Conventional VATS lobectomy/segmentectomy: Morbidity and long term results

Jalal Assouad

Hôpital Tenon

Paris

15-18 April 2015, Geneva, Switzerland

Organisers

Partners

Hôpitaux Universitaires Est Parisien
TENON

tenon thoracic intitute

Disclosures

- Consultant for Ethicon company
- Consultant for Covidien company

Conventional VATS lobectomy/segmentectomy: Morbidity and long term results

Conventional VATS?

- Complete VATS (c-VATS) Dr Asamura
- Several ports VATS (Uniportal = Dr Diego Gonzales-Rivas)
- Not assisted by the robot (Dr Cerfolio)
- VATS procedure follows the international recommendations (ACCP, ESTS, ESMO, SFCTCV). Early stages NSCLC without extension of the indications

Hôpitaux Universitaires Est Parisien
TENON

Société Française de Chirurgie Thoracique et Cardio-vasculaire
French Society of Thoracic and Cardiovascular Surgery

tenon thoracic institute

Surgical Risks

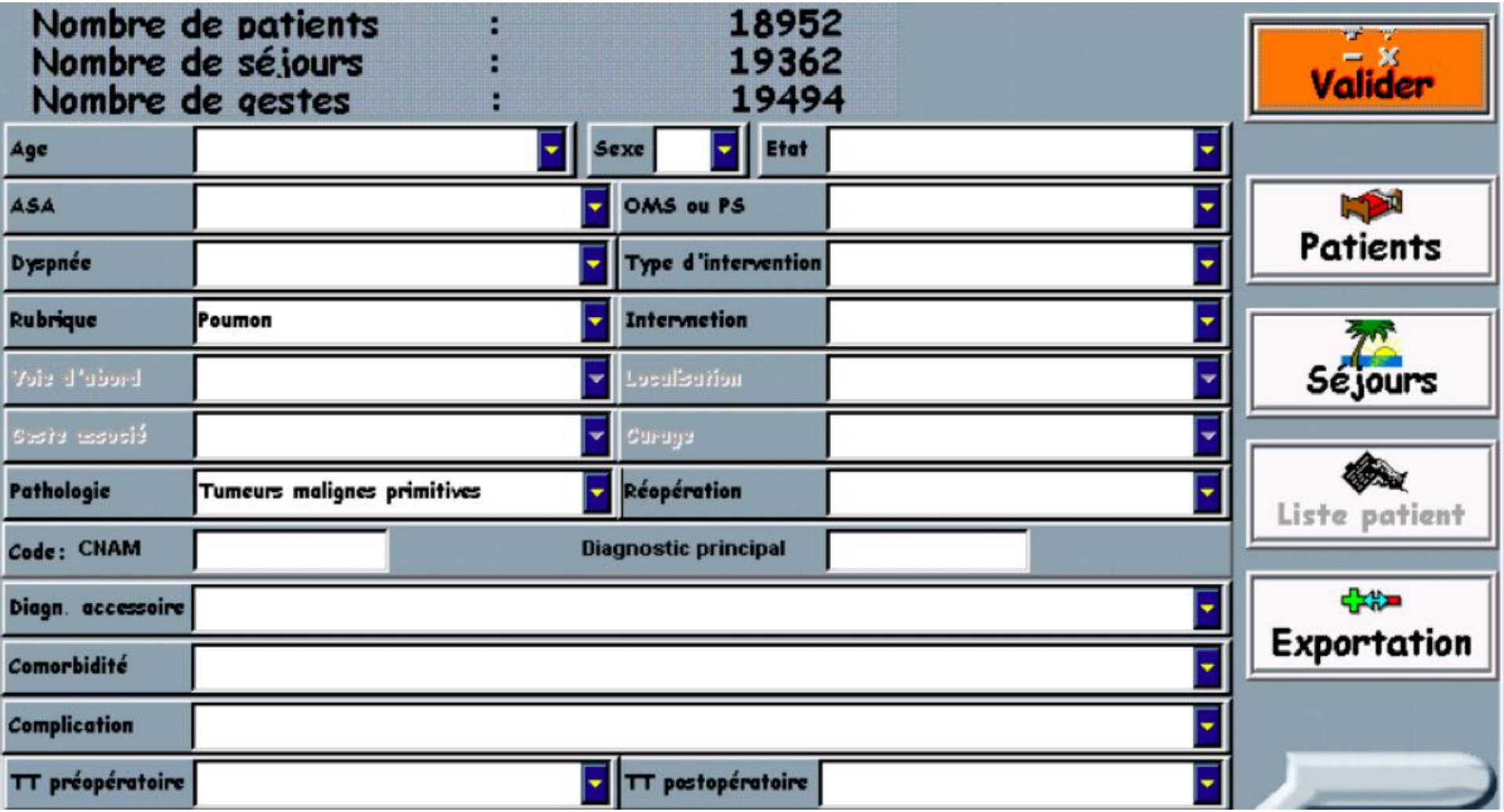
- In France the SFCTCV (French Society of Thoracic and Cardio-Vascular Surgery) created a national registry: EPITHOR

- EPITHOR 80% of all thoracic procedures performed in France

- All participating thoracic surgeons can connect and download the national data

Hôpitaux Universitaires Est Parisien
TENON

tenon thoracic intitute



EPITHOR

WEDGE RESECTIONS

			Base nationale	
Décès peropératoire			0,00	%
Décès postopératoire			1,07	%
Décès à 30 jours			1,60	%
Nombre de dossiers renseignés			1 312	

Morbidité
Mortalité
Tendances

Impression

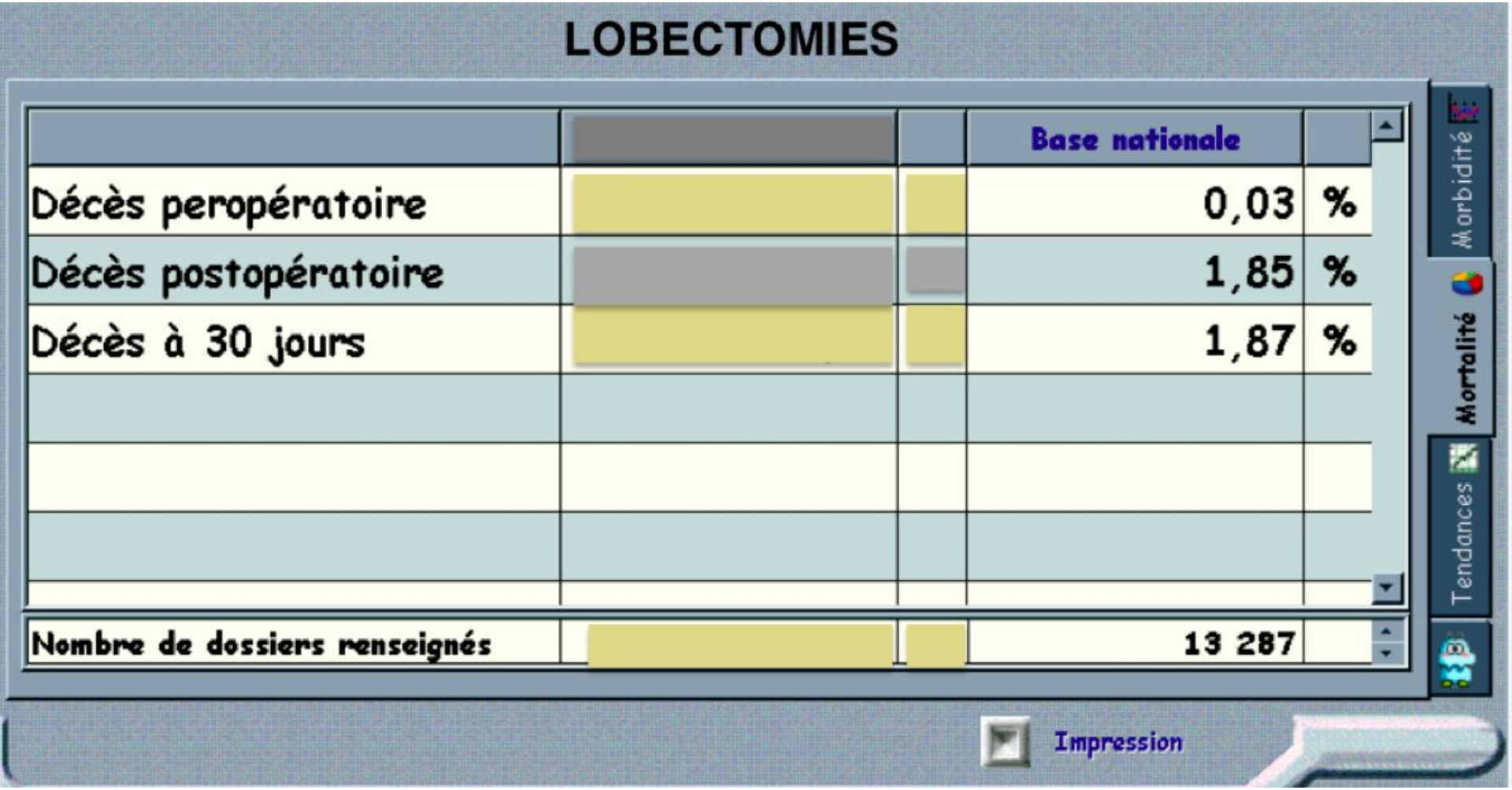
SEGMENTECTOMIES

			Base nationale	
Décès peropératoire			0,00	%
Décès postopératoire			0,85	%
Décès à 30 jours			0,94	%
Nombre de dossiers renseignés			1 063	

Morbidité
Mortalité
Tendances

Impression

EPITHOR



EPITHOR

PNEUMONECTOMIES

			Base nationale	
Décès peropératoire			0,26	%
Décès postopératoire			4,39	%
Décès à 30 jours			5,13	%
Nombre de dossiers renseignés			1 889	

Morbidité | Mortalité | Tendances

EPITHOR

- These results are based on open surgery (thoracotomies) more than thoracoscopy

- In France VATS represents 20-25% of all pulmonary resection

- It is increasing regularly results of VATS are now available on EPITHOR

State of VATS literature

- There is a lack in randomized trials on VATS resections. The level of evidence is mainly level B.
- Major publications concerning the outcomes of VATS lobectomies and segmentectomies compare the results of VATS to open surgery
- Few papers focused on VATS only

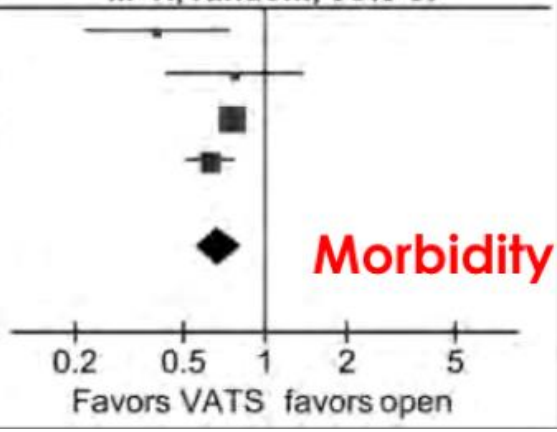
Early outcomes

Metanalysis of propensity score-matched patients

Study or subgroup	VATS Events	VATS Total	Thoracotomy Events	Thoracotomy Total	Weight	Risk ratio M-H, random, 95% CI
Ilonen (2011)	12	116	30	116	8.4%	0.40 [0.22, 0.74]
Park (2011)	17	136	22	136	9.2%	0.77 [0.43, 1.39]
Paul (2010)	336	1281	444	1281	47.8%	0.76 [0.67, 0.85]
Villamizar (2009)	88	284	140	284	34.6%	0.63 [0.51, 0.78]
Total (95% CI)		**1817**		**1817**	**100.0%**	**0.67 [0.56, 0.82]**
Total events	453		636			

