Současné indikace a budoucí perspektivy robotické chirurgie plicních nádorů

III. chirurgická klinika 1. LF UK a FN Motol
Pneumoonkochirurgické centrum FN Motol
Centrum kardiovaskulární, thorakoabdominální a transplantační chirurgie FN Motol

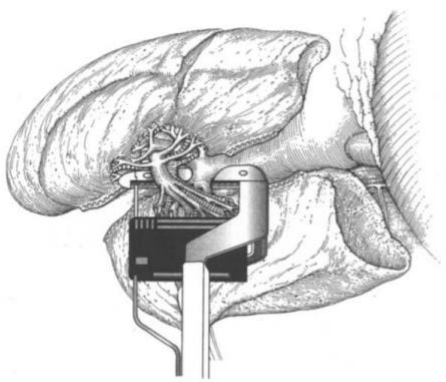
Historie

Video-Assisted Thoracic Surgical Non-Rib Spreading Simultaneously Stapled Lobectomy (VATS(n)SSL)

Ralph J. Lewis and Robert J. Caccavale

Two hundred consecutive patients underwent a video-assisted thoracic surgical non-rib spreading simultaneously stapled lobectomy (VATS(n)SSL). Ninety-three were males and 107 were females, ranging in age from 20 to 92 years. Lesions consisted of 171 primary lung carcinomas, 7 metastatic tumors, and 22 benign lesions. Resections included 47 right upper lobe, 18 right middle lobe, 46 right lower lobe, 52 left upper lobe, 26 left lower lobe and 11 bilobectomies, ie, 9 right upper and middle lobes and 2 right middle and lower lobes. Operating time averaged 79.5 minutes, and no patient received a transfusion. Tumors ranged from 1 cm to 9 cm, bronchial stumps were 4 to 5 mm, and length of hospitalization averaged 3.07 days. Complications were minimal, and there was no surgical mortality. No patient developed a bronchopleural fistula or neoplastic port implant. Twenty-four patients have died of metastases. At a median follow-up of 34 months for all stages of carcinoma, there is an overall survival rate of 86%. Survival rate is 92% for stage I. VATS(n)SSL is a new technique for lobectomy that has proven to be beneficial for patients needing resection.

Key words: VATS non-rib spread simultaneously stapled lobectomy.



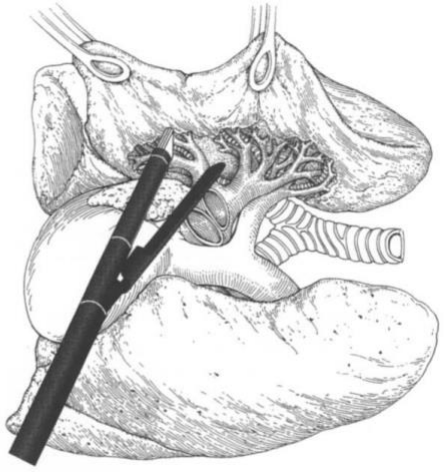


Figure 4. The stapler pin is down. All hilar structures of the right lower lobe are confined, in their normal, anatomic configuration, within the jaws of the stapler.

Video-Assisted Thoracic Surgery Lobectomy: Experience With 1,100 Cases

Robert J. McKenna, Jr, MD, Ward Houck, MD, and Clark Beeman Fuller, MD

Cedars Sinai Medical Center, Los Angeles, California

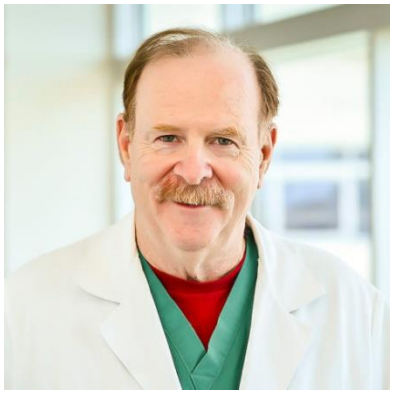
Background. Although many video-assisted thoracic surgery (VATS) lobectomies have been performed over the 12 years since the first VATS lobectomy, controversies about the procedure remain regarding the safety and associated morbidity and mortality of that procedure. This series is reviewed to assess these issues.

Methods. Between 1992 and 2004, we performed 1,100 VATS lobectomies in 595 women (54.1%) and 505 men (45.9%), with a mean age of 71.2 years. Diagnoses were as follows: benign disease (53), pulmonary metastases (27), lymphoma (5), and lung cancer (1,015). Of the primary lung cancers, 641 (63.1%) were adenocarcinoma. With visualization on a monitor, anatomic hilar dissection and lymph node sampling or dissection were performed, primarily through a 5-cm incision without spreading the ribs.

Results. There were 9 deaths (0.8%), and none was intraoperative or due to bleeding; 932 patients had no postoperative complications (84.7%). Blood transfusion was required in 45 of 1,100 patients (4.1%). Length of stay was median 3 days (mean, 4.78). One hundred eighty patients (20%) were discharged on postoperative day 1 or 2. Conversion to a thoracotomy occurred in 28 patients (2.5%). Recurrence developed in the incisions in 5 patients (0.57%). In 2003, 89% of 224 lobectomies were performed with VATS.

Conclusions. VATS lobectomy with anatomic dissection can be performed with low morbidity and mortality rates. The risk of intraoperative bleeding or recurrence in an incision seems minim

(Ann Thorac Surg 2006;81:421–6)



Uniportal VATS lobektomie

Ann Thorac Surg. 2013 Feb;95(2):426-32. doi: 10.1016/j.athoracsur.2012.10.070. Epub 2012 Dec 5.

Uniportal video-assisted thoracoscopic lobectomy: two years of experience.

Gonzalez-Rivas D[1], Paradela M, Fernandez R, Delgado M, Fieira E, Mendez L, Velasco C, de la Torre M.

⊕ Author information

Abstract

BACKGROUND: A video-assisted thoracoscopic approach to lobectomy varies among surgeons. Typically, 3 to 4 incisions are made. Our approach has evolved from a 3-port to a 2-port approach to a single 4- to 5-cm incision with no rib spreading. We report results with single-incision video-assisted thoracic major pulmonary resections during our first 2 years of experience.

METHODS: In June 2010, we began performing video-assisted thoracoscopic lobectomies through a uniportal approach (no rib spreading). By July 12, 2012, 102 patients had undergone this single-incision approach.

RESULTS: Of 102 attempted major resections, 97 were successfully completed with a single incision (operations in 3 patients were converted to open surgery and 2 patients needed 1 additional incision). Five uniportal pneumonectomies were not included in the study. We have

European Journal of Cardio-Thoracic Surgery 49 (2016) i6–i16
doi:10.1093/ejcts/ezv410 Advance Access publication 25 November 2015

REVIEW

Cite this article as: Gonzalez-Rivas D, Yang Y, Stupnik T, Sekhniaidze D, Fernandez R, Velasco C *et al.* Uniportal video-assisted thoracoscopic bronchovascular, tracheal and carinal sleeve resections. Eur J Cardiothorac Surg 2016;49:i6–i16.

Uniportal video-assisted thoracoscopic bronchovascular, tracheal and carinal sleeve resections†

Diego Gonzalez-Rivas[a,b,*], Yang Yang[b,†], Tomaz Stupnik[c], Dmitrii Sekhniaidze[d], Ricardo Fernandez[a], Carlos Velasco[e], Yuming Zhu[b] and Gening Jiang[b]

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[b] Department of Thoracic Surgery, Shanghai Pulmonary Hospital, Tongji University School of Medicine, Shanghai, China
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[d] Department of Thoracic Surgery, Regional Oncological Center, Tyumen, Russian Federation
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Historie RATS

ELSEVIER

European Journal of Cardio-thoracic Surgery 21 (2002) 864–868

EUROPEAN JOURNAL OF CARDIO-THORACIC SURGERY

www.elsevier.com/locate/ejcts

Early experience with robotic technology for thoracoscopic surgery☆

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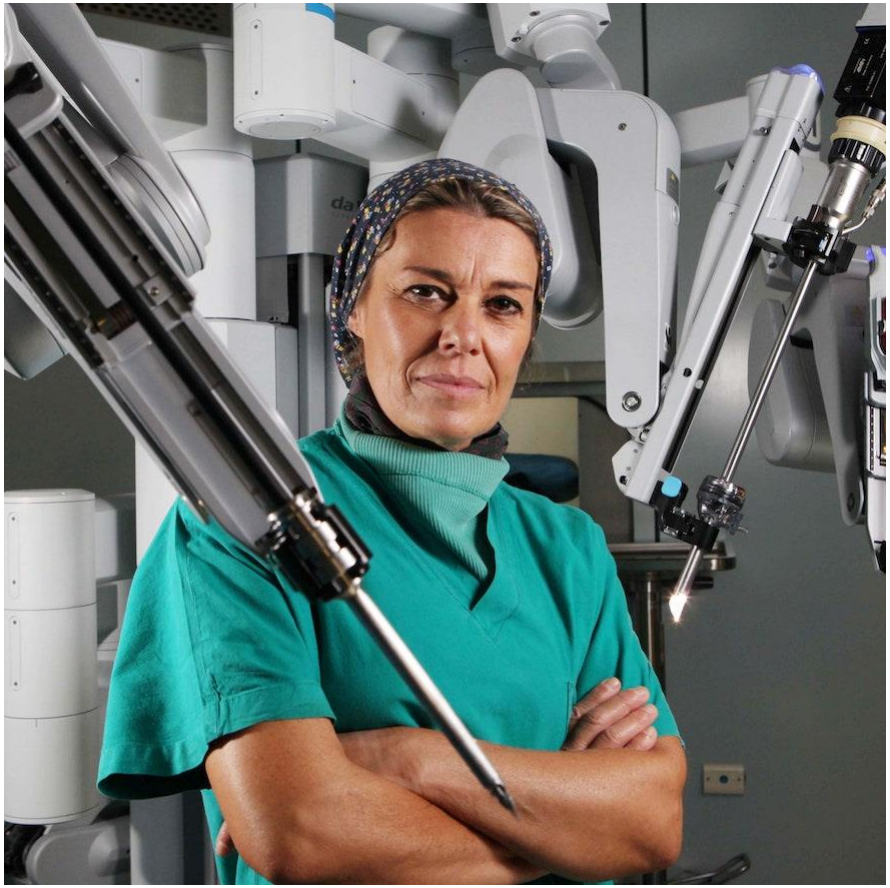
Received 14 September 2001; received in revised form 1 February 2002; accepted 11 February 2002

Abstract

Objective: Recently, robots have been introduced into surgical procedures in an attempt to facilitate surgical performance. The purpose of this study was to develop a technique to perform thoracoscopic lung resection using a telemanipulation system. **Methods**: We have used a robotic system to perform thoracoscopic surgery in 12 cases: five lobectomies, three tumor enucleations, three excisions and one bulla stitching completed with fibrin glue for spontaneous pneumothorax. The operations were performed using the Intuitive Microsurgical system (Da Vinci System) through three ports and, a fourth space 'service entrance' incision, in the major lung resection. **Results**: Three procedures begun with the robotic technique were completed by a minimal thoracotomy. No technical operative mishaps were associated with the manoeuvres of robotic arms. In all manoeuvres (up, down, insertion, extraction, etc.), the robotic arms moved appropriately in the favorable operative fields. All patients tolerated the procedure well and the post-operative course was satisfactory, requiring few analgesics. **Conclusions**: Although further studies on robotically assisted procedures are needed to clarify the clinical feasibility of this procedure, the results in our cases are encouraging. We believe that thoracoscopic procedures using a robotic manipulation system may be technically feasible in selected cases and in the hands of experienced thoracic surgeons.

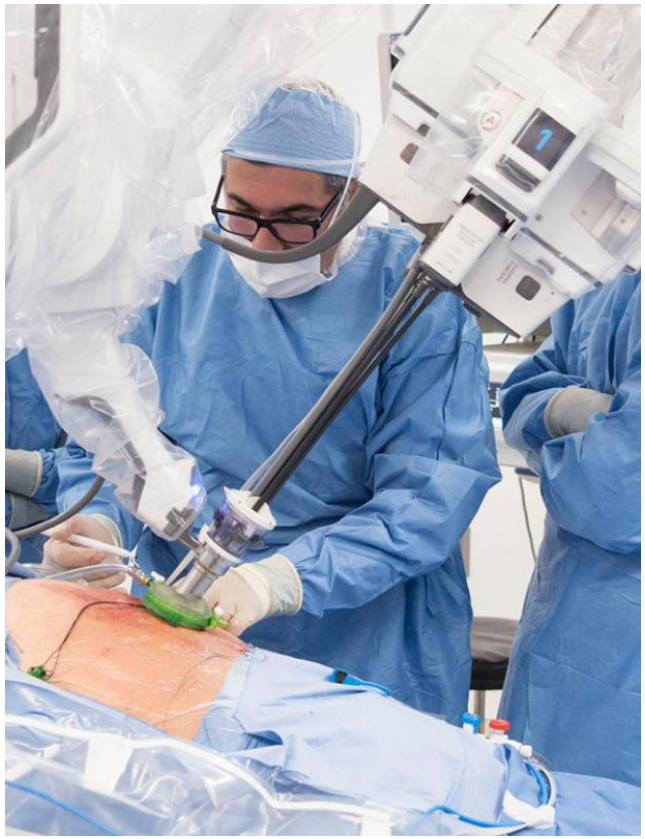
Keywords: Robotic surgery; Thoracoscopy; Video-assisted thoracoscopy



Národní Program Transplantace Plic

FN MOTOL

Uniportální RATS

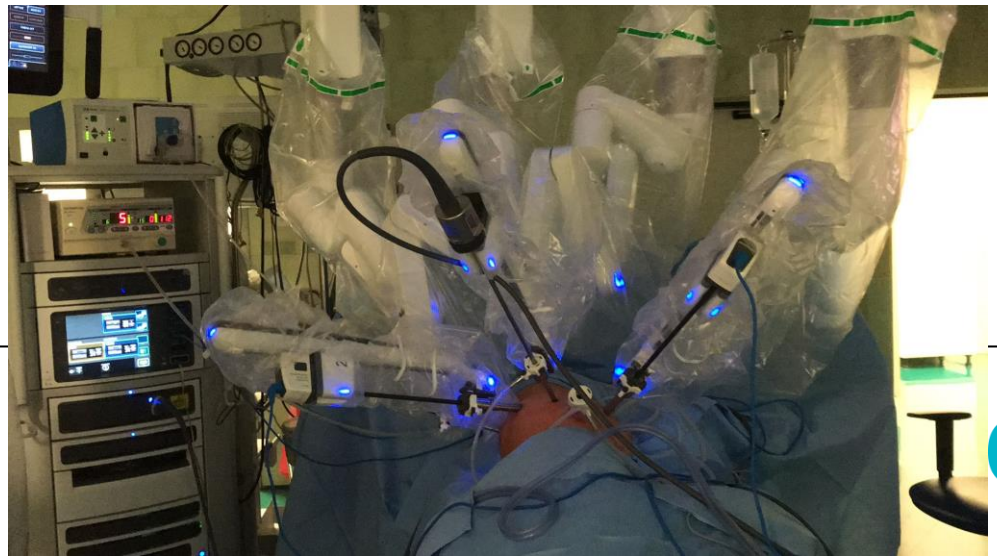


Miniinvazivní chirurgie plic – proč?

