XXXI
Diada Pneumològica
Sitges, 12 i 13 d'abril de 2013

Cirurgia de Resecció Pulmonar: Límits Anatòmics

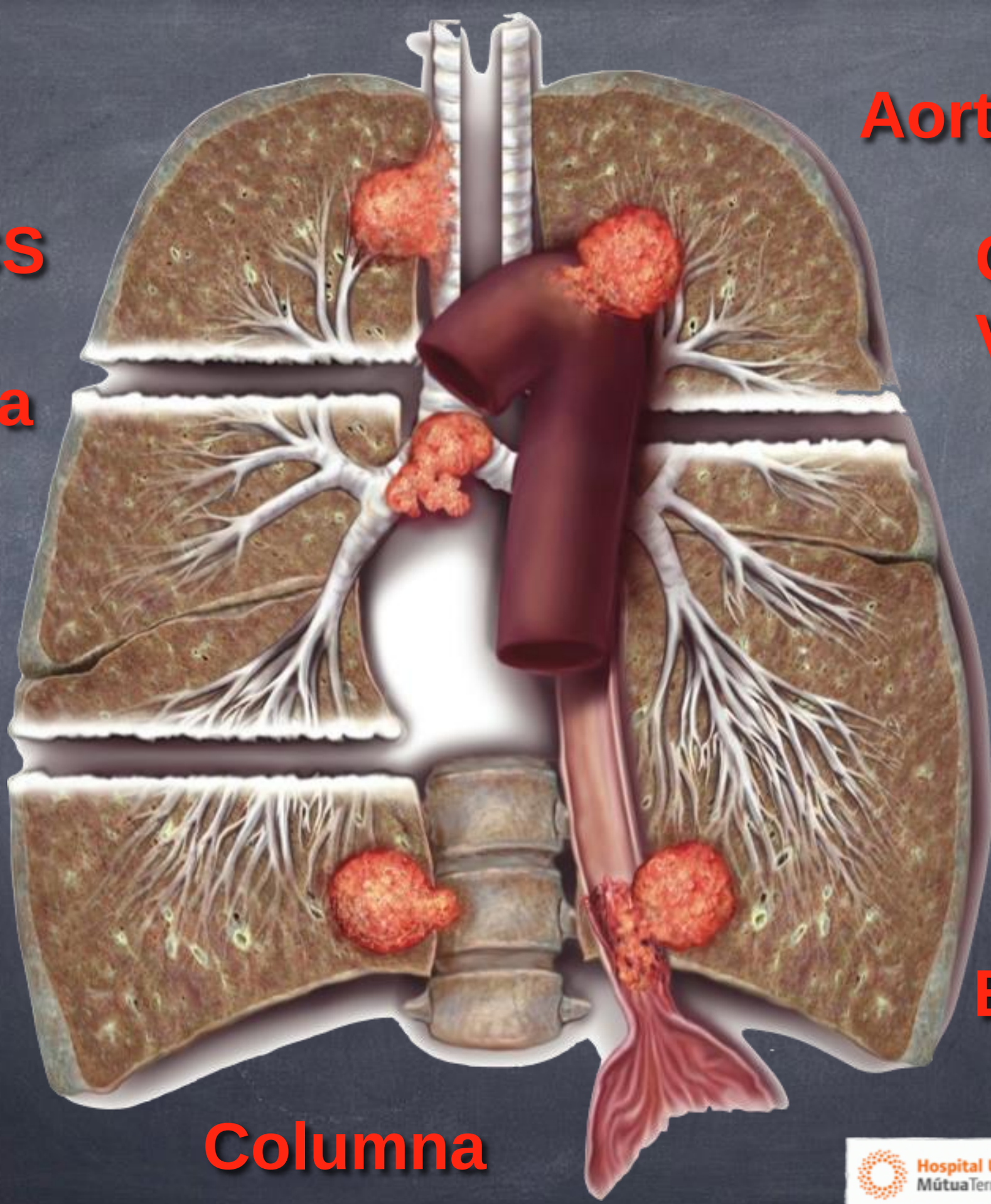
Dr. Sergi Call Caja
Servei de Cirurgia Toràcica
Hospital Universitari Mútua de Terrassa

N2

T4

M1

T4



Aorta

VCS

Grans Vasos

Tràquea

Nervi Laringi

Carina

Mediastí

Cor

Esòfag

Columna

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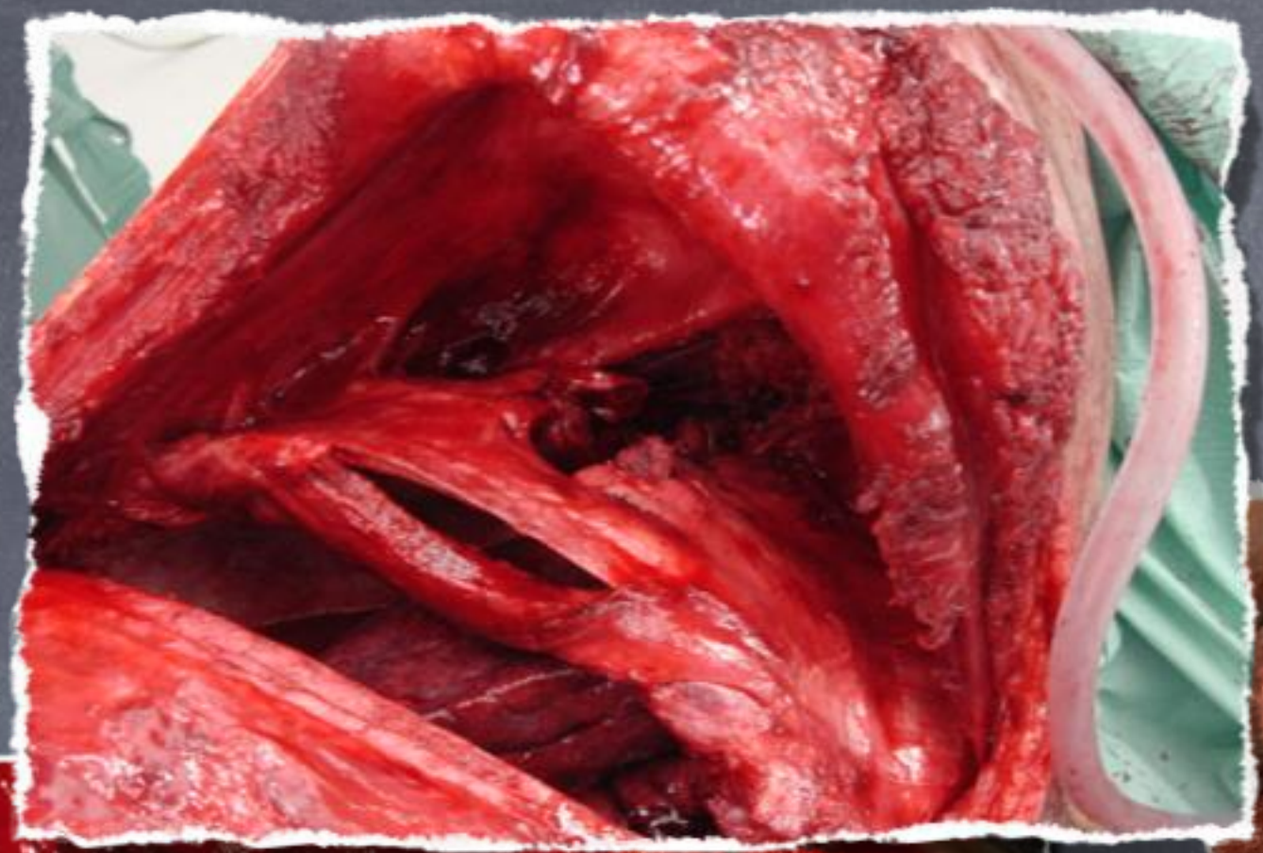
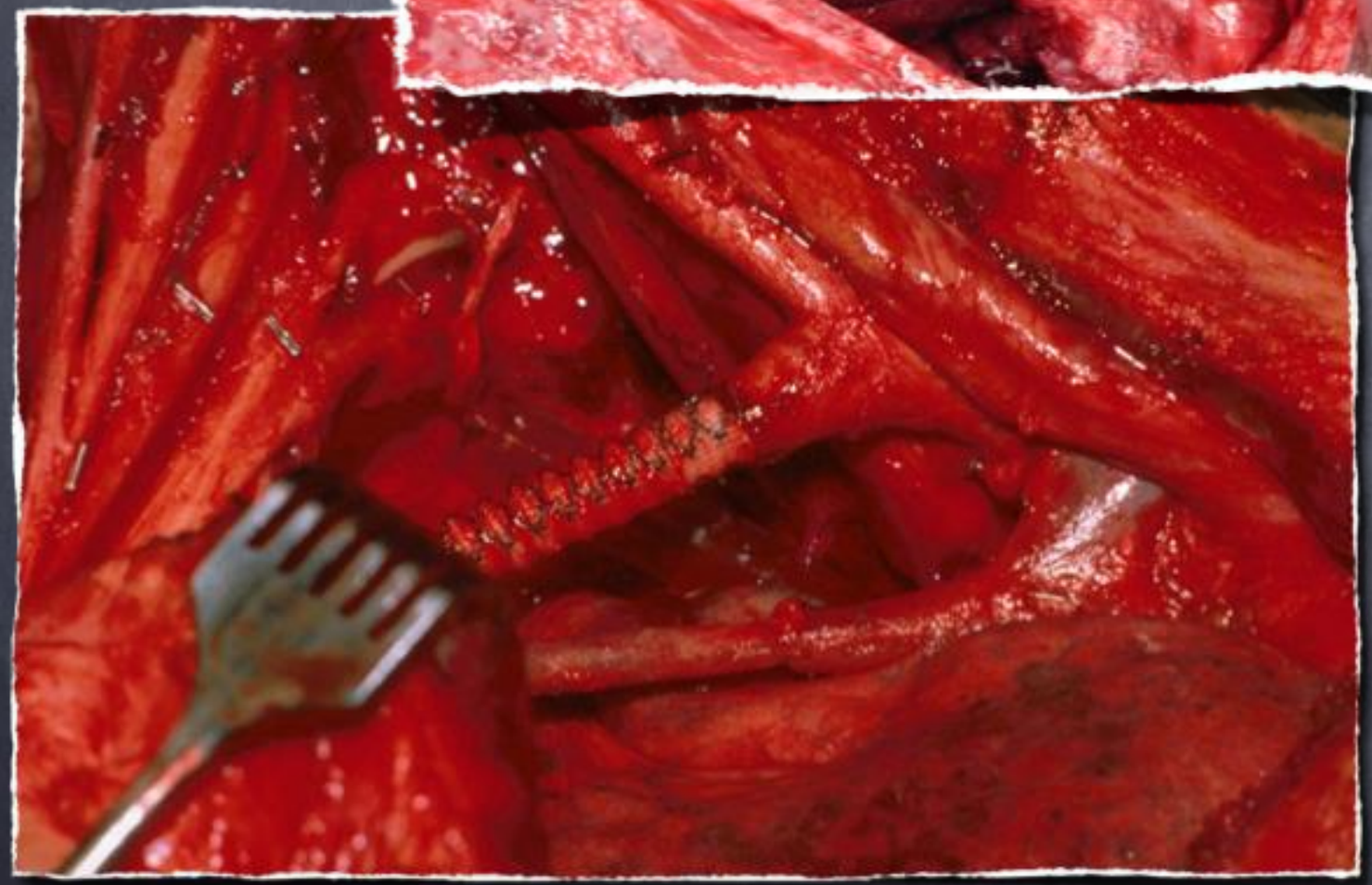
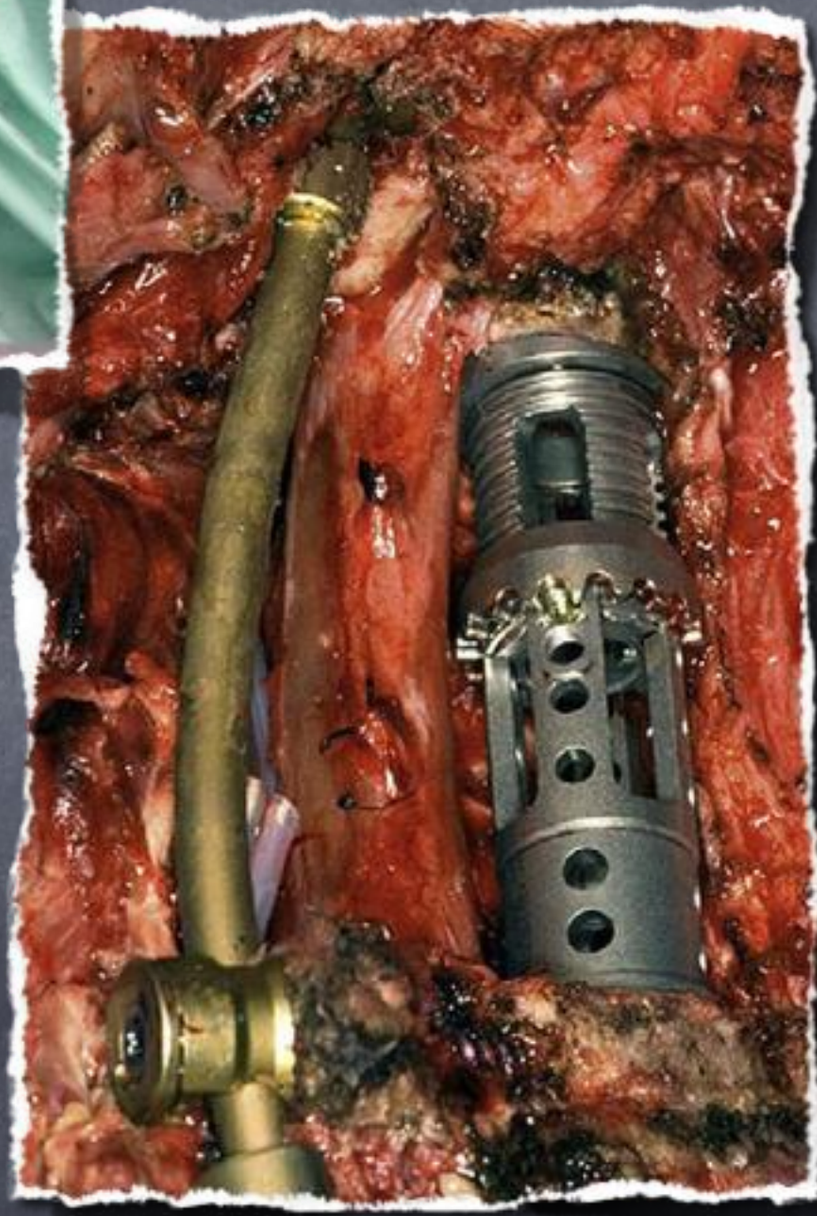
T4







