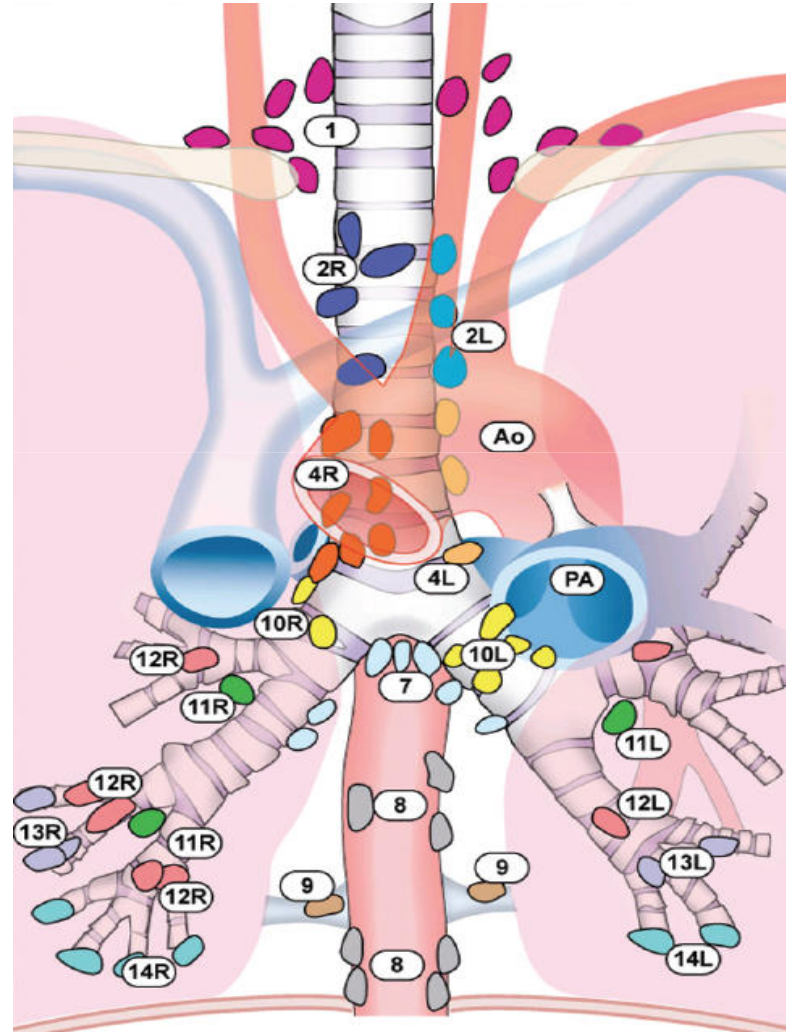
LUNG CANCER SURGERY: MLNS OR SAMPLING IS MANDATORY

Intra-operative
mediastinal staging

either MLNS or
systematic sampling
should include

**2R, 4R, 7,
10, 11, 12 R**

**5, 6, 7,
10, 11, 12 L**



SURGERY FOR HILAR LC: SLEEVE IS BETTER

Table 4 Comparison of survival between sleeve lobectomy and pneumonectomy

Study	Year	Total no. of patients	No. of patients (5-Year survival)	
			Sleeve lobectomy	Pneumonectomy
Gaissert ⁴⁴	1996	128	72 (42.0%)	56 (44.0%)
Yoshino ⁴⁵	1997	58	29 ^a (65.7%)	29 ^a (58.8%)
Suen ⁴³	1999	200	58 (37.5%)	142 (35.8%)
Okada ¹⁴	2000	120	60 (48.0%)	60 (28.0%)
Deslauriers ¹²	2004	1230	184 (52.0%)	1046 (31.0%)
Ludwig ⁴⁶	2005	310	116 (39.0%)	194 (27.0%)
Kim ³¹	2005	249	49 (53.7%)	200 (59.5%)
Takeda ⁴⁷	2006	172	62 (54.0%)	110 (33.0%)

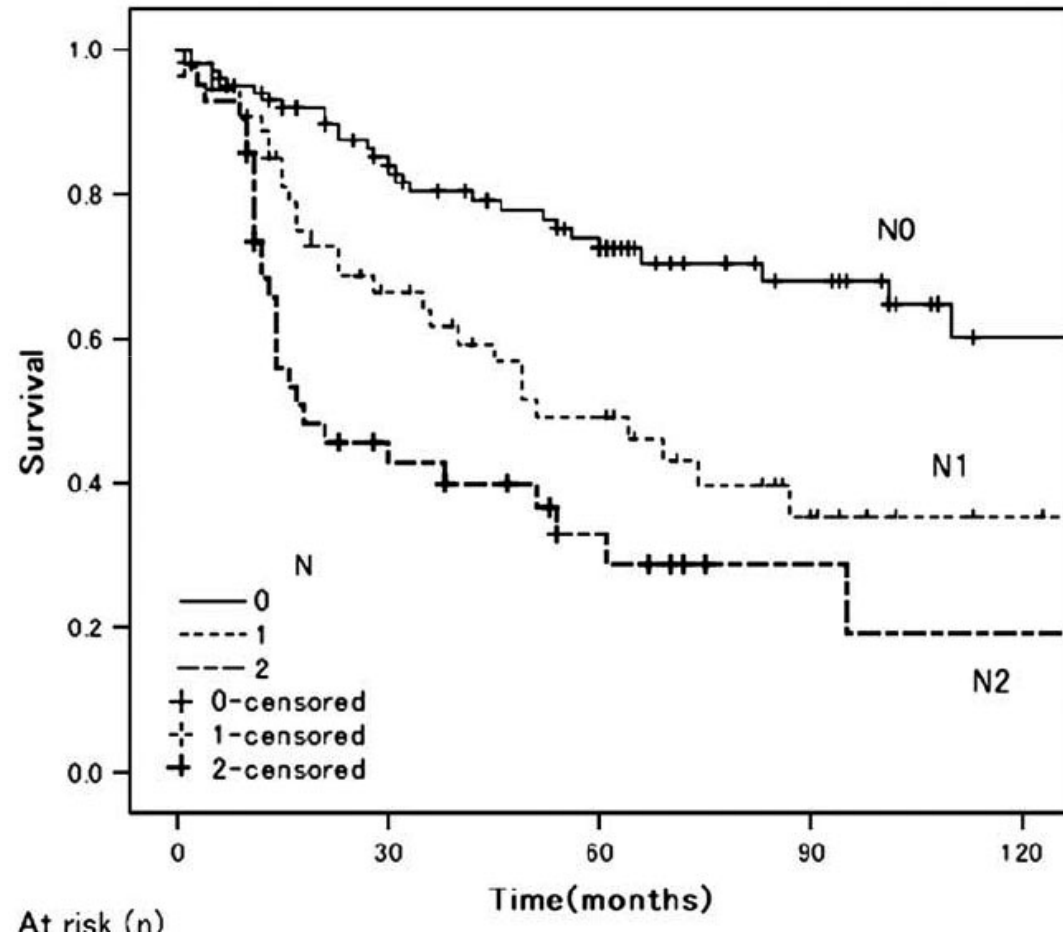
^aThree-year survival figures

operative mortality 1.6% vs 5.3% p=0.036

Deslaurier, Gen Thorac Cardiovasc Surg 2009;57: 3-9

Central Hilar Lesions: airways sleeve & nodal status

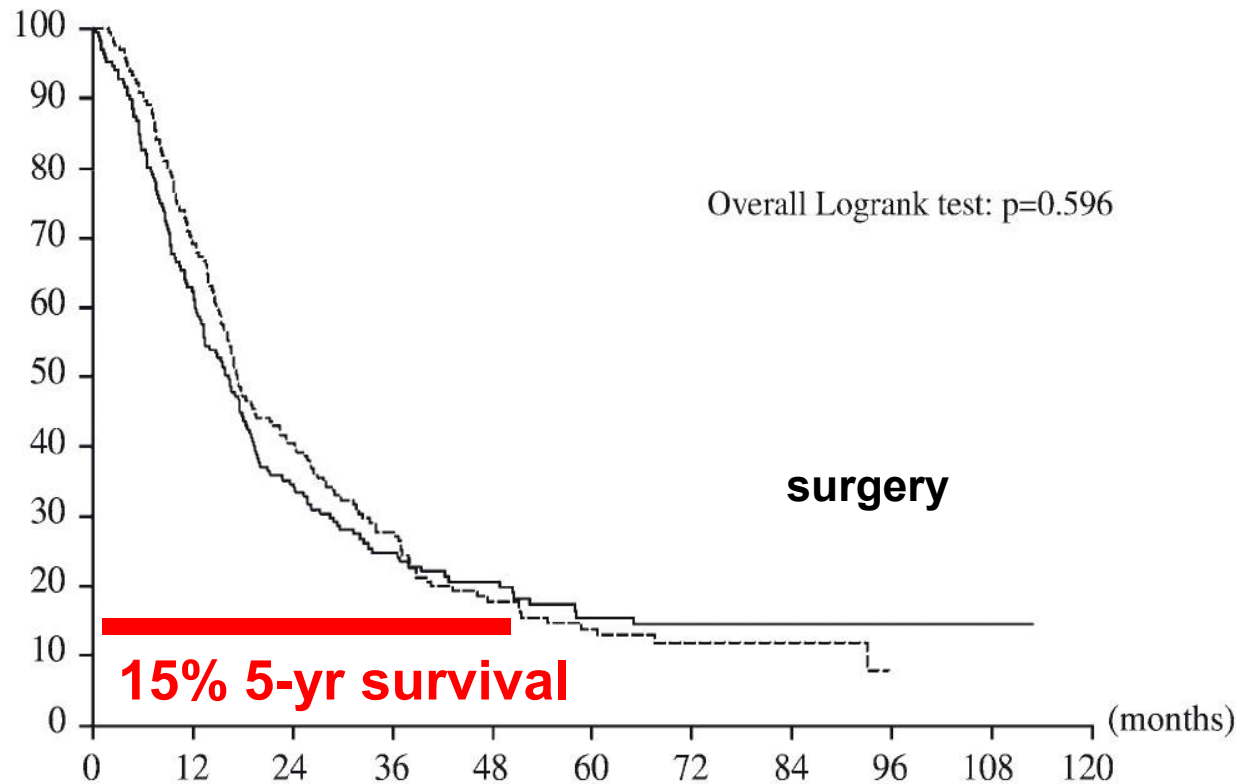
	N0	N1	N2
5-yr surv	73%	50%	33%
10-yr surv	60%	35%	19%
201 pts			



