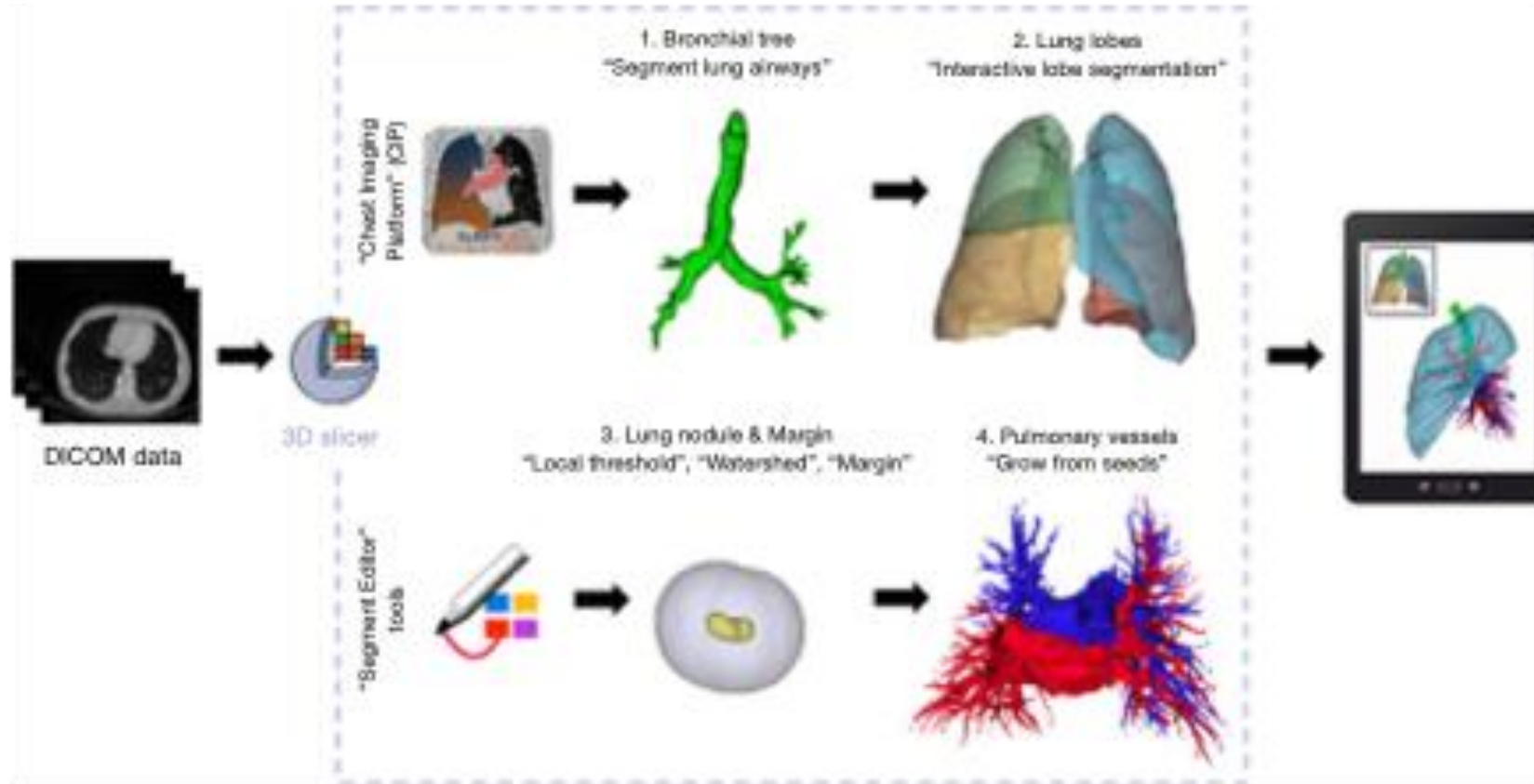


3D Rekonstruktion vor Segment-Resektion - PRO

Prim. Priv. Doz. Dr. Stefan Watzka, BA MA EMBA FACS

Abteilung für Thoraxchirurgie, Klinik Floridsdorf, Wien

Prinzipieller Workflow



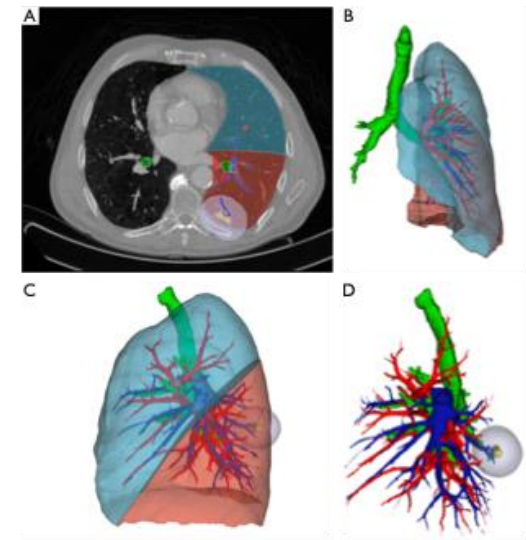
Transl Lung Cancer Res 2024;13(7):1595-1608 | <https://dx.doi.org/10.21037/tlcr-24-134>

Evaluating three-dimensional lung reconstructions for thoracoscopic lung resections using open-source software: a pilot study



Iris E. W. G. Laven^{1^A}, Vincent P. S. Oosterhoff^{1,2}, Aimée J. P. M. Franssen^{1^A}, Lori M. van Roozendaal^{1^A}, Karel W. E. Hulsewé^{1^A}, Yvonne L. J. Vissers^{1^A}, Erik R. de Loos^{1^A}

- 83 % der 3D-Lungenrekonstruktionen wurden als für die präoperative Planung geeignet eingestuft.
- In 62 % wurden anatomische Variationen erkannt, die der Arzt bei der herkömmlichen Computertomographie übersehen hatte.
- In 62 % wären die Resektionslinien und/oder der Operationsplan aufgrund dieser Erkenntnisse geändert worden.



Transl Lung Cancer Res 2024;13(7):1595-1608 | <https://dx.doi.org/10.21037/tlcr-24-134>

European Society of Thoracic Surgeons expert consensus recommendations on technical standards of segmentectomy for primary lung cancer

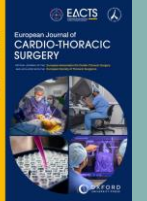


Table 3: Statements that achieved high consensus ($\geq 90\%$)

Statements	Level of agreement (%)
1. A segmentectomy should be defined as an anatomic lung resection lesser than a lobectomy and including the dissection and division of the corresponding segmental artery/arteries, bronchi and veins. In some cases, segments may not require the individual division of the segmental vein as venous tributaries are divided along the intersegmental plane	100
3. Segmentectomies should be classified based on the number of anatomic segments removed into single or multiple segmentectomies (>1 segment removed)	100
4. The functional benefit of segmentectomies involving >2 segments (i.e. left upper division, basilar segmentectomy) is uncertain and requires further research	100
5. Preoperative 3D reconstruction is highly recommendable in most cases to better define the location of the tumour, possible anatomic vascular variants and to ensure that adequate resection margins would be achieved with that specific segmentectomy	96
5a. The availability of a 3D model does not prevent from a precise intraoperative localization of the tumour, whenever it is possible	96

Cite this article as: Brunelli A, Decaluwe H, Gonzalez M, Gossot D, Petersen RH, Augustin F et al. European Society of Thoracic Surgeons expert consensus recommendations on technical standards of segmentectomy for primary lung cancer. Eur J Cardiothorac Surg 2023; doi:10.1093/ejcts/ezad224.