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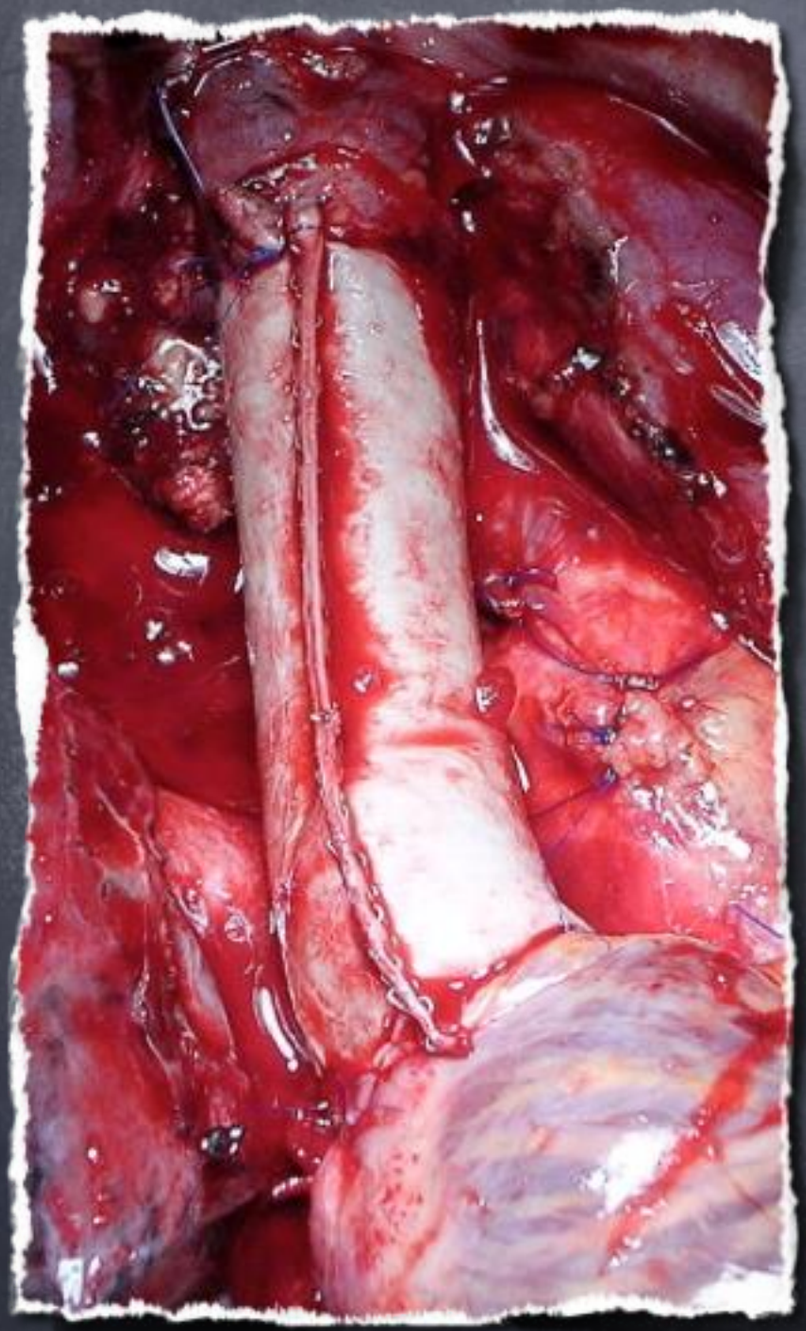

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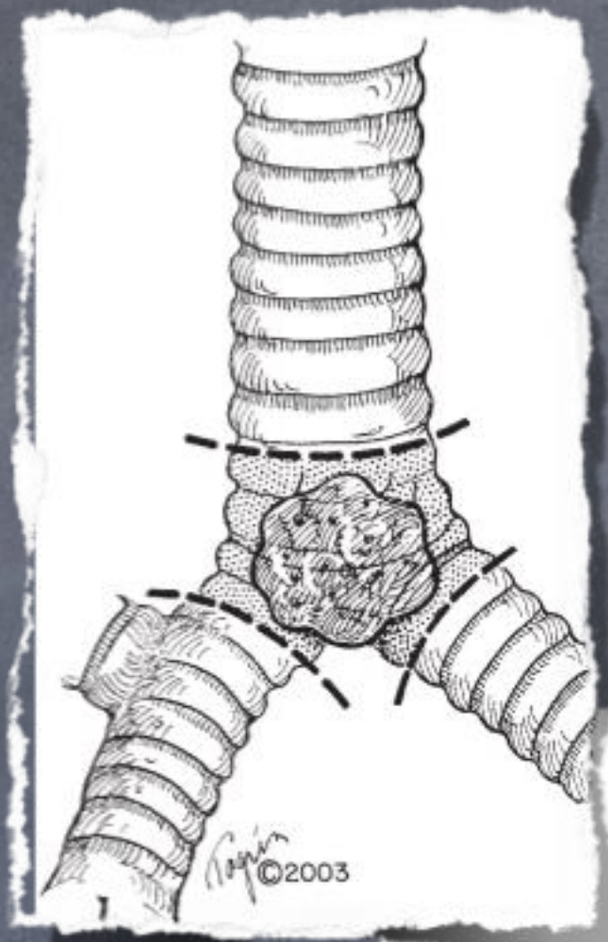
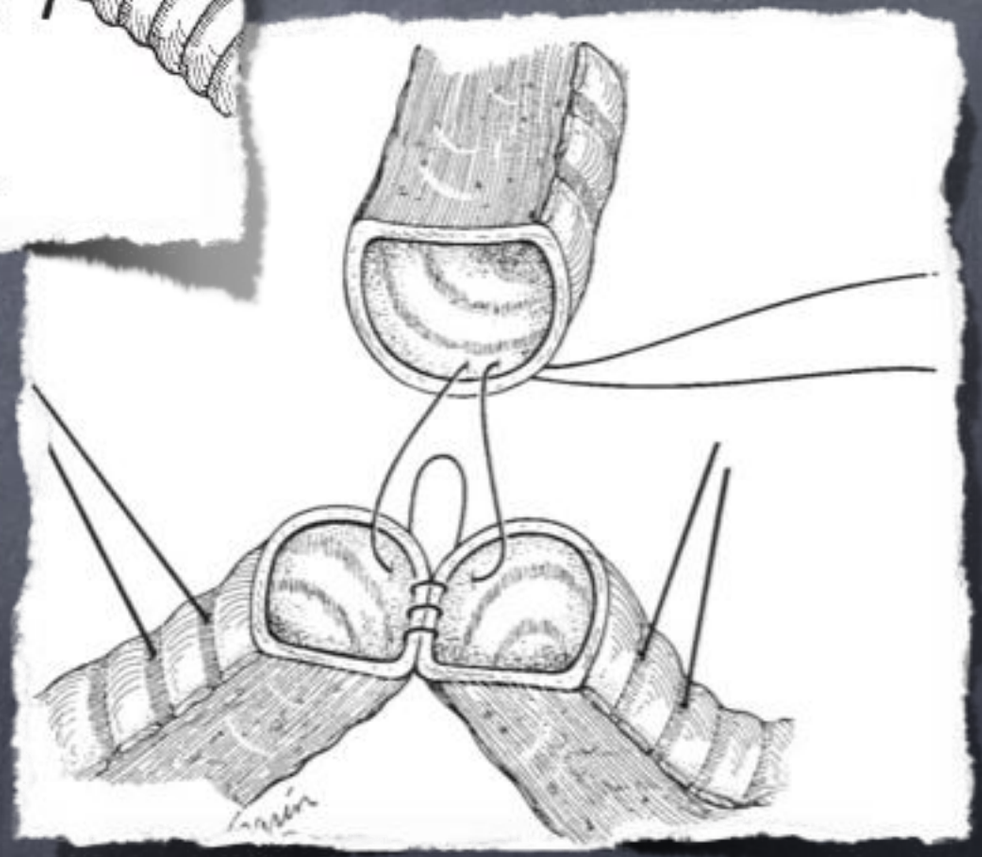
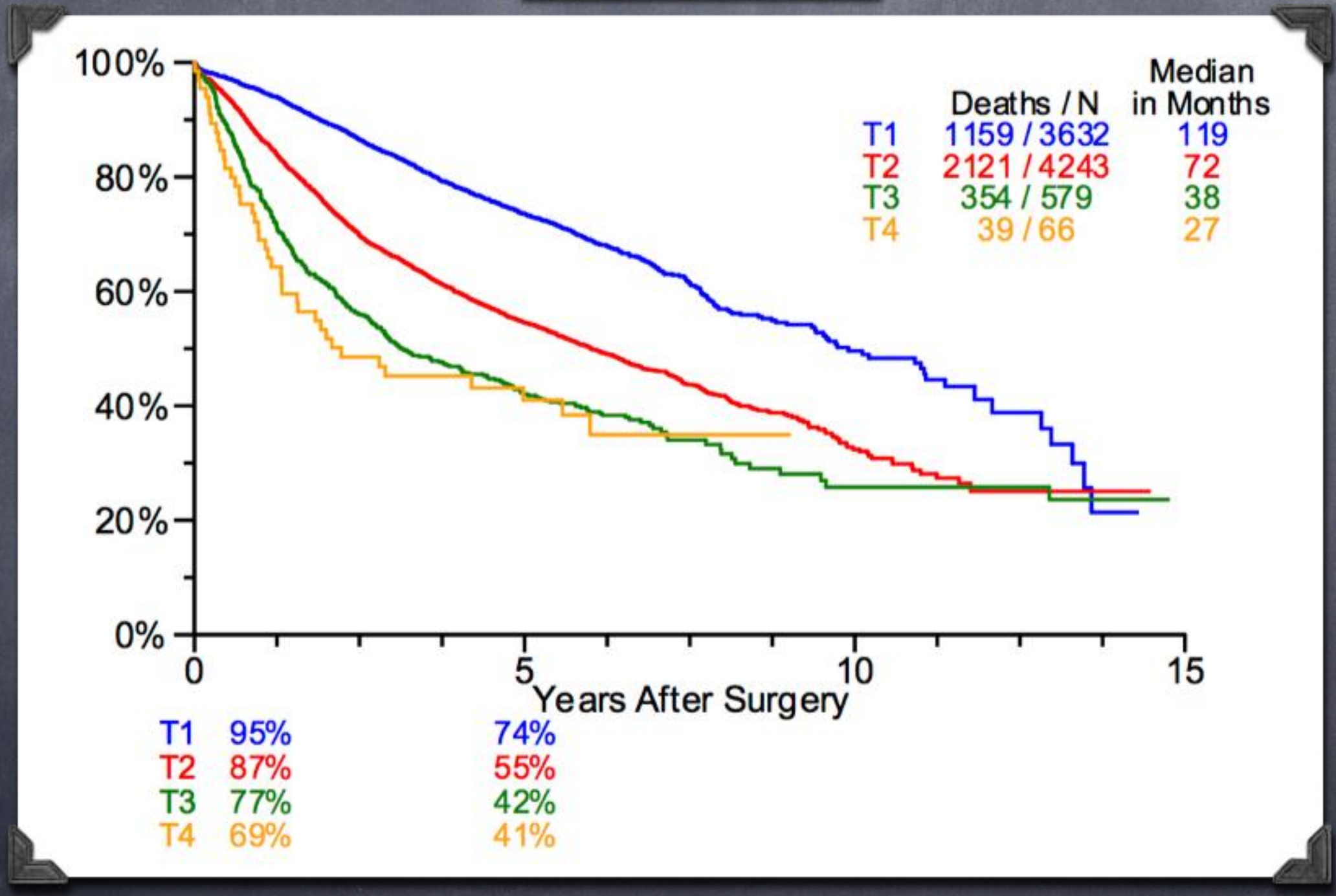




T4

Supervivència dels pacients N0 M0 R0 segons la Tp

IASLC



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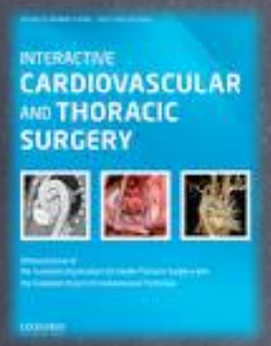


Best evidence topic - Thoracic oncologic

Does surgery have a role in T4N0 and T4N1 lung cancer?