- Minimalizace traumatu hrudní stěny
  - Lepší kvalita života
  - Kratší doba hospitalizace
  - Srovnatelná onkologická radikalita
  - Adjuvantní onkologická léčba
  - Ekonomické a kapacitní aspekty
- VATS
  - Technické limity, vynucené polohy operatérů
- RATS
  - Pravděpodobně bez technických omezení, komfort týmu

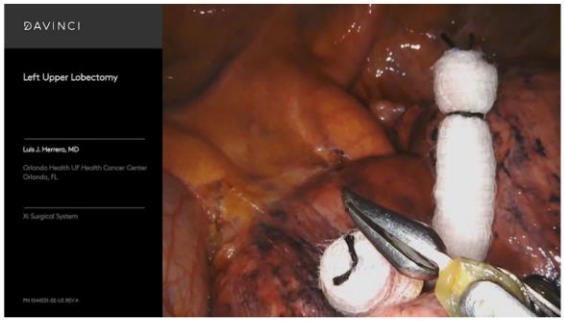
Minimalizace traumatizace hrudní stěny

- trokary se zónou minimálního pohybu
- redukce na dvě mezižebří
- lokální anestezie před zavedením
- minimalizace zánětlivé odpovědi
- interkostální závěrečný blok bupivacain



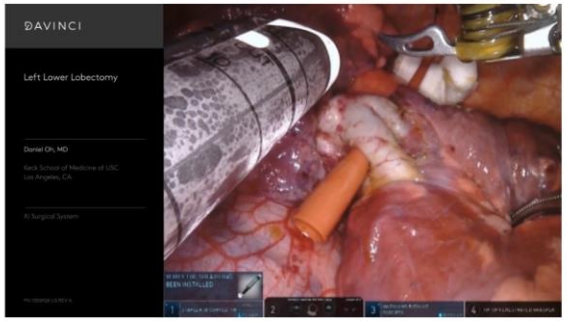
Minimalizace traumatizace hrudní stěny a výborný přístup k hilovým strukturám

1. Mediastinal and hilar lymph node dissection

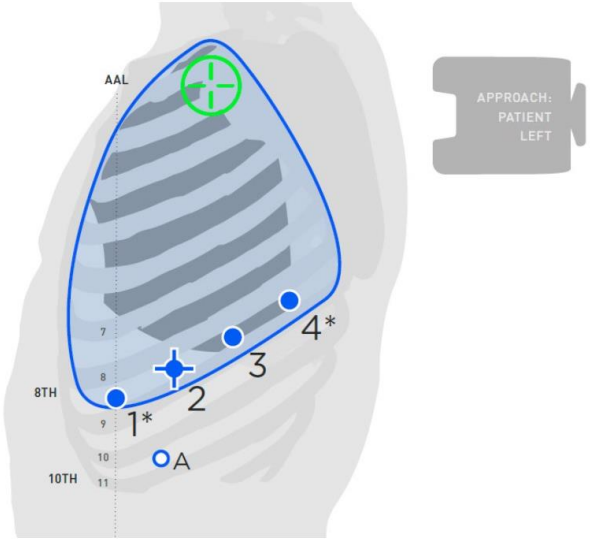


2. Dynamic exposure and retraction

3. Fully wristed, surgeon-controlled stapling



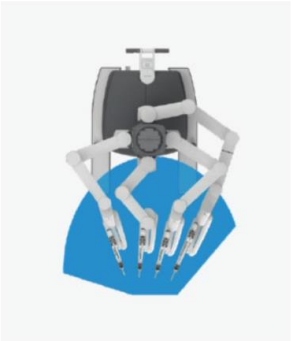
Da Vinci Xi surgical system access and exposure



Workspace comparison

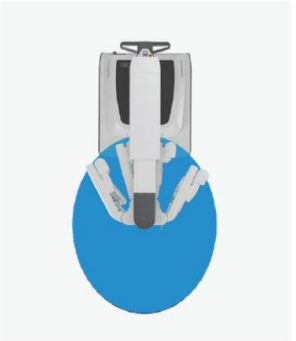
da Vinci Si

da Vinci X



1.5x greater
than da Vinci Si surgical system

da Vinci Xi

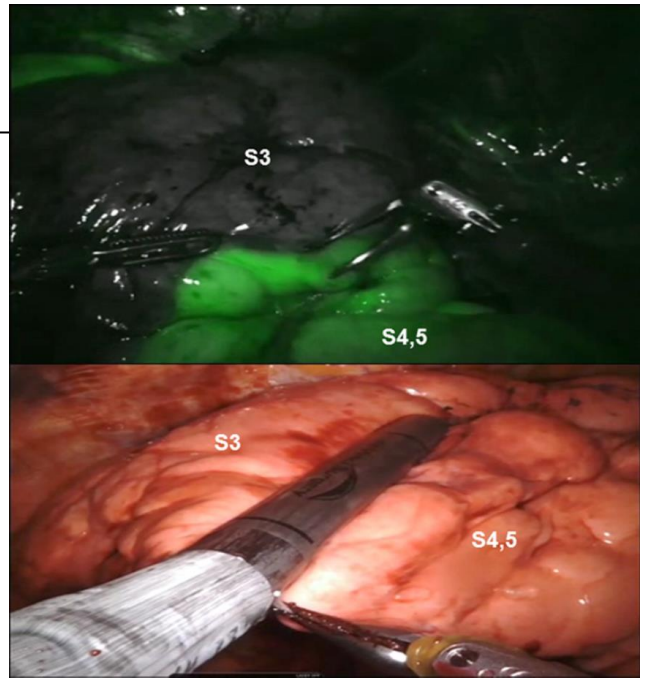


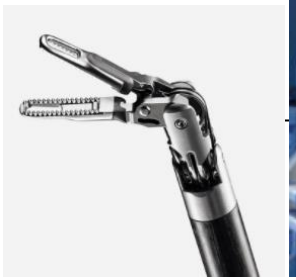
3x greater
than da Vinci Si surgical system
when dual docked

RATS – resekce plic

Robotický systém

- lepší vizualizace, endowrist
- CO2- kapnothorax, fluorescence
- téměř neomezené technické možnosti
- bez vynucených poloh, komfort týmu





Přístup, vizualizace, preparace, disekce, přerušení struktur

1. Access and exposure

Multi-quadrant access

Long Bipolar Grasper

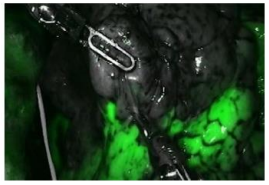
Integrated energy

Suction irrigator

2. Visualization and perfusion assessment

Anatomical segment visualization

3DHD optics &
10x magnification



Firefly imaging

3. Dissect and divide

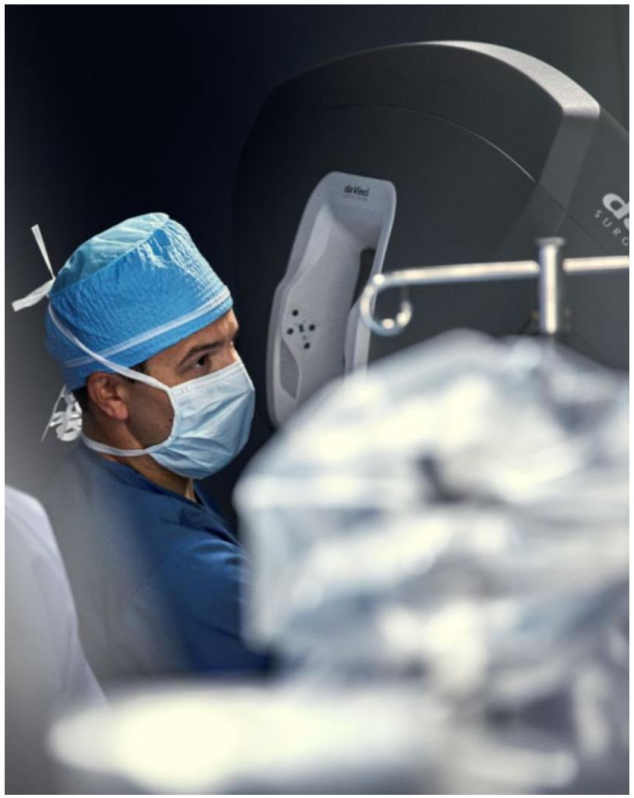
Long Bipolar Grasper

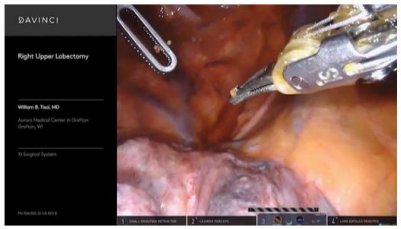
Da Vinci Stapling

Národní Program Transplantace Plic

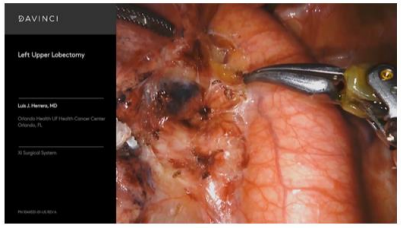
FN MOTOL

Spektrum výkonů – plíce, thymus





Right upper lobectomy



Left upper lobectomy

Right thymectomy

- Lobectomy
- Thymectomy
- Segmentectomy
- Wedge resection
- Mediastinal mass reduction
- Lymphadenectomy

Interactive CardioVascular and Thoracic Surgery (2018) 1–9
doi:10.1093/icvts/ivy315

ORIGINAL ARTICLE

Cite this article as: O'Sullivan KE, Kreaden US, Hebert AE, Eaton D, Redmond KC. A systematic review and meta-analysis of robotic versus open and video-assisted thoracoscopic surgery approaches for lobectomy. Interact CardioVasc Thorac Surg 2018; doi:10.1093/icvts/ivy315.

A systematic review and meta-analysis of robotic versus open and video-assisted thoracoscopic surgery approaches for lobectomy

Katie E. O'Sullivan[a,*], Usha S. Kreaden[b], April E. Hebert[b], Donna Eaton[a] and Karen C. Redmond[a]

[a] Department of Thoracic Surgery, Mater Misericordiae University Hospital, Dublin, Ireland
[b] Department of Clinical Affairs, Intuitive Surgial Inc., Sunnyvale, CA, USA

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Received 15 April 2018; received in revised form 8 October 2018; accepted 14 October 2018

Key question

Which approach has a better short-term survival rate: robotic surgery or open surgery or video-assisted lobectomy?

Key finding(s)

A meta-analysis of the 30-day mortality rate revealed favourable survival for robotic surgery compared with open and video-assisted lobectomy.

Take-home message

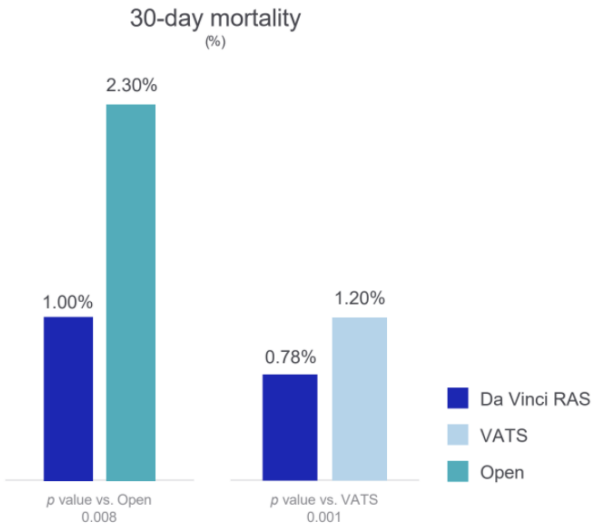
Current results favour robotics. A randomised controlled trial is required to ensure there is no selection bias in outcomes reported to date.

Da vinci robotic system

CONCLUSION

Data collected to date suggest that robotic lobectomy is a valid alternative to VATS and open approaches. Its advantages over open surgery include lower blood transfusion rates and length of hospital stay. Furthermore, 30-day mortality is lower with robotic lobectomy compared to open lobectomy. Its disadvantages are likely prolonged operative duration as data support likely shorter operative times with open surgery. Compared with VATS, it is possible that the 30-day mortality is lower with the robotic approach; however, this result must be cautiously interpreted. There are clinically significant limitations in the level of evidence at present; however, this is the largest published systematic review qualifying robotic lobectomy as a reasonable alternative to VATS and open surgery to date. Meaningful data on long-term survival are not available; therefore, no definitive conclusions can be drawn. Furthermore, a randomized controlled trial in the era of developing technologies may help in the further understanding of the role of robotics in thoracic surgery.

A systematic review and meta-analysis of robotic versus open and video-assisted thoracoscopic surgery approaches for lobectomy[26]



O'Sullivan KE, et al.[26]

RAS (n=138) vs. Open (n=1857)

RAS (n=168) vs. VATS (n=2466)

Data Source:

Systematic Review of publications pertaining to robotic lobectomy from Jan 2010 to September 2017.

A total of 13 publications were suitable for further analysis. These studies were subdivided for comparative purposes into those describing open lobectomy versus robotic lobectomy and those describing VATS versus robotic lobectomy.

Study information

[26] O'Sullivan KE, Kreaden US, Hebert AE, Eaton D, Redmond KC. A systematic review and meta-analysis of robotic versus open and video-assisted thoracoscopic surgery approaches for lobectomy. Interact Cardiovasc Thorac Surg. 2019 Apr 1;28(4):526-534. doi: 10.1093/icvts/ivy315. PMID: 30496420.

