Chirurgická léčba rakoviny plic
se zaměřením na léčbu časných stadií

Robert Lischke

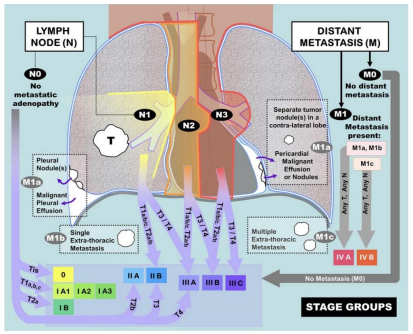
III. chirurgická klinika 1. LF UK a FN Motol

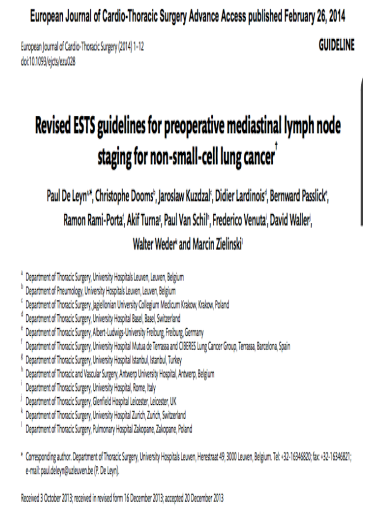
Pneumoonkochirurgické centrum FN Motol

Kontroverze

- Staging – indikace multidisciplinárního týmu
- Rozsah operačního výkonu
  - Rozsah plicní resekce
  - Mediastinální lymfadenektomie
  - Lokální recidiva po operačním výkonu
- Invazivita operačního výkonu
- Národní organizace chirurgické péče o pacienta s Ca plic

Staging (restaging)





European Journal of Cardio-Thoracic Surgery Advance Access published February 26, 2014

European Journal of Cardio-Thoracic Surgery (2014) 1–12
doi:10.1093/ejcts/ezu028

GUIDELINE

Revised ESTS guidelines for preoperative mediastinal lymph node staging for non-small-cell lung cancer†

Paul De Leyn*,a, Christophe Doomsb, Jaroslaw Kuzdzalc, Didier Lardinoisd, Bernward Passlickd, Ramon Rami-Portae, Akif Turnaf, Paul Van Schilg, Federico Venutah, David Wallerh, Walter Wederi and Marcin Zielinskij

a Department of Thoracic Surgery, University Hospitals Leuven, Leuven, Belgium
b Department of Pneumology, University Hospitals Leuven, Leuven, Belgium
c Department of Thoracic Surgery, Jagiellonian University Collegium Medicum Krakow, Krakow, Poland
d Department of Thoracic Surgery, University Hospital Basel, Basel, Switzerland
e Department of Thoracic Surgery, Albert Ludwigs University Freiburg, Freiburg, Germany
f Department of Thoracic Surgery, University Hospital Mutua de Terrassa and CIBERES Lung Cancer Group, Terrassa, Barcelona, Spain
g Department of Thoracic Surgery, University Hospital Istanbul, Istanbul, Turkey
h Department of Thoracic and Vascular Surgery, Antwerp University Hospital, Antwerp, Belgium
i Department of Thoracic Surgery, University Hospital, Rome, Italy
j Department of Thoracic Surgery, Glenfield Hospital Leicester, Leicester, UK
k Department of Thoracic Surgery, University Hospital Zurich, Zurich, Switzerland
l Department of Thoracic Surgery, Pulmonary Hospital Zakopane, Zakopane, Poland

* Corresponding author. Department of Thoracic Surgery, University Hospitals Leuven, Herestraat 49, 3000 Leuven, Belgium. Tel: +32-16344600; fax: +32-16344607; e-mail: paul.deleyn@uzleuven.be (P. De Leyn).

Received 3 October 2013; received in revised form 16 December 2013; accepted 20 December 2013

- Zásadní chyba indikovat operaci bez detailního stagingu

- Goldstraw P. The IASLC lung cancer staging project: proposals for the revision of the TNM stage groupings in the forthcoming (seventh) edition of the TNM classification of malignant tumours. J Thorac Oncol 2007; 2: 706–714

- Léčba a prognóza je zcela závislá na stadiu v době diagnózy

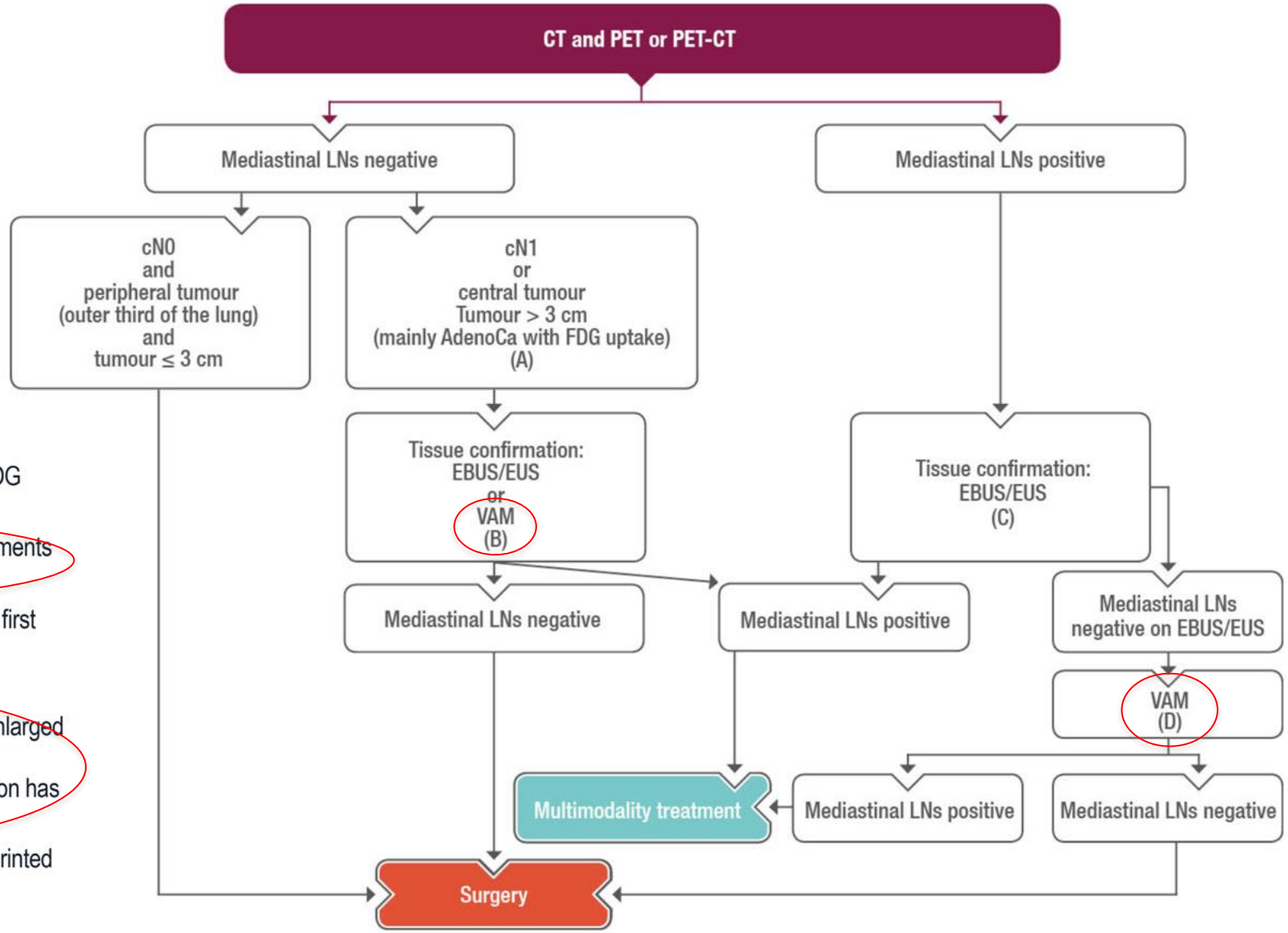
- Postižení hilových a mediastinálních uzlin – zásadně důležitý prognostický faktor – **zásadní faktor pro plánovaní chirurgické léčby**

- Velikost tumoru a prorůstání do okolních struktur nemusí být limitem operace – **neoprávněná kontraindikace chirurgického výkonu**

CLINICAL PRACTICE GUIDELINES

Staging and risk assessment

Locoregional LN staging in patients with non-metastatic NSCLC



(A) In tumours > 3 cm (mainly in adenocarcinoma with high FDG uptake) invasive staging should be considered

(B) Depending on local expertise to adhere to minimal requirements for staging

(C) Endoscopic techniques are minimally invasive and are the first choice if local expertise with EBUS/EUS needle aspiration is available

(D) Due to its higher NPV, in the case of PET-positive or CT-enlarged mediastinal LNs, VAM with nodal dissection or biopsy remain indicated when endoscopic staging is negative. Nodal dissection has an increased accuracy over biopsy

De Leyn P et al. Eur J Cardiothorac Surg 2014;3:787–98. Reprinted with permission.

ESMO

CLINICAL PRACTICE GUIDELINES

Staging and risk assessment

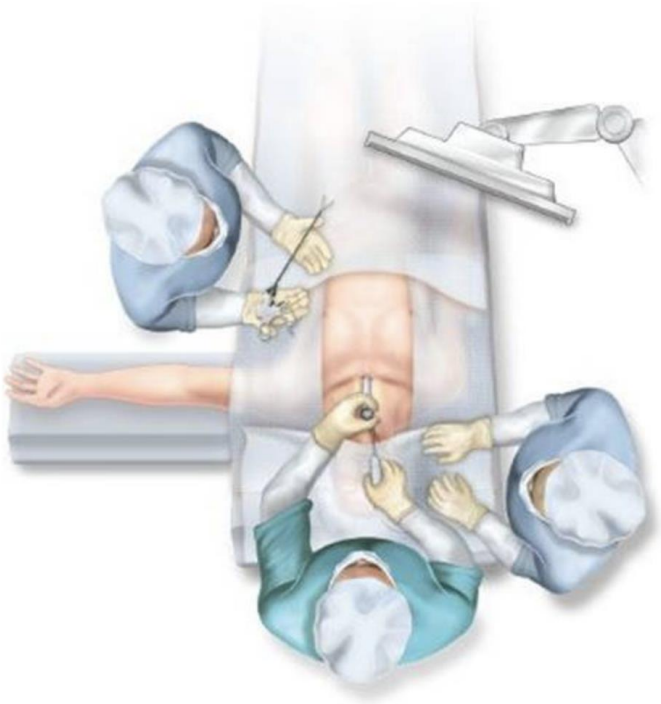
Locoregional staging

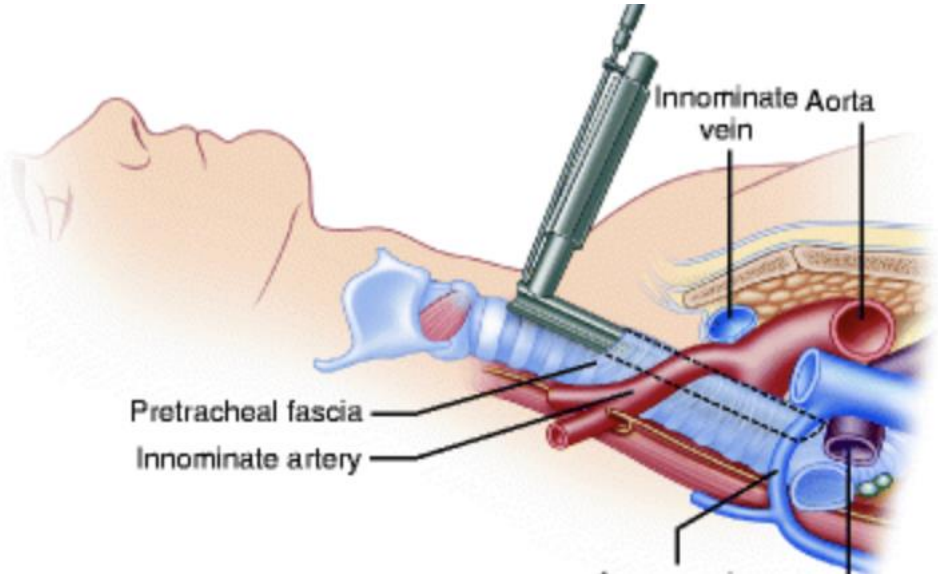
Summary of recommendations	LoE, GoR
The size of the invasive component should be used to assign T category	III, A
Subsolid lesions need dedicated radiological expertise for evaluation	V, A
Two primaries should be separately evaluated, staged and treated	III, A
Endosonography is recommended for abnormal mediastinal/hilar LNs	I, A
Needle aspiration under EBUS and/or EUS is preferred for pathological confirmation	I, A
Mediastinoscopy is indicated if EBUS and/or EUS negative	I, A
Screening brain MRI might be useful in patients considered for curative therapy	III, B

ESMO

Mediastinoskopie

- Indikace multidisciplinárního týmu





Rozsah operačního výkonu

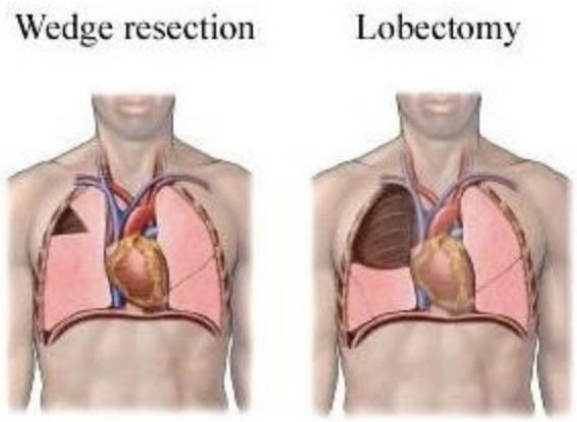
- Onkologický aspekt
  - Přežívání
    - Open/VATS/RATS
    - (anatomické vs subanatomické resekce)
  - Upstaging – rozsah lymfadenektomie – open/VATS
  - Lokální recidiva

- Aspekt invazivity operačního výkonu
  - Bolest
  - Doba hospitalizace JIP
  - Doba hospitalizace
  - Kvalita života
  - …….

Rozsah resekce plic

- Stadium I a II

- Lobektomie
- Segmentektomie
- Klínovitá resekce
- Lymfadenektomie



- Zlatý standard
- Mortalita 2 %

Heterogenita pacientů – individuální přístup

Funkční aspekt
Celkový stav
Věk
Komorbidity

Onkologický aspekt
Staging
Rozsah výkonu Invazivita výkonu volba přístupu Open/VATS/RATS

Onkologické aspekty

Thoracoscopic Approach to Lobectomy for Lung Cancer Does Not Compromise Oncologic Efficacy

Mark F. Berry, MD, Thomas A. D'Amico, MD, Mark W. Onaitis, MD, and Chris R. Kelsey, MD

Division of Thoracic Surgery and Department of Radiation Oncology, Duke University Medical Center, Durham, North Carolina

Background. We compared survival between video-assisted thoracoscopic surgery (VATS) and thoracotomy approaches to lobectomy for non-small cell lung cancer.

Methods. Overall survival of patients who had lobectomy for any stage non-small cell lung cancer without previous chemotherapy or radiation from 1996 to 2008 was evaluated using the Kaplan-Meier method and multivariate Cox analysis. Propensity scoring was used to assess the impact of selection bias.

Results. Overall, 1,087 patients met inclusion criteria (610 VATS, 477 thoracotomy). Median follow-up was not significantly different between VATS and thoracotomy patients overall (53.4 versus 45.4 months, respectively; $p = 0.06$) but was longer for thoracotomy for surviving patients (102.4 versus 67.9 months, $p < 0.0001$). Thoracotomy patients had larger tumors (3.9 ± 2.3 versus 2.8 ± 1.5 cm, $p < 0.0001$), and more often had higher stage cancers (50% [n = 237] versus 71% [n = 435] stage I, $p < 0.0001$) compared with VATS patients. In multivariate analysis of all patients, thoracotomy approach (hazard ratio [HR] 1.22, $p = 0.01$), increasing age (HR 1.02 per year, $p < 0.0001$), pathologic stage (HR 1.45 per stage, $p < 0.0001$), and male sex (HR 1.35, $p = 0.0001$) predicted worse survival. In a cohort of 560 patients (311 VATS, 249 thoracotomy) who were assembled using propensity scoring and were similar in age, stage, tumor size, and sex, the operative approach did not impact survival ($p = 0.5$), whereas increasing age (HR 1.02 per year, $p = 0.01$), pathologic stage (HR 1.44 per stage, $p < 0.0001$), and male sex (HR 1.29, $p = 0.01$) predicted worse survival.

Conclusions. The thoracoscopic approach to lobectomy for non-small cell lung cancer does not result in worse long-term survival compared with thoracotomy.

(Ann Thorac Surg 2014;■:■–■)

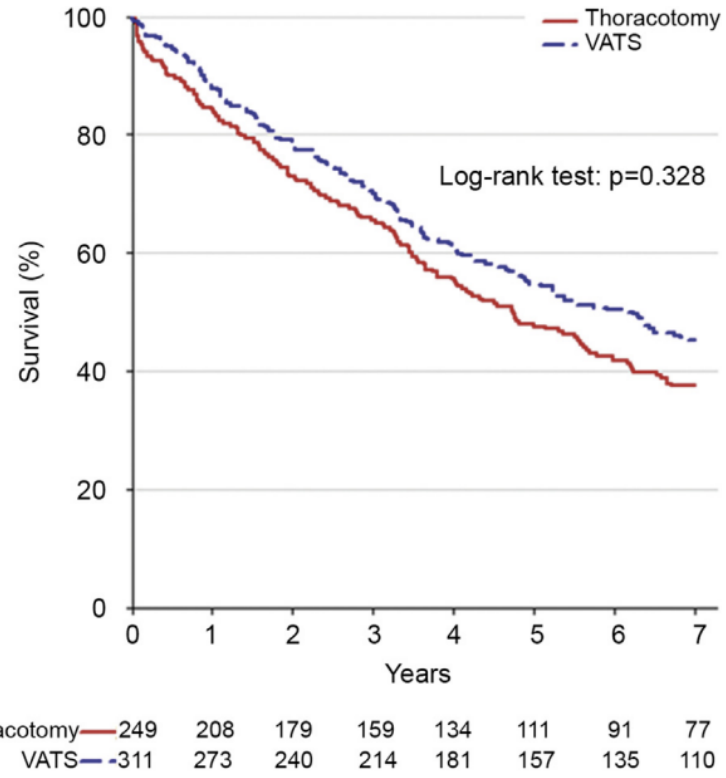


Fig 2. Survival of propensity-matched patients stratified by operative approach (log rank p = 0.3). (Red line = thoracotomy; blue line = video-assisted thoracoscopic surgery [VATS].)

Onkologické aspekty

A National Study of Nodal Upstaging After Thoracoscopic Versus Open Lobectomy for Clinical Stage I Lung Cancer

Peter B. Licht, MD, PhD, Ole Dan Jørgensen, MD, PhD, Lars Ladegaard, MD, and Erik Jakobsen, MD, MPM

Department of Cardiothoracic Surgery and Danish Lung Cancer Registry, Odense University Hospital, Odense, Denmark

Background. Nodal upstaging after surgical intervention for non-small cell lung cancer (NSCLC) occurs when unsuspected lymph node metastases are found during the final evaluation of surgical specimens. Recent data from The Society of Thoracic Surgery (STS) database demonstrated significantly lower nodal upstaging after thoracoscopic (VATS) lobectomy than after thoracotomy. STS data, however, may be biased from voluntary reporting, and survival was not investigated. We used a complete national registry to compare nodal upstaging and survival after lobectomy by VATS or thoracotomy.

Methods. The Danish Lung Cancer Registry was used to identify patients who underwent lobectomy for clinical stage I NSCLC from 2007 to 2011. Patient demographics, comorbidity, preoperative staging, surgical approach, number of lymph nodes harvested, final pathology, and survival were evaluated. Nodal upstaging was identified by comparing cT N M with pT N M.

Results. Lobectomy for clinical stage I NSCLC was performed in 1,513 patients: 717 (47%) by VATS and 796 (53%) by thoracotomy. Nodal upstaging occurred in 281 patients (18.6%) and was significantly higher after thoracotomy for N1 upstaging (13.1% vs 8.1%; $p < 0.001$) and N2 upstaging (11.5% vs 3.8%; $p < 0.001$). Overall unadjusted survival was significantly higher after VATS, but after adjusting for differences in sex, age, comorbidity, and pT N M by Cox regression analysis, we found no difference between VATS and thoracotomy (hazard ratio, 0.98; 95% confidence interval, 0.80 to 1.22, $p = 0.88$).

Conclusions. National data confirm that nodal upstaging was lower after VATS than after open lobectomy for clinical stage I NSCLC. Multivariate survival analysis, however, showed no difference in survival, indicating that differences in nodal upstaging result from patient selection for reasons not captured in our registry.