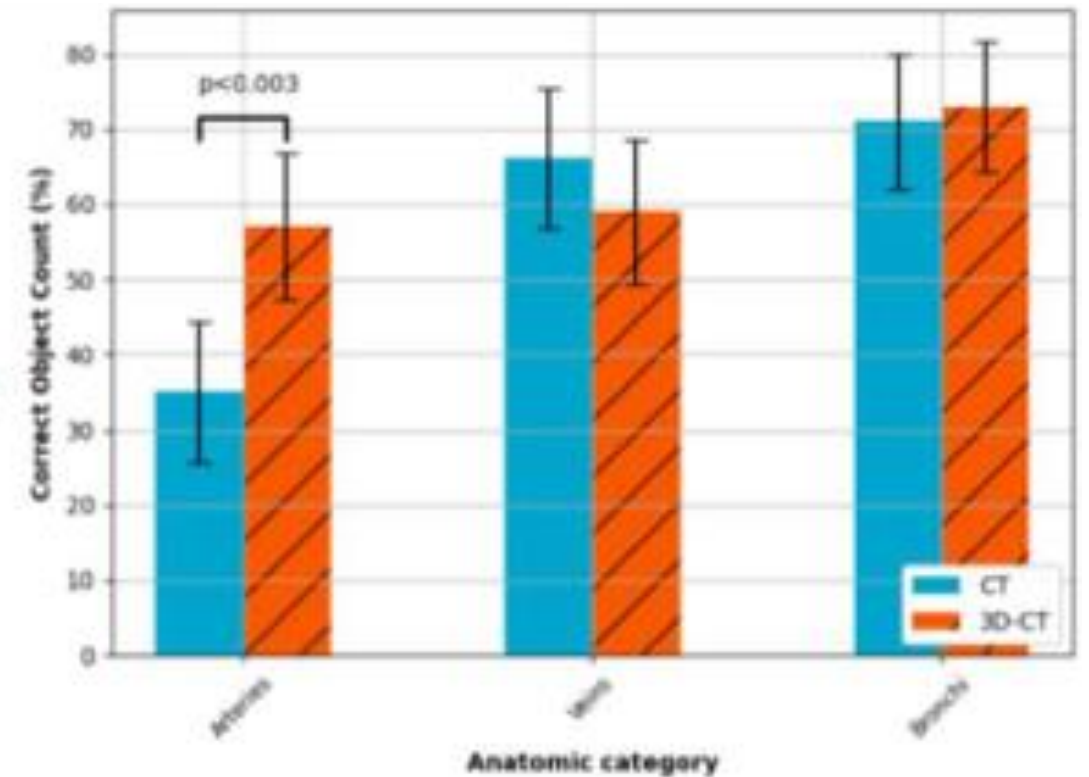
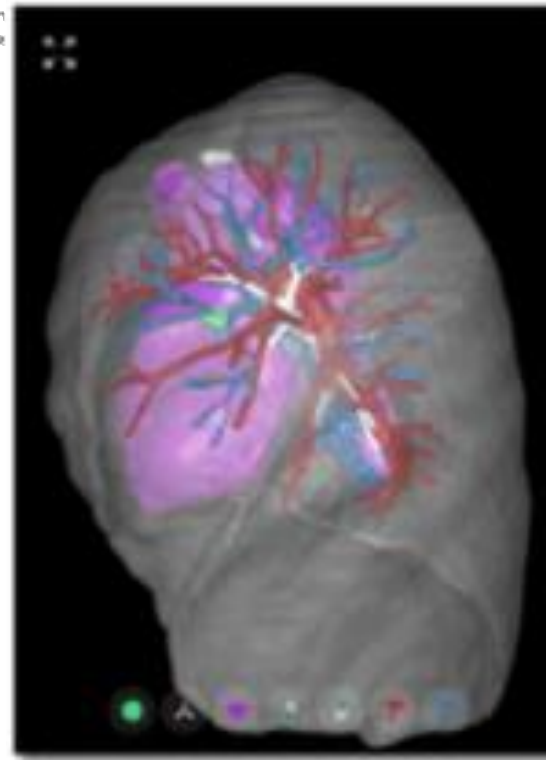
Surgeon Knowledge of the Pulmonary Arterial System and Surgical Plan Confidence Is Improved by Interactive Virtual 3D-CT Models of Lung Cancer Patient Anatomies

frontiers
in Surgery

ORIGINAL RESEARCH
published: 29 March 2021
doi: 10.3389/fsurg.2021.662428

Kunal Bhakhri^{1*}, Eoin R. Hyde², Sze M. Mak³, Lorenz U. Berger², Sebastien Ourselin², Tom Routledge¹ and Andrea Billé¹