Robotic lobectomy is inferior to both VATS and open with respect to operative duration (robotic vs. VATS; WMD 4.98, 95% CI 2.61–7.36, P <0.001, robotic vs. open WMD 65.56, 95% CI 53.66–77.46, P < 0.00001). Robotic lobectomy is a valid alternative to the VATS approach and is superior to the open approach with respect to complications [OR 0.67, 95% CI 0.58–0.76, P < 0.00001] and duration of hospital stay (WMD -1.4, 95% CI -1.96–0.85, P < 0.00001). Robotic approach is superior with respect to 30-day mortality compared to VATS (OR 0.61, 95% CI 0.45–0.83, P = 0.001 and open approaches (OR 0.53, 95% CI 0.33–0.85, P = 0.008).

Robotic-Assisted, Video-Assisted Thoracoscopic and Open Lobectomy: Propensity-Matched Analysis of Recent Premier Data

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

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

GENERAL THORACIC

Background. Robotic-assisted lobectomy (RL) is becoming a popular alternative technique to video-assisted thoracoscopic lobectomy (VL), although open lobectomy (OL) remains the most common approach. The objective of this study is to provide a comparative analysis of perioperative clinical outcomes from elective RL, VL, and OL.

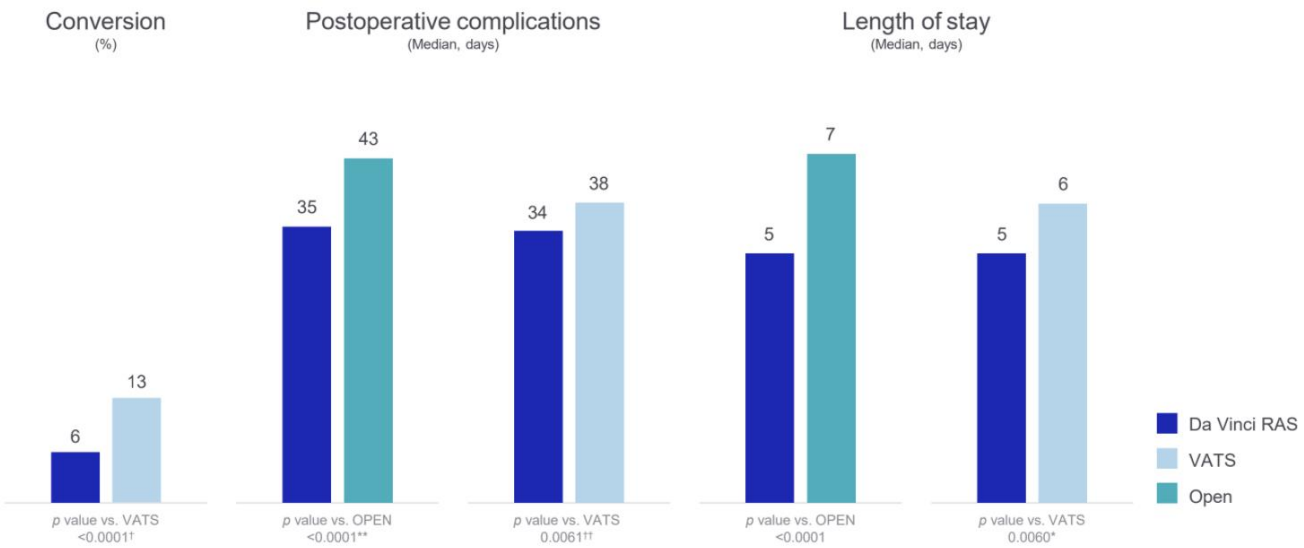
Methods. The Premier Healthcare Database was analyzed for lobectomies performed from January 1, 2011, to September 30, 2015. International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis and procedure codes were used to identify surgical approaches, complications, and mortality. Propensity score matching (1:1) for patient and hospital characteristics allowed comparison of RL versus OL (n = 2,775 each) and RL versus VL (n = 2,951 each).

Results. Compared with OL in propensity matched analysis, RL was associated with a lower postoperative complication rate ($p < 0.0001$), shorter hospital stay ($p < 0.0001$), and lower mortality rate ($p = 0.0282$). Patients in the RL group were more likely to be discharged home than to a transitional health care facility ($p < 0.0001$). Compared with VL, the RL group had a lower conversion rate to thoracotomy ($p < 0.0001$), lower overall postoperative complication rate ($p = 0.0061$), and shorter hospital stay ($p = 0.006$). The RL patients also were more likely to be discharged home than to a transitional health care facility ($p = 0.0108$). The postoperative mortality rates of RL and VL were similar ($p = 0.44$). There was no difference in iatrogenic injuries when comparing RL with OL and RL with VL ($p = 0.1284$ and $p = 0.5477$, respectively).

Conclusions. Robotic-assisted lobectomy was associated with improved outcomes for certain perioperative clinical variables, including shorter length of stay and lower complication rates. It was also was associated with a lower conversion rate to OL compared with VL.

(Ann Thorac Surg 2017;104:1733–40)

Robotic-assisted lobectomy associated with fewer postoperative complications and conversions, and reduced LOS[6]



Daniel Oh, MD
Los Angeles, CA
System training 2011

Oh 2017[6]

RAS vs. open (n=2775)

RAS vs. VATS (n=2951)

Data Source: Premier (National Database)

Propensity score-matched comparative data: Perioperative outcomes in lobectomy

Study information

[6] Oh D, Reddy R, Gorrepati M, Mehendale S, Reed M. Robotic-Assisted, Video-Assisted Thoracoscopic and Open Lobectomy: Propensity-Matched Analysis of Recent Premier Data. Ann Thorac Surg. 2017;104(5):1733-1740. doi:10.1016/j.athoracsur.2017.06.020.

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

GENERAL THORACIC

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.

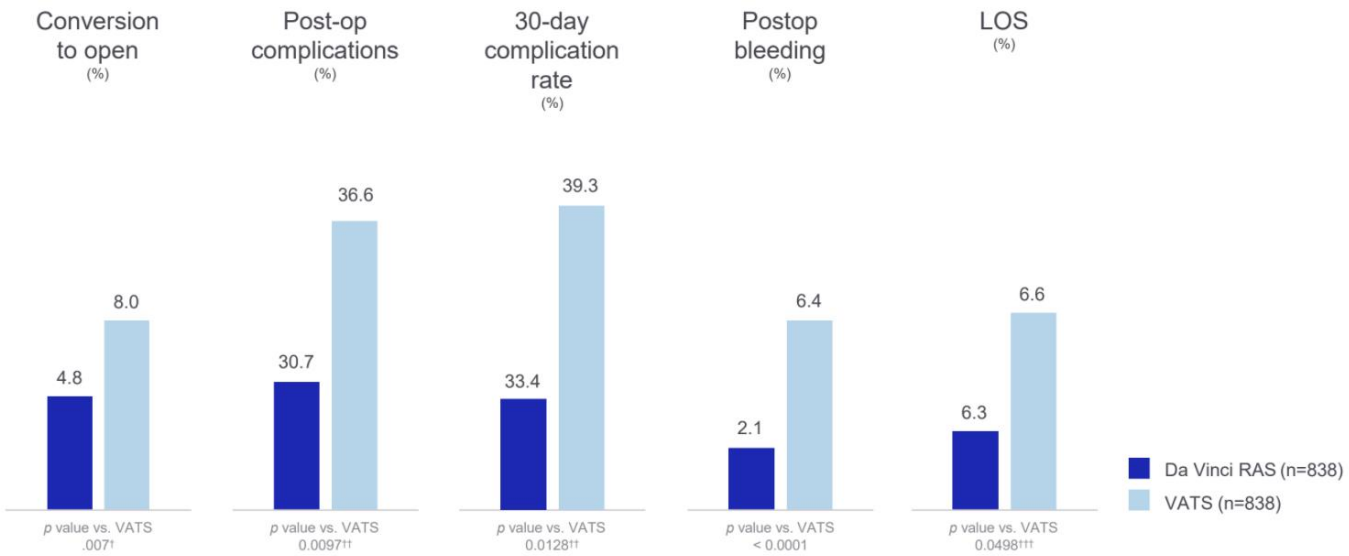
Methods. Patients 18 years or older, who underwent elective lobectomy by surgeons who performed 20 or more annual lobectomies by robotic-assisted or thoracoscopic approach from January 2011 through September 2015, were identified in the Premier Healthcare database with the use of codes from the ninth 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)

Robotic-assisted versus thoracoscopic lobectomy outcomes from high-volume thoracic surgeons[23]



Reddy et al. 2018[23]

RATS vs. VATS (n=838)

Data Source: Premier (National Perspective Database)

Propensity score-matched comparisons of peri-operative clinical outcomes from high-volume surgeons (>20 lobectomies/year)

Study information

[23] Reddy R, Gorrepati M, Oh D, Mehendale S, Reed M. Robotic-Assisted Versus Thoracoscopic Lobectomy Outcomes From High-Volume Thoracic Surgeons. Ann Thorac Surg. 2018;106(3):902-908. doi:10.1016/j.athoracsur.2018.03.048

Segmentektomie versus Lobektomie u Tu < 2cm

General Thoracic and Cardiovascular Surgery
https://doi.org/10.1007/s11748-019-01219-y

SPECIAL EDITION

Diagnosis and Treatment for Early Stage Non-small Cell Lung Cancer

Are segmentectomy and lobectomy comparable in terms of curative intent for early stage non-small cell lung cancer?

Takahiro Mimae[1] · Morihito Okada[1]

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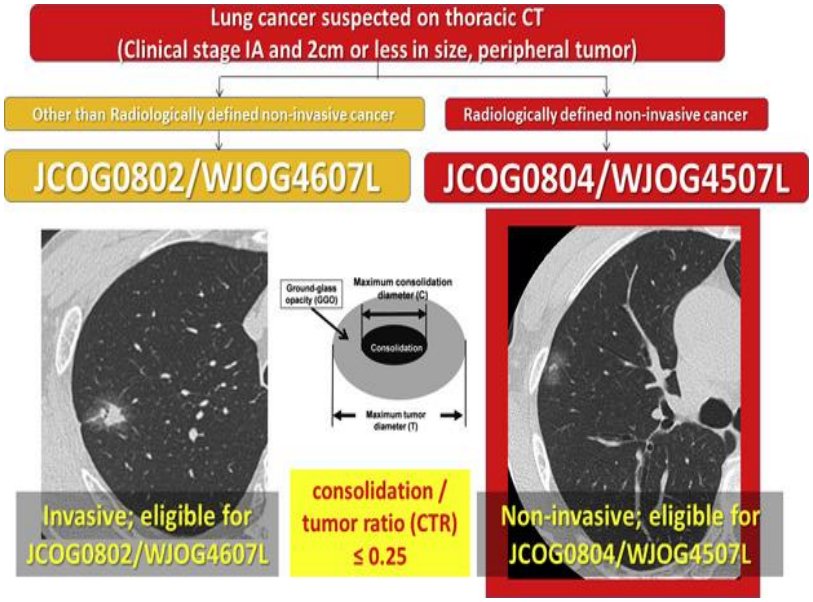
Abstract

In 1995, Ginsberg et al. compared lobectomy with limited resection including segmentectomy and wide-wedge resection for stage I lung cancer in a randomized controlled trial and found that limited resection should not be applied to otherwise healthy patients with clinical stage IA lung cancer who can tolerate lobectomy. However, recent advances in diagnostic technology have improved the precision of detecting early-stage and small lung cancers. Therefore, whether radical segmentectomy, anatomical segmentectomy with hilar and mediastinal lymph node dissection (that is more valuable than wedge resection in terms of oncological aspects) and lobectomy are comparable in terms of curative intent for patients with early-stage non-small cell lung cancer (NSCLC) remains controversial. The role of segmentectomy differs according to tumor or patient characteristics. High resolution computed tomography findings of tumor size, location, and the presence or ratio of a ground glass opacity (GGO) component and the maximum of standardized uptake value on fluorine-18-2-deoxy-D-glucose positron emission tomography are important for selecting surgical procedures because the malignant potential of even early-stage NSCLC is variable. The ongoing JCOG0802/WJOG4607L, JCOG1211, and CALGB140503 trials will disclose the influence of segmentectomy for patients with early-staged NSCLCs that are small peripheral tumors based on preoperative high-resolution computed tomography findings about preserved pulmonary function and long-term prognosis. Segmentectomy is a key surgical procedure that general thoracic surgeons will need to master considering that it can be converted to lobectomy if the surgical margin is insufficient or lymph node metastasis is intraoperatively confirmed.



Kenji Suzuki , Comparison of pulmonary segmentectomy and lobectomy: Safety results of a randomized trial The Journal of Thoracic and Cardiovascular Surgery, September 2019

Národní Program Transplantace Plic

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RATS lobektomie / segmentektomie

Original Article

Introduction of robotic surgery leads to increased rate of segmentectomy in patients with lung cancer

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Contributions: (I) Conception and design: All authors; (II) Administrative support: CD Scott, MJ Weyant, DA Fullerton; (III) Provision of study materials or patients: JD Mitchell, RA Meguid, CD Scott, MJ Weyant; (IV) Collection and assembly of data: AK Gergen, A White; (V) Data analysis and interpretation: K Gergen; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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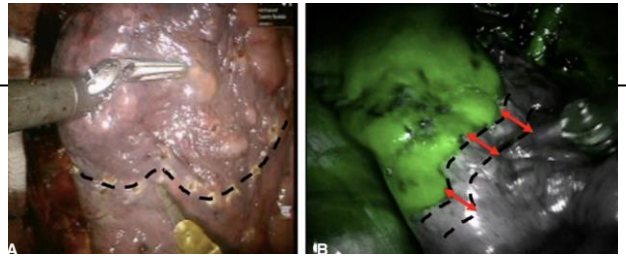
Background: Pulmonary segmentectomy provides an anatomic lung resection while avoiding removal of excess normal lung tissue. This may be beneficial in patients with minimal pulmonary reserve who present with early-stage non-small cell lung cancer (NSCLC). However, the operative performance of a segmentectomy using a video-assisted thoracoscopic approach can be technically challenging. We hypothesized that introduction of the robotic surgical system would facilitate the performance of a segmentectomy as measured by an increase in the proportion of segmentectomies being pursued.

Methods: We completed a retrospective analysis of thoracoscopic and robotic anatomic lung resections, including lobectomies and segmentectomies, performed in patients with primary lung cancer from the time of initiation of the robotic thoracic surgery program in November 2017 to November 2019. We compared the proportion of thoracoscopic and robotic segmentectomies performed during the first year compared to the second year of the data collection period.

Results: A total of 138 thoracoscopic and robotic anatomic lung resections were performed for primary lung cancer. Types of lung cancer resected (adenocarcinoma, squamous cell carcinoma, or other), tumor size based on clinical T staging (T1–T4), and tumor location were not significantly different between years (P=0.44, P=0.98, and P=0.26, respectively). The proportion of segmentectomies increased from 8.6% during the first year to 25.0% during the second year (P=0.01). One out of 6 (16.7%) segmentectomies were performed using the robot during the first year versus 15 out of 17 (88.2%) during the second year (P=0.003).