Stage III NSCLC RCTs: **surgery vs RT**

EORTC trial

332 patients / 41 inst
1994-2002
0.6 pts / yr / inst



47% pneumonectomy
50% incomplete resections
7% died within 30 days

25% downstaging to N0
5% T0N0

Stage III NSCLC RCTs: CTRT + / - surgery

NCI trial

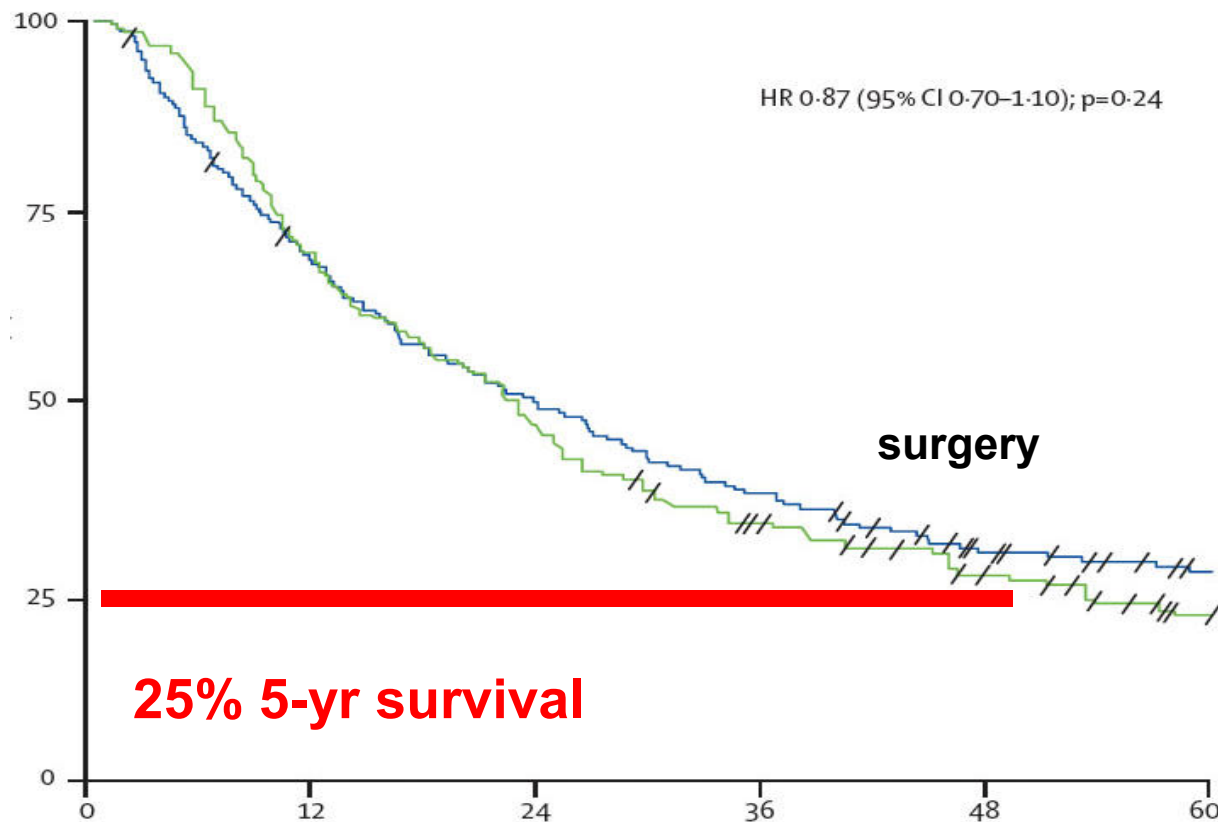
396 patients
1994-2001
30 pts / yr

54 (27%) pneumonectomy
10 (19%) died within 30 days
14 (26%) died without cancer

= 88% of non cancer deaths

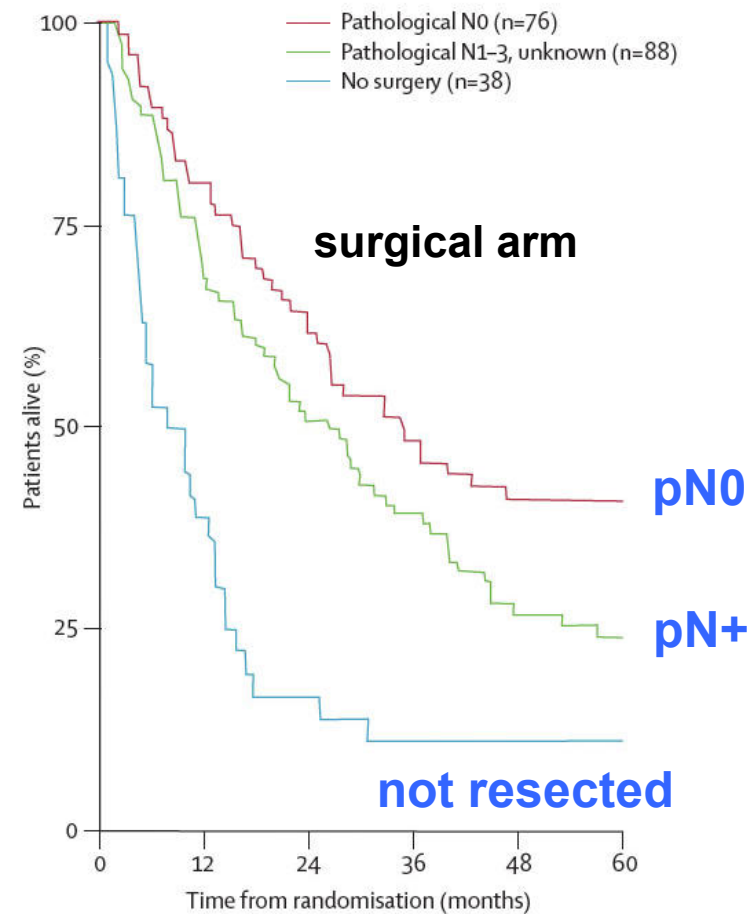
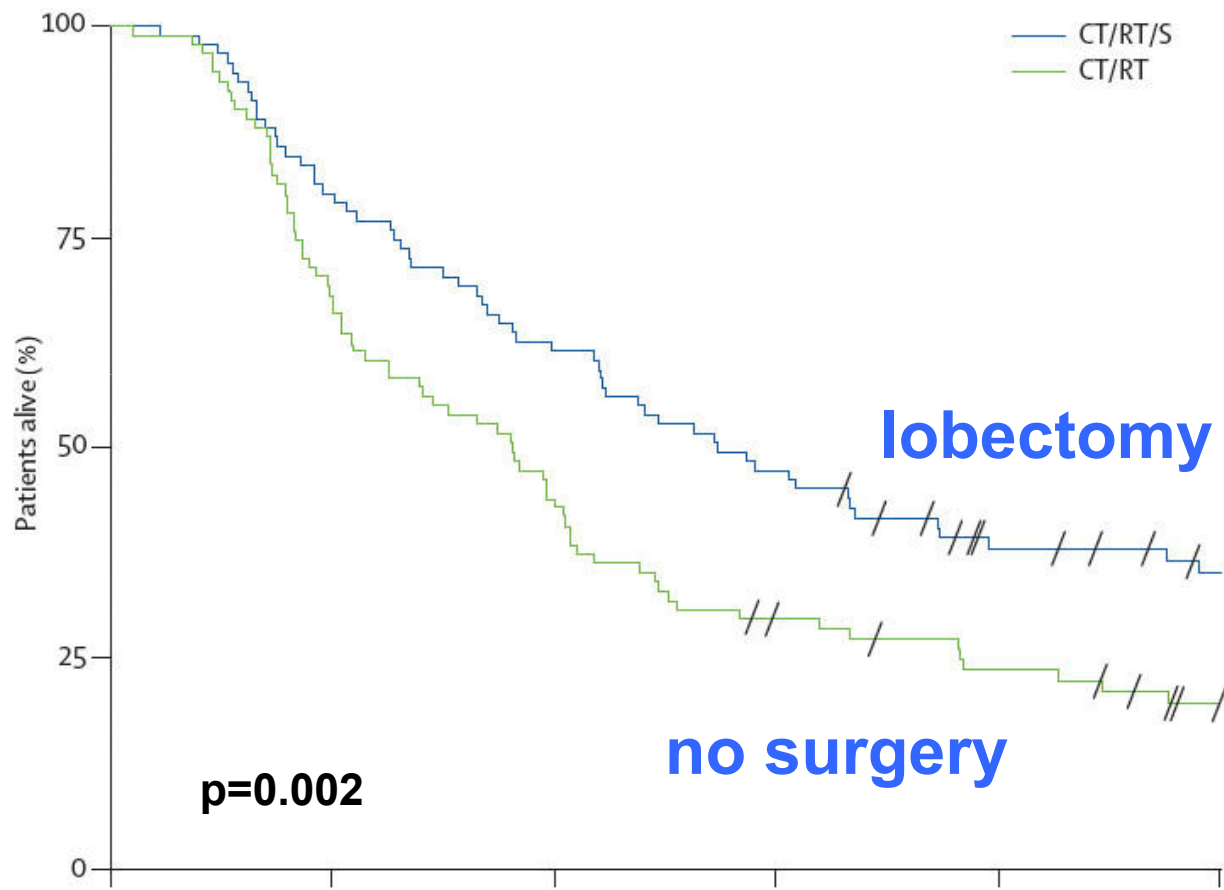
23% downstaging to N0
14% T0N0

Albain, Lancet 2009; 374 : 379-386



Stage III NSCLC: RT + lobectomy vs RT

NCI trial



LUNG CANCER SURGERY: IS PNEUMONECTOMY ACCEPTABLE ?

	years	#	mortality
Martin 2001 right	1993-99	97/470 46/470	11% 24%
Weder 2010	1998-06	176/827	3%
Barnett 2011 right	2000-06	70/549	4% 3%

SURGERY FOR T3 – 4 LC: **yes** or **no** ?