Heterogeneity: $\tau^2 = 0.02$; $\chi^2 = 5.79$, df = 3 ($P = 0.12$); $I^2 = 48\%$

Test for overall effect: $Z = 3.99$ ($P < 0.0001$)



Morbidity

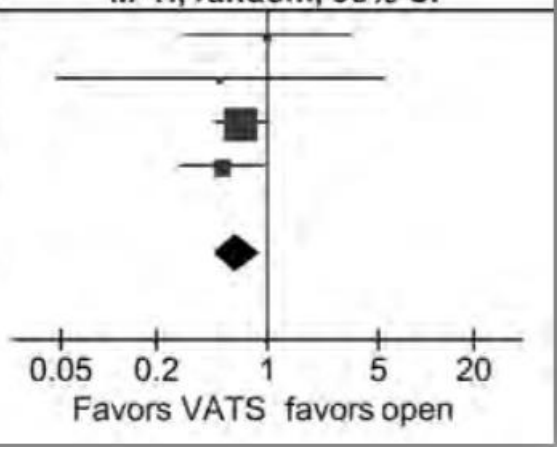
(b)

Study or subgroup	VATS Events	VATS Total	Thoracotomy Events	Thoracotomy Total	Weight	Risk ratio M-H, random, 95% CI
Ilonen (2011)	5	116	5	116	7.1%	1.00 [0.30, 3.36]
Park (2011)	1	136	2	136	1.8%	0.50 [0.05, 5.45]
Paul (2010)	38	1281	56	1281	64.1%	0.68 [0.45, 1.02]
Villamizar (2009)	14	284	27	284	26.9%	0.52 [0.28, 0.97]
Total (95% CI)		**1817**		**1817**	**100.0%**	**0.65 [0.47, 0.89]**
Total events	58		90			

Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 1.08$, df = 3 ($P = 0.78$); $I^2 = 0\%$

Test for overall effect: $Z = 2.65$ ($P = 0.008$)

Pulmonary complications



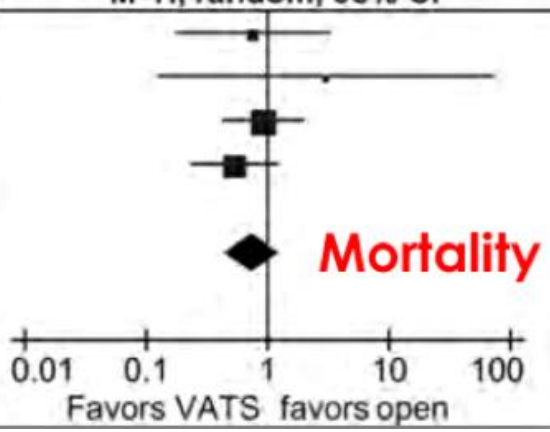
Cao C et al. Interactive CardioVascular and Thoracic Surgery 2013;16:244–249

Metanalysis of propensity score-matched patients

Study or subgroup	VATS Events	VATS Total	Thoracotomy Events	Thoracotomy Total	Weight	Risk ratio M-H, random, 95% CI
Ilonen (2011)	3	116	4	116	12.7%	0.75 [0.17, 3.28]
Park (2011)	1	136	0	136	2.7%	3.00 [0.12, 73.00]
Paul (2010)	12	1281	13	1281	45.5%	0.92 [0.42, 2.02]
Villamizar (2009)	8	284	15	284	39.1%	0.53 [0.23, 1.24]
Total (95% CI)		**1817**		**1817**	**100.0%**	**0.75 [0.44, 1.27]**
Total events	24		32			

Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 1.63$, df = 3 ($P = 0.65$); $I^2 = 0\%$

Test for overall effect: $Z = 1.08$ ($P = 0.28$)



Cao C et al. Interactive CardioVascular and Thoracic Surgery 2013;16:244–249

Video-Assisted Thoracic Surgery in Lung Cancer Resection

A Meta-Analysis and Systematic Review of Controlled Trials

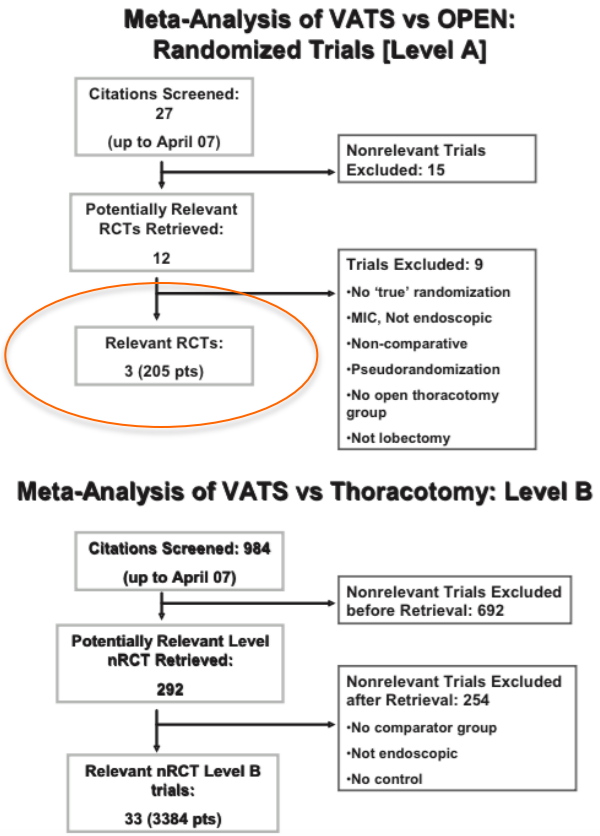


FIGURE 1. Meta-analysis of VATS versus OPEN: randomized trials (level A). Meta-analysis of VATS versus thoracotomy (level B).

Cheng et al. Innovation 2007;2:261-292

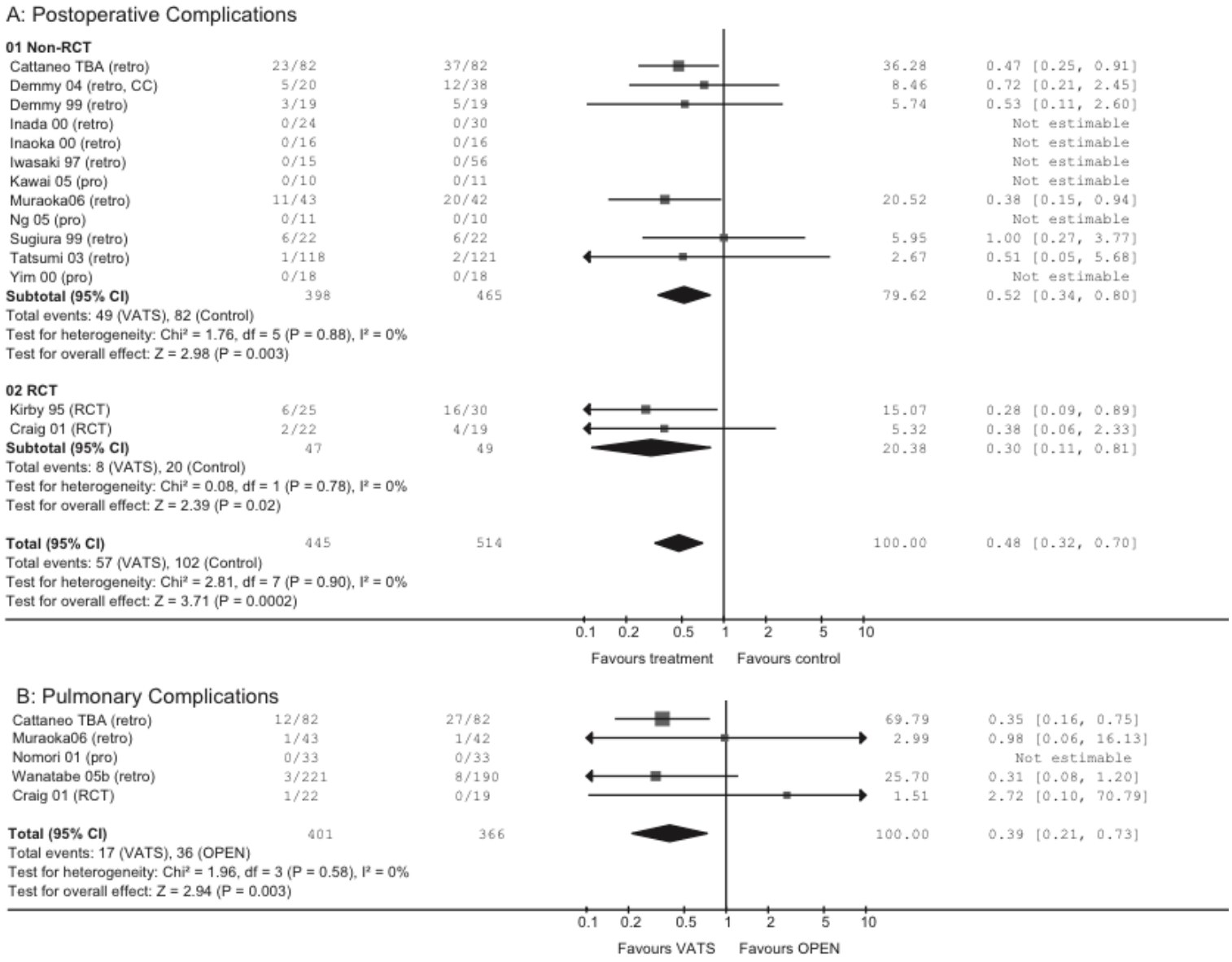


FIGURE 3. A, Postoperative complications. B, Pulmonary complications. C, Blood loss, mL or g. D, Chest tube drainage (days).