Conclusions: Use of the robot led to a significant increase in the number of segmentectomies performed in patients undergoing anatomic lung resection. With increasing lung cancer awareness and widely available screening, a greater number of small, early-stage tumors suitable for segmentectomy will likely be detected. We conclude that robotic-assisted surgery may facilitate the challenges of performing a minimally invasive segmentectomy.



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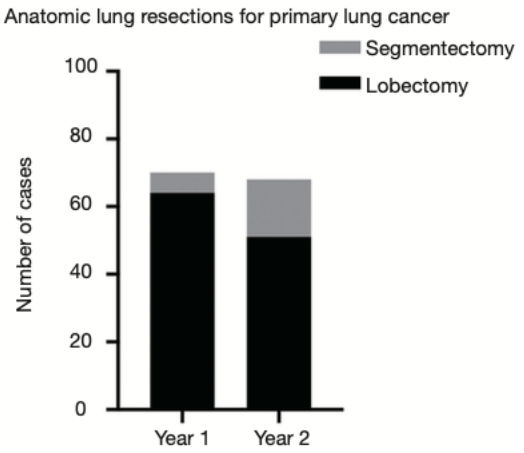

Figure 2 Following the introduction of robotic thoracic surgery, patients with primary lung cancer undergoing segmentectomy increased from 8.6% to 25.0% of all anatomic lung resections (P=0.01).

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Robotická sleeve resekce – bronchus, plicní tepna

Innovations
2021, Vol. 16(2) 132–135

DOI: 10.1177/1556984521992384
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SAGE

Robotic-Assisted Complex Pulmonary Resection: Sleeve Lobectomy for Cancer

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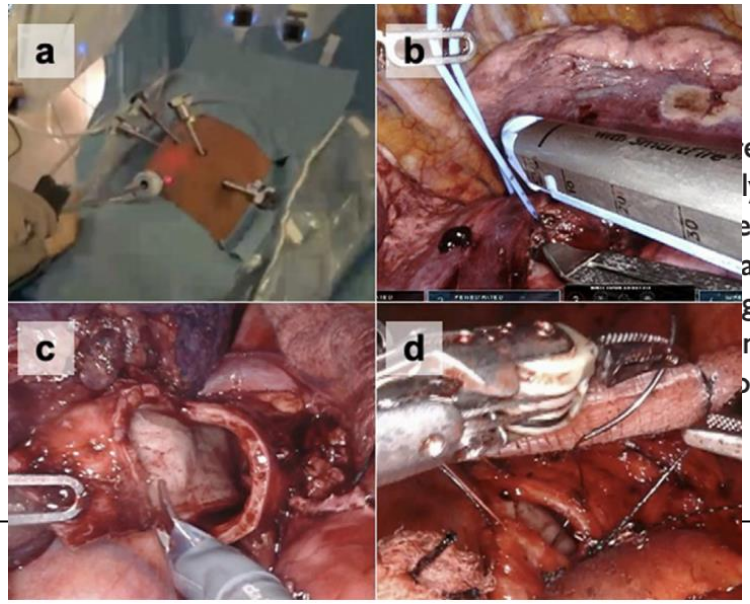

esections such as segmentectomy and sleeve lobectomy has steadily in-
ly challenging as they require fine dissection and suturing, which is often
echniques. Robotic surgery is well-suited for complex pulmonary surgery
and precise tissue manipulation and dissection. Herein we describe our
gery with a specific focus on right upper sleeve lobectomy for cancer,
nciples discussed are generalizable to other complex lung and tracheo-
obotic platform.

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

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Key question

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

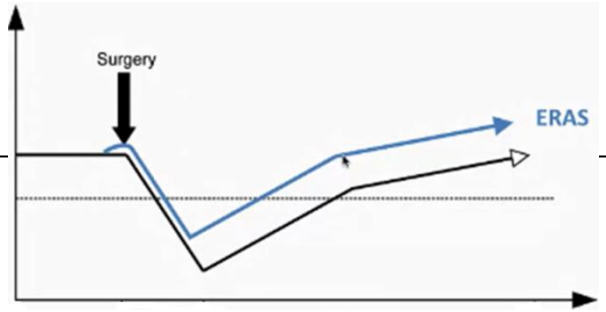
Key findings

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.

- prehabilitace
- klinický protokol
- sacharidový roztok
- miniinvazivní operace
- jeden drén na spád
- bez cévky a epidurálu
- časná realimentace
- časná mobilizace



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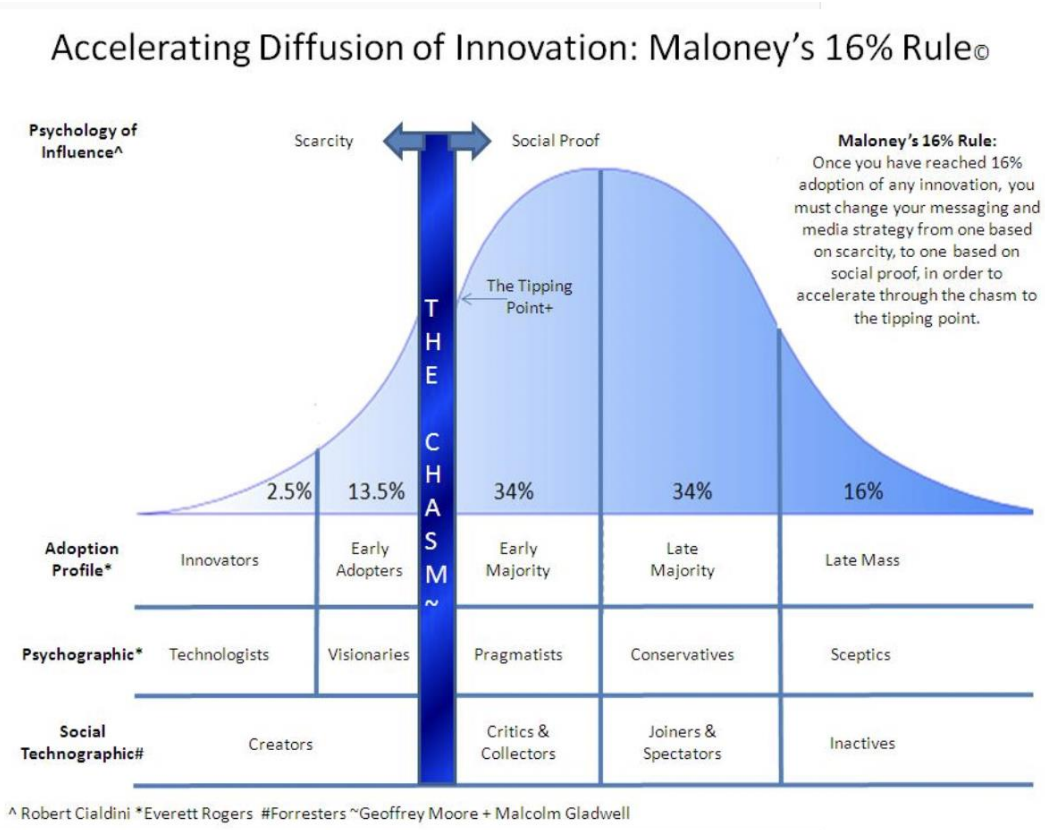
INNOVATE OR DIE

INSIGHTS INTO INNOVATIVE BRANDS FROM THE PEOPLE BEHIND THEM

You are here: Home » The Secret to Accelerating Diffusion of Innovation: The 16% Rule Explained

May 10, 2010 | 30 Comments

The Secret to Accelerating Diffusion of Innovation: The 16% Rule Explained

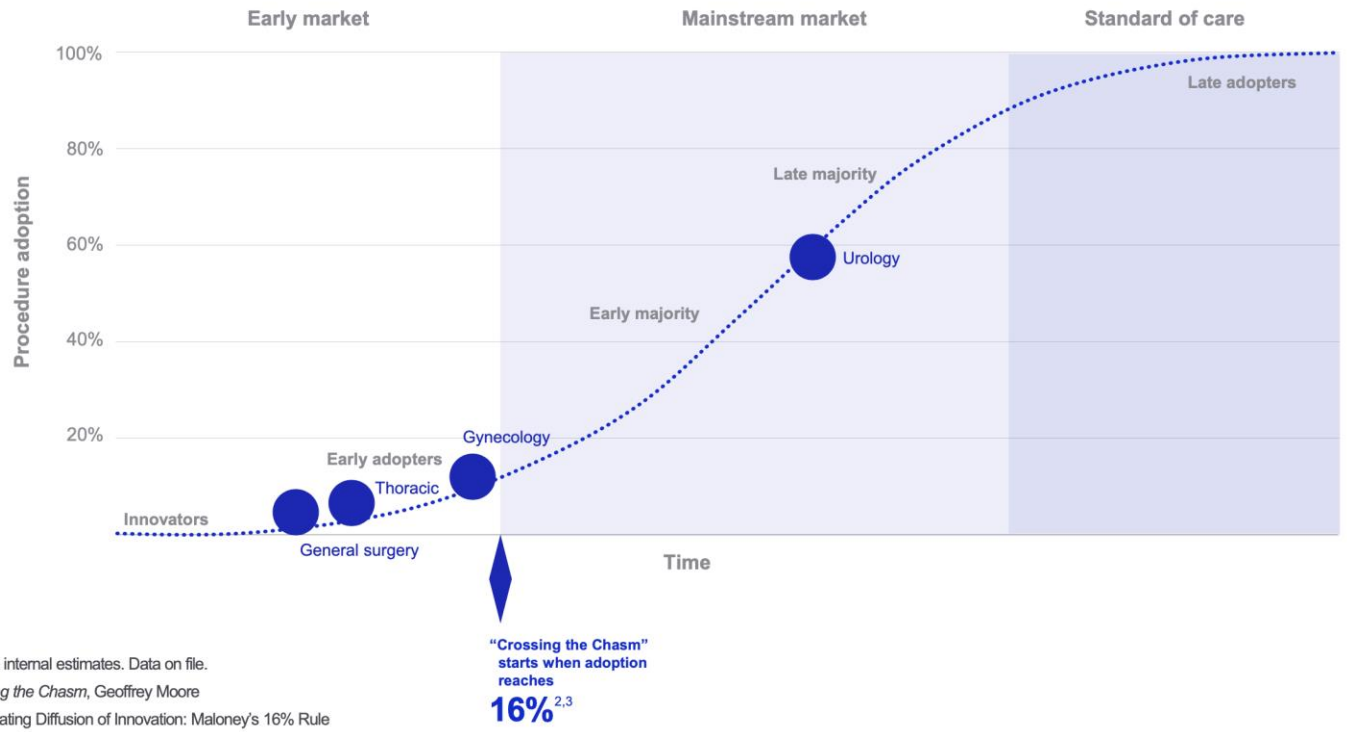


Accelerating Diffusion of Innovation - Maloney's 16% Rule

Odhady v roce 2020

EU da Vinci robotic-assisted surgery adoption

Conceptual presentation based on company estimates[1]



[1] Intuitive internal estimates. Data on file.

[2] *Crossing the Chasm*, Geoffrey Moore

[3] Accelerating Diffusion of Innovation: Maloney's 16% Rule

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Geographic distribution of robotic-assisted thoracic surgery centers

2008

2018

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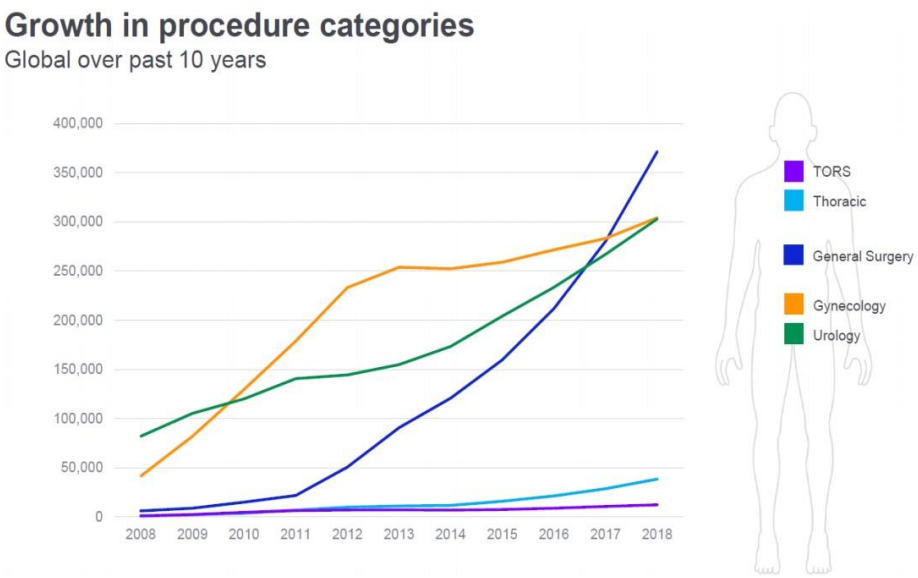
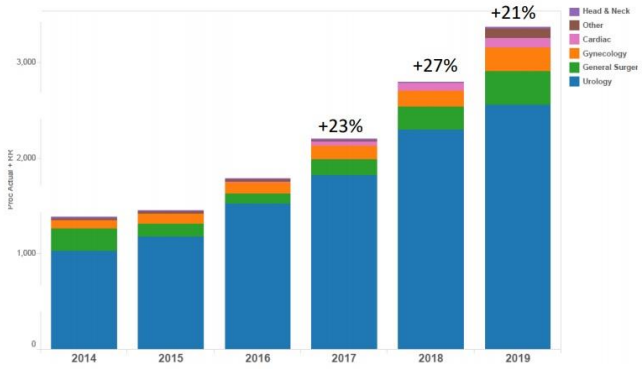
Robotická chirurgie ve světě a v ČR



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

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Konkurence přináší technologický pokrok a snížení ceny robotické chirurgie

v roce 2020 – 900.000 výkonů v USA
v roce 2025 – 3 000.000 výkonů v USA

Robotic Surgical Companies that are transforming the field of surgical procedures

Top 10 Robotic Surgery Companies in the United States

20/03/2021 | iData Research | Articles, Robotics & Navigation Devices | No comments

Find out more about US Market Report Suite for Surgical Navigation and Robotic Systems

About Robotic Surgery

As technological advancements continuously emerge over the decades, surgery has proven itself as a sophisticated discipline capable of treating a plethora of diseases and conditions. Consequently, as computer hardware and software become increasingly refined, these technologies have been implemented in the operating room as well. With the late popularization of minimally invasive procedures and surgeries, finely operated robotic surgery platforms have found a prosperous young market in the medical device industry. In fact, procedures focused on minimally invasive implementations account for nearly 80% of the total surgical robotics market.