T3

Chest wall
Diaphragm
Phrenic n.
Med ple
Pericard

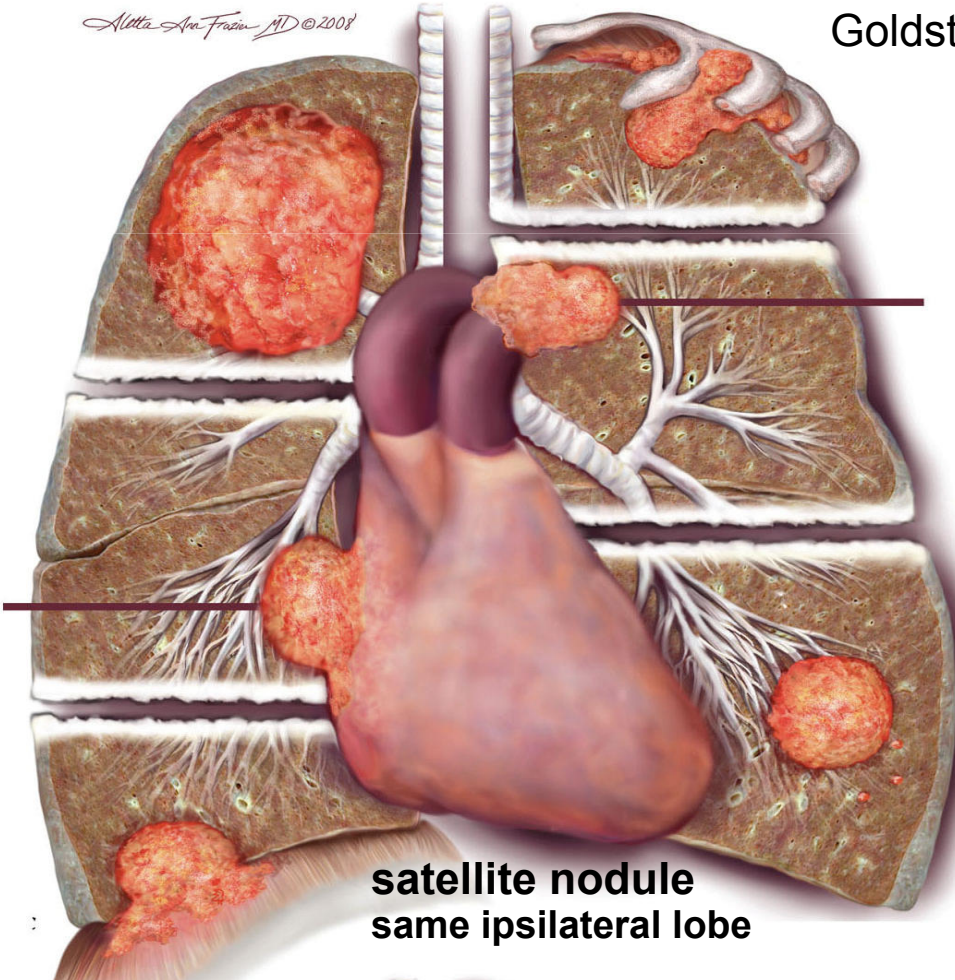
T4

Heart
Great vessels
Trachea
Recurr n.
Oesophagus
Vertebra
Carina

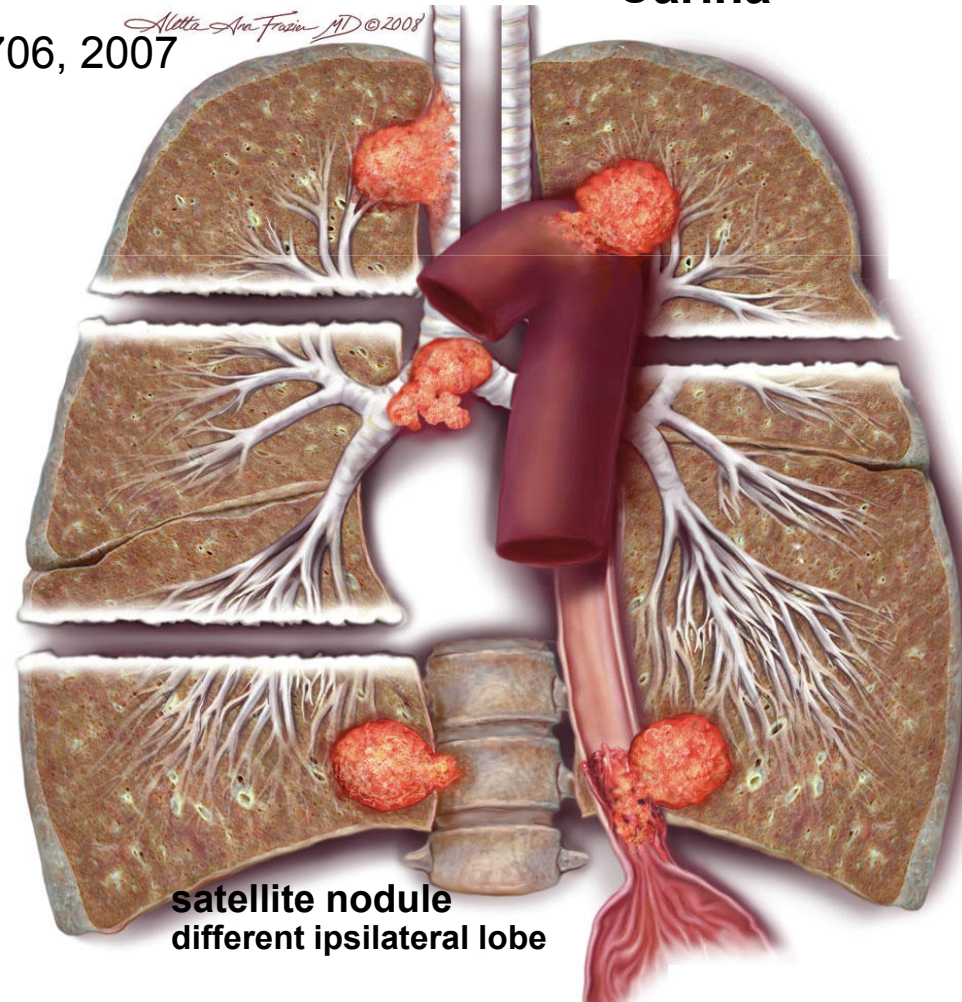
Alitta Am-Frasin MD © 2008

Goldstraw JTO, 2:706, 2007

Alitta Am-Frasin MD © 2008



**satellite nodule
same ipsilateral lobe**



**satellite nodule
different ipsilateral lobe**

SURGERY FOR T3 – 4 LC: WHEN, HOW AND WHERE?

- **technically feasible (R0) in few cases**
- **with acceptable morbidity / mortality**
- **for carefully selected patients**
- **by multi-disciplinary teams**
- **in highly specialized centres**

Central Hilar Lesions: carinal resection

Tracheal sleeve pneumonectomy for bronchogenic carcinoma can be accomplished with acceptable mortality and morbidity, providing good long-term results.

Nodal involvement seems to be an exclusion criterion for surgery.

Meticulous anesthetic management and surgical technique guarantee a better postoperative outcome.

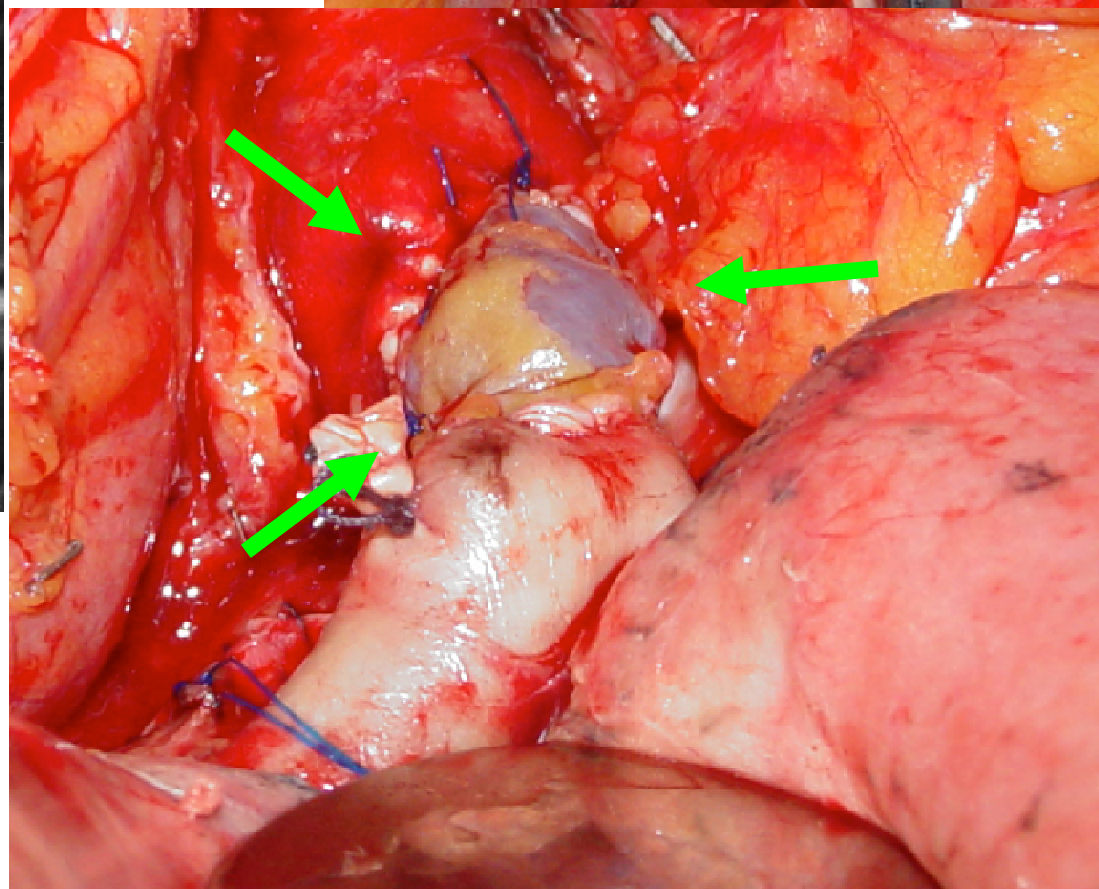
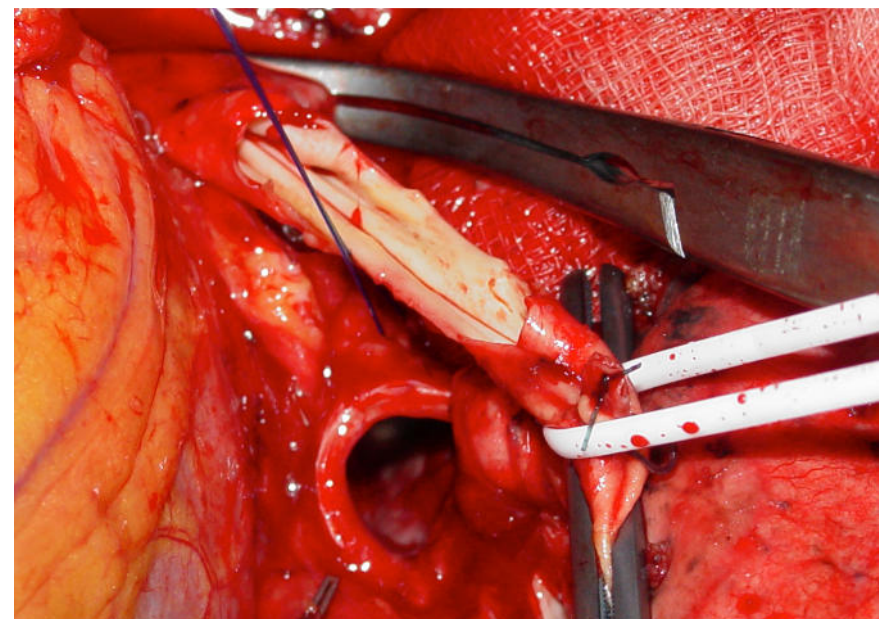
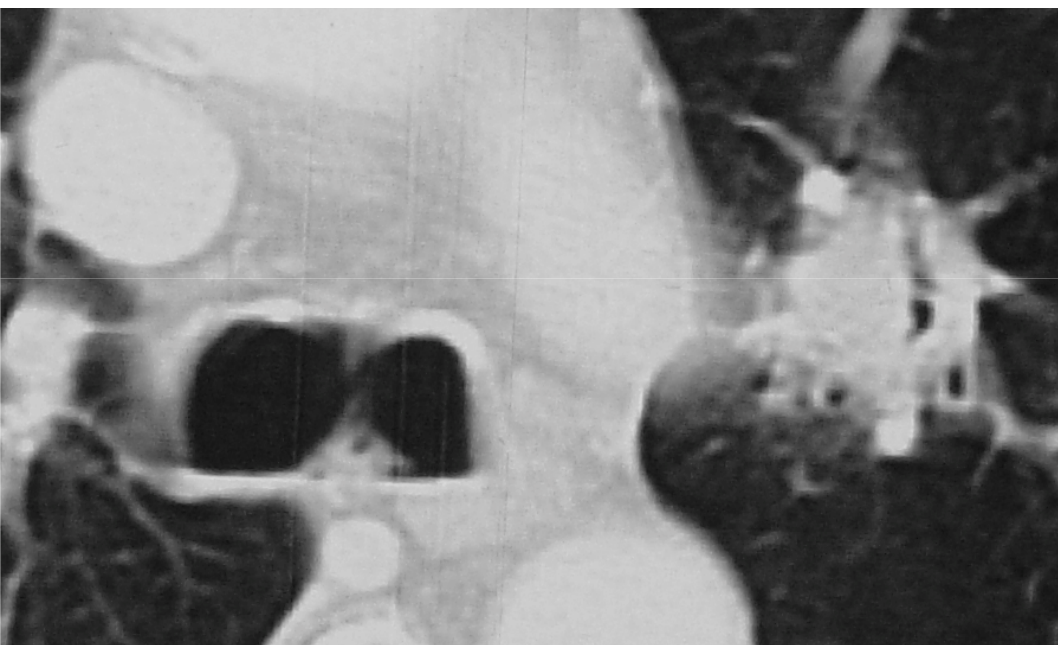
SURGERY FOR T3 – 4 LC: VASCULAR RECONSTRUCTION