(Ann Thorac Surg 2013;96:943–50)

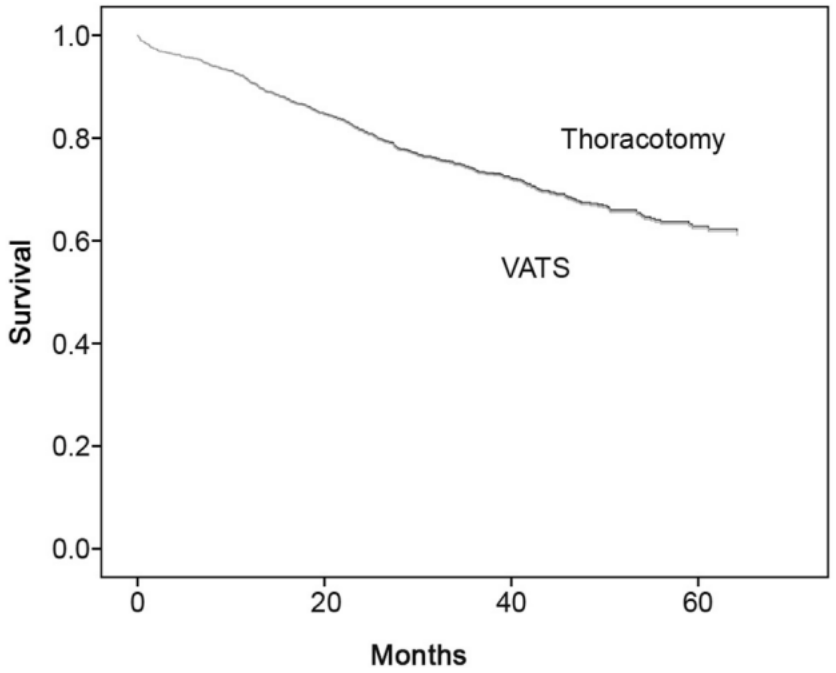
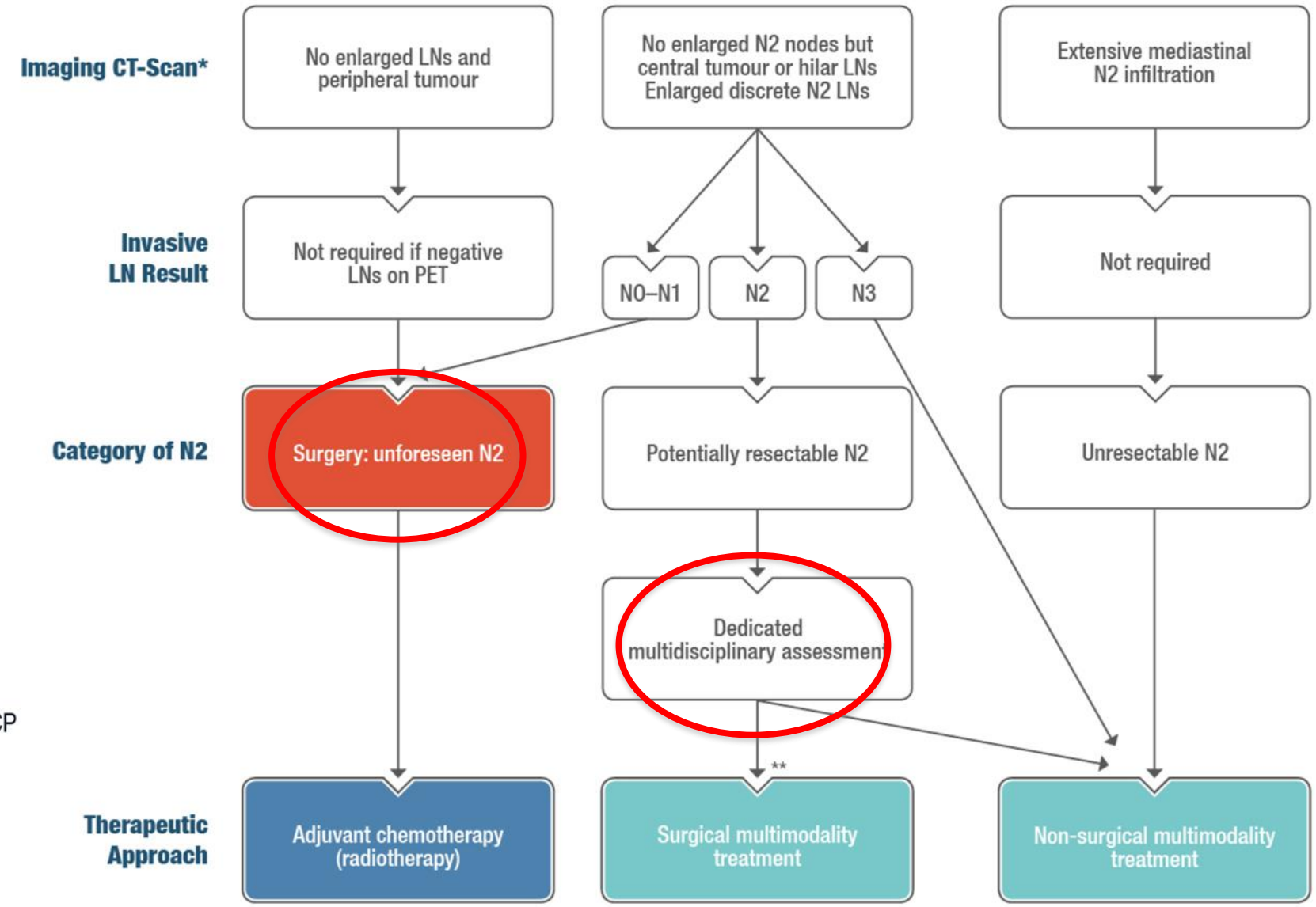


Fig 3. Overall survival after adjusting for differences between patients undergoing thoracotomy and video-assisted thoracoscopic surgery (VATS) demonstrates that the surgical approach per se did not influence survival significantly.

CLINICAL PRACTICE GUIDELINES

Staging and risk assessment

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



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

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

ESMO

Sublobární resekce

Comparison of pulmonary segmentectomy and lobectomy: Safety results of a randomized trial

Kenji Suzuki, MD,[a] Hisashi Saji, MD, PhD,[b] Keiju Aokage, MD, PhD,[c] Shun-ichi Watanabe, MD,[d] Morihito Okada, MD, PhD,[e] Junki Mizusawa, ME,[f] Ryu Nakajima, MD,[g] Masahiro Tsuboi, MD, PhD,[c] Shinichiro Nakamura, PhD,[h] Kenichi Nakamura, MD,[f] Tetsuya Mitsudomi, MD,[i] and Hisao Asamura, MD,[j] on behalf of the West Japan Oncology Group and Japan Clinical Oncology Group*

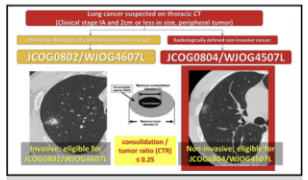
ABSTRACT

Background: No definitive comparisons of surgical morbidity between segmentectomy and lobectomy for non–small cell lung cancer have been reported.

Methods: We conducted a randomized controlled trial to confirm the noninferiority of segmentectomy to lobectomy in regard to prognosis (trial No. JCOG0802/WJOG4607L). Patients with invasive peripheral non–small cell lung cancer tumor of a diameter ≤2 cm were randomized to undergo either lobectomy or segmentectomy. The primary end point was overall survival. Here, we have focused on morbidity and mortality. Predictors of surgical morbidity were evaluated by the mode of surgery. Segmentectomy was categorized into simple and complex. Simple segmentectomy was defined as segmental resection of the right or left segment 6, left superior, or lingular segment. Complex segmentectomy was resection of the other segment. This trial is registered with the University Hospital Medical Information Network–Clinical Trial Registry (UMIN000002317).

Results: Between August 10, 2009, and October 21, 2014, 1106 patients (lobectomy n = 554 and segmentectomy n = 552) were enrolled. No mortality was noted. Complications (grade ≥ 2) occurred in 26.2% and 27.4% in the lobectomy and segmentectomy arms ($P = .68$), respectively. Fistula/pulmonary-lung (air leak) was detected in 21 (3.8%) and 36 (6.5%) patients in the lobectomy and segmentectomy arms ($P = .04$), respectively. Multivariable analysis revealed that predictors of pulmonary complications, including air leak and empyema (grade ≥ 2) were complex segmentectomy (vs lobectomy) (odds ratio, 2.07; 95% confidence interval, 1.11-3.88; $P = .023$), and > 20 pack-years of smoking (odds ratio, 2.61; 95% confidence interval, 1.14-5.97; $P = .023$).

Conclusions: There was no difference in almost any postoperative measure of intraoperative and postoperative complication in segmentectomy and lobectomy patients, except more air leakage was observed in the segmentectomy arm. Segmentectomy will be a standard treatment if the superior pulmonary function and noninferiority in overall survival are confirmed. (J Thorac Cardiovasc Surg 2019;■:1-13)



The 2 phase III trials, JCOG0802/WJOG4607L and JCOG0804/WJOG4507L, were based on JCOG0201.

Central Message

Segmentectomy and lobectomy for peripheral lung cancer tumors 2.0 cm or smaller in size were feasible; however, segmentectomy was not less invasive than lobectomy in terms of postoperative air leak.

Perspective

Segmentectomy was not always less invasive than lobectomy and complex segmentectomy could result in frequent early postoperative pulmonary morbidity. Thus, although segmentectomy will be a standard treatment if the superior pulmonary function and its noninferiority in overall survival are confirmed, postoperative morbidity should be taken into consideration when deciding on an indication of segmentectomy.

See Commentary on page XXX.

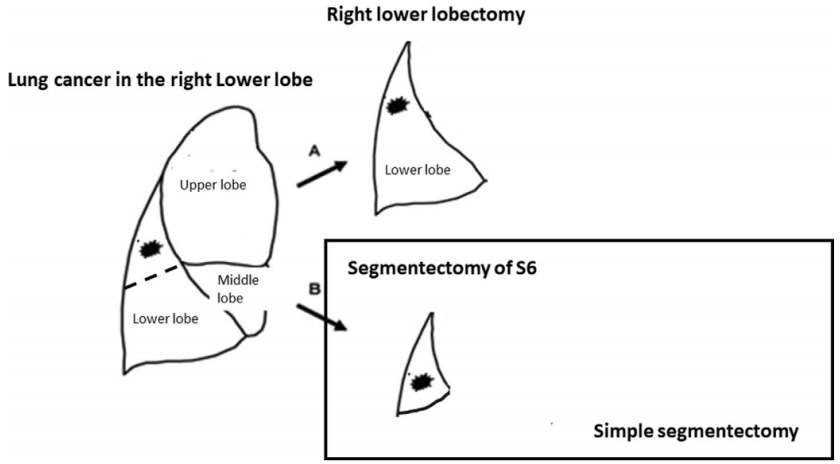


FIGURE 2. Scheme of resection of segment 6 in the right lower lobe, and this is categorized as simple segmentectomy. Simple segmentectomy was defined as resection of the right or left superior segment of the lower lobe (S6), the left superior, and the lingular segment. Resection of those segments is simple because there is just 1 intersegmental plane to identify.

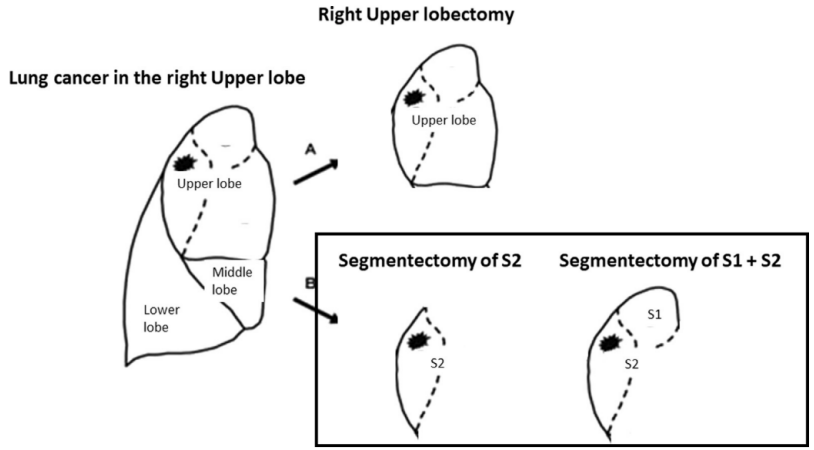


FIGURE 3. Scheme of resection of segment of S2 or bisegments of S1 and S2 in the right upper lobe, and both are categorized as complex segmentectomy. Complex segmentectomy was defined as resection of any segment other than bilateral superior segment of the lower lobe (S6), lingular, or superior segment of the left upper lobe. Moreover, complex segmentectomy was defined as resection of any segment that had more than 1 intersegmental plane.

Suzuki et al. J Thorac Cardiovasc Surg. 2019

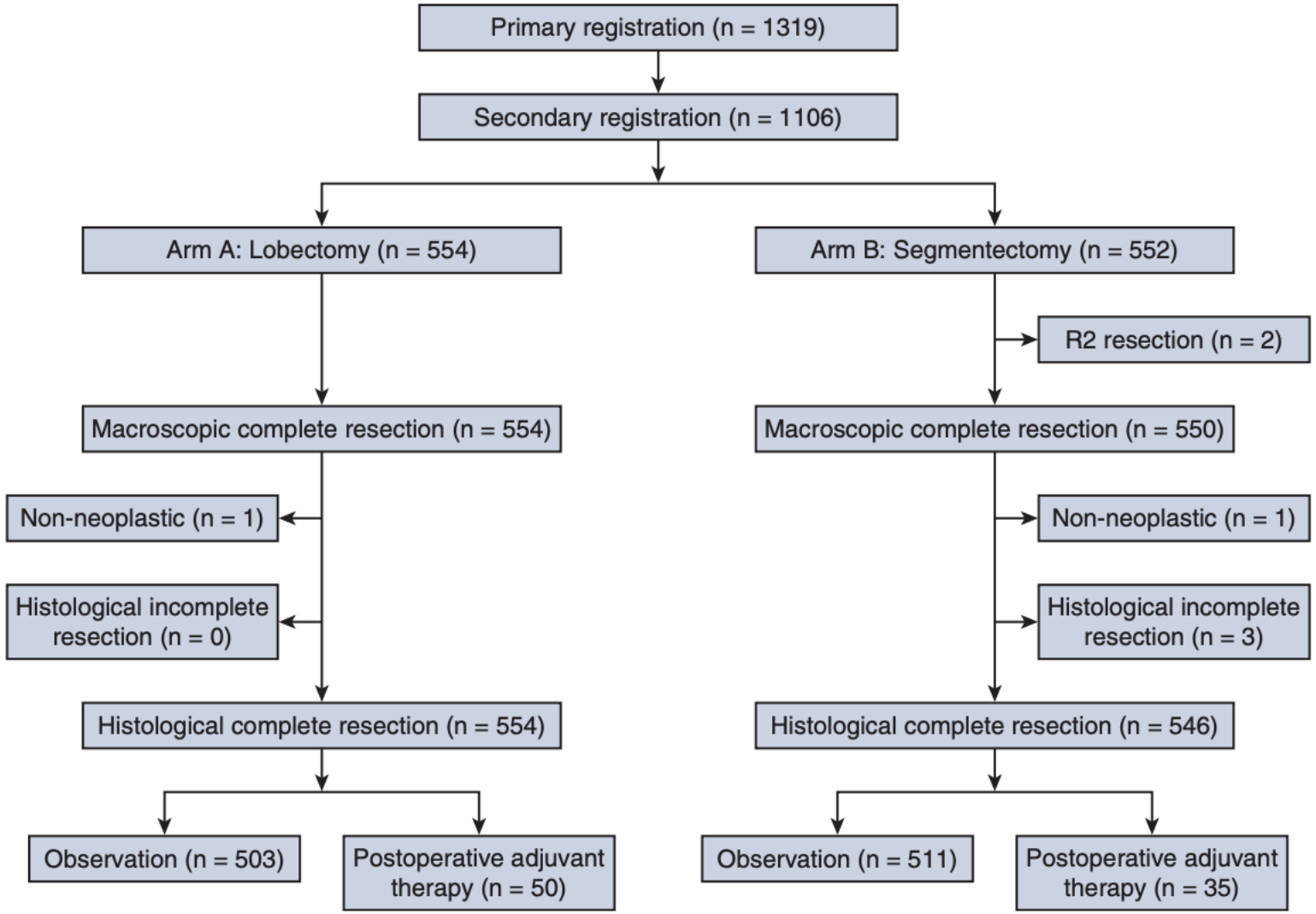


FIGURE 4. CONSORT diagram of the JCOG0802/WJOG4607L trial, which compared lobectomy and segmentectomy for the treatment of lung cancer with radiologically invasive appearance on thin-section computed tomography with stage I disease. Primary registration was done in 1319 patients and 1106 were randomized intraoperatively. Finally, 554 and 552 patients were randomized to lobectomy and segmentectomy arms, respectively.

Comparison of pulmonary segmentectomy and lobectomy: Safety results of a randomized trial

Kenji Suzuki, MD,[a] Hisashi Saji, MD, PhD,[b] Keiju Aokage, MD, PhD,[c] Shun-ichi Watanabe, MD,[d] Morihito Okada, MD, PhD,[e] Junki Mizusawa, ME,[f] Ryu Nakajima, MD,[g] Masahiro Tsuboi, MD, PhD,[c] Shinichiro Nakamura, PhD,[h] Kenichi Nakamura, MD,[f] Tetsuya Mitsudomi, MD,[i] and Hisao Asamura, MD,[j] on behalf of the West Japan Oncology Group and Japan Clinical Oncology Group*

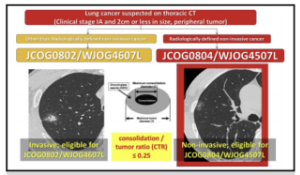
ABSTRACT

Background: No definitive comparisons of surgical morbidity between segmentectomy and lobectomy for non–small cell lung cancer have been reported.

Methods: We conducted a randomized controlled trial to confirm the noninferiority of segmentectomy to lobectomy in regard to prognosis (trial No. JCOG0802/WJOG4607L). Patients with invasive peripheral non–small cell lung cancer tumor of a diameter ≤2 cm were randomized to undergo either lobectomy or segmentectomy. The primary end point was overall survival. Here, we have focused on morbidity and mortality. Predictors of surgical morbidity were evaluated by the mode of surgery. Segmentectomy was categorized into simple and complex. Simple segmentectomy was defined as segmental resection of the right or left segment 6, left superior, or lingular segment. Complex segmentectomy was resection of the other segment. This trial is registered with the University Hospital Medical Information Network–Clinical Trial Registry (UMIN000002317).

Results: Between August 10, 2009, and October 21, 2014, 1106 patients (lobectomy n = 554 and segmentectomy n = 552) were enrolled. No mortality was noted. Complications (grade ≥ 2) occurred in 26.2% and 27.4% in the lobectomy and segmentectomy arms ($P = .68$), respectively. Fistula/pulmonary-lung (air leak) was detected in 21 (3.8%) and 36 (6.5%) patients in the lobectomy and segmentectomy arms ($P = .04$), respectively. Multivariable analysis revealed that predictors of pulmonary complications, including air leak and empyema (grade ≥ 2) were complex segmentectomy (vs lobectomy) (odds ratio, 2.07; 95% confidence interval, 1.11-3.88; $P = .023$), and > 20 pack-years of smoking (odds ratio, 2.61; 95% confidence interval, 1.14-5.97; $P = .023$).

Conclusions: There was no difference in almost any postoperative measure of intraoperative and postoperative complication in segmentectomy and lobectomy patients, except more air leakage was observed in the segmentectomy arm. Segmentectomy will be a standard treatment if the superior pulmonary function and noninferiority in overall survival are confirmed. (J Thorac Cardiovasc Surg 2019;■:1-13)



The 2 phase III trials, JCOG0802/WJOG4607L and JCOG0804/WJOG4507L, were based on JCOG0201.

Central Message

Segmentectomy and lobectomy for peripheral lung cancer tumors 2.0 cm or smaller in size were feasible; however, segmentectomy was not less invasive than lobectomy in terms of postoperative air leak.

Perspective

Segmentectomy was not always less invasive than lobectomy and complex segmentectomy could result in frequent early postoperative pulmonary morbidity. Thus, although segmentectomy will be a standard treatment if the superior pulmonary function and its noninferiority in overall survival are confirmed, postoperative morbidity should be taken into consideration when deciding on an indication of segmentectomy.

See Commentary on page XXX.

