

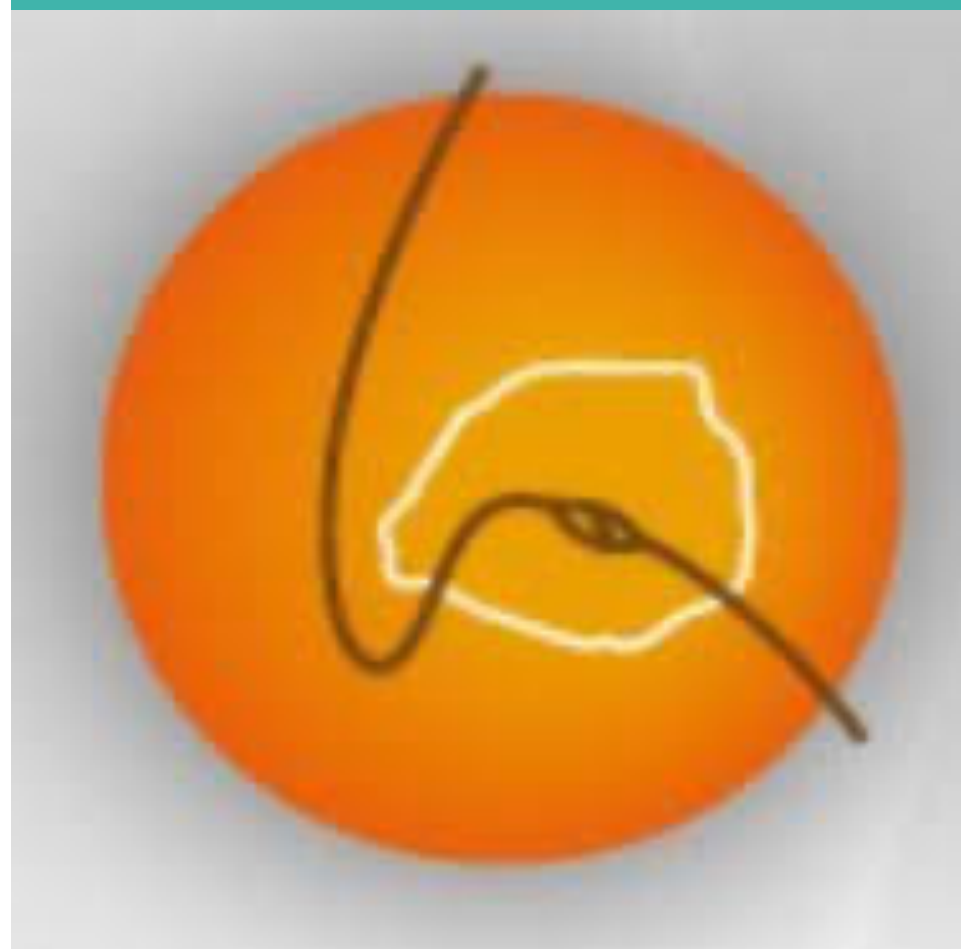


Chirurgie Thoracique 4.0

**Dr Antoine-Marie
MOLINA**



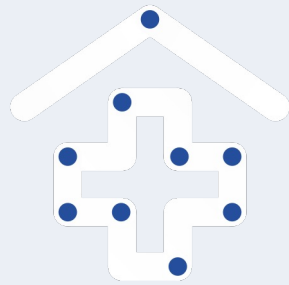
**Dr Agathe
Seguin-Givelet**





Dr Antoine-Marie Molina





N.I.T.S.

Et si l'anesthésie devenait mini-invasive ?



SPIF - 28 SEPTEMBRE 2024

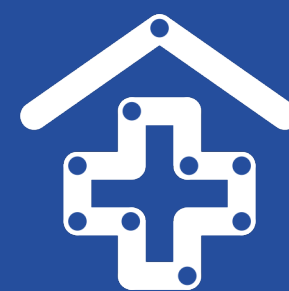
Dr. Antoine-Marie Molina Barragan
Anesthésiste-réanimateur



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MONTSOURIS



Gold Standard



L'anesthésie nécessite une curarisation, une ventilation uni-pulmonaire et nécessite une analgésie multi-modale

01

Anesthésie générale



02

Intubation oro-trachéale sélective



03

Anesthésie Loco-régionale



Complications

Respiratoire

- Acute lung injury/ARDS: 2.5% des patients
- Pneumopathie post-opératoire



Intubation

- Traumatisme laryngé
- Rupture trachéale ou bronchique (0.19-0.22%) : sur-distension du ballonnet, mandrin...)



Cardiovasculaire

- MINS 17.9%
- Post operative myocardial infarction 0.2-1,1%
- FAPO (6.4-46%)



Neuro-cognitive

- 14,1 à 30,3% chez les plus de 65 ans



Minor surgery, Major anesthesia ?



Chirurgie

- VATS
- Robot
- Mini-thoracotomie
- Segmentectomie
- ENB

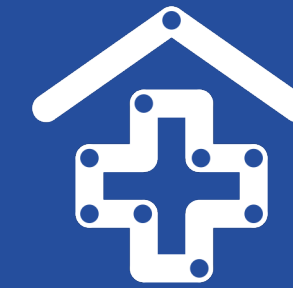


Prévalence de la fragilité (frail et pre-frail) selon les critères de Fried:

68.8% en chirurgie thoracique



N.I.T.S.



Ventilation spontanée, pression négative
=> exclusion naturelle par le pneumothorax

01

Anesthésie
Loco-régionale



02

Sédation



03

Ventilation
SPONTANEE



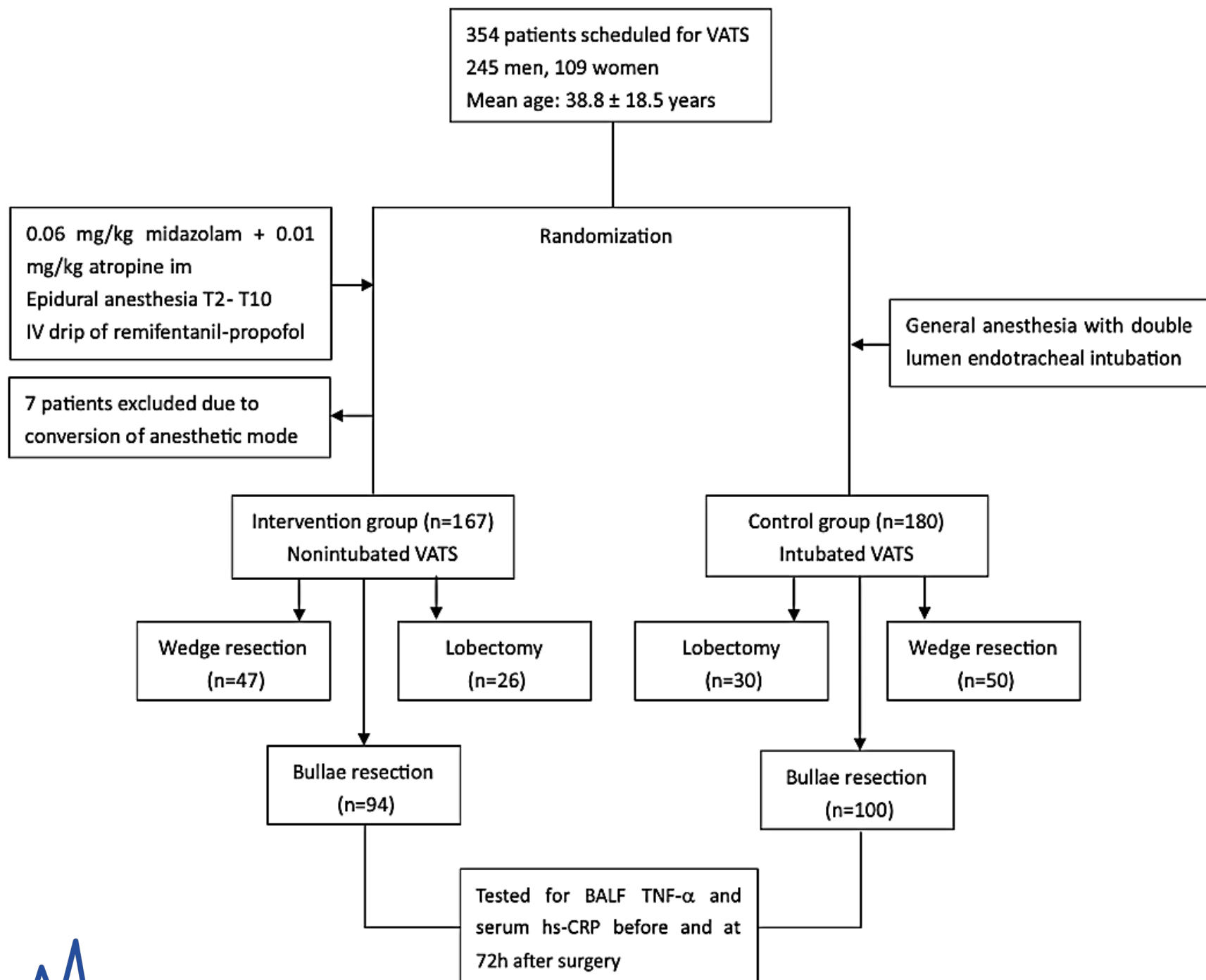
Pas de curare, pas de sonde d'intubation



Institut Mutualiste Montsouris



Liu et al. 2015: NIVATS surgery under epidural anesthesia compared with conventional anesthetic option: a randomized control study



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Complications	Intervention Group (167 Patients)		Control Group (180 Patients)		P Value
	n	%	n	%	
Any complication	11	6.7	30	16.7	.004
Respiratory complications	7	4.2	18	10.0	.039
Pulmonary air leak	3	1.8	5	2.8	
Pulmonary infection	2	1.2	7	3.9	
Atelectasis	1	0.6	3	1.7	
Bronchospasm	1	0.6	3	1.7	
Respiratory failure	0	0	0	0	
Cardiac complications	0	0	2	0	— ^a
Arrhythmias	0	0	2	1.1	
Myocardial infarction	0	0	0	0	
Cardiac failure	0	0	0	0	
Complications of epidural anesthesia	4	2.4	0	0	.053
Endotracheal intubation-related complications	0	0	10	5.6	.002
Death	0	0	0	0	



Non-intubated spontaneous ventilation in VATS: a meta-analysis.

Wen et al., Eur J Cardiothorac Surg. 2020

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- Etudes incluses jusqu'à octobre 2018
- 27 études: 9 RCT, 18 observationnelles
- 56% Asie, 44% en Europe

- **2.537 patients:**
 - 1.283 NI-VATS
 - 1.254 I-VATS

• Temps opératoires (SMD):	-0.174, 95% CI -0.340 to -0.007; P = 0.041	P = 0.041
• Temps d'anesthésie (SMD):	-0.710, 95% CI -1.050 to -0.369; P < 0.001	P < 0.001
• Durée de drainage (SMD):	-1.122, 95% CI -2.208 to -0.036; P = 0.043	P = 0.043
• Durée des séjours à l'hôpital (SMD):	-0.581, 95% CI -0.792 to -0.371; P < 0.001	P < 0.001
• Complications globales (OR):	0.505, 95%CI 0.384-0.665; P < 0.001	P < 0.001
• Taux de mortalité (OR):	0.123, 95% CI 0.021-0.717; P = 0.020	P = 0.020

Taux de conversion en intubation 3.2% (95% CI 1.9-4.4%)



Hypothèses

Intubation

- Pas de traumatisme
- Diminution de l'inflammation

Ventilation spontanée

- Pas de ventilator-induced lung injury
- Meilleure rapport V/Q

Curare

- Pas de paralysie diaphragmatique
- Pas de curarisation résiduelle

Diminution de l'inflammation

- Diminution de l'immunosuppression
- Diminution des neuronal injuries

Meilleure oxygénation cérébrale

- Hypercapnie per-opératoire
- Augmentation du débit sanguin cérébrale
- Meilleure oxygénation cérébrale

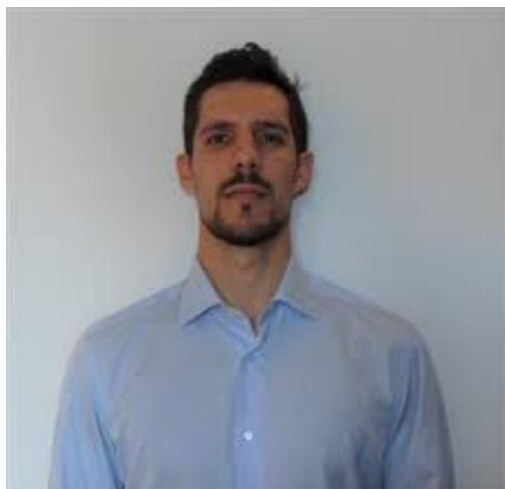
Hémodynamique

- Plus de stabilité
- Moins de défaillance d'organe
- Moins de complication CV, rénale, cognitive...

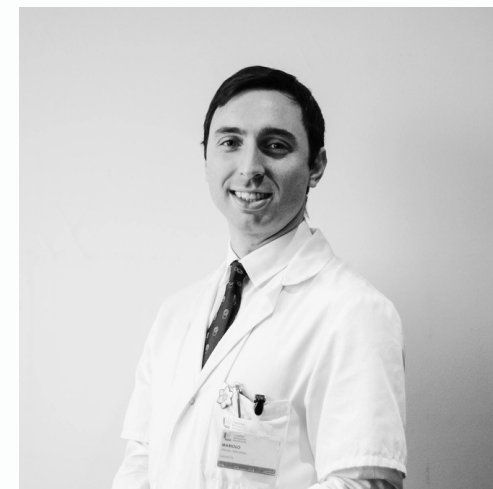
EN PRATIQUE



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Dr G. Mattioni



Dr A. Mariolo



Minor Surgery, Minor anesthesia...

- **Former les anesthésistes**
 - Intégrer la NITS dans l'arsenal des anesthésistes
 - Intégrer la NITS au parcours RAAC
 - Développer l'ambulatoire en chirurgie thoracique

- **Poursuivre la recherche**
 - Sélection des patients
 - Indications chirurgicales
 - Choix de l'ALR
 - Gestion de l'urgence





Nouvelles situations à gérer

- 3,2% d'intubation dans la meta-analyse
- Entre 1 et 10% dans la littérature
- Diminue avec l'expérience des équipes
- Situation de stress car position inhabituelle, inconfortable
- Nécessite:
 - Une coopération chirurgien-anesthésiste
 - Des protocoles d'urgence
 - Un entraînement des équipes (simulation ++)
 - Sélectionner les patients





Dr Agathe Seguin-Givelet



Groupe Hospitalier Privé
Ambroise Paré - Hartmann



Liens d'intérêts

Astra Zeneca : Speaker and consulting

Medtronic : Speaker and consulting

SIVAN : Consulting

Roche : Consulting

Intuitive : Speaker

Ethicon : Speaker

Olympus : Speaker

GE : Speaker

Hepta medical : Consulting

Plan

La technique anesthésique : NITS

La voie d'abord : VATS, RTAS, U VATS U RATS etc

La chirurgie guidée par l'image

Le geste chirurgical :

- Epargne parenchymateuse
- Curage ganglionnaire
- Destruction « in situ » ?