SVC

PA

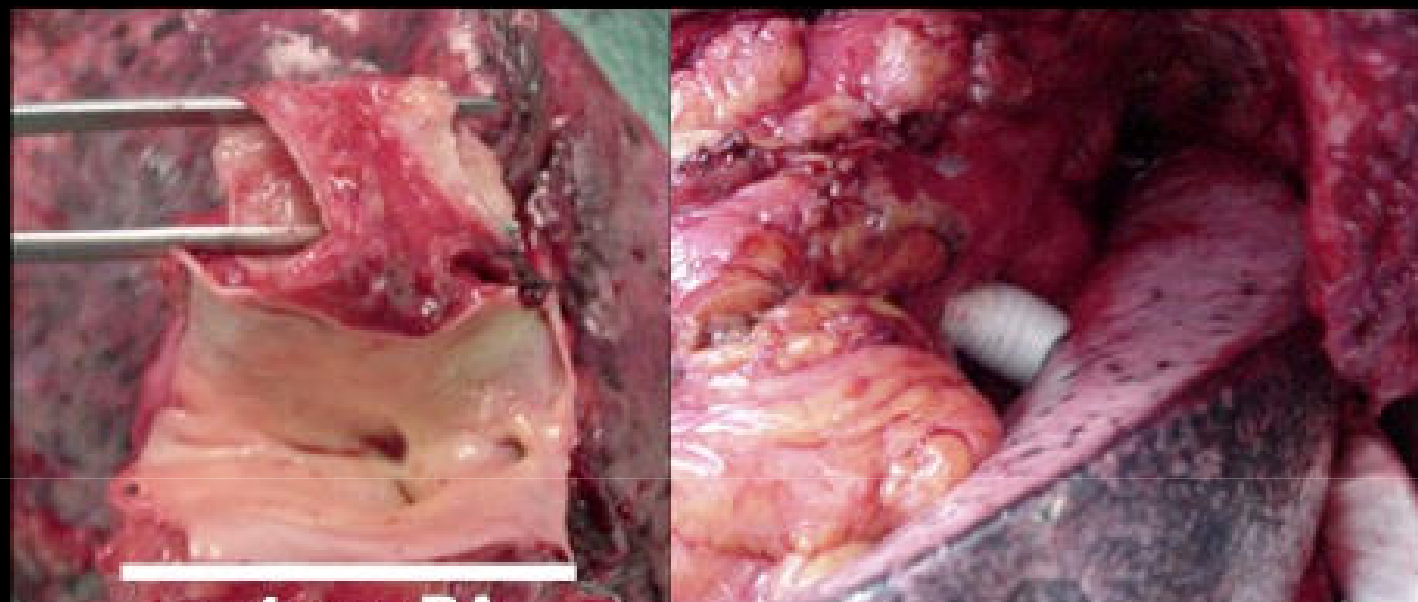
- **end-to-end anastomosis**
- **pericardial patch**
- **PTFE**
- **cadaveric graft**
- **autologous venous graft**

sleeve lobectomy + PA resection + pericardial patch



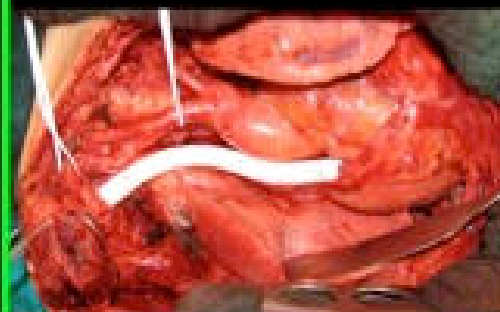
sleeve lobectomy + PA resection + PTFE graft

57-yr old LUL squamous ca
9-yr after RUL + I-III rib + RT
induction CDDP-GEM x 4



> 4 cm PA

SVC resections + - PTFE



JTCS 94:361, 1987
JTCS102:259, 1991
ATS 70:1172, 2000
EJTCS 20:1045, 2001
EJTCS 21:1080, 2002
EJTCS 37:1764, 2010

SURGERY FOR T3 – 4 LC: SVC RECONSTRUCTION

CARDIO-THORACIC
SURGERY



ELSEVIER

European Journal of Cardio-thoracic Surgery 21 (2002) 1080–1086

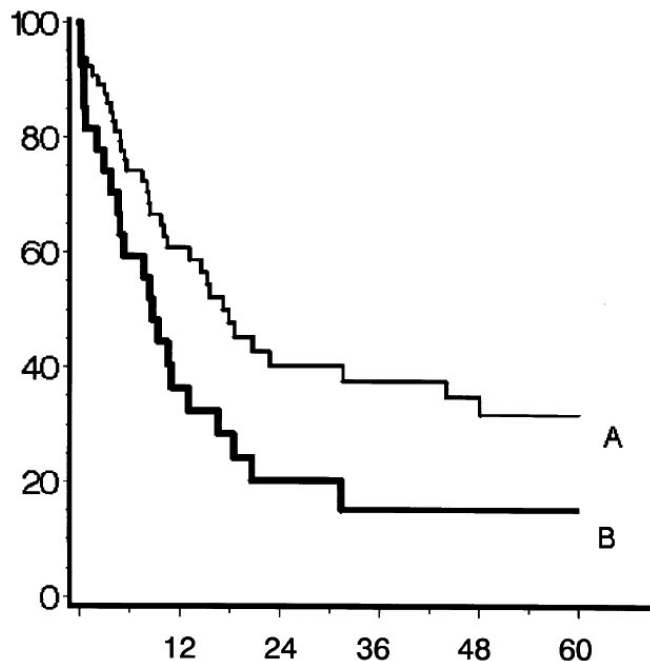
www.elsevier.com/locate/ejcts

Superior vena cava resection with prosthetic replacement for non-small cell lung cancer: long-term results of a multicentric study[☆]

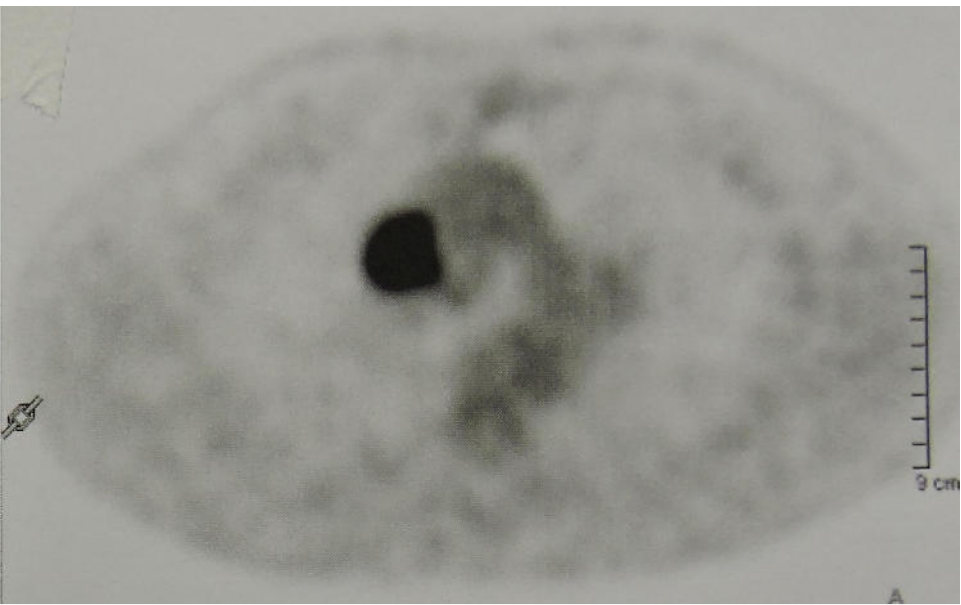
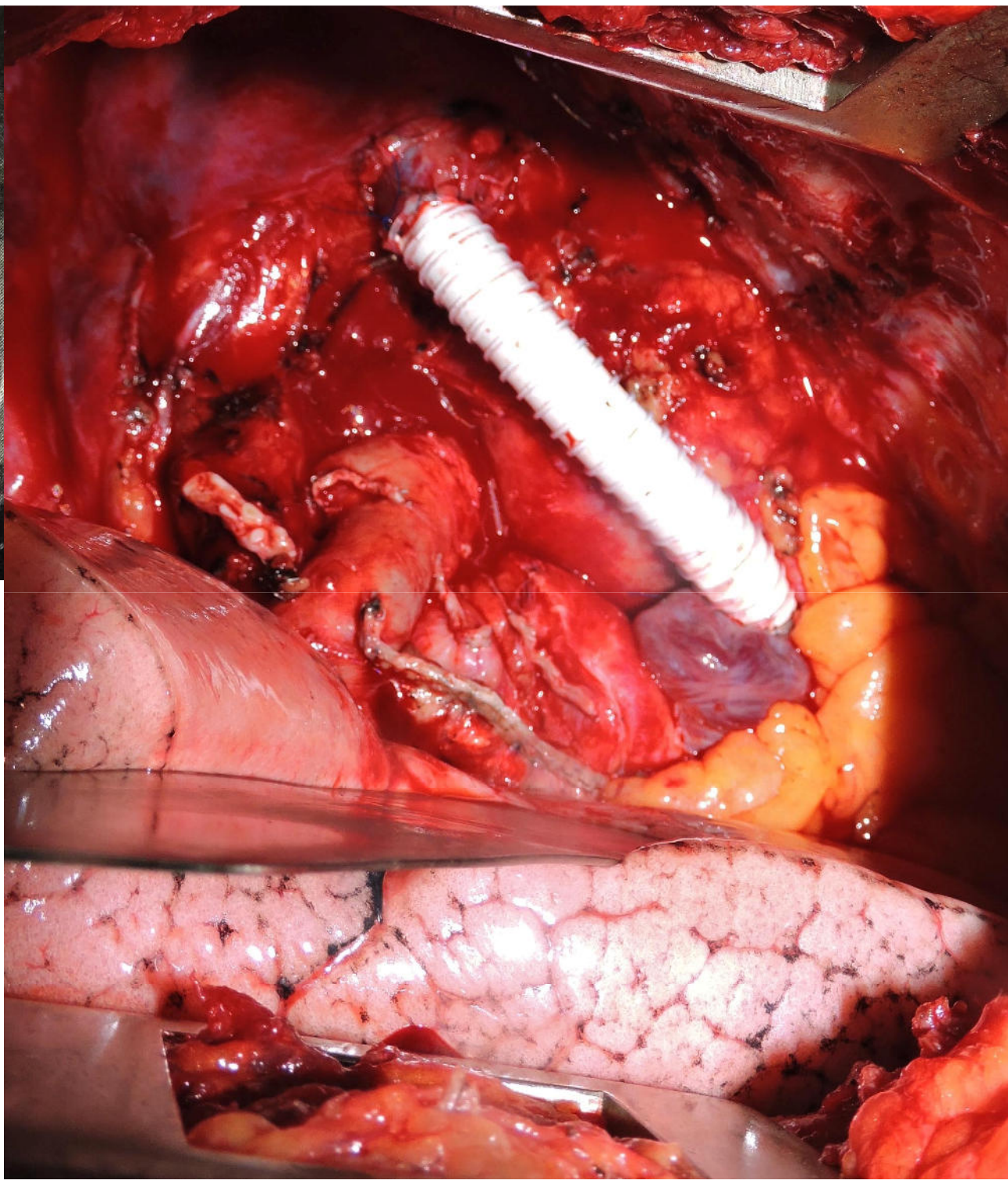
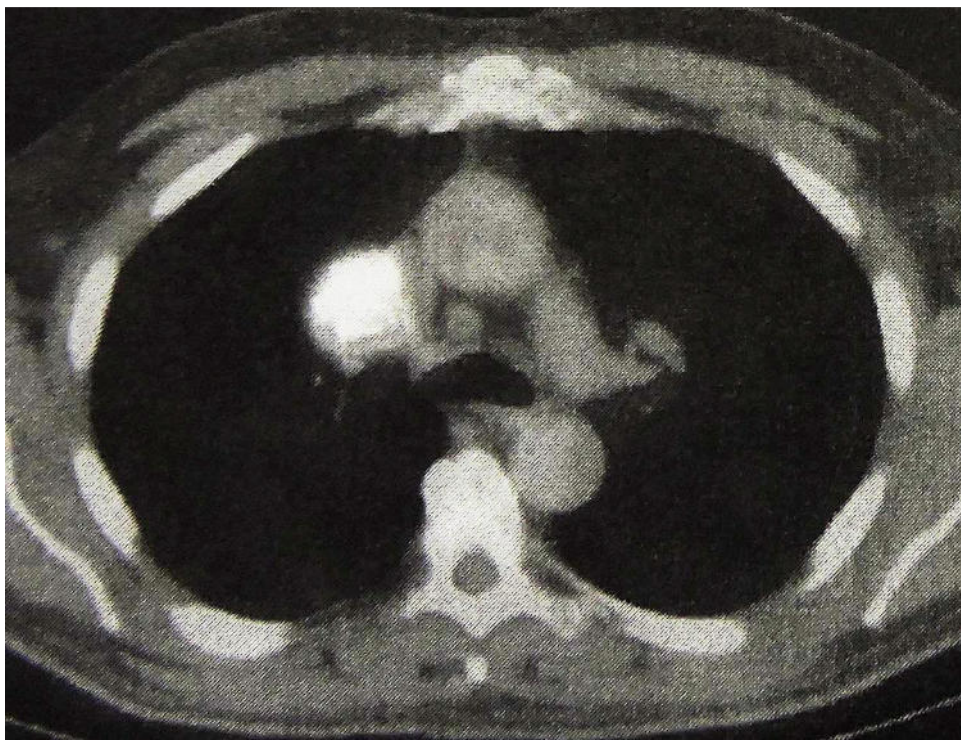
Lorenzo Spaggiari^{a,*}, Pascal Thomas^b, Pierre Magdeleinat^c, Haruhiko Kondo^d, Gilles Rollet^b,
Jean Francois Regnard^c, Ryosuke Tsuchiya^d, Ugo Pastorino^a