Constituting just under 900,000 robotic-assisted surgical procedures performed in the United States last year, the robotic surgery market is expected to grow impressively to approach 3 million procedures by 2025.

Implementace RATS – III. chirurgická klinika 1. LF UK a FN Motol - 2020

- Jednání s pojišťovnami a Ministerstvem zdravotnictví – pilotní projekt
- **První program robotické chirurgie plic v ČR**
- Live surgery + Proctoring + Learning curve
- VATS (učící křivka 50 případů)
- RATS (učící křivka 20 případů)
- Proktoři
  - Sasha Stamenkovic (Londýn, GB)
  - Ghada M M Shahin (Zwolle, NL)
  - Danjouma Cheufou (Würzburg, D)




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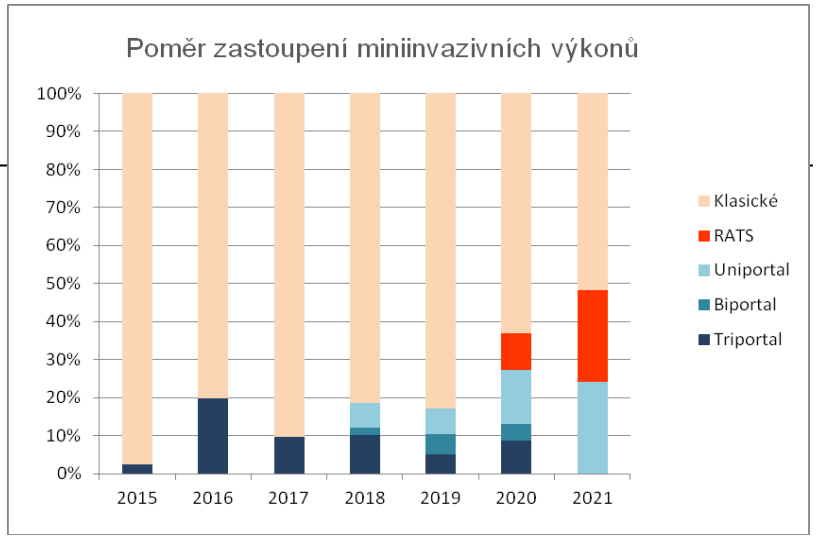
Úskalí/Konverze/Komplikace u RATS – příprava v dlouhém tréninku

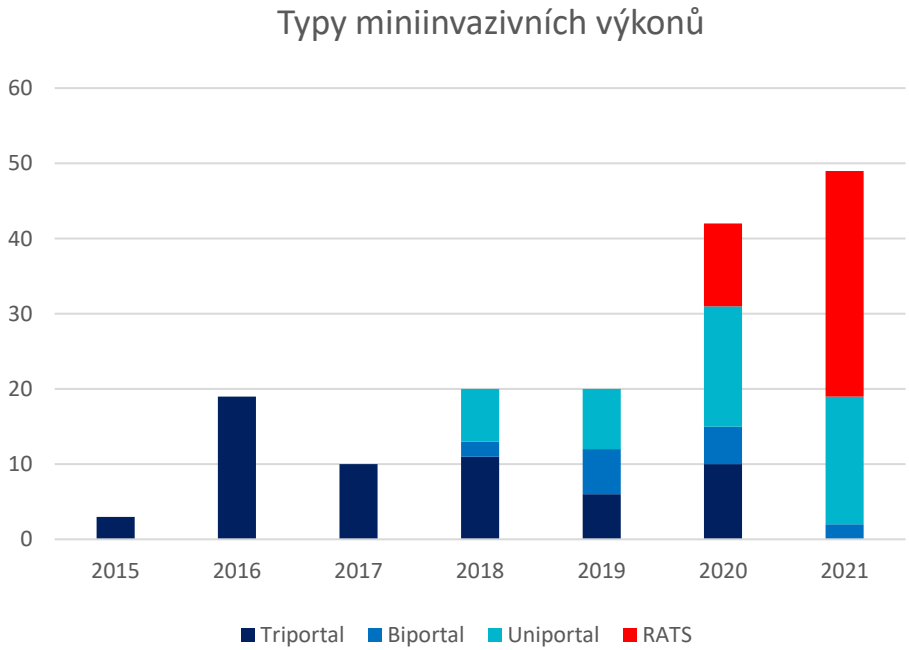
- krvácení (poranění cév, masivní krvácení)
    - připravený scénář (komprese, domluva s anesteziologem, stabilizace pacienta, příprava jemného instrumentária a konverzního síta, konverze, posílení operační skupiny)
- technické důvody, onkologická radikalita
- poranění struktur (dýchacích cest, jícnu, chylothorax)
- airleak

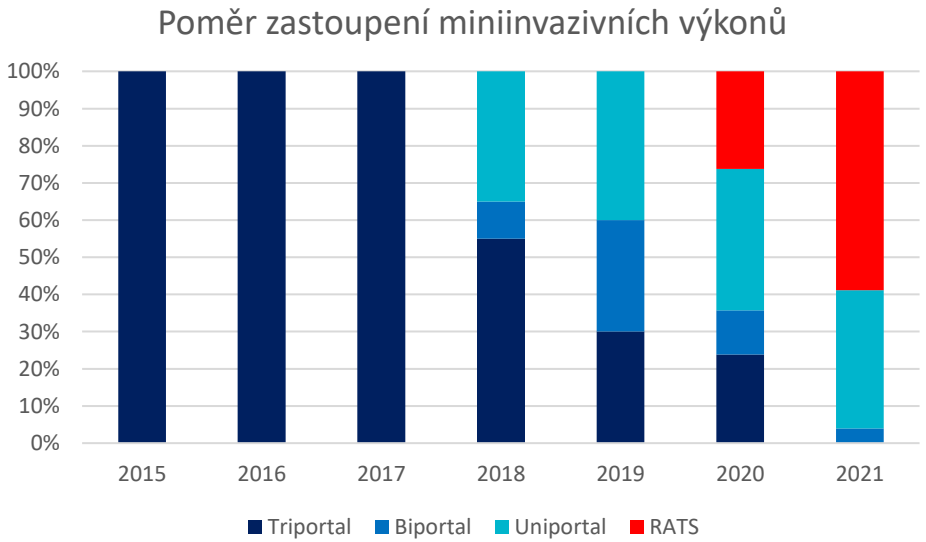
Soubor – RATS lobektomie

III. chirurgická klinika 1. LF UK a FN Motol

- 8/2020 – 12/2021 - 41 pacientů
- věk 66 ± 9,5 let
- ženy 26 (63%), muži 15 (37%)







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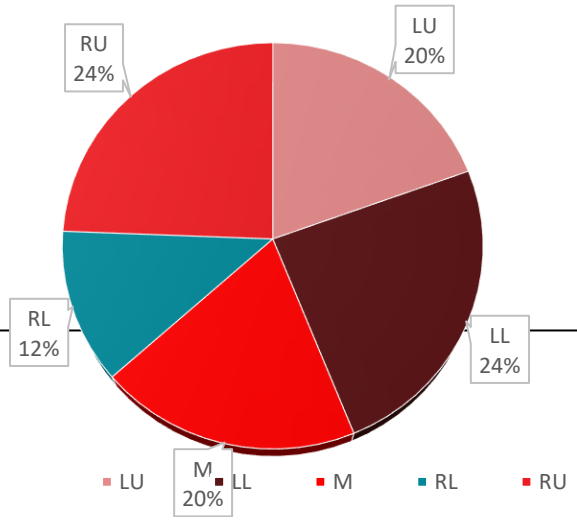
Diagnózy

• NSCLC	27 (65,9%)
• SCLC	1 (2,4%)
• Karcinoid	5 (12,2%)
• Metastázy	4 (9,8%)
• Infekt+Bronchiektazie	3 (7,3%)
• Hamartom středního laloku	1 (2,4%)

Distribuce podle laloků



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Lymfadenektomie u BCA

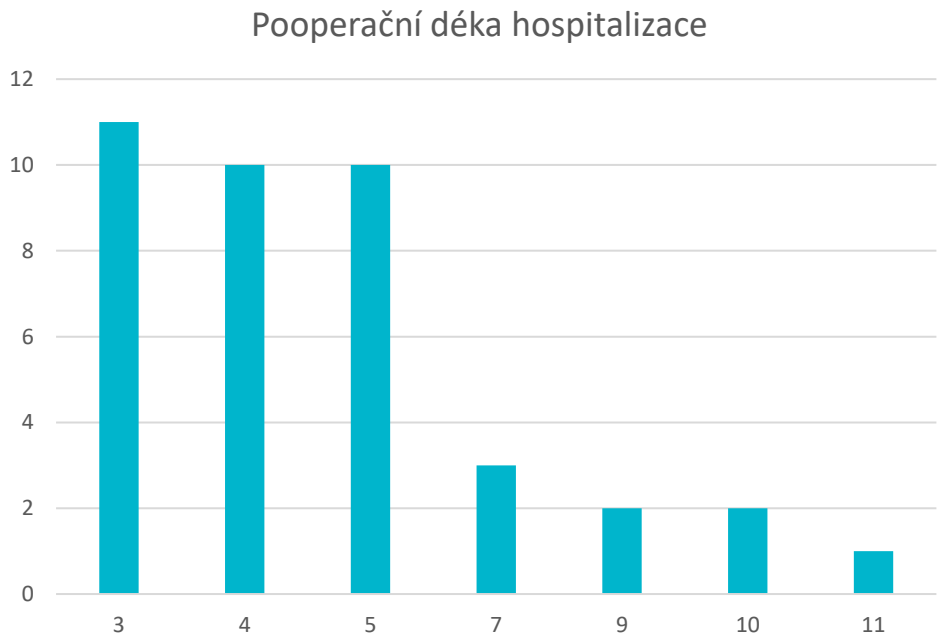
- N0 36 (92,7%)
- N1 0 (0%)
- N2 3 (7,3%)
- počet uzlin soubor celkem 10,2 ± 4,7
- v období od 9/2021 15,8 ± 3,8

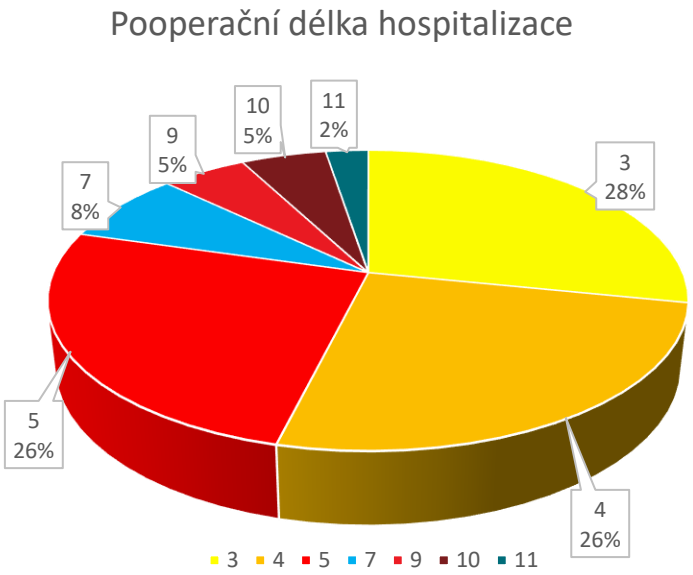
Komplikace

- Konverze pro krvácení 3 (7,3%)
  - krevní ztráta do 350ml, bez nutnosti transfúze
- Prolongovaný airleak 3 (7,3%)
- Pooperační pneumonie 2 (4,8%)
- Torze středního bronchu 1 (2,4%)
- Fluidothorax s redrenáží 1 (2,4%)
- Močová infekce 1 (2,4%)

Hospitalizace

- Délka hospitalizace - 4,9 ± 2,2 dnů
- 80% pacientů propuštěno nejdéle 5. pooperační den





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Indikace k RATS – III. chirurgická klinika 1. LF UK a FN Motol - 2022

- jasně indikovaná lobektomie
  - velikost tumoru < 7cm
  - relativní kontraindikací je vrůst do hrudní stěny, podle rozsahu a lokalizace
  - zatím neprovádíme sleeve resekce
  - dostatek místa na naložení stapleru na bronchus

- lokalizace tumoru vyžaduje lobektomii
  - lokalizace ve středním laloku

- ověřený bronchogenní karcinom

- segmentektomie

Diskuze

- porovnání Open – VATS – RATS – randomizované studie
- minimalizace morbidity v rámci ERAS
- RATS umožňuje navýšení operability BCA
    - pacienti nad 80 let věku
    - pacienti s hraniční únosností pro resekci plic
    - stadium IIIa NSCLC/downstaging po neoadjuvantní terapii
    - segmentektomie
    - sleeve lobektomie - bronchus/plicní tepna
    - 3D mapování, indocynová zeleň
    - umělá inteligence
- onkologická radikalita
- extenzivní lymfadenektomie, upstaging
- minimalizace krevní ztráty
- posouvá limity
- zvyšuje operabilitu BCA?
- ekonomické aspekty, délka hospitalizace, spotřební materiál, úhrady,
- délka hospitalizace a kapacita oddělení
- **RATS - přítomnost a budoucnost plicní a hrudní chirurgie**

Léčba rakoviny plic – pneumolog, pneumoonkolog, onkolog, chirurg

Pokročilá diagnostika

…EGFR, ALK, PDL….