Enjeux

Préambule : ce que cherche le patient

1. Participer à la décision
2. Être soigné comme une personne unique
3. Le moins invasif possible



With the increasing utilisation of lung cancer screening we're finding smaller and smaller lesions and at least in the States, **those patients are getting surgery less and less often.**

Not only because of the primary care physicians, but also because patients are choosing non-surgical methods. **They do not want surgery; they want less and less invasive procedures.**

K. Naunheim EJCTS 2018, Thoracic surgeon USA

La voie d'abord

LIVRE ROUGE DE LA CHIRURGIE THORACIQUE FRANCAISE

CANCER PRIMITIF DU POUMON

Epithor : 2016 – 2022



	Mini-invasive		Classique	
2016	2371	39,5%	3622	60.3%
2017	3089	45.1%	3752	54.7%
2018	3521	46.8%	3988	53.0%
2019	3011	52.6%	2701	47.2%
2020	4407	53.1%	3879	46.7
2021	3892	57.8%	2826	41.9%
2022	5016	63.2%	2912	36.7%

La voie d'abord : innovations

Robot = Moyen de rendre accessible des intervention complexes

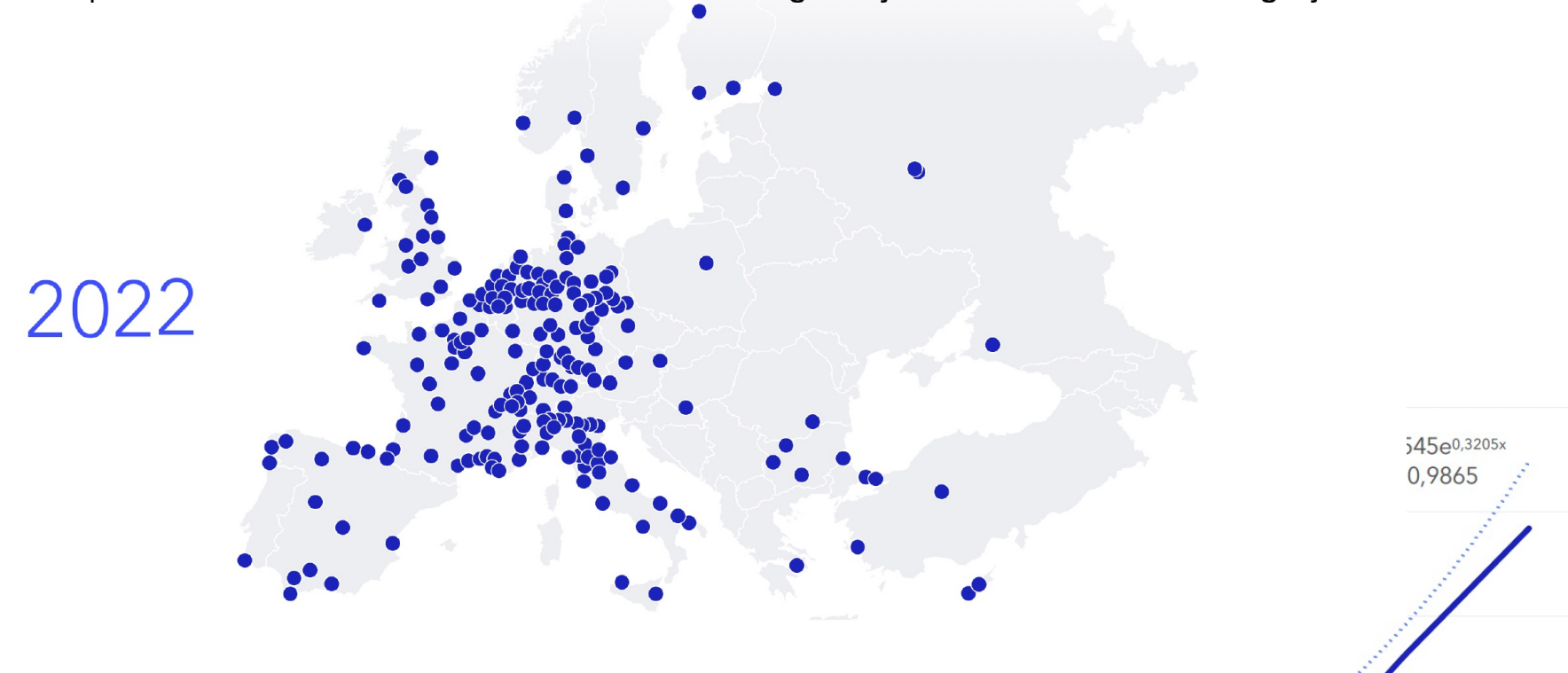
Comparison 2012-2022

Comparison of cities with more than one da Vinci surgical system used in thoracic surgery

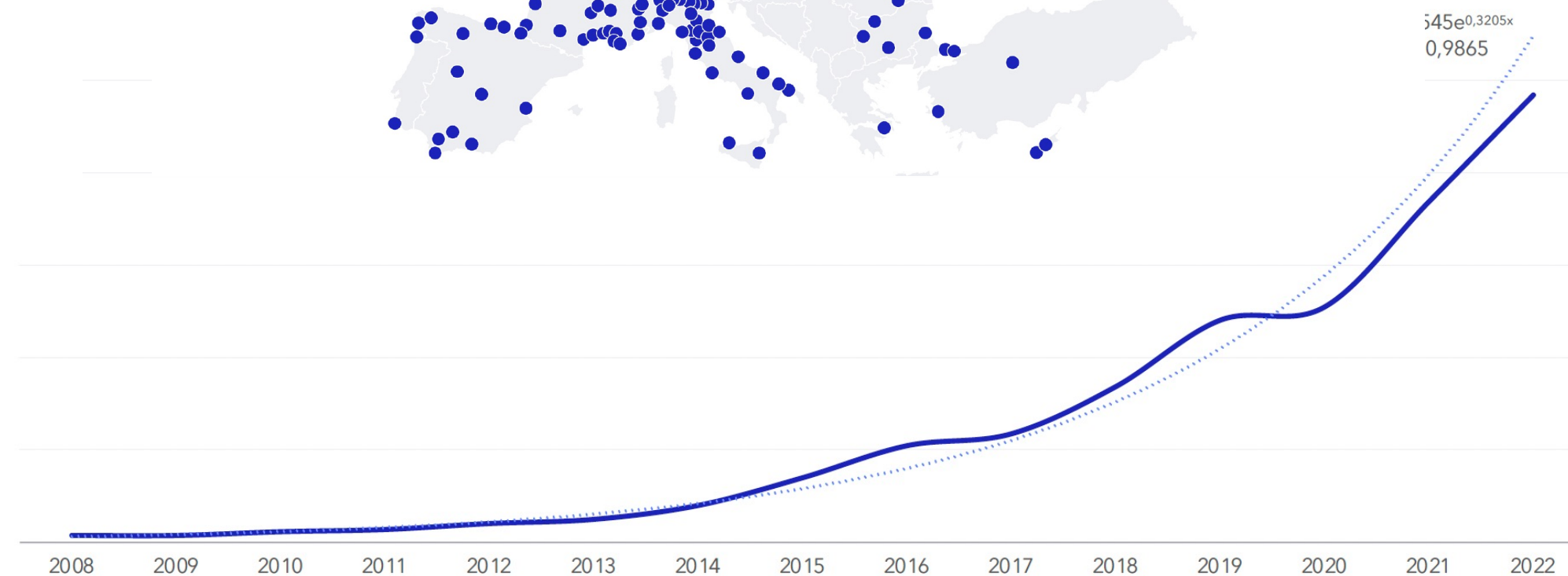


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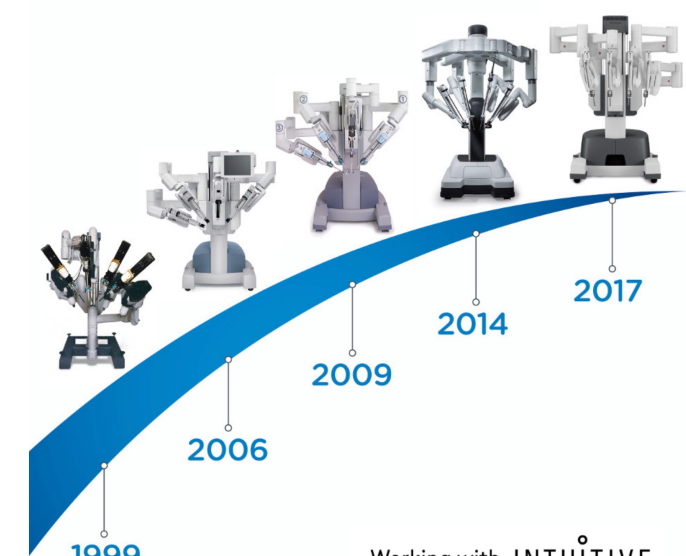


Nombre de cas robotiques en Europe



La voie d'abord : innovations

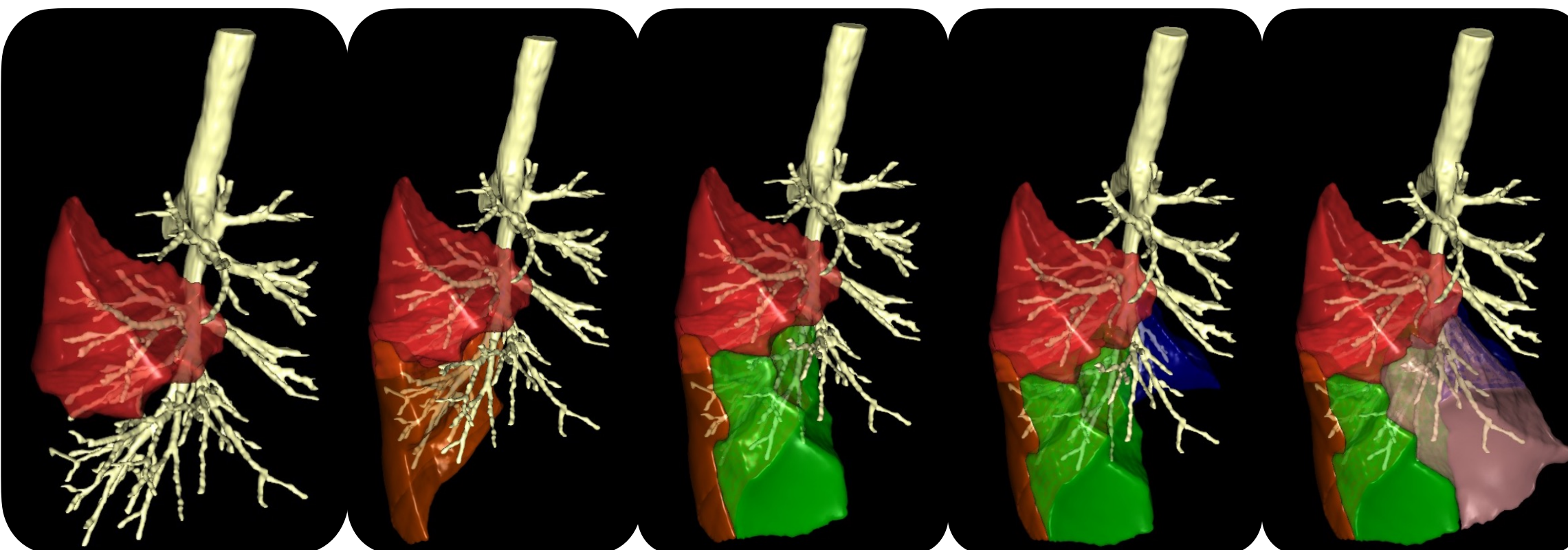
La Robotique = gadget ou nécessité ?



CMR

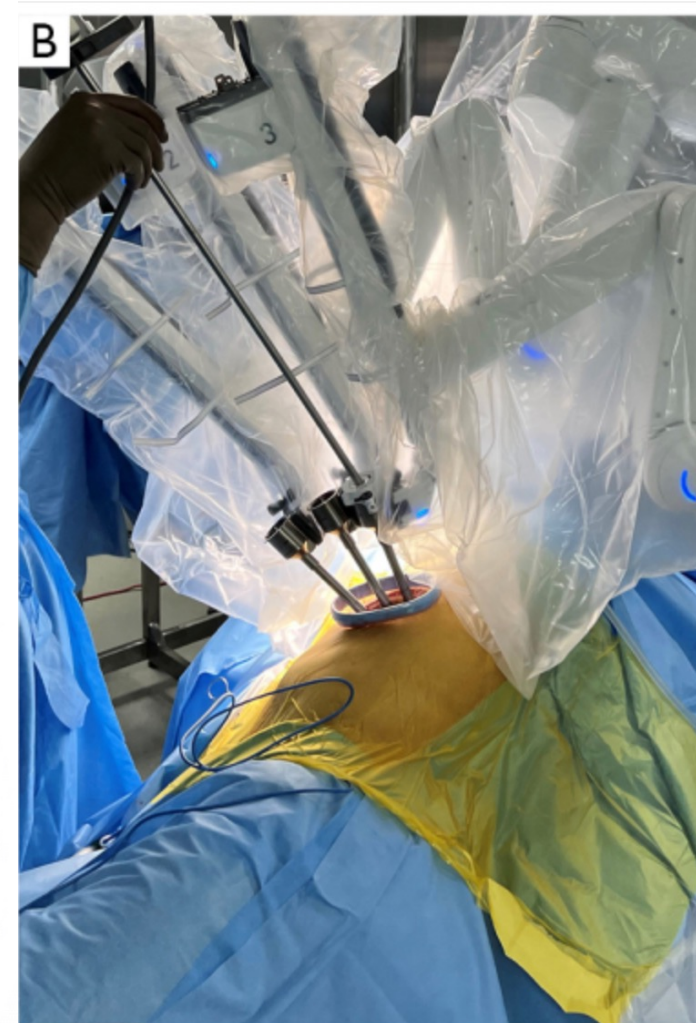
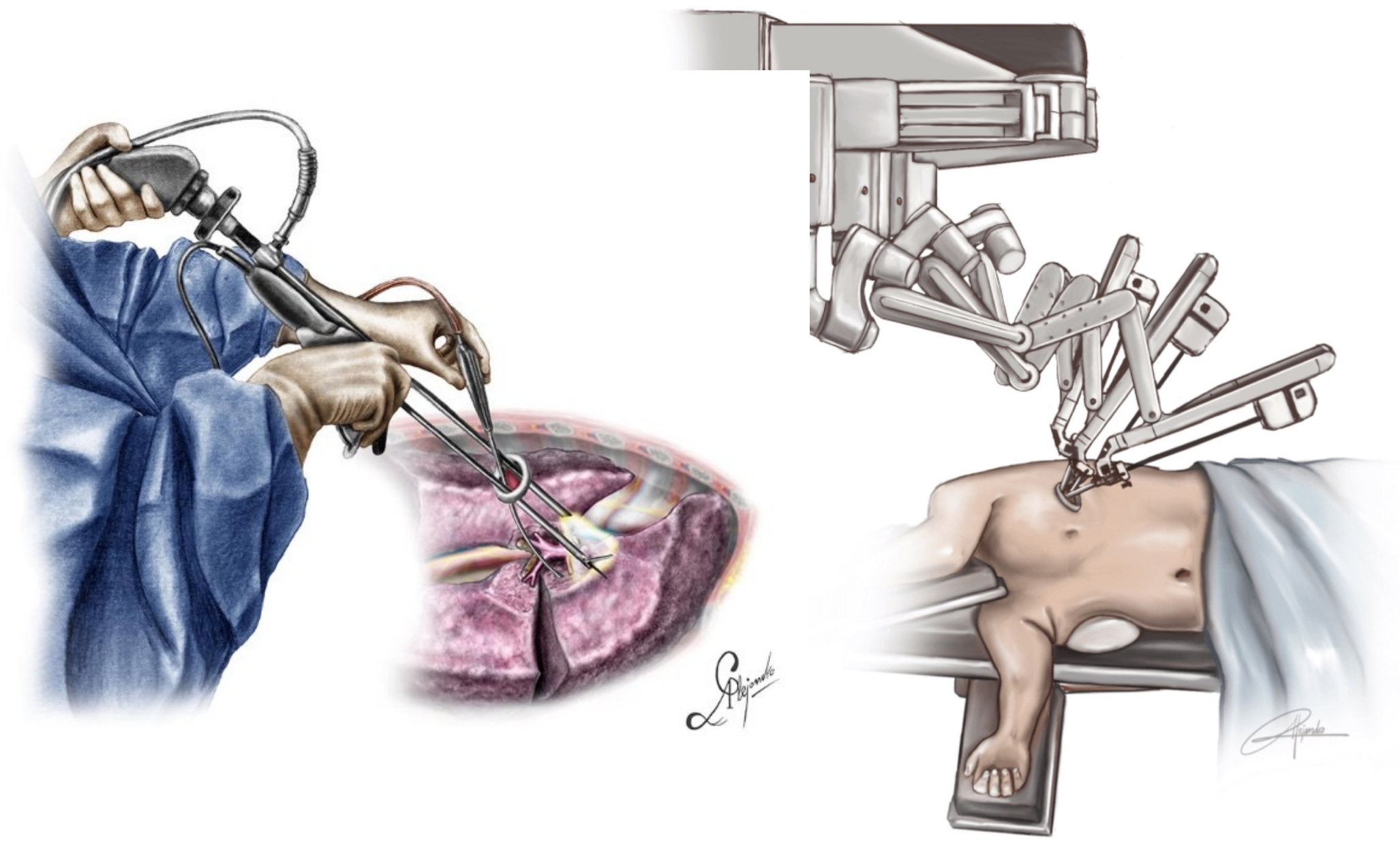