5-year survival:

32% partial resection (65 pts)
15% total replacement (25 pts)



Eur J Thorac Cardiothoracic Surg 2002;21:1080-6



SURGERY FOR T3 – 4 LC: **safety of ptfe replacement**



EUROPEAN JOURNAL OF
CARDIO-THORACIC
SURGERY

European Journal of Cardio-thoracic Surgery 37 (2010) 764–769

www.elsevier.com/locate/ejcts

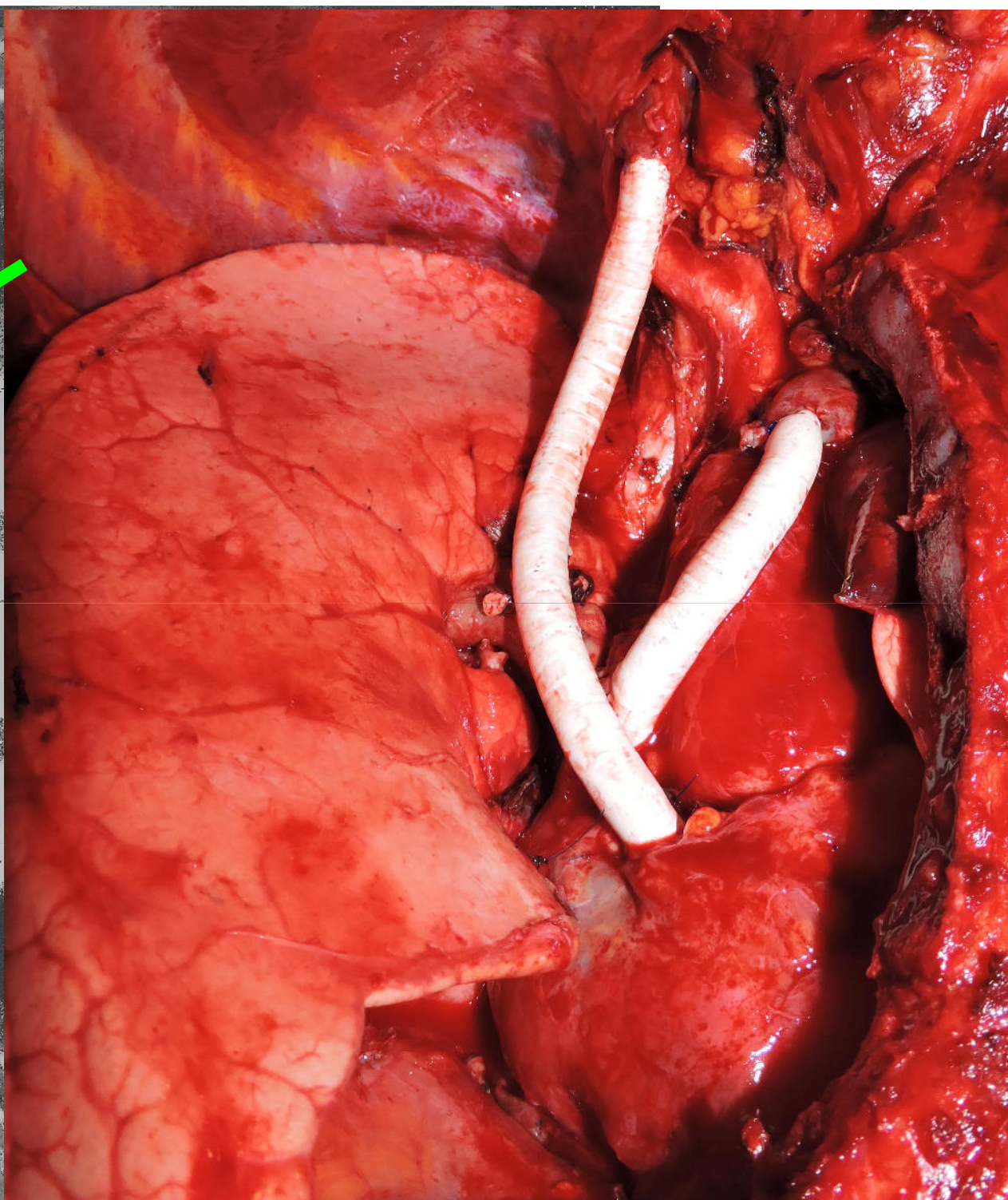
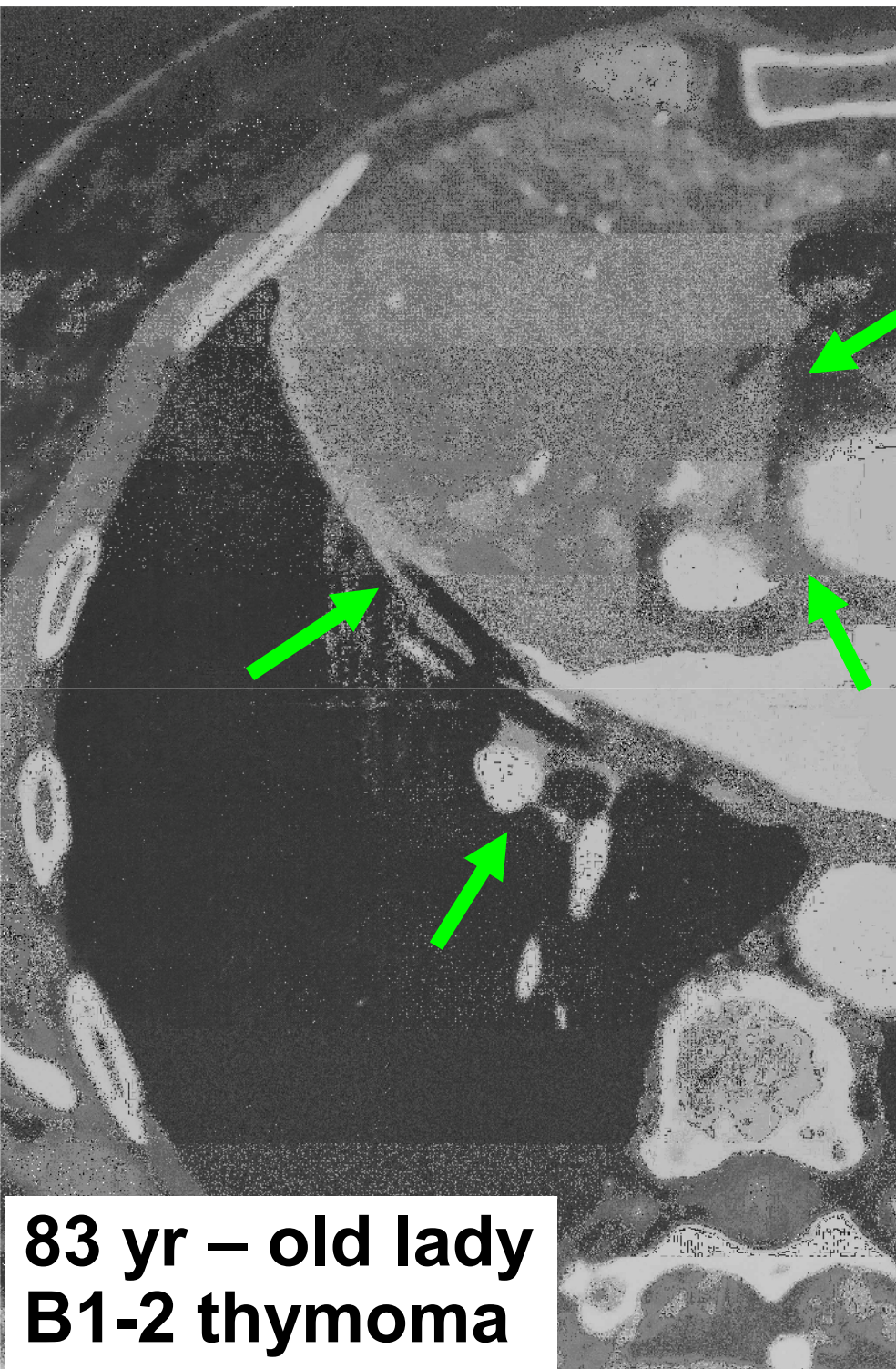
Superior vena cava resection in thoracic malignancies: does
prosthetic replacement pose a higher risk?☆