Anthony Chambers[a], Tom Routledge[b], Andrea Billè[b], Marco Scarci[b,*]

[a]*Brighton and Sussex Medical School, University of Sussex, Brighton, East Sussex BN1 9PX, UK*
[b]*Department of Thoracic Surgery, Guy's Hospital, Great Maze Pond, London SE1 9RT, UK*

Received 9 February 2010; received in revised form 13 June 2010; accepted 24 June 2010

- 150 ARTICLES -15 Màxima evidència - **2395** pacients
- No correlació entre estructura infiltrada i pronòstic
- Factors de bon pronòstic:
  - ☑ **RESECCIÓ COMPLETA**
  - ☑ **ABSÈNCIA N2**

Tumors del Sulcus Pulmonar

T3

T4

Vèrtebra

canal medul·lar

plexe braquial

vasos subclavis

T3-4 Tumors del Sulcus Pulmonar

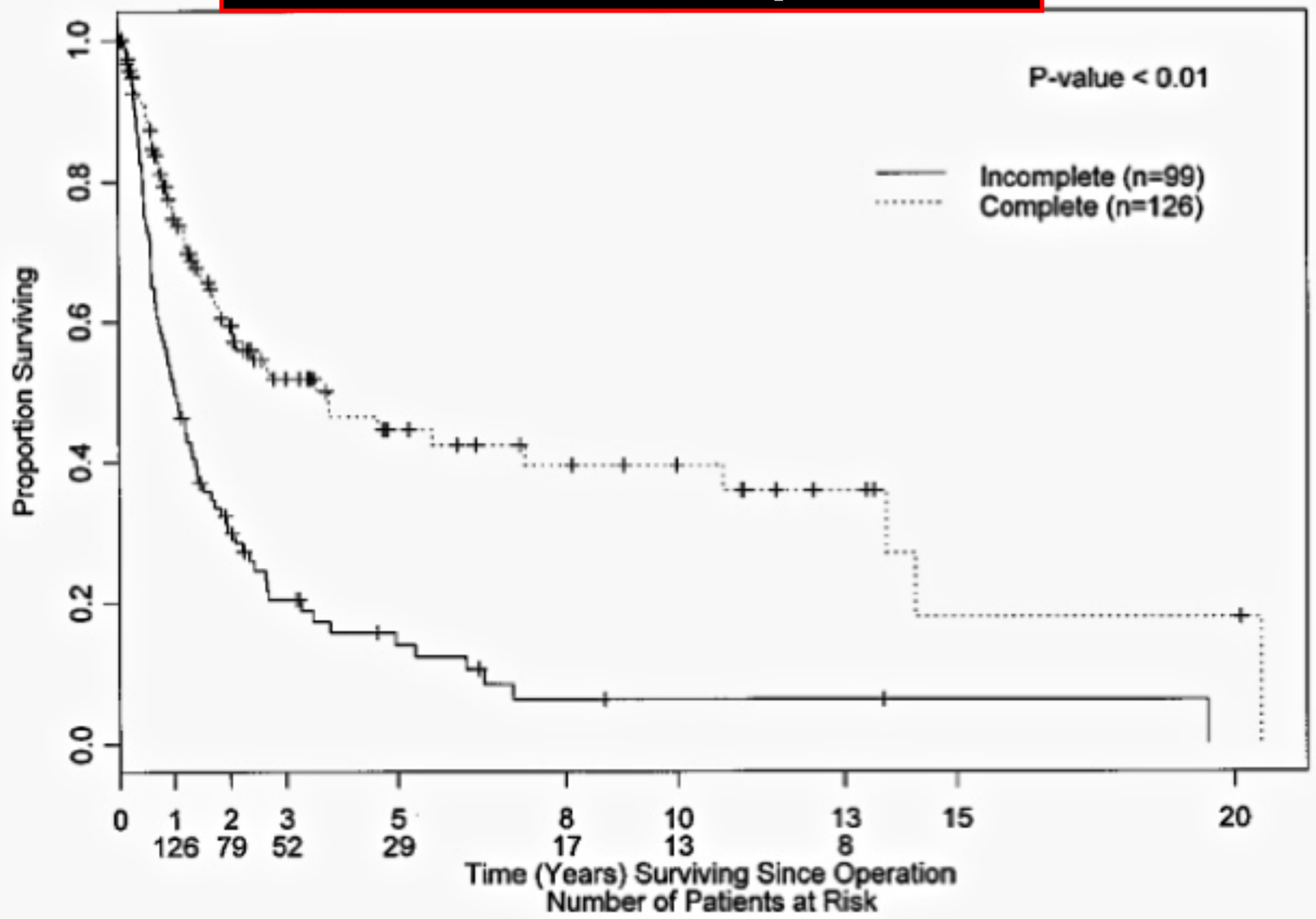
FACTORS DETERMINING OUTCOME AFTER SURGICAL RESECTION OF T3 AND T4 LUNG CANCERS OF THE SUPERIOR SULCUS

Valerie W. Rusch, MD[a]
Kalpaj R. Parekh, MD[a*]
Larry Leon, MS[d]
Ennapadam Venkatraman, PhD[d]
Manjit S. Bains, MD[a]
Robert J. Downey, MD[a]
Patrick Boland, MD[b]
Mark Bilsky, MD[c]
Robert J. Ginsberg, MD[a]

- ☑ 1974-1998 225 pacients--> Toracotomia
- ☑ 55% van rebre RT d'inducció
- ☑ 4% de mortalitat perioperatòria

T3-4 Tumors del Sulcus Pulmonar

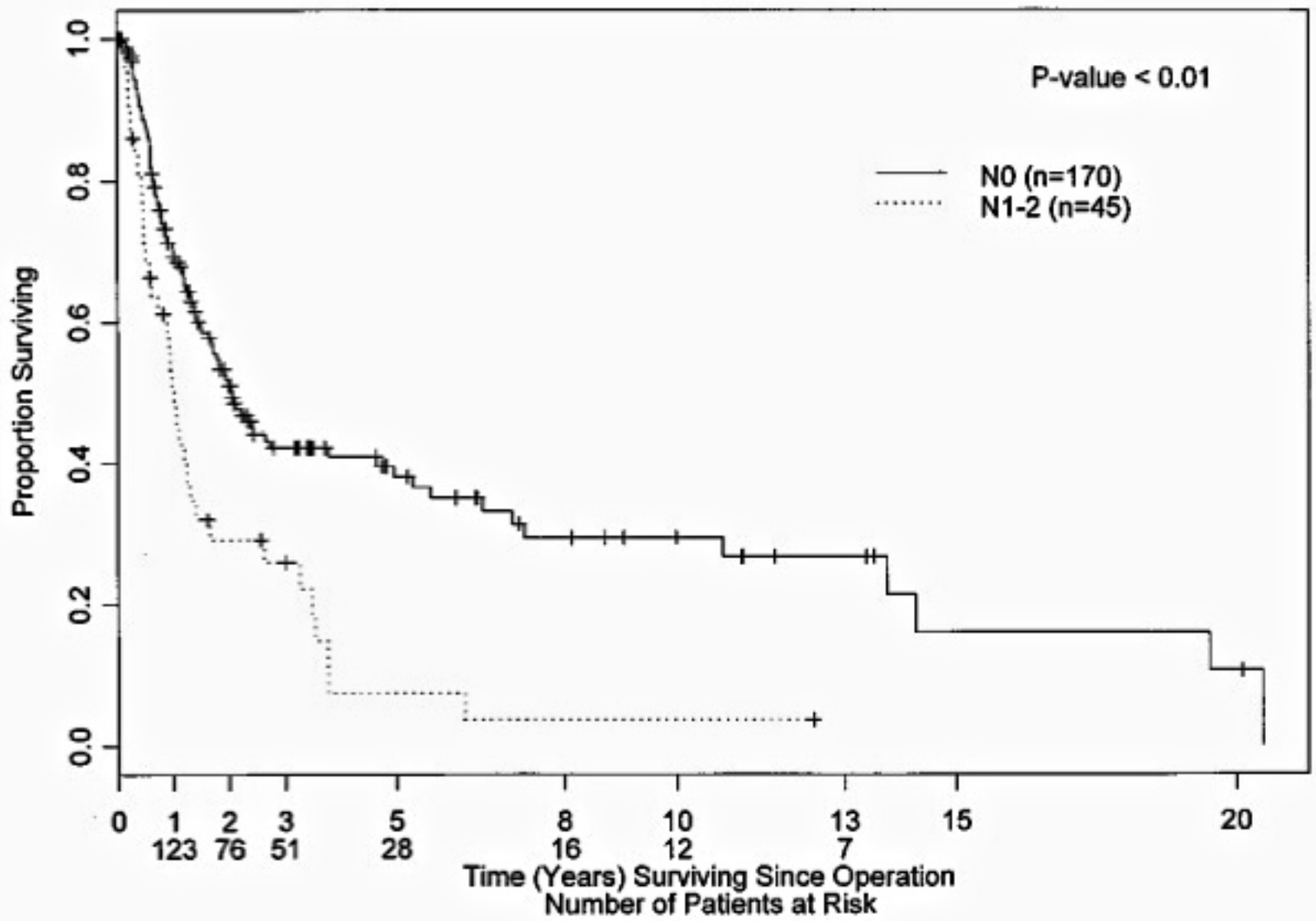
☑ Resecció Complerta



Rusch V et al. J Thorac Cardiovasc Surg 2000; 119: 1147-53

T3-4 Tumors del Sulcus Pulmonar

☑ Afectació Ganglionar



Rusch V et al. J Thorac Cardiovasc Surg 2000; 119: 1147-53

T3-4 Tumors del Sulcus Pulmonar

225 pacients	IIB (52%)	IIIA (15%)	IIIB (27%)
RC	64%	54%	39%
S (Mitjana)	33 m	12 m	12m
S (5 anys)	46%	0%	13%

p= 0.7

p= < 0.01

Rusch V et al. J Thorac Cardiovasc Surg 2000; 119: 1147-53

Table V. *Results of the multivariable analysis of prognostic factors influencing overall survival*

		Hazard ratio	
*Prognostic factor**	*P value*	*Estimated*	*95% CI*
Wedge	.08	1.4	(1.0, 2.1)
T4	.05	1.6	(1.0, 2.5)
IR	<.01	2.2	(1.4, 3.3)
N1 or N2	<.01	2.1	(1.4, 3.2)

- ☑ T3 > T4
- ☑ RESECCIÓ COMPLETA
- ☑ ABSÈNCIA N2

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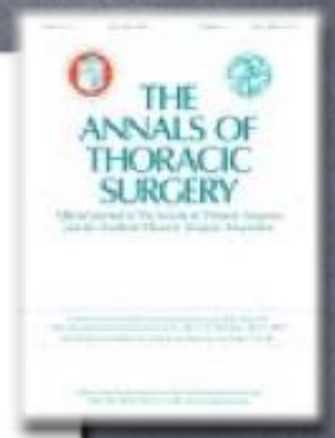
T4

Grans Vasos



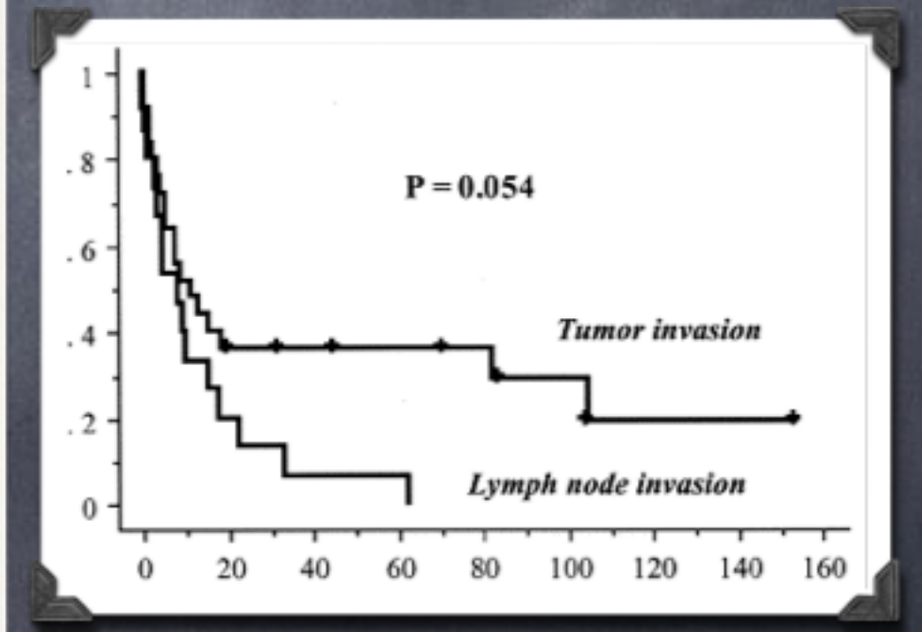
Combined Resection of Superior Vena Cava for Lung Carcinoma: Prognostic Significance of Patterns of Superior Vena Cava Invasion

Presented at the Fortieth Annual Meeting of The Society of Thoracic Surgeons, San Antonio, TX, Jan 26–28, 2004.