COMPLEXIFICATION
- des interventions
- de la voie d'abord



La voie d'abord : innovations

Uniportal VATS and RATS



La voie d'abord : En dehors du THORAX !

Outside the Cage Subcostal RATS Lobectomy: Technical Aspects and Results of the First Series of a Novel Approach to Pulmonary Lobectomy

Innovations
2023, Vol. 18(6) 519-524
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DOI: 10.1177/15569845231217257
journals.sagepub.com/home/inv
Sage

Luciano Bulgarelli Maqueda^{1,2}, MD^{ID}, Maxime Têtu², MS, Pedro Guimarães Rocha Lima^{1,2}, MD, Feras Abu-Reida^{1,2}, MD, Omniyah Alashgar¹, MBBS, Gabriel Dayan², MD, Basil Nasir^{1,2}, MBCh, Pasquale Ferraro^{1,2}, MD, and Moïshe Liberman^{1,2}, MD, PhD

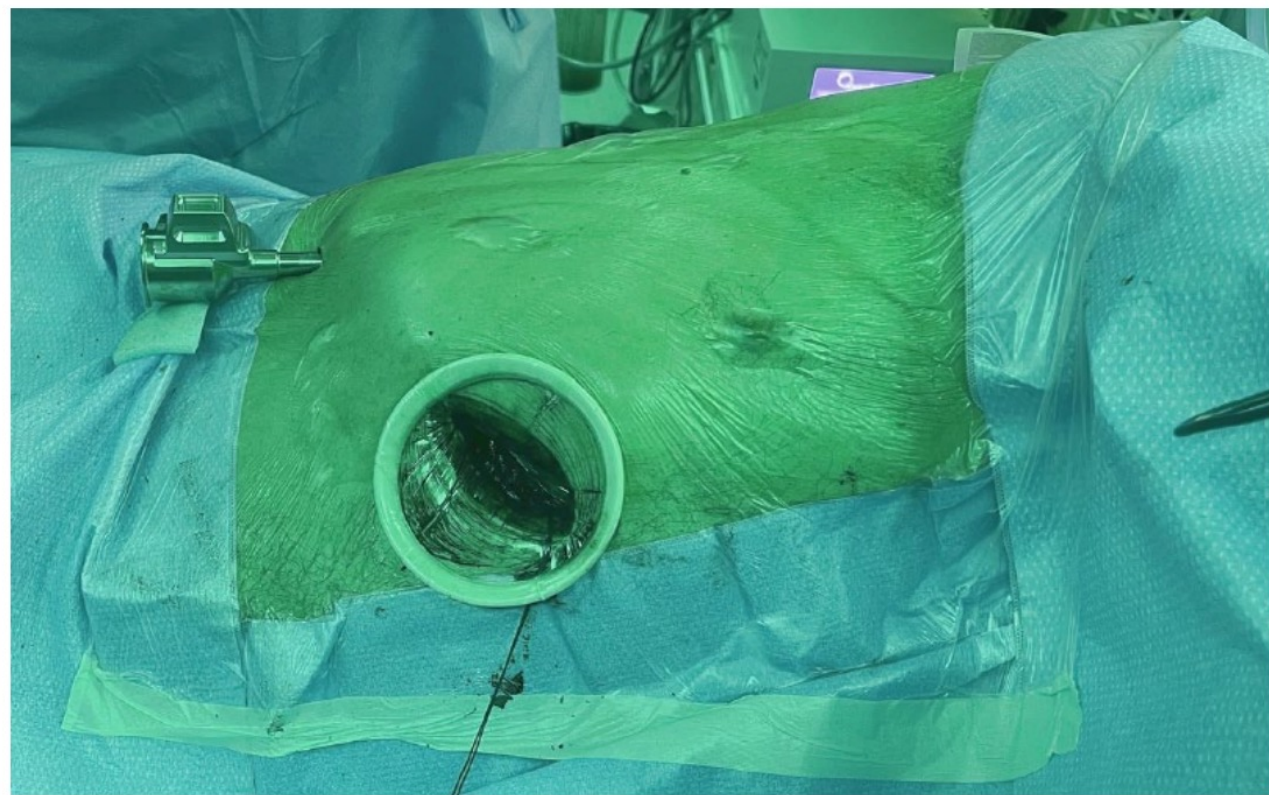


Fig. 1. Subcostal port positioning for right hemithorax outside the thoracic cage robot-assisted thoracic surgery.

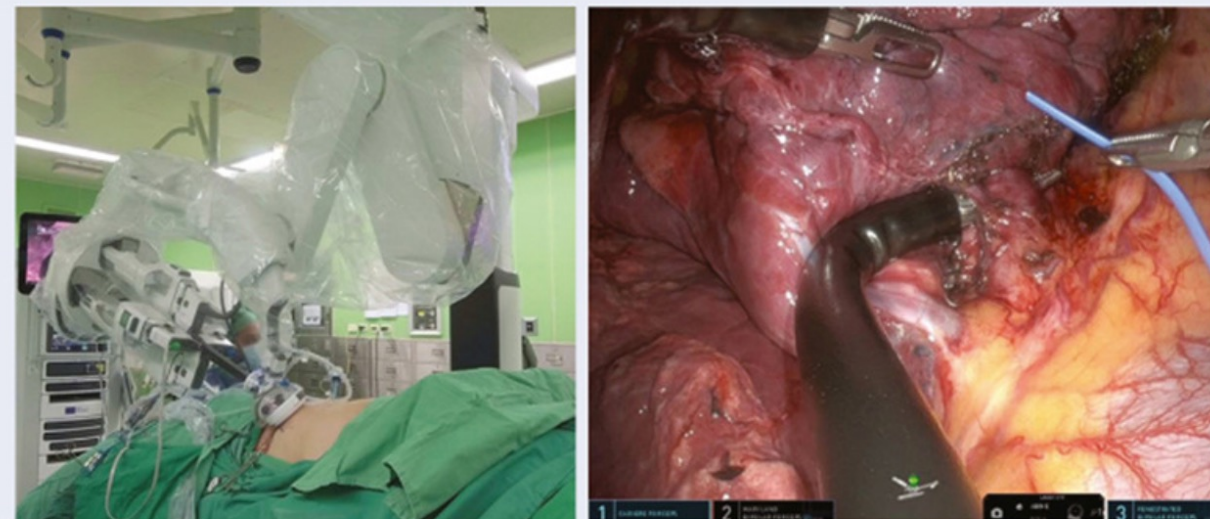


@AATSHQ

Uniportal Robotic Anatomic Lung Resection: A Pilot Trial

Methods

We evaluated 35 consecutive patients who underwent anatomical lung resection using a single-port robotic platform (da Vinci[®] SP system) via a subcostal approach.



Results

Primary endpoint

- Conversion rate: 2.9% (1/35)

Secondary endpoints

- Median Console time: 153 (93-267) min
- R0 resection rate: 100%
- Median LN harvest station: 6 (4-8)
- Median LN harvest number: 13 (5-37)
- Two major complications: 5.7% (2/35)

*Segmental pulmonary congestion
Recurrent pleural effusion*

Conclusion

Performing anatomical lung resection through a subcostal approach using the da Vinci[®] SP system is both safe and feasible.

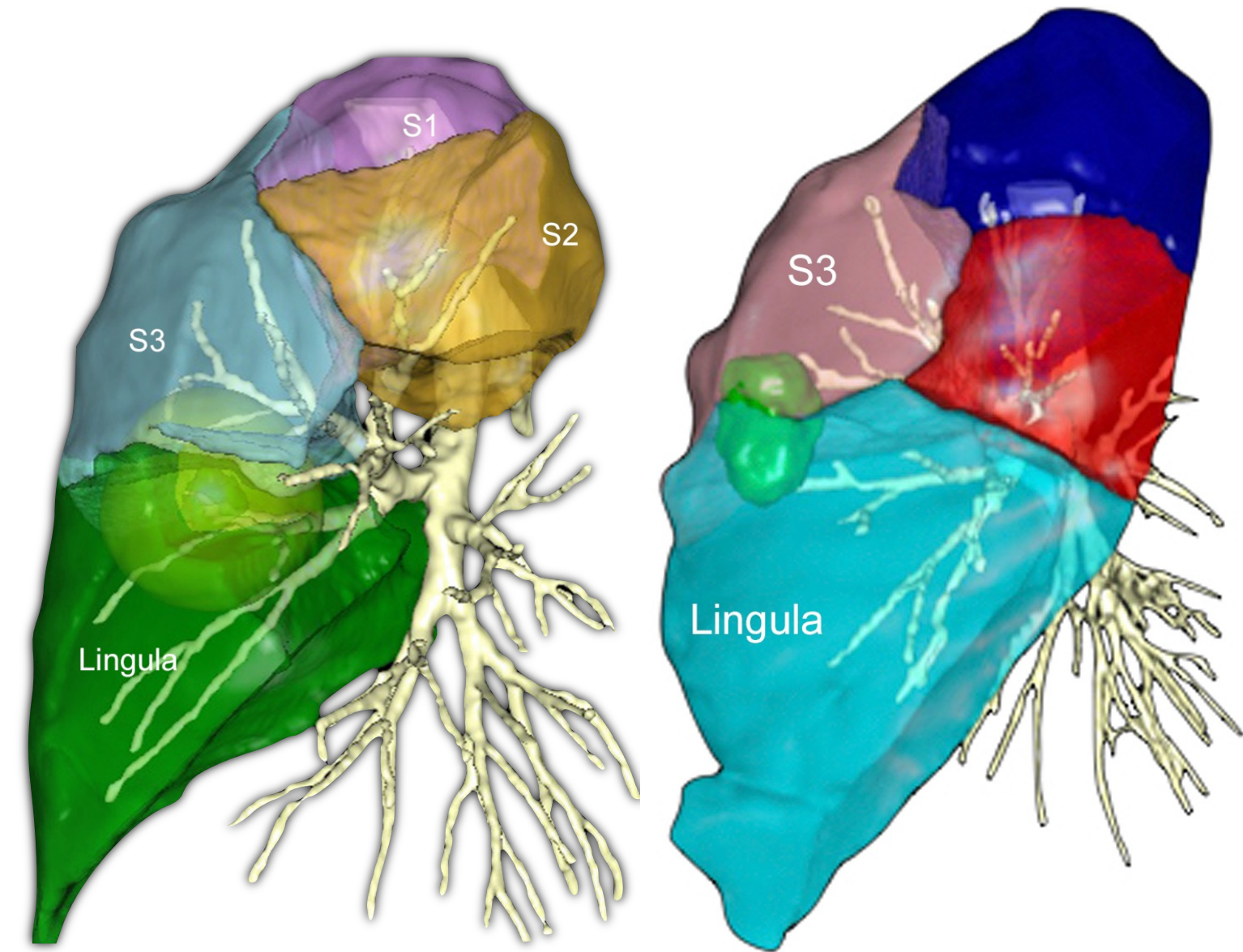
Cheng, Chao, et al., 2023

Innovations technologiques (en chirurgie thoracique)