¹ Department of Thoracic Surgery, Guy's & St Thomas' Hospital, London, United Kingdom
² Engineering and Imaging Sciences, King's College London, London, United Kingdom, ³ De
Thomas Hospital, London, United Kingdom



Systematische Review und Meta-Analyse

Preoperative Three-Dimensional Lung Simulation Before Thoracoscopic Anatomical Segmentectomy for Lung Cancer: A Systematic Review and Meta-Analysis

Zhongtian Xiang, Bo Wu, Xiang Zhang, Nan Feng, Yiping Wei, Jianjun Xu and Wenxiong Zhang*

Department of Thoracic Surgery, The Second Affiliated Hospital of Nanchang University, Nanchang, China



SYSTEMATIC REVIEW
published: 31 March 2022
doi: 10.3389/fsurg.2022.856290

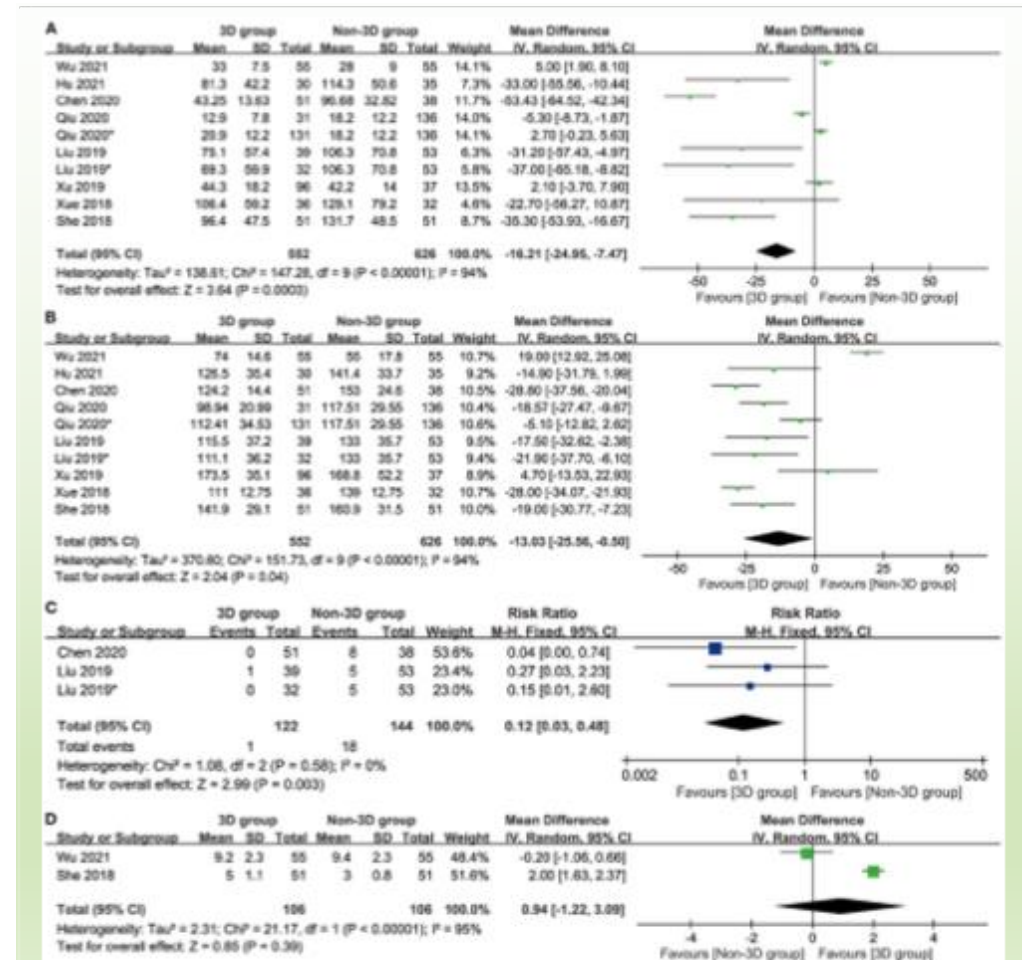


FIGURE 2 | Forest diagrams of intraoperative indicators: blood loss (A), operative time (B), conversion (C), resected LNs (D).

Three-dimensional reconstruction/personalized three-dimensional printed model for thoracoscopic anatomical partial-lobectomy in stage I lung cancer: a retrospective study



Bin Qiu^a, Ying Ji^a, Huayu He, Jun Zhao, Qi Xue, Shugeng Gao

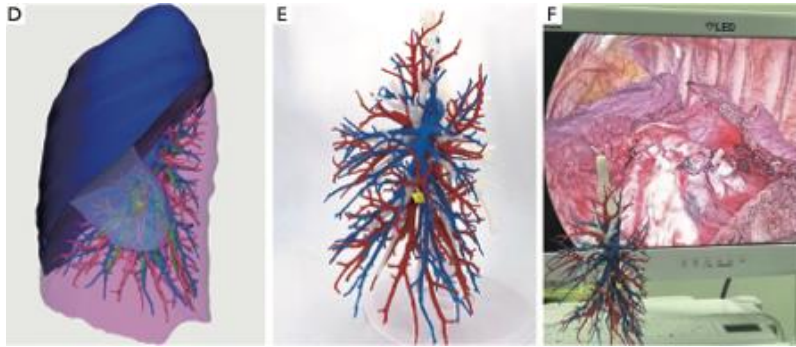