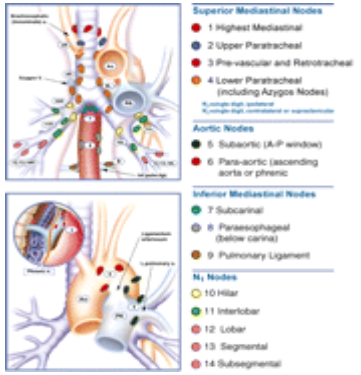
Segmentektomie/lobektomie – stejné výsledky u periferní T pod 2cm

Segmentektomie není méně invazivní pro větší výskyt air leaku

Suzuki et al. J Thorac Cardiovasc Surg. 2019

Systematická lymfadenektomie

- right upper and middle lobe: 2R, 4R and **7**;
- right lower lobe: 4R, **7**, 8 and 9;
- left upper lobe: 5, 6 and **7**;
- left lower lobe: **7**, 8 and 9.
- In total, the lymphadenectomy specimen should include at least 6 nodes.



ELSEVIER

European Journal of Cardio-thoracic Surgery 30 (2006) 787–792

EUROPEAN JOURNAL OF CARDIO-THORACIC SURGERY

www.elsevier.com/locate/ejcts

Invited paper

ESTS guidelines for intraoperative lymph node staging in non-small cell lung cancer☆

Didier Lardinois[a], Paul De Leyn[b], Paul Van Schil[c], Ramon Rami Porta[d], David Waller[e], Bernward Passlick[f], Marcin Zielinski[g], Klaus Junker[h], Erino Angelo Rendina[i], Hans-Beat Ris[j], Joachim Hasse[k], Frank Detterbeck[l], Toni Lerut[b], Walter Weder[a,*]

Lokální rekurence

Local Cancer Recurrence: The Realities, Challenges, and Opportunities for New Therapies

David A. Mahvi, MD[1]; Rong Liu, MD PhD[2]; Mark W. Grinstaff, PhD[3]; Yolonda L. Colson, MD PhD[4]; Chandrajit P. Raut, MD MSc[5]

[1]Postdoctoral Research Fellow, Division of Surgical Oncology, Department of Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, MA; [2]Instructor in Surgery, Division of Thoracic Surgery, Department of Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, MA; [3]Michael A. Bell Family Distinguished Chair in Healthcare Innovation and Professor of Translational Research, Biomedical Engineering, Chemistry, Materials Science and Engineering, and Medicine

Abstract: Locoregional recurrence negatively impacts both long-term survival and quality of life for several malignancies. For appropriate-risk patients with an isolated, resectable, local recurrence, surgery represents the only potentially curative therapy. However, oncologic outcomes remain inferior for patients with locally recurrent disease even after macroscopically complete resection. Unfortunately, these operations are often extensive, with significant perioperative morbidity and mortality. This review highlights selected malignancies (mesothelioma, sarcoma, lung cancer, breast cancer, rectal cancer, and peritoneal surface malignancies) in which surgical resection is a key treatment modality and local recurrence plays a significant role in overall oncologic outcome with regard to survival and quality of life. For each type of cancer, the current, state-of-the-art treatment strategies and

TABLE 5. Outcomes Associated With Various Treatment Options for Patients With Locally Recurrent, Early-Stage Non–Small Cell Lung Cancer

TREATMENT	LOCOREGIONAL RECURRENCE, %	POSITIVE MARGIN RATE, %
Surgery		
Lobectomy	4.9-7	1.4
Segmentectomy	9.1-16	2.1
Wedge resection	11-27.8	4.0
Stereotactic body radiotherapy[a]	8-15	NA

Abbreviations: NA, not applicable. [a]Stereotactic body radiotherapy only includes early-stage non–small cell lung cancers.

Non–small cell lung cancer

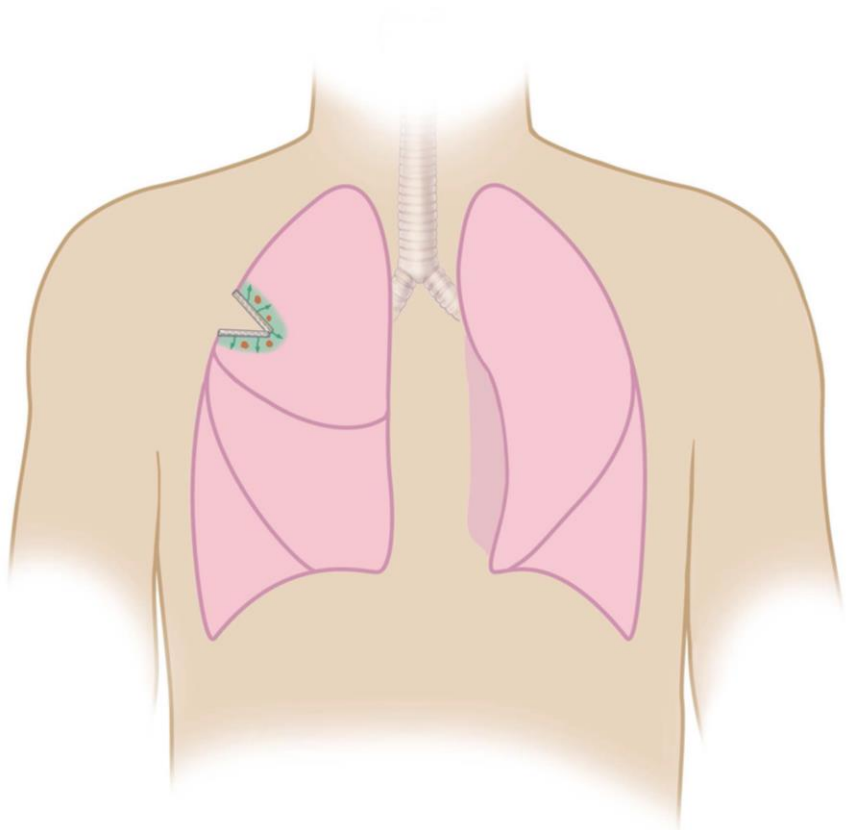
- Surgery (lobectomy, segmentectomy, wedge)
- Chemotherapy
- SBRT
- Bevacizumab
- Surgical re-resection
- Chemotherapy
- Radiotherapy
- Nab-paclitaxel
- ALK inhibitors (phase 3)
- Immunotherapy (phase 3)
- TKI (phase 2/3)
- Brachytherapy (phase 3)

Corresponding author: Chandrajit

Biomaterials. 2016 January ; 76: 273–281. doi:10.1016/j.biomaterials.2015.10.060.

Prevention of Lung Cancer Recurrence Using Cisplatin-Loaded Superhydrophobic Nanofiber Meshes

Jonah A. Kaplan[1], **Rong Liu**[2], **Jonathan D. Freedman**[1], **Robert Padera**[3], **John Schwartz**[4], **Yolonda L. Colson**[2,*], and **Mark W. Grinstaff**[1,*]



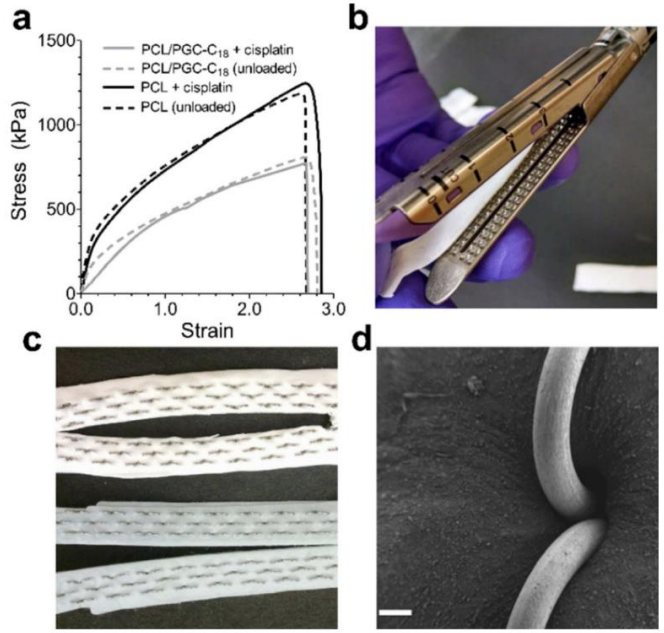


Figure 4.

Mechanical (tensile) testing and surgical stapling abilities of superhydrophobic nanofiber meshes. (**a**) Stress-strain curves for electrospun meshes consisting of PCL (black) and PCL/PGC-C_{18} (grey); solid lines = drug-loaded, dashed lines = unloaded. (**b**) Approximate 1-cm wide strips cut from a larger mesh being loaded into a surgical stapler. (**c**) A stapled superhydrophobic mesh (top) and poly(glycolic acid) (clinical analogue) surgical mesh (bottom). (**d**) SEM of stapled mesh (scale bar = 200 μm).

CLINICAL PRACTICE GUIDELINES

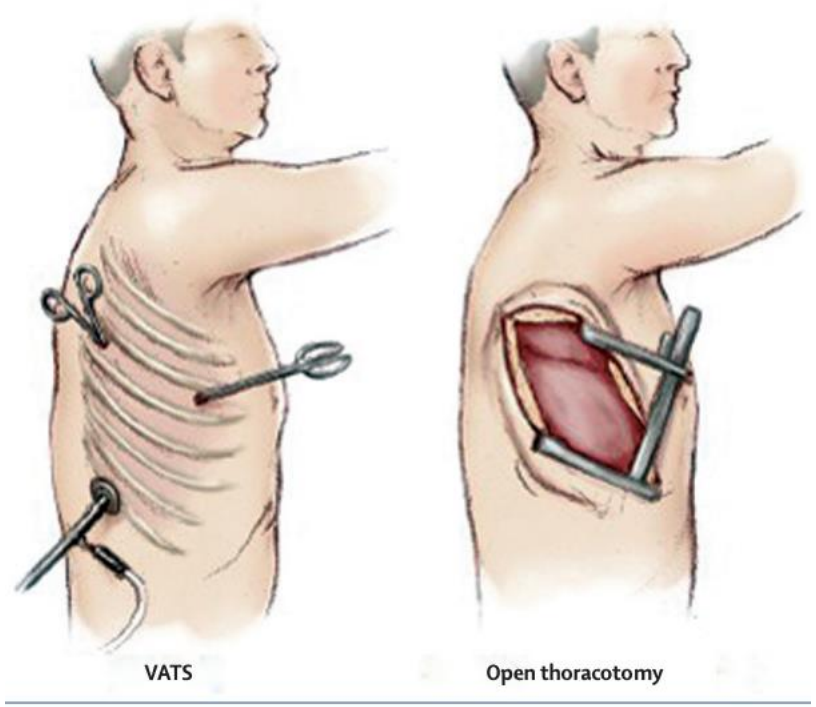
Treatment

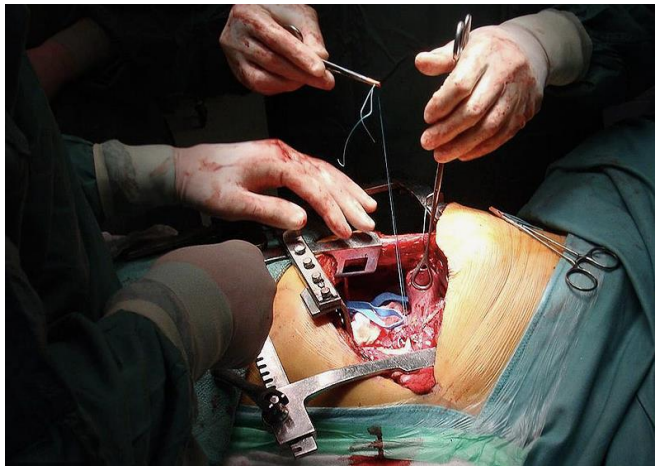
Early NSCLC (stages I and II)
– Surgery

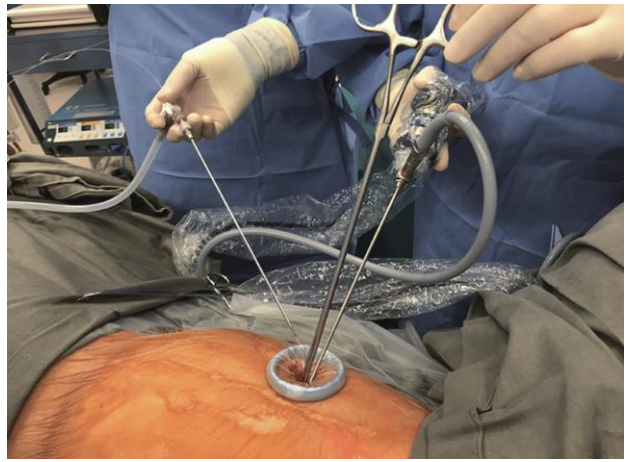
Summary of recommendations	LoE, GoR
Surgery is the preferred treatment for stages I and II • Recommended for patients with only a non-centrally located resectable tumour on both CT and PET images • Anatomical resection is preferred over wedge resection	III, A I, A
Segmentectomy acceptable for pure GGO lesions or adenocarcinomas *in situ* or with minimal invasion	III, B
Lobectomy is the standard surgical treatment of tumours ≥ 2 cm with solid appearance on CT	II, B
LN dissection conform to IASLC specifications for staging	III, A
Thoracotomy or VATS access can be carried out as appropriate according to surgeon expertise	III, A
VATS is the preferred choice in stage I	V, C
Complete resection is recommended whenever possible in patients with multifocal disease • All patients with multifocal lung cancer should be discussed by an MDT	III, B

ESMO

Invazivita operačního výkonu







Robotic Thoracic Surgery

- Otevřeně/VATS/RATS

European Journal of Cardio-Thoracic Surgery 49 (2016) 870–875
doi:10.1093/ejcts/ezv205 Advance Access publication 18 June 2015

ORIGINAL ARTICLE

Cite this article as: Laursen LØ, Petersen RH, Hansen HJ, Jensen TK, Ravn J, Konge L. Video-assisted thoracoscopic surgery lobectomy for lung cancer is associated with a lower 30-day morbidity compared with lobectomy by thoracotomy. Eur J Cardiothorac Surg 2016;49:870–875.

Video-assisted thoracoscopic surgery lobectomy for lung cancer is associated with a lower 30-day morbidity compared with lobectomy by thoracotomy

Lykke Østergaard Laursen[a,b,*], René Horsleben Petersen[b], Henrik Jessen Hansen[b], Tina Kold Jensen[c], Jesper Ravn[b] and Lars Konge[a]

[a] Centre for Clinical Education, Centre for HR, The Capital Region of Denmark, Copenhagen, Denmark
[b] Department of Cardio-Thoracic, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark
[c] Department of Environmental Medicine, University of Southern Denmark, Odense, Denmark

* Corresponding author: Nørrebrogade 217, 3.th, 2200 Copenhagen, Denmark. Tel: +45-61-6664 22; e-mail: tgf372@alumni.ku.dk (L.Ø. Laursen).

Received 13 January 2015; received in revised form 8 April 2015; accepted 13 April 2015

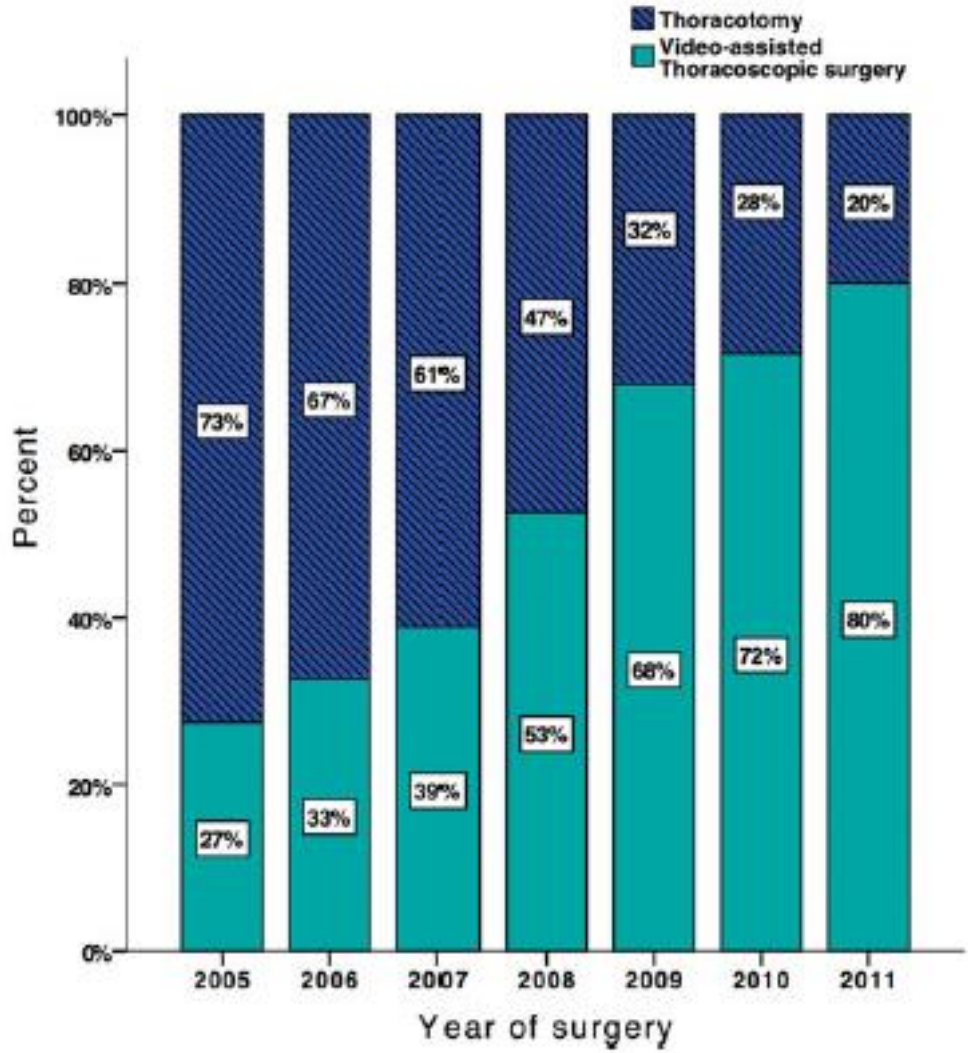
Abstract

OBJECTIVES: Lung cancer is the most common cause of cancer-related deaths worldwide. Survival is highly dependent on surgery. Video-assisted thoracoscopic surgery (VATS) is increasingly chosen over open thoracotomy (OT) because of the possible benefits of the minimally invasive approach. Consequently, our aim was to compare the 30-day morbidity and mortality for lung cancer patients operated by VATS lobectomy or lobectomy by OT.

METHOD: Data were obtained from prospective national and regional databases, including patients who underwent lobectomy for lung cancer in the eastern part of Denmark from 1 January 2005 to 31 December 2011. All patients operated before 2009 were re-staged according to the latest International Association for the Study of Lung Cancer lung cancer classification. Patient characteristics, comorbidities, pathology and operative data were assessed using an independent samples *t*-test, Pearson's χ^2, Fisher's exact test and Mann–Whitney test. Morbidity was assessed using multinomial logistic regression adjusted for gender, age, cancer stage, forced expiratory volume in 1 s (FEV1), year of surgery and Charlson comorbidity score.

RESULTS: In total, 1379 patients underwent lobectomy, 785 patients via VATS and 594 patients via thoracotomy. The two groups were similar in gender and FEV1. The patients operated by VATS were older ($P < 0.001$), and had a lower Charlson comorbidity score ($P = 0.034$), higher frequency of adenocarcinomas ($P < 0.001$) and lower cancer stage ($P < 0.001$). Among the VATS patients, 285 (36.3%) and among the thoracotomy patients, 288 (48.5%) had minor complications ($P < 0.001$); and 157 (20.0%) VATS patients and 212 (35.7%) thoracotomy patients had major complications ($P < 0.001$). The 30-day mortality rate was 1% in the VATS group and 1.5% in the thoracotomy group ($P = 0.47$). Multinomial logistic regression analysis showed that the prevalence of both minor [odds ratio (OR) = 1.51; 95% confidence interval (CI) = 1.18–1.96] and major complications (OR = 1.91, 95% CI = 1.44–2.53) was significantly higher for patients who underwent lobectomy via thoracotomy compared with VATS.

CONCLUSION: Patients undergoing lobectomy via VATS were less likely to have at least one minor complication within the first 30 post-operative days and less likely to have at least one major complication, compared with patients operated by thoracotomy. These findings remained after adjusting for gender, age, FEV1, cancer stage, year of surgery and Charlson comorbidity score.