Chirurgie guidée par l'image

Imagerie / reconstruction 3D

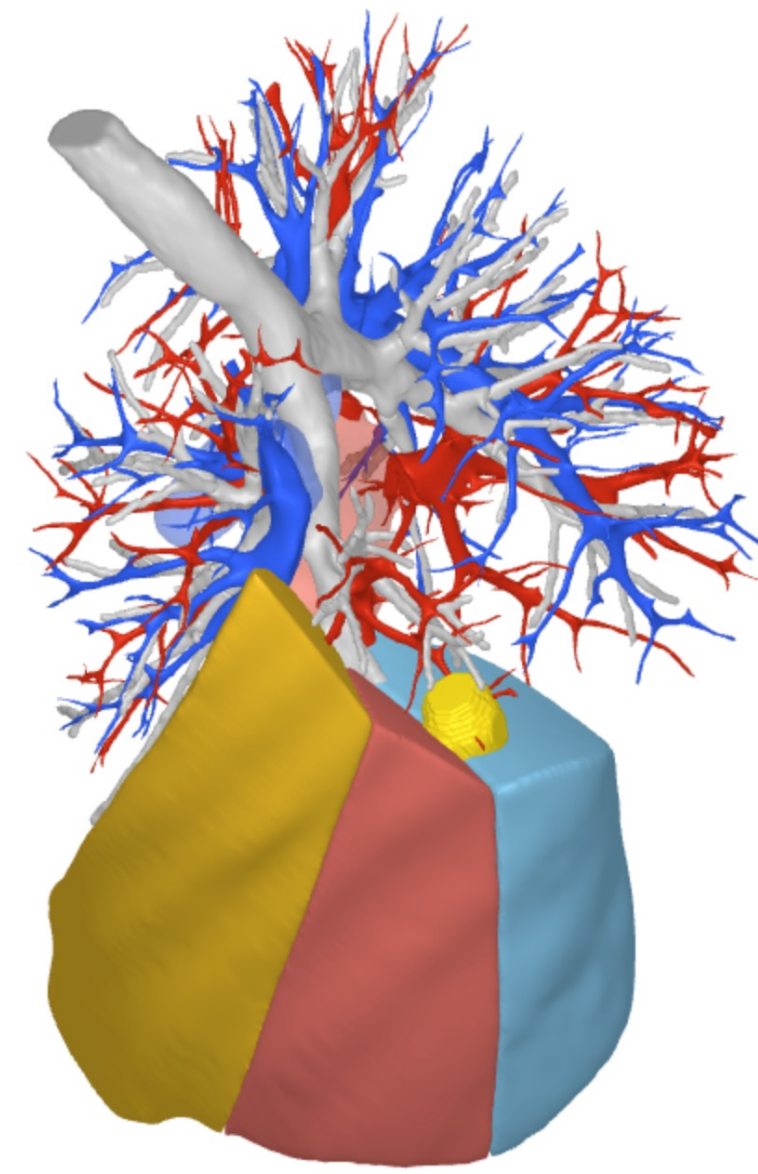
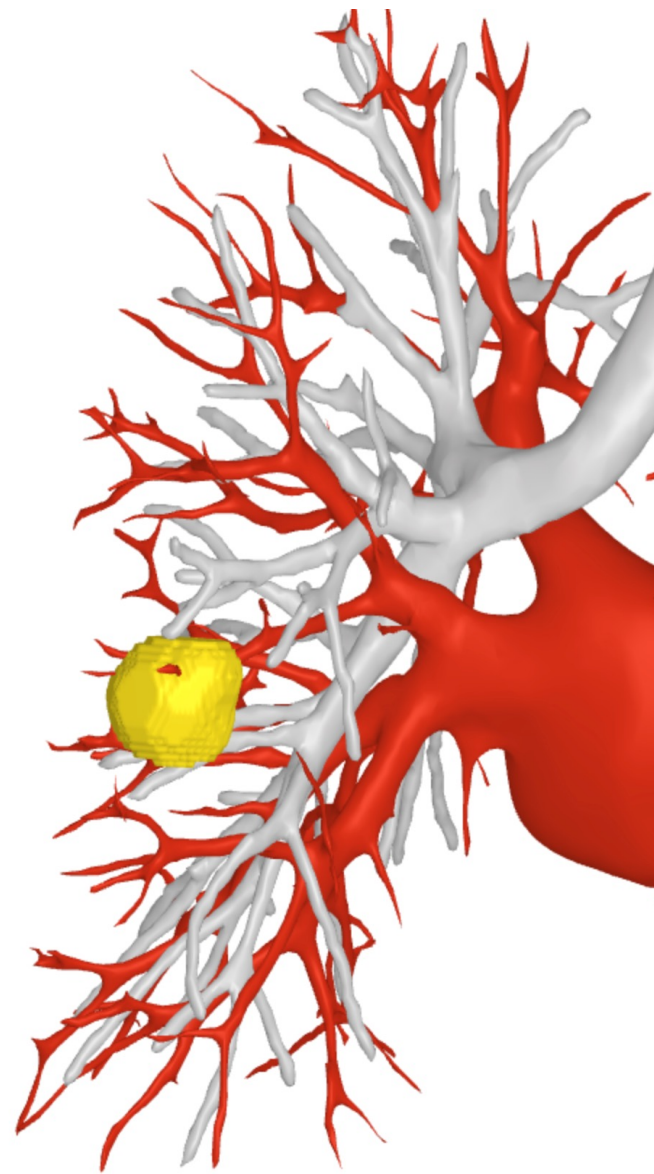
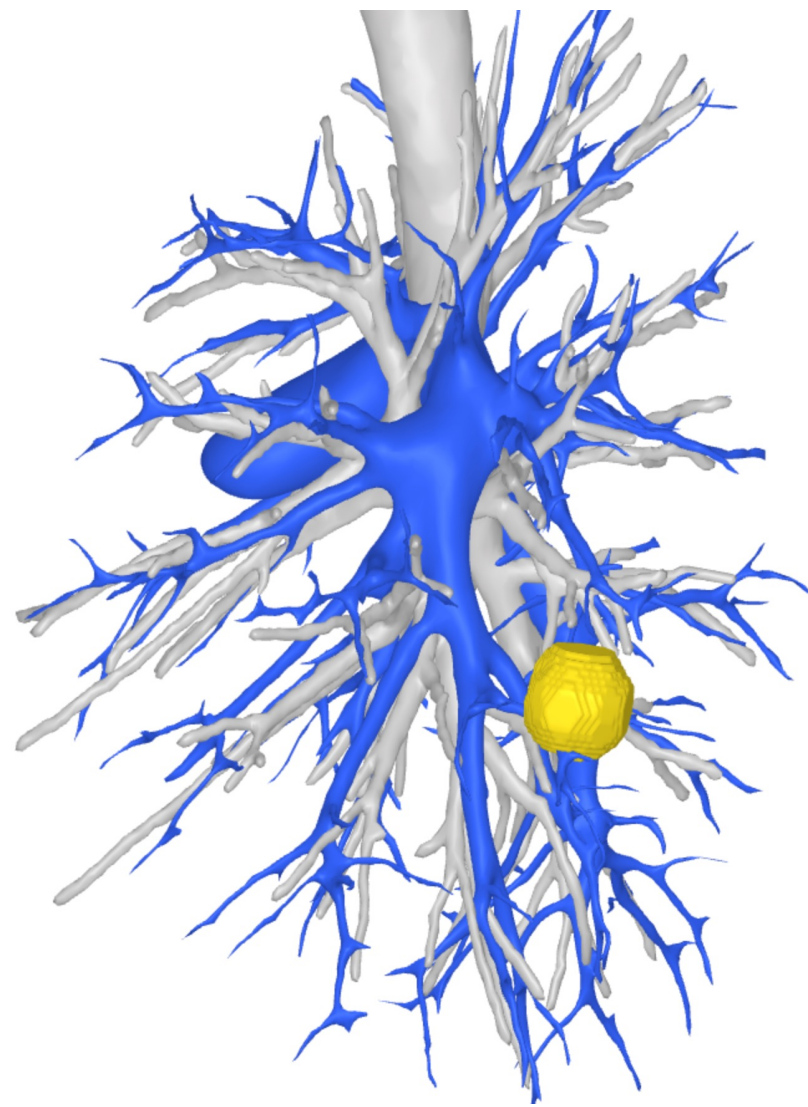
- **Sécurisation** et précision du geste
- Planification = **moins invasif**
- **Relation** médecin patient
- Simulation/ Enseignement



Modèle Visible Patient

Innovations technologiques (en chirurgie thoracique)

Chirurgie guidée par l'image... SANS injection



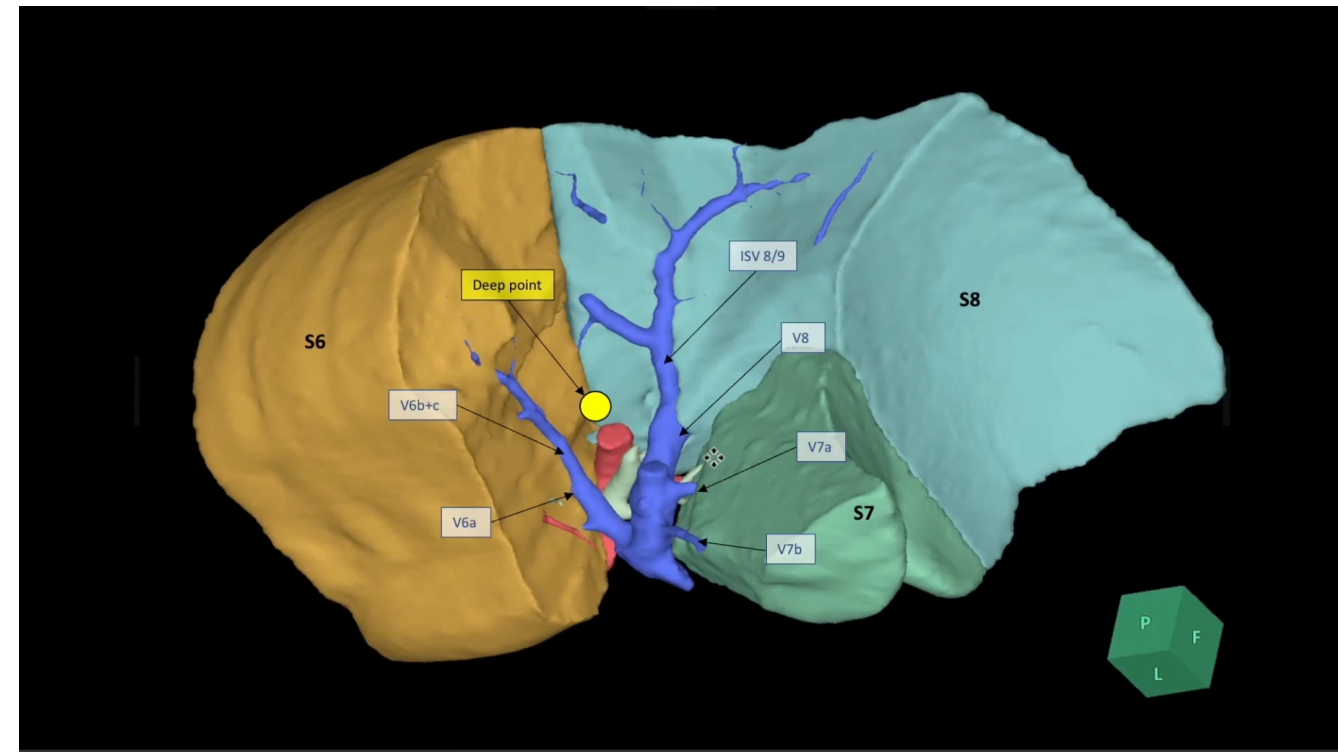
Modèle Infervision

Innovations technologiques (en chirurgie thoracique)