Table 4 Intraoperative and postoperative characters of three groups

Variable	3D-M	3D-R	P value	3D-M	N-3D	P value	3D-R	N-3D	P value
Operative duration, min, mean $\pm$ SD									
Simple segmentectomy	94.5 $\pm$ 17.2	106.8 $\pm$ 39.3	0.27	94.5 $\pm$ 17.2	107.9 $\pm$ 33.5	0.23	106.8 $\pm$ 39.3	107.9 $\pm$ 33.5	0.88
Complex segmentectomy	99.6 $\pm$ 21.7	116.1 $\pm$ 30.7	0.01*	99.6 $\pm$ 21.7	125.1 $\pm$ 23.6	<0.001*	116.1 $\pm$ 30.7	125.1 $\pm$ 23.6	0.04*
Blood loss, ml, mean $\pm$ SD	12.9 $\pm$ 7.8	20.9 $\pm$ 12.2	0.001*	12.9 $\pm$ 7.8	18.2 $\pm$ 12.2	0.02*	20.9 $\pm$ 12.2	18.2 $\pm$ 12.2	0.07
Postoperative drainage, mL, mean $\pm$ SD	608.9 $\pm$ 369.5	650 $\pm$ 435	0.63	608.8 $\pm$ 369.5	566.3 $\pm$ 401.9	0.59	650 $\pm$ 435	566.3 $\pm$ 401.9	0.11
Chest tube duration, days, mean $\pm$ SD	4.5 $\pm$ 1.6	4.1 $\pm$ 1.5	0.13	4.6 $\pm$ 1.6	4.1 $\pm$ 1.4	0.16	4.1 $\pm$ 1.5	4.1 $\pm$ 1.4	0.75
Postoperative complications, n (%)	0	3	—	0	1	—	3	1	—
Pulmonary air leakage (>7 days)		1			1		1	1	
Pneumonia		1					1		
Atelectasis		1					1		
Hospital length of stay, days, mean $\pm$ SD	4.5 $\pm$ 1.6	4.7 $\pm$ 1.5	0.54	4.5 $\pm$ 1.6	5 $\pm$ 1.5	0.174	4.7 $\pm$ 1.5	5 $\pm$ 1.5	0.21

