

ADVANCES IN SURGICAL TECHNIQUES

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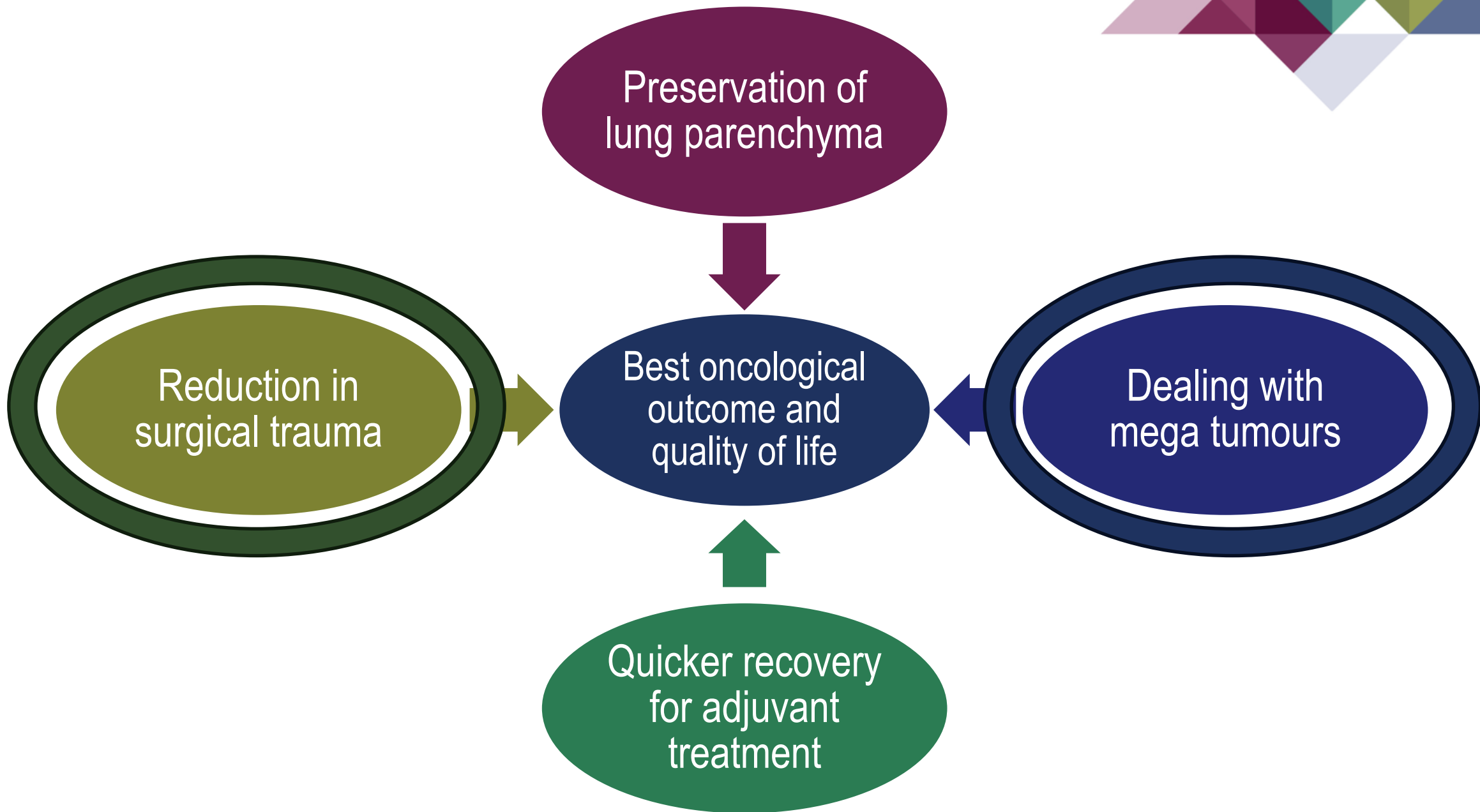
Department of Surgery

Prince of Wales Hospital



DECLARATION OF INTERESTS

- **Medtronic – research and consultancy**
- **Johnson and Johnson – research fund**
- **Noah - research fund**



REDUCTION IN SURGICAL TRAUMA

How minimally invasive can we go?

MINIMALLY INVASIVE LUNG CANCER SURGERY

Posterolateral
thoracotomy



3-Port

Video-Assisted Thoracoscopic
Surgery (VATS)



CHEST

Supplement

DIAGNOSIS AND MANAGEMENT OF LUNG CANCER, 3RD ED: ACCP GUIDELINES

**Treatment of Stage I and II Non-small Cell
Lung Cancer**

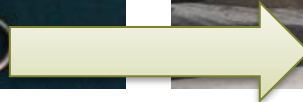
Diagnosis and Management of Lung Cancer,
3rd ed: American College of Chest Physicians
Evidence-Based Clinical Practice Guidelines

Lobectomy: Surgical Issues

3.2.1. For patients with clinical stage I NSCLC, a minimally invasive approach such as video-assisted thoracic surgery (thoracoscopy) is preferred over a thoracotomy for anatomic pulmonary resection and is suggested in experienced centers (Grade 2C).

- Sihoe ADL. Video-assisted thoracoscopic surgery as the gold standard for lung cancer surgery. *Respirology*. 2020; 25: 49–60.
- Howington JA, Blum MG, Chang AC, Balekian AA, Murthy SC. Treatment of stage I and II non-small cell lung cancer: diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest* 2013; 143(5 Suppl.): e278S–313S.

CHANGE IN INSTRUMENTS DESIGN



ADVANCED IN STAPLER TECHNOLOGY

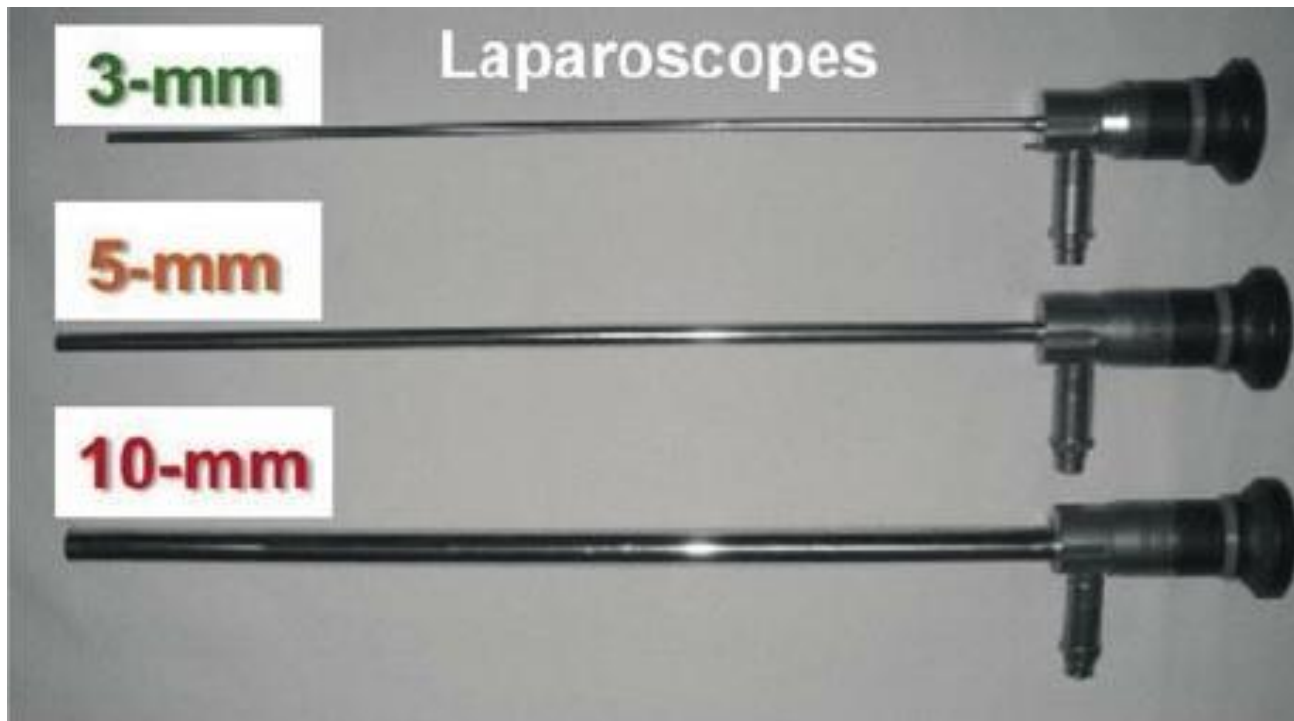
Allow excellent haemostasis in major pulmonary vessels by VATS

Reduced blood loss

Less conversion

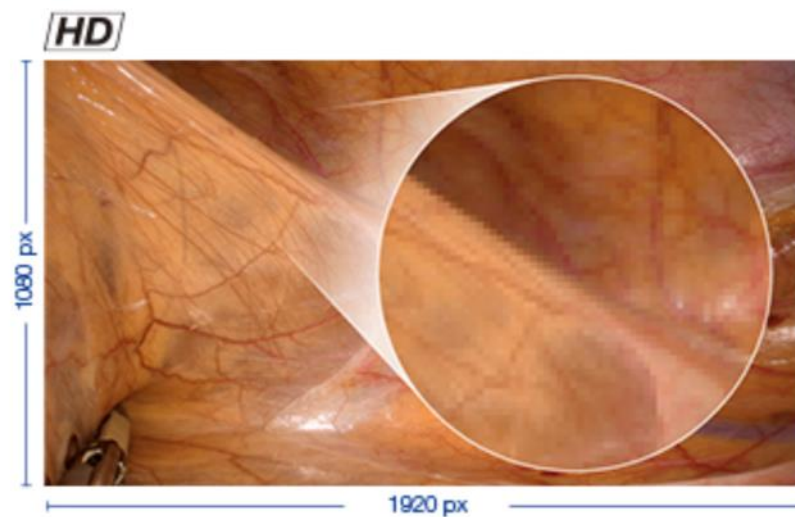
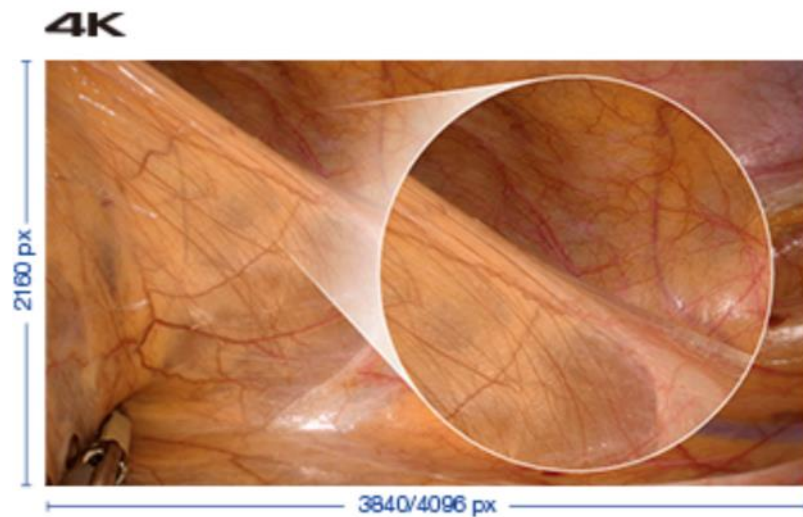


CHANGES IN ENDOSCOPES

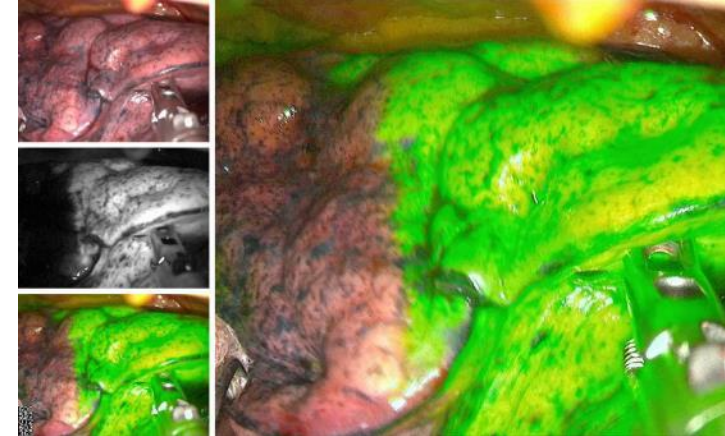


IMPROVEMENT IN VISUALIZATION

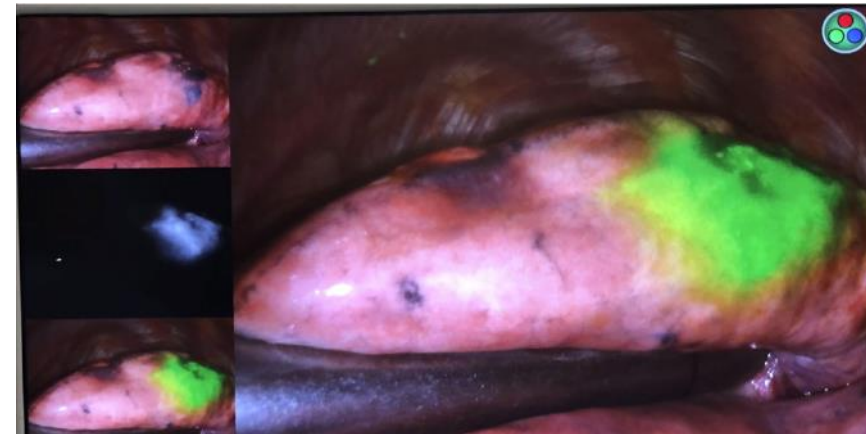
- Much clearer intra-operative visualization of anatomy
- Shorter operative time
- Less complication



ENHANCED / AUGMENTED VISUALIZATION



intra-op IV ICG for segmentectomy



LESS IS MORE?

Single port/ Uniportal thoracic surgery gained popularity in mid 2010s

PubMed®

single port VATS for lung cancer

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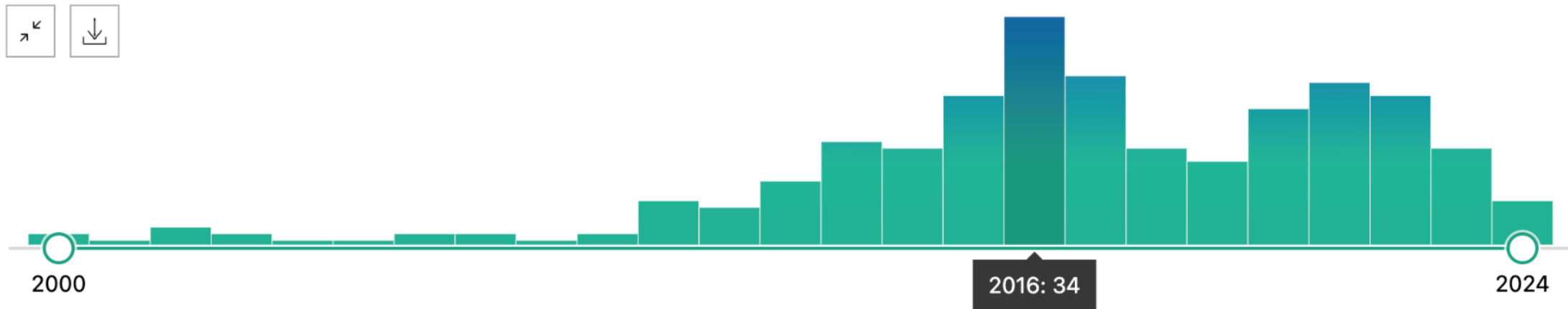
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RESULTS BY YEAR

219 results

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RATS IS MORE?



Robotic thoracic surgery for lung cancer



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RESULTS BY YEAR

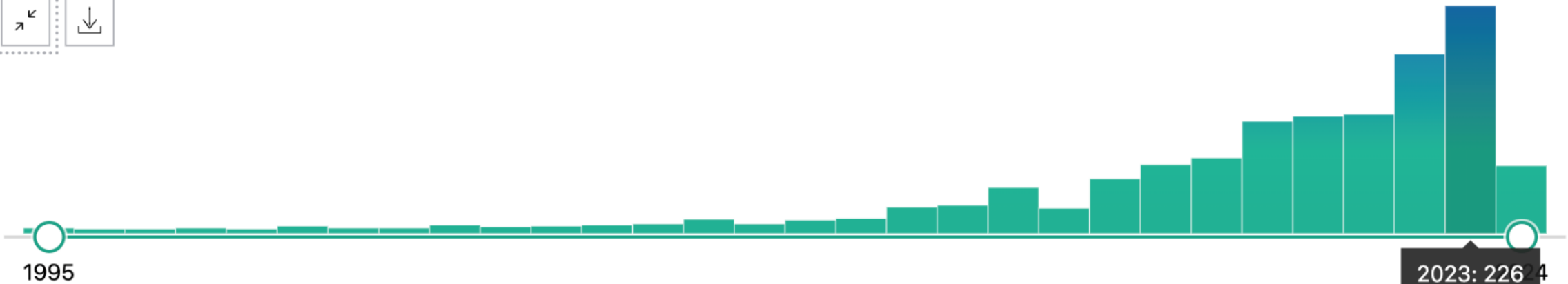
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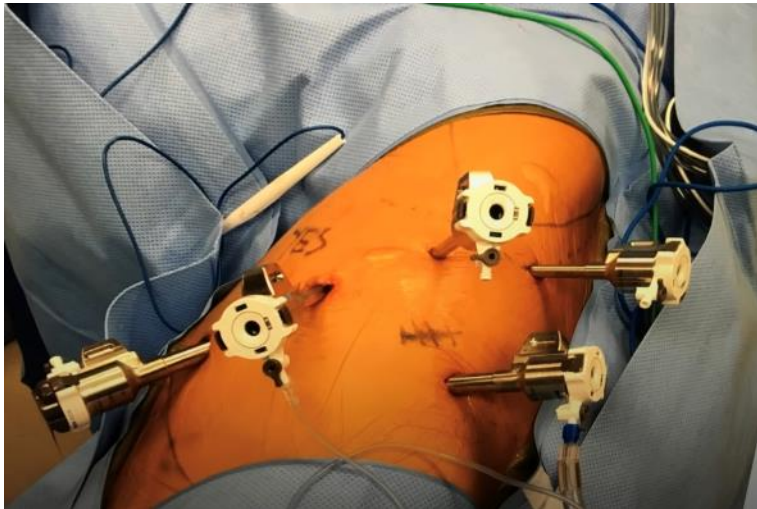


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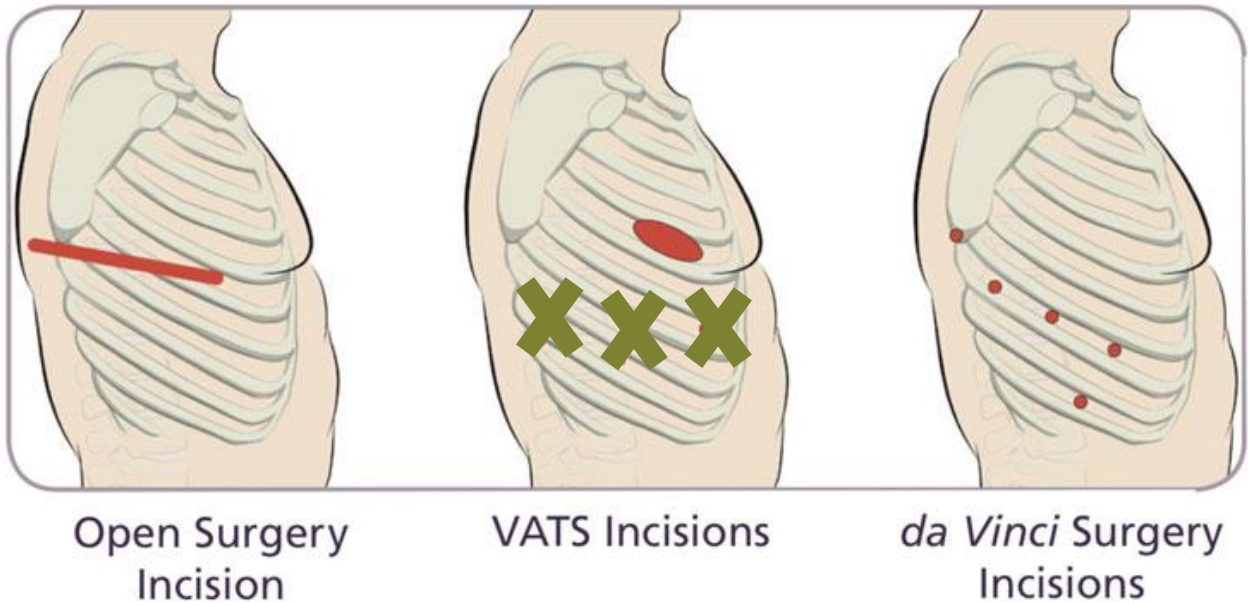




Herrera LJ. Robotic-Assisted Left Upper Lobectomy in Non-Small Cell Lung Cancer With N1 Disease. April 2018. doi:10.25373/ctsnet.6123011.

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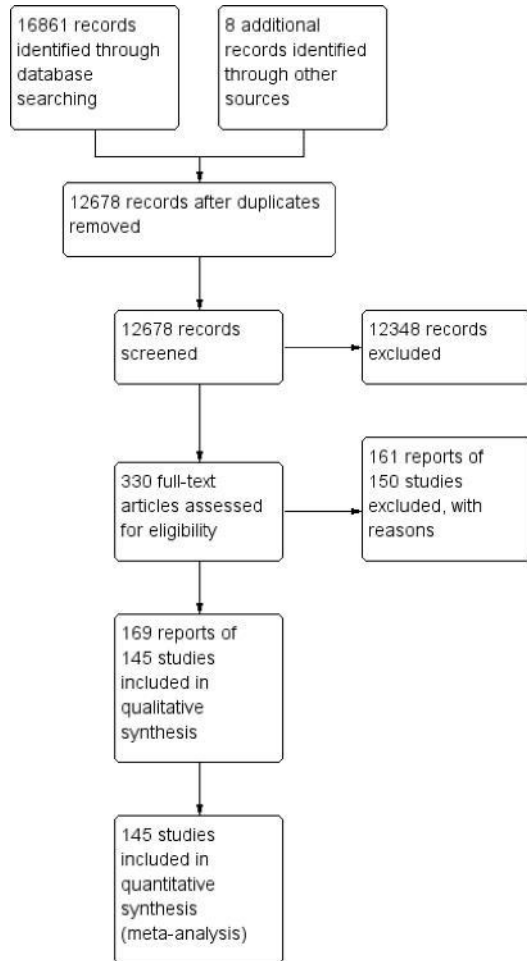




WHY ARE WE HAVING THIS REVERSE EVOLUTION?

- more precise, delicate and accurate in tissue management than VATS (?)

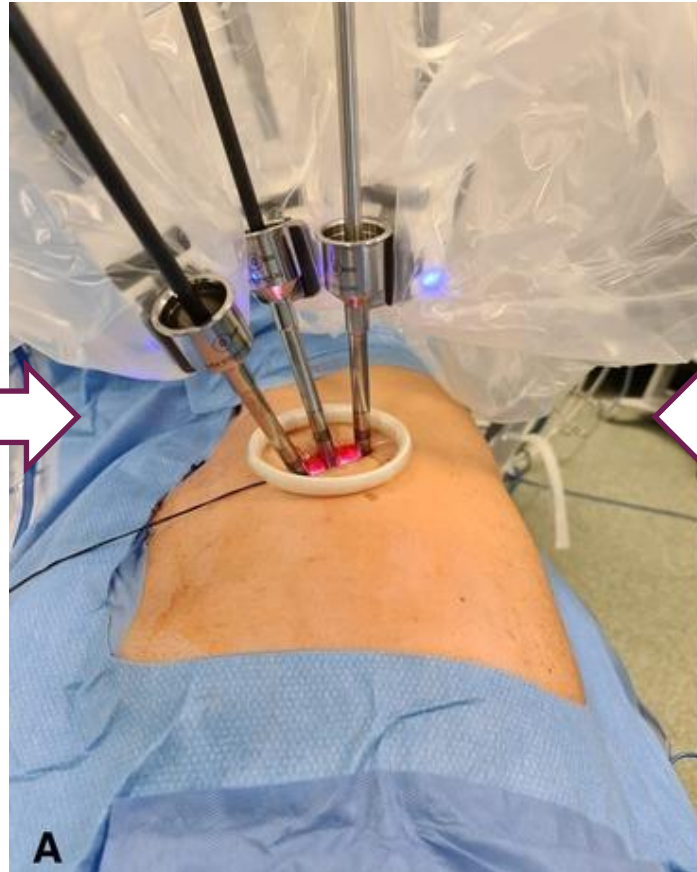
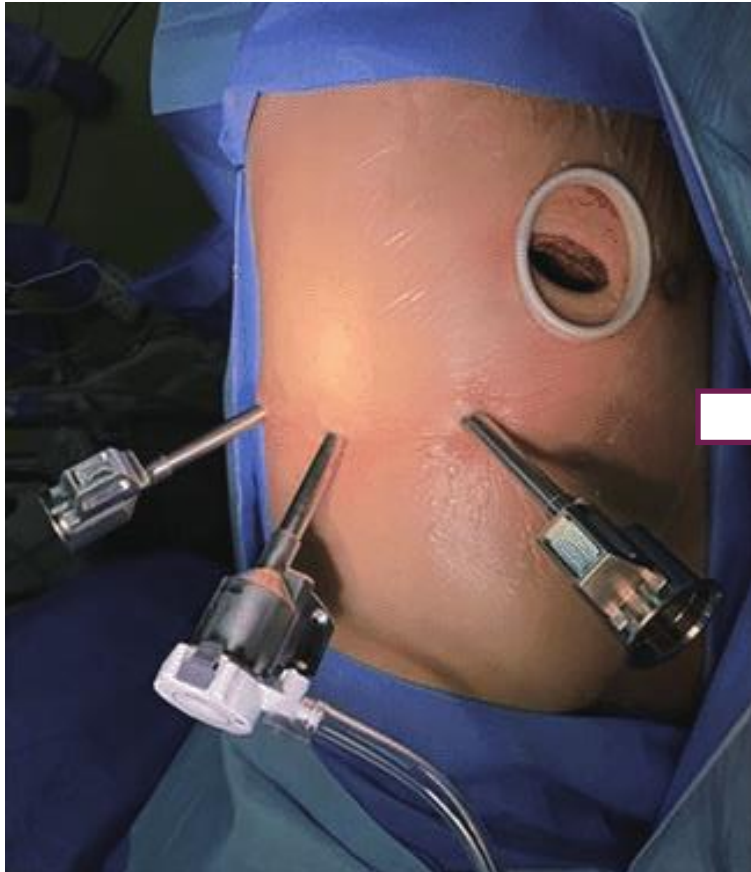
ADVANTAGE OF RATS OVER VATS ?



- Oncological outcomes (survival, recurrence, lymph node evaluation), safety (adverse events)
- Function (pain, quality of life, pulmonary function)
- Cost-effectiveness
- Different VATS approaches were similar for most outcomes, although uVATS may be associated with less pain and analgesic requirements (IIb).

Conclusions: This meta-analysis supports the role of VATS lobectomy for non-small cell lung cancer. Apart from potentially less pain and analgesic requirement with uVATS, different minimally invasive surgical approaches appear to have similar outcomes.

THE BEST OF BOTH WORLDS

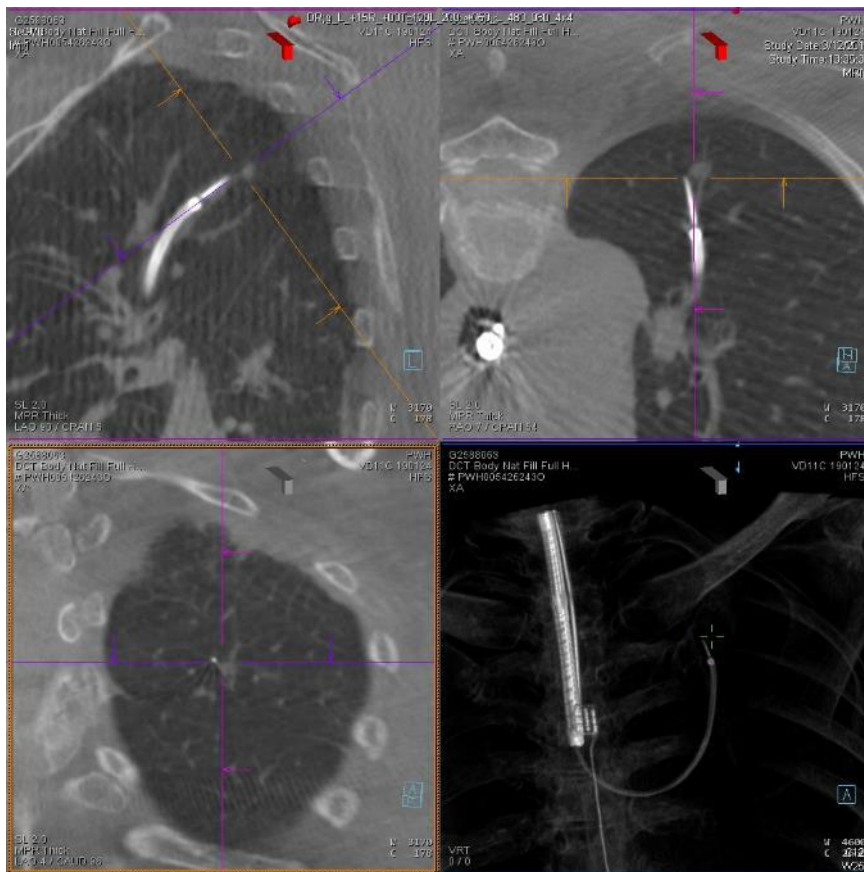


USE OF HYBRID OPERATING ROOM TO ASSIST LUNG RESECTION

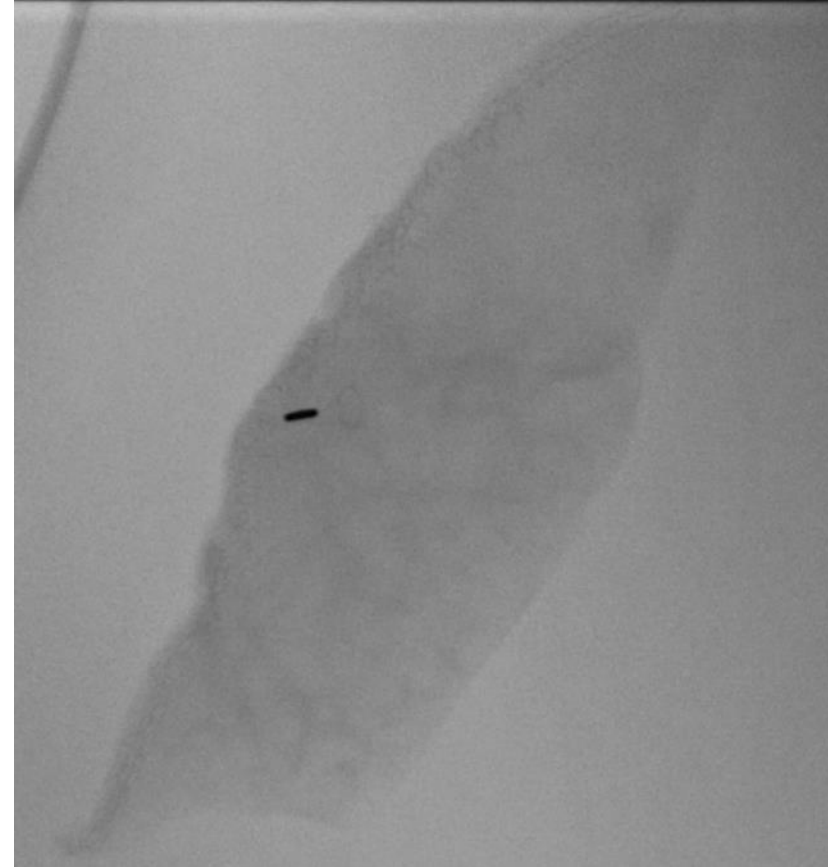
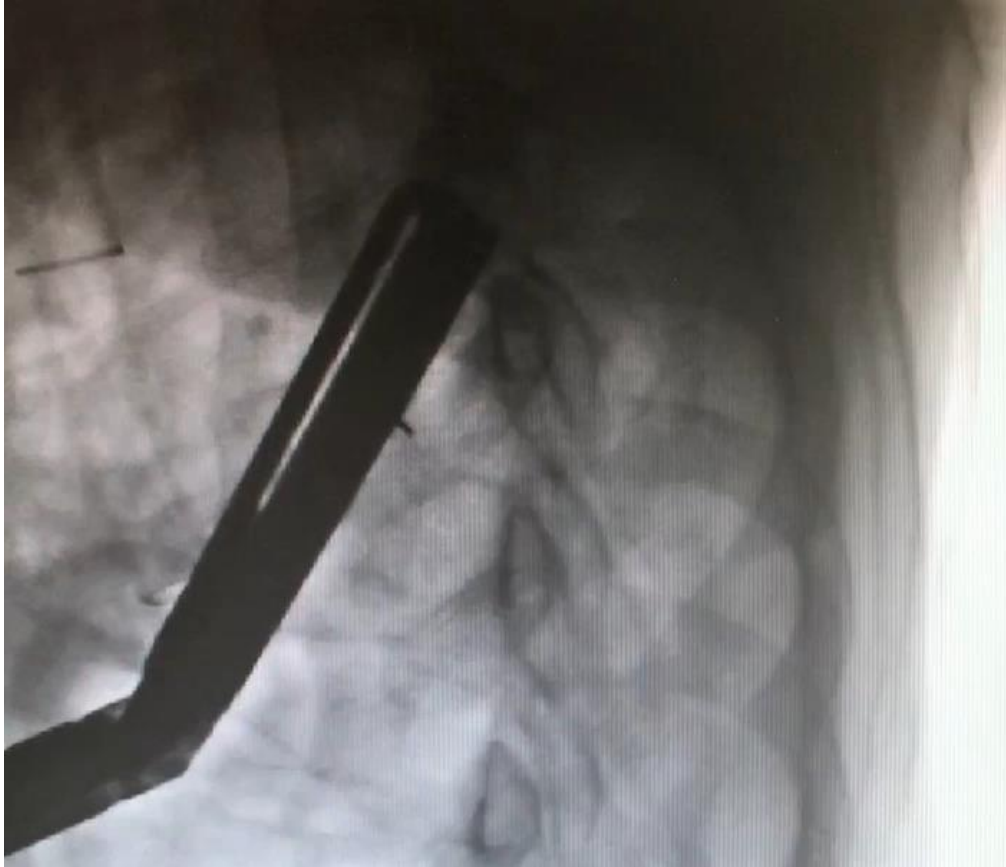


Zhao ZR, Li Z, Situ DR, Ng CS. Recent clinical innovations in thoracic surgery in Hong Kong. *J Thorac Dis.* 2016 Aug;8(Suppl 8):S618-26. doi: 10.21037/jtd.2016.03.93. PMID: 27651937; PMCID: PMC5009073.

MARKING FOR DEEP RESECTION MARGIN

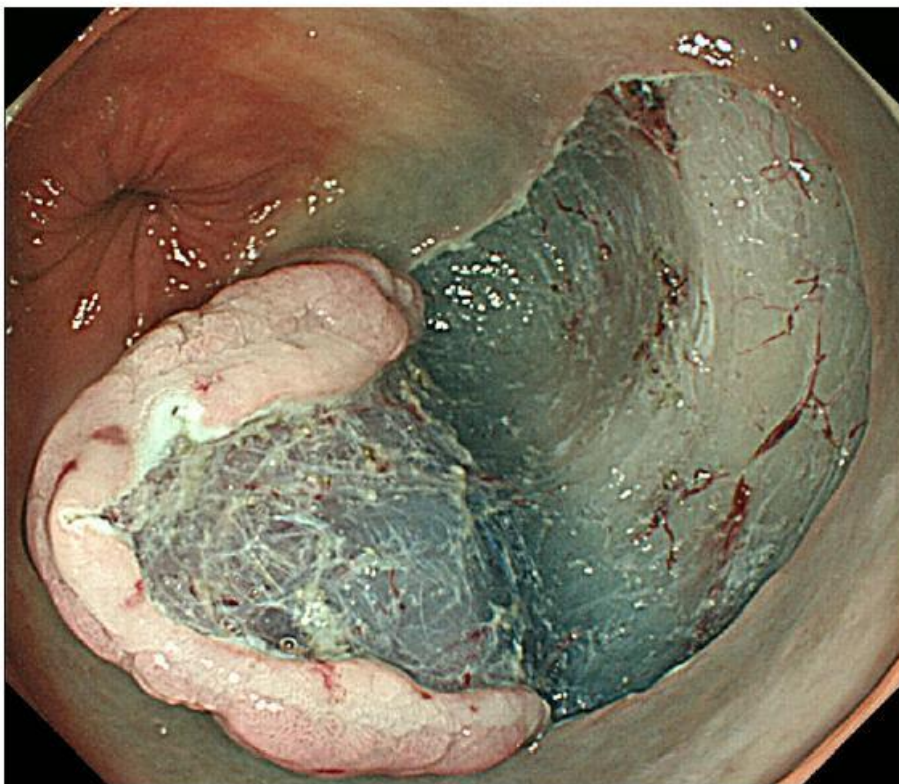


ON TABLE FLUOROSCOPIC GUIDANCE FOR RESECTION MARGIN

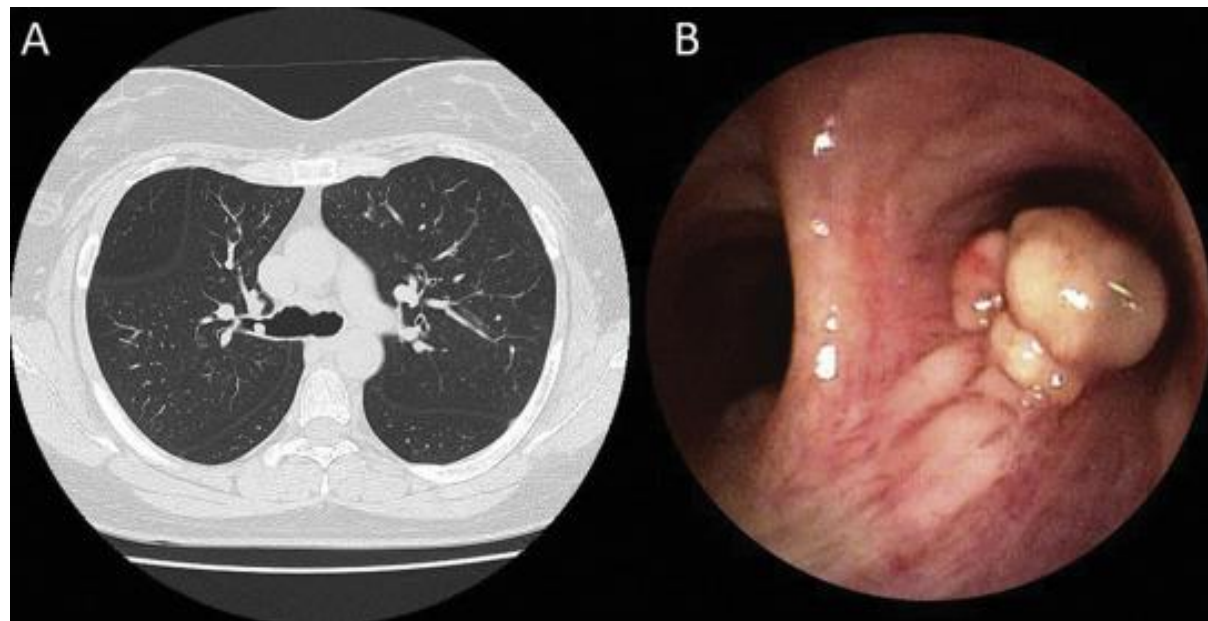


ANYTHING EVEN LESS INVASIVE?

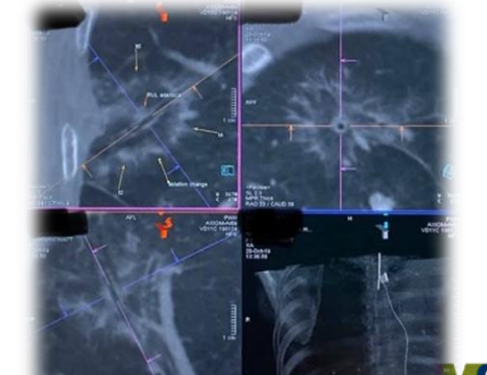
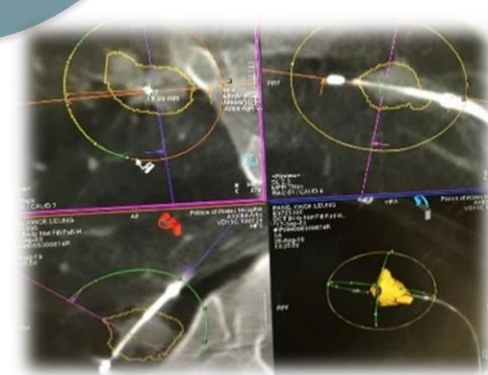
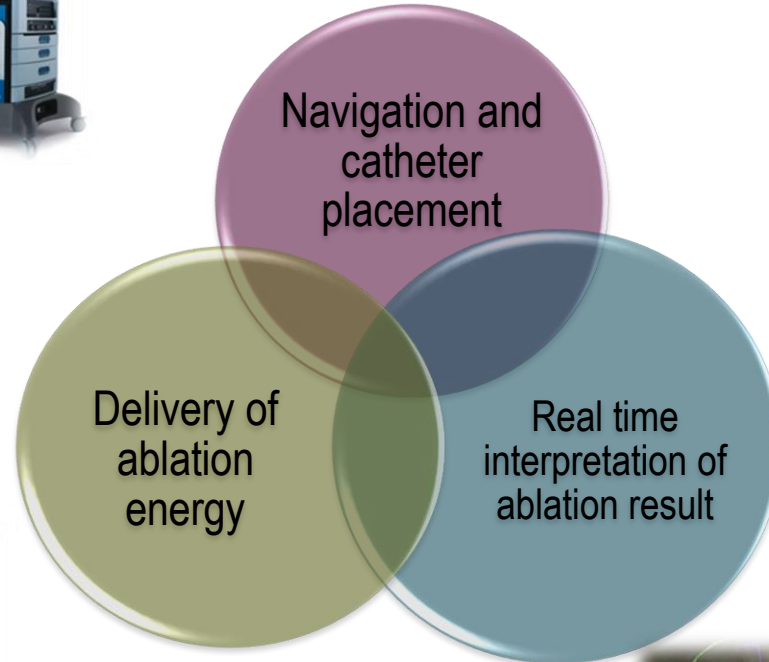
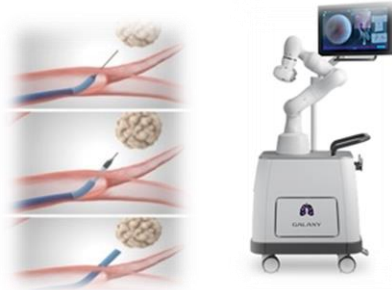
ENDOSCOPIC SURGERY



ESD is not something that we are looking for in lung cancer management



BRONCHOSCOPIC ABLATION ENABLED BY AMALGAMATION OF TECHNOLOGIES





Acquisition



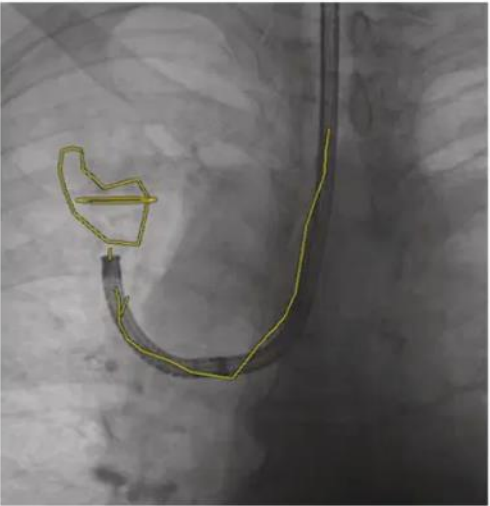
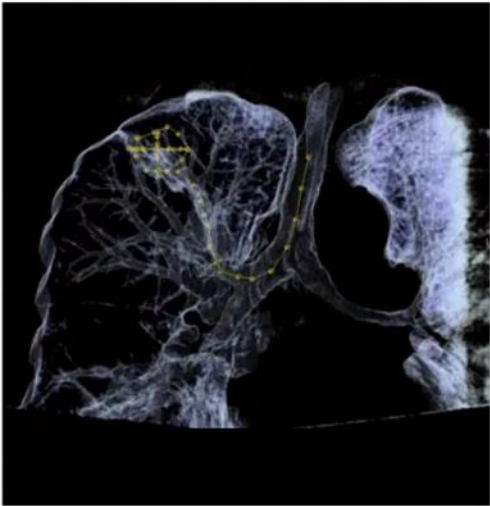
Planning



Guidance

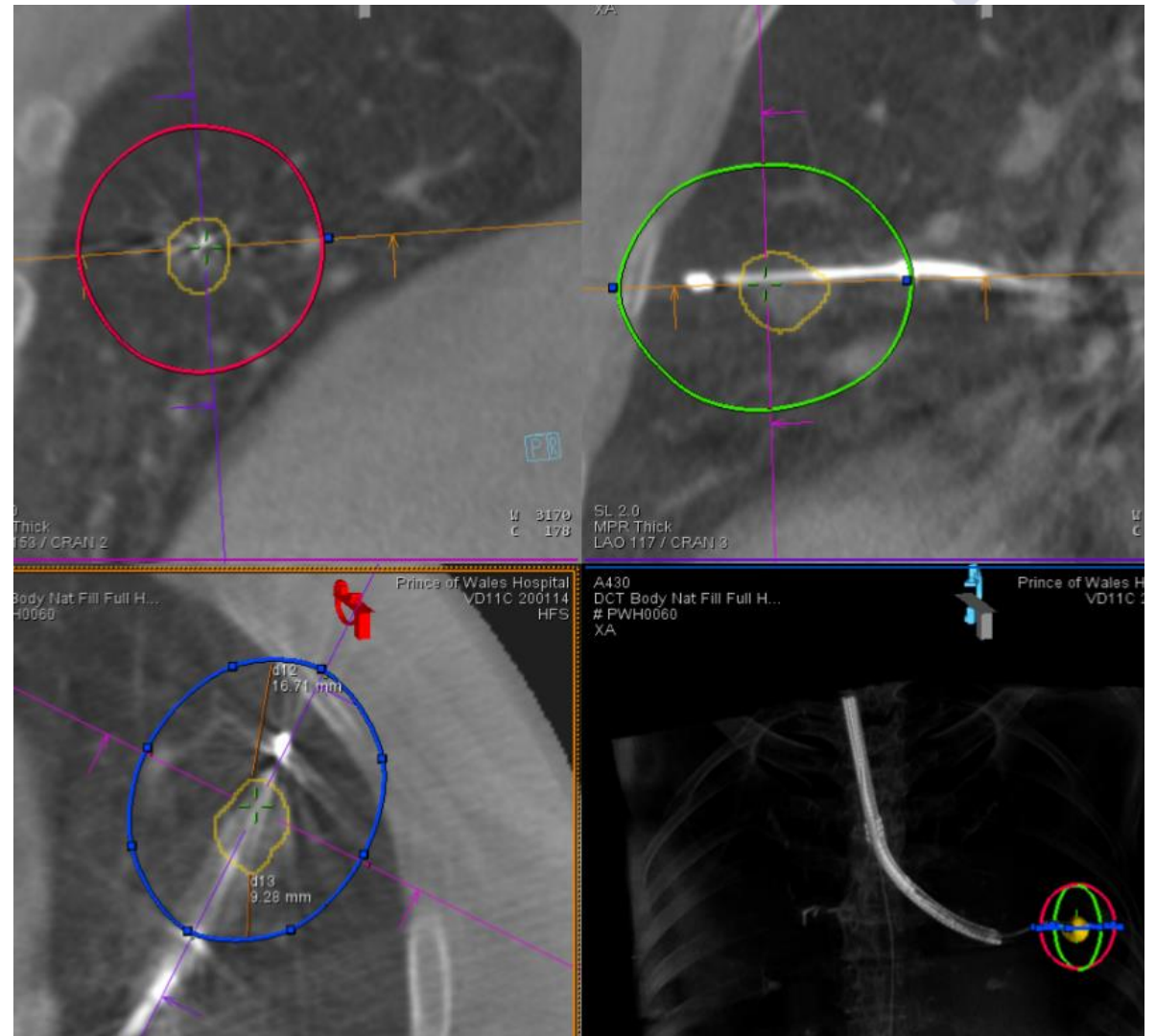


Biopsy/ablation

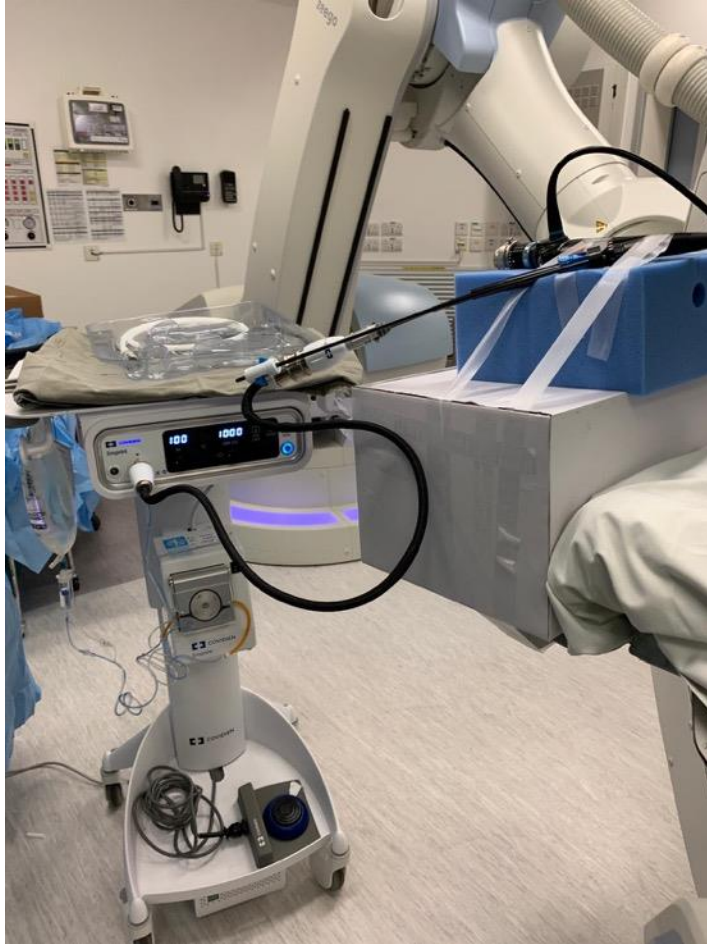


IDEAL CASE SCENARIO