Postoperative pain and quality of life after lobectomy via video-assisted thoracoscopic surgery or anterolateral thoracotomy for early stage lung cancer: a randomised controlled trial

Morten Bendixen, Ole Dan Jørgensen, Christian Kronborg, Claus Andersen, Peter Bjørn Licht

Lancet Oncol 2016; 17: 836–44

Published Online May 6, 2016 http://dx.doi.org/10.1016/S1470-2045(16)00173-X

See Comment page 699

Department of Cardiothoracic Surgery (M Bendixen PhD, O D Jørgensen PhD, Prof P B Licht PhD) **and Department of Cardiothoracic Anaesthesia** (C Andersen PhD), **Odense University Hospital, Odense, Denmark; and Centre of Health Economics Research (COHERE)** (C Kronborg PhD) **and Odense Patient data Explorative Network (OPEN)** (Prof P B Licht), **University of Southern Denmark, Odense, Denmark**

Correspondence to: Prof Peter B Licht, Department of Cardiothoracic Surgery, Odense University Hospital, Odense DK-5000, Denmark **Peter.Licht@rsyd.dk**

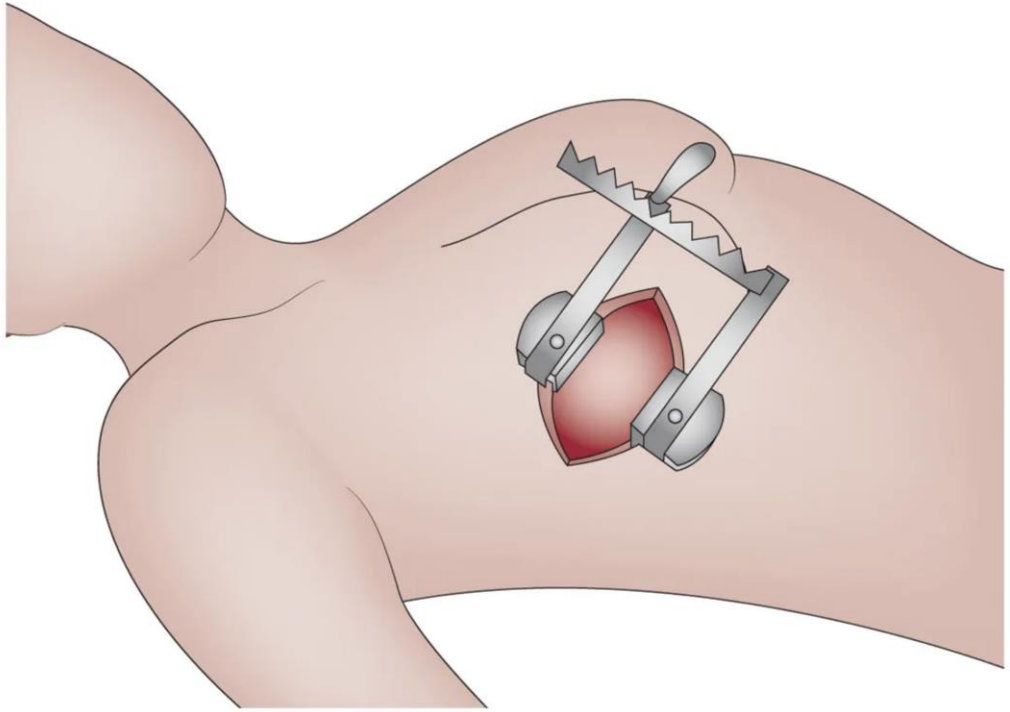
Summary

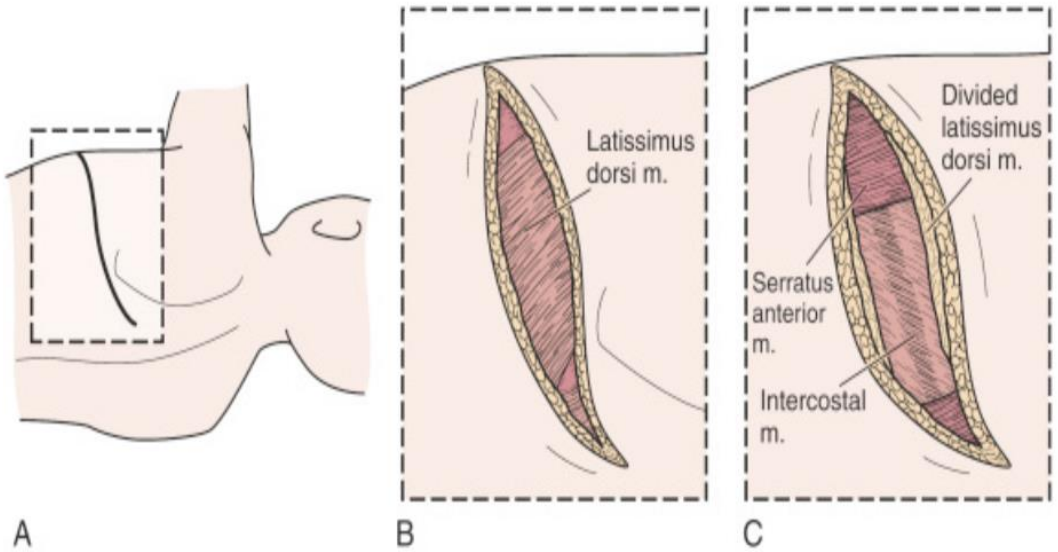
Background Video-assisted thoracoscopic surgery (VATS) is used increasingly as an alternative to thoracotomy for lobectomy in the treatment of early-stage non-small-cell lung cancer, but remains controversial and worldwide adoption rates are low. Non-randomised studies have suggested that VATS reduces postoperative morbidity, but there is little high-quality evidence to show its superiority over open surgery. We aimed to investigate postoperative pain and quality of life in a randomised trial of patients with early-stage non-small-cell lung cancer undergoing VATS versus open surgery.

Methods We did a randomised controlled patient and observer blinded trial at a public university-based cardiothoracic surgery department in Denmark. We enrolled patients who were scheduled for lobectomy for stage I non-small-cell lung cancer. By use of a web-based randomisation system, we assigned patients (1:1) to lobectomy via four-port VATS or anterolateral thoracotomy. After surgery, we applied identical surgical dressings to ensure masking of patients and staff. Postoperative pain was measured with a numeric rating scale (NRS) six times per day during hospital stay and once at 2, 4, 8, 12, 26, and 52 weeks, and self-reported quality of life was assessed with the EuroQol 5 Dimensions (EQ5D) and the European Organisation for Research and Treatment of Cancer (EORTC) 30 item Quality of Life Questionnaire (QLQ-C30) during hospital stay and 2, 4, 8, 12, 26, and 52 weeks after discharge. The primary outcomes were the proportion of patients with clinically relevant moderate-to-severe pain (NRS ≥3) and mean quality of life scores. These outcomes were assessed longitudinally by logistic regression across all timepoints. Data for the primary analysis were analysed by modified intention to treat (ie, all randomised patients with pathologically confirmed non-small-cell lung cancer). This trial is registered with ClinicalTrials.gov, number NCT01278888.

Findings Between Oct 1, 2008, and Aug 20, 2014, we screened 772 patients, of whom 361 were eligible for inclusion and 206 were enrolled. We randomly assigned 103 patients to VATS and 103 to anterolateral thoracotomy. 102 patients in the VATS group and 99 in the thoracotomy group were included in the final analysis. The proportion of patients with clinically relevant pain (NRS ≥3) was significantly lower during the first 24 h after VATS than after anterolateral thoracotomy (VATS 38%, 95% CI 0·28–0·48 *vs* thoracotomy 63%, 95% CI 0·52–0·72, p=0·0012). During 52 weeks of follow-up, episodes of moderate-to-severe pain were significantly less frequent after VATS than after anterolateral thoracotomy (p<0·0001) and self-reported quality of life according to EQ5D was significantly better after VATS (p=0·014). By contrast, for the whole study period, quality of life according to QLQ-C30 was not significantly different between groups (p=0·13). Postoperative surgical complications (grade 3–4 adverse events) were similar between the two groups, consisting of prolonged air leakage over 4 days (14 patients in the VATS group *vs* nine patients in the thoracotomy group), re-operation for bleeding (two *vs* none), twisted middle lobe (one *vs* three) or prolonged air leakage over 7 days (five *vs* six), arrhythmia (one *vs* one), or neurological events (one *vs* two). Nine (4%) patients died during the follow-up period (three in the VATS group and six in the thoracotomy group).

Interpretation VATS is associated with less postoperative pain and better quality of life than is anterolateral thoracotomy for the first year after surgery, suggesting that VATS should be the preferred surgical approach for lobectomy in stage I non-small-cell lung cancer.





Invazivita operačního výkonu

Review Article on Thoracic Surgery

Video-assisted thoracic surgery and open chest surgery in lung cancer treatment: present and future

Frank Detterbeck[1], Laureano Molins[2]

[1]Section of Thoracic Surgery, Department of Surgery, Yale University School of Medicine, New Haven, CT, USA; [2]Thoracic Surgery, Hospital Clínic & Sagrat Cor, University of Barcelona, Barcelona, Spain

Contributions: (I) Conception and design: All authors; (II) Administrative support: None; (III) Provision of study materials or patients: None; (IV) Collection and assembly of data: F Detterbeck; (V) Data analysis and interpretation: F Detterbeck; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

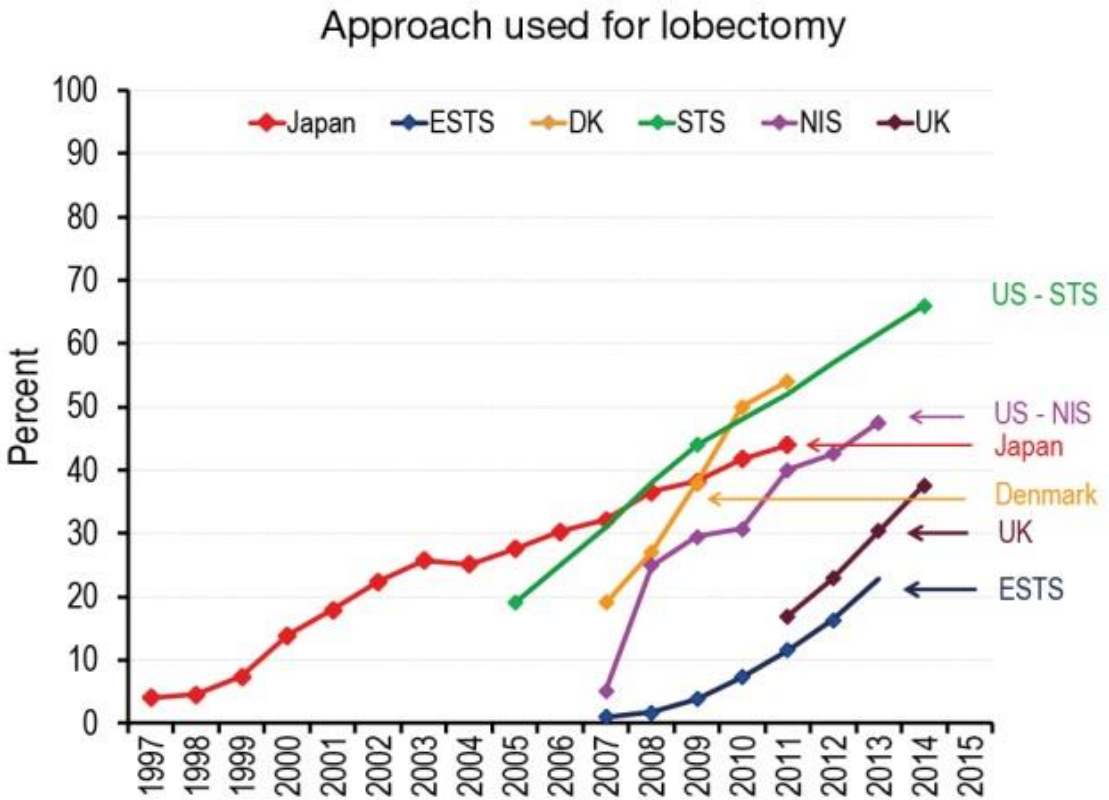
Correspondence to: Frank Detterbeck. Section of Thoracic Surgery, Department of Surgery, Yale University School of Medicine, 330 Cedar St., New Haven, CT, USA. Email: Frank.detterbeck@yale.edu.

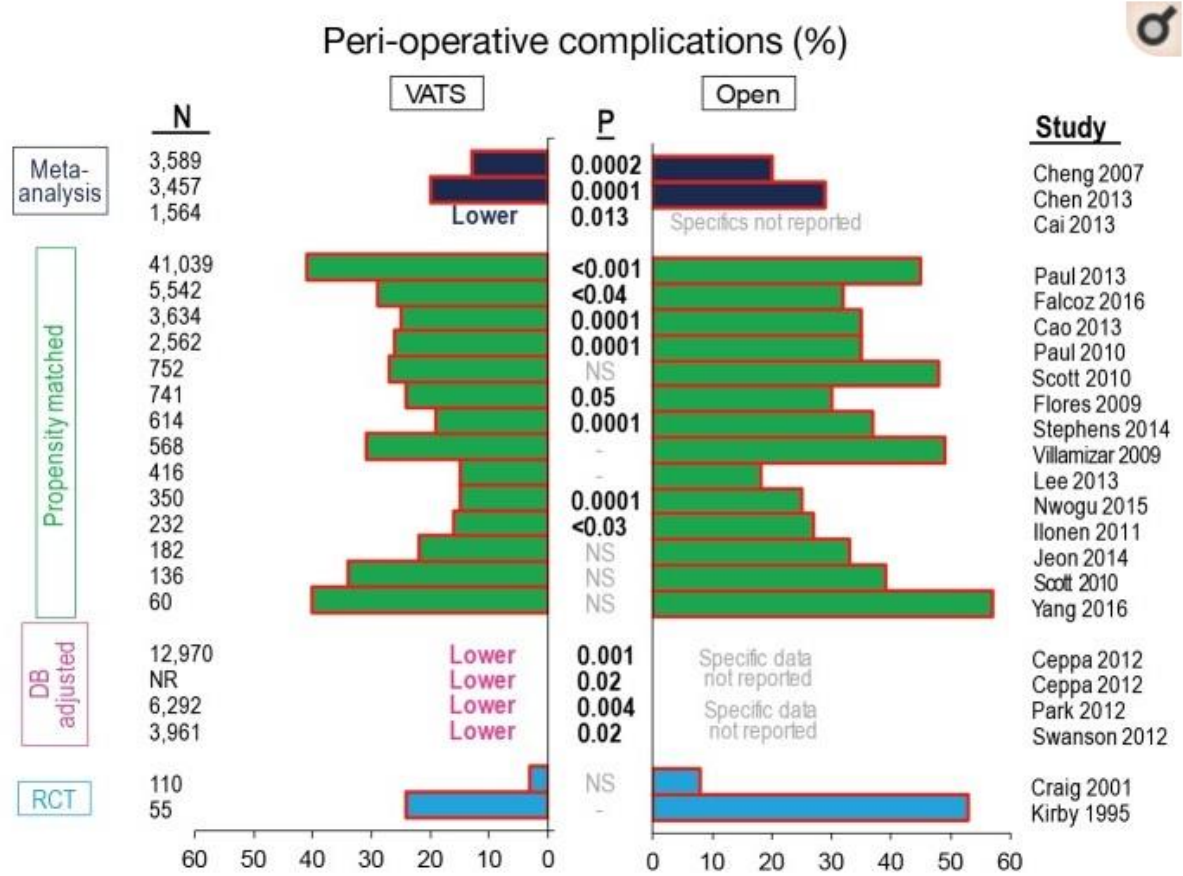
Abstract: Surgical resection remains the most effective treatment of early stage lung cancer. The surgical approach has evolved, and now consists primarily of video-assisted thoracic surgery (VATS) and more limited incisions even with open techniques. Both approaches have their place. Many factors contribute to deciding whether one or the other is better for a particular tumor, patient and in a particular setting and region. Video assisted surgery, where appropriate, is associated with fewer complications and a shorter hospital stay, and similar long term survival. But modern open surgery is also associated with good results. This article reviews the data and discusses considerations to weigh in finding the right balance between the video-assisted and the open approaches.

Keywords: Lobectomy; lung cancer; thoracic surgery; thoracotomy; video-assisted thoracic surgery (VATS)

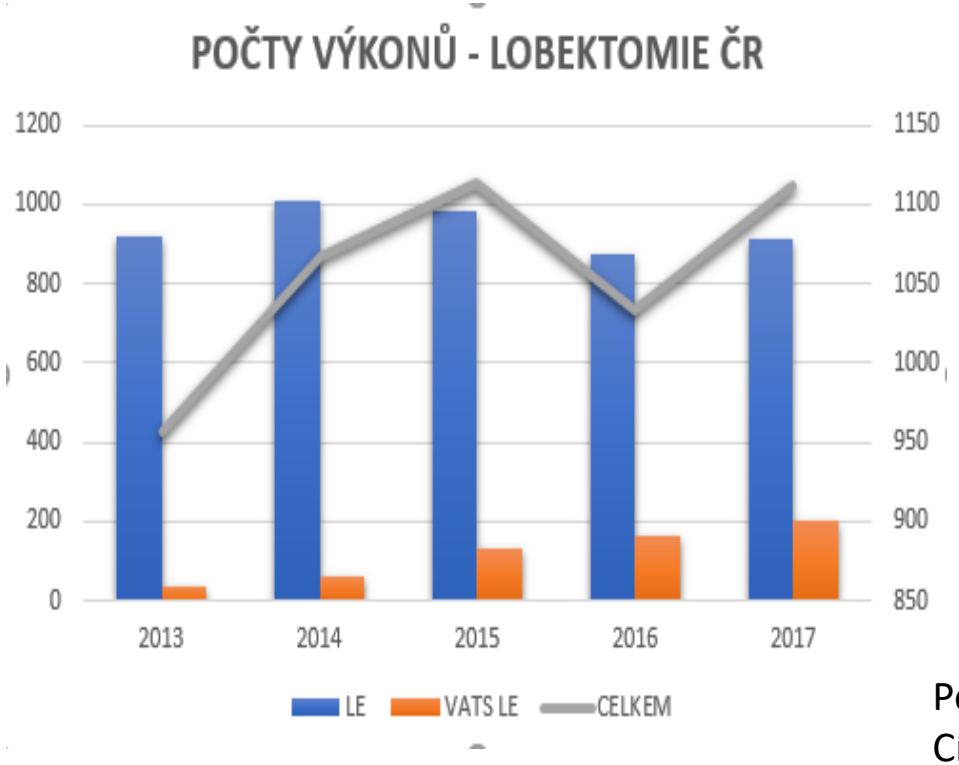
Received: 26 September 2016; Accepted: 01 October 2016; Published: 06 December 2016.