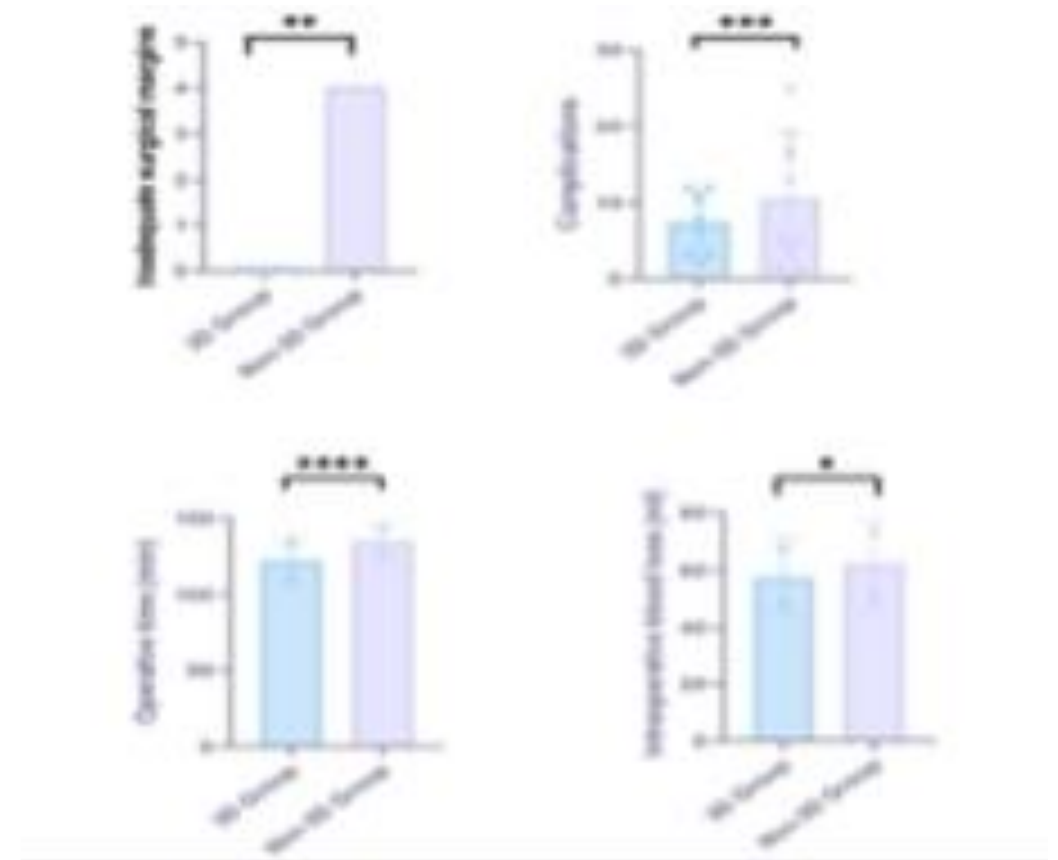
*, P<0.05. 3D-M, 3D model group; 3D-R, 3D-reconstruction group; N-3D, non-3D group.

Transl Lung Cancer Res 2020;9(4):1235-1246 | <http://dx.doi.org/10.21037/tlcr-20-571>

Three-Dimensional Reconstruction and Virtual Simulation of Patient-Specific Anatomy for Procedural Planning in Thoracoscopic Segmentectomy: A Systematic Review and Meta-Analysis

Hongbo He^{1,2}; Chengyuan Yu^{1,2}; Yichen Yang^{1,2}; Jos G. Maessen^{1,2}; Peyman Sardari Nia^{1,2}

- Die 3D-Rekonstruktion verringerte die Wahrscheinlichkeit unzureichender Resektionsränder sowie die postoperative Komplikationsrate ($P < .001$).
- Bei komplexen Segmentektomien reduzierte die 3D-Rekonstruktion die Operationsdauer ($P < .001$) und den intraoperativen Blutverlust ($P = .020$).
- Kein Unterschied hinsichtlich der Anzahl der resezierten Lymphknoten, der Drainage-Dauer und -Menge, und des postoperativen Krankenhausaufenthalts.