Kenji Suzuki, MD[a], Hisao Asamura, MD[a], Shun-ichi Watanabe, MD[a], Ryosuke Tsuchiya, MD[a]

[a] Thoracic Surgery Division, National Cancer Center Hospital, Tokyo, Japan

- ☑ N= 40 casos 1980-2001
- ☑ Recanvi complert VCS: 11 casos
- ☑ S (5 anys)
  - ☑ Global 24%
  - ☑ Si N2 = 6.6%



T4

Grans Vasos

Surgical resection for lung cancer with infiltration of the thoracic aorta

Mitsunori Ohta, MD,[a] Hirohisa Hirabayasi, MD,[a] Hiroyuki Shiono, MD,[a] Masato Minami, MD,[a] Hajime Maeda, MD,[b] Hiroshi Takano, MD,[a] Shinichiro Miyoshi, MD,[c] and Hikaru Matsuda, MD[a]

- ☑ 1986-2002: 16 reseccions Ao
  - ☑ 9 bypass parcial F-F
  - ☑ 3 bypass temporal Ao asc-Ao desc
- ☑ Mortalitat: 12.5% Morbiditat: 31%

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T4

Grans Vasos

Surgical resection for lung cancer with infiltration of the thoracic aorta

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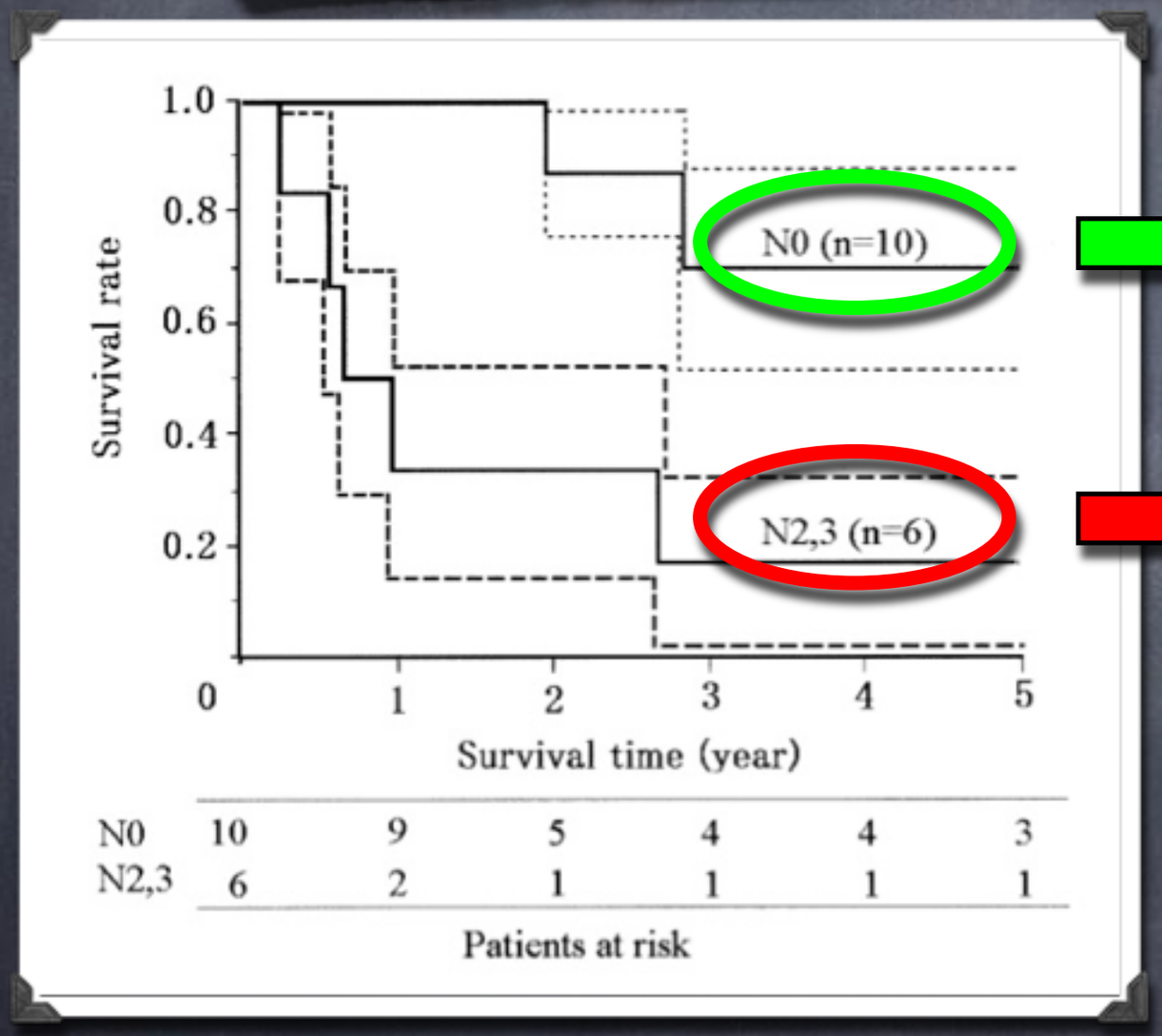

10p N0

S (5anys): 70%

Mitjana: 31 mesos

6p N2,3

S (5anys): 17%

Mitjana: 10 mesos

T4

Reseccions de Carina

Resection for bronchogenic carcinoma involving the carina: Long-term results and effect of nodal status on outcome

John D. Mitchell, Douglas J. Mathisen, Cameron D. Wright, John C. Wain, Dean M. Donahue, James S. Allan, Ashby C. Moncure and Hermes C. Grillo

J Thorac Cardiovasc Surg 2001;121:465-471

- ☑ 1973-1998: 60 reseccions de carina
- ☑ Mortalitat global 15% (20% ---->10)
- ☑ Np = 34 N0p - 15 N1p - 11N2-3p
- ☑ S (5 anys)= 42%

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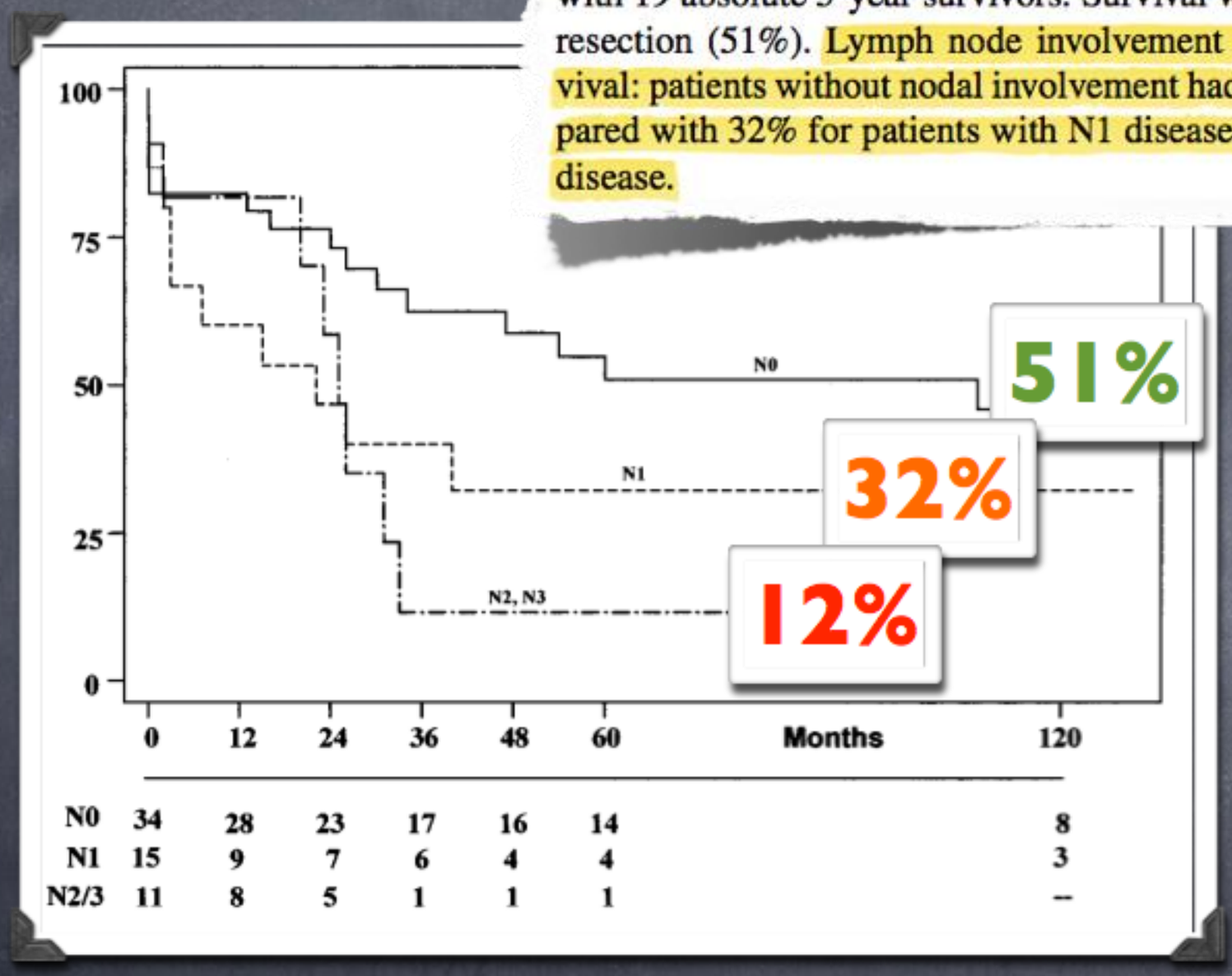
Reseccions de Carina

with 19 absolute 5-year survivors. Survival was highest after isolated carinal resection (51%). Lymph node involvement had a strong influence on survival: patients without nodal involvement had a 5-year survival of 51%, compared with 32% for patients with N1 disease and 12% for those with N2/N3 disease.



Mitchell JD, Mathisen DJ, Wright CD, Wain JC, Donahue DM, Allan JS, Moncure AC, Grillo HC. Resection for bronchogenic carcinoma involving the carina: long-term results and effect of nodal status on outcome. J Thorac Cardiovasc Surg. 2001 Mar;121(3):465-71.

T4

Reseccions de Carina

		Nodal status			Operative mortality	Operative morbidity	Five-year survival
		N0	N1	N2/3			
Carinal pneumonectomy, n (%)	35	15	13	7	7 (20%)	16 (46%)	38%
Carinal resection and reconstruction, n (%)	18	13	1	4	2 (11%)	7 (39%)	51%
Carinal plus lobar resection, n (%)	5	4	1	0	0	3 (60%)	40%
Carinal resection after prior pneumonectomy, n (%)	2	2	0	0	0	1 (50%)	50%
Totals, n (%)	60	34	15	11	9 (15%)	27 (45%)	42%

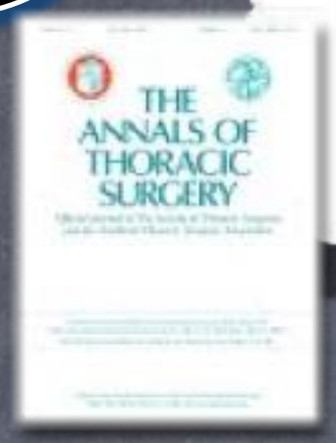
Mitchell JD, Mathisen DJ, Wright CD, Wain JC, Donahue DM, Allan JS, Moncure AC, Grillo HC. Resection for bronchogenic carcinoma involving the carina: long-term results and effect of nodal status on outcome. J Thorac Cardiovasc Surg. 2001 Mar;121(3):465-71.

Table 2 Results of tracheal sleeve pneumonectomy for bronchogenic carcinoma in selected series

Author	Year	No. of patients	Mortality (%)	Morbidity (%)	5-year survival
Dartevelle [8]	1995	55	7.3	10.8	40
Mitchell [9]	2001	35	20.0 ->10%	46	38
Regnard [10]	2005	60	8.3	53.3	26.5
Roviaro [11]	2006	53	7.5	11.3	33.4
de Perrot [12]	2006	103	7.8	47	44
Macchiarini [13]	2006	34	2	16	51

Rea F, Marulli G, Schiavon M, Zuin A, Hamad AM, Feltracco P, Sartori F. Tracheal sleeve pneumonectomy for non small cell lung cancer (NSCLC): short and long-term results in a single institution. Lung Cancer. 2008 Aug;61(2):202-8.

