

Thoracoscopic Lobectomy: Oncologic Outcomes

6th Annual Atlanta Lung Cancer Symposium
February 7, 2009

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Disclosure

No conflicts related to this presentation



Objectives

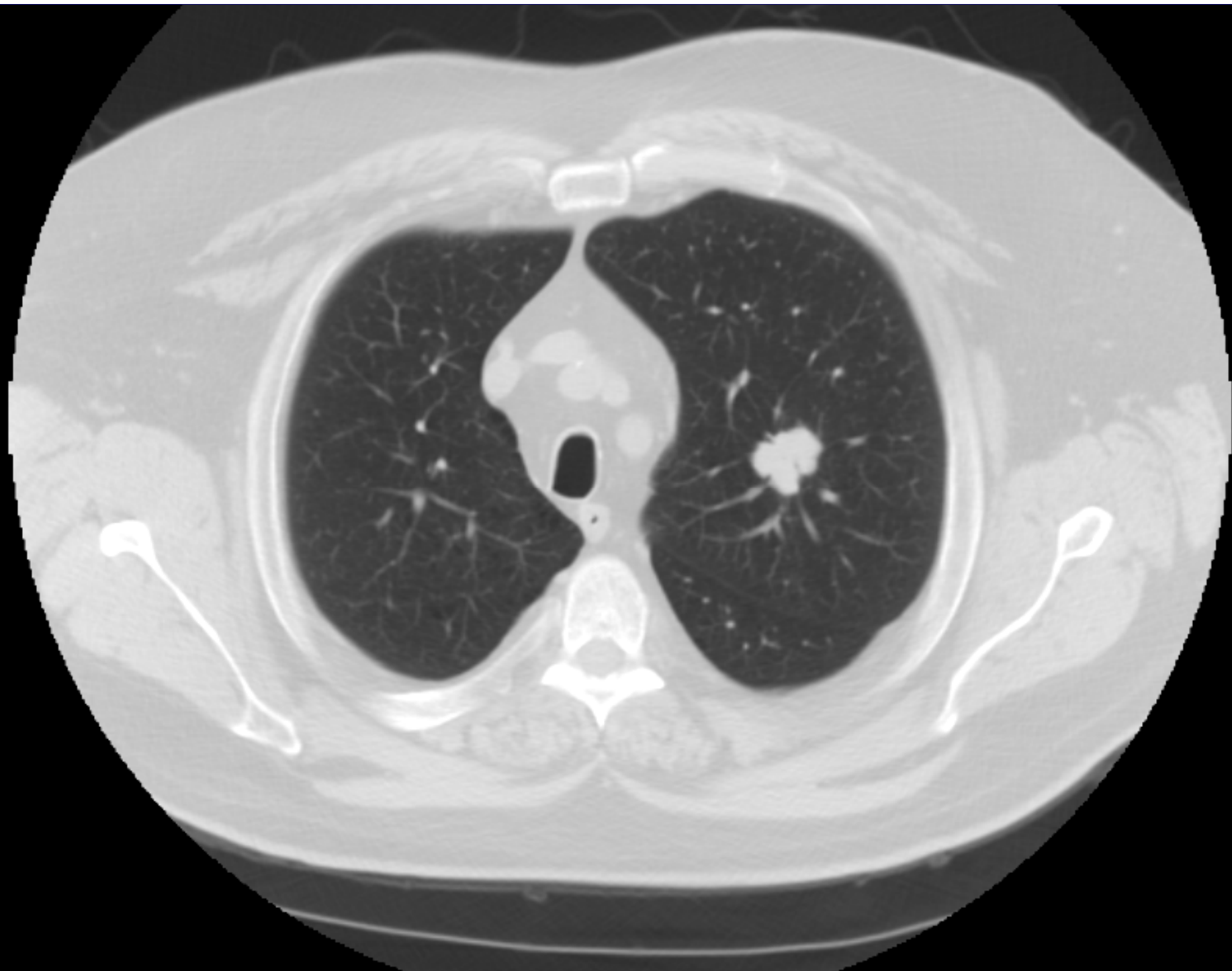
- Review oncologic outcomes of thoracoscopic lobectomy
- Discuss aspects of thoracoscopic lobectomy that may improve outcomes