Chemoterapie

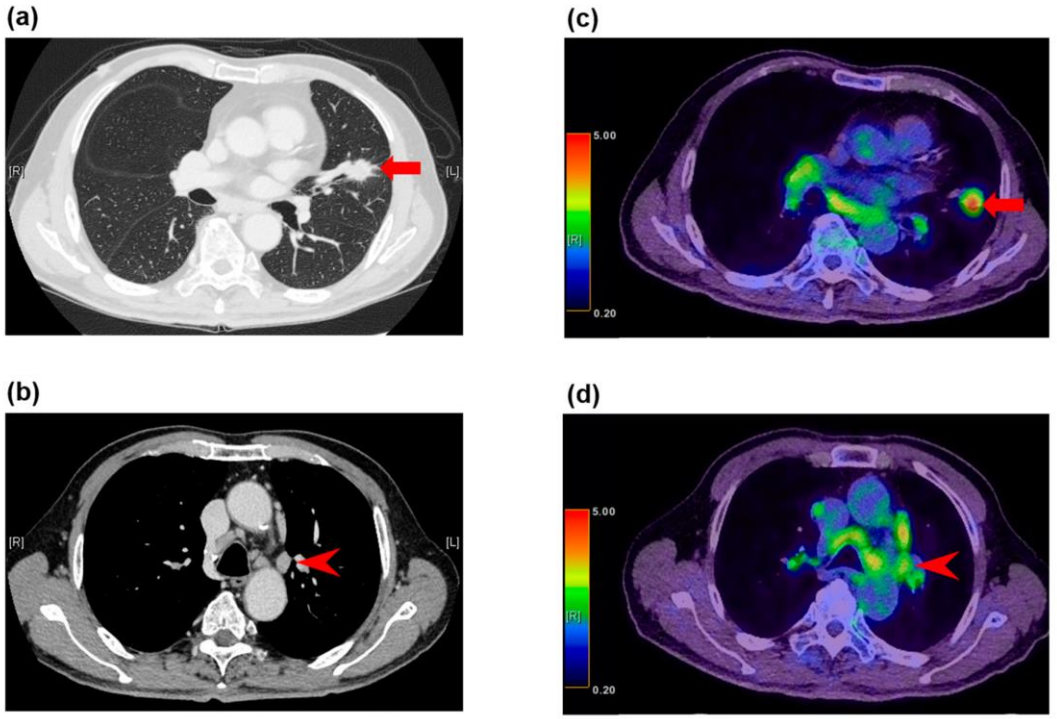
Biologická léčba

Imunologická léčba

Radioterapie

Cyberknife

Chirurgie a její kvalita???



Surgical treatments of stages I NSCLC

Multidisciplinary discussion

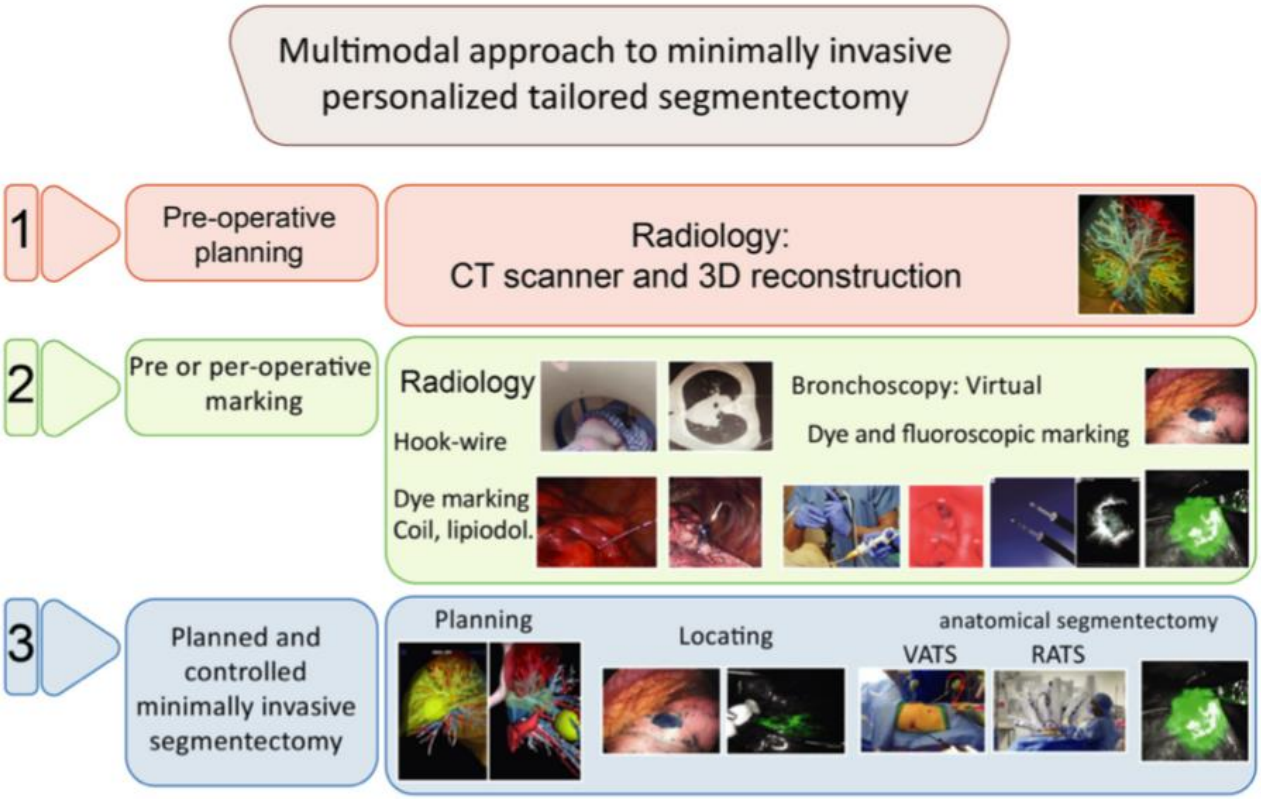
From T1 mI to T1b, N0, M0 NSCLC

- Resection
  - Lobectomy
  - Or segmentectomy for:
    - Ground-glass opacity < 2 cm
    - Adenocarcinoma in situ
    - Adenocarcinoma minimally invasive (mI) < 2 cm
    - Adenocarcinoma invasive < 2 cm
    - Required margins > 1 cm
      Or Required margins > size of lung nodule
- Lymph node assessment:
  - Complete LND
  - Or Lobe-specific lymph node assessment
- Approaches:
  - Open procedure: thoracotomy
  - Minimally invasive surgery: RATS or VATS

From T1c to T2a, N0, MO NSCLC

- Resection
  - Lobectomy
- Lymph node assessment:
  - Complete LND
  - Or Lobe specific lymph node assessment
- Approaches:
  - Open procedure: thoracotomy
  - Minimally invasive surgery as RATS or VATS

*Montagne,F.;Guisier,F.; Venissac, N.; Baste, J.-M. The Role of Surgery in Lung Cancer Treatment: Present Indications and Future Perspectives—State of the Art. Cancers**2021***



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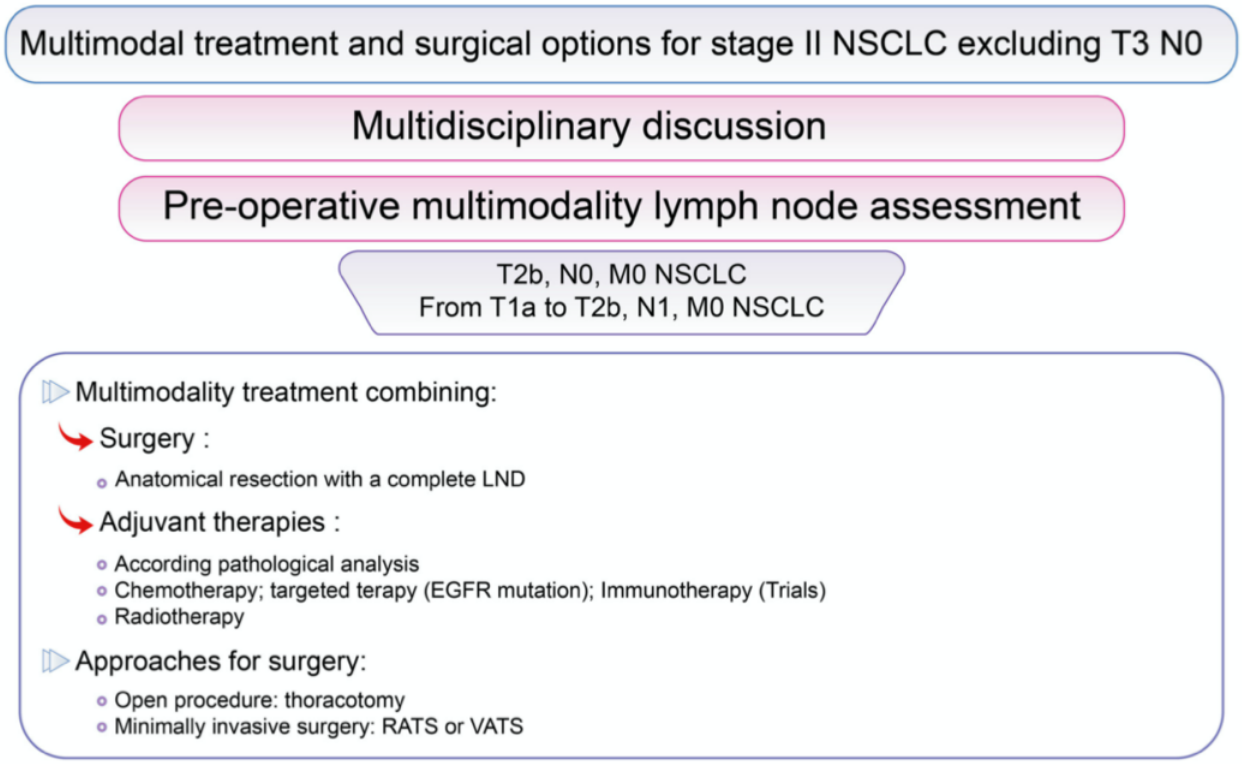
complex cases.



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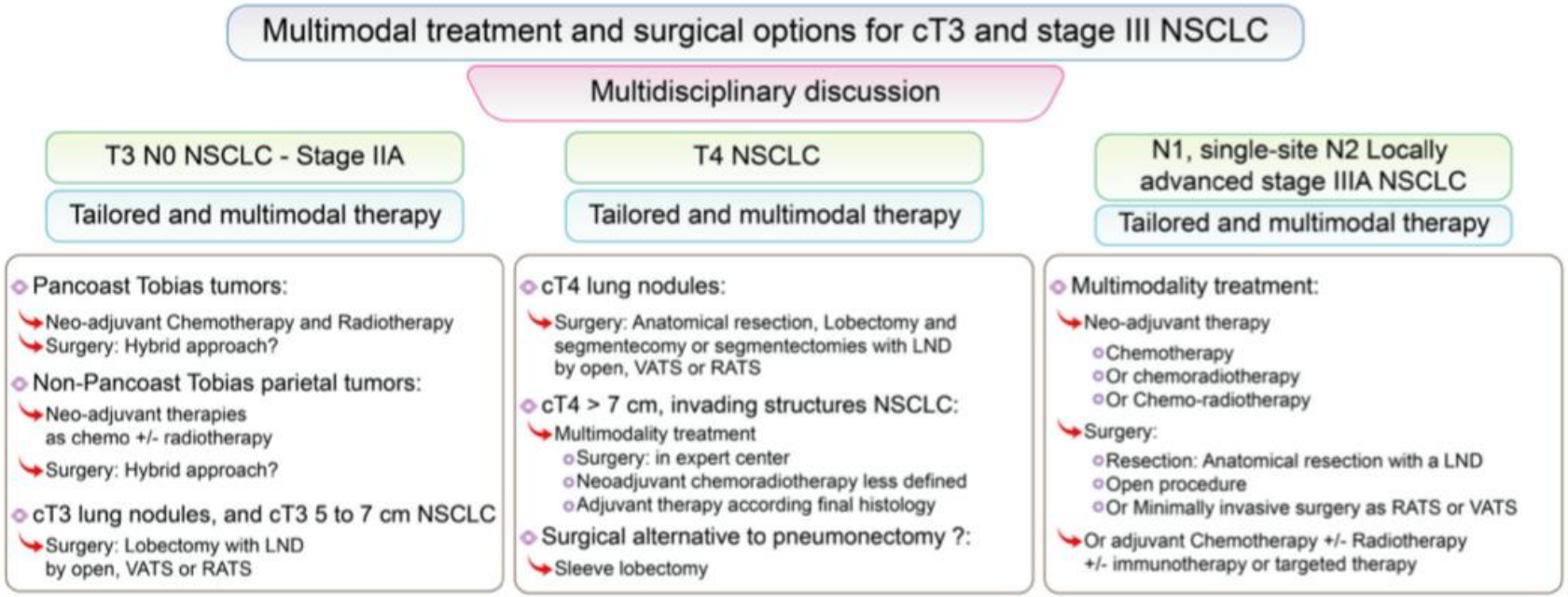

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Deformable three-dimensional CT images