European Journal of Cardio-Thoracic Surgery 2025, 67(9), eza283
<https://doi.org/10.1093/ejcts/ezaf283> Advance Access publication 26 August 2025

Surgical Outcomes Using Three-Dimensional Image Simulation for Segmentectomy Planning in Patients with Stage IA1-2 Non-Small Cell Lung Cancer

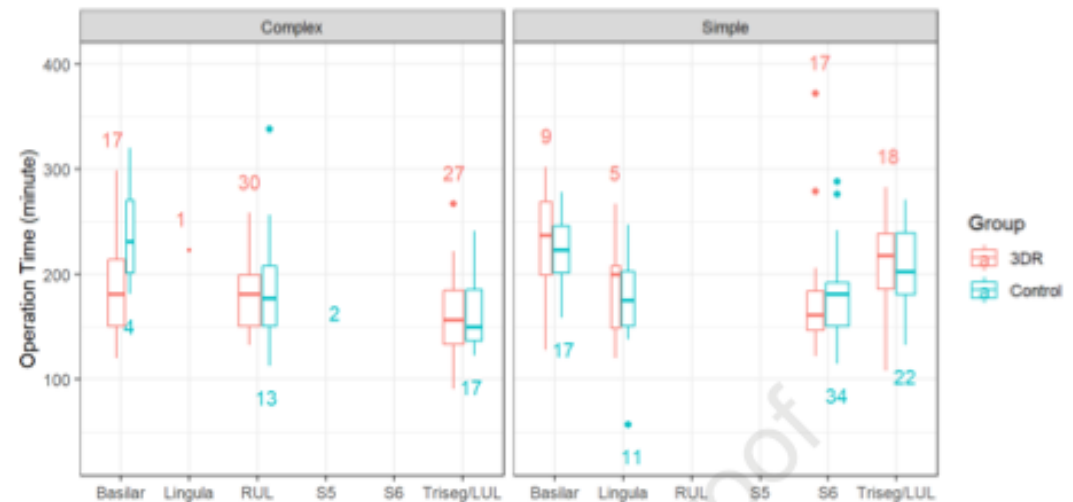


- 274 Patienten mit Stadium IA1–2 NSCLC, die sich einer Segmentresektion mit oder ohne 3D-Rekonstruktion (3DR) unterzogen haben.
- Patienten in der 3DR-Gruppe hatten weniger Komplikationen während des Krankenhausaufenthalts.
- Bei Patienten mit komplexen basale Segmentresektionen war die Verwendung von 3DR mit einer kürzeren Operationszeit assoziiert ($p=0.13$).

Table 4. Multivariable analysis of clinicopathologic variables associated with postoperative complications

Characteristic	Odds ratio (95% confidence interval)	P-value ^a
Presence of renal comorbidities	3.98 (0.85-18.7)	0.080
Use of 3DR	0.37 (0.18-0.78)	0.009

^aMultivariable logistic regression model.



The Journal of Thoracic and Cardiovascular Surgery <https://doi.org/10.1016/j.jtcvs.2025.11.021>

Take-Home Messages

- 3D-Rekonstruktion hilft, anatomische Variationen zu erkennen, die bei der herkömmlichen Computertomographie übersehen worden wären.
- 3D-Rekonstruktion trägt zur Verringerung intraoperativer Komplikationen bei.
- 3D-Rekonstruktion gewährleistet einen ausreichenden anatomischen Sicherheitsabstand.
- 3D-Rekonstruktion verringert bei komplexen Segmentektomien die Operationsdauer.

Danke für die Aufmerksamkeit