T4



Results of Primary Surgery With T4 Non Small Cell Lung Cancer During a 25-Year Period in a Single Center: The Benefit is Worth the Risk

Bedrettin Yildizeli, Philippe G. Dartevelle, Elie Fadel, Sacha Mussot and Alain Chapelier

Ann Thorac Surg 2008;86:1065-1075
DOI: 10.1016/j.athoracsur.2008.07.004

- ☑ **1981-2006= 271 cirurgies de T4-CCNP**
  - ☑ **126 Tumors del Sulcus**
  - ☑ **92 Reseccions de Carina**
  - ☑ **39 recanvis de VCS**
  - ☑ **14 Altres (columna, esòfag, Aorta)**
- ☑ **Morbiditat i Mortalitat global: 35% i 4%**

T4

Results of Primary Surgery With T4 Non Small Cell Lung Cancer During a 25-Year Period in a Single Center: The Benefit is Worth the Risk

Bedrettin Yildizeli, Philippe G. Dartevelle, Elie Fadel, Sacha Mussot and Alain Chapelier

Ann Thorac Surg 2008;86:1065-1075
DOI: 10.1016/j.athoracsur.2008.07.004

Table 5. Factors Affecting Survival in Patients With T4 Non–Small Cell Lung Cancer (n = 271)

			p Value	
Risk Factors	n	5-Year Survival	Univariate Analysis	Multivariate Analysis
Neoadjuvant treatment (Yes/No)	75/196	37.0/38.8	0.7	
Pneumonectomy/lesser resections	134/137	39.2/37.7	0.9	
Subclavian artery involvement (Yes/No)	50/221	24.9/41.7	0.01	0.02
SVC invasion (Yes/No)	52/220	34.7/39.3	0.9	
Complete resection (R0/R1)	249/22	40.4/15.9	0.005	0.006
Squamous cell cancer/non–squamous cell cancer	133/138	37.2/37.5	0.8	
N0/N1 versus N2/N3/M1	208 versus 63	43.0 versus 17.7	0.002	0.01
Adjuvant treatment (Yes/No)	139/132	34.7/42.4	0.8	

T4

Another important issue is mediastinal staging of patients with T4 NSCLC. Because this study covers a period of 25 years, only 13.6% of our patients underwent mediastinoscopy, and unfortunately we have found that 20.7% of the patients had either N2 or N3 disease. This figure really shows the importance of preoperative mediastinal staging to select the proper patients who may benefit from a long-term survival after surgery. If a lymph node is 1 cm or less on a

tality and morbidity less prohibitive and yield a more favorable prognosis. It has been well demonstrated that the prognosis after operations for T4 tumors mainly depends on the N stage and complete resection. Patients with N0 or minimal N1 disease and patients with complete resection do significantly better after radical resection, a finding that clearly justifies operative therapy in these patients. Presence of pN2 disease should be considered a potential contraindication to resection of T4 tumors. On the other h

technical complexity of the operation

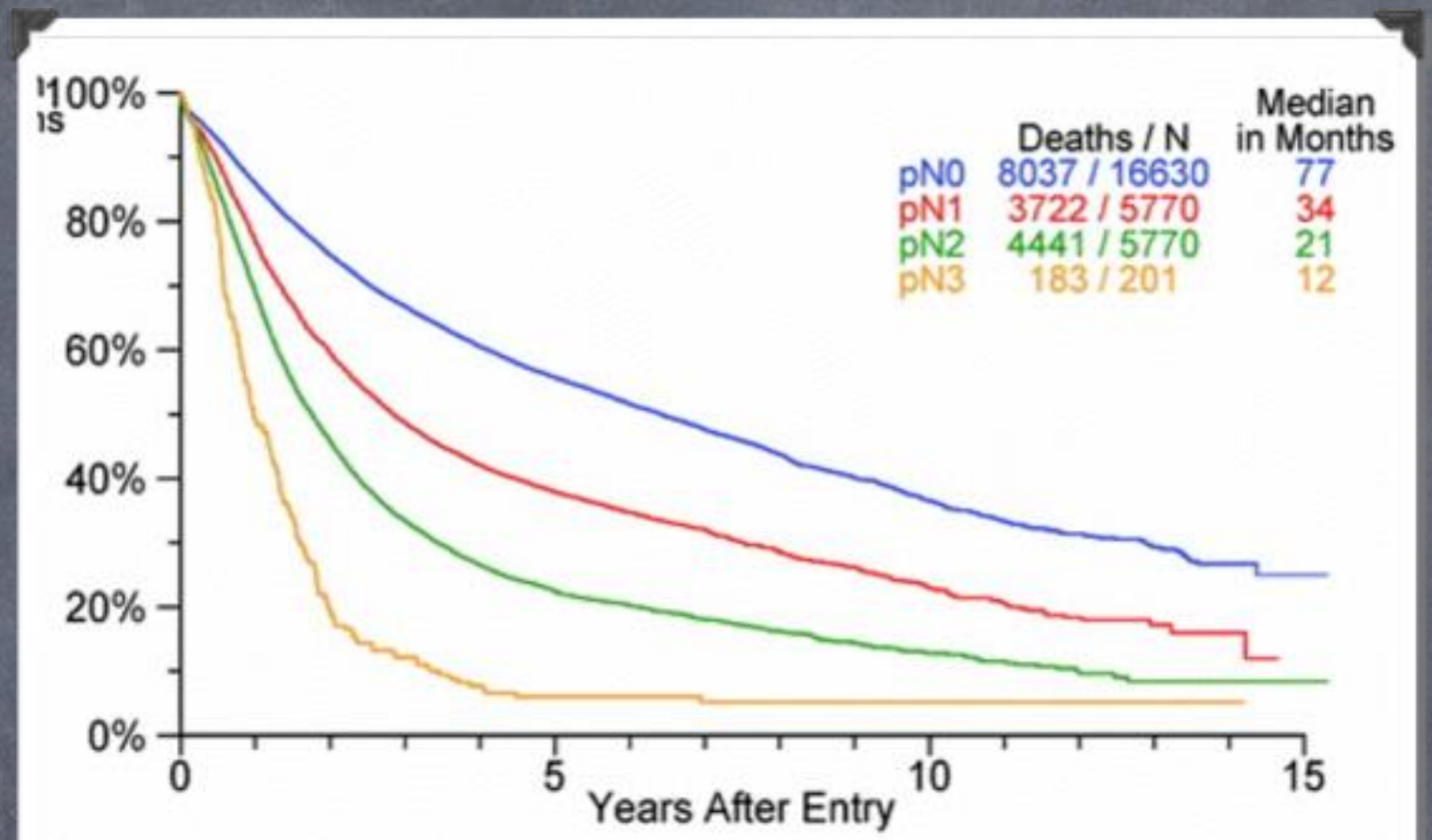
whenever a complete resection is thought to be technically possible. Complete resection of T4 NSCLC results in a 40.4% 5-year survival rate. Patients with NSCLC who have carinal involvement, SVC invasion, and superior sulcus tumor even with vertebral invasion or mediastinal invasion without mediastinal lymph node involvement should undergo radical surgery without any attempt of giving neoadjuvant chemotherapy.

The thoracic medical and surgical community should

Yildizeli B, Dartevelle PG, Fadel E, Mussot S, Chapelier A. Results of primary surgery with T4 non-small cell lung cancer during a 25-year period in a single center: the benefit is worth the risk. Ann Thorac Surg. 2008 Oct;86(4):1065-75; discussion 1074-5.

N2-3

Supervivència dels pacients N2p

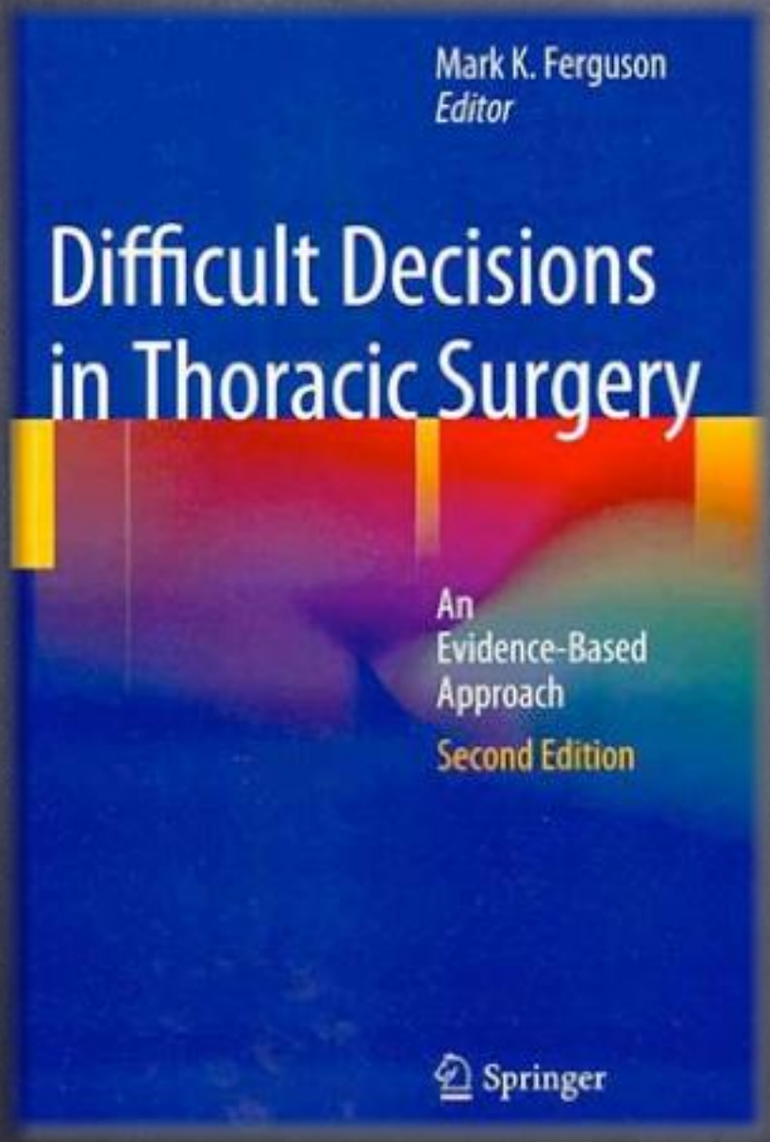


	1 Yr	5 Yrs		HR	P
pN0	86%	56%			
pN1	77%	38%	vs pN0:	1.63	<.0001
pN2	69%	22%	vs pN1:	1.51	<.0001
pN3	49%	6%	vs pN2:	1.81	<.0001

Rusch VW. et al. J Thorac Oncol. 2007;2: 603–612

N2

Cirurgia del N2



N2 Disease Discovered at Thoracotomy: Resect or Abort?

Frank C. Detterbeck

- **Revisió Literatura 1980-2009**
- **Key words: Surgery / NSCLC / N2**
- **Revisions sistemàtiques de l'autor**

✓ Detterbeck F. What to do with surprise N2: intraoperative management of patients with non-small cell lung cancer. *J Thorac Oncol*. 2008;3:289–302.

✓ Detterbeck F, Jantz M, Wallace M, Vansteenkiste J, Silvestri G. Invasive Mediastinal Staging of Lung Cancer: an ACCP Evidence Based Clinical Practice Guideline (2nd edition). *Chest*. 2007; 132:202S-220S.

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N2

Cirurgia del N2

Factors pronòstics Cohort N2 Quirúrgica

Table 9.3. M… …f factors predicting poor survival in pN2 patients[a].

Study		Multi-estació	cN2	R1,2	#7		N1	T3,4		Lower Lobe	pneum	Ader…	Edat avançada
Andre[6]	702	<0.0001	<0.0001	NS	–	–	–	–	<0.0001	–	–	–	NS	–
Ichinose[85]	406	<0.0001	NS	–	<0.03	–	–	–	<0.05[b]	–	–	NS	NS	0.02
Riquet[83]	237	<0.05	–	<0.05	NS	NS	NS	NS	NS	NS	NS	NS	NS	–
Suzuki[89]	222	<0.001	**<0.001**	0.02	–	–	–	–	NS	0.001	–	NS	NS	NS
Miller[82]	167	<0.05	–	NS	–	<0.05	NS	(NS)[c]	NS	–	–	<0.05	NS	<0.05
Thomas[88]	163	<0.02	–	–	–	NS	–	NS	NS	–	–	–	NS	–
Tanaka[87]	155	NS	NS	**0.001**	–	–	–	–	0.03	–	–	–	NS	NS
Inoue[106]	154	0.005	**<0.001**	–	–	–	–	–	NS	–	<0.04	–	**0.002**	0.007
Cerfolio[118]	148	0.03	–	–	–	–	–	–	NS	–	–	–	NS	–
Iwasaki[113]	142	NS	–	–	NS	0.002	–	–	NS	–	–	NS	NS	NS
Vansteenkiste[79]	140	0.03	0.04	NS	–	NS	NS	(NS)[c]	0.003	–	NS	NS	0.03	NS
Tanaka[107]	99	**0.01**	**<0.04**	–	–	–	–	–	NS	–	–	–	NS	NS
Ohta[116]	94	–	NS	–	0.03	**≤0.001**	–	NS	**<0.001**	NS	NS	–	NS	NS
Prognostic Value[d]		**High**	**Mod**	**Mod**	**Mod**	**Mod**	**–**	**–**	**Low**	**Low**	**Low**	**–**	**–**	**Low**

Recull d'estudis (1980-2009) amb una n= >90 de pacients pN2 amb anàlisis multivariant

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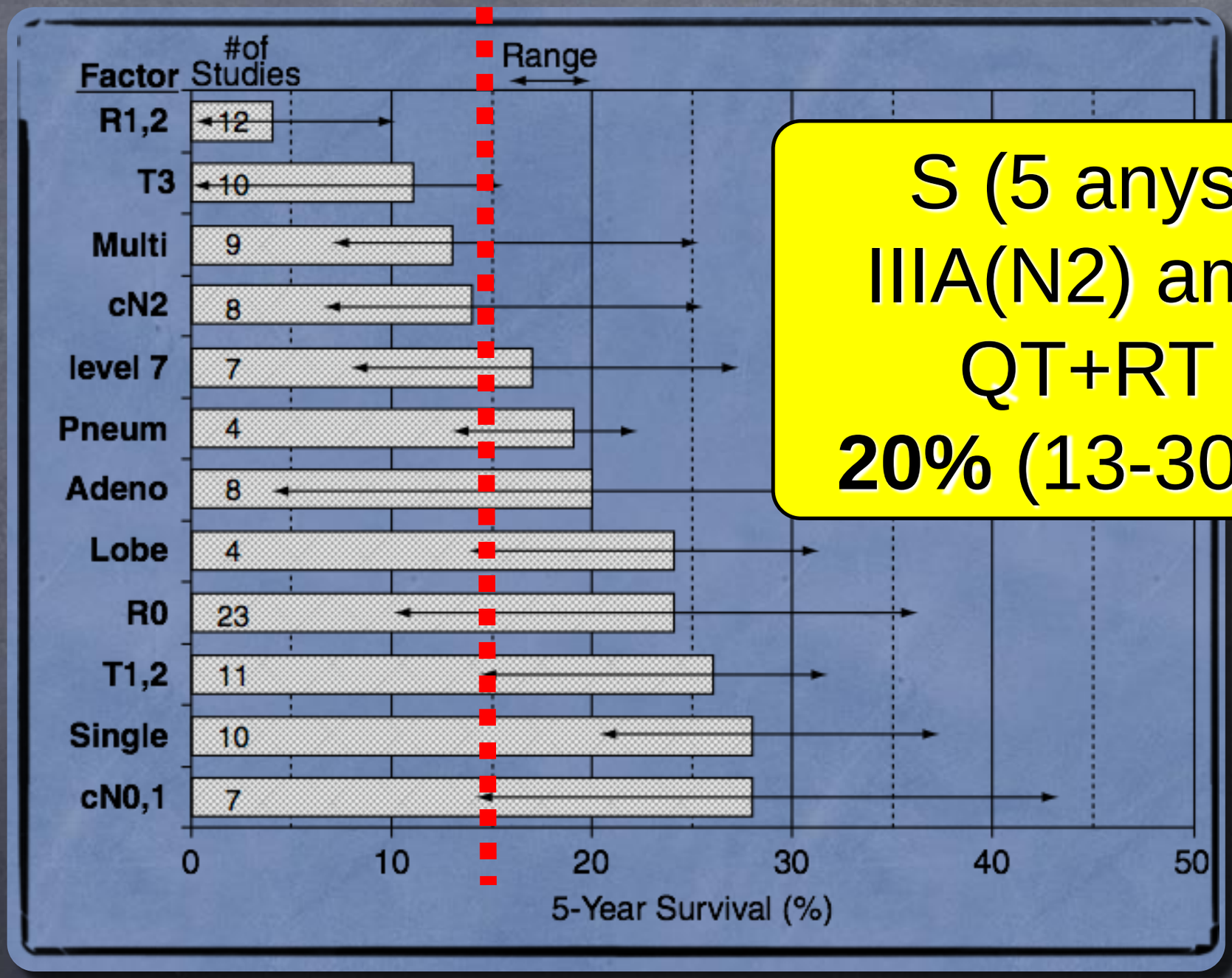
N2