Cheng et al. Innovation 2007;2:261)292

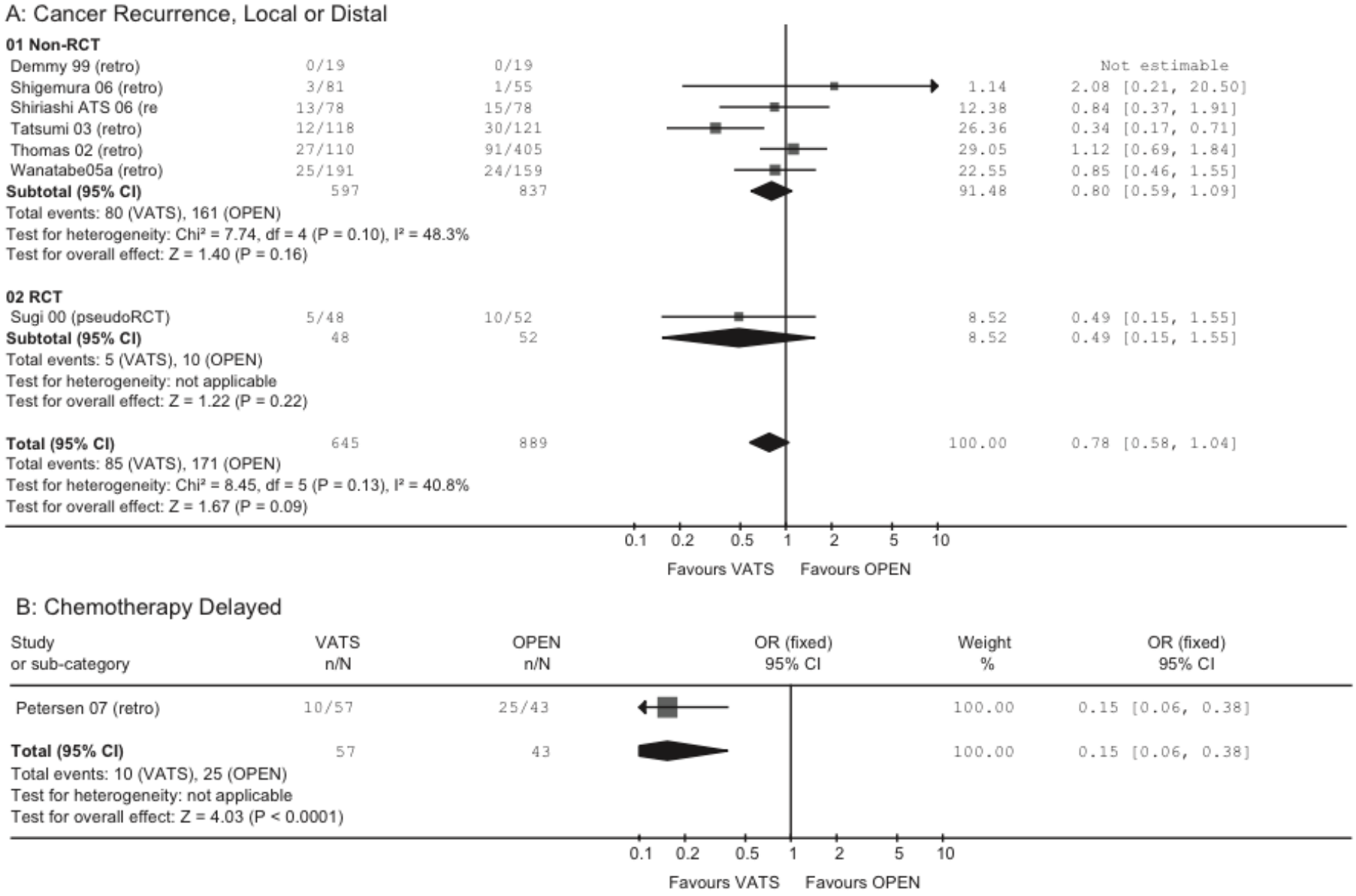
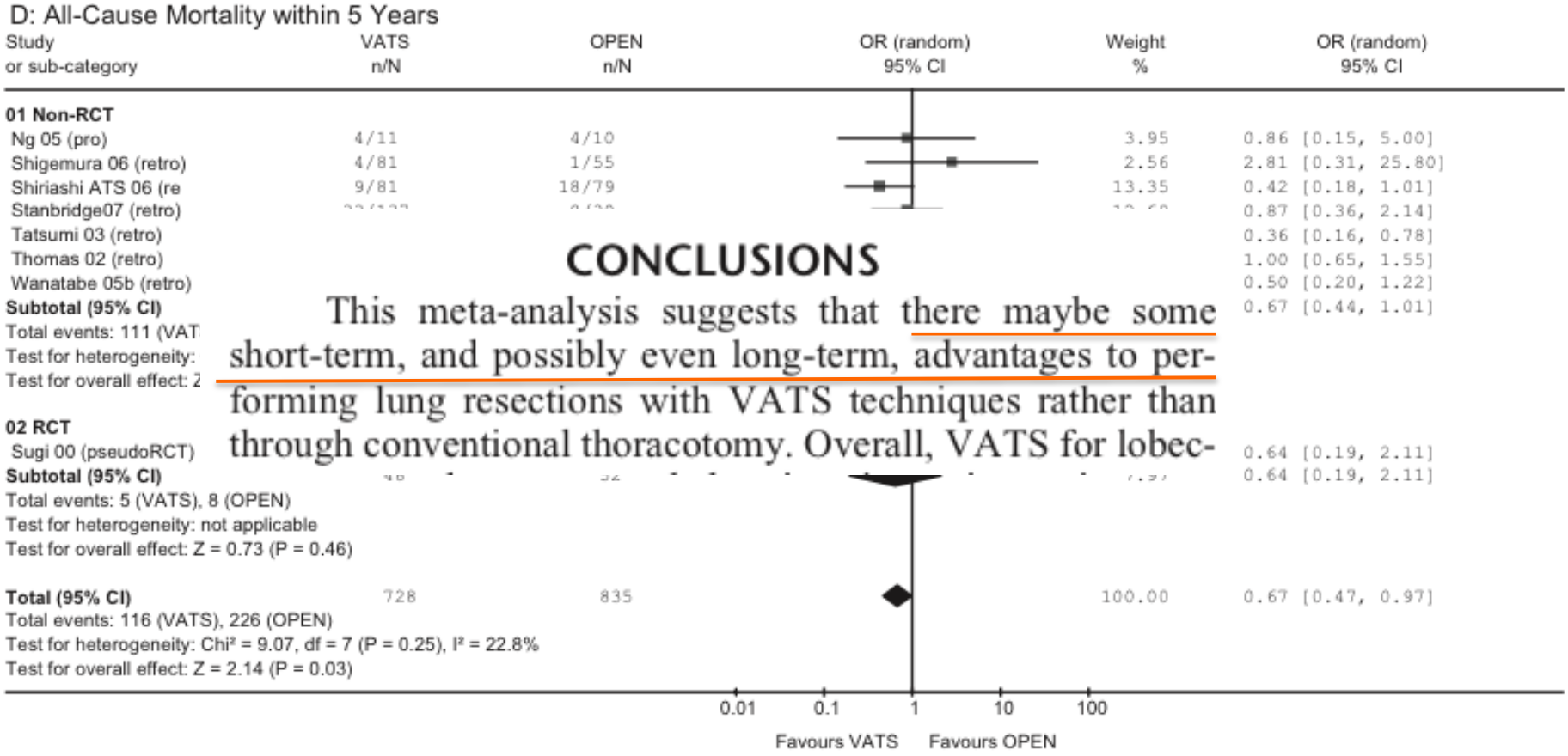


FIGURE 5. A, Cancer recurrence, local or distal. B, Chemotherapy delayed.



CONCLUSIONS

This meta-analysis suggests that there maybe some short-term, and possibly even long-term, advantages to performing lung resections with VATS techniques rather than through conventional thoracotomy. Overall, VATS for lobec-

Cheng et al. Innovation 2007;2:261)292

REVIEW

Surgery for Early-Stage Non-Small Cell Lung Cancer: A Systematic Review of the Video-Assisted Thoracoscopic Surgery Versus Thoracotomy Approaches to Lobectomy

Bryan A. Whitson, MD, PhD, Shawn S. Groth, MD, Susan J. Duval, PhD, Scott J. Swanson, MD, and Michael A. Maddaus, MD

Department of Surgery, Division of Thoracic and Foregut Surgery, and School of Public Health, Division of Epidemiology and Community Health, University of Minnesota, Minneapolis, Minnesota; and Department of Cardiothoracic Surgery, Mount Sinai School of Medicine, New York, New York

Selection of studies from 1992 to 2007

Observational study (one randomized study)

Q4- Does VATS lobectomy confer a superior overall survival advantage compared with The thoracotomy?

(Ann Thorac Surg 2008;86:2008–18)

Surgery for Early-Stage Non-Small Cell Lung Cancer: A Systematic Review of the Video-Assisted Thoracoscopic Surgery Versus Thoracotomy

Conclusion

In our systematic review of the available world's English language literature, we found that VATS lobectomy for patients with early-stage NSCLC, compared with thoracotomy lobectomy, was associated with less morbidity and improved overall survival rates.

							Value
							0.28
							0.12
							0.18
4-year	8	759	88.4 (81.7–95.1)	10	981	71.4 (62.4–80.3)	0.003
5-year	5	531	80.1 (67.5–92.7)	16	1975	65.6 (56.7–74.4)	0.064
Overall complications, %	11	2149	16.4 (12.2–20.6)	9	979	31.2 (19.7–42.8)	0.018
Atrial fibrillation, %	7	1095	5.2 (2.0–8.4)	4	294	9.0 (2.1–15.8)	0.33
Pneumonia, %	7	1095	2.7 (0.9–4.6)	3	245	6.0 (0.0–13.2)	0.40
Persistent air leak, %	8	1120	5.0 (3.3–6.8)	5	325	8.8 (2.4–15.2)	0.27
Chest tube duration, d	9	713	4.2 (3.2–5.3)	7	355	5.7 (4.9–6.5)	0.025
Length of stay, d	14	2218	8.3 (6.9–9.8)	12	856	13.3 (9.5–17.1)	0.016

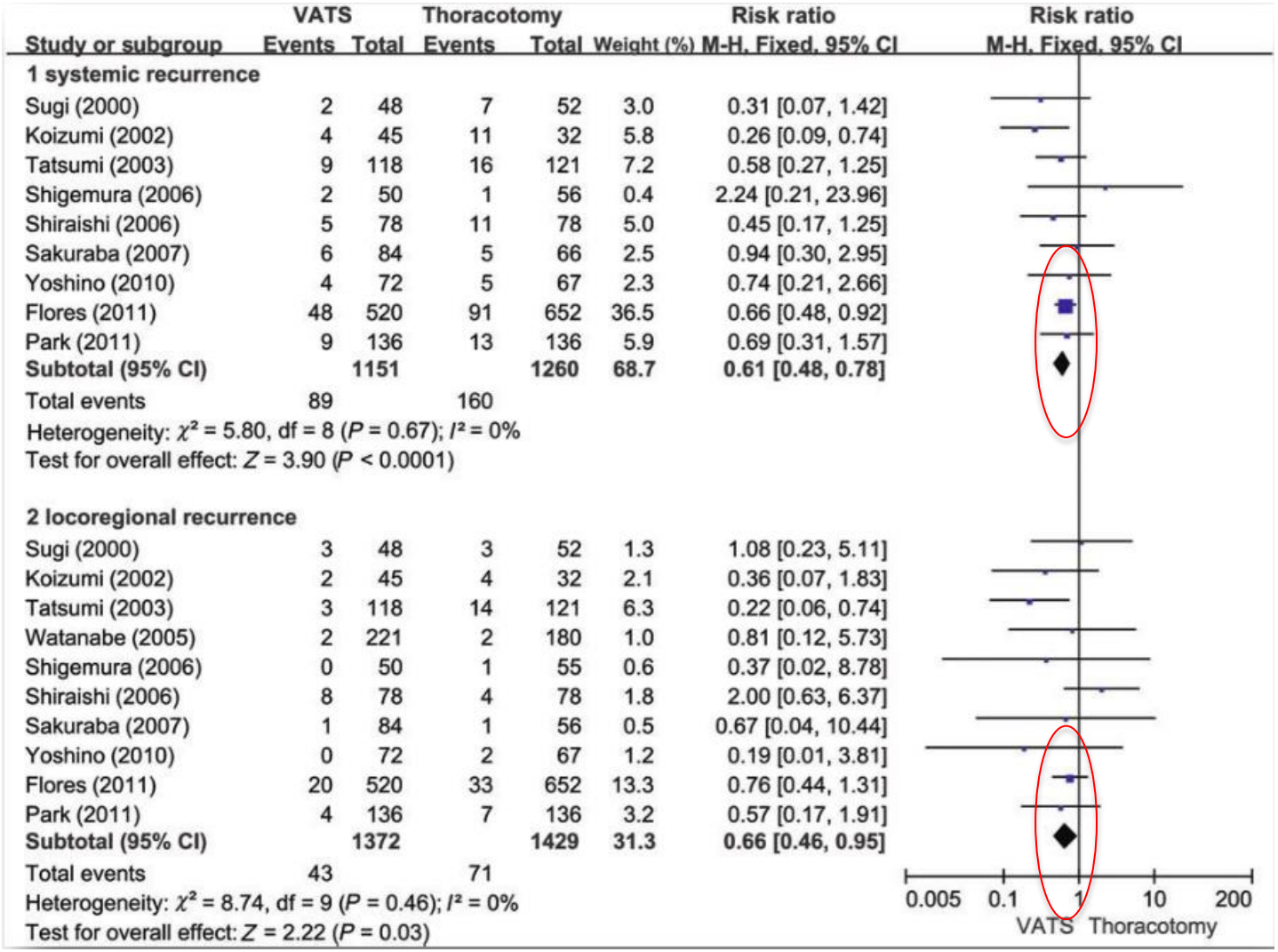
CI = confidence interval; VATS = video-assisted thoracoscopic surgery.