- Chirurgická resekce je nejfektivnější metoda léčby časných stadií Ca plic
- VATS/limitované incize u otevřených výkonů
  - oba přístupy mají svoje místo
- Mnoho faktorů rozhoduje, který přístup je lepší pro konkrétní lokální nález, pro konkrétního pacienta
- VATS – kratší hospitalizace, méně komplikací, stejné dlouhodobé přežívaní
- Moderní „otevřená chirurgie“ má dobré výsledky


Approach used for lobectomy
Percent
100
90
80
70
60
50
40
30
20
10
0
Japan
ESTS
DK
STS
NIS
UK
US - STS
US - NIS
Japan
Denmark
UK
ESTS
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015

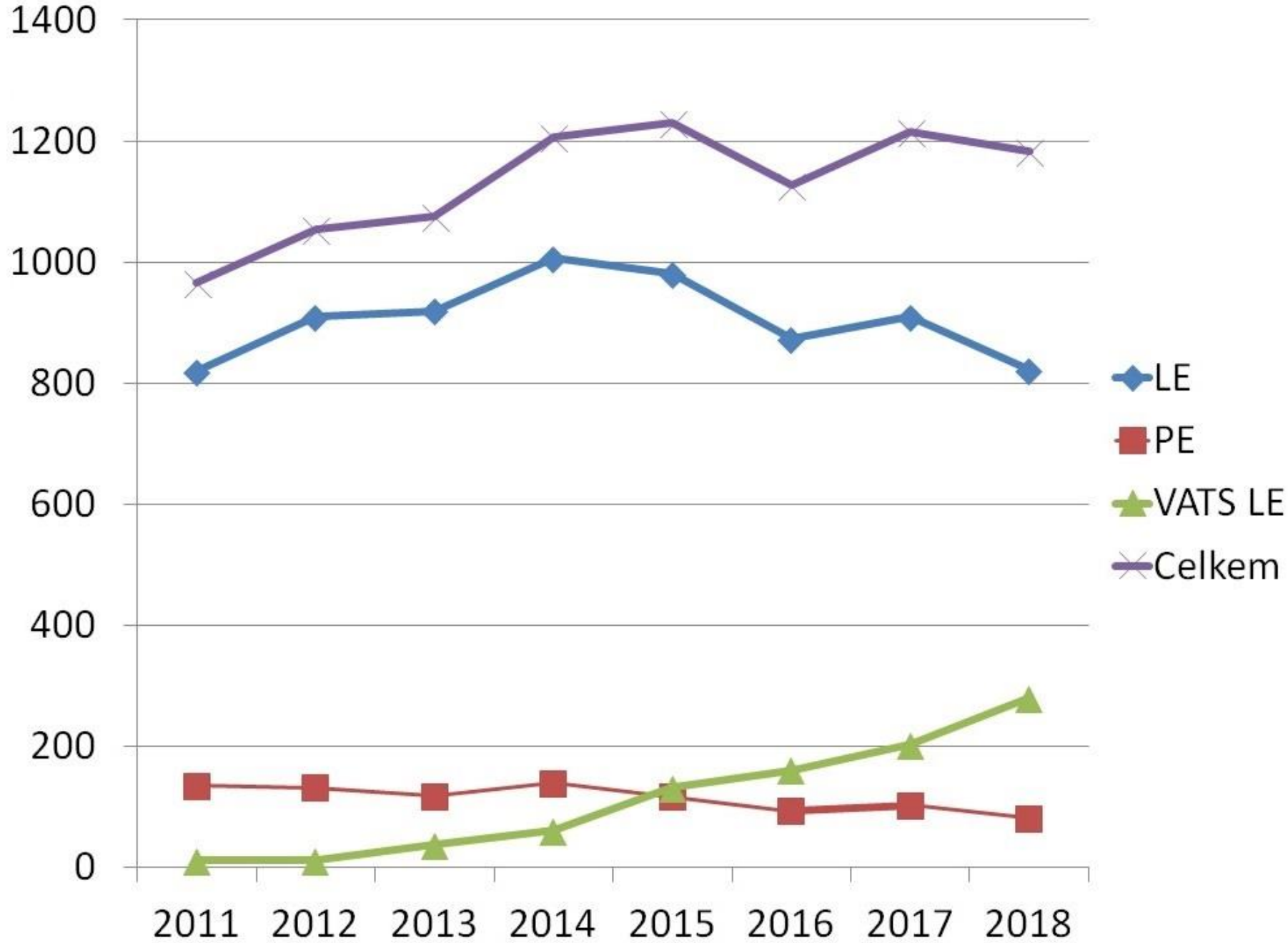

Peri-operative complications (%)
VATS
Open
N
P
Study
Meta-analysis
Propensity matched
DB adjusted
RCT
3,589
3,457
1,564
0.0002
0.0001
0.013
Lower
Specifics not reported
Cheng 2007
Chen 2013
Cai 2013
41,039
5,542
3,634
2,562
752
741
614
568
416
350
232
182
136
60
<0.001
<0.04
0.0001
0.0001
NS
0.05
0.0001
-
-
0.0001
<0.03
NS
NS
NS
Paul 2013
Falcoz 2016
Cao 2013
Paul 2010
Scott 2010
Flores 2009
Stephens 2014
Villamizar 2009
Lee 2013
Nwogu 2015
Ilonen 2011
Jeon 2014
Scott 2010
Yang 2016
12,970
NR
6,292
3,961
Lower
Lower
Lower
Lower
0.001
0.02
0.004
0.02
Specific data not reported
Specific data not reported
Ceppa 2012
Ceppa 2012
Park 2012
Swanson 2012
110
55
NS
-
Craig 2001
Kirby 1995
60 50 40 30 20 10 0
0 10 20 30 40 50 60

POČET VÝKONŮ LOBEKTOMIE- ČR



	LE	VATS LE	CELKEM
2013	919	38	957
2014	1006	61	1067
2015	981	132	1113
2016	873	161	1034
2017	910	202	1112
CELKEM	4689	594	5283

Penetrace VATS – 11,2%,
Cílová penetrace - 30 - 40%


1400
1200
1000
800
600
400
200
0
2011
2012
2013
2014
2015
2016
2017
2018
LE
PE
VATS LE
Celkem

Evolution of da Vinci® Technology

20 Years of Advanced Robotic-Assisted Surgery Learning and Development

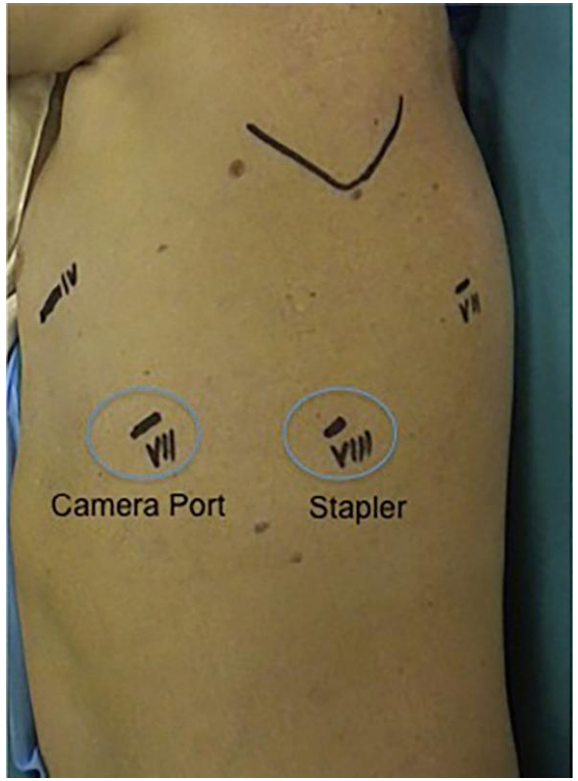
MEDTRONIC RAS

MODULAR SOLUTION DESIGNED TO ADDRESS COST AND UTILIZATION BARRIERS

Veronesi

4 ramena, 4 incize, CO2 insuflace

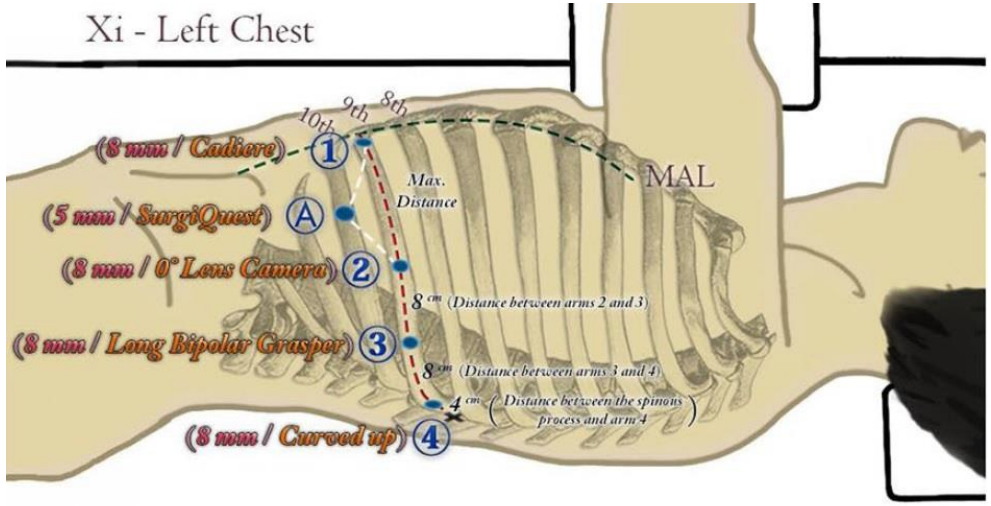
Přední přístup



Cerfolio

4 ramena, 5 incizí, bez CO2 insuflace

Zadní přístup



Comparison of robotic and video-assisted thoracic surgery for lung cancer: a propensity-matched analysis

Feichao Bao, Chong Zhang, Yunhai Yang, Zhehao He, Luming Wang, Jian Hu

Department of Thoracic Surgery, First Affiliated Hospital of Zhejiang University, Hangzhou 310003, China

Contributions: (I) Conception and design: F Bao, J Hu; (II) Administrative support: J Hu; (III) Provision of study materials or patients: L Wang, Z He; (IV) Collection and assembly of data: C Zhang, Y Yang; (V) Data analysis and interpretation: F Bao; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Jian Hu, MD. Department of Thoracic Surgery, First Affiliated Hospital of Zhejiang University, No. 79, Qingchun Road, Hangzhou 310003, China. Email: hujian.medzju@gmail.com.

Background: Reports of comparison between robotic and thoracoscopic surgery for lung cancer are limited, we aimed to compare the perioperative outcomes of robotic and thoracoscopic anatomic pulmonary resection for lung cancer.

Methods: A total of 184 patients with lung cancer underwent anatomic pulmonary resection by robotics or thoracoscopy. A propensity-matched analysis with incorporated preoperative variables was used to compare the perioperative outcomes between the two procedures.

Results: Overall, 71 patients underwent robotic pulmonary resection, including 64 lobectomies and 7 segmentectomies, while 113 patients underwent thoracoscopic lobectomy and segmentectomy. Propensity match produced 69 pairs. The mean length of postoperative stay (7.6±4.6 *vs.* 6.4±2.6 d, P=0.078), chest tube duration (5.3±3.7 *vs.* 4.4±1.7 d, P=0.056), number of lymph nodes retrieved (17.9±6.9 *vs.* 17.4±7.0, P=0.660), stations of lymph nodes resected (7.4±1.6 *vs.* 7.6±1.7, P=0.563), operative blood loss (53.9±29.3 *vs.* 50.3±37.9 mL, P=0.531), morbidity rates (42.0% *vs.* 30.4%, P=0.157) were similar between the robotics and thoracoscopy. However, robotics was associated with higher cost ($12,067±1,610 *vs.* $8,328±1,004, P<0.001), and longer operative time (136±40 *vs.* 111±28 min, P<0.001).

Conclusions: Robotics seems to have higher hospital costs and longer operative time, without superior advantages in morbidity rates and oncologic efficiency. Further prospective randomized clinical trials were needed to validate both of its short- and long-term oncologic efficiency.

Robotic-Assisted Versus Thoracoscopic Lobectomy Outcomes From High-Volume Thoracic Surgeons

Rishindra M. Reddy, MD, FACS, Madhu Lalitha Gorrepati, MD, Daniel S. Oh, MD, Shilpa Mehendale, MS, MBA, and Michael F. Reed, MD

Department of Surgery, Section of Thoracic Surgery, University of Michigan, Ann Arbor, Michigan; Clinical Affairs, Intuitive Surgical, Inc, Sunnyvale, California; Division of Thoracic Surgery, Keck School of Medicine of the University of Southern California, Los Angeles, California; and Division of Thoracic Surgery, Department of Surgery, Penn State Health Milton S. Hershey Medical Center, Hershey, Pennsylvania

Background. Reports of surgical outcomes comparing proficient surgeons who perform either robotic-assisted or video-assisted thoracoscopic lobectomy are lacking. We evaluate the comparative effectiveness of robotic-assisted and video-assisted thoracoscopic lobectomies by surgeons who performed 20 or more annual surgical procedures in a national database.

Methods. Patients 18 years or older, who underwent elective lobectomy by surgeons who performed 20 or more annual lobectomies by robotic-assisted or thoracoscopic approach from January 2011 through September 2015, were identified in the Premier Healthcare database with the use of codes from the ninth revision of the International Statistical Classification of Diseases and Related Health Problems. Propensity-score matching based on patient and hospital characteristics and by year was performed 1:1 to identify comparable cohorts for analysis (n = 838 in each cohort). All tests were two-sided, with statistical significance set at p less than 0.05.

Results. A total of 23,779 patients received an elective lobectomy during the study period: 9,360 were performed by video-assisted thoracoscopic approach and 2,994 were by robotic-assisted approach. Propensity-matched comparison of lobectomies performed by surgeons who performed 20 or more procedures annually (n = 838) showed that robotic-assisted procedures had a longer mean operative time by 25 minutes (mean 247.1 minutes vs 222.6 minutes, $p < 0.0001$) but had a lower conversion-to-open rate (4.8% vs 8.0%, $p = 0.007$) and a lower 30-day complication rate (33.4% vs 39.2%, $p = 0.0128$). Transfusion rates and 30-day mortality rates were similar between the two cohorts.

Conclusions. When surgical outcomes are limited to surgeons who perform 20 or more annual procedures, the robotic-assisted approach is associated with a lower conversion-to-open rate and lower 30-day complication rate when than video-assisted thoracoscopic surgeons, with a mean operative time difference of 25 minutes.

(Ann Thorac Surg 2018;106:902–8)

Comparison of Video-Assisted Thoracoscopic Surgery and Robotic Approaches for Clinical Stage I and Stage II Non-Small Cell Lung Cancer Using The Society of Thoracic Surgeons Database

Brian E. Louie, MD, Jennifer L. Wilson, MD, Sunghee Kim, PhD, Robert J. Cerfolio, MD, Bernard J. Park, MD, Alexander S. Farivar, MD, Eric Vallières, MD, Ralph W. Aye, MD, William R. Burfeind, Jr, MD, and Mark I. Block, MD

Division of Thoracic Surgery, Swedish Cancer Institute, Seattle, Washington; Division of Thoracic Surgery, Beth Israel Deaconess Medical Center, Boston, Massachusetts; Duke Clinical Research Institute, Duke University Medical Center, Durham, North Carolina; Department of Cardiothoracic Surgery, University of Alabama at Birmingham, Birmingham, Alabama; Division of Thoracic Surgery, Memorial Sloan-Kettering Cancer Center, New York, New York; Division of Thoracic Surgery, St. Luke's University Health Network, Bethlehem, Pennsylvania; and Division of Thoracic Surgery, Memorial Healthcare System, Hollywood, Florida

Background. Data from selected centers show that robotic lobectomy is safe and effective and has 30-day mortality comparable to that of video-assisted thoracoscopic surgery (VATS). However, widespread adoption of robotic lobectomy is controversial. We used The Society of Thoracic Surgeons General Thoracic Surgery (STS-GTS) Database to evaluate quality metrics for these 2 minimally invasive lobectomy techniques.

Methods. A database query for primary clinical stage I or stage II non-small cell lung cancer (NSCLC) at high-volume centers from 2009 to 2013 identified 1,220 robotic lobectomies and 12,378 VATS procedures. Quality metrics evaluated included operative morbidity, 30-day mortality, and nodal upstaging, defined as cN0 to pN1. Multivariable logistic regression was used to evaluate nodal upstaging.

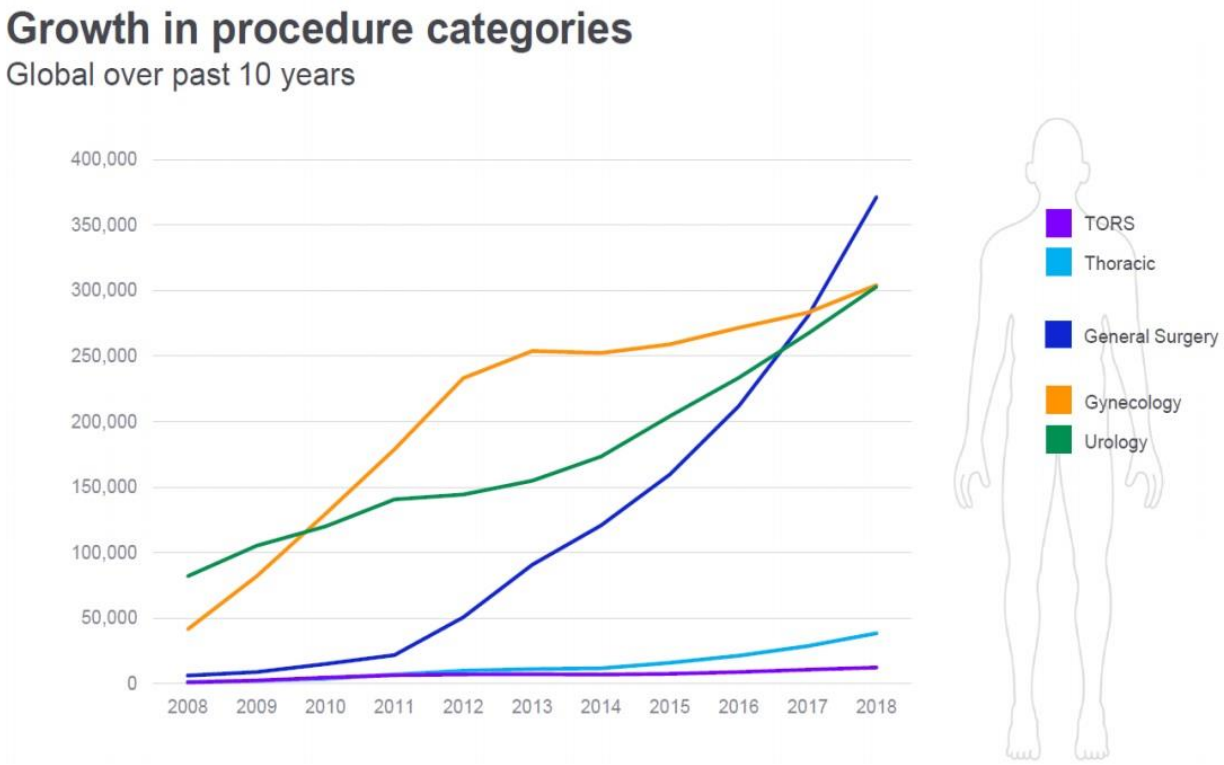
Results. Patients undergoing robotic lobectomy were older, less active, and less likely to be an ever smoker and had higher body mass index (BMI) (all $p < 0.05$). They were also more likely to have coronary heart disease or hypertension (all $p < 0.001$) and to have had preoperative mediastinal staging ($p < 0.0001$).

Robotic lobectomy operative times were longer (median 186 versus 173 minutes; $p < 0.001$); all other operative measurements were similar. All postoperative outcomes were similar, including complications and 30-day mortality (robotic lobectomy, 0.6% versus VATS, 0.8%; $p = 0.4$). Median length of stay was 4 days for both, but a higher proportion of patients undergoing robotic lobectomy had hospital stays less than 4 days (48% versus 39%; $p < 0.001$). Nodal upstaging overall was similar ($p = 0.6$) but with trends favoring VATS in the cT1b group and robotic lobectomy in the cT2a group.

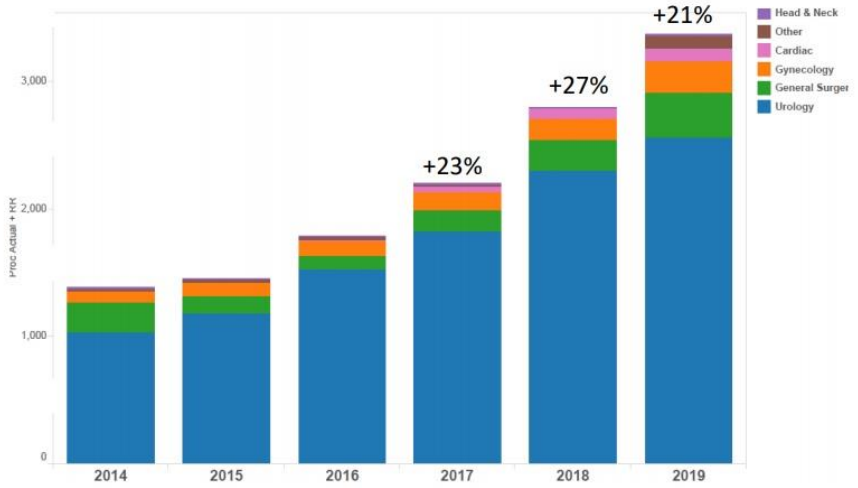
Conclusions. Patients undergoing robotic lobectomy had more comorbidities and robotic lobectomy operative times were longer, but quality outcome measures, including complications, hospital stay, 30-day mortality, and nodal upstaging, suggest that robotic lobectomy and VATS are equivalent.