Plan de vol

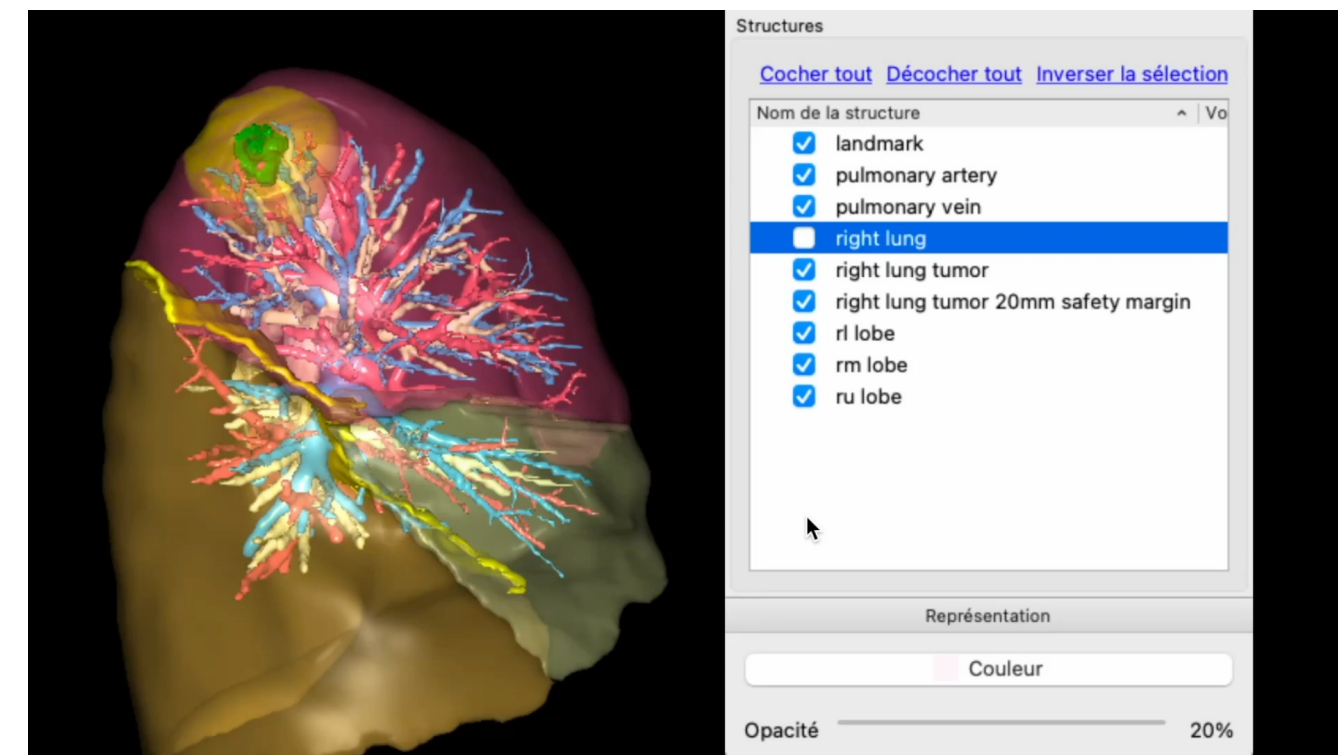


La patrouille de France



Plan de vol
Segmentectomie S9+10
par voie sous xyphoïdienne

Images: Karel Pfeuty
CH St Briec

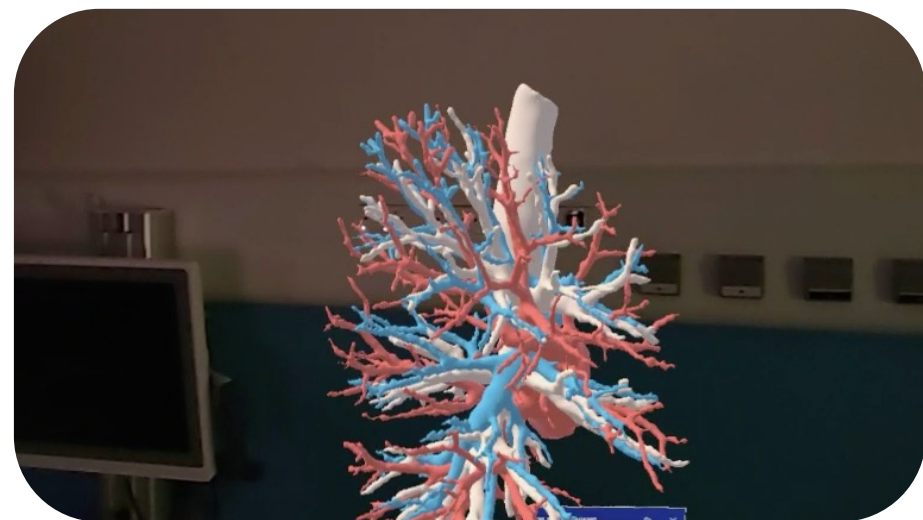
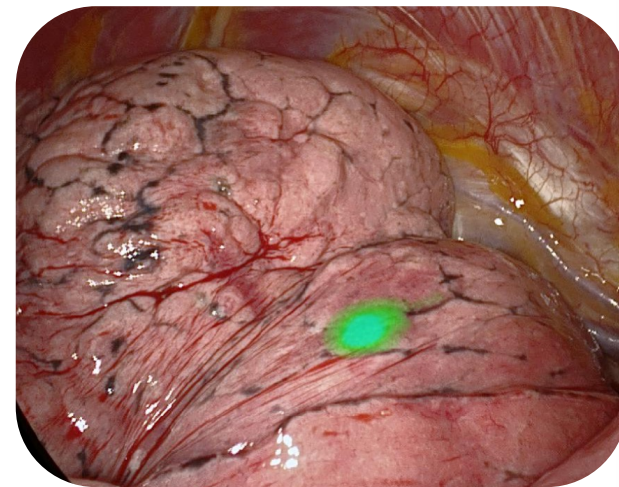
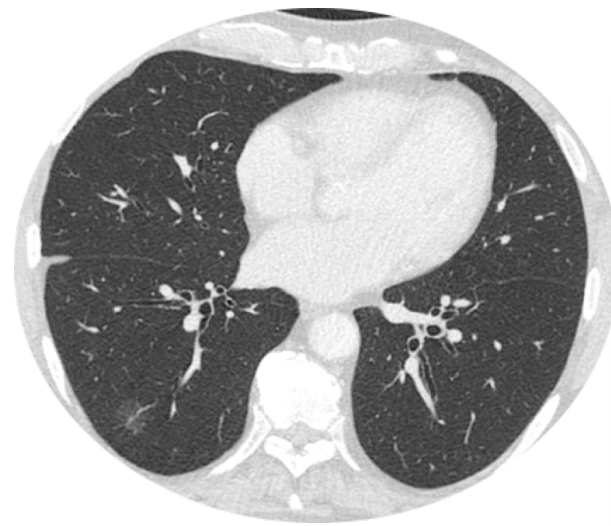
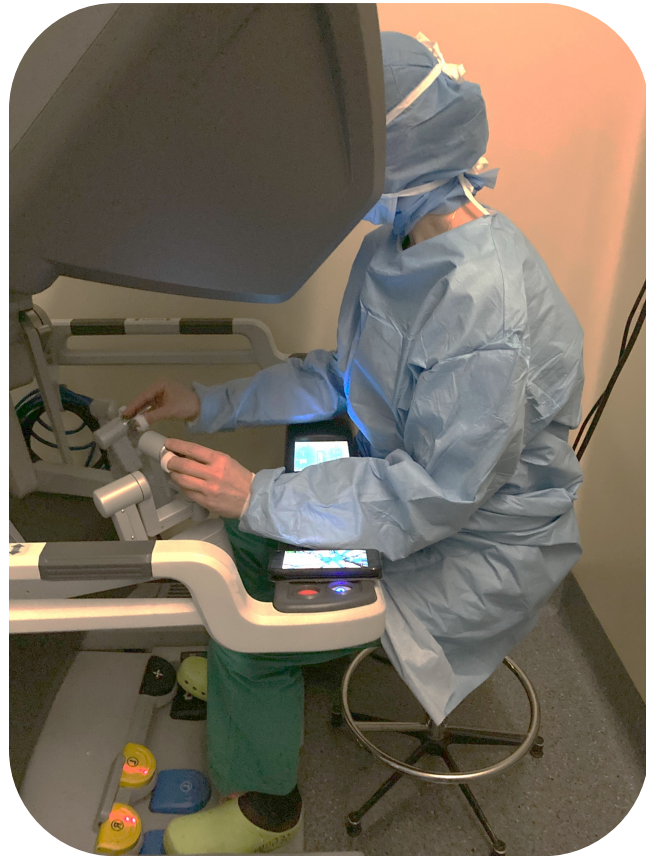


Plan de vol
Segmentectomie S1+2 par
voie basée sur la scissure

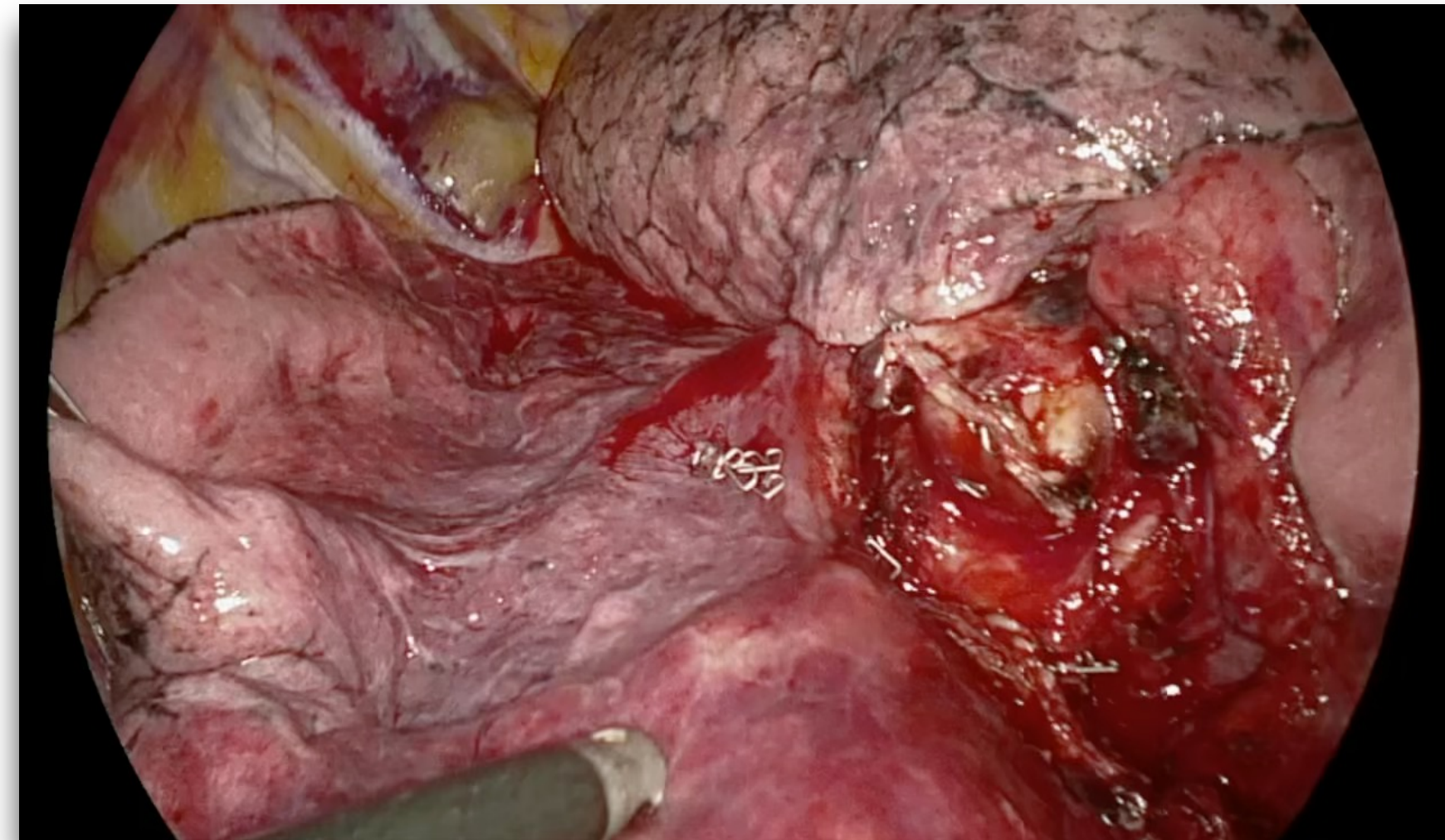
Images: Agathe Seguin-Givelet,
Ambroise Paré

Innovations technologiques (en chirurgie thoracique)

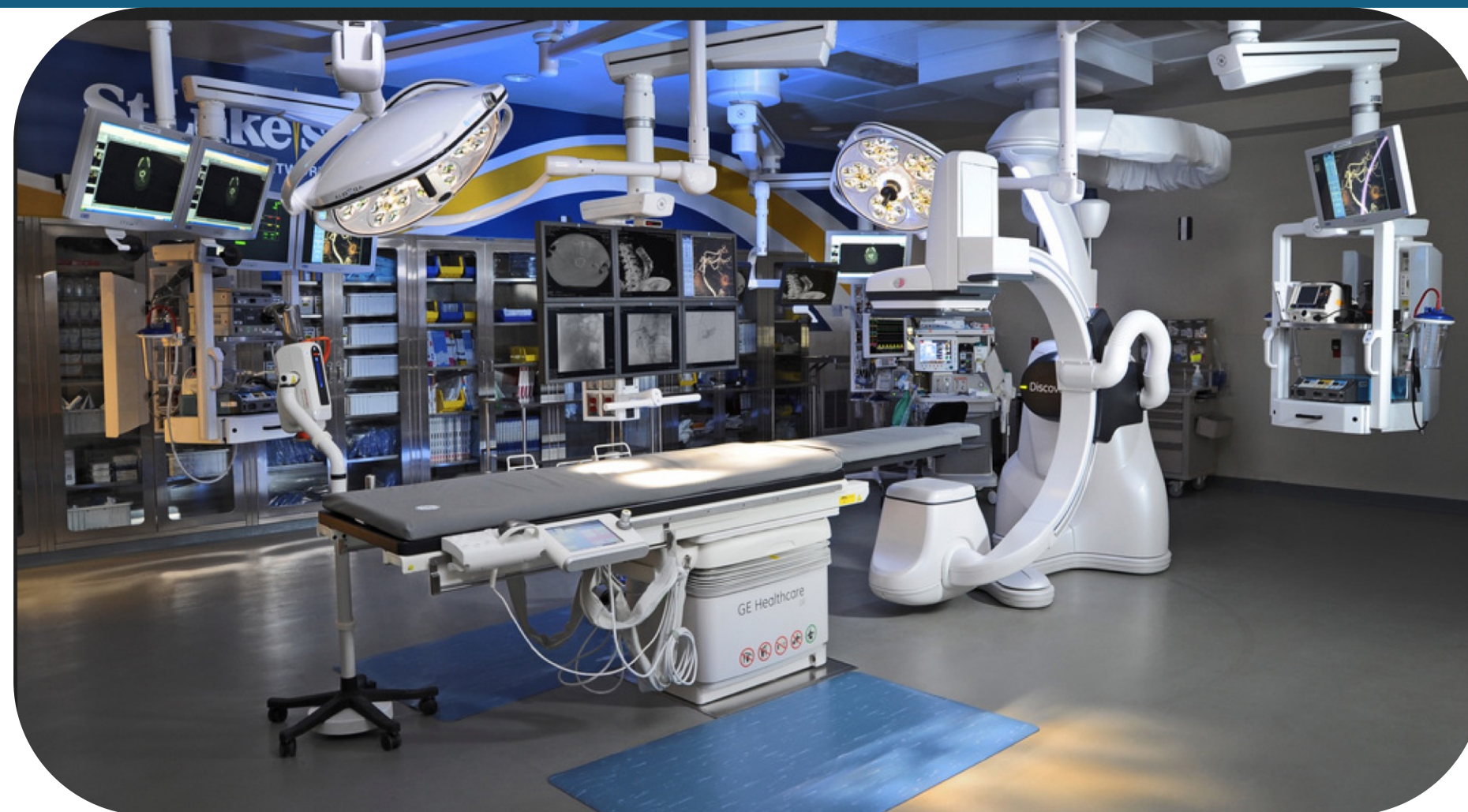
Sécurisation per opératoire



Rendre visible l'invisible



Profonde transformation de la salle d'op !

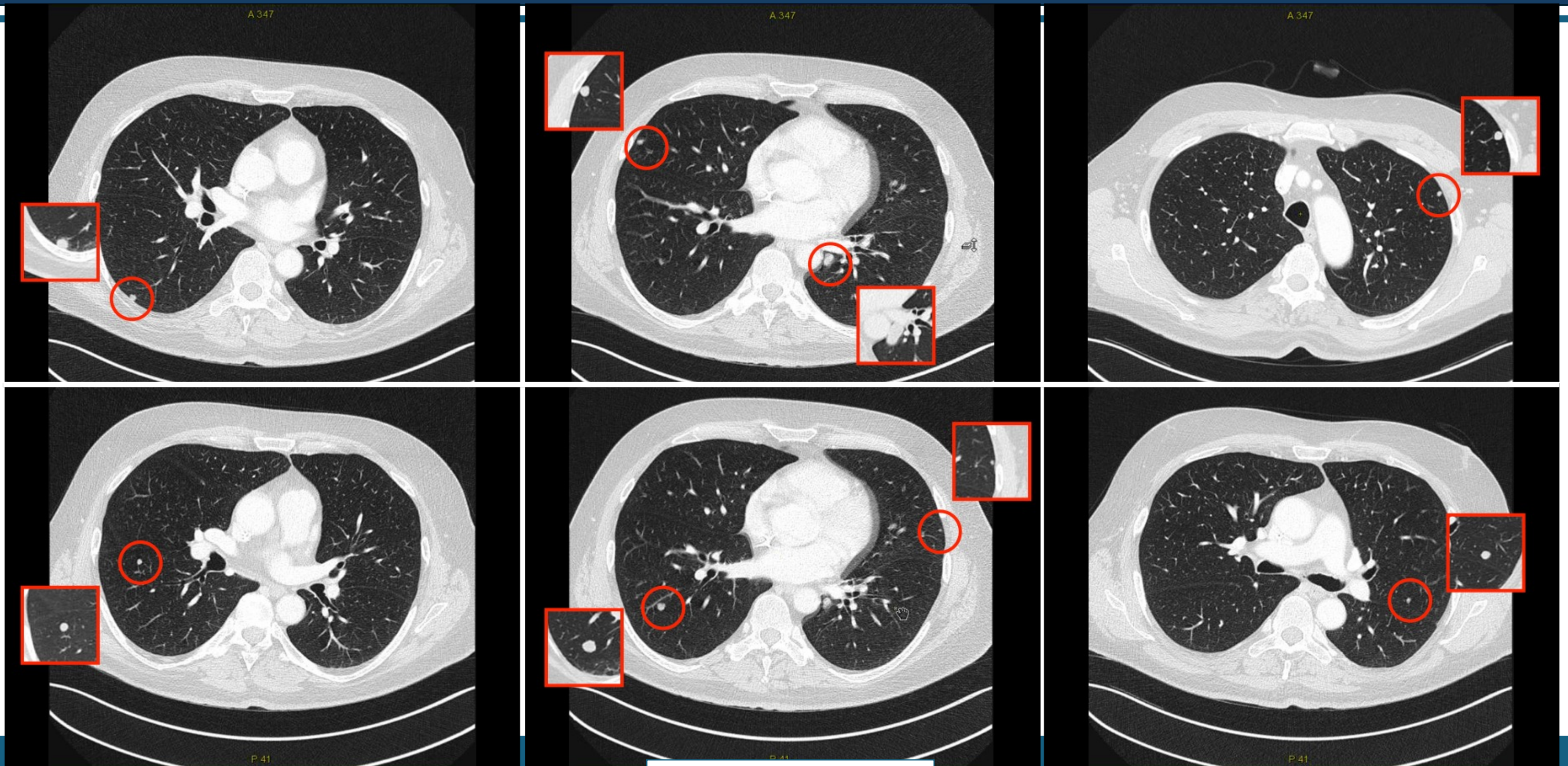


Using the Hybrid Operating Room in Thoracic Surgery *A Paradigm Shift*

(Innovations 2018;13:372–377)