(Ann Thorac Surg 2008;86:2008–18)

Survival (oncological results)

Metastatic recurrence

Local relapse



Study or subgroup	VATS Events	VATS Total	Thoracotomy Events	Thoracotomy Total	Weight (%)	Risk ratio M-H, Fixed, 95% CI
1 systemic recurrence						
Sugi (2000)	2	48	7	52	3.0	0.31 [0.07, 1.42]
Koizumi (2002)	4	45	11	32	5.8	0.26 [0.09, 0.74]
Tatsumi (2003)	9	118	16	121	7.2	0.58 [0.27, 1.25]
Shigemura (2006)	2	50	1	56	0.4	2.24 [0.21, 23.96]
Shiraishi (2006)	5	78	11	78	5.0	0.45 [0.17, 1.25]
Sakuraba (2007)	6	84	5	66	2.5	0.94 [0.30, 2.95]
Yoshino (2010)	4	72	5	67	2.3	0.74 [0.21, 2.66]
Flores (2011)	48	520	91	652	36.5	0.66 [0.48, 0.92]
Park (2011)	9	136	13	136	5.9	0.69 [0.31, 1.57]
Subtotal (95% CI)		**1151**		**1260**	**68.7**	**0.61 [0.48, 0.78]**
Total events	89		160			
Heterogeneity: $\chi^2 = 5.80$, df = 8 ($P = 0.67$); $I^2 = 0\%$						
Test for overall effect: $Z = 3.90$ ($P < 0.0001$)						
2 locoregional recurrence						
Sugi (2000)	3	48	3	52	1.3	1.08 [0.23, 5.11]
Koizumi (2002)	2	45	4	32	2.1	0.36 [0.07, 1.83]
Tatsumi (2003)	3	118	14	121	6.3	0.22 [0.06, 0.74]
Watanabe (2005)	2	221	2	180	1.0	0.81 [0.12, 5.73]
Shigemura (2006)	0	50	1	55	0.6	0.37 [0.02, 8.78]
Shiraishi (2006)	8	78	4	78	1.8	2.00 [0.63, 6.37]
Sakuraba (2007)	1	84	1	56	0.5	0.67 [0.04, 10.44]
Yoshino (2010)	0	72	2	67	1.2	0.19 [0.01, 3.81]
Flores (2011)	20	520	33	652	13.3	0.76 [0.44, 1.31]
Park (2011)	4	136	7	136	3.2	0.57 [0.17, 1.91]
Subtotal (95% CI)		**1372**		**1429**	**31.3**	**0.66 [0.46, 0.95]**
Total events	43		71			
Heterogeneity: $\chi^2 = 8.74$, df = 9 ($P = 0.46$); $I^2 = 0\%$						
Test for overall effect: $Z = 2.22$ ($P = 0.03$)						

Trend in favour of VATS

Zhang Z et al. European Journal of Cardio-Thoracic Surgery 2013;44:407–414

Survival (oncological results)

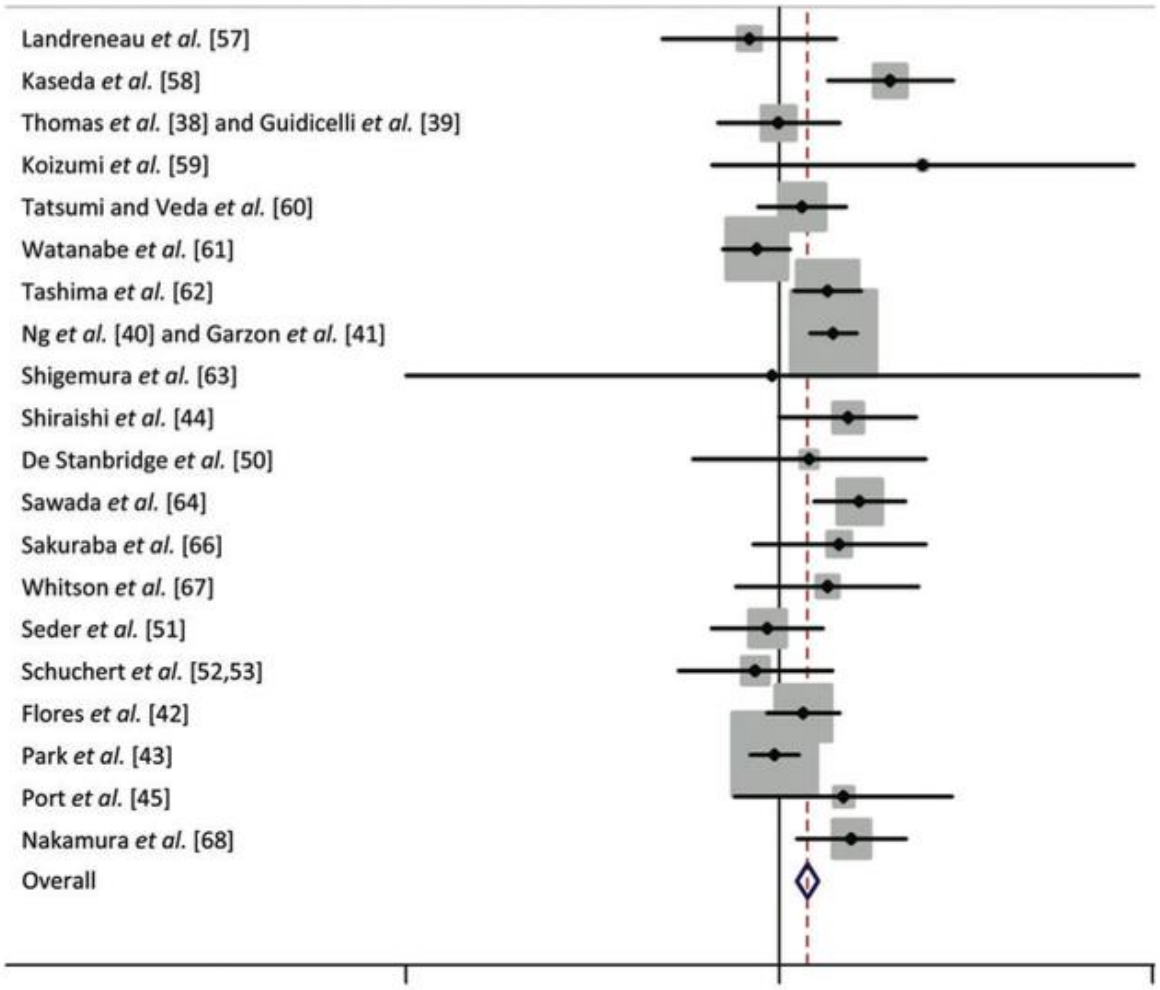


Figure 1: Meta-analysis of studies comparing VATS to thoracotomy. $Q = 42.6$ (0.001); $I^2 = 55.7\%$.

Trend in favour of VATS

Taioli et al. Eur J Cardiothorac Surg. 44(2013)591-597

VATS Lobectomy Has Better Perioperative Outcomes Than Open Lobectomy: CALGB 31001, an Ancillary Analysis of CALGB 140202 (Alliance)

Roswell Park Cancer Institute, State University of New York at Buffalo, Buffalo, New York; University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania; Alliance Statistics and Data Center, Duke University Medical Center, Durham, North Carolina; Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts; and State University of New York Upstate Medical Center, Syracuse, New York

The Alliance for Clinical Trials in Oncology

Propensity-matched analysis

Open	VATS	Total
237	282	519
Stage I-II	Stage I-II	Stage I-II

(Ann Thorac Surg 2015;99:399–405)

VATS Lobectomy Has Better Perioperative Outcomes Than Open Lobectomy: CALGB 31001, an Ancillary Analysis of CALGB 140202 (Alliance)

Roswell Park Cancer Institute, State University of New York at Buffalo, Buffalo, New York; University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania; Alliance Statistics and Data Center, Duke University Medical Center, Durham, North Carolina; Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts; and State University of New York Upstate Medical Center, Syracuse, New York

Propensity-matched analysis

Table 4. End Points: Matched Data

Variable	Open (n = 175)	VATS (n = 175)	Total (n = 350)	*p* Value
Length of hospital stay (days)				<0.0001
Mean (SD)	8.0 (6.0)	5.4 (4.7)	6.7 (5.5)	
Median (range)	6 (3.0–44.0)	4 (1.0–34.0)	5 (1.0–44.0)	
Number of patients with prolonged hospital stay (>14 days)	15 (8.6%)	11 (6.3%)	26 (7.5%)	<0.0001
Chest tube duration				<0.0001
Mean (SD)	5.0 (2.5)	3.3 (1.7)	4.1 (2.3)	
Median (range)	4 (1–19)	3 (1–11)	4 (1–19)	
Any surgical procedure complication				<0.0001
Yes	44 (25.1%)	26 (14.9%)	70 (20%)	
No	131 (74.9%)	149 (85.1%)	280 (80%)	
Discharge disposition				<0.0001
Home	158 (90.3%)	164 (93.7%)	322 (92%)	
Other	17 (9.7%)	11 (6.3%)	28 (8%)	

SD = standard deviation; VATS = video-assisted thoracoscopic surgery.

(Ann Thorac Surg 2015;99:399–405)

VATS Lobectomy Has Better Perioperative Outcomes Than Open Lobectomy: CALGB 31001, an Ancillary Analysis of CALGB 140202 (Alliance)

Roswell Park Cancer Institute, State University of New York at Buffalo, Buffalo, New York; University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania; Alliance Statistics and Data Center, Duke University Medical Center, Durham, North Carolina; Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts; and State University of New York Upstate Medical Center, Syracuse, New York

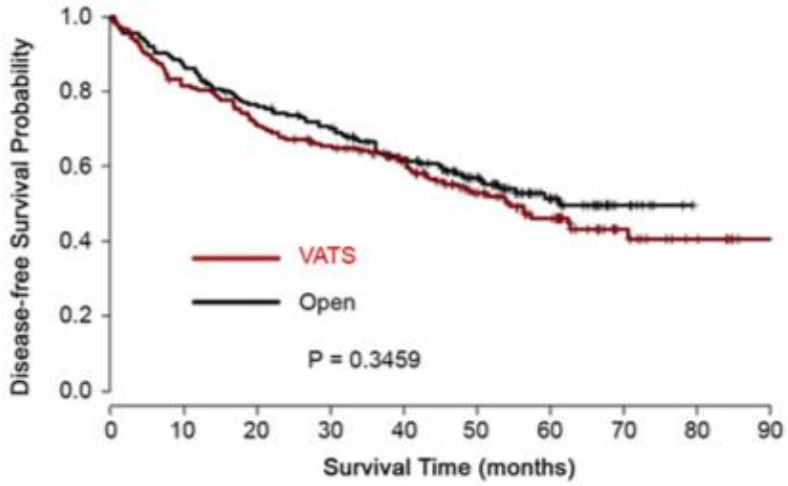


Fig 1. Kaplan-Meier plot of disease-free survival from matched data for open lobectomy (black line) versus video-assisted thoracoscopic surgery (VATS; red line).