Francesco Leo^{*}, Roberto Bellini, Barbara Conti, Vincenzo Delledonne,
Luca Tavecchio, Ugo Pastorino

similar morbidity & mortality

2.2% for partial SVC resection (44 pts)
3.5% for total replacement (28 pts)

Eur J Thorac Cardiothoracic Surg 2010;37:1764-9



**83 yr – old lady
B1-2 thymoma**

tracheal sleeve & SVC resection

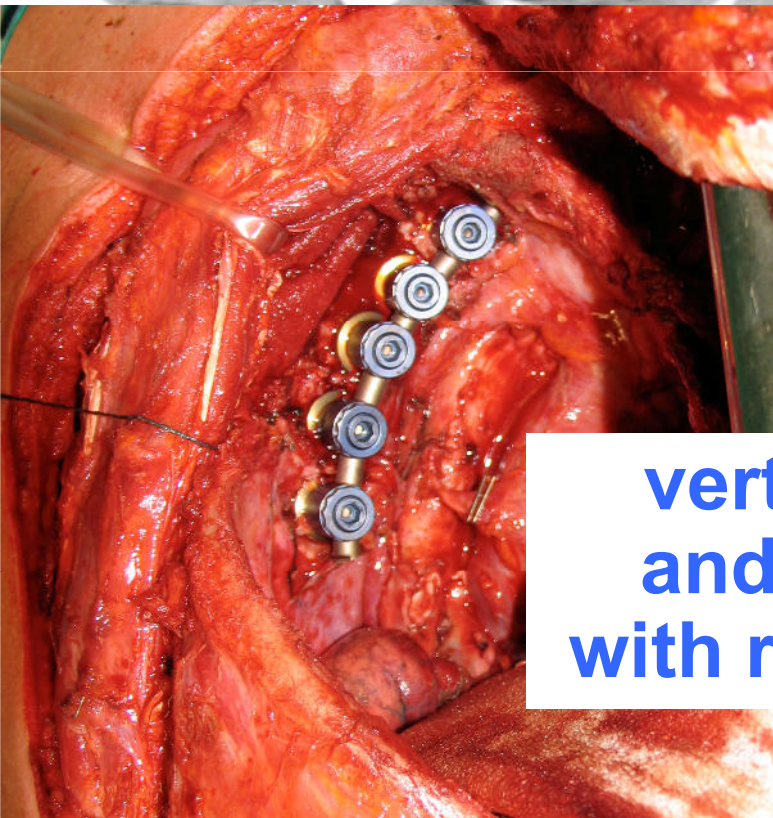
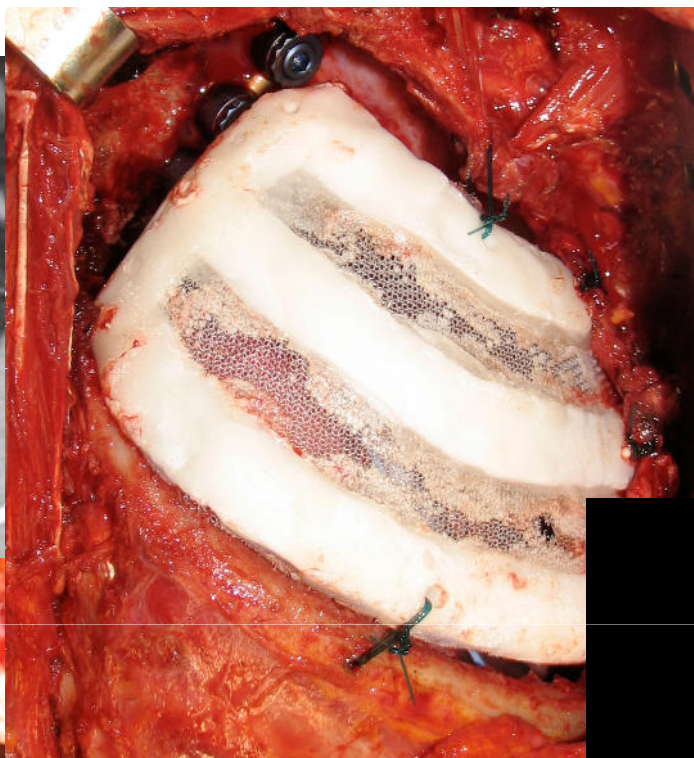
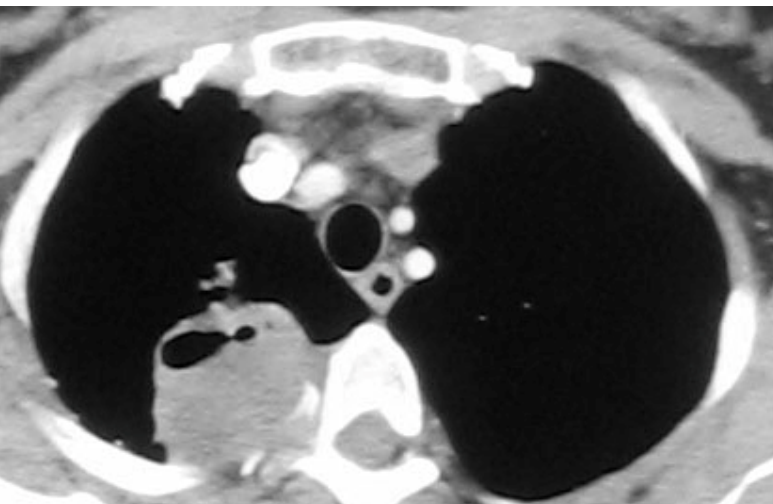
Combined Tracheal Sleeve and Superior Vena Cava Resections for Non-Small Cell Lung Cancer

age	type	resection	pTNM	SVC
45	adeno	pneumo	T4N2	partial
49	squ	pneumo	T4N2	prosthesis
62	squ	pneumo	T1N2	prosthesis
67	squ	lobect	T4N1	prosthesis
66	adeno	pneumo	T2N1	partial
54	squ	bilobect	T4N1	partial

median SVC resection 3 cm

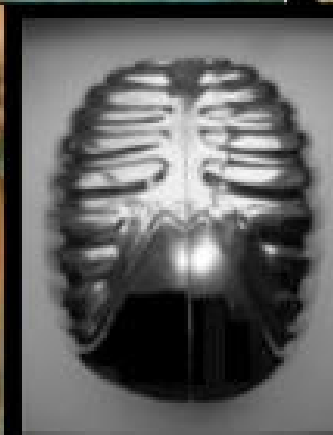
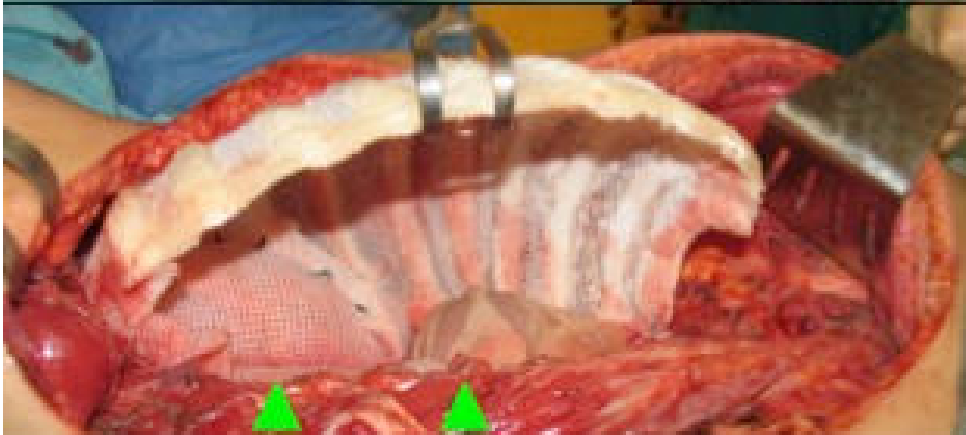
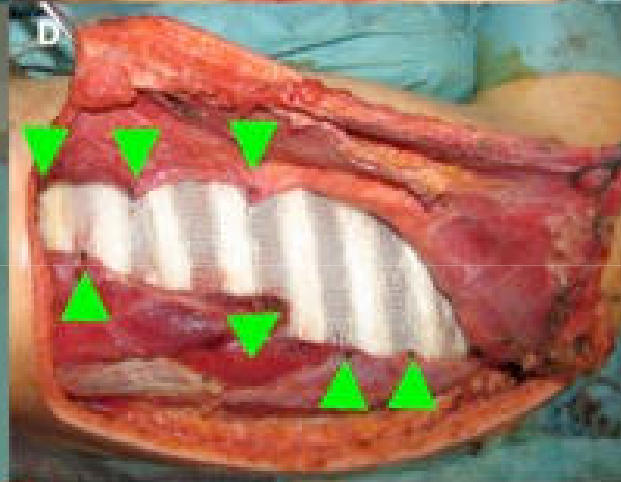
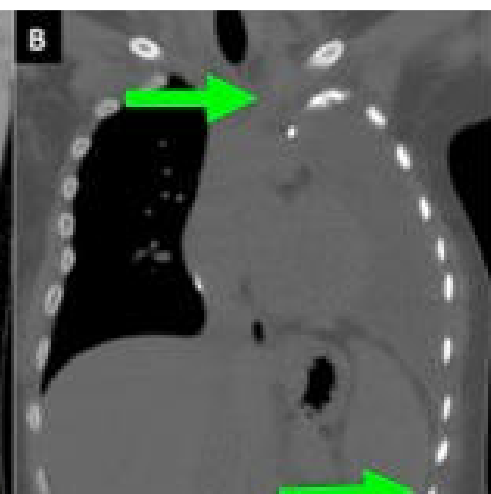
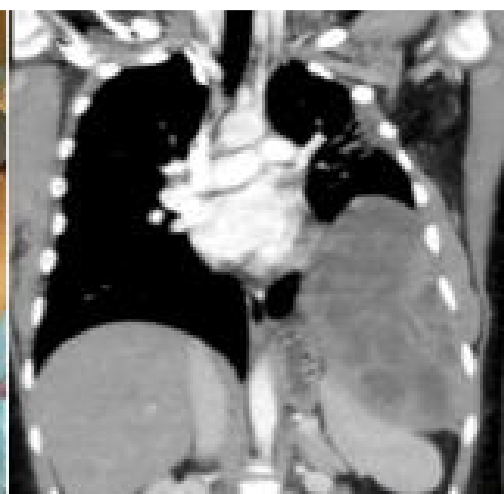
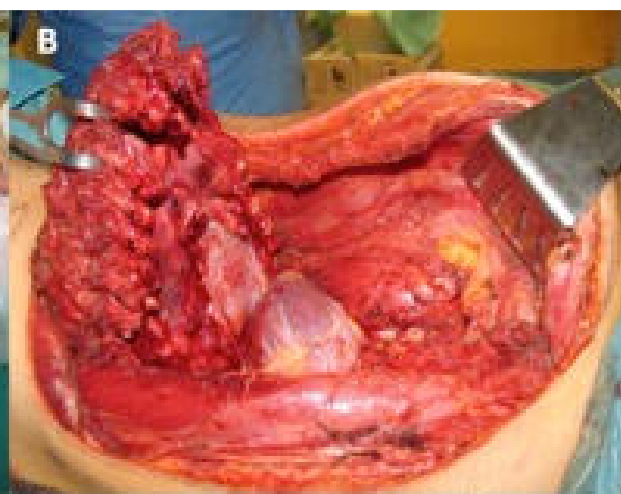
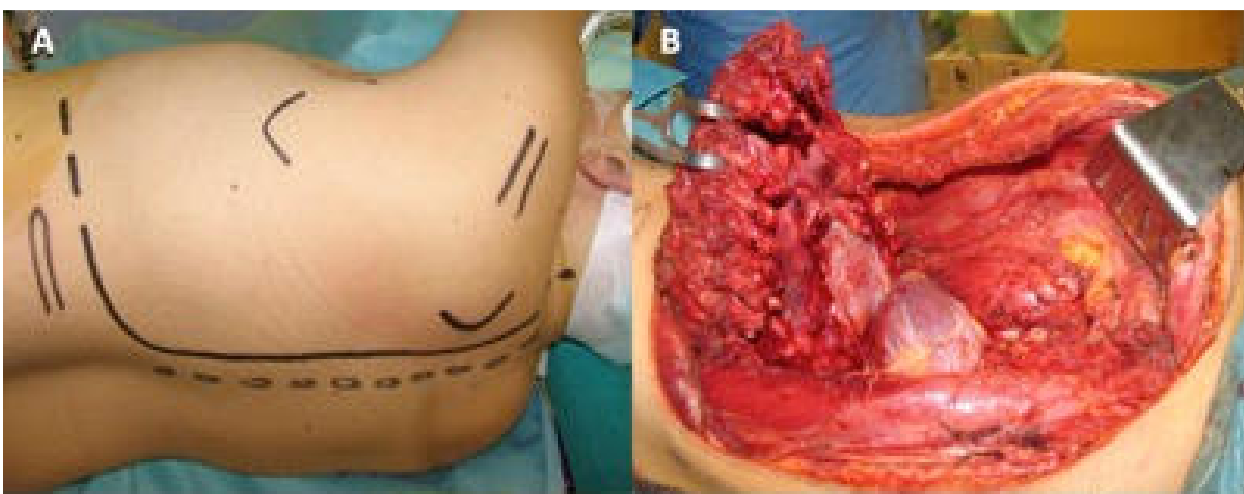
median tracheal resection 2.25 cm