Cirurgia del N2

Supervivència Cohort N2 Quirúrgica



S (5 anys) IIIA(N2) amb QT+RT **20%** (13-30%)

R1,2

T3

Multiestació

cN2

Estudis de 1980-2009 amb una n= >100 pN2 que analitzen Factors Pronòstics i Supervivència

N2

Cirurgia Post Inducció

Randomized Controlled Trial of Resection Versus Radiotherapy After Induction Chemotherapy in Stage IIIA-N2 Non–Small-Cell Lung Cancer

Jan P. van Meerbeeck, Gijs W. P. M. Kramer, Paul E. Y. Van Schil, Catherine Legrand, Egbert F. Smit, Franz Schramel, Vivianne C. Tjan-Heijnen, Bonne Biesma, Channa Debruyne, Nico van Zandwijk, Ted A. W. Splinter, Giuseppe Giaccone

On behalf of the European Organisation for Research and Treatment of Cancer-Lung Cancer Group

Radiotherapy plus chemotherapy with or without surgical resection for stage III non-small-cell lung cancer: a phase III randomised controlled trial

Kathy S Albain, R Suzanne Swann, Valerie W Rusch, Andrew T Turrisi III, Frances A Shepherd, Colum Smith, Yuhchyau Chen, Robert B Livingston, Richard H Feins, David R Gandara, Willard A Fry, Gail Darling, David H Johnson, Mark R Green, Robert C Miller, Joanne Ley, Willliam T Sause, James D Cox

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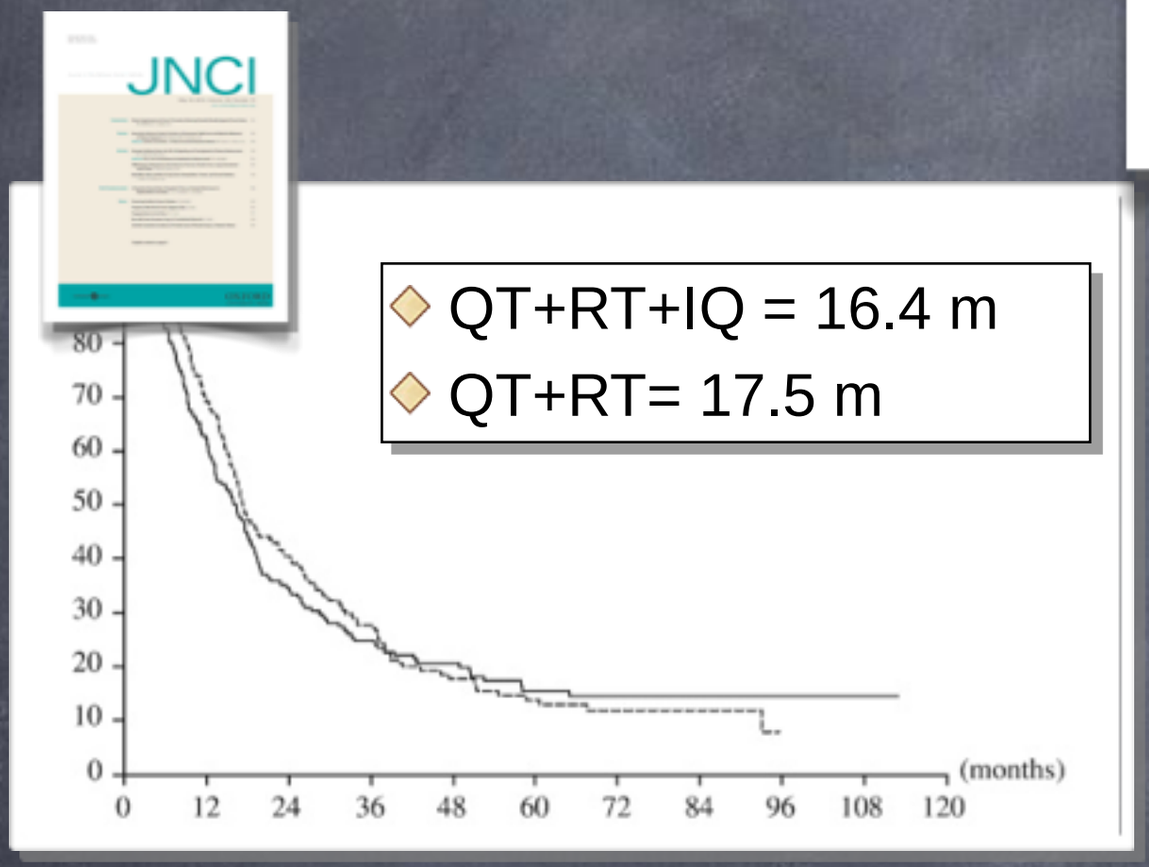
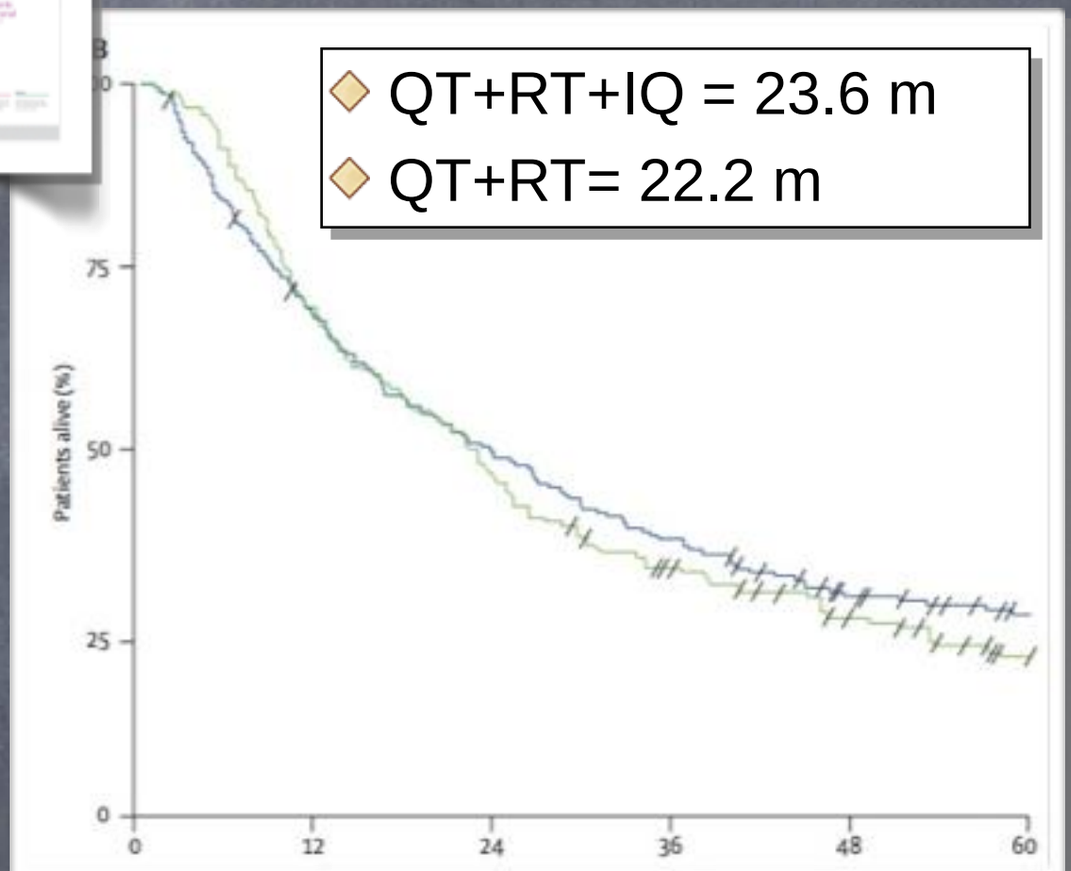
Cirurgia Post Inducció



- QT+RT+IQ = 16.4 m
- QT+RT= 17.5 m



- QT+RT+IQ = 23.6 m
- QT+RT= 22.2 m

La cirurgia no afegeix **cap benefici** en la supervivència global d'ambós estudis

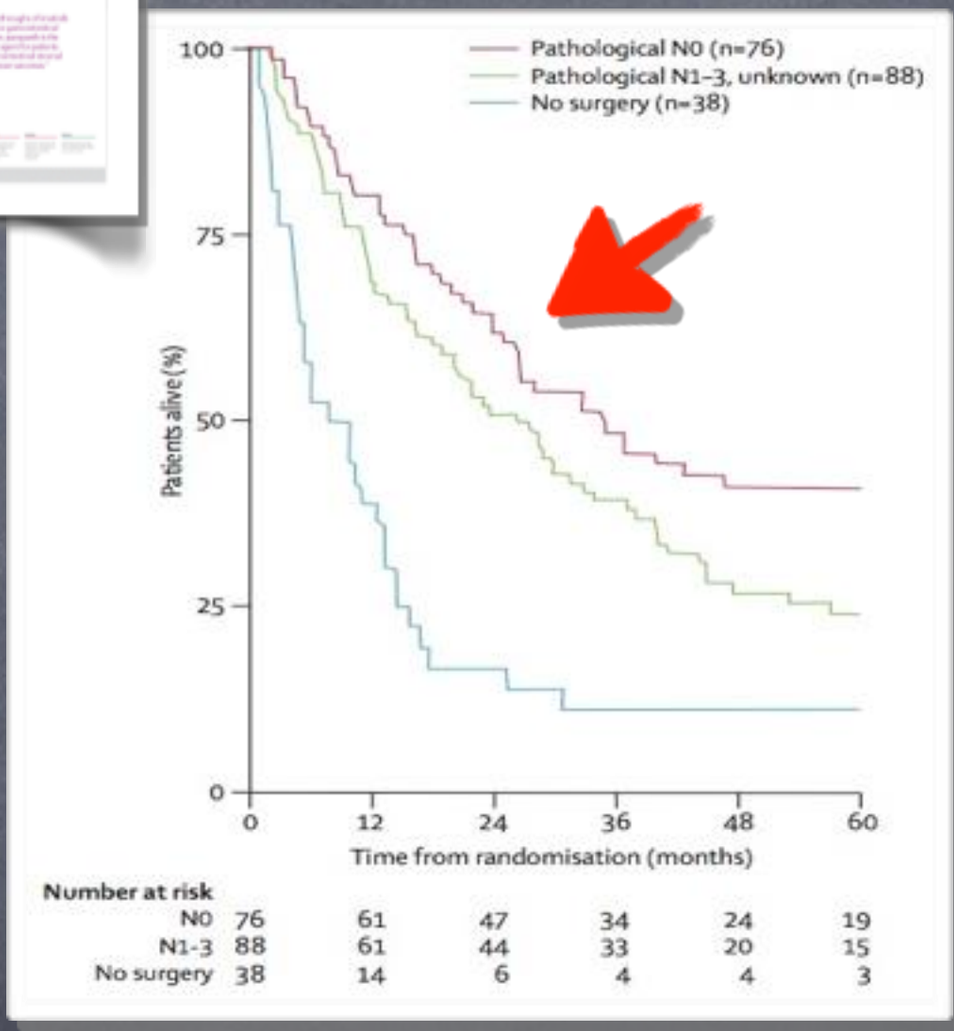
N2

Cirurgia Post Inducció

Factors bon pronòstic

ploratory analyses in 154 patients in the resection surgery arm*

	N	Median OS, months (95% CI)	5-year OS, %
Extent of resection			
(Bi-)lobectomy	58	25.4 (17.7 to 48.9)	27
Pneumonectomy	72	13.4 (11.1 to 19.5)	12
Mediastinal status			
ypN0–1	64	22.7 (17.6 to 42.7)	29
ypN2	86	14.9 (11.2 to 18.5)	7
Type of resection			
Complete	77	24.1 (16.7 to 42.4)	27
Incomplete	76	12.1 (9.5 to 17.1)	7
No PORT	92	14.1 (11.2 to 19.9)	19
PORT	62	18.0 (15.0 to 25.9)	13