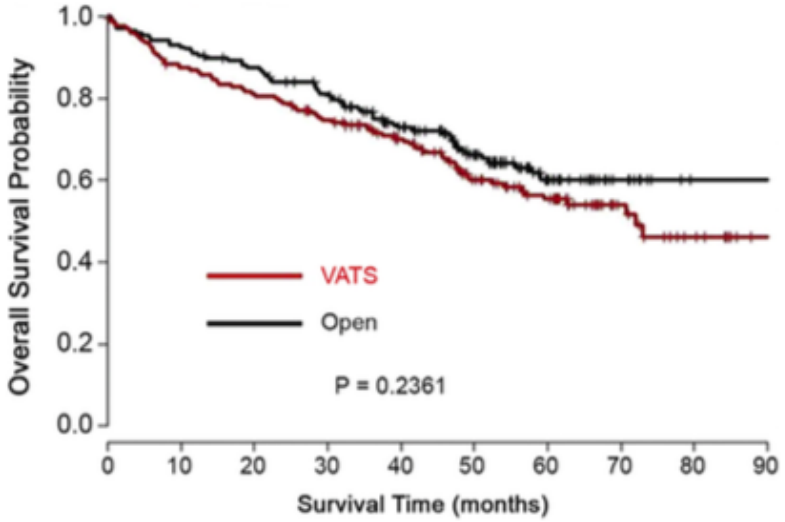


Fig 2. Kaplan-Meier plot of overall survival from matched data for open lobectomy (black line) versus video-assisted thoracoscopic surgery (VATS; red line).

(Ann Thorac Surg 2015;99:399–405)

Thoracoscopic lobectomy is associated with improved short-term and equivalent oncological outcomes compared with open lobectomy for clinical Stage I non-small-cell lung cancer: a propensity-matched analysis of 963 cases†

Table 3: Postoperative events in patients undergoing lobectomy

Postoperative event	VATS (n = 307)	Open (unmatched, n = 656)	P-value	Open (matched, n = 307)	P-value
Atelectasis	5 (2)	21 (3)	0.20	5 (2)	1.0
Air leak >5 days, n (%)	13 (4)	51 (8)	0.15	30 (10)	1.0
Pneumonia, n (%)	17 (6)	55 (8)	0.12	28 (9)	0.12
Bronchopleural fistula, n (%)	0 (0)	2 (<1)	1.0	1 (<1)	1.0
Tracheostomy, n (%)	3 (1)	12 (2)	0.41	7 (2)	0.34
Reintubation, n (%)	7 (2)	18 (3)	0.67	8 (3)	1.0
Respiratory arrest, n (%)	2 (1)	9 (1)	0.51	5 (2)	0.45
ARDS, n (%)	3 (1)	9 (1)	0.76	6 (2)	0.51
MI, n (%)	2 (1)	8 (1)	0.52	4 (1)	0.68
Atrial arrhythmia, n (%)	36 (12)	132 (20)	0.001	64 (21)	0.003
Ventricular arrhythmia, n (%)	0 (0)	4 (1)	0.31	2 (1)	0.50
CVA, n (%)	1 (<1)	3 (1)	1.0	0 (0)	1.0
PE, n (%)	1 (<1)	1 (<1)	0.54	0 (0)	1.0
DVT, n (%)	0 (0)	0 (0)	1.0	0 (0)	1.0
Bleeding, n (%)	3 (1)	7 (1)	1.0	3 (1)	1.0
Empyema, n (%)	0 (0)	3 (1)	1.0	1 (<1)	1.0
Sepsis, n (%)	3 (1)	10 (2)	0.77	8 (3)	0.23
Renal failure, n (%)	1 (<1)	12 (2)	0.07	7 (2)	0.07
Reoperation, n (%)	9 (3)	6 (1)	0.02	4 (1)	0.27
Chest tube duration, median days	2 ± 4	3 ± 20	0.0001	3 ± 19	0.0001
Operative time, median minutes	173 ± 57	160 ± 57	0.0001	159 ± 56	0.0001
Length of stay, median days	4 ± 8	6 ± 7	0.0001	6 ± 8	0.0001
Pulmonary morbidity	29 (9)	110 (17)	0.003	59 (19)	0.001
Overall morbidity	59 (19)	220 (34)	0.0001	114 (37)	0.0001
Thirty-day/in-hospital death	1 (<1)	9 (1)	0.18	5 (2)	0.22
Ninety-day death	3 (1)	16 (2)	0.13	8 (3)	0.23

Data are presented as mean + standard deviations where shown.
Open: conventional thoracotomy; VATS: video-assisted thoracoscopic surgery; ARDS: acute respiratory distress syndrome; MI: myocardial infarction; CVA: cerebrovascular accident; PE: pulmonary embolus; DVT: deep venous thrombosis.

Stephens N et al. Eur J Cardiovasc Sur 46(2014)607-613

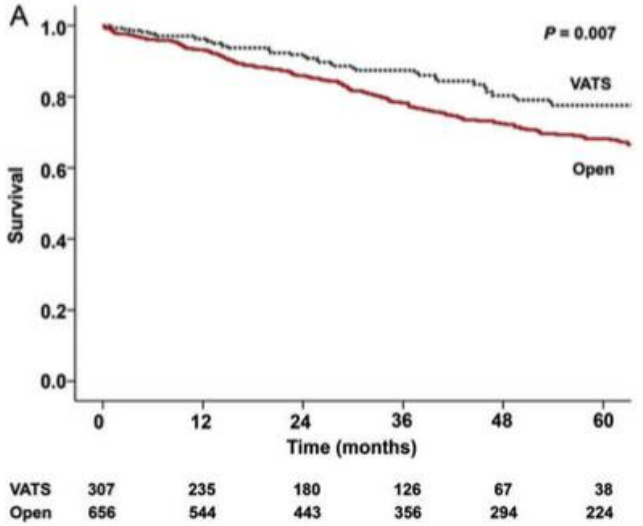


Figure 1: Kaplan–Meier overall survival estimates of VL and OL in (**A**) unmatched analysis ($n = 963$) and (**B**) propensity-matched analysis ($n = 614$).

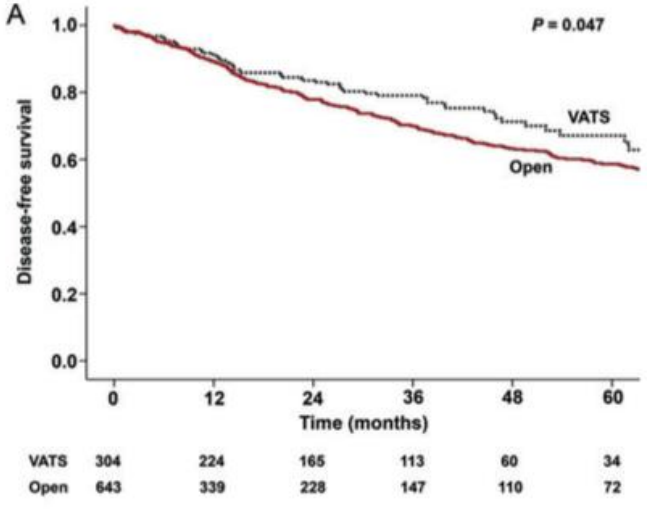


Figure 2: Kaplan–Meier disease-free survival estimates of VL and OL in (**A**) unmatched analysis ($n = 944$) and (**B**) propensity-matched analysis ($n = 600$).

Stephens N et al. Eur J Cardiovasc Sur 46(2014)607-613

Quality of Life

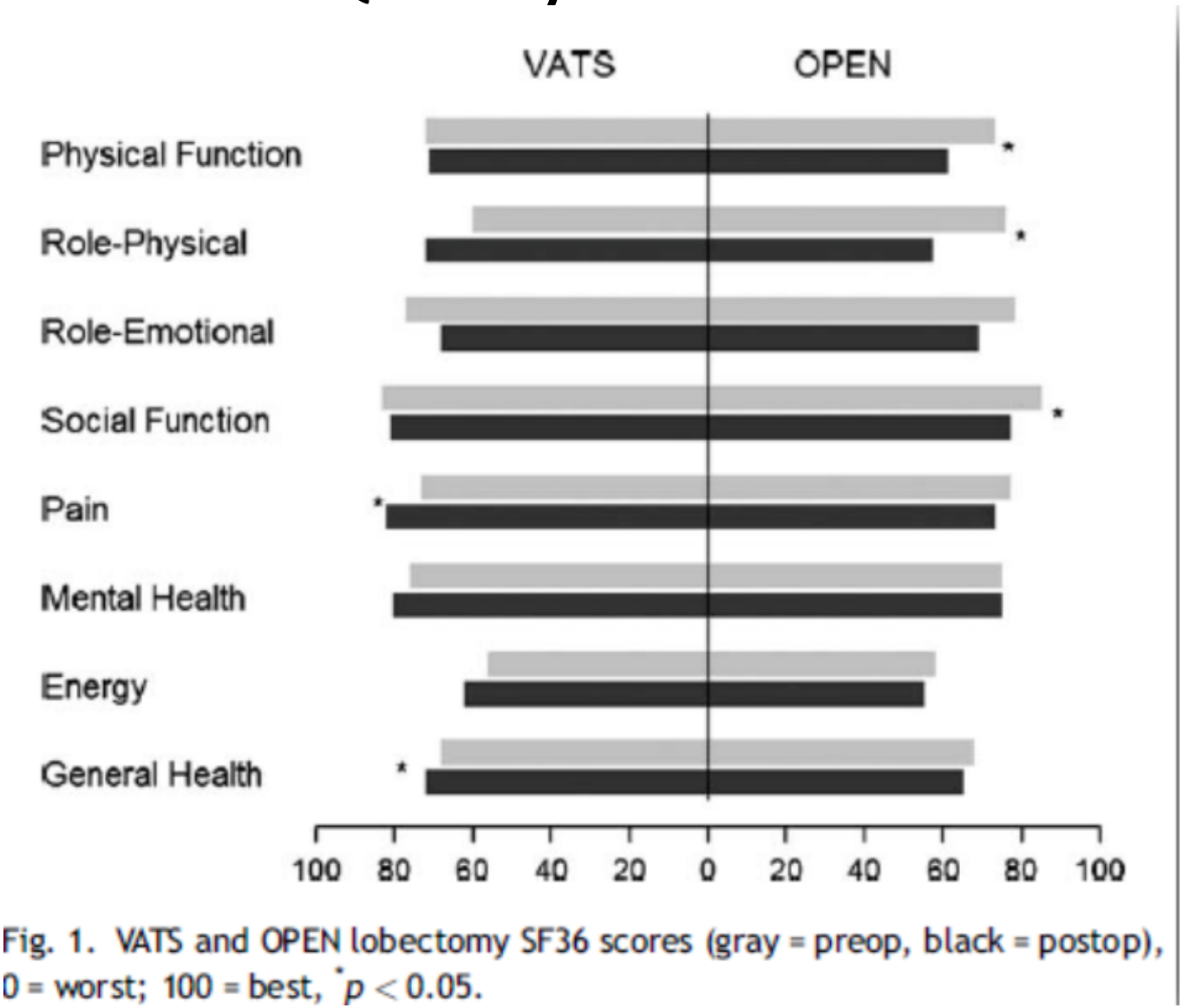
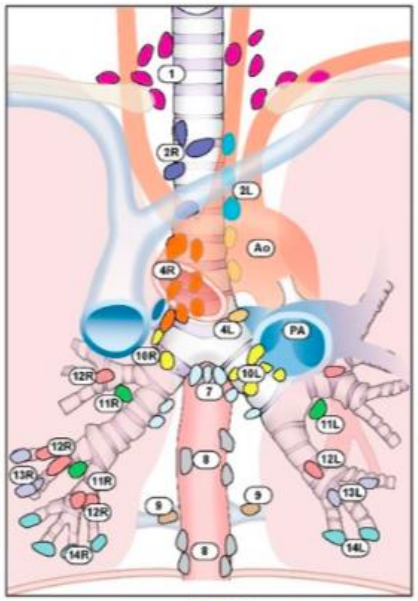
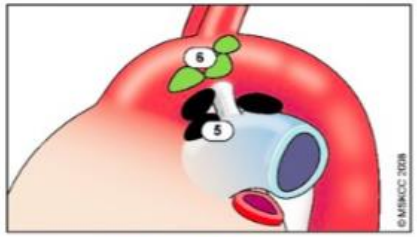