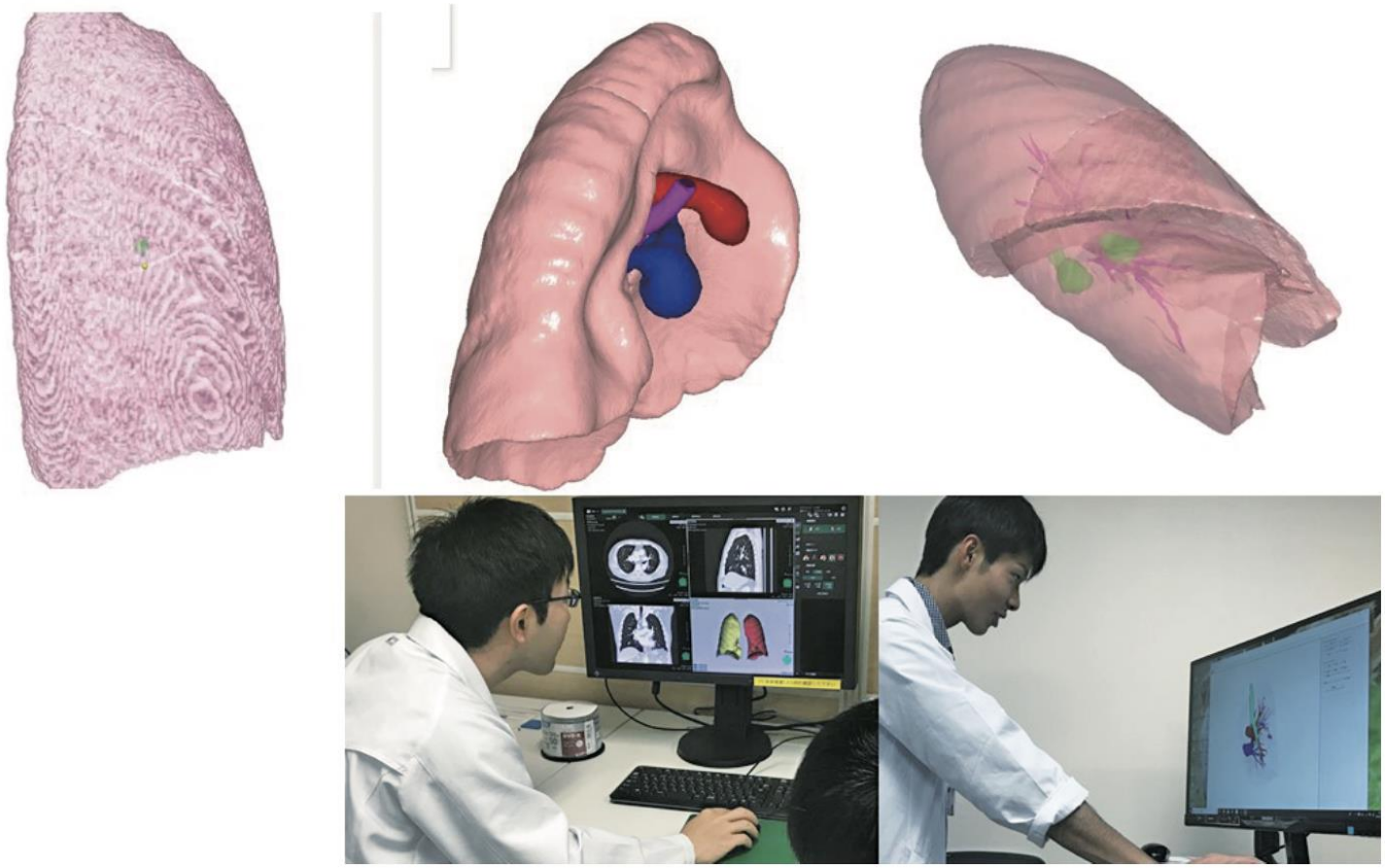
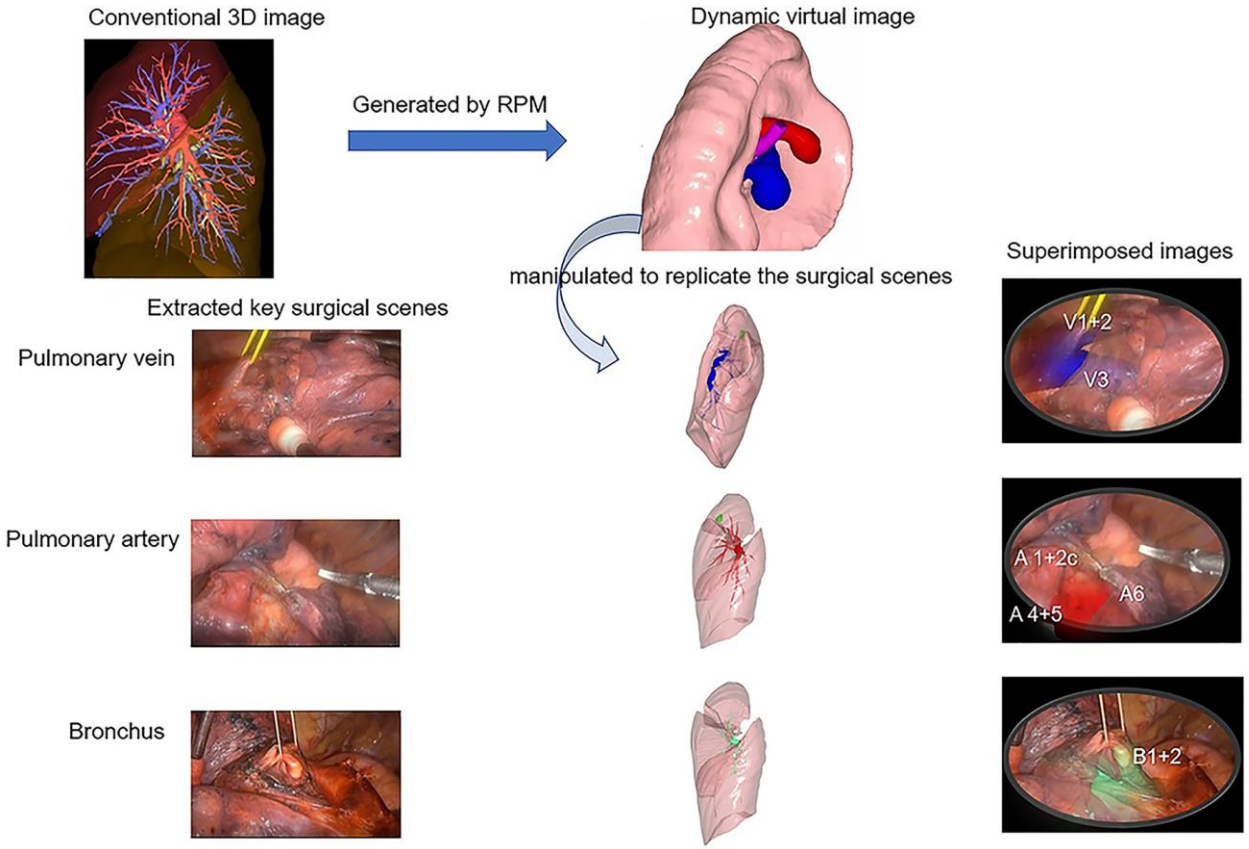


Fig. 3 Resection process map (RPM)

*Montagne,F.;Guisier,F.; Venissac, N.; Baste, J.-M. The Role of Surgery in Lung Cancer Treatment: Present Indications and Future Perspectives—State of the Art. Cancers**2021***

The workflow for creating explanatory images from conventional three-dimensional computed tomography.



Interact CardioVasc Thorac Surg, ivab379, https://doi.org/10.1093/icvts/ivab379

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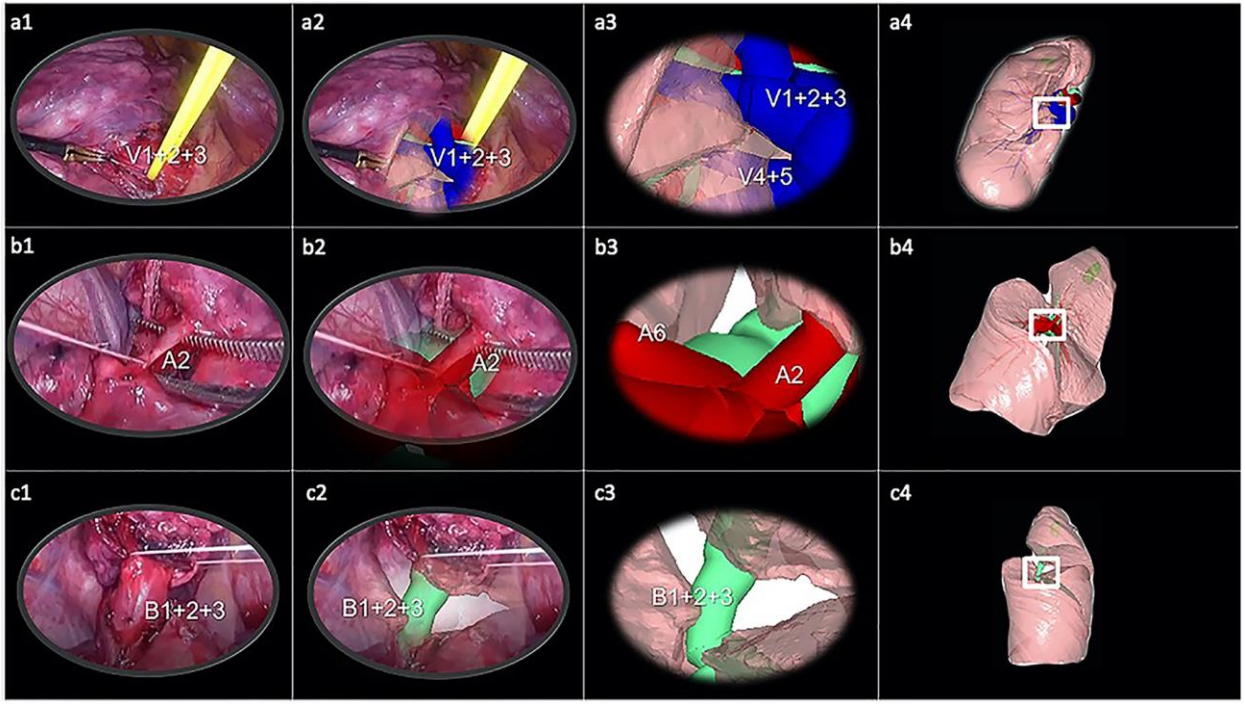
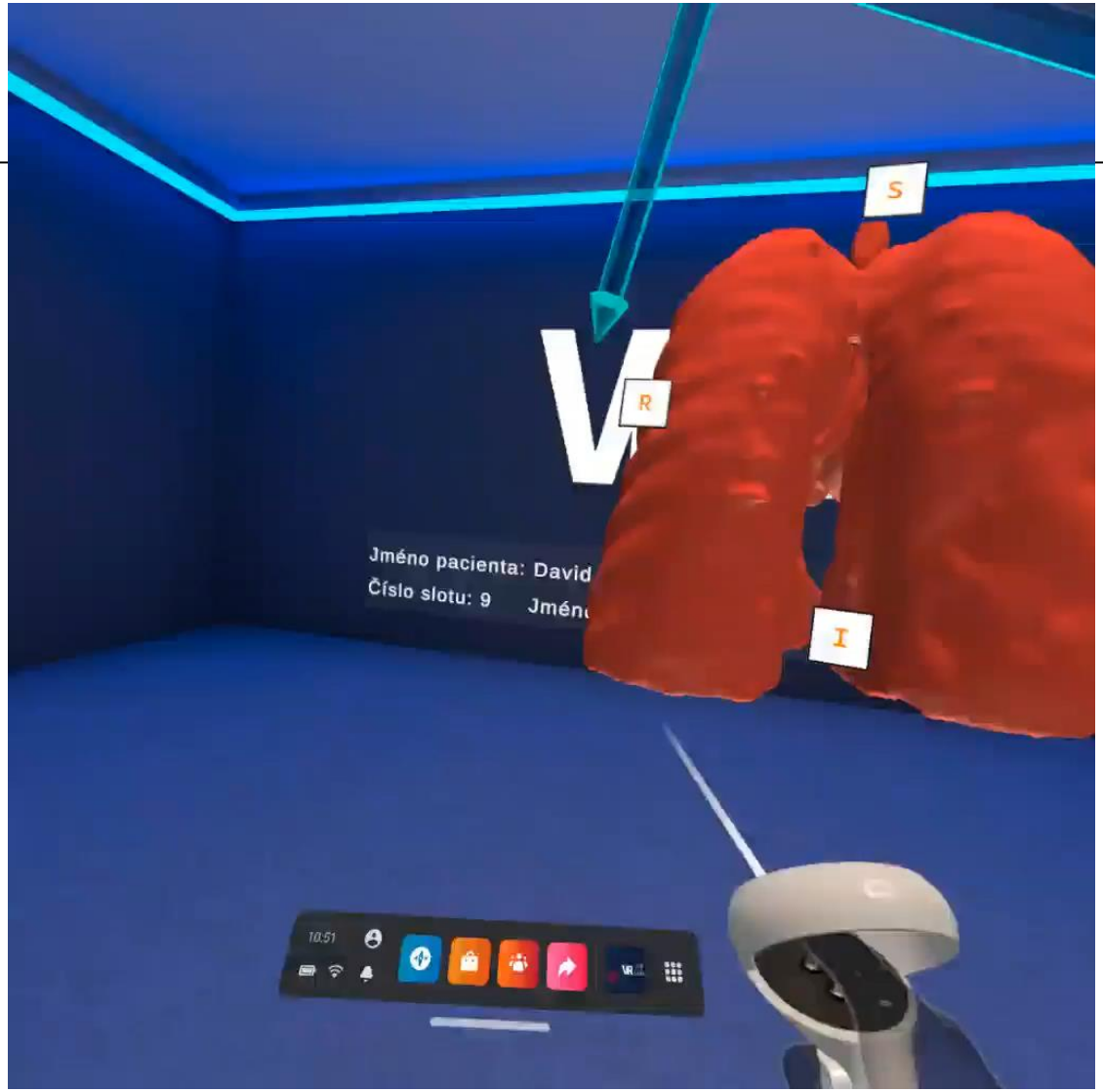
Prává horní lobektomie



Interact CardioVasc Thorac Surg, ivab379, https://doi.org/10.1093/icvts/ivab379



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Dva póly chirurgie plic v ČR

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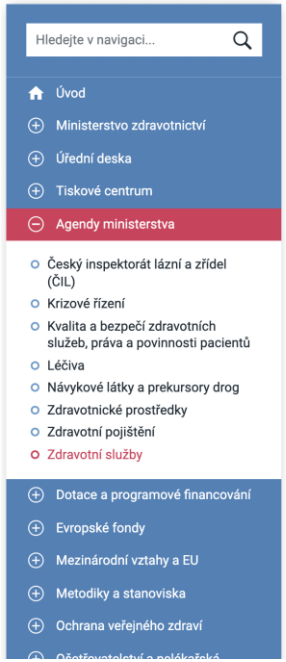
MINISTERSTVO ZDRAVOTNICTVÍ
ČESKÉ REPUBLIKY



S dotazy ke covid-19 se obracejte na celorepublikovou informační linku ke koronaviru 1221.
Pro volání ze zahraničí můžete využít telefonní číslo +420 226 20 1221.