(Ann Thorac Surg 2016;102:917–24)

Robotická chirurgie ve světě a v ČR



ČR robotické výkony celkem

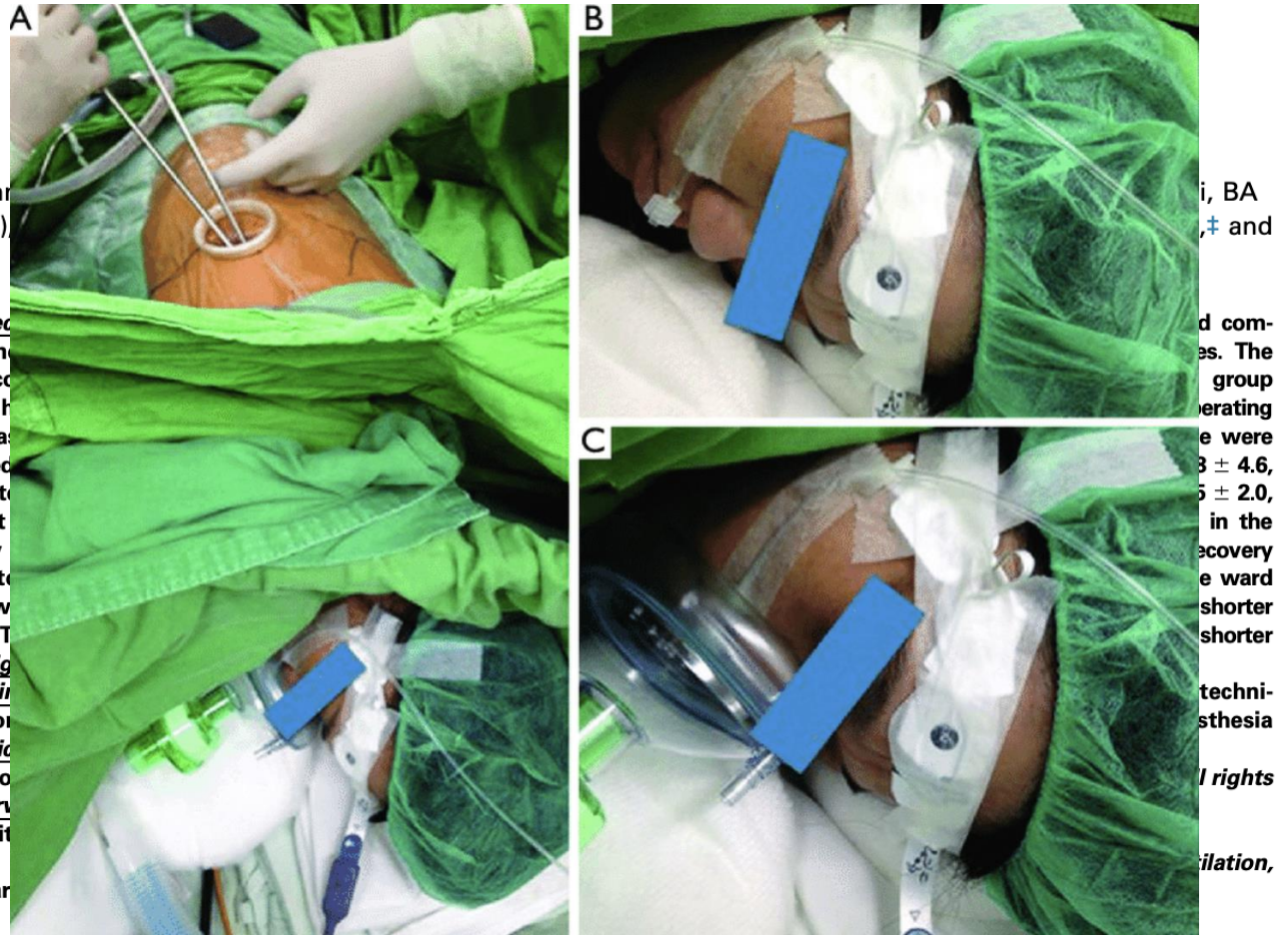


Vč. 2019 - konzervativní odhad

- Dvouciferný nárust ročně
- Výrazné posilování chirurgie a gynekologie
- chirurgie nyní cca 10% celkového počtu da Vinci výkonů

Snaha o minimalizaci invazivity anesteziologické části výkonu

Koncept výkonů bez intubace



Irons et al. Journal of Cardiothoracic and Vascular Anesthesia, 2016

Guidelines for enhanced recovery after lung surgery: recommendations of the Enhanced Recovery After Surgery (ERAS®) Society and the European Society of Thoracic Surgeons (ESTS)

Timothy J.P. Batchelor[a,*], Neil J. Rasburn[b], Etienne Abdelnour-Berchtold[c], Alessandro Brunelli[d], Robert J. Cerfolio[e], Michel Gonzalez[c], Olle Ljungqvist[f], René H. Petersen[g], Wanda M. Popescu[h], Peter D. Slinger[i] and Babu Naidu[j]

Key question

What is the optimal perioperative management for patients undergoing lung surgery?

Key findings

Recommendations were developed for 45 ERAS items, from initial presentation through to postoperative discharge.

Take-home message

The use of a systematic multimodal perioperative care pathway has the potential to improve outcomes after lung surgery.

European Journal of Cardio-Thoracic Surgery, 2019

Kdo? – Hrudní chirurg, multidisciplinární tým

Surgeon Specialty and Long-Term Survival After Pulmonary Resection for Lung Cancer

Farhood Farjah, MD, MPH, David R. Flum, MD, MPH, Thomas K. Varghese, Jr, MD, Rebecca Gaston Symons, MPH, and Douglas E. Wood, MD

Department of Surgery, University of Washington, Seattle, Washington

Background. Long-term outcomes and processes of care in patients undergoing pulmonary resection for lung cancer may vary by surgeon type. Associations between surgeon specialty and processes of care and long-term survival have not been described.

Methods. A cohort study (1992 through 2002, follow-up through 2005) was conducted using Surveillance, Epidemiology, and End-Results-Medicare data. The American Board of Thoracic Surgery Diplomates list was used to differentiate board-certified thoracic surgeons from general surgeons (GS). Board-certified thoracic surgeons were designated as cardiothoracic surgeons (CTS) if they performed cardiac procedures and as general thoracic surgeons (GTS) if they did not.

Results. Among 19,745 patients, 32% were cared for by GTS, 45% by CTS, and 24% by GS. Patient age, comorbidity index, and resection type did not vary by surgeon specialty (all $p > 0.10$). Compared with GS and CTS, GTS more frequently used positron emission tomography (36% versus 26% versus 26%, respectively; $p = 0.005$) and lymphadenectomy (33% versus 22% versus 11%, respectively; $p < 0.001$). After adjustment for patient, disease, and management characteristics, hospital teaching status, and surgeon and hospital volume, patients treated by GTS had an 11% lower hazard of death compared with those who underwent resection by GS (hazard ratio, 0.89; 99% confidence interval, 0.82 to 0.97). The risks of death did not vary significantly between CTS and GS (hazard ratio, 0.94; 99% confidence interval, 0.88 to 1.01) or GTS and CTS (hazard ratio, 0.94; 99% confidence interval, 0.87 to 1.03).

Conclusions. Lung cancer patients treated by GTS had higher long-term survival rates than those treated by GS. General thoracic surgeons performed preoperative and intraoperative staging more often than GS or CTS.

(Ann Thorac Surg 2009;87:995–1006)

Kde operovat ? – Vysoko-objemová centra

150 výkonů/rok

VOLUME 31 · NUMBER 25 · SEPTEMBER 1 2013

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

High Procedure Volume Is Strongly Associated With Improved Survival After Lung Cancer Surgery

Margreet Lüchtenborg, Sharma P. Riaz, Victoria H. Coupland, Eric Lim, Erik Jakobsen, Mark Krasnik, Richard Page, Michael J. Lind, Michael D. Peake, and Henrik Møller

Margreet Lüchtenborg, Sharma P. Riaz, Victoria H. Coupland, and Henrik Møller, King's College London School of Medicine; Eric Lim, Royal Brompton Hospital, London; Richard Page, Liverpool Heart and Chest Hospital, Liverpool; Michael J. Lind, Queens Centre for Oncology and Haematology, Hull; Michael D. Peake, Glenfield Hospital, Leicester, United Kingdom; Erik Jakobsen, Odense University Hospital, Odense; and Mark Krasnik, Rigshospitalet, Copenhagen, Denmark.

Published online ahead of print at www.jco.org on July 29, 2013.

Supported by the National Institute for Health Research (NIHR) Biomedical Research Centre based at Guy's and St Thomas' National Health Service (NHS) Foundation Trust and King's College London.

The views expressed are those of the authors and not necessarily those of the NHS or NIHR.

Authors' disclosures of potential conflicts of interest and author contributions are found at the end of this

A B S T R A C T

Purpose
Studies have reported an association between hospital volume and survival for non–small-cell lung cancer (NSCLC). We explored this association in England, accounting for case mix and propensity to resect.

Methods
We analyzed data on 134,293 patients with NSCLC diagnosed in England between 2004 and 2008, of whom 12,862 (9.6%) underwent surgical resection. Hospital volume was defined according to number of patients with resected lung cancer in each hospital in each year of diagnosis. We calculated hazard ratios (HRs) for death in three predefined periods according to hospital volume, sex, age, socioeconomic deprivation, comorbidity, and propensity to resect.

Results
There was increased survival in hospitals performing > 150 surgical resections compared with those carrying out < 70 (HR, 0.78; 95% CI, 0.67 to 0.90; P_{trend} < .01). The association between hospital volume and survival was present in all three periods of follow-up, but the magnitude of association was greatest in the early postoperative period.

Conclusion
High-volume hospitals have higher resection rates and perform surgery among patients who are older, have lower socioeconomic status, and have more comorbidities; despite this, they achieve better survival, most notably in the early postoperative period.

J Clin Oncol 31:3141-3146. © 2013 by American Society of Clinical Oncology

Kde operovat?

European Journal of Cardio-Thoracic Surgery 45 (2014) 779–786
doi:10.1093/ejcts/ezu016 Advance Access publication 20 February 2014

GUIDELINE

European guidelines on structure and qualification of general thoracic surgery

Chairs: Alessandro Brunelli[a,*] and Pierre Emmanuel Falcoz[b]

Panel: Thomas D'Amico[c], Henrik Hansen[d], Eric Lim[e], Gilbert Massard[b], Thomas W. Rice[f], Gaetano Rocco[g], Pascal Thomas[h], Dirk Van Raemdonck[i], Miguel Congregado[j], Herbert Decaluwe[i], Tomasz Grodzki[k], Toni Lerut[i], Thomas Molnar[l], Michele Salati[m], Marco Scarci[n], Paul Van Schil[o], Gonzalo Varela[p], Federico Venuta[q], Franca Melfi[r], Cengiz Gebitekin[s], Jaroslaw Kuzdzal[t], Gunda Leschber[u], Isabelle Opitz[v], Kostas Papagiannopoulos[a], Alec Patterson[w], Enrico Ruffini[x], Walter Klepetko[y] and Alper Toker[z]

Kde operovat ?

Vysoce specializované/standardní oddělení

Table 1: Characteristics of GTS units of standard and high specialization

GTS unit	Characteristics
High-specialization unit	Setting: within or in affiliation with a university setting Dedicated surgical ward (4–6 beds/100 major thoracic procedures) Access to dedicated Thoracic ICU Head of unit: UEMS EBTS or UEMS-recognized equivalent certification, minimum of 5 years of practice in GTS Dedicated staff and institutional resources Team: qualified general thoracic surgeons performing a minimum of 100 major thoracic procedures per year per surgeon Surgeons expected to participate in research activities One fully equipped operating theatre per 300–400 major thoracic procedures per year In addition to on-site minimum facilities[a], access to oesophageal pathophysiology laboratory; more advanced imaging techniques including MRI and on-site or collaboration with PET scanning facility; specialist laboratories relevant to sub-speciality work, such as transplantation, including ECMO facilities Minimum Institutional case-load: 300 ± 50 major thoracic procedures/year
Standard unit	Setting: freestanding or within a combined unit Dedicated staff and institutional resources Head of unit: UEMS EBTS or UEMS-recognized equivalent certification, minimum of 5 years of practice in GTS Team: qualified general thoracic surgeons performing a minimum of 100 major thoracic procedures per year per surgeon One fully equipped operating theatre per 300–400 Dedicated surgical ward (4–6 beds/100 major thoracic procedures) Access to dedicated thoracic beds within a multispeciality ICU Access to on-site support minimum facilities[a] Minimum institutional case-load: 150 ± 50

Hrudní chirurgie v Evropě a v ČR

European Journal of Cardio-Thoracic Surgery 45 (2014) 779–786
doi:10.1093/ejcts/ezu016 Advance Access publication 20 February 2014

GUIDELINE

European guidelines on structure and qualification of general thoracic surgery

Chairs: Alessandro Brunelli[a,*] and Pierre Emmanuel Falcoz[b]

- Atestace z hrudní chirurgie vedoucího pracoviště je podmínkou
- Počet vekých hrudních výkonů 150
- Ideálně 100 výkonů/chirurga
- Počet VATS resekcí 50/rok, 20/rok/chirurga

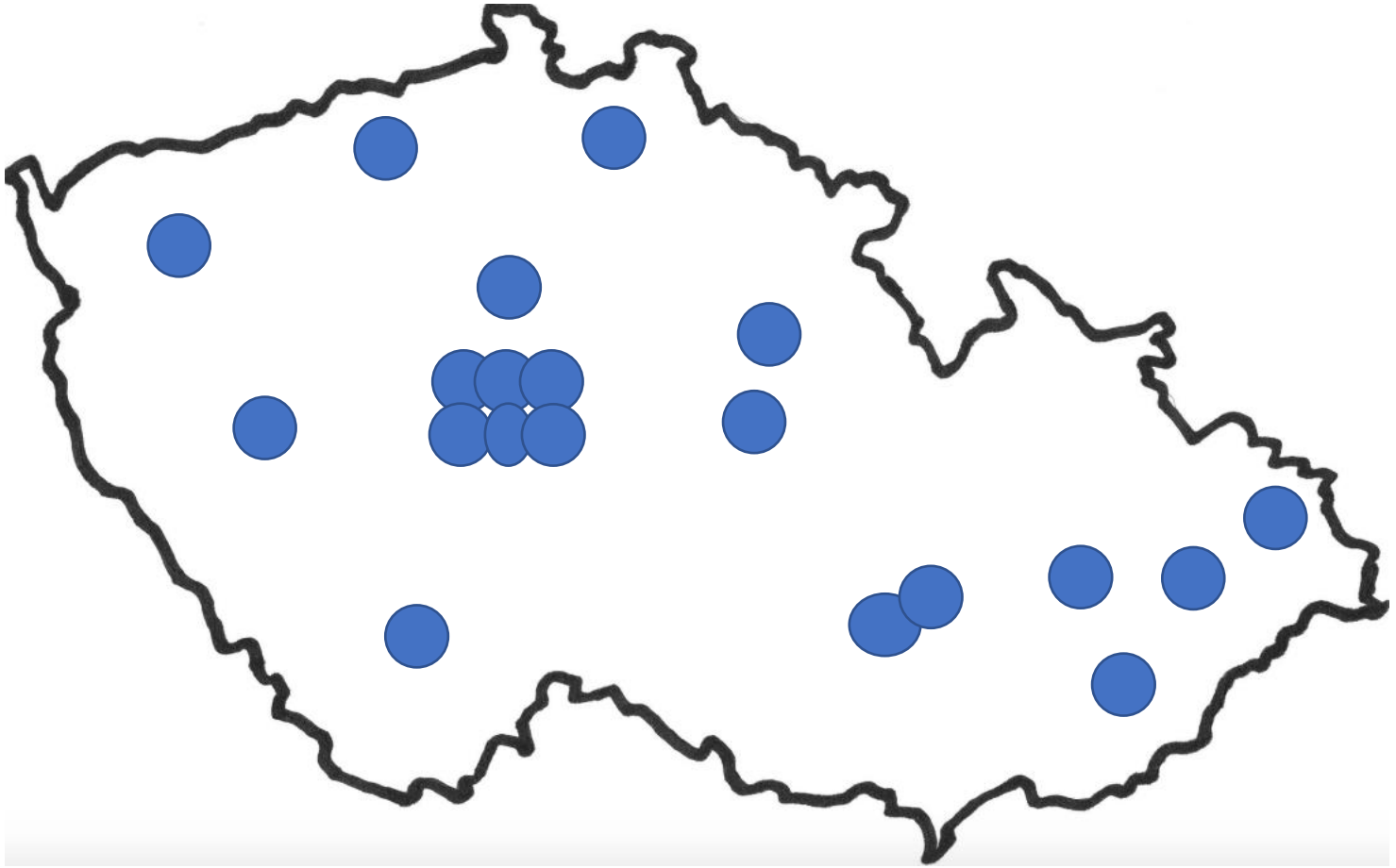
Hrudní chirurgie v ČR

- 20 pracovišť
- Malé objemy
- Oddělení bez atestace z hrudní chirurgie ?

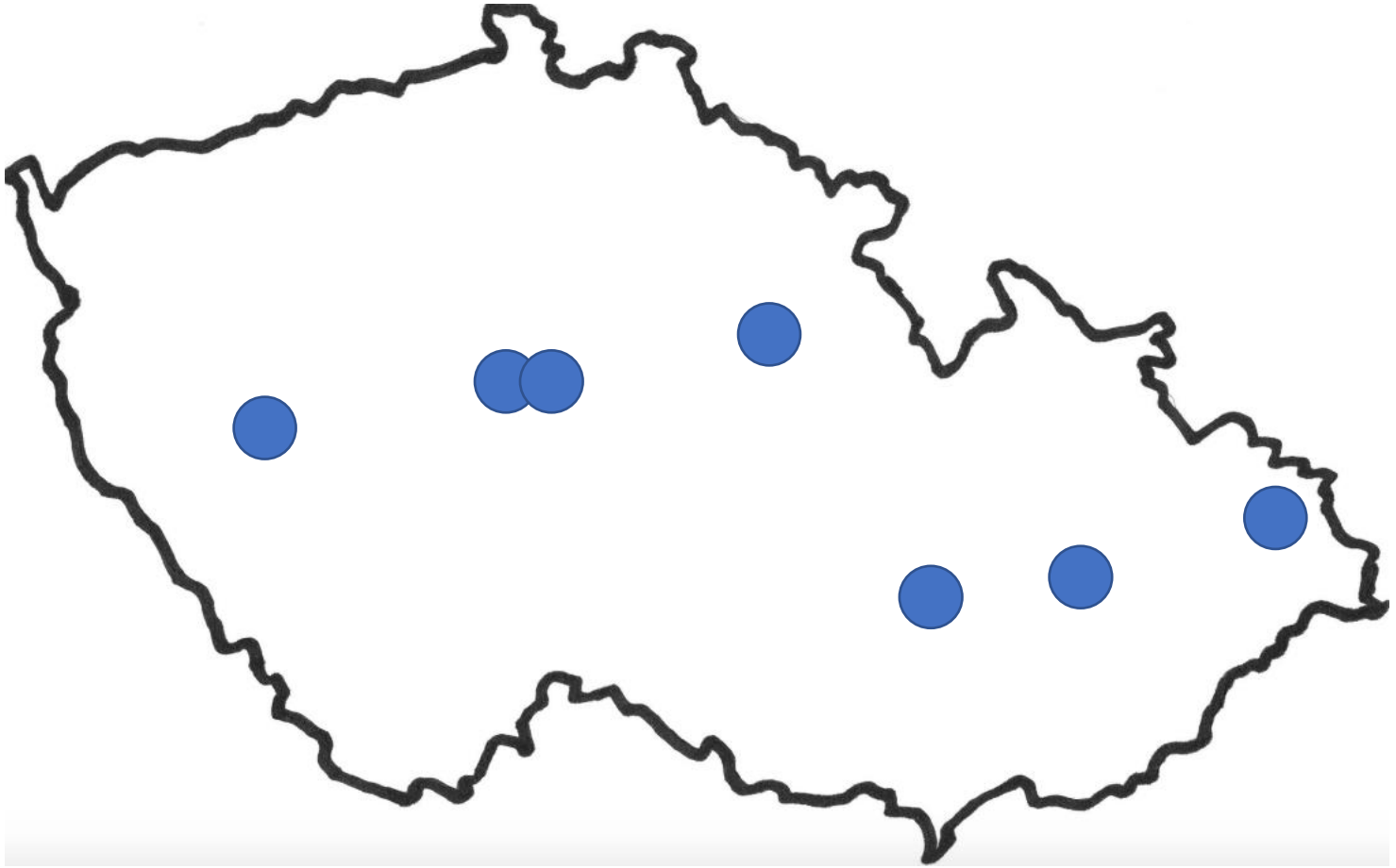
Chirurgie Ca plic 2018

lobektomie klasicky	64	102	70	3	26	23	68	61	34	91	3	20	27	28	39	28	67	22	30	15	821
pneumonektomie klasicky	3	10	22		7	1	3	3	3	9		1	2	1	1	1	5	2	2	5	81
VATS lobektomie		19	67		22		2	25	7	15		20			11	20	20	33	7	12	280
resekce průdušnice	1	7	2					4									1	2			17
resekce hrudní stěny	1	27	12		4	2		3	1	6			3	5	7	2	13			7	93
explorace u BCA	2	5	4			2	3	1		2					4		1	2	2		28
transplantace plic		42																			42

Chirurgie Ca plic 2019



Pneumoonkochirurgická centra 2020



Audit kvality chirurgické péče

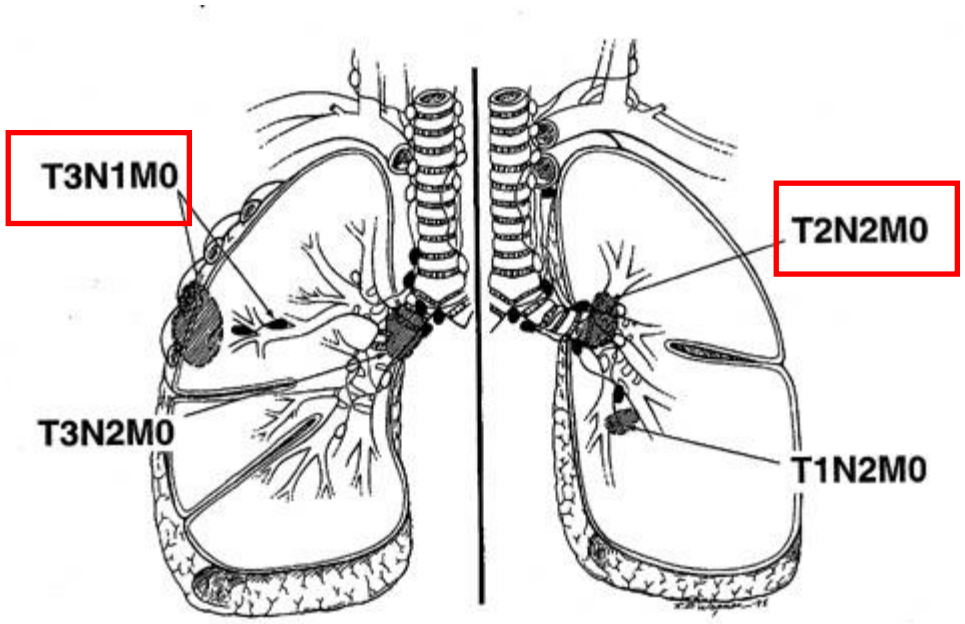
- Objem centra
- Personální zajištění
- Multidisciplinární tým
- Technické vybavení
- Komplement