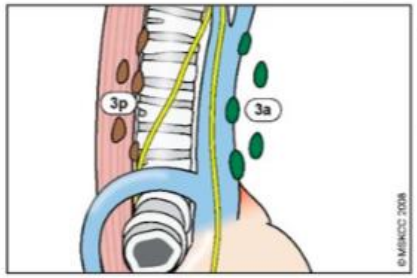
Fig. 1. VATS and OPEN lobectomy SF36 scores (gray = preop, black = postop), 0 = worst; 100 = best, $^{*}p < 0.05$.

Handy JR Jr et al. Does video-assisted thoracoscopic lobectomy for lung cancer provide improved functional outcomes compared with open lobectomy? Eur J Cardio-thorac Surg 2010; 37: 451—455

Lymphadenectomy







Supraclavicular zone

- **1** Low cervical, supraclavicular, and sternal notch nodes

Superior Mediastinal Nodes

Upper zone

- **2R** Upper Paratracheal (right)
- **2L** Upper Paratracheal (left)
- **3a** Pre-vascular
- **3p** Retrotracheal
- **4R** Lower Paratracheal (right)
- **4L** Lower Paratracheal (left)

Aortic Nodes

AP zone

- **5** Subaortic
- **6** Para-aortic (ascending aorta or phrenic)

Inferior Mediastinal Nodes

Subcarinal zone

- **7** Subcarinal

Lower zone

- **8** Paraesophageal (below carina)
- **9** Pulmonary ligament

N_1 Nodes

Hilar/Interlobar zone

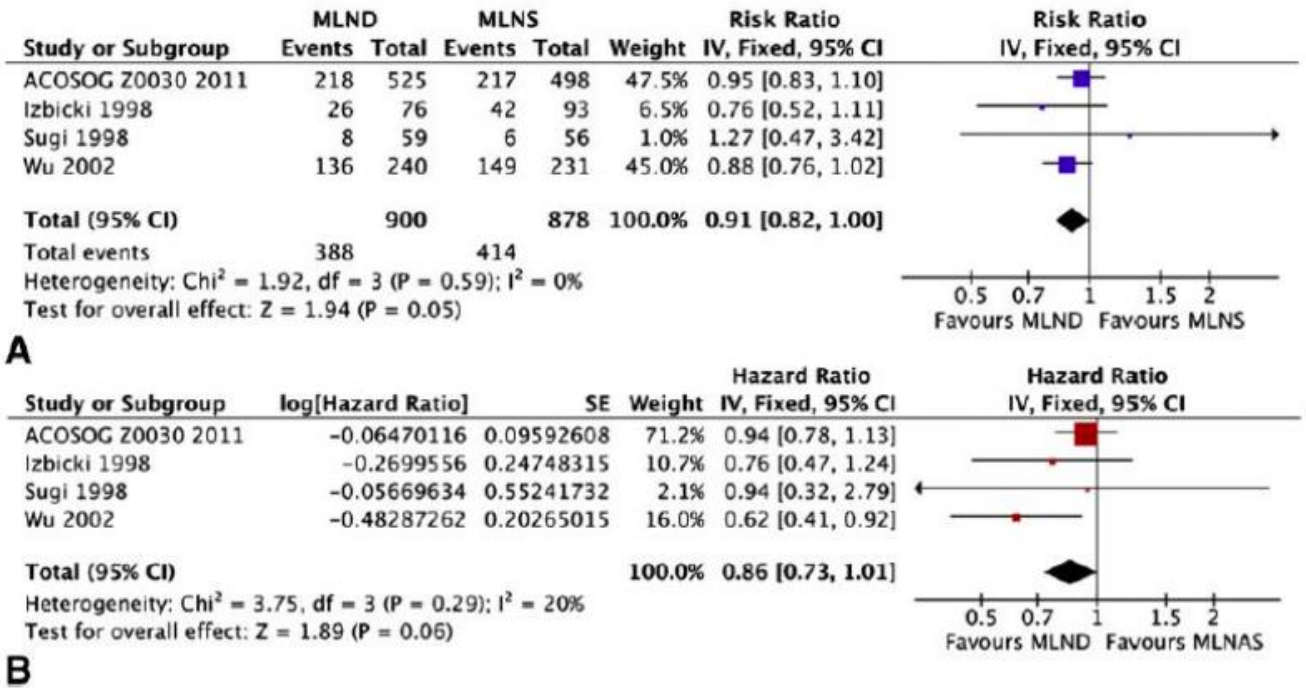
- **10** Hilar
- **11** Interlobar

Peripheral zone

- **12** Lobar
- **13** Segmental
- **14** Subsegmental

Lymphadenectomy vs. Sampling

MLND= Nodes dissection
MLNS= Nodes sampling



Study or Subgroup	MLND Events	MLND Total	MLNS Events	MLNS Total	Weight	Risk Ratio IV, Fixed, 95% CI
ACOSOG Z0030 2011	218	525	217	498	47.5%	0.95 [0.83, 1.10]
Izbicki 1998	26	76	42	93	6.5%	0.76 [0.52, 1.11]
Sugi 1998	8	59	6	56	1.0%	1.27 [0.47, 3.42]
Wu 2002	136	240	149	231	45.0%	0.88 [0.76, 1.02]
Total (95% CI)		**900**		**878**	**100.0%**	**0.91 [0.82, 1.00]**
Total events	388		414			

Heterogeneity: Chi² = 1.92, df = 3 (P = 0.59); I² = 0%
Test for overall effect: Z = 1.94 (P = 0.05)

Risk Ratio IV, Fixed, 95% CI
0.5 0.7 1 1.5 2
Favours MLND Favours MLNS

A

Study or Subgroup	log[Hazard Ratio]	SE	Weight	Hazard Ratio IV, Fixed, 95% CI
ACOSOG Z0030 2011	-0.06470116	0.09592608	71.2%	0.94 [0.78, 1.13]
Izbicki 1998	-0.2699556	0.24748315	10.7%	0.76 [0.47, 1.24]
Sugi 1998	-0.05669634	0.55241732	2.1%	0.94 [0.32, 2.79]
Wu 2002	-0.48287262	0.20265015	16.0%	0.62 [0.41, 0.92]
Total (95% CI)			**100.0%**	**0.86 [0.73, 1.01]**

Heterogeneity: Chi² = 3.75, df = 3 (P = 0.29); I² = 20%
Test for overall effect: Z = 1.89 (P = 0.06)

Hazard Ratio IV, Fixed, 95% CI
0.5 0.7 1 1.5 2
Favours MLND Favours MLNAS

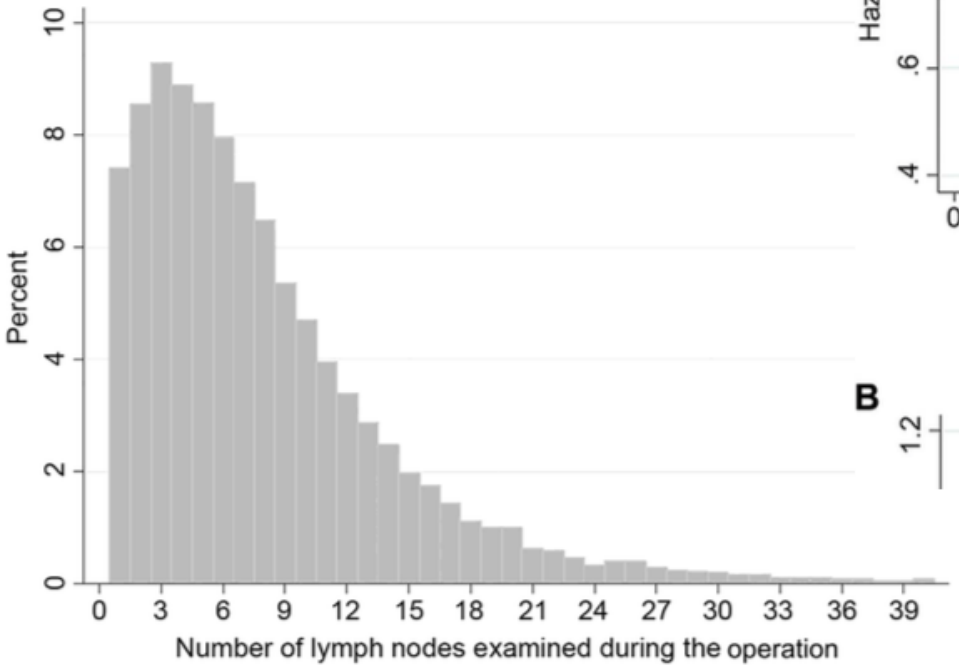
B

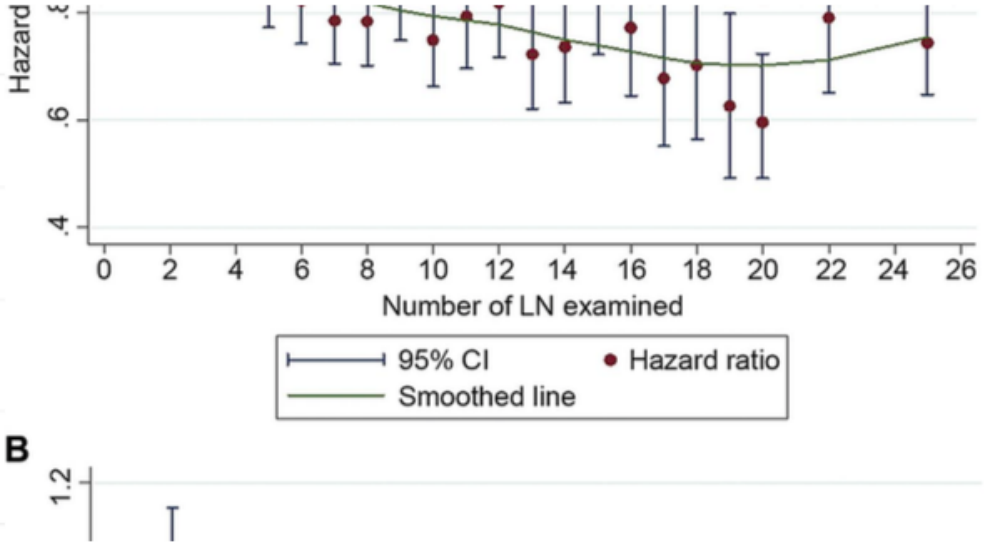
FIGURE 1. All cause mortality (*A*, risk ratio; *B*, hazard ratio) among patients with early-stage non-small cell lung cancer randomized to mediastinal lymph node dissection (*MLND*) versus sampling (*MLNS*) during pulmonary resection. *IV*, Inverse variance; *CI*, confidence interval; *ACOSOG*, American College of Surgery Oncology Group; *SE*, standard error.