SURGERY FOR T3 – 4 LC: chest wall RECONSTRUCTION



**vertebral resection
and reconstruction
with rib-like prosthesis**

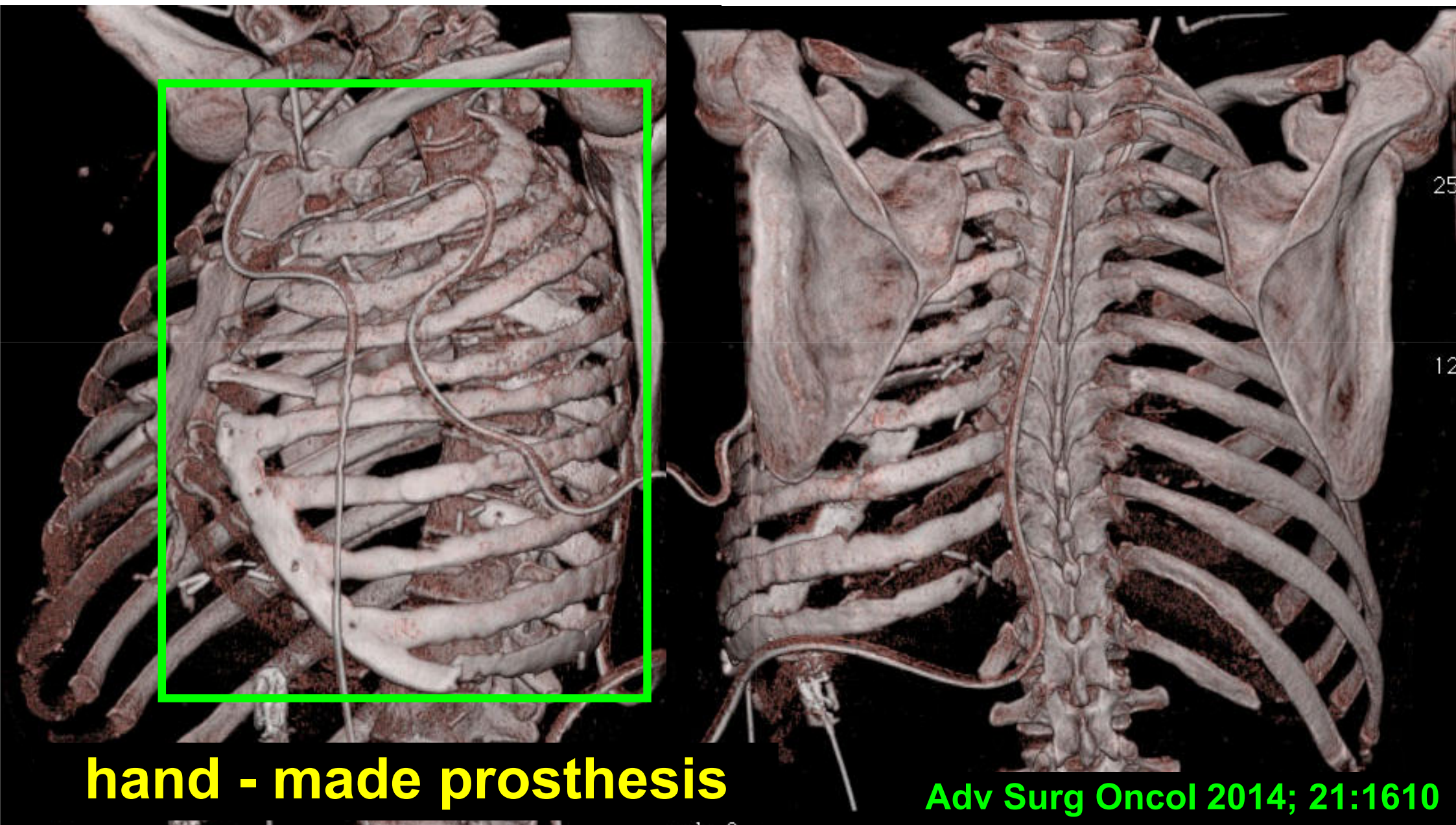




**TPP / CW resections
+ rib-like prosthesis**
ATS 92:1208, 2011
EJC 49:2689, 2013
ASO 21:1610 2014
TJ 102:89, 2016

17-yr old boy with recurrent Ewing SA

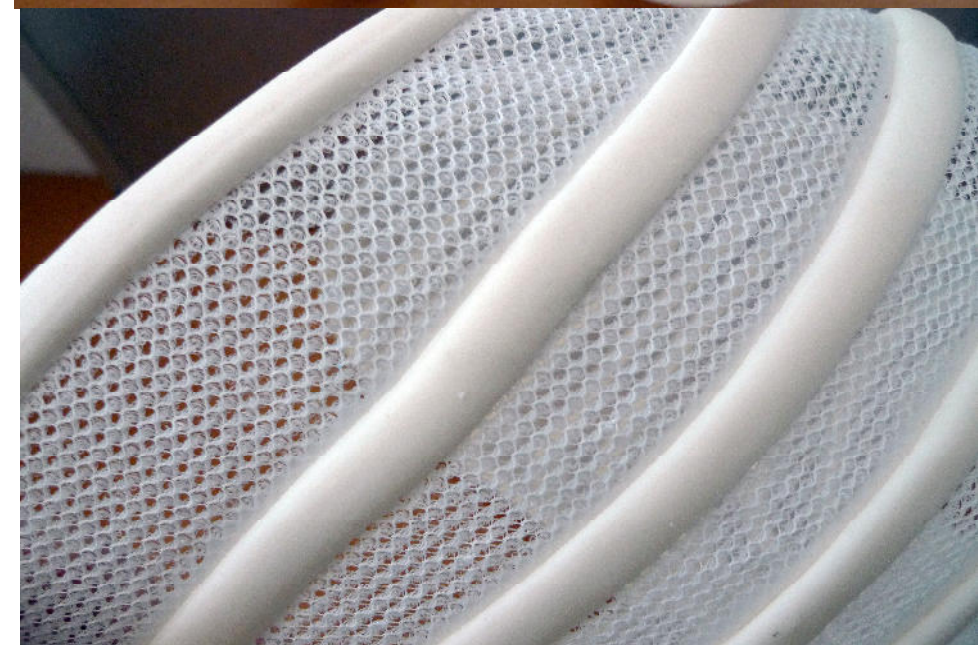
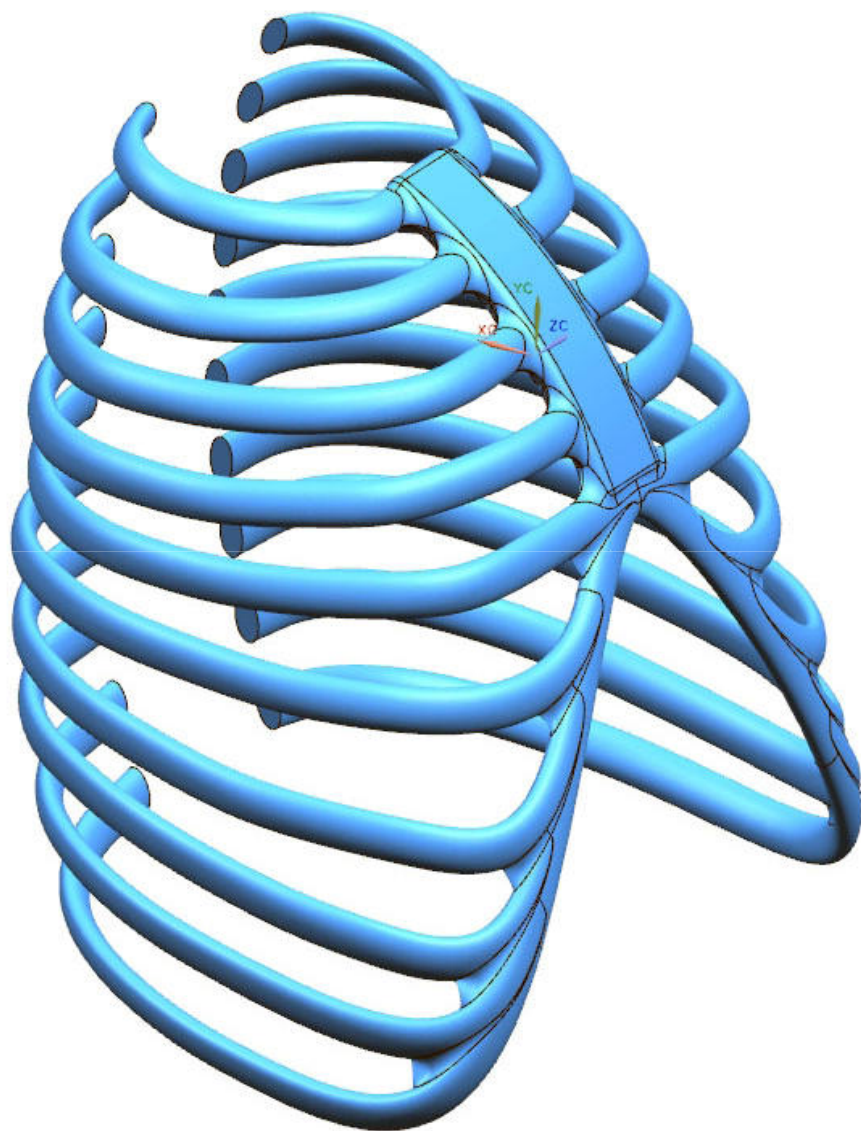
SURGERY FOR T3 – 4 LC: chest wall RECONSTRUCTION