- Přežívání, mortality/morbidity
- Operabilita BCA v POCH centru
- Follow up
- Poměr lobektomie/pneumonektomie
- Počet sleeve resekcí
- Počet explorací

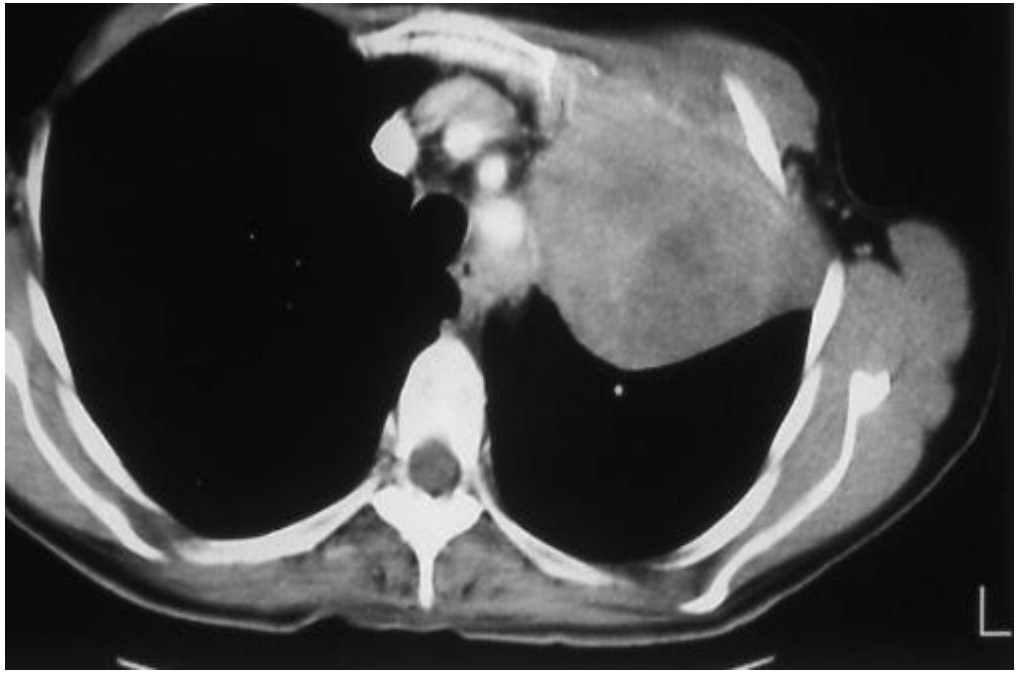
Závěr

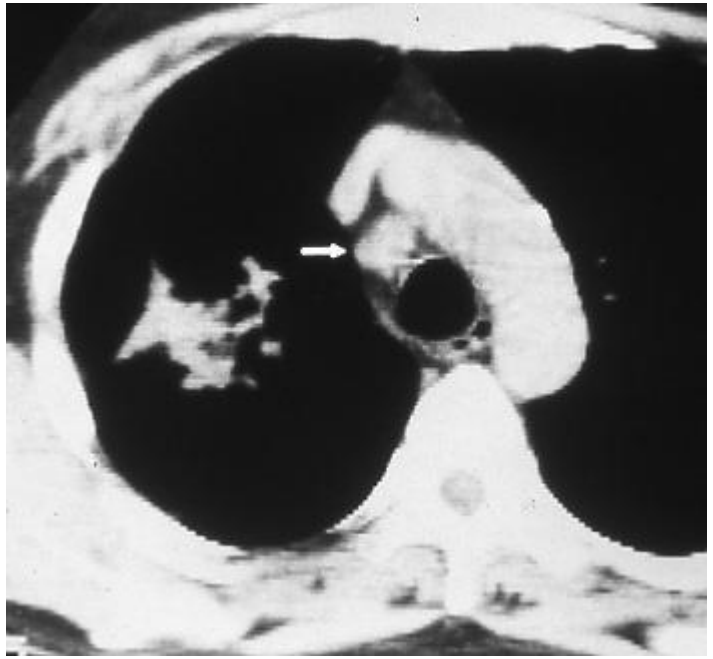
- Chirurgie – základní léčebná modalita u Ca plic v časném stadiu
- Screening
- Centralizace pacientů – Pneumoonkochirurgická centra
- Implementace miniinvazivní chirurgie – VATS, RATS
- Multidisciplinární tým
- Stadium IIIA a IIIB - vysoce specializovaná centra
- Intenzivní perioperační péče –Implementace ERAS protokolů
- Audit kvality

- robert.lischke@fnmotol.cz
- III. chirurgická klinika 1. LF UK a FN Motol



IIIA, IIIB – z chirurgického pohledu heterogenní skupina



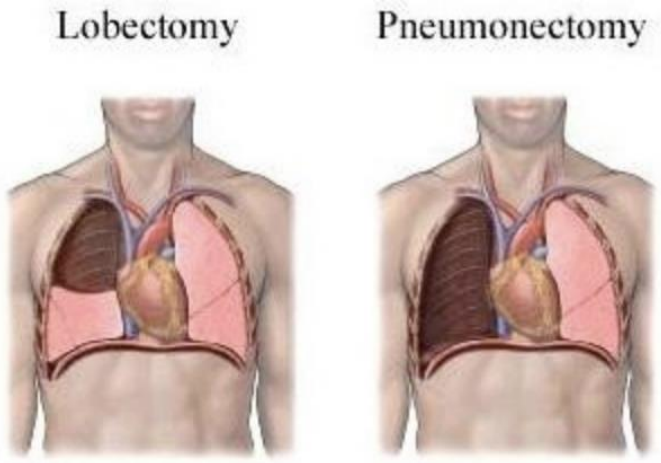


Jak operovat, strategie operace, přístup

- Stadium IIIA, IIIB

- N2 – multimodální léčba
- T4 – multimodální léčba, pokročilá chirurgická technika

- Lobektomie
- Pneumonektomie



- Sleeve resekce – bronchus tepna

- Resekce horní duté žíly, levé síně, aorty, obratle, hrudní stěny
- Lymfadenektomie

- Intenzivní péče, ECMO, mimotělní oběh

Možnosti zvýšení operability Ca plic

- centralizace – Pneumoonkochirurgická centra
- audit kvality
- časná diagnostika, screening
- dokonalý a rychlý staging a restaging
- rozšíření operačních indikací
  - broncho - a angioplastiky
  - operace pokročilých nálezů
  - zvýšení věku operovaných nemocných
- týmová spolupráce
  - pneumolog
  - rentgenolog, patolog
  - onkolog, radioterapeut
  - hrudní chirurg, kardiochirurg,spondylochirurg
  - mimotělní oběh, intenzivní péče, rehabilitace

Chirurgie Ca plic

- Koho operovat?
- Jak operovat?
- Kdo?
- Kde operovat?

Koho operovat?

- Stadium onemocnění
- Morfologická verifikace
- Funkční stav pacienta

European Journal of Cardio-Thoracic Surgery 49 (2016) 1492–1496
doi:10.1093/ejcts/ezv339 Advance Access publication 26 September 2015

ORIGINAL ARTICLE

Cite this article as: Brunelli A, Tentzeris V, Sandri A, McKenna A, Liew SL, Milton R *et al*. A risk-adjusted financial model to estimate the cost of a video-assisted thoracoscopic surgery lobectomy programme. Eur J Cardiothorac Surg 2016;49:1492–6.

A risk-adjusted financial model to estimate the cost of a video-assisted thoracoscopic surgery lobectomy programme†

Alessandro Brunelli*, Vasileios Tentzeris, Alberto Sandri, Alexandra McKenna, Shan Liung Liew, Richard Milton, Nilanjan Chaudhuri, Emmanuel Kefaloyannis and Kostas Papagiannopoulos

Department of Thoracic Surgery, St James's University Hospital, Leeds, UK

* Corresponding author. Department of Thoracic Surgery, St James's University Hospital, Beckett Street, Leeds LS9 7TF, UK. Tel: +44-113-2068776; fax: +44-113-2068824; e-mail: brunellialex@gmail.com (A. Brunelli).

Received 29 June 2015; received in revised form 18 August 2015; accepted 3 September 2015

Abstract

OBJECTIVE: To develop a clinically risk-adjusted financial model to estimate the cost associated with a video-assisted thoracoscopic surgery (VATS) lobectomy programme.

METHODS: Prospectively collected data of 236 VATS lobectomy patients (August 2012–December 2013) were analysed retrospectively. Fixed and variable intraoperative and postoperative costs were retrieved from the Hospital Accounting Department. Baseline and surgical variables were tested for a possible association with total cost using a multivariable linear regression and bootstrap analyses. Costs were calculated in GBP and expressed in Euros (EUR:GBP exchange rate 1.4).

RESULTS: The average total cost of a VATS lobectomy was €11 368 (range €6992–€62 535). Average intraoperative (including surgical and anaesthetic time, overhead, disposable materials) and postoperative costs [including ward stay, high dependency unit (HDU) or intensive care unit (ICU) and variable costs associated with management of complications] were €8226 (range €5656–€13 296) and €3029 (range €529–€51 970), respectively. The following variables remained reliably associated with total costs after linear regression analysis and bootstrap: carbon monoxide lung diffusion capacity (DLCO) <60% predicted value ($P = 0.02$, bootstrap 63%) and chronic obstructive pulmonary disease (COPD; $P = 0.035$, bootstrap 57%). The following model was developed to estimate the total costs: 10 523 + 1894 × COPD + 2376 × DLCO < 60%. The comparison between predicted and observed costs was repeated in 1000 bootstrapped samples to verify the stability of the model. The two values were not different ($P > 0.05$) in 86% of the samples. A hypothetical patient with COPD and DLCO less than 60% would cost €4270 more than a patient without COPD and with higher DLCO values (€14 793 vs €10 523).

CONCLUSIONS: Risk-adjusting financial data can help estimate the total cost associated with VATS lobectomy based on clinical factors. This model can be used to audit the internal financial performance of a VATS lobectomy programme for budgeting, planning and for appropriate bundled payment reimbursements.

VATS – CONVENTIONAL APPROACH

Current costs of video-assisted thoracic surgery (VATS) lobectomy

Tunc Lacin, Scott Swanson

Department of Thoracic Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA

ABSTRACT Video-assisted thoracoscopic lobectomy has many benefits over open surgery such as smaller incisions, less pain, less blood loss, faster postoperative recovery, shortened hospital stay, similar or superior survival rates. In contrast video-assisted thoracic surgery (VATS) has higher equipment costs, increased operating room times, at least initially, and a learning curve for the team. However when an experienced surgeon performs the surgery, significant hospital savings combined with better outcomes are achieved by video-assisted thoracoscopic lobectomy.

KEY WORDS Video-assisted thoracic surgery (VATS); lobectomy; costs; quality of life

J Thorac Dis 2013;5(S3):S190-S193. doi: 10.3978/j.issn.2072-1439.2013.07.13

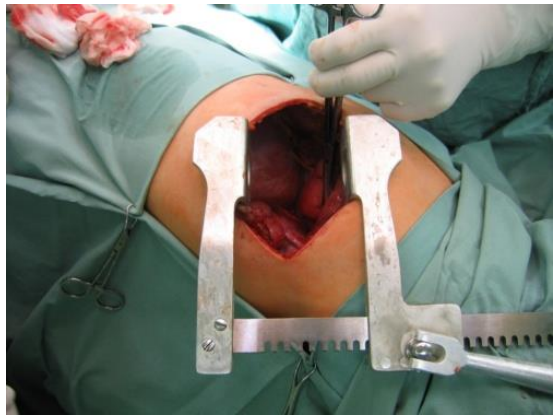
Table 1. The analysis of costs, surgery time and length of stay in open versus VATS lobectomy (3).

Procedure dependent variant	Lobectomy		P value
	Adjusted outcome	Standard deviation	
Hospital costs (dollars)			
Open	$21,016.04	$5,645.14	0.027
VATS	$20,316.19	$5,457.15	
Surgery time (hours)			
Open	3.75	0.47	0.000
VATS	4.09	0.52	
Length of stay (days)			
Open	7.83	2.05	0.000
VATS	6.15	1.61	

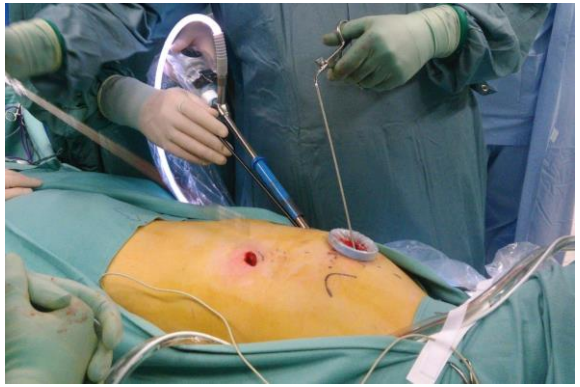
Versius surgical robotic system

Transforming surgery. For good.

- Torakotomie



- VATS



- RATS

Přežívání podle stadie (60 měsíců)

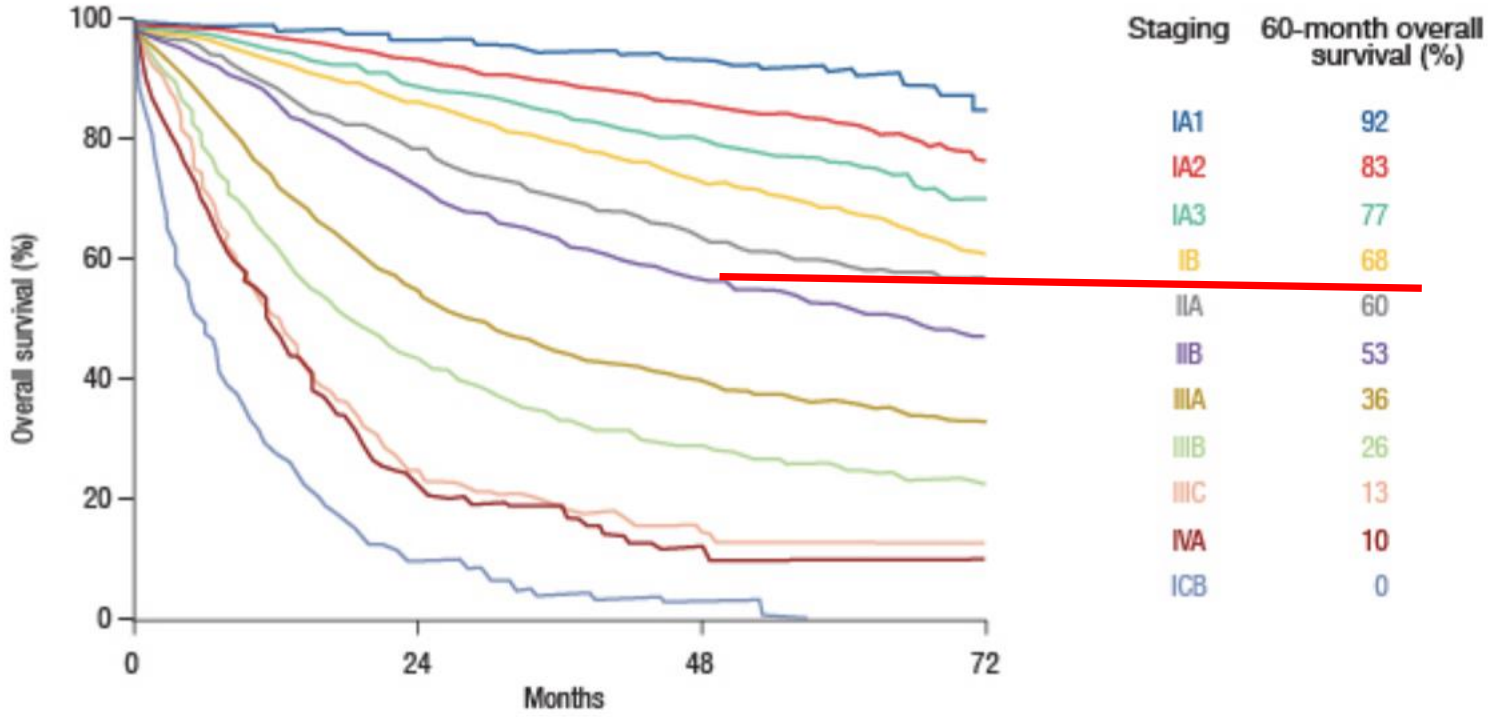
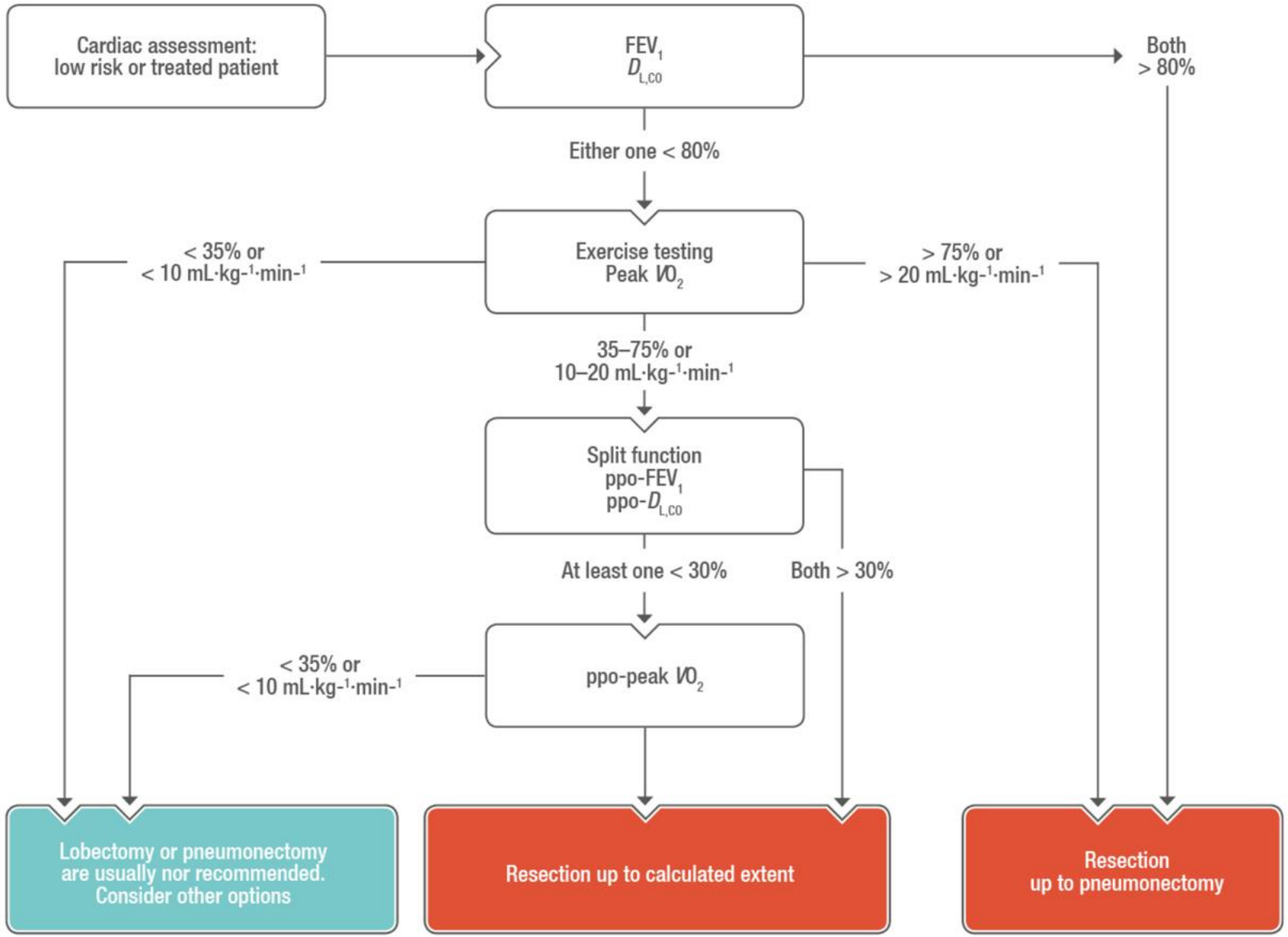


Figure: Overall survival according to the 8th Edition IASCL staging proposals

CLINICAL PRACTICE GUIDELINES

Staging and risk assessment

Preoperative respiratory evaluation



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

Reprinted with permission from the European Respiratory Society.