- **Resecció completa**
- **N0-1yp**

N2

Cirurgia Post Inducció: HUMT

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]

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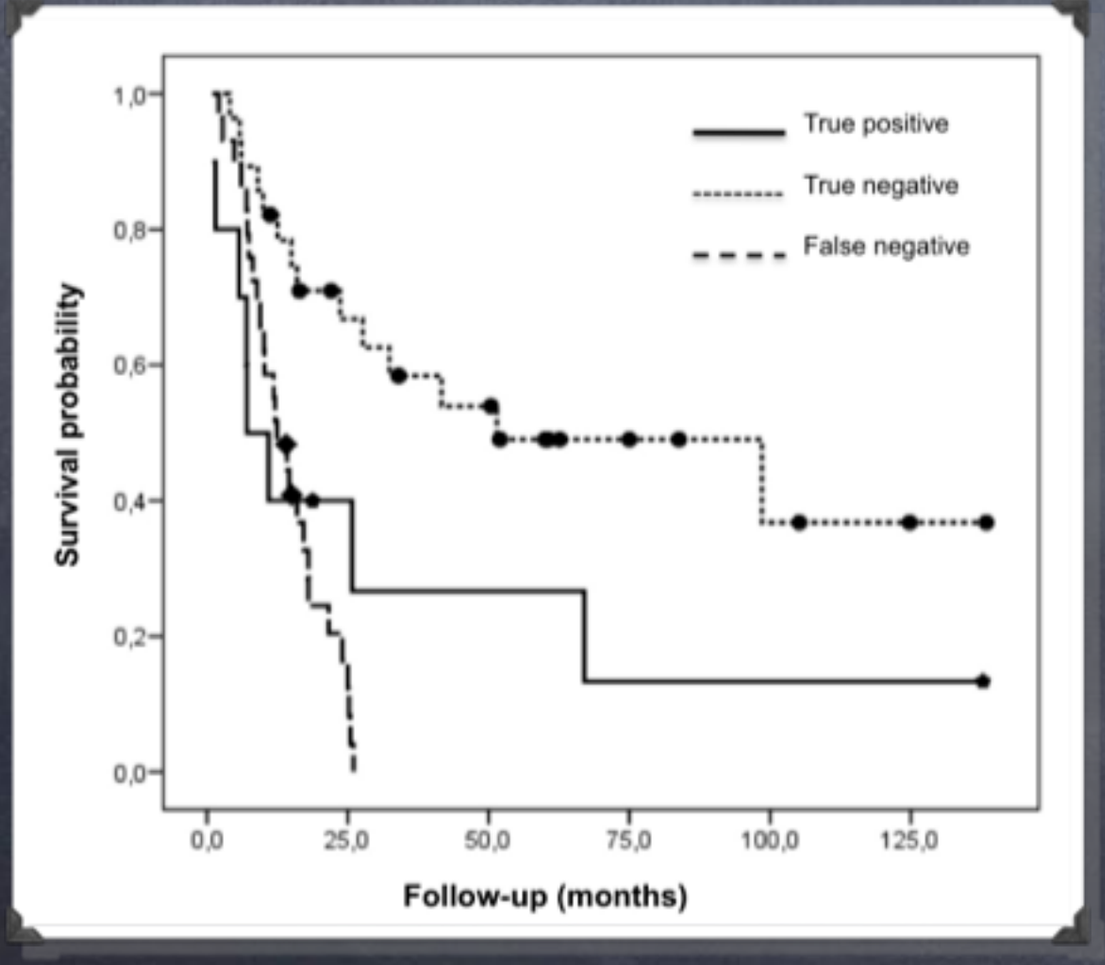

	2-y survival	5-y survival	Median survival (95% CI)
ypN2 (FN)	16,3%	0%	7 m (4.7-9.3)
ycN2 (TP)	26%	13%	12.4 (6.8-17.3)
(TN)	67%	49%	51.5 m (0-112.4)

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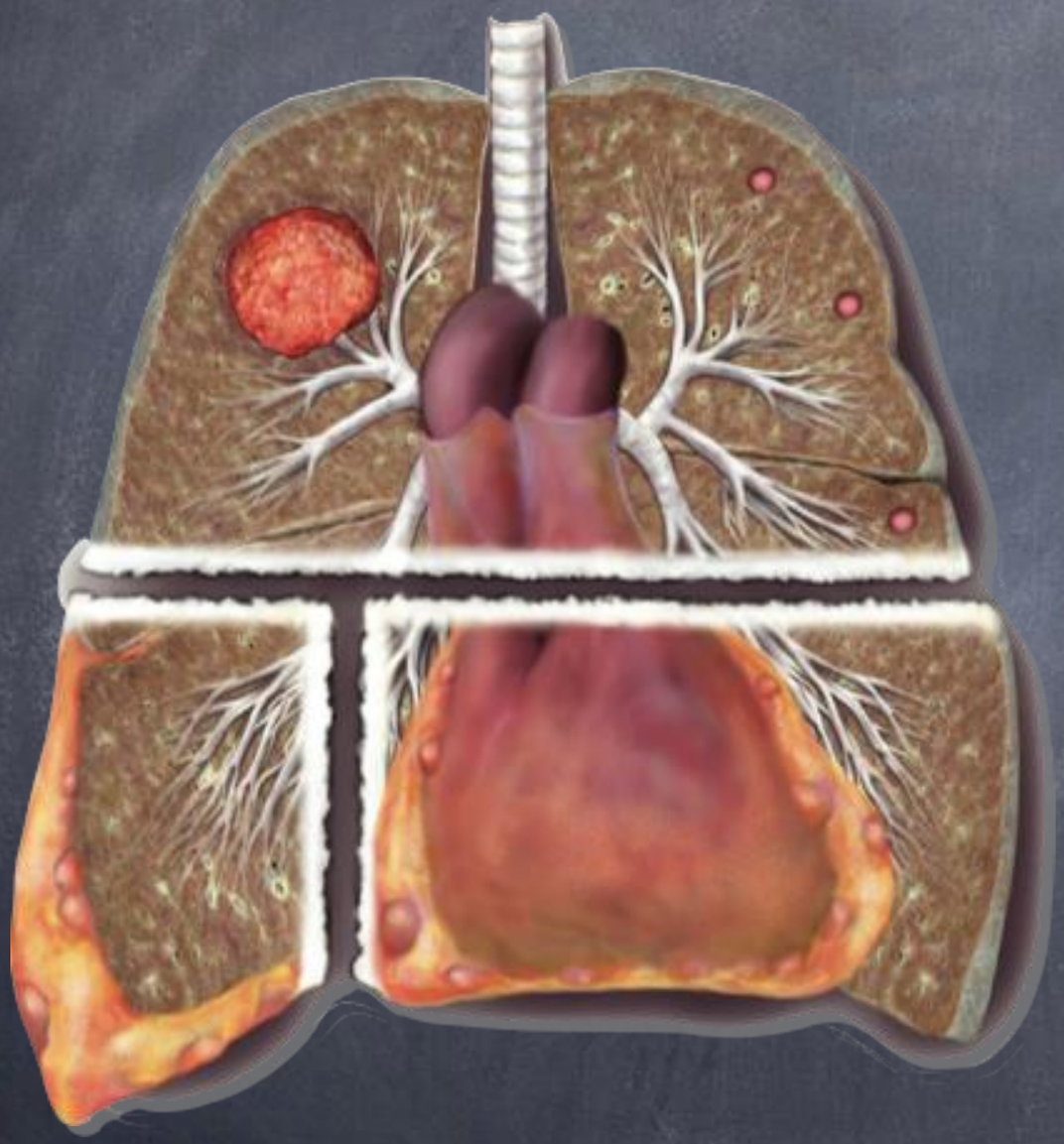
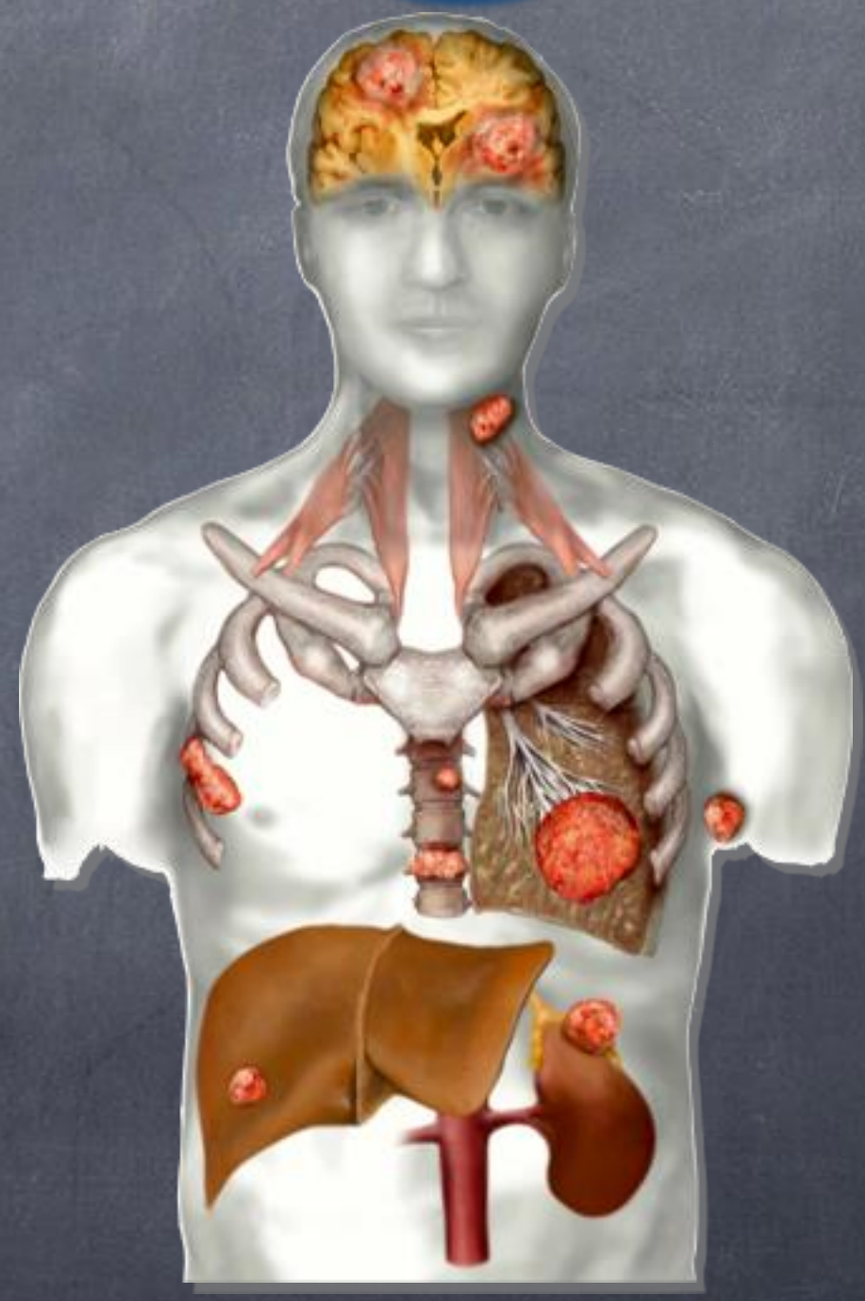
M1a



M1b



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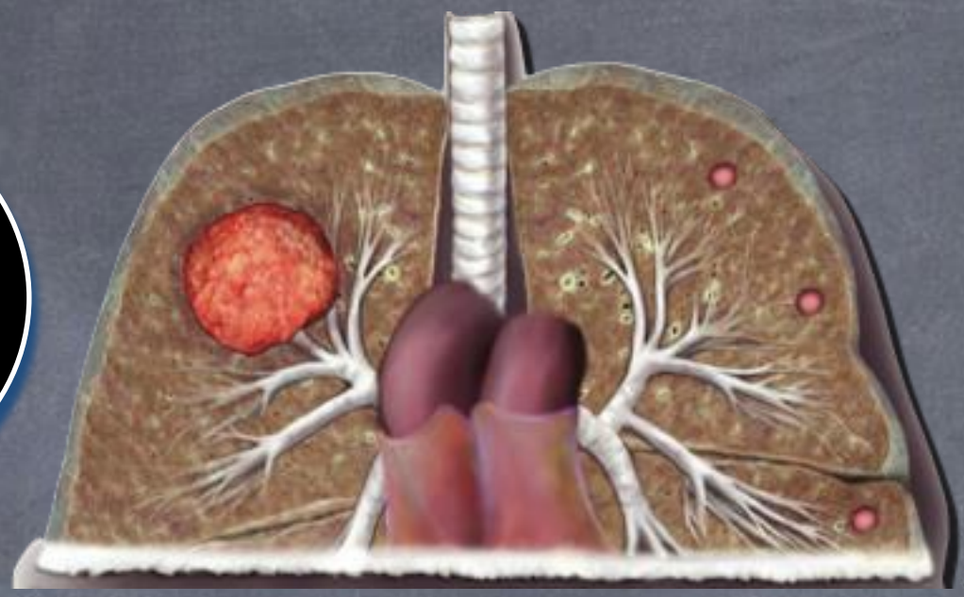
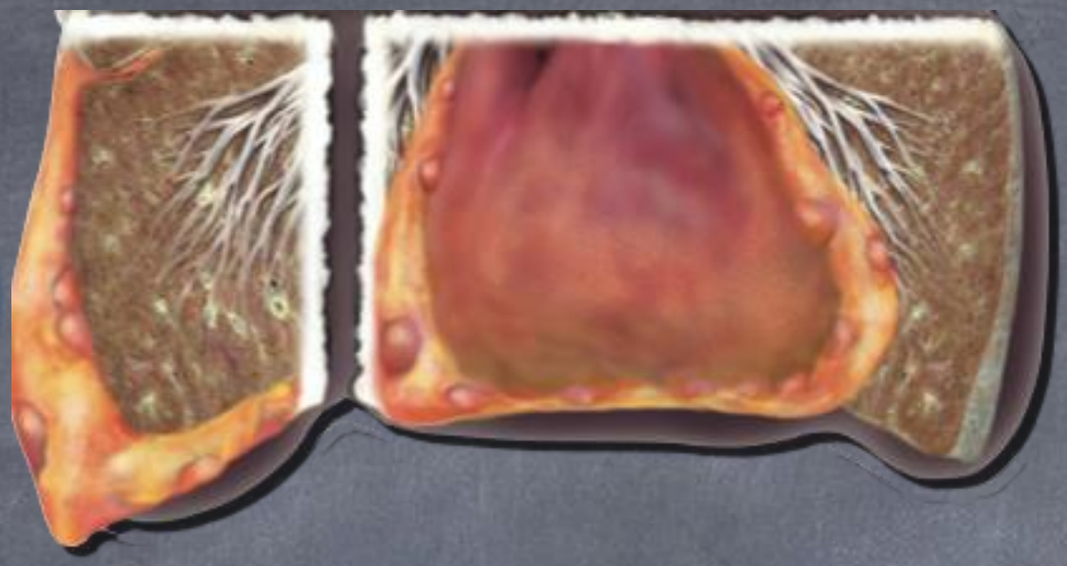
M1a