V rámci opatření proti koronavirové nákaze upřednostněte, prosím, **písemný, elektronický či telefonický kontakt před osobním setkáním na ministerstvu.**

Úvod > Agendy ministerstva > Zdravotní služby > Centra vysoce specializované péče > Seznam center vysoce specializované péče v ČR > CVS pneumoonkochirurgické péče

CVS pneumoonkochirurgické péče

Vytvořeno: 6. 12. 2019 Poslední aktualizace: 6. 12. 2019

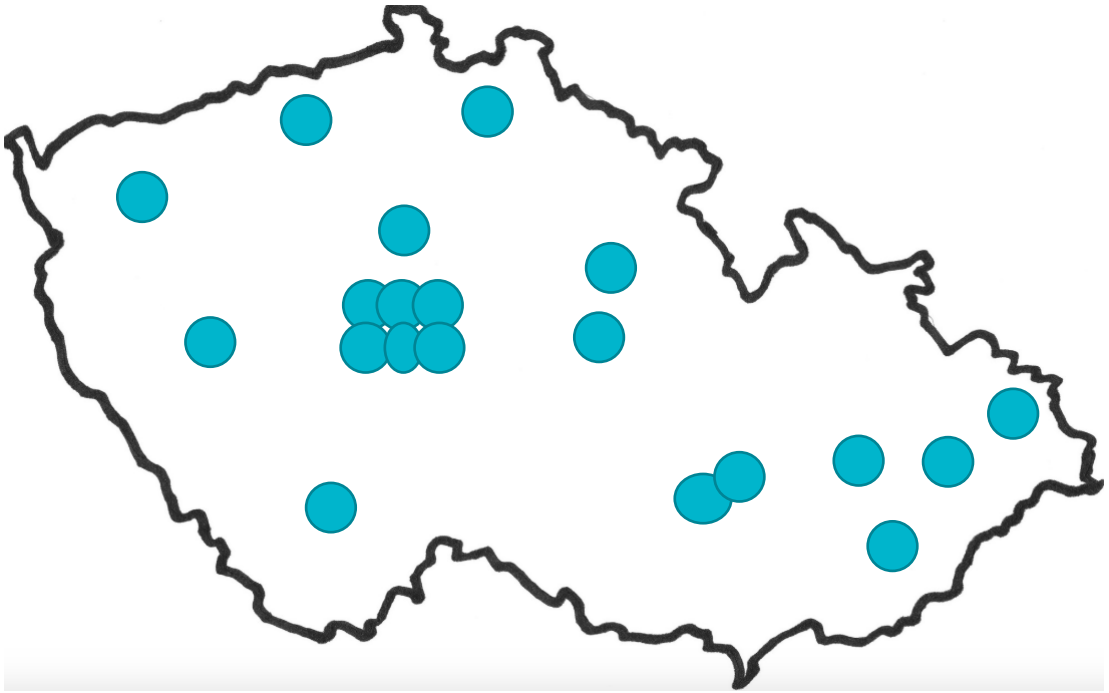
Centra vysoce specializované pneumoonkochirurgické péče

Výzva uveřejněna ve Věstníku MZ ČR č. 12/2017 Seznam center uveřejněn ve Věstníku MZ č. 3/2018	Statut udělen do:
Thomayerova nemocnice Praha, Vídeňská 800, 140 59 Praha 4- Krč IČO:00024341	31. 12. 2022
Fakultní nemocnice v Motole, V Úvalu 84, 150 06 Praha 5 IČO: 00064203	31. 12. 2022
Fakultní nemocnice Olomouc, I. P. Pavlova 6, 775 20 Olomouc IČO: 00098892	31. 12. 2022
Fakultní nemocnice Hradec Králové, Sokolská 581, 500 05 Hradec Králové IČO: 00179906	31. 12. 2022
Fakultní nemocnice Brno, Jihlavská 340/20, 625 00 Brno IČO:65269705	31. 12. 2022
Fakultní nemocnice Plzeň, Edvarda Beneše 1128/13, 305 99 Plzeň IČO: 00669806	31. 12. 2022
Krajská zdravotní, a.s., Sociální péče 3316/12A, 401 13 Ústí nad Labem IČO: 25488627	31. 12. 2022

Národní Program Transplantace Plic

FN MOTOL

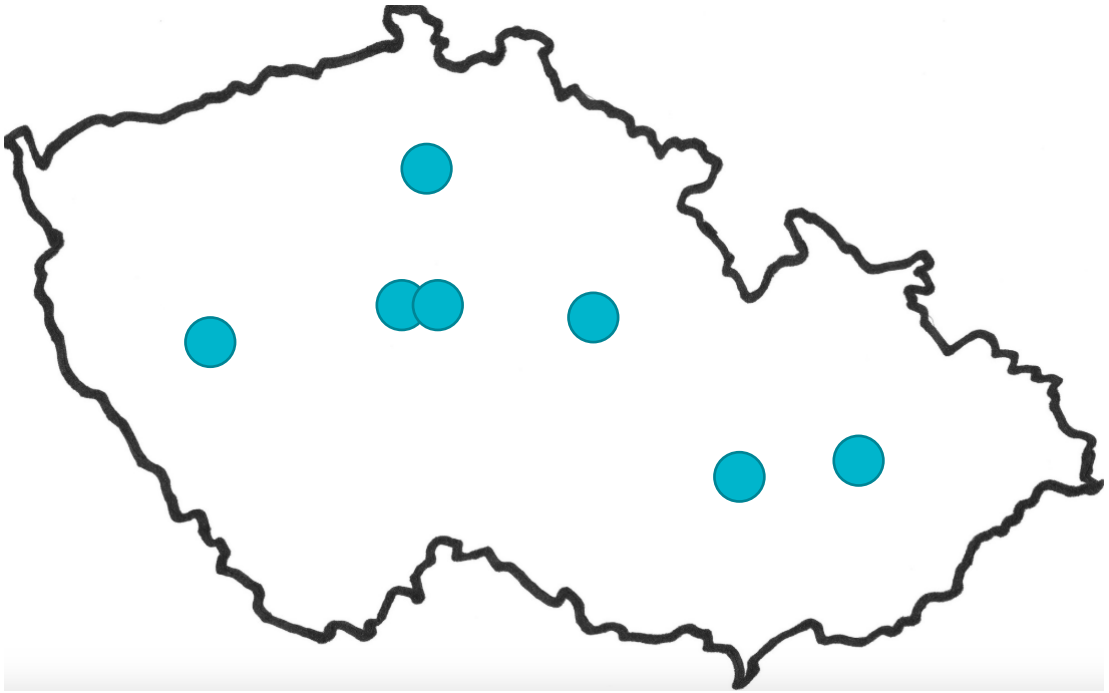
Chirurgie Ca plic 2022 – 20-21 pracovišť



Národní Program Transplantace Plic

FN MOTOL

Pneumoonkochirurgická centra 2022



Národní Program Transplantace Plic

FN MOTOL

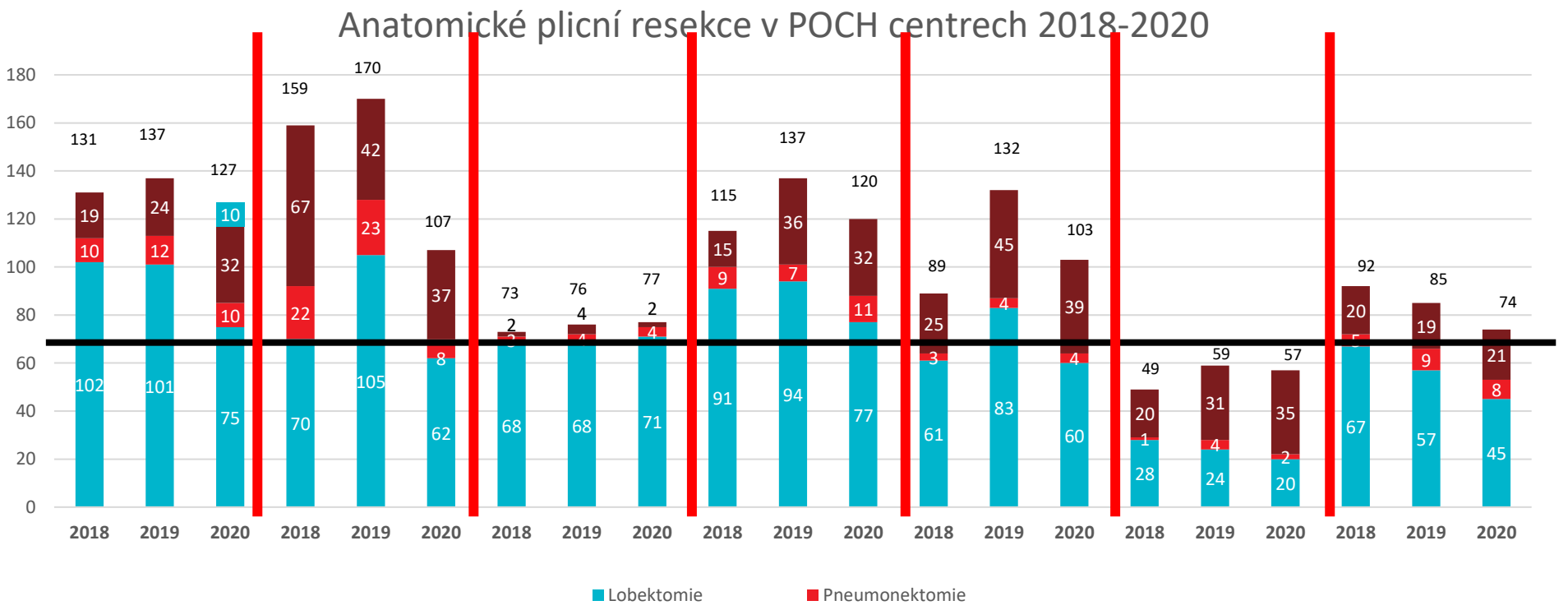
Pneumo-onkochirurgická (POCH) centra

Dle Věstníku MZČR 12/2017:

- Pro zajištění kvality a dostupnosti vysoce specializované pneumoonkochirurgické péče se za optimální pro ČR považuje:
  1 centrum na 1 250 000 obyvatel, bude tedy ustaveno nejvýše 8 center POCH.

- Statut centra POCH bude udělen na období 5 let.

ANATOMICKÉ RESEKCE PLIC V POCH 2018 - 2020



Národní Program Transplantace Plic

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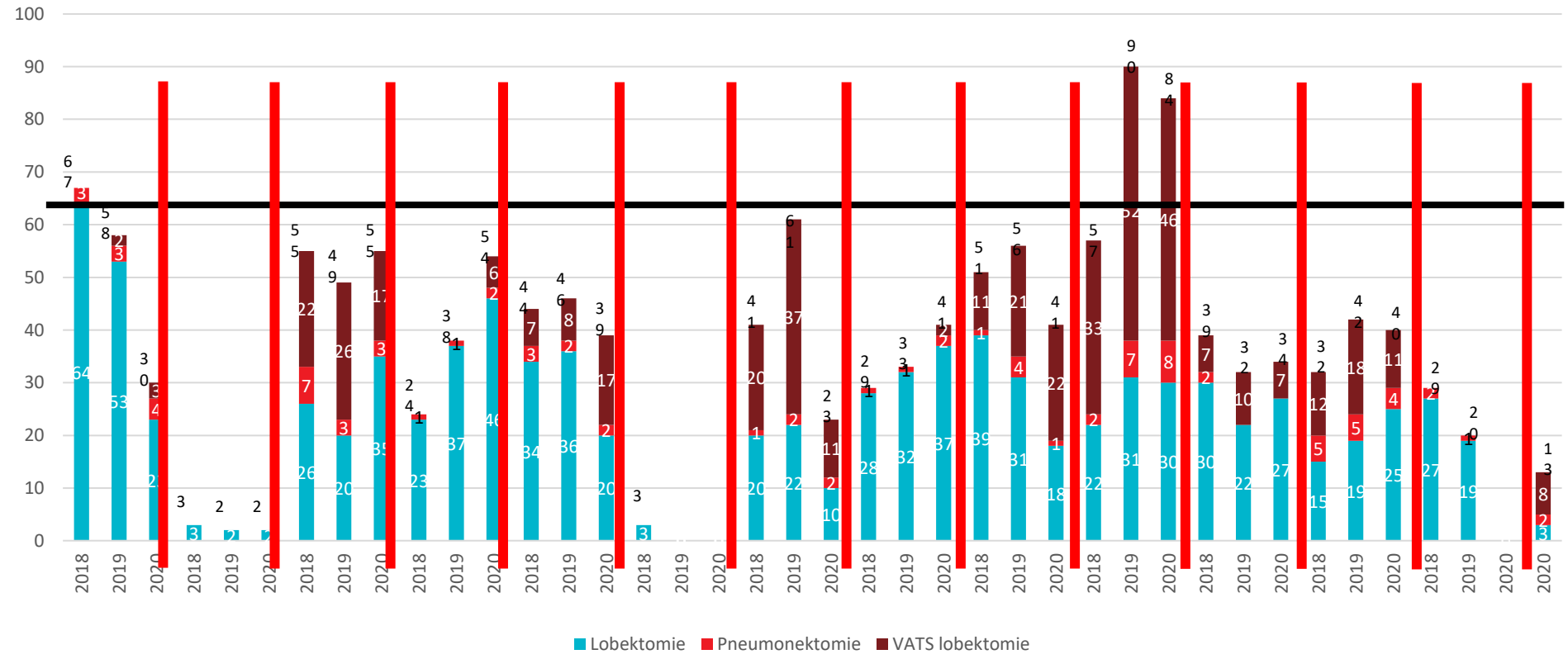
ANATOMICKÉ RESEKCE PLIC **MIMO** POCH 2018 - 2020



Národní Program Transplantace Plic

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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]

Národní Program Transplantace Plic

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HRUDNÍ CHIRURGIE v EU – GUIDELINES 2014

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

[a]See Inpatient Diagnostic Facilities for the list of minimum on-site support facilities.

Brunelli A, Falcoz PE, D'Amico T, Hansen H, Lim E, Massard G, Rice TW, Rocco G, Thomas P, Van Raemdonck D, Congregado M, Decaluwe H, Grodzki T, Lerut T, Molnar T, Salati M, Scarci M, Van Schil P, Varela G, Venuta F, Melfi F, Gebitekin C, Kuzdzal J, Leschber G, Opitz I, Papagiannopoulos K, Patterson A, Ruffini E, Klepetko W, Toker A. European guidelines on structure and qualification of general thoracic surgery. Eur J Cardiothorac Surg. 2014 May;45(5):779-86. doi: 10.1093/ejcts/ezu016. Epub 2014 Feb 20. PMID: 24562007.

Audit kvality chirurgické péče

- Objem centra – 150/350 velkých výkonů/rok
- Personální zajištění – atestace z hrudní chirurgie, 5 let práce
- **Multidisciplinární tým**
    - **každý pacient musí být diskutován MDT týmem Pneumoonkochirurgického centra**
    - **konsensus Pneumologické a Onkologické společnosti ČLS JEP**
- Technické vybavení
- Komplement

- Přežívání, mortality/morbidity
- Operabilita BCA v POCH centru
- Follow up
- Poměr lobektomie/pneumonektomie
- Počet sleeve resekcí
- Počet explorací
- Penetrace miniinvazivní technik – VATS, **RATS**

Závěr

- Chirurgie – základní léčebná modalita u Ca plic v časném stadiu
- RATS přítomnost a budoucnost chirurgie plic
- Potřeba zvýšení operability u pacientů s Ca plic
- Screening karcinomu plic
- **Centralizace pacientů – Pneumoonkochirurgická centra**
- **Závěr a indikace multidisciplinárního týmu – Pneumoonkochirurgická centra**
- Stadium I a II
- Stadium IIIA a IIIB - **vysoce specializovaná centra**
- Intenzivní pooperační péče, ERAS
- Audit kvality

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