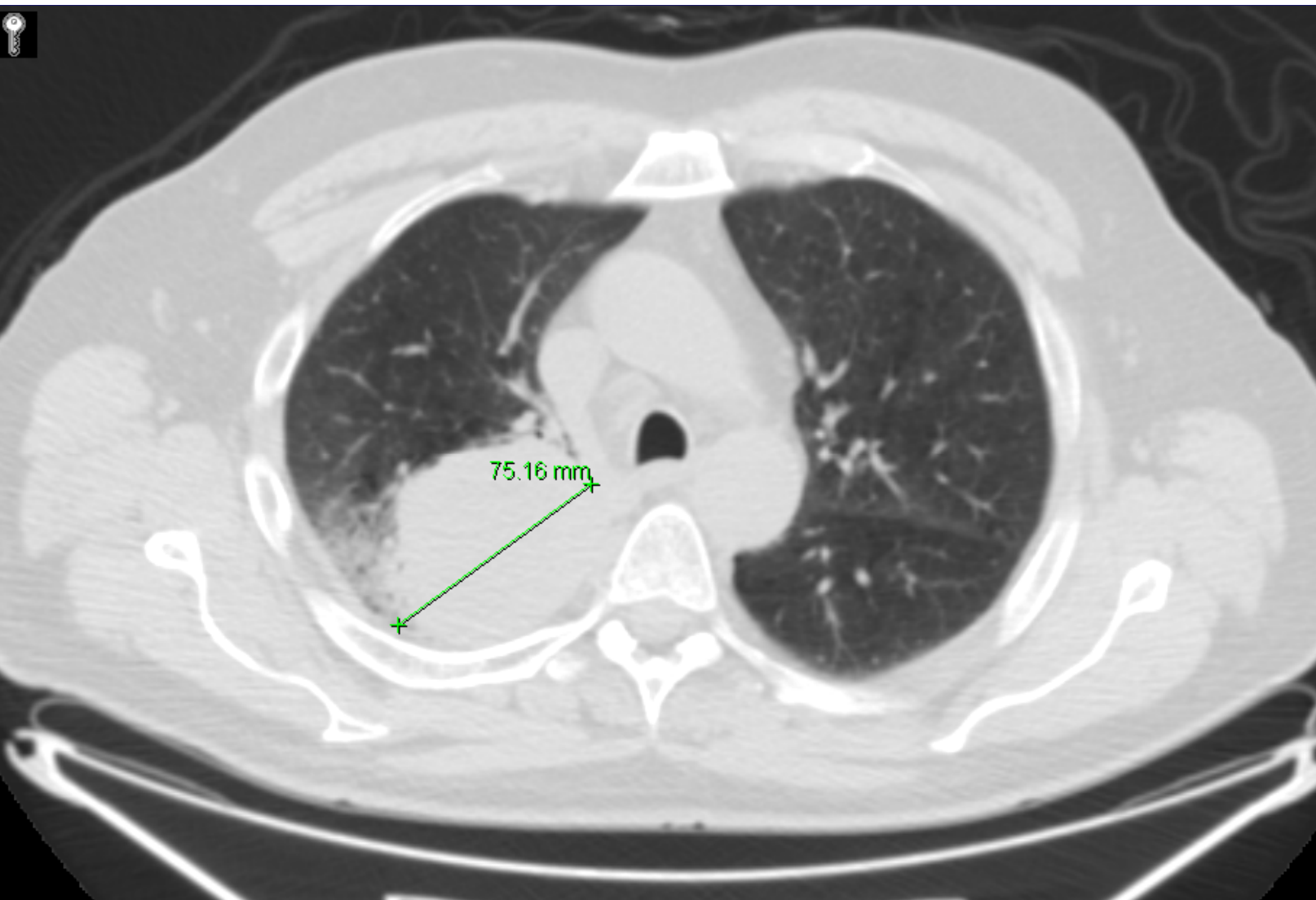


Oncologic Outcomes

- Ability to achieve complete resection
- Mediastinal lymph node dissection
- Immunologic competence
- Survival and surgical outcomes
- Adjuvant therapy



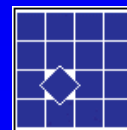






Complete Resection

- There are no studies that report or suggest a difference in ability to achieve complete resection in patients with Stage I or II NSCLC
- There is evidence that there is equivalence in selected patients with Stage IIIA after induction therapy



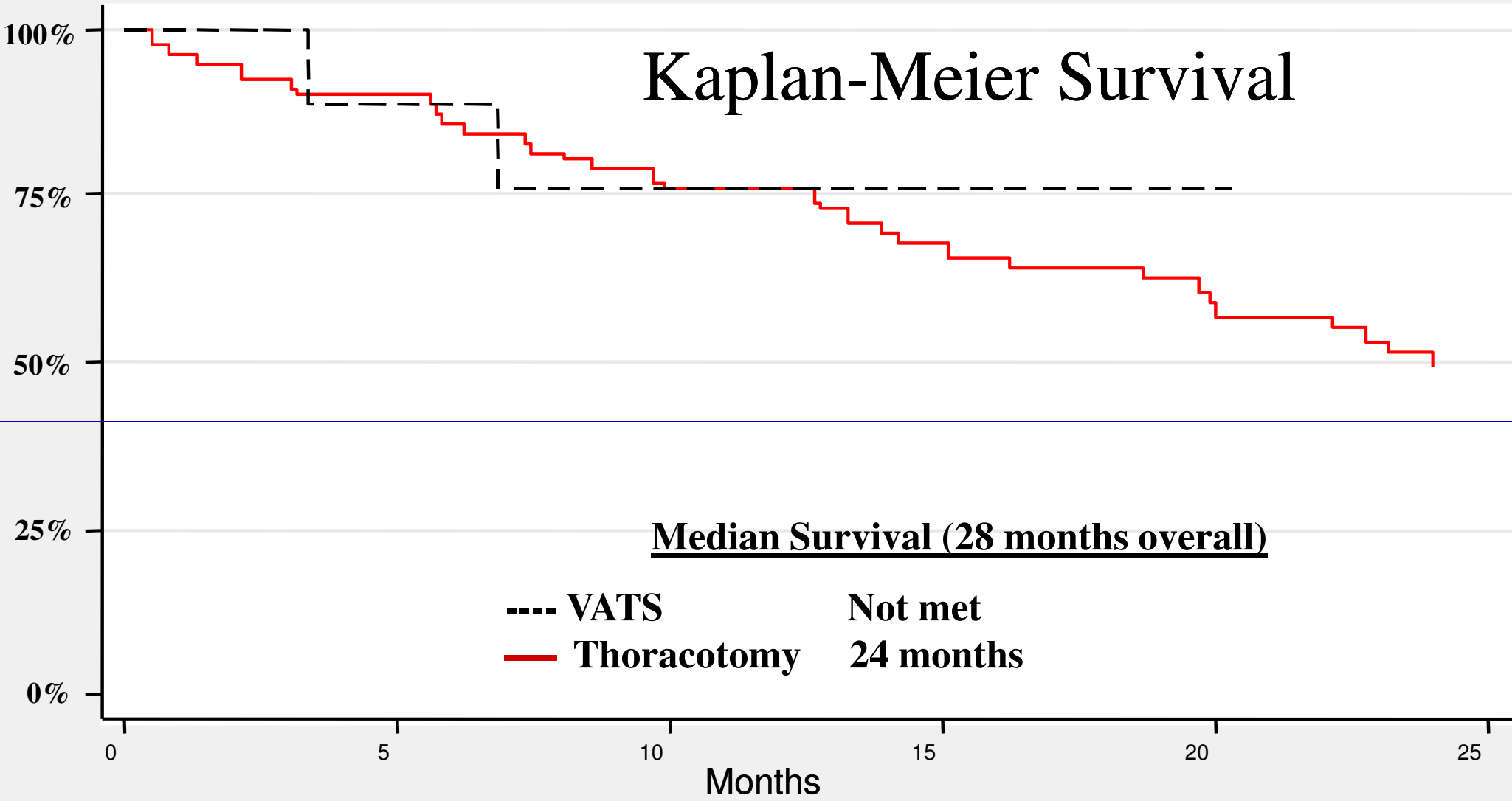
Thoracoscopic Lobectomy: Safe and Effective Strategy After Induction Therapy

Petersen RP, D'Amico TA. Ann Thorac Surg 2006; 82:214-219

Outcome	VATS N=12 (%)	Thoracotomy N=85 (%)	p-value
Complete Resection	12 (100)	85 (100)	1.00
Chest tube duration	2 (2-3)	4 (2-12)	<0.001
LOS	3 (2-6)	5 (2-63)	<0.01
30-Day mortality	0 (0)	4 (5)	0.44
Hemorrhage	1 (8)	1 (1)	0.10
Pneumonia	0 (0)	8 (9)	0.27
Respiratory failure	0 (0)	2 (2)	0.59
Atrial fibrillation	0 (0)	10 (12)	0.21



Kaplan-Meier Survival



Median Survival (28 months overall)