hand - made prosthesis

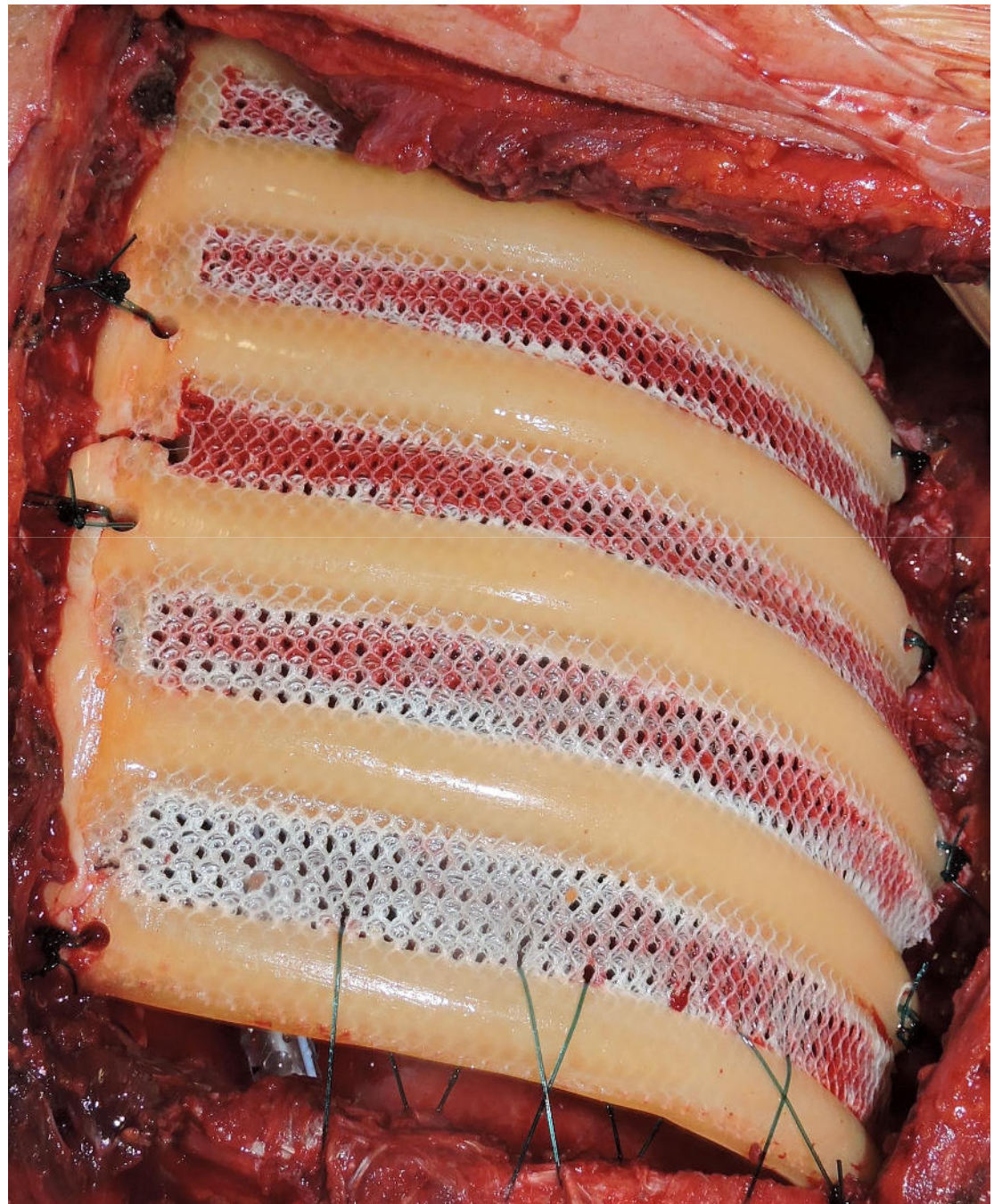
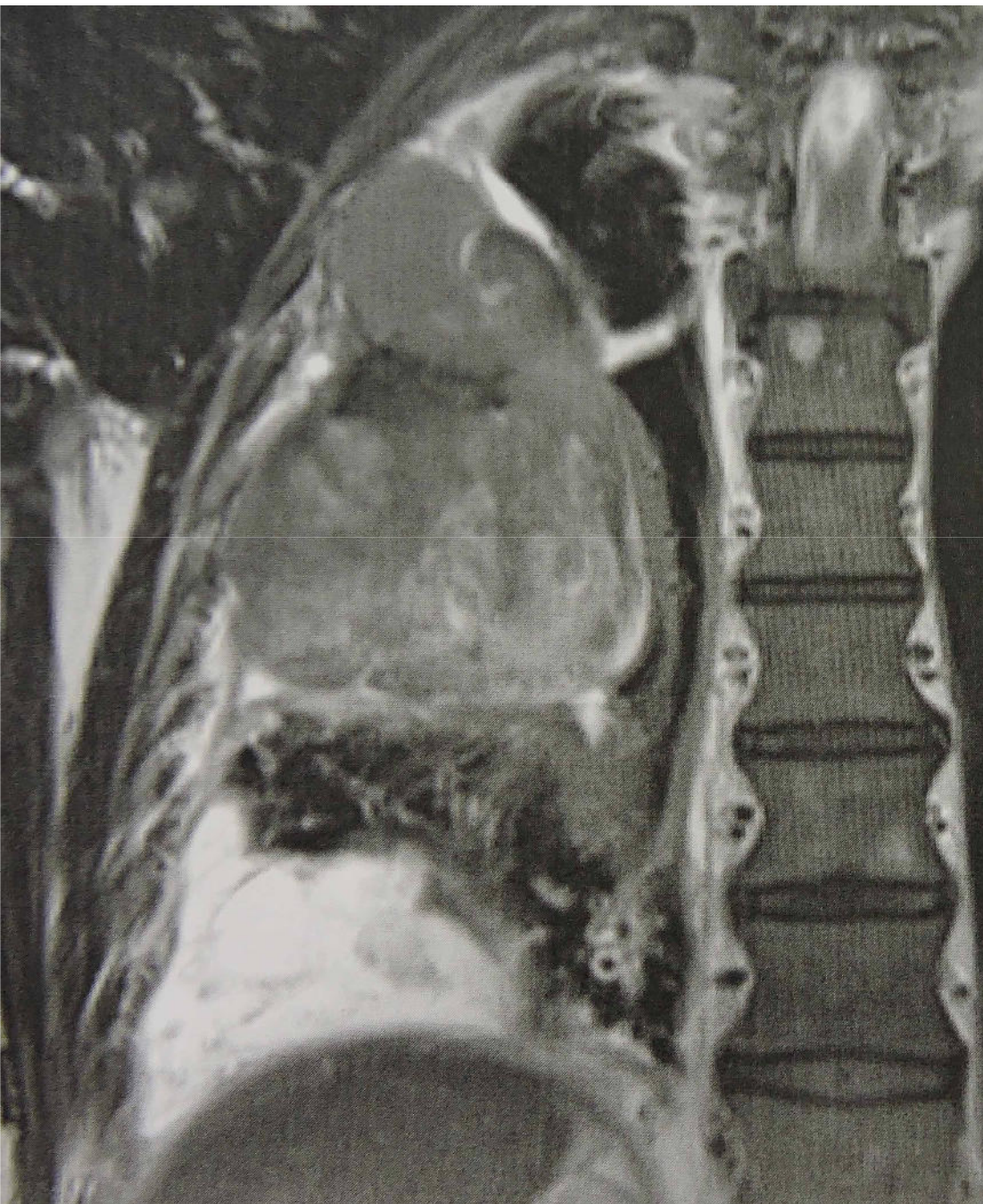
Adv Surg Oncol 2014; 21:1610

SURGERY FOR T3 – 4 LC: chest wall RECONSTRUCTION



custom - made prosthesis

SURGERY FOR T3 – 4 LC: chest wall RECONSTRUCTION



Treatment of Stage III Non-small Cell Lung Cancer

Diagnosis and Management of Lung Cancer,
3rd ed: American College of Chest Physicians
Evidence-Based Clinical Practice Guidelines

Neoadjuvant therapy followed by surgery is neither clearly better nor clearly worse than definitive chemoradiation.

Most of the arguments made regarding patient selection for neoadjuvant therapy and surgical resection provide evidence for better prognosis but not for a beneficial impact of this treatment strategy; however, weak comparative data suggest **a possible role if only lobectomy is needed in a center with a low perioperative mortality rate**

Future trials are needed to investigate the roles of individualized chemotherapy, surgery and adaptive radiation

Special Treatment Issues in Non-small Cell Lung Cancer

Diagnosis and Management of Lung Cancer,
3rd ed: American College of Chest Physicians
Evidence-Based Clinical Practice Guidelines

Carefully selected patients with **central T4 tumors that do not have mediastinal node involvement are uncommon**, but **surgical resection appears to be beneficial** as part of their treatment rather than definitive chemoradiotherapy alone.

Stage III NSCLC: treatment strategy at INTM

- **limited N2, no bulky or N3**
fit for resection and stopped smoking

induction chemotherapy
3 - 4 cycles (based on response)
(bi) lobectomy or **left pneumo**
PORT for residual yN2

- **bulky or unfit for surgery**
chemo - radiotherapy
possibly concurrent

SURGERY FOR LOCALLY ADVANCED NSCLC: MORTALITY (INTM)

2003 – 2015 **#** **30-day mortality**

overall *	2548		1.4%
lobectomy	1916		1.1%
pneumonectomy	287		3.1%
right / extended	184		3.8%
simple lobe/segment	1800		0.7%
vascular reconstruction	99	15%	2%
chest wall reconstruction	130		2.3%
other extended	164		4.3%

* anatomical only: segment, lobe or pneumo

75% of other primaries

SURGERY FOR LOCALLY ADVANCED NSCLC: **SURVIVORS (INTM)**

2003 – 2011	#	alive at 5-yrs
--------------------	----------	-----------------------

stage III-IV	602	33%
---------------------	------------	------------

pN2	325	29%
------------	------------	------------

vascular reconstruction	99	43%
--------------------------------	-----------	------------

chest wall reconstruction	130	30%
----------------------------------	------------	------------

other extended	164	40%
-----------------------	------------	------------

Stage III NSCLC: multi-modality strategy

**how
select
the right
surgical
patient**

- multidisciplinary decision
- tri-modality staging
- response to induction CT or CT/RT
- adequate function & risk profile
- limited resection / reconstruction
- best RT planning / resistance

SURGERY FOR STAGE III NSCLC: SUMMARY

- **technically feasible (R0) in few cases**
- **with acceptable morbidity / mortality**
- **highly selective & biology driven**
- **expert multi-disciplinary team**
- **in highly specialized centres**
- **cost / effective balance vs. CT/RT**