Tagaki Het al. J Thorac Cardiovasc Surg 2011; 142:477-8

Lymphadenectomy – N0

CONCLUSIONS: Lymph node evaluation falls far short of optimal in patients with resected pN0 NSCLC, raising the odds of underestimation of long-term mortality risk and failure to identify candidates for postoperative adjuvant therapy. This represents a major quality gap for which corrective intervention is warranted.





Study Cohort: at least 1 lymph node examined, pathologic "node-negative" non-small cell lung cancer n = 24,650

SEER Database 1998-2009

Osarogiagbon RU et al. Ann Thorac Surg 2014 Feb;97(2):385-93

VATS vs. thoracotomy

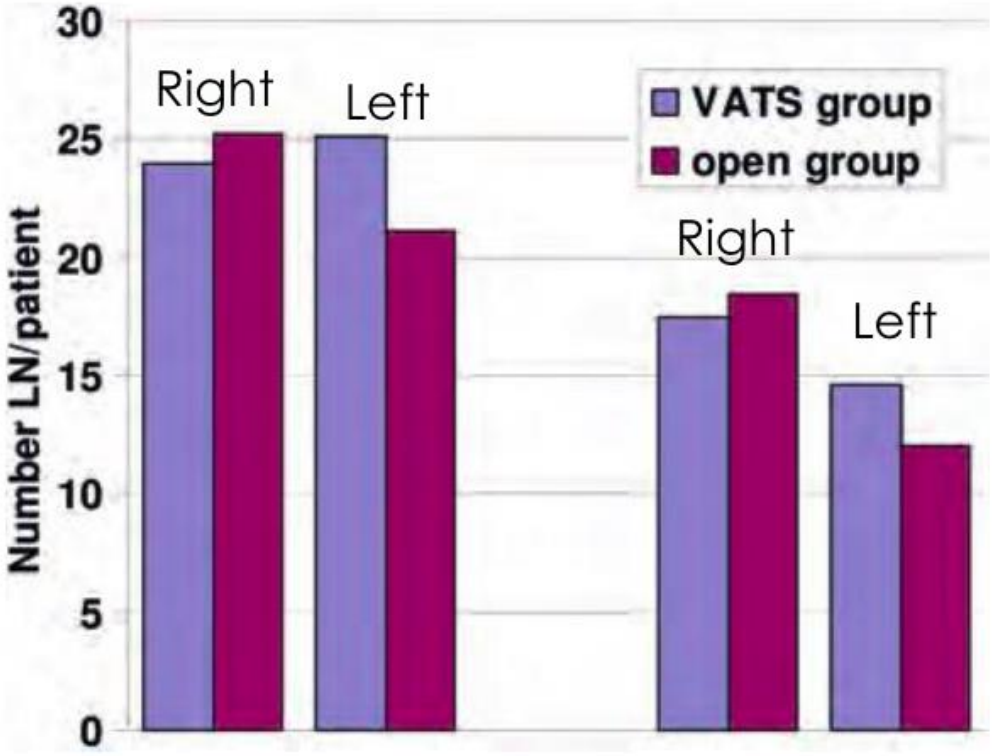
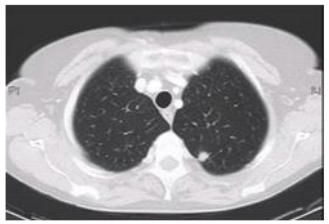
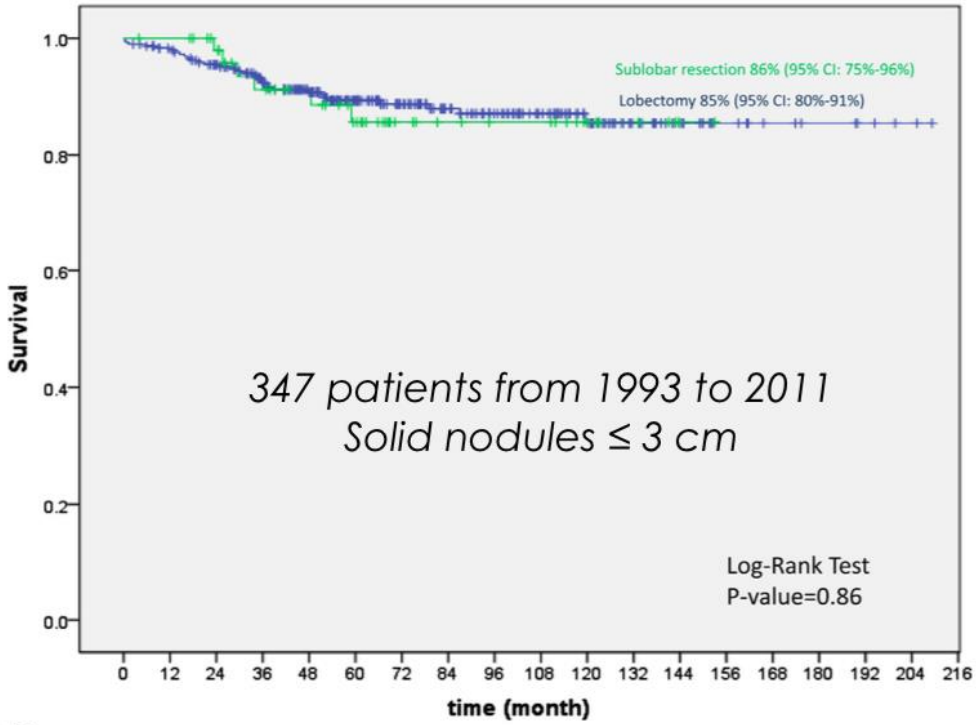


Figure 4: Number of lymph nodes removed per patient, overall (N1 and N2) and mediastinal (N2).

alade E et al. Eur J Cardio-thorac Surg 2013;44:244–249

Lobectomy vs segmentectomy





No. at risk

Lobectomy	294	281	262	234	203	162	132	106	88	71	52	31	20	12	8	6	4	2	0
Sublobar resection	53	52	47	40	35	28	18	15	13	13	7	5	1	0	0	0	0	0	0

FIGURE 1. Kaplan–Meier survival curves for 337 patients with clinical stage IA lung cancer manifesting as a solid nodule (nodule diameter of ≤30 mm), separately for those who underwent lobectomy (n = 294) and SLR (n = 53). *CI*, Confidence interval.

Prospective multi-institutional study

International Early Lung Cancer Action Program (I-ELCAP) database

Altorki NK et al. J Thorac Cardiovasc Surg 2014-feb;147(2):754-62.

North America -CALGB 140503

- **A Randomized Phase III Trial of Lobectomy versus Sublobar Resection for Small (< 2cm) Peripheral Non-Small Cell Lung Cancer**
- Start 2007
- Slow recruitment

Japan – JCOG0802

- **A Phase III Randomized Trial of Lobectomy Versus Limited Resection for Small-sized Peripheral Non-small Cell Lung Cancer**
- (JCOG0802/WJOG4607L)
- Kenichi Nakamura, Hisashi Saji, Ryu Nakajima, Morihito Okada, Hisao Asamura, Taro Shibata, Shinichiro Nakamura, Hirohito Tada and Masahiro Tsuboi
- Start 2009. Planned 1100 patients

Thoracoscopic segmentectomy compares favorably with thoracoscopic lobectomy for patients with small stage I lung cancer

TABLE 3. Recovery and follow-up

Variable	Segmentectomy (n = 31)	Lobectomy (n = 113)	*P* value
Mean follow-up (mo, mean ± SD)	22 ± 16.6)	21 ± 12.6)	.83
Chest tube duration (d, median and range)	2 (1-33)	3 (2-35)	.18
Stay (d, median and range)	4 (1-98)	4 (3-34)	.10
Complications (No.)	8 (25.8%)	30 (26.6%)	.82
Major	3 (9.7%)	7 (6.2%)	
Minor	5 (16.1%)	23 (20.4%)	
Perioperative death (30–d, No.)	0	1	
Recurrence* (No.)	5 (17.2%)	23 (20.4%)	.71
Locoregional	1 (3.5%)	4 (3.6%)	
Distant	3 (10.3%)	13 (11.5%)	
Both	1 (3.5%)	5 (5.3%)	

*Among patients treated for clinical stage I non–small cell lung cancer, n = 29 for segmentectomy and n = 113 for lobectomy.

Shapiro M et al. J Thorac Cardiovasc Surg 2009;137:1388-93

Video-Assisted Thoracoscopic Surgery Segmentectomy: A Safe and Effective Procedure

Table 3. Measured Variables

Variables	VATS (n = 15)	Open (n = 26)	*p* Value
Tumor size (cm)	2.2 ± 1	2.9 ± 2	0.26
Lymph nodes	4 ± 3	6 ± 5	0.40
Lymph node stations	3 ± 1	3 ± 2	0.62
OR time (minutes)	145 ± 55	140 ± 38	0.70
Chest tube duration (days)	2.8 ± 1.3	5.2 ± 3.0	0.001
Length of stay (days)	3.5 ± 1.4	8.3 ± 6.1	0.01
Atrial fibrillation	0	4 (15%)	0.11
Pneumonia	0	2 (8%)	0.27
Acute renal failure	0	3 (12%)	0.17
Mortality	0	2 (8%)	0.27
Discharge to home	15 (100%)	22 (85%)	0.63
Total cost	$45,101	$46,798	0.56

OR = operating room; VATS = video-assisted thoracoscopic surgery.

Bradley G etal. Ann Thorac Surg2010;89:1571-6)

Clinical outcomes and changes in lung function after segmentectomy versus lobectomy for lung cancer cases

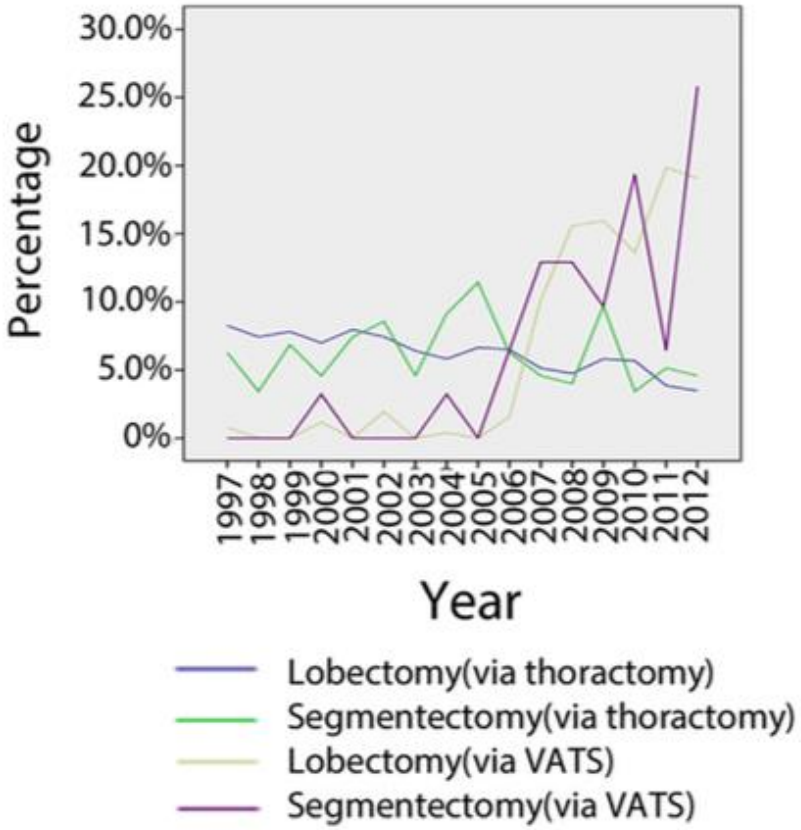


FIGURE 1. Proportion of surgery types of 2509 cases, 1997 to 2012, Mayo Clinic (Minnesota). *VATS*, Video-assisted thoracic surgery.

Mayo Clinic
Retrospective study
From 1997 to 2012.
Included 212 segmentectomy
2336 lobectomy
Several groups: open thoracotomy or VATS

Bo Deng et al. J Thorac Cardiovasc Surg 2014;148:1186-92

Clinical outcomes and changes in lung function after segmentectomy versus lobectomy for lung cancer cases

TABLE 3. Postoperative complications of segmentectomy versus lobectomy (VATS approach)

Variable	Total			Matched cases by PS		
	Group L (n = 266)	Group S (n = 35)	*P* value	Group L (n = 105)	Group S (n = 35)	*P* value
No complications	197 (74.1)	24 (68.6)	.49	76 (72.4)	24 (68.6)	.67
Atrial fibrillation*	26 (9.8)	2 (5.7)	.44	11 (10.5)	2 (5.7)	.40
Air leak >7 d†	25 (9.4)	8 (22.9)	.02‡	8 (7.6)	8 (22.9)	.01‡
Pulmonary complications§	5 (1.9)	3 (8.6)	.02‡	0 (0.0)	3 (8.6)	<.01‡
Anesthetic complications‖	11 (4.1)	2 (5.7)	.66	7 (6.7)	2 (5.7)	.84
Chylothorax or hemothorax¶	4 (1.6)	0 (0.0)	.47	0 (0.0)	0 (0.0)	—
Acute renal failure	1 (0.4)	1 (2.9)	.09	0 (0.0)	1 (2.9)	.08
Gastrointestinal system#	2 (0.8)	0 (0.0)	.61	2 (1.9)	0 (0.0)	.41
Urinary retention	3 (1.1)	0 (0.0)	.53	0 (0.0)	0 (0.0)	—
Embolism**	2 (0.8)	0 (0.0)	.61	0 (0.0)	0 (0.0)	—

Data presented as n (%). *PS*, Propensity score; *L*, lobectomy; *S*, segmentectomy. *Development of postoperative atrial fibrillation. †Prolonged air leak lasting > 7 days. ‡Statistically significant. §Pneumonia and its consequences (ie, adult respiratory distress syndrome or respiratory failure). ‖Postoperative confusion, vocal cord paralysis, or alcohol withdrawal symptoms. ¶Gastroparesis or ileus. #Wound dehiscence or infection. **Deep venous thrombosis or pulmonary embolism.

Bo Deng et al. J Thorac Cardiovasc Surg 2014;148:1186-92

Clinical outcomes and changes in lung function after segmentectomy versus lobectomy for lung cancer cases

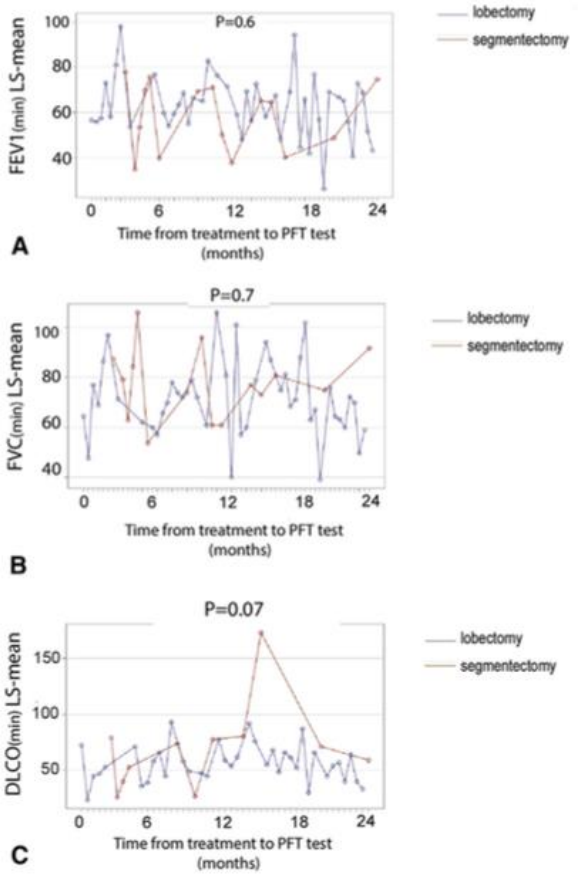
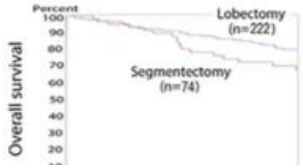


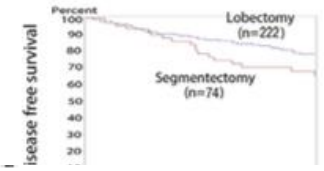
FIGURE 2. No significant difference was found in the trend of postoperative pulmonary function test (*PFT*) data. A, Forced expiratory volume in 1 second (*FEV1*), (B) forced vital capacity (*FVC*), and (C) diffusing capacity of the lung for carbon monoxide (*DLCO*) after segmentectomy or lobectomy. *LS*, Least squares.

Post operative lung function
No differences

Bo Deng et al. J Thorac Cardiovasc Surg 2014;148:1186-92

Clinical outcomes and changes in lung function after segmentectomy versus lobectomy for lung cancer cases



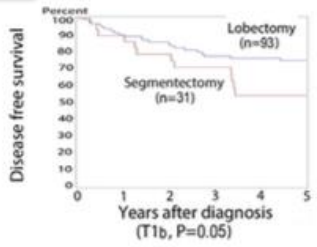


Collectively, we believe both surgical types are safe. Therefore, we would advocate lobectomy for stage IA NSCLC, especially T1b. Given the disparity in the

Life table

Surgery	Survival rate within 5 years after surgery 0	1	2	3	4	5	Mean survival time (95% CI)
segmentectomy	100%	96.4%	85.3%	73.4%	60.5%	55.8%	3.9 years (3.4-4.5)
lobectomy	100%	94.6%	88.9%	82.8%	78.6%	77.6%	4.4 years (4.1-4.6)

C



Life table

Surgery	Survival rate within 5 years after surgery 0	1	2	3	4	5	Mean survival time (95% CI)
segmentectomy	100%	86.0%	74.6%	66.5%	54.1%	54.1%	3.6 years (3.0-4.3)
lobectomy	100%	89.2%	83.5%	77.4%	76.1%	74.7%	4.1 years (3.8-4.5)

D

FIGURE 3. Overall and disease-free survival of patients with stage T1a and T1b after segmentectomy or lobectomy. No significant difference was found in overall or disease-free survival for those with T1a after (A) segmentectomy or (B) lobectomy. A marginally significant difference was found in overall and disease-free survival for those with stage T1b after (C) segmentectomy or (D) lobectomy. *CI*, Confidence interval.

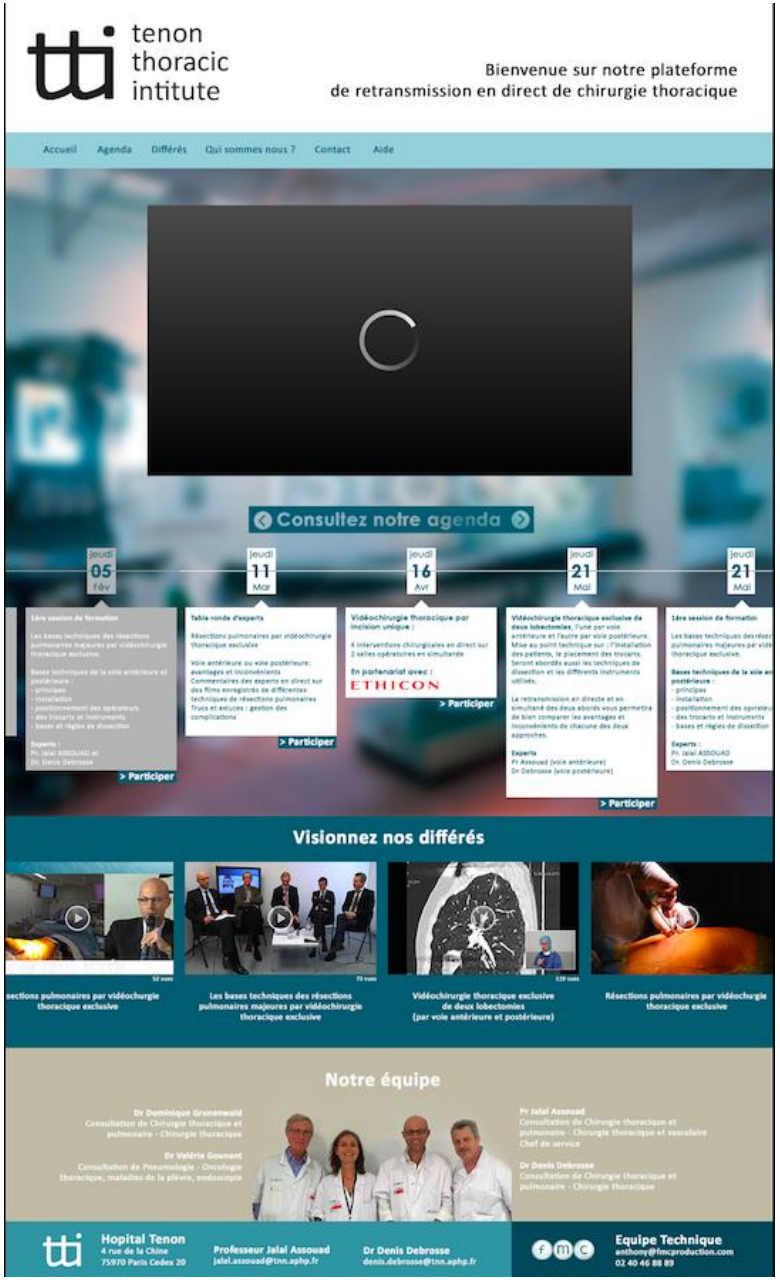
Bo Deng et al. J Thorac Cardiovasc Surg 2014;148:1186-92

Conclusions

- Minimally invasive lobectomy and segmentectomy + lymphadenectomy are safe approaches (less morbidity than thoracotomy)
- Literature shows equivalent long term results comparing VATS to thoracotomy in the treatment of early stage NSCLC
- Lack in randomized trials
- Sub-lobar resections (segmentectomy) could become the gold standard in early stage resections (results of both randomized trials)

Thank you for your attention

Tenon Thoracic Institute
Surgical e-learning plateforme
Free registery
www.tenon.thoracic.institut



Hôpitaux Universitaires Est Parisien
TENON

tenon thoracic intitute