---- VATS Not met
— Thoracotomy 24 months

log-rank test p-value=0.64

Mediastinal Lymph Node Dissection

- Several studies confirm equivalent lymph node dissections



Video-assisted Thoracoscopic Lobectomy Achieves a Satisfactory Long-term Prognosis in Patients with Clinical Stage IA Lung Cancer

Kazuro Sugi, M.D.,¹ Yoshikazu Kaneda, M.D.,² Kensuke Esato, M.D.²

World J Surg. 2000;24 : 27-31

- Randomized trial, with 100 consecutive patients with clinical stage IA NSCLC
- Endpoints: nodal dissection and survival

Variable	Open group	VATS group	<i>p</i>
No. of lymph nodes ^a			
Hilar	8.4 ± 1.0	8.2 ± 1.5	0.88
Mediastinal	13.4 ± 1.7	13.0 ± 2.5	0.88

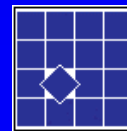


Systematic node dissection by VATS is not inferior to that through an open thoracotomy: A comparative clinicopathologic retrospective study

Atsushi Watanabe, MD, Tetsuya Koyanagi, MD, Hisayoshi Ohsawa, MD, Tohru Mawatari, MD, Shinji Nakashima, MD, Noriyuki Takahashi, MD, Hiroki Sato, MD, *and* Tomio Abe, MD,
Sapporo, Japan

Surgery. 2005;138:510-517.

- Compared LN harvest in 350 patients with c-Stage I NSCLC
- 191 thoracoscopic lobectomies and 159 open lobectomies



Watanabe et al *Surgery*. 2005;138:510-517

Table III. Number of dissected nodes in right side

Surgery. 2005;138:510-517.

	<i>Upper + Middle</i>			<i>Lower</i>		
	<i>VATS (n = 78)</i>	<i>OT (n = 52)</i>	<i>P value</i>	<i>VATS (n = 49)</i>	<i>OT (n = 41)</i>	<i>P value</i>
TNDN	30.7 ± 11.1	31.1 ± 13.4	.831	33.8 ± 13.1	30.9 ± 12.1	.279
TNMND	19.7 ± 8.4	22.0 ± 8.6	.122	23.4 ± 10.3	21.0 ± 8.3	.241
1+2	5.5 ± 4.5	5.2 ± 4.1	.767	5.7 ± 4.0	4.4 ± 3.8	.128
3	4.7 ± 2.9	4.9 ± 4.5	.730	5.1 ± 3.3	5.8 ± 5.0	.416
4	2.4 ± 2.7	2.8 ± 2.9	.544	2.8 ± 2.5	2.2 ± 2.5	.298
7	6.4 ± 4.3	6.9 ± 4.1	.559	7.9 ± 5.3	6.2 ± 4.2	.107
8	2.1 ± 1.3	2.4 ± 1.9	.578	2.4 ± 1.8	2.0 ± 1.2	.424
9	0.3 ± 1.0	0.7 ± 1.0	.026	0.8 ± 1.0	1.2 ± 1.0	.290
10	2.0 ± 3.0	1.2 ± 2.0	.099	1.4 ± 2.1	1.2 ± 1.7	.685
11s	2.2 ± 2.5	2.3 ± 3.3	.775	0.6 ± 1.3	1.0 ± 1.5	.156
11i	1.1 ± 2.1	0.8 ± 2.0	.421	3.0 ± 2.4	2.0 ± 2.0	.063

Watanabe et al *Surgery*. 2005;138:510-517

Table IV. Number of dissected nodes in left side

Surgery. 2005;138:510-517.

	<i>Upper</i>			<i>Lower</i>		
	<i>VATS (n = 48)</i>	<i>OT (n = 40)</i>		<i>VATS (n = 16)</i>	<i>OT (n = 26)</i>	
TNDN	28.0 ± 10.2	28.1 ± 11.3	.964	29.7 ± 7.1	25.5 ± 11.8	.212
TNMND	14.8 ± 8.1	17.5 ± 8.2	.123	18.8 ± 7.2	15.8 ± 7.2	.202
3	2.1 ± 2.5	1.9 ± 2.5	.694	2.0 ± 2.4	2.9 ± 2.9	.293
4	2.0 ± 1.9	2.3 ± 3.0	.537	1.7 ± 1.6	1.7 ± 1.9	.940
5	2.2 ± 1.9	2.7 ± 2.3	.275	2.6 ± 2.3	2.0 ± 1.8	.363
6	2.2 ± 2.2	2.6 ± 2.8	.442	2.5 ± 3.9	1.8 ± 1.6	.425
7	4.3 ± 4.2	4.9 ± 4.1	.477	5.8 ± 4.9	4.0 ± 3.2	.157
8	2.0 ± 1.6	2.3 ± 2.3	.637	3.0 ± 2.1	1.3 ± 1.4	.063
9	2.5 ± 1.0	2.5 ± 1.5	.975	2.8 ± 2.7	2.1 ± 1.9	.389
10	3.6 ± 2.4	2.5 ± 2.1	.025	2.3 ± 2.3	2.3 ± 2.0	.978
11	3.0 ± 3.2	2.4 ± 2.0	.260	3.3 ± 3.2	3.0 ± 2.9	.777

Survival

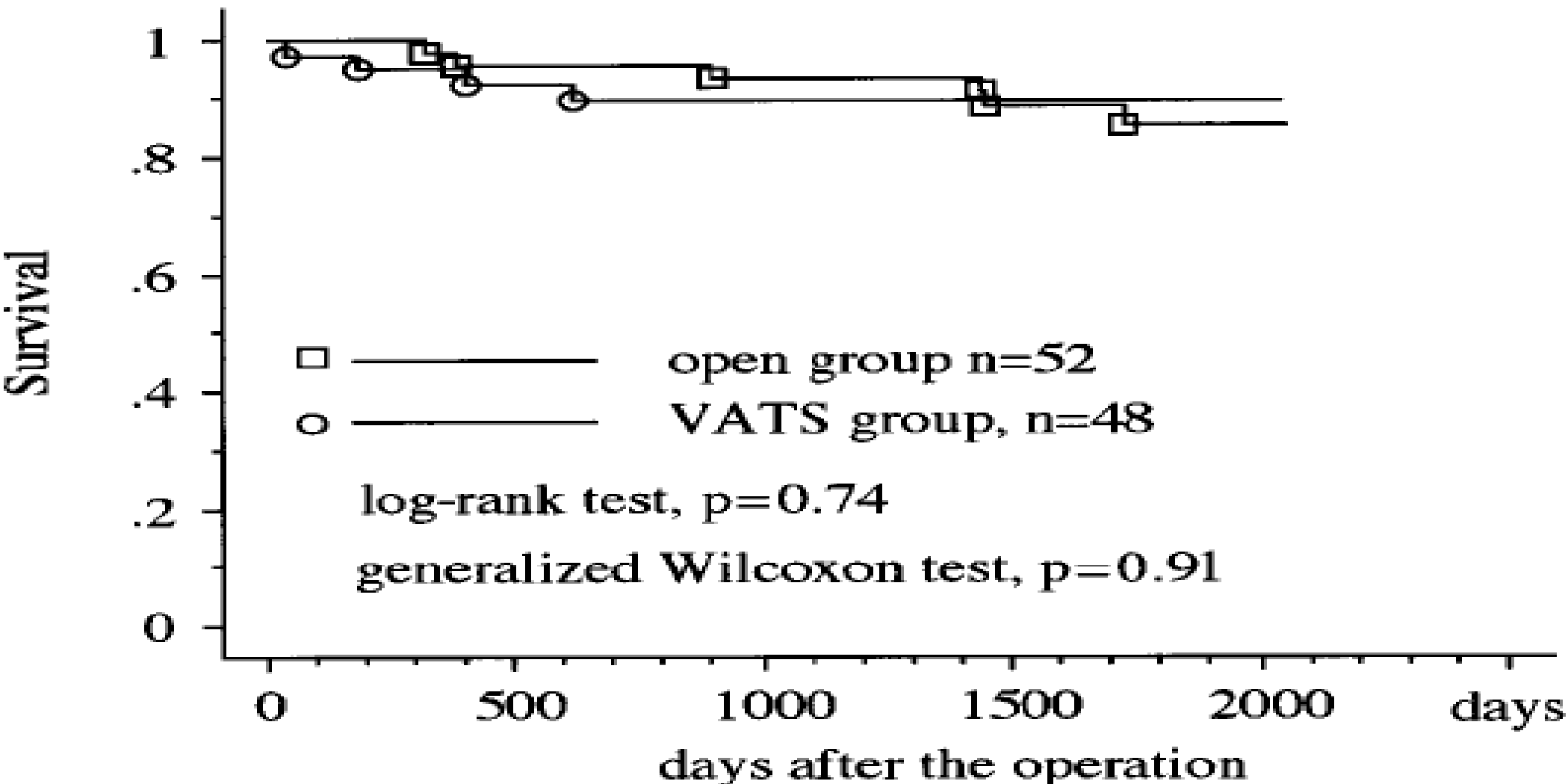
- There are no large prospective randomized trials
- Numerous comparisons demonstrate no difference in survival



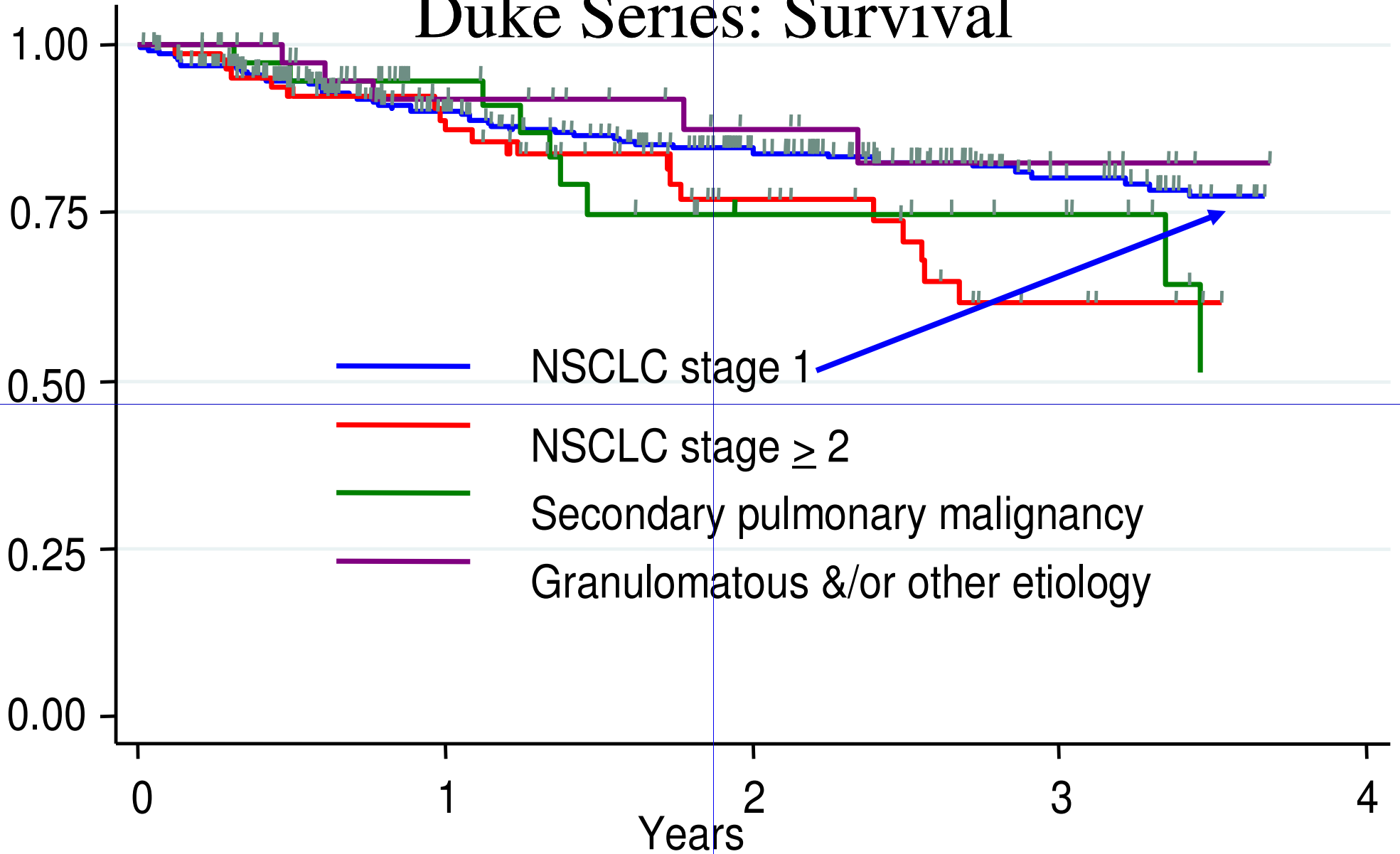
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Duke Series: Survival



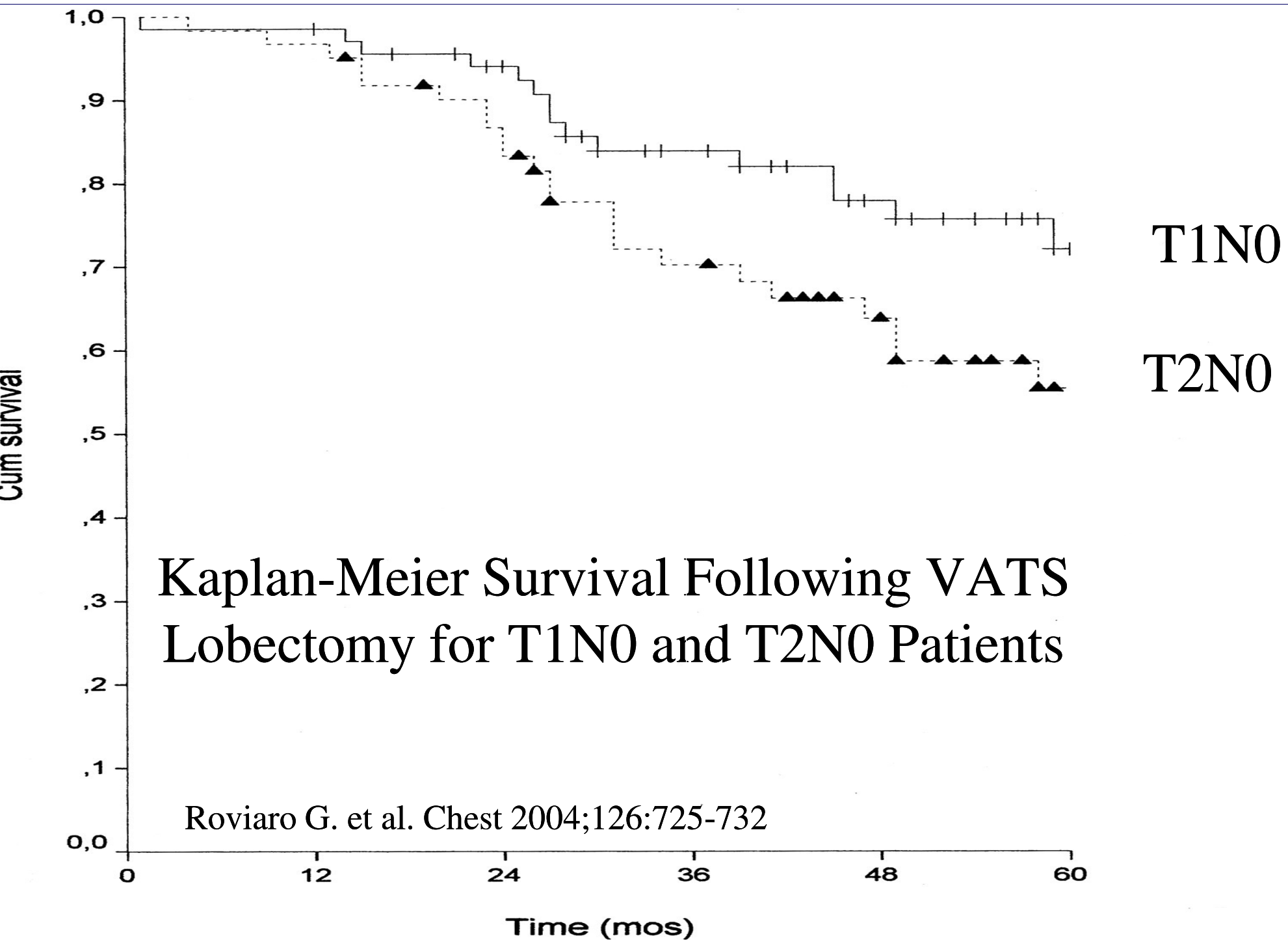
Long-term Survival After Videothoracoscopic Lobectomy for Stage I Lung Cancer

Roviaro G et al, *Chest* 2004;126:725-732

- 257 patients with clinical stage I lung cancer
- 5-yr survival

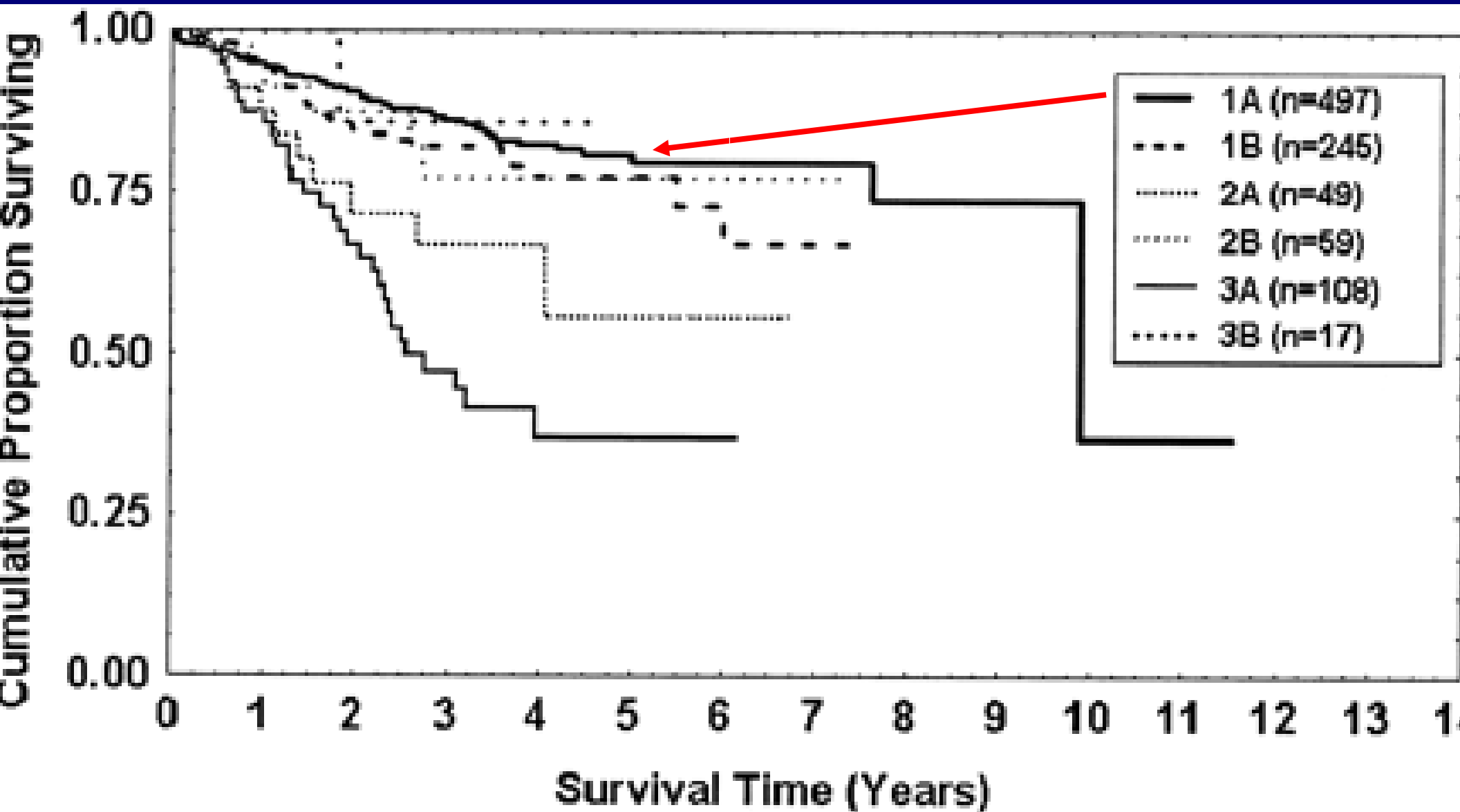
All Stage I	63.6%
T1N0	70.2%
T2N0	56.1%





VATS Lobectomy: Experience With 1,100 Cases

McKenna RJ, et al. Ann Thorac Surg 2006 81:421- 426



Survival

Open Series	Stage I	Stage II
Mountain	63%	47%
Goldstraw	63%	42%



Survival

Open Series	Stage I	Stage II
Mountain	63%	47%
Goldstraw	63%	42%
Thoracoscopic Series		
Duke	75%	60%
Edinburgh	78%	51%
Memorial Sloan Kettering	79%	
Cedars	70%	60%



Potential Oncologic Advantages of Thoracoscopic Lobectomy

- Inflammatory response/immunologic competence
- Adjuvant therapy
- Overall morbidity and mortality



VATS Lobectomy Reduces Cytokine Responses Compared with Conventional Surgery

Yim APC et al. *Ann Thorac Surg* 2000; 70:243-47

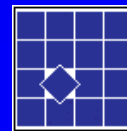
- 36 patients with clinical stage I NSCLC
- Randomized to VATS or thoracotomy for lobectomy
- Inflammatory cytokines IL-6 and IL-8 levels significantly lower in VATS group
- ? Preserved humoral immunity



Pulmonary Function, Postoperative Pain, Serum Cytokine Level After Lobectomy: A Comparison of VATS and Conventional Procedure

Nagahiro I, et al. *Ann Thorac Surg* 2001; 72:362-5

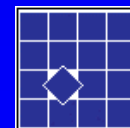
- 22 patients with clinical stage I NSCLC
- 13 VATS, 9 Thoracotomy (non-randomized)
- VATS associated
 - Less postoperative pain
 - Preserved pulmonary function
 - Less inflammatory cytokine production



Complications after Thoracoscopic Lobectomy

Park B. et al. J Thorac Cardiovasc Surg 2007; 133: 775 - 779

Complication	VATS (n=122)	Open (n=122)	P
Afib	15 (12%)	20 (16%)	.36
Atelectasis	2 (1.6%)	5 (4.1%)	.28
Prolonged air leak	4 (3.8%)	7 (5.7%)	.54
Pneumonitis	2 (1.6%)	5 (4.1%)	.28
Total	21 (17.2%)	34 (27.9%)	.05



Thoracoscopic Lobectomy is Associated with Fewer Postoperative Complications (Western Thoracic Surgical Association 2008)

- Compared outcomes after lobectomy
- Thoracoscopic (n=300) vs Thoracotomy (n=283)
- Analysis of overall postoperative complications
- Propensity analysis, matching preoperative variables and stage



Postoperative Outcomes (Overall)

Feature	THOR (n=283)	VATS (n=300)	P
Atrial Fibrillation, n (%)	58 (20%)	38 (13%)	0.01
Atelectasis, n (%)	30 (11%)	14 (5%)	0.007
Pneumonia, n (%)	24 (8%)	9 (3%)	0.004
Sepsis, n (%)	6 (2%)	0	0.01
Renal Failure, n (%)	12 (4%)	3 (1%)	0.01
Transfusion, n (%)	15 (5%)	6 (2%)	0.03
PE, n (%)	4 (1%)	0	0.04
Hospital mortality, n (%)	11 (3.9%)	2 (0.7%)	0.008
Chest Tube (days)	4.3 ± 2.1	3.8 ± 3.6	0.05
Length of stay (days)	7.2 ± 9	4.8 ± 4	0.001

Oncologic Outcomes



Outcomes: Propensity Matched

Feature	THOR (n=153)	VATS (n=153)	P
Death, n (%)	5 (3.3%)	2 (1.3%)	0.45
No complication, n (%)	89 (58%)	110 (72%)	0.016
Atrial Fibrillation, n (%)	33 (22%)	20 (13%)	0.045
Atelectasis, n (%)	14 (9%)	7 (5%)	0.11
Prolonged air leak, n (%)	21 (14%)	19 (12%)	0.7
Bleeding, n (%)	3 (2%)	1 (0.7%)	0.6
Transfusion, n (%)	8 (5.2%)	3 (2%)	0.12
Wound infection, n (%)	1 (0.4%)	0	1.0
Pneumonia, n (%)	14 (9.2%)	7 (4.6%)	0.11



Outcomes: Propensity Matched

Feature	THOR (n=153)	VATS (n=153)	P
Sepsis, n (%)	2 (1.3%)	0	0.5
Renal Failure, n (%)	5 (3.3%)	1 (0.7%)	0.21
CVA, n (%)	1 (0.7%)	1 (0.7%)	1.0
MI, n (%)	2 (1.3%)	1 (0.7%)	1.0
Ventricular arrhythmia, n (%)	2 (1.3%)	1 (0.7%)	1.0
DVT, n (%)	2 (1.3%)	0	0.5
PE, n (%)	2 (1.3%)	0	0.5
Chest tube duration (days)	4.6 ± 2.5	4.1 ± 3.9	0.001
Length of hospital stay (days)	7.0 ± 6	4.8 ± 4	0.001



Thoracoscopic Lobectomy in the Elderly

- Lobectomy in 361 patients >70 years of age
- Thoracoscopic lobectomy 234; thoracotomy 127

	<u>Thoracoscopic</u>	<u>Open</u>	<u>pvalue</u>
No Cx	61%	36%	p<0.00001
Afib	18%	28%	p=0.04
Respiratory cx	5%	12%	p=0.03
Transfusion	7%	16%	p=0.01
Delirium	5%	13%	p=0.03



Thoracoscopic Lobectomy: Lower Morbidity

	Thoracoscopic Lobectomy	Thoracotomy
No Cx (all)	72%	58%
No Cx (>70 yrs)	61%	36%
A-Fib (all)	9%	22%
A-Fib (>70 yrs)	18%	28%

STS Database Analysis will be presented at AATS



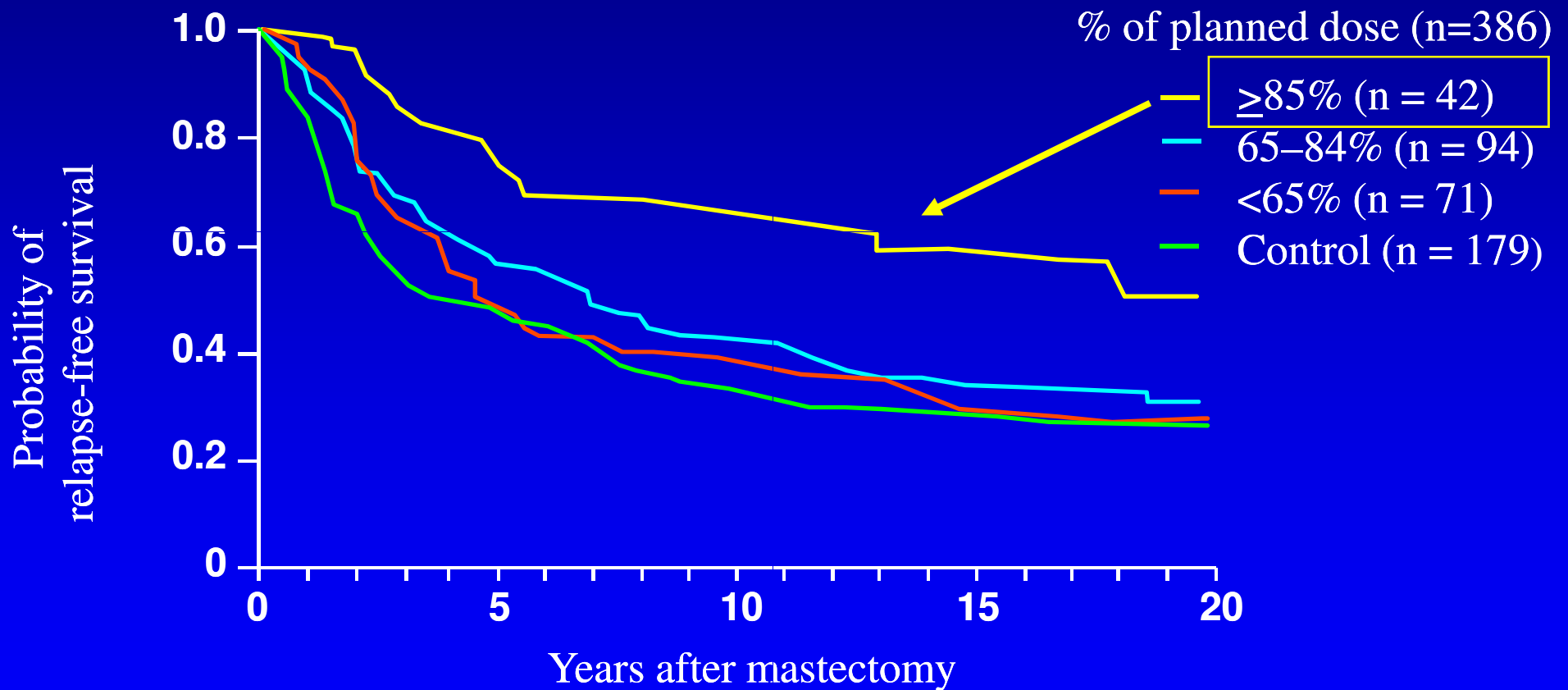
Thoracoscopic Lobectomy and Adjuvant Chemotherapy After For NSCLC

- Chemotherapy improves survival after resection for patients with stage II and III NSCLC
- The ability to deliver adjuvant chemotherapy may be limited by post-operative issues
- Does thoracoscopic lobectomy improve the delivery of adjuvant therapy, compared to thoracotomy?



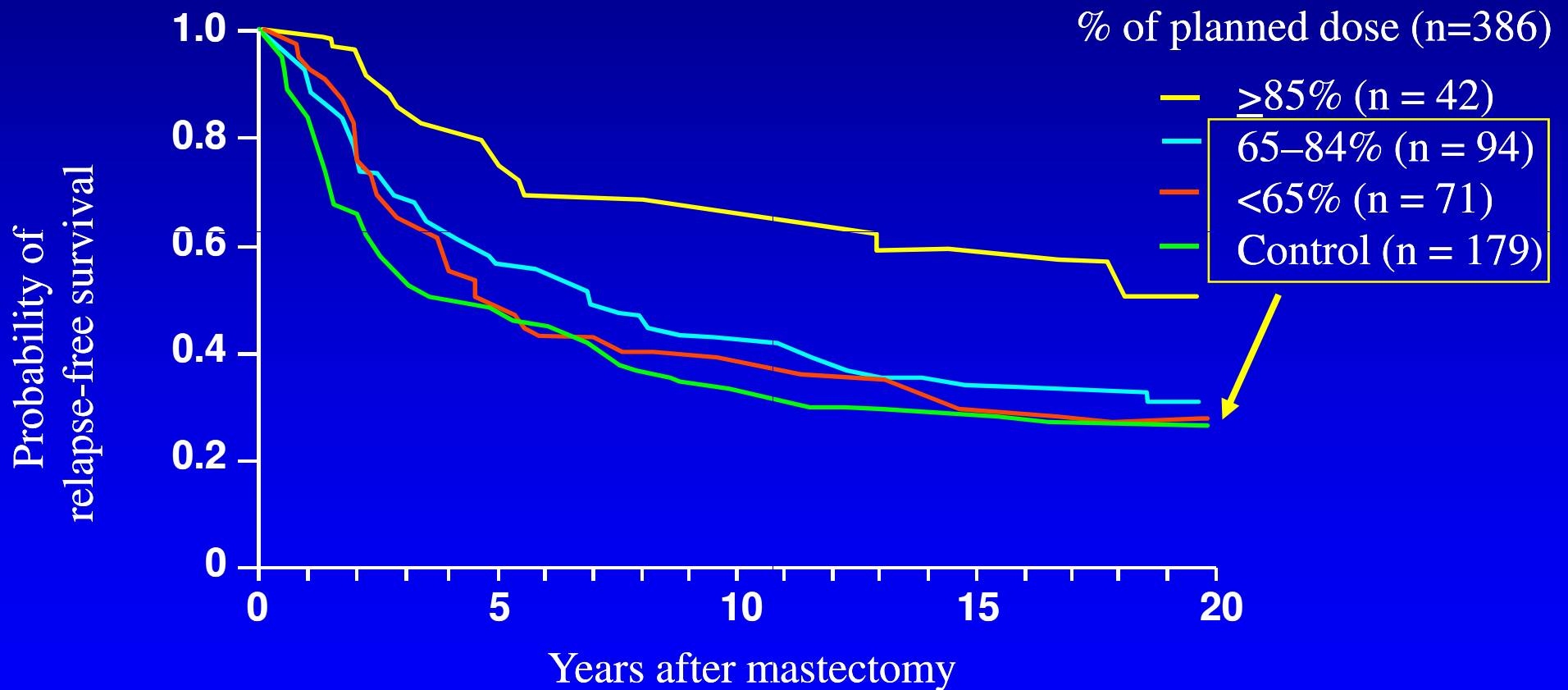
Full-Dose Adjuvant Chemotherapy Improves Outcome in Breast Cancer (The Milan Study)

Bonadonna G, et al. *N Engl J Med.* 1995;332:901–906



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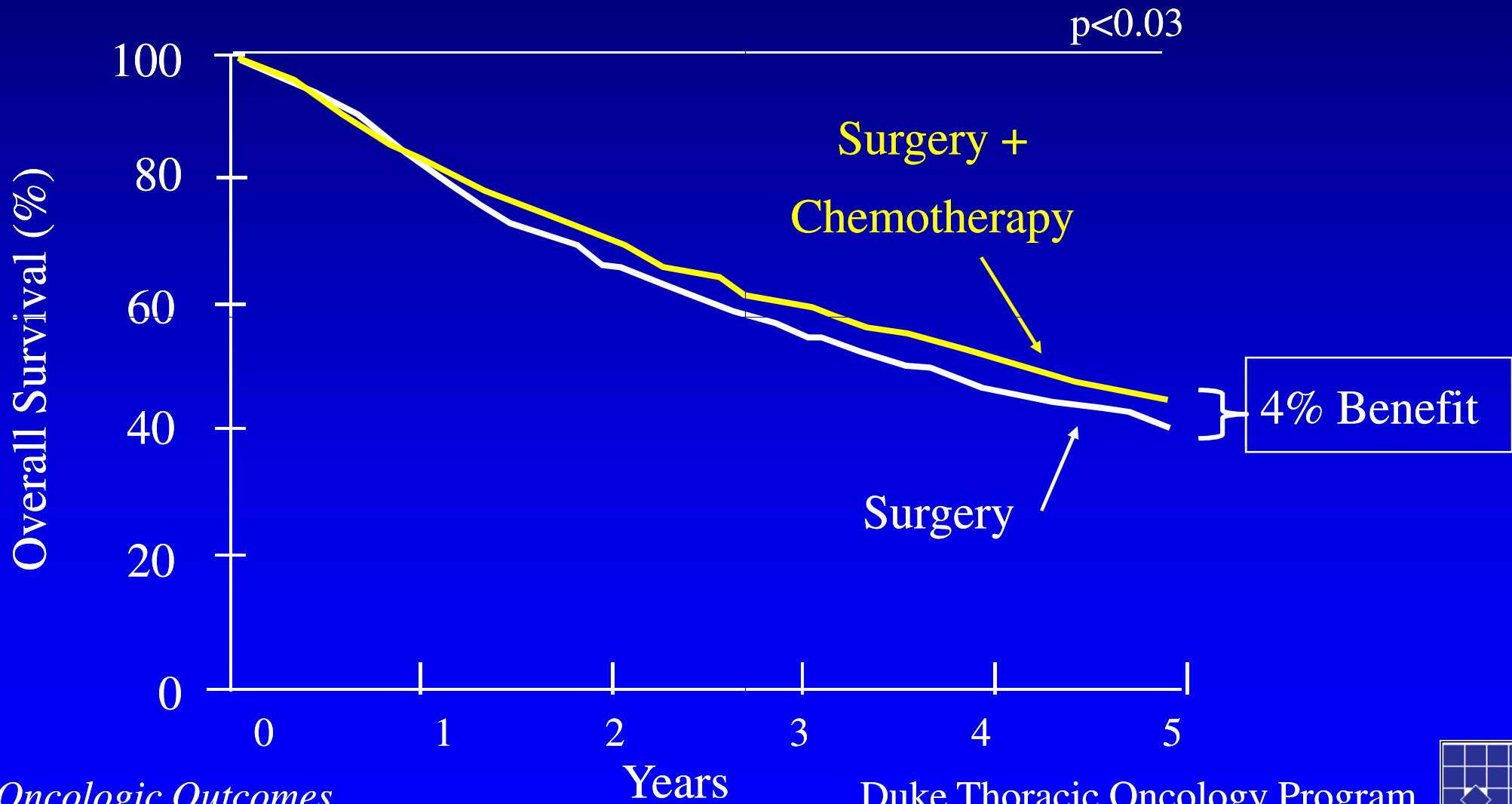
Bonadonna G, et al. *N Engl J Med*. 1995;332:901–906



International Adjuvant Lung Cancer Trial

International Adjuvant Lung Cancer Trial Collaborative Group

New Engl J Med 2004; 350:351-360



Thoracoscopic Lobectomy Facilitates The Delivery Of Adjuvant Chemotherapy After Resection For NSCLC

Petersen R, et al. Ann Thorac Surg 2007; 83: 1245-1250

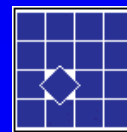
- 100 consecutive patients undergoing lobectomy and adjuvant chemotherapy (1999-2004)

Thoracoscopic	57
Thoracotomy	43



Efficacy of Chemotherapy Delivery

	Thoracoscopic N=57	Thoracotomy N=43	<i>p</i> -value
Any delayed chemo doses	18%	58%	<0.001
Any reduced chemo doses	26%	49%	0.02
75% of planned regimen	61%	40%	0.03



Adjuvant Rx after Thoracoscopic Lobectomy

Thoracoscopic lobectomy is associated with more effective administration of adjuvant therapy

- Fewer patients with delayed and reduced doses
- More received at least 75% of planned regimen
- Effect on survival must be studied



Thoracoscopic Lobectomy: Summary

Thoracoscopic strategies improve outcomes:

- Superior quality of life outcomes
- Equivalent oncologic outcomes (LN, survival)
- Fewer overall complications
- Improved delivery of adjuvant therapy, which may result in improved survival