Carsten Schroeder, MD, PhD, Jane M. Chung, MD,* Andrew B. Mitchell, MD,* Thomas A. Dillard, MD,†
Alessandro G. Radaelli, PhD,‡ and Stephanie Schampaert, PhD‡*

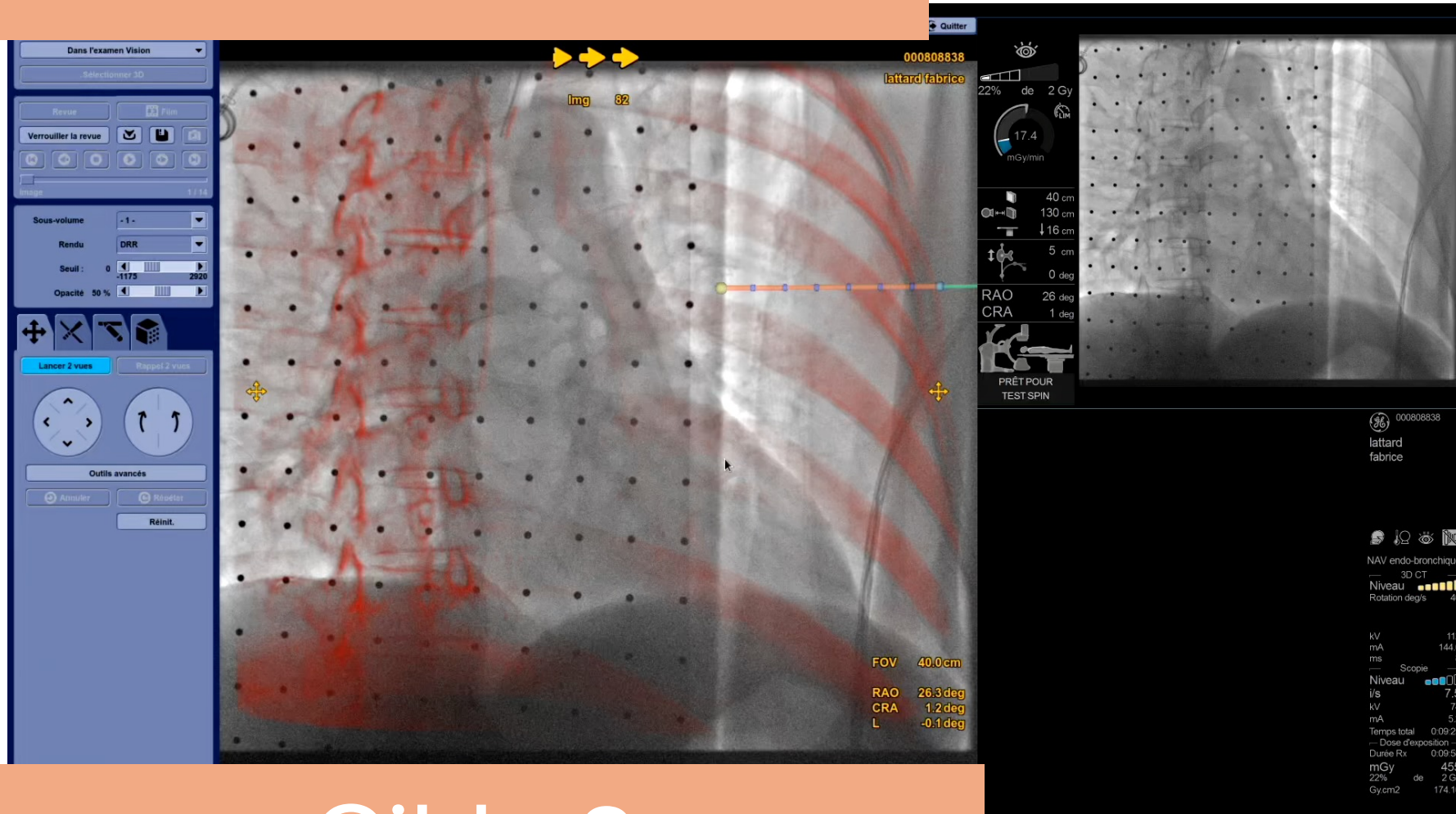
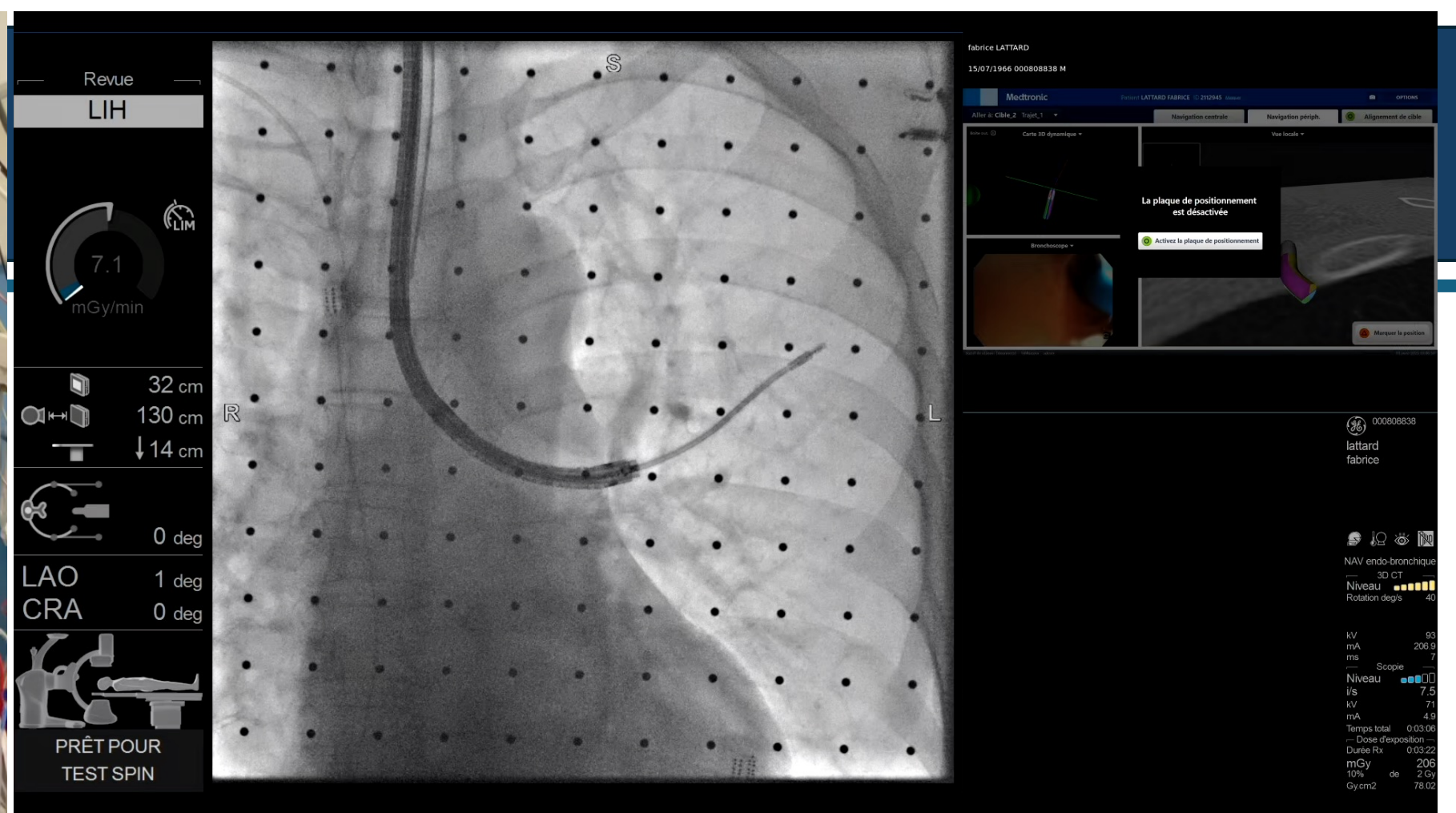
Wedges pour métastases



Crédit G. Boddaert



Cible 1



Cible 3

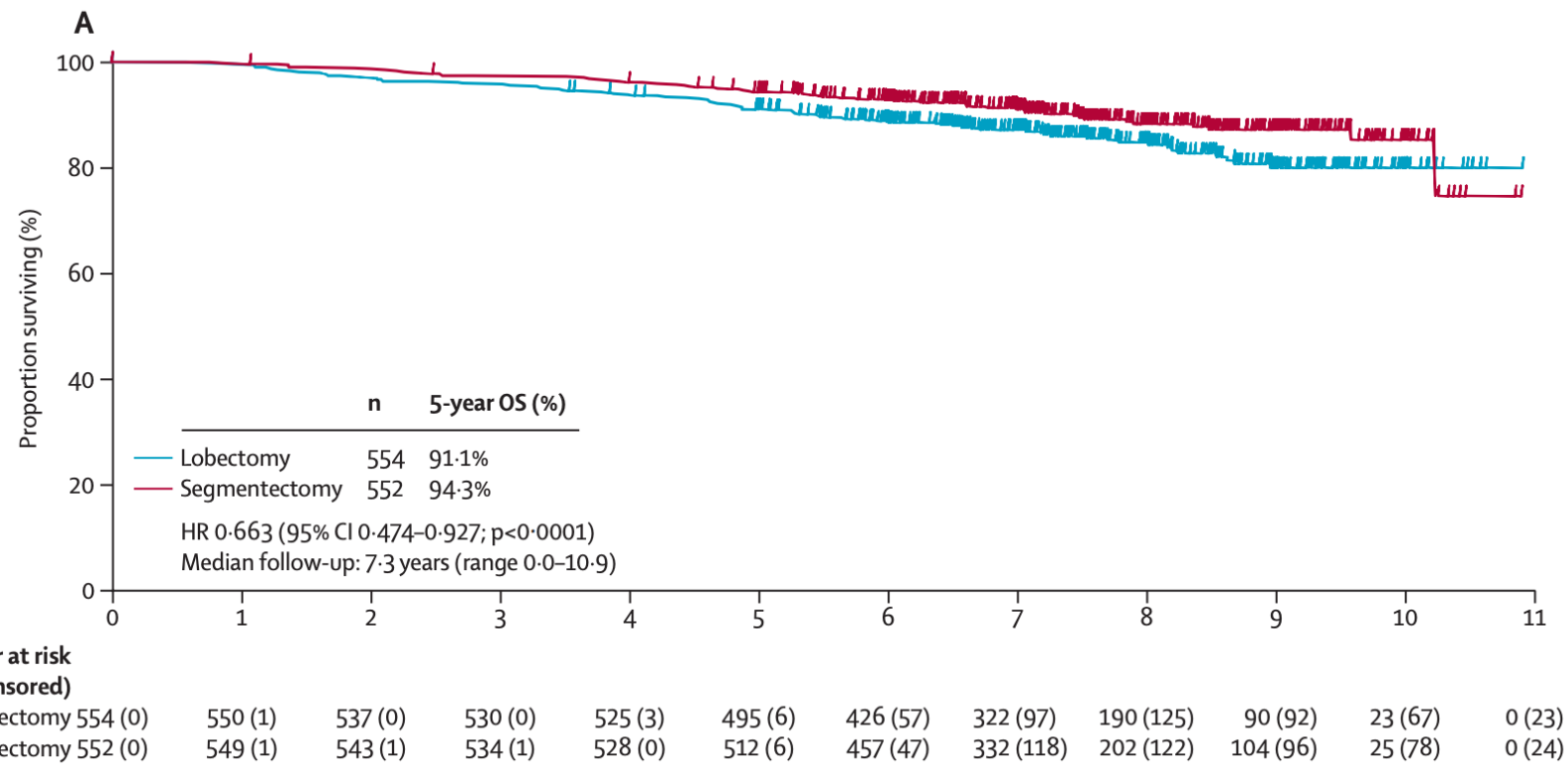


2022-2023 : l'année du changement (officiel) !

Segmentectomy versus lobectomy in small-sized peripheral non-small-cell lung cancer (JCOG0802/WJOG4607L): a multicentre, open-label, phase 3, randomised, controlled, non-inferiority trial

Hisashi Saji, Morihito Okada, Masahiro Tsuboi, Ryu Nakajima, Kenji Suzuki, Keiju Aokage, Tadashi Aoki, Jiro Okami, Ichiro Yoshino, Hiroyuki Ito, Norihito Okumura, Masafumi Yamaguchi, Norihiko Ikeda, Masashi Wakabayashi, Kenichi Nakamura, Haruhiko Fukuda, Shinichiro Nakamura, Tetsuya Mitsudomi, Shun-Ichi Watanabe, Hisao Asamura, on behalf of the West Japan Oncology Group and Japan Clinical Oncology Group*

Lancet 2022;399:1607-17



The NEW ENGLAND JOURNAL of MEDICINE

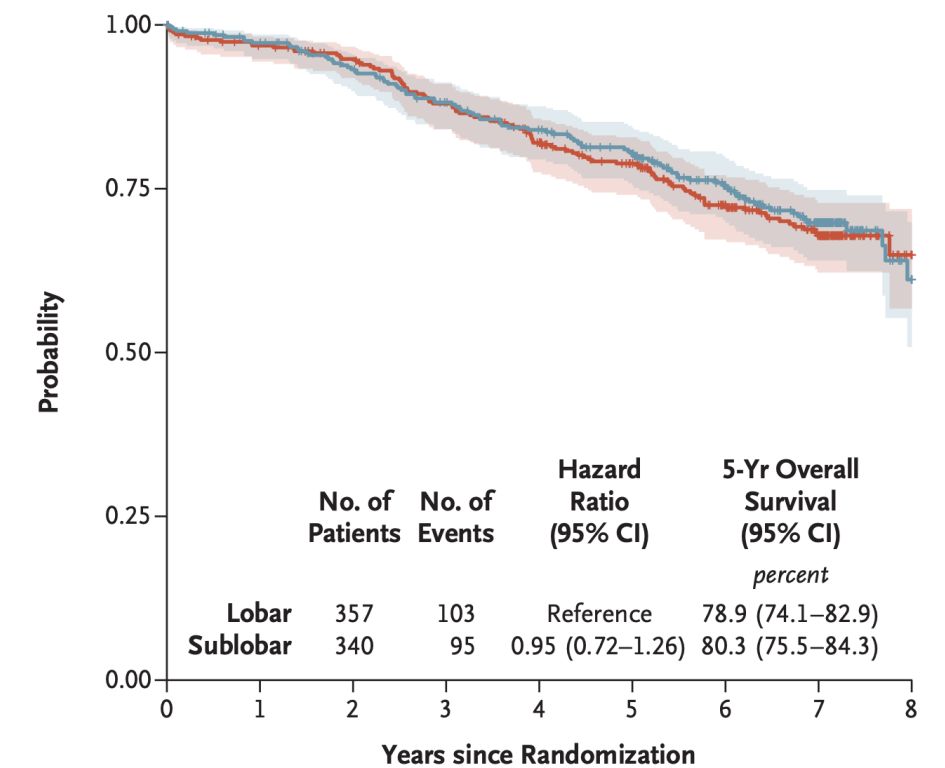
ESTABLISHED IN 1812 FEBRUARY 9, 2023 VOL. 388 NO. 6

Lobar or Sublobar Resection for Peripheral Stage IA Non-Small-Cell Lung Cancer

Nasser Altorki, M.D., Xiaofei Wang, Ph.D., David Kozono, M.D., Ph.D., Colleen Watt, B.S., Rodney Landrenau, M.D., Dennis Wigle, M.D., Ph.D., Jeffrey Port, M.D., David R. Jones, M.D., Massimo Conti, M.D., Ahmad S. Ashrafi, M.D., Moïshe Liberman, M.D., Ph.D., Kazuhiro Yasufuku, M.D., Ph.D., Stephen Yang, M.D., John D. Mitchell, M.D., Harvey Pass, M.D., Robert Keenan, M.D., Thomas Bauer, M.D., Daniel Miller, M.D., Leslie J. Kohman, M.D., Thomas E. Stinchcombe, M.D., and Everett Vokes, M.D.

N Eng J Med 2023; 388: 6

B Overall Survival



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N Eng J Med 2023; 388: 6

Segmentectomie (sublobar ?) > lobectomie

Ttt de référence

- CBNPC pour les Stades I

- <2 cm

- avec ratio de consolidation CTR>0.5

Lobar	357	337	322	297	270	240	192	142	14
Sublobar	340	320	298	276	258	236	185	127	19

Recommandations européennes ESTS

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

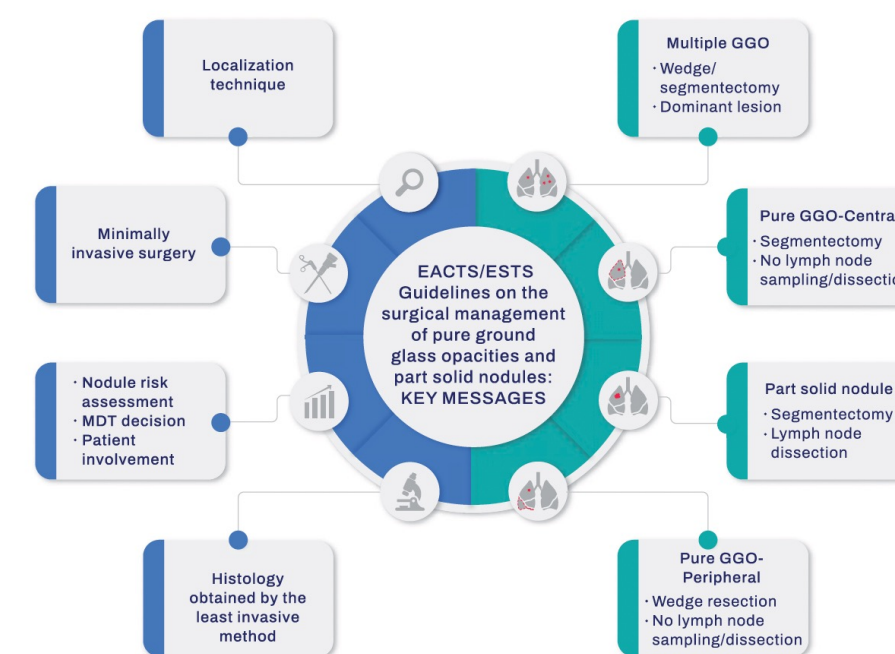
Alessandro Brunelli ^{a,*}, Herbert Decaluwe ^b, Michel Gonzalez ^c, Dominique Gossot ^d,
Rene Horsleben Petersen ^e, Florian Augustin ^f, Jalal Assouad ^g, Jean Marc Baste ^h, Hasan Batirel ⁱ,
Pierre Emmanuel Falcoz ^j, Santiago Figueroa Almanzar ^k, Jozsef Furak ^l, Maria Teresa Gomez-Hernandez ^m,
David Gomez de Antonio ⁿ, Henrik Hansen ^o, Marcelo Jimenez ^m, Aris Koryllos ^o, Elisa Meacci ^p, Isabelle Opitz ^q,
Pierre Benoit Pages ^r, Cezary Piwkowski ^s, Enrico Ruffini ^t, Didier Schneider ^d, Tomaz Stupnik ^u, Zalan Szanto ^v,
Pascal Thomas ^w, Alper Toker ^x, Davide Tosi ^y and Giulia Veronesi ^z

European Journal of Cardio-Thoracic Surgery 2023, 63(6), ezad224

European guidelines for the surgical management of pure ground-glass opacities and part-solid nodules: Task Force of the European Association of Cardio-Thoracic Surgery and the European Society of Thoracic Surgeons

Giuseppe Cardillo ^{a,b,t,t†} (Co-Chairperson) (Italy), René Horsleben Petersen ^{c,d,x,t,t†} (Co-Chairperson) (Denmark),
Sara Ricciardi ^{a,e,x,x†} (Italy), Akshay Patel ^{f,g,t†} (United Kingdom), Joshil V. Lodhia ^{h,s} (United Kingdom),
Michael R. Gooseman ^{i,s} (United Kingdom), Alessandro Brunelli ^h (United Kingdom),
Joel Dunning ^j (United Kingdom), Wentao Fang ^k (China), Dominique Gossot ^l (France),
Peter B. Licht ^m (Denmark), Eric Lim ⁿ (United Kingdom), Eric Dominique Roessner ^o (Germany),
Marco Scarci ^p (United Kingdom), and Milan Milojevic ^{q,r} (Serbia/the Netherlands)

European Journal of Cardio-Thoracic Surgery 2023, 64(4), ezad222



Curage et Immunothérapie : début d'une controverse ?

- **Curage radical** toujours recommandé
- MAIS
- Les ganglions lymphatiques = sites fréquents de métastases = **source de tolérance immunitaire** spécifique à la tumeur.
- Sites cruciaux **d'éducation et d'activation immunitaires** en réponse à l'immunothérapie.
- **Approches visant à reprogrammer les réponses immunitaires dans les ganglions**

Trends in Cell Biology



Volume 33, Issue 12, December 2023, Pages 1021-1034

Opinion

Lymph nodes: at the intersection of cancer treatment and progression

Nathan E. Reticker-Flynn¹  , Edgar G. Engleman²  

Immunothérapie : indications

ORIGINAL ARTICLE

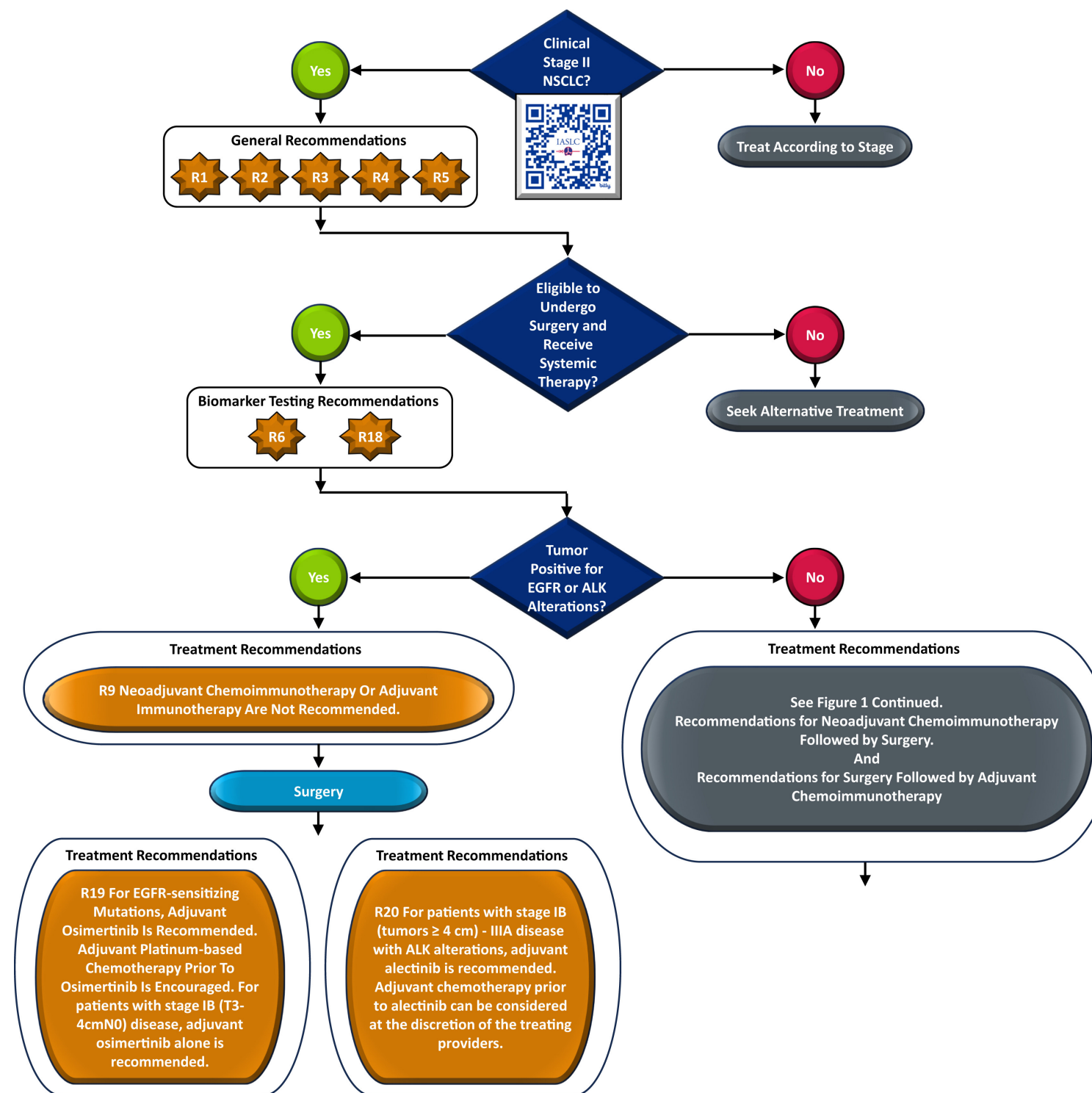


Neoadjuvant and Adjuvant Treatments for Early Stage Resectable NSCLC: Consensus Recommendations From the International Association for the Study of Lung Cancer

Jonathan D. Spicer, MD, PhD,^a Tina Cascone, MD, PhD,^b Murry W. Wynes, PhD,^c Myung-Ju Ahn, MD, PhD,^d Sanja Dacic, MD, PhD,^e Enriqueta Felip, MD, PhD,^f Patrick M. Forde, MD, PhD,^g Kristin A. Higgins, MD,^h Mark G. Kris, MD,ⁱ Tetsuya Mitsudomi, MD, PhD,^{j,k} Mariano Provencio, MD, PhD,^l Suresh Senan, MD, PhD,^m Benjamin J. Solomon, M.B.B.S., PhD,ⁿ Ming Sound Tsao, MD,^o Masahiro Tsuboi, MD,^p Heather A. Wakelee, MD,^q Yi-Long Wu, MD,^r James Chih-Hsin Yang, MD, PhD,^s Caicun Zhou, MD, PhD,^t David H. Harpole, MD,^u Karen L. Kelly, MD^{c,*}

Journal of Thoracic Oncology Vol. ■ No. ■

Sous presse !



Ruptures technologiques (en chirurgie thoracique)

Exemple de la Thermo-ablation par voie endobronchique « Traiter au cœur sans retirer »



2° congrès International Hong Kong 24-27 octobre 2023

> 300 interventions au monde



Sécurisation (diminution des complications)

Moins Invasif

- Adhésion du patient
- SANS cicatrice

Robotique (meilleure accessibilité)

Coûts ++

Chirurgiens thoraciques et pneumologues

Thermo ablation par voie endobronchique



32nd ESTS MEETING

26 - 28 MAY 2024 • BARCELONA, SPAIN

“Barcelona 2024 - ESTS, more than a Society!”



Seule série française
 100 % de succès
 100% de contrôle local à 1 an
 1% de pneumothorax



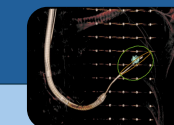
LUNG METASTATIC DISEASE TREATED BY MICROWAVE BRONCHOSCOPIC ABLATION: INNOVATIVE APPROACH: REPORT OF THE FRENCH INITIAL EXPERIENCE

Institut du thorax
 Curie - Montsouris



A. SEGUIN-GIVELET ^{1,2}, A. MEKKAR ¹, L. PERROT ³, A. MARIOLO ¹, G. BODDAERT ¹, E. KOVAKS ¹, C. LAFOUASSE ¹, D. GOSSOT ¹, K. LAU ⁴

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 4- Department of Thoracic Surgery, Barts Thorax Centre, St Bartholomew's Hospital, Barts Health NHS Trust, London, UK



OBJECTIVE

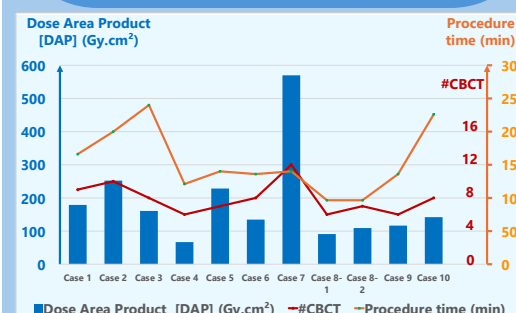
Transbronchial microwave ablation (TMWA) is an alternative treatment modality for malignant lung metastatic disease less than 2 cm. As recently showed in NAVABLATE study, no mortality was reported, and complications was less frequent (13,3%) than percutaneous approach. Based on these results we developed the first TMWA program in France and we present here the early morbi-mortality of our initial experience.

METHODS

From December 2022 to April 2024, patients ≥ 18 years of age with a metastatic pulmonary nodule, ≤ 20 mm in diameter were proposed for TMWA in case of contraindicated SBRT or surgery (to spare parenchyma) or even declined surgery. Ablations were done under general anesthesia in a hybrid theater with Cone Beam Computed Tomography (CBCT) using Allia (General Electric). Navigation to the target was conducted using Illumisite system and ablations using the Emprint ablation catheter kit (Medtronic). Post-ablation CT scans were arranged at first month, 3rd month, 6th month, 9th month and 12th month.

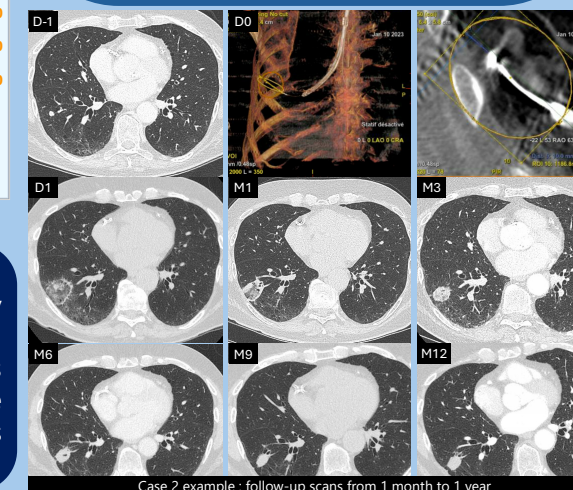
RESULTS

11 lung nodules from 10 patients were treated. Median nodule size was 9 mm (range 8 to 19 mm). Median procedure time was 140 min (range 97 to 240 min). Median radiation exposure and cone Beam CT number were respectively 142 Gy/cm² and 8 CBCT. Procedure-day technical success was 100%/ Mean minimal ablation margins was 9 mm. Hospital stay was 1 day for all patients. No mortality was reported. Complications occurred in two patients: cross country pleural effraction and PNO during navigation with spontaneous resolution (Case 1) but requiring chest tube (Case 8). This patient was readmitted at D8 for a new PNO requiring prolonged redo drainage. No hemoptysis nor pain nor pleural effusion were reported. One year imaging showed 100% technique efficacy with none of the nodules having evidence of progression.



CONCLUSIONS

Bronchoscopic lung thermal ablation is an innovative approach and minimally invasive local therapy for lung malignancies proven safe and feasible. This novel technique may represent a future treatment modality for lung metastases but also for early stage lung cancers.



Case 2 example : follow-up scans from 1 month to 1 year



Navigation robot assistée

Robotic Assisted-Bronchoscopy With Cone-Beam CT ICG Dye Marking for Lung Nodule Localization: Experience Beyond USA

Joyce W. Y. Chan, Aliss T. C. Chang, Peter S. Y. Yu, Rainbow W. H. Lau and Calvin S. H. Ng*

Division of Cardiothoracic Surgery, Department of Surgery, Prince of Wales Hospital, The Chinese University of Hong Kong, Hong Kong, China

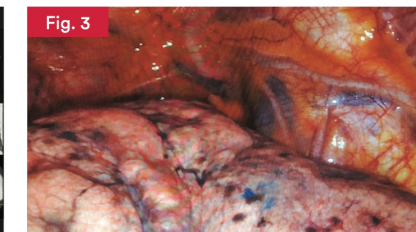
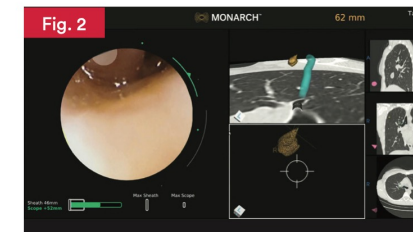
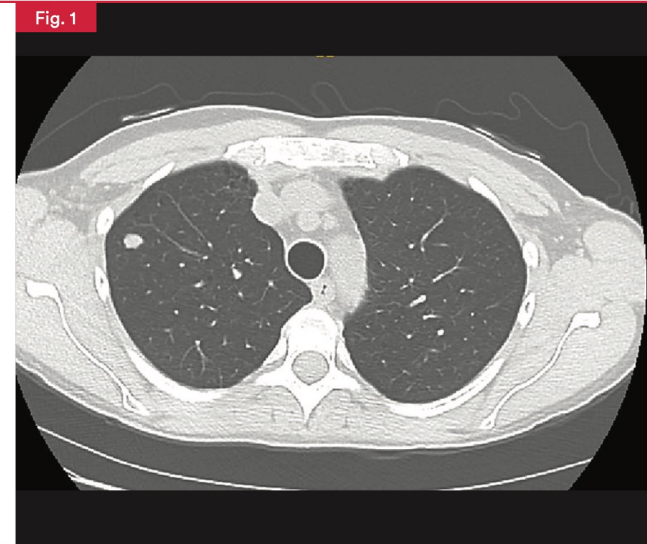


Frontiers in Surgery

MONARCH™
BRONCHOSCOPY CASE STUDY

DR. GUSTAVO CUMBO-NACHELI – SPECTRUM
HEALTH, MICHIGAN

Peripheral Nodule
Dye-Marking with the
MONARCH™ Platform

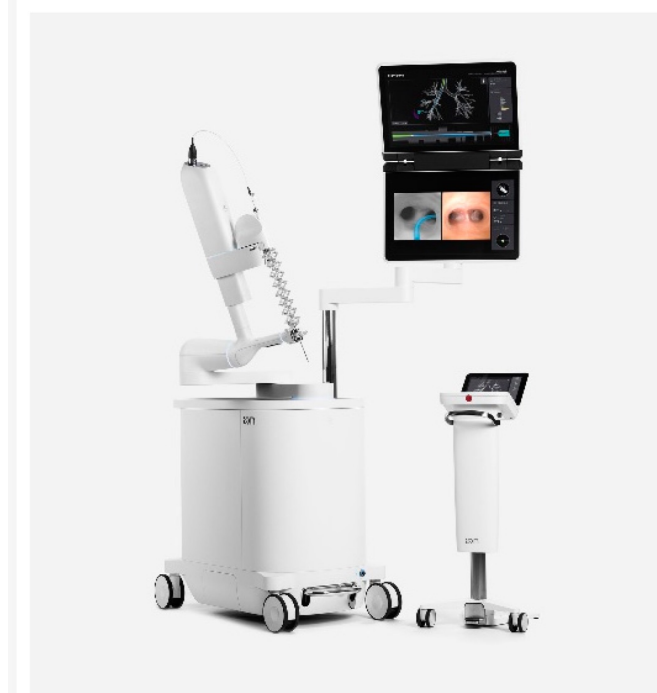


Nodule Characteristics

Lobar Location
Right upper lobe,
apical segment

Nodule Size
10 mm

Figure 2. Ion™ Endoluminal System by Intuitive Surgical.



Enjeux de prédiction (en chirurgie thoracique)

L'Intelligence Artificielle en santé

Review

Artificial Intelligence in Lung Cancer Screening: The Future Is Now

Michaela Cellina ¹ , Laura Maria Cacioppa ^{2,3}, Maurizio Cè ⁴ , Vittoria Chiarpenello ⁴, Marco Costa ⁴, Zakaria Vincenzo ⁴, Daniele Pais ⁴, Maria Vittoria Bausano ⁴, Nicolò Rossini ², Alessandra Bruno ² and Chiara Floridi ^{2,3,5,*}

Cancers 2023, 15, 4344. <https://doi.org/10.3390/cancers15174344>



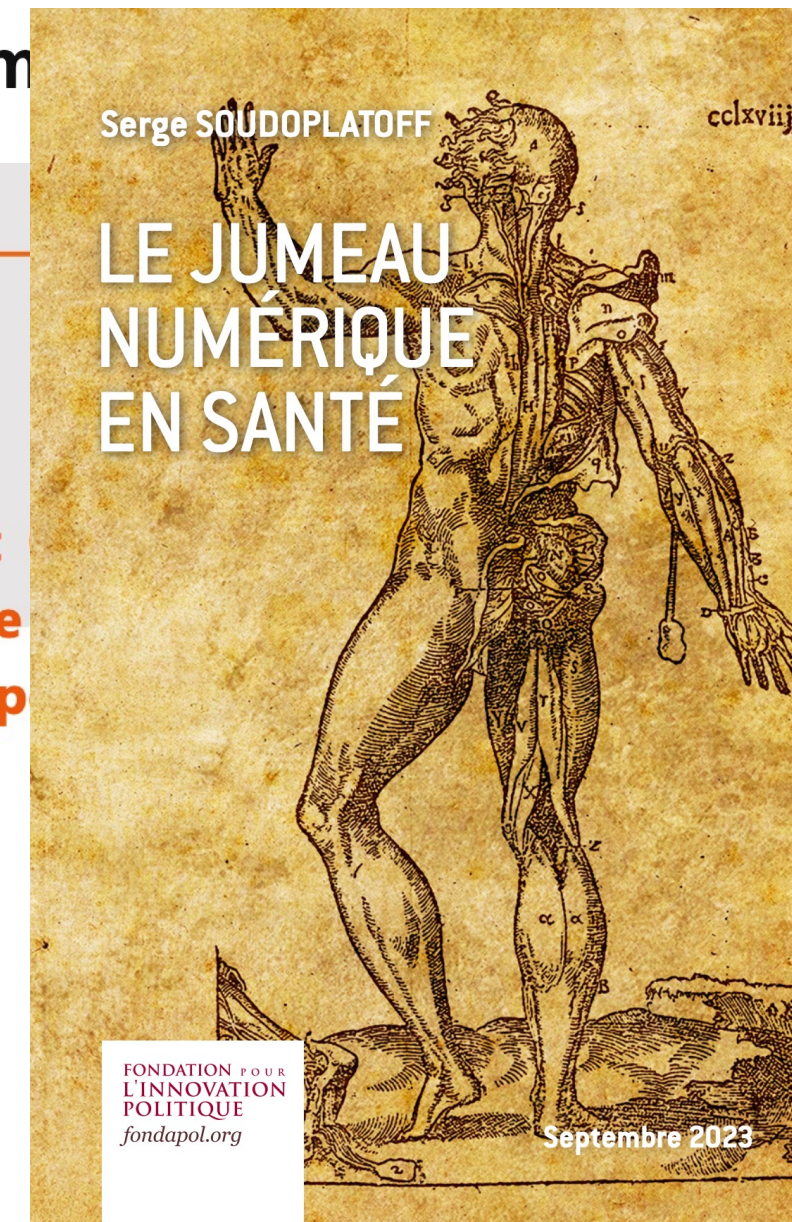
Développement de jumeaux numériques

 E-SANTÉ

Les jumeaux numériques



Unicancer et simulateur de le cancer du p



aires de santé



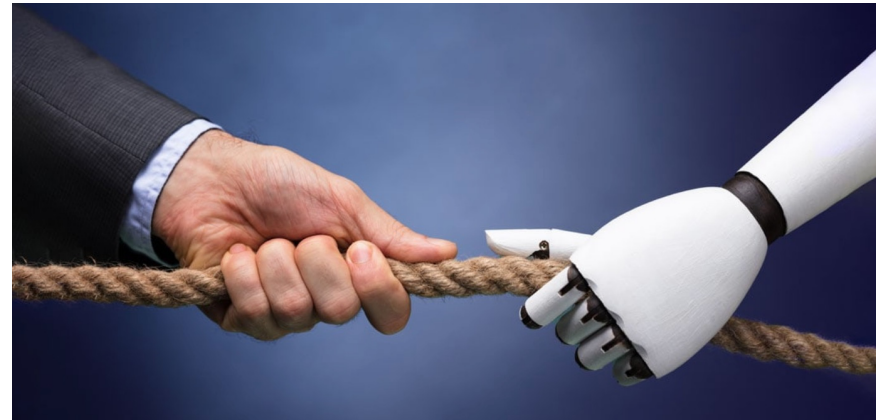
communiqué de presse

développer un équivalent dans

Enjeux HUMAINS pour le patient

RESSOURCES / REVUE-RH / VOLUME-26-NO-1

Le combat du siècle; technologie vs humanité



Relations +++



Chirurgie thoracique



Dr A Seguin-Givelet



Dr M Durand



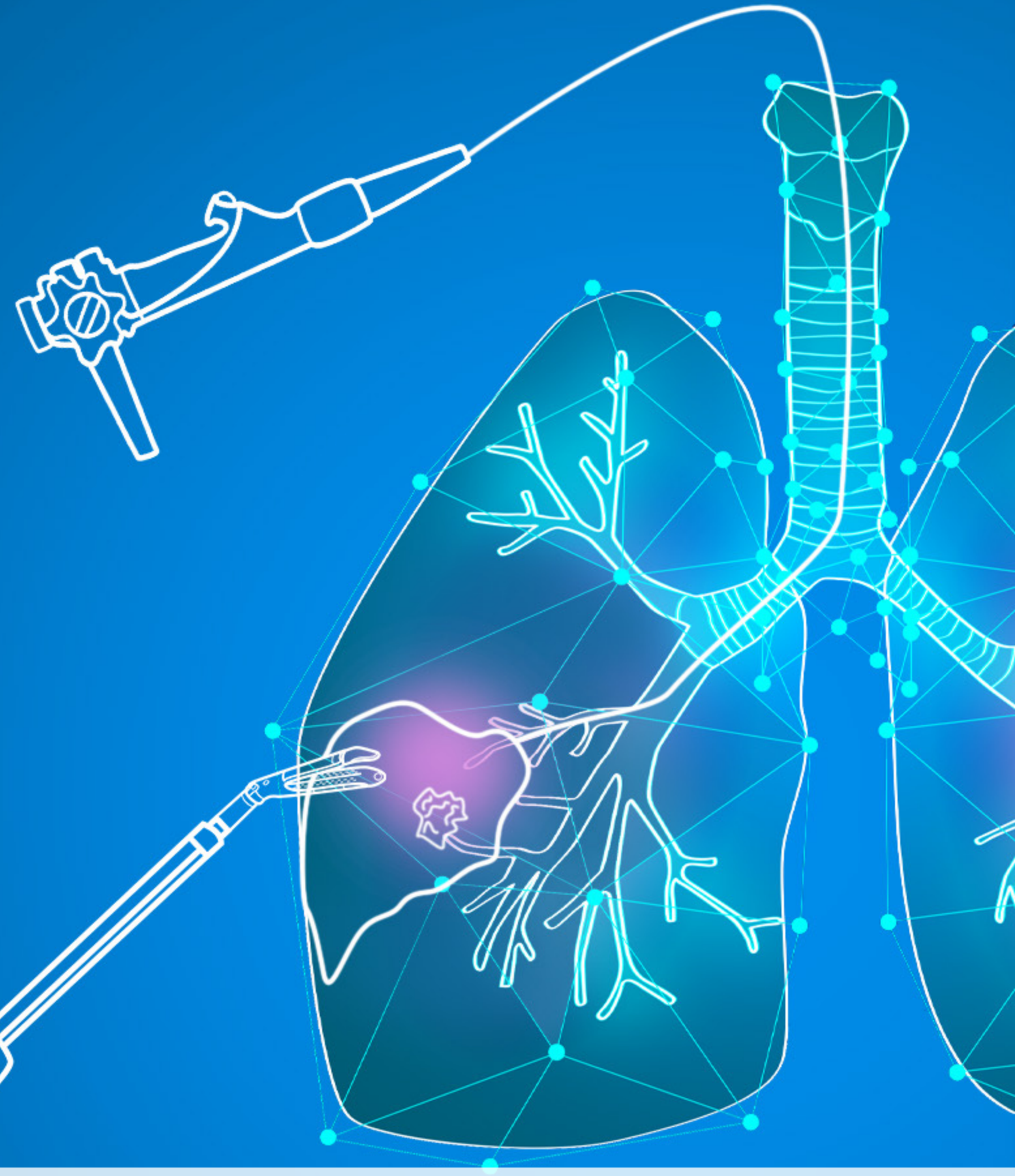
Dr M Pryschepau



Save the date

2025 International Sublobar Resections and Bronchoscopic Ablation Summit

January 9th & 10th, 2025
Paris, France



Further
information :