- En l'actual edició del TNM, **millor pronòstic** que el M1b
- Possibilitat de ser **2n primari**
  - Supervivència (5 anys): 38-63%
  - Si es **descarta afectació ganglionar mediastínica**, es recomana resecció d'ambdós lesions

De Leyn P et al. Eur J Cardiothorac Surg 2008; 34: 1215-22
Kocaturk CI et al. Eur J Cardiothorac Surg 2011; 39: 160-6

M1a



Prognosis of resected non-small cell lung cancer patients with carcinomatous pleuritis of minimal disease

Yukito Ichinose [a,*], Ryosuke Tsuchiya [b], Teruaki Koike [c], Osamu Kuwahara [d], Ken Nakagawa [e], Yasushi Yamato [f], Koichi Kobayashi [g], Yoh Watanabe [h], Masahiro Kase [i], Kohei Yokoi [j], and the Japan Oncology Group

- n=100 reseccions + carcinomatosis mínima
- C. Pleural Mínima (E0D1, E1D0, E1D1)
  - Sense embassament pleural (E0)
  - Embassament Pleural < 300 ml (E1)
  - Sense carcinomatosis pleural (D0)
  - Carcinomatosis pleural mínima (D1)

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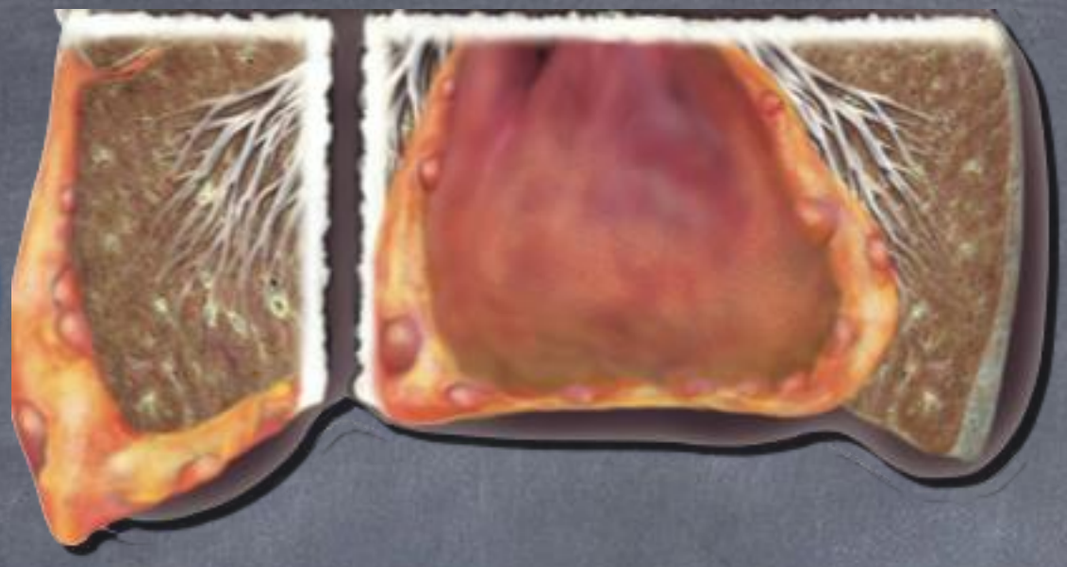
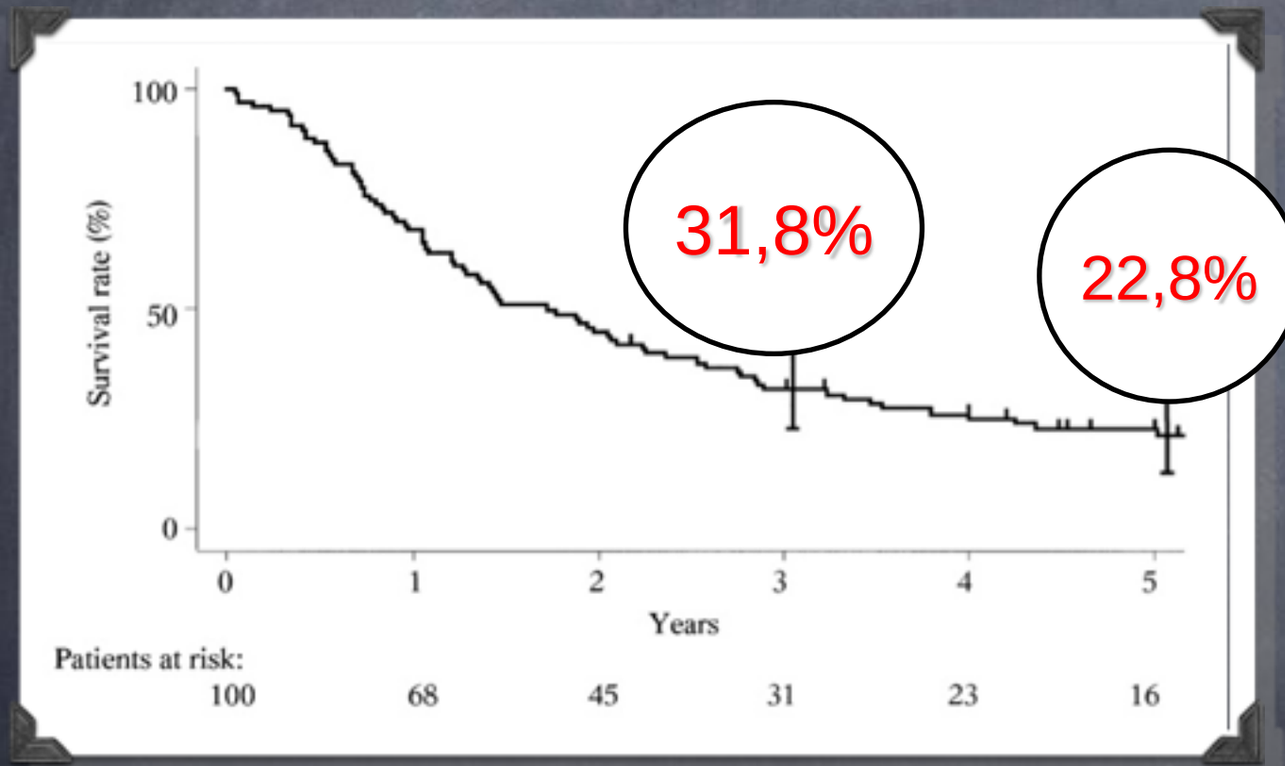
M1a

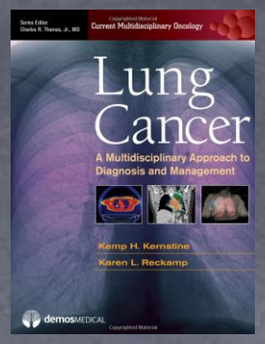




Factors Bon Pronòstic

- **Sexe Femení** **p=0.0145**
- **cN0** **p=0.0032**
- **pN0** **p=0.0012**
- **QT intrapleural** **p=0.0373**
- **QT intrapleural**
  + QT post-IQ **p= 0.0347**

M1b



14 Surgery for T4 and N3 NSCLC, Additional Pulmonary Nodules, and Isolated Distant Metastases

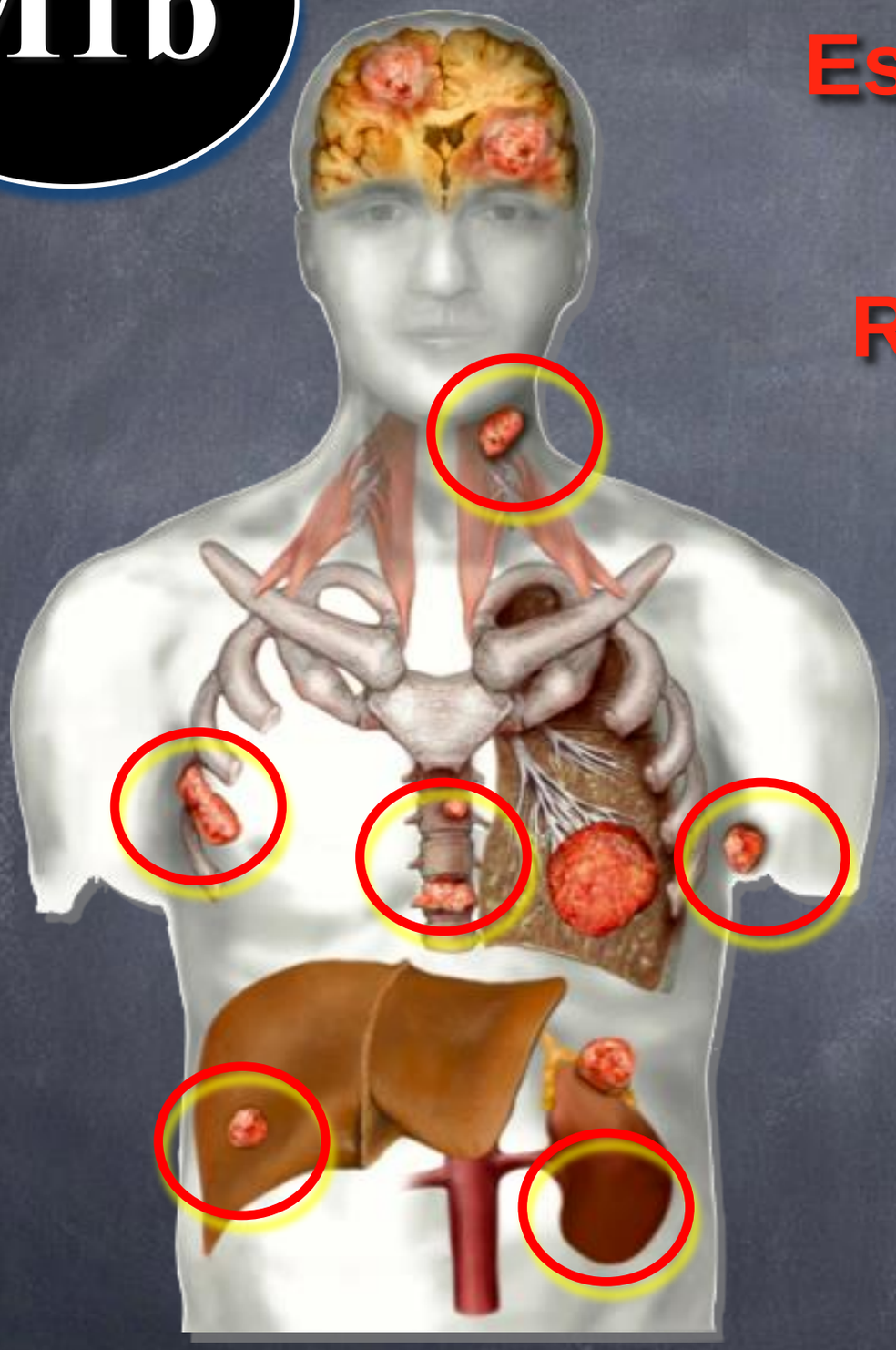
Anthony W. Kim
Frank C. Detterbeck

- **Super (5 anys): 15-20%**
- **+ RT Holocraneal = < recidives**

- No diferències entre M1 sincròniques vs Metacròniques
- Factors pronòstics: difícils de definir (sèries curtes)
  - ☑ Presència N2
  - ☑ DFI < 6 mesos (M1 adrenals)

- **Super (5 anys): 25%**

M1b



Melsa

Pell

Estòmac

ós

Teixits

Ronyó

Tous

Colon

Fetge

Pàncrees

Factors Mal Pronòstic:

- ☑ Presència N2
- ☑ Tumor primari no controlable
- ☑ DFI < 6 mesos (si metacrònic)

Conclusions

T4

- Resecció Complerta
- Evitar operar pacients N2-3

N2

- Factors Mal Pronòstic: Multiestació, T3, R1-2,cN2
- Importància de la sel·lecció de pacients post-inducció:
  - ☑ N0cy-N1cy

M1

M1a (pleura)

- Si carcinomatosis mínima, IQ?

M1a (nòdul contr)

- Possibilitat de 2n primari
- IQ si es descarta afectació ganglionar

M1b

- IQ si es descarta N2 + Primari controlat