ESMO

CLINICAL PRACTICE GUIDELINES

Staging and risk assessment

Pre-treatment risk assessment

Summary of recommendations	LoE, GoR
In non-metastatic NSCLC, the cardiopulmonary fitness of the patient determines the choice of treatment	III, A
Risk-specific models can estimate the risk of postoperative morbidity/mortality	III, B
Assessment of cardiac and pulmonary function is necessary to estimate the risk of operative morbidity	III, A
Recalibrated RCRI is recommended	III, A
No further investigations needed if FEV_1 and DLCO > 80% of predicted values and no major comorbidities • For others, include exercise testing and split lung function	III, A
Comorbidities should be evaluated and optimised before surgery	III, A
In patients with limited pulmonary function due to emphysema, a lung volume reduction effect may be observed after resection	III, B

ESMO

European Journal of Cardio-Thoracic Surgery 48 (2015) 588–599
doi:10.1093/ejcts/ezv287

ORIGINAL ARTICLE

Cite this article as: Decaluwe H, Petersen RH, Hansen H, Piwkowski C, Augustin F, Brunelli A *et al.* Major intraoperative complications during video-assisted thoracoscopic anatomical lung resections: an intention-to-treat analysis. Eur J Cardiothorac Surg 2015;48:588–99.

Major intraoperative complications during video-assisted thoracoscopic anatomical lung resections: an intention-to-treat analysis†

Herbert Decaluwe[a,b,*], René Horsleben Petersen[c], Henrik Hansen[c], Cezary Piwkowski[d], Florian Augustin[e], Alessandro Brunelli[f], Thomas Schmid[e], Kostas Papagiannopoulos[f], Johnny Moons[a,b] and Dominique Gossot[g], on behalf of the ESTS Minimally Invasive Thoracic Surgery Interest Group (MITIG)

[a] Department of Thoracic Surgery, University Hospitals Leuven, Leuven, Belgium
[b] Department of Clinical and Experimental Medicine, KU Leuven, Leuven, Belgium
[c] Department of Cardiothoracic Surgery, Copenhagen University Hospital Rigshospitalet, Copenhagen, Denmark
[d] Department of Thoracic Surgery, Karol Marcinkowski University, Poznan, Poland
[e] Department of Thoracic Surgery, Innsbruck Medical University, Innsbruck, Austria
[f] Department of Thoracic Surgery, St James's University Hospital, Leeds, UK
[g] Department of Thoracic Surgery, Institut Mutualiste Montsouris, Paris, France

* Corresponding author. Herestraat 49, Leuven 3000, Belgium. Tel: +32-16-346820; fax: +32-16-346821; e-mail: herbert.decaluwe@uzleuven.be (H. Decaluwe).

Received 24 May 2015; received in revised form 14 July 2015; accepted 20 July 2015

Abstract

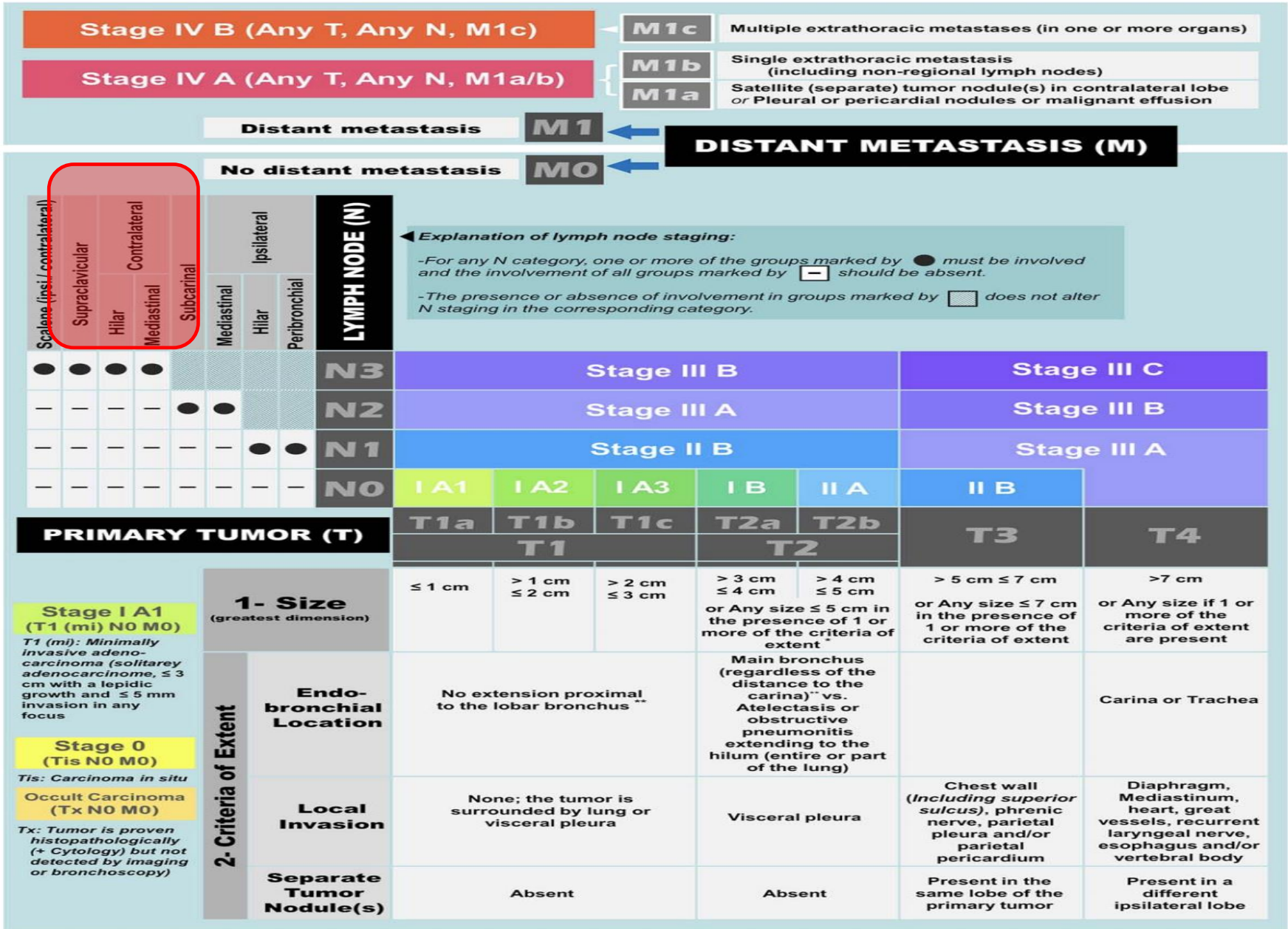
OBJECTIVES: A multicentre evaluation of the frequency and nature of major intraoperative complications during video-assisted thoracoscopic (VATS) anatomical resections.

METHODS: Six European centres submitted their series of consecutive anatomical lung resections with the intention to treat by VATS. Conversions to thoracotomy, vascular injuries and major intraoperative complications were studied in relation to surgeons' experience. Major complications included immediate life-threatening complications (i.e. blood loss of more than 2 l), injury to proximal airway or other organs or those leading to unplanned additional anatomical resections. All cases were discussed by a panel and recommendations were drafted.

RESULTS: A total of 3076 patients were registered. Most resections (90%, $n = 2763$) were performed for bronchial carcinoma. There were 3 intraoperative deaths, including 1 after conversion for technical reasons. In-hospital mortality was 1.4% ($n = 43$). Conversion to open thoracotomy was observed in 5.5% ($n = 170$), of whom 21.8% ($n = 37$) were for oncological reasons, 29.4% ($n = 50$) for technical reasons and 48.8% ($n = 83$) for complications. Vascular injuries were reported in 2.9% ($n = 88$) patients and led to conversion in 2.2% ($n = 70$). In 1.5% ($n = 46$), major intraoperative complications were identified. These consisted of erroneous transection of bronchovascular structures ($n = 9$); injuries to gastrointestinal organs ($n = 5$) or proximal airway ($n = 6$); complications requiring additional unplanned major surgery ($n = 9$) or immediate life-threatening complications ($n = 17$). Twenty-three percent of the in-hospital mortalities ($n = 10/43$) were related to major intraoperative complications. Eight pneumonectomies (five intraoperative and three postoperative at 0.3%) were a consequence of a major complication. Surgeon's experience was related to non-oncological conversions, but not to vascular injuries or major complications in a multivariable logistic regression analysis.

CONCLUSION: Major intraoperative complications during VATS anatomical lung resections are infrequent, seem not to be related to surgical experience but have an important impact on patient outcome. Constant awareness and a structured plan of action are of paramount importance to prevent them.

TNM STAGING OF LUNG CANCER - 8th EDITION



CLINICAL PRACTICE GUIDELINES

Diagnosis and pathology/molecular biology

Work-up for diagnosis and staging

*Tests needed for clinical staging

†Screening for brain metastases by MRI might be useful in patients considered for curative therapy

‡Depending on site and size of tumour with biopsy/aspiration/brush/washing

§Bronchoscopy is usually sufficient to diagnose NSCLC, though may not allow a detailed sub-classification

Parameter	Mandatory	Optional
General	Medical history* Physical examination* Assessing comorbidity Performance status	
Imaging	X-ray thorax CT thorax* PET-CT thorax* MRI brain†	Bone scintigraphy Contrast-enhanced CT brain
Laboratory	Blood cell counts Renal function Liver enzymes Bone parameters	
Cardio-pulmonary function	FVC, FEV_1, DLCO ECG If indicated: CPET	Ejection fraction, CAG
Tissue procurement	Bronchoscopy‡,§ EBUS/EUS mediastinal nodes* CT-guided biopsy	Mediastinoscopy

A National Study of Nodal Upstaging After Thoracoscopic Versus Open Lobectomy for Clinical Stage I Lung Cancer

Peter B. Licht, MD, PhD, Ole Dan Jørgensen, MD, PhD, Lars Ladegaard, MD, and Erik Jakobsen, MD, MPM

Department of Cardiothoracic Surgery and Danish Lung Cancer Registry, Odense University Hospital, Odense, Denmark

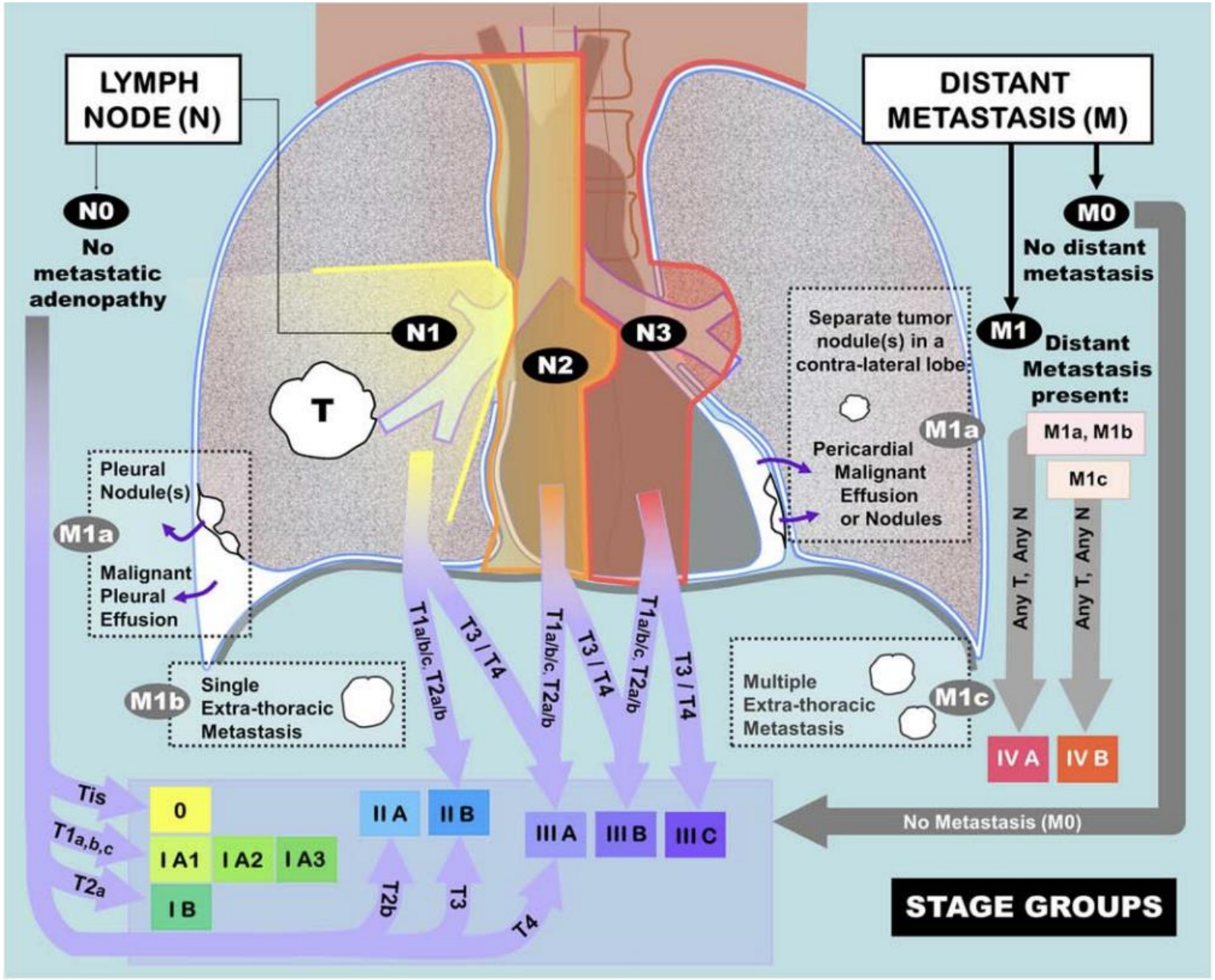
Background. Nodal upstaging after surgical intervention for non-small cell lung cancer (NSCLC) occurs when unsuspected lymph node metastases are found during the final evaluation of surgical specimens. Recent data from The Society of Thoracic Surgery (STS) database demonstrated significantly lower nodal upstaging after thoracoscopic (VATS) lobectomy than after thoracotomy. STS data, however, may be biased from voluntary reporting, and survival was not investigated. We used a complete national registry to compare nodal upstaging and survival after lobectomy by VATS or thoracotomy.

Methods. The Danish Lung Cancer Registry was used to identify patients who underwent lobectomy for clinical stage I NSCLC from 2007 to 2011. Patient demographics, comorbidity, preoperative staging, surgical approach, number of lymph nodes harvested, final pathology, and survival were evaluated. Nodal upstaging was identified by comparing cT N M with pT N M.

Results. Lobectomy for clinical stage I NSCLC was performed in 1,513 patients: 717 (47%) by VATS and 796 (53%) by thoracotomy. Nodal upstaging occurred in 281 patients (18.6%) and was significantly higher after thoracotomy for N1 upstaging (13.1% vs 8.1%; $p < 0.001$) and N2 upstaging (11.5% vs 3.8%; $p < 0.001$). Overall unadjusted survival was significantly higher after VATS, but after adjusting for differences in sex, age, comorbidity, and pT N M by Cox regression analysis, we found no difference between VATS and thoracotomy (hazard ratio, 0.98; 95% confidence interval, 0.80 to 1.22, $p = 0.88$).

Conclusions. National data confirm that nodal upstaging was lower after VATS than after open lobectomy for clinical stage I NSCLC. Multivariate survival analysis, however, showed no difference in survival, indicating that differences in nodal upstaging result from patient selection for reasons not captured in our registry.

(Ann Thorac Surg 2013;96:943–50)



European Journal of Cardio-Thoracic Surgery Advance Access published February 26, 2014

European Journal of Cardio-Thoracic Surgery (2014) 1–12
doi:10.1093/ejcts/ezu028

GUIDELINE

Revised ESTS guidelines for preoperative mediastinal lymph node staging for non-small-cell lung cancer†

Paul De Leyn[a,*], Christophe Dooms[b], Jaroslaw Kuzdzal[c], Didier Lardinois[d], Bernward Passlick[e], Ramon Rami-Porta[f], Akif Turna[g], Paul Van Schil[h], Frederico Venuta[i], David Waller[j], Walter Weder[k] and Marcin Zielinski[l]

[a] Department of Thoracic Surgery, University Hospitals Leuven, Leuven, Belgium
[b] Department of Pneumology, University Hospitals Leuven, Leuven, Belgium
[c] Department of Thoracic Surgery, Jagiellonian University Collegium Medicum Krakow, Krakow, Poland
[d] Department of Thoracic Surgery, University Hospital Basel, Basel, Switzerland
[e] Department of Thoracic Surgery, Albert-Ludwigs-University Freiburg, Freiburg, Germany
[f] Department of Thoracic Surgery, University Hospital Mutua de Terrassa and CIBERES Lung Cancer Group, Terrassa, Barcelona, Spain
[g] Department of Thoracic Surgery, University Hospital Istanbul, Istanbul, Turkey
[h] Department of Thoracic and Vascular Surgery, Antwerp University Hospital, Antwerp, Belgium
[i] Department of Thoracic Surgery, University Hospital, Rome, Italy
[j] Department of Thoracic Surgery, Glenfield Hospital Leicester, Leicester, UK
[k] Department of Thoracic Surgery, University Hospital Zurich, Zurich, Switzerland
[l] Department of Thoracic Surgery, Pulmonary Hospital Zakopane, Zakopane, Poland

* Corresponding author. Department of Thoracic Surgery, University Hospitals Leuven, Herestraat 49, 3000 Leuven, Belgium. Tel: +32-16346820; fax: +32-16346821; e-mail: paul.deleyn@uzleuven.be (P. De Leyn).

Received 3 October 2013; received in revised form 16 December 2013; accepted 20 December 2013

Continuous 389 cases of Da Vinci robot-assisted thoracoscopic lobectomy in treatment of non-small cell lung cancer: experience in Shanghai Chest Hospital

Jia Huang[#], Jiantao Li[#], Hanyue Li, Hao Lin, Peiji Lu, Qingquan Luo

Shanghai Lung Tumor Clinical Medical Center, Shanghai 200030, China

Contributions: (I) Conception and design: J Huang, J Li, Q Luo; (II) Administrative support: H Li, Q Luo; (III) Provision of study materials or patients: H Lin, P Lu; (IV) Collection and assembly of data: J Huang, H Li; (V) Data analysis and interpretation: J Li, H Lin; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

[#]These authors contributed equally to this work.

Correspondence to: Qingquan Luo. Shanghai Lung Tumor Clinical Medical Center, Shanghai 200030, China. Email: luoqingquan@hotmail.com.

Background: To analyze the perioperative indexes of 389 patients with non-small cell lung cancer in single center after robot-assisted thoracoscopic (RATS) lobectomy, and to summarize the surgical key points in robotic lobectomy.

Methods: The clinical data of 389 stage I non-small cell lung cancer patients who underwent RATS lobectomy from May 2013 to December 2016 were retrospectively analyzed. Among them, there were 261 females (67.1%) and 128 males (32.9%); aged from 20–76 years old, with a mean age of 55.01 years; with ASA I in 106 cases, ASA II in 267 cases and ASA III in 16 cases; with BMI from 16.87–34.05, averaged at 23.09±2.79. The largest tumor in preoperative chest CT measurement was 0.3–3.0 cm, ranging from 1.29±0.59 cm; with stage Ia in 153 cases, stage Ib in 148 cases, stage Ic in 32 cases, stage IIb in 26 cases and stage IIIa in 30 cases; including 380 adenocarcinomas and 9 squamous carcinomas.

Results: The operating time was 46–300 min, averaged at 91.51±30.80 min; with a blood loss of 0–100 mL in 371 cases (95.80%), 101–400 mL in 12 cases (3.60%) and >400 mL in 2 cases (0.60%); there were 4 (1.2%) conversions to thoracotomy, in which 2 patients had massive hemorrhage and 2 patients had extensive dense adhesion; there was no mortality during operation and perioperatively. The drainage on the first day after operation was 0–960 mL, averaged at 231.39±141.87 mL; the postoperative chest tube was placed for 2–12 d, averaged at 3.96±1.52 d; the postoperative hospital stay was 2–12 d, averaged at 4.96±1.51 d, with postoperative hospital stay >7 d in 12 cases (3.60%). The postoperative air leakage was the main reason (35 cases, 9%) for prolonged hospital stay, and there was no re-admitted case within 30 days. All the patients underwent systemic lymph node dissection. The total cost of hospitalization was 60,389.66–134,401.65 CNY, averaged at 93,809.23±13,371.26 CNY.

Conclusions: The application of Da Vinci robot surgery system in resectable non-small cell lung cancer is safe and effective, and could make up for the deficiencies of traditional thoracoscopic surgery. The number and level of robot surgery in our center have reached international advanced level, but the relatively expensive cost has become a major limitation in limiting its widespread use. With continuous improvements in robotic technology, its scope of application will be wider, which will inevitably bring new insights in lung surgical technology.

Keywords: Da Vinci robot surgery system; lobectomy; minimally invasive surgery

Submitted Mar 13, 2018. Accepted for publication Jun 08, 2018.
doi: 10.21037/jtd.2018.06.80
View this article at: http://dx.doi.org/10.21037/jtd.2018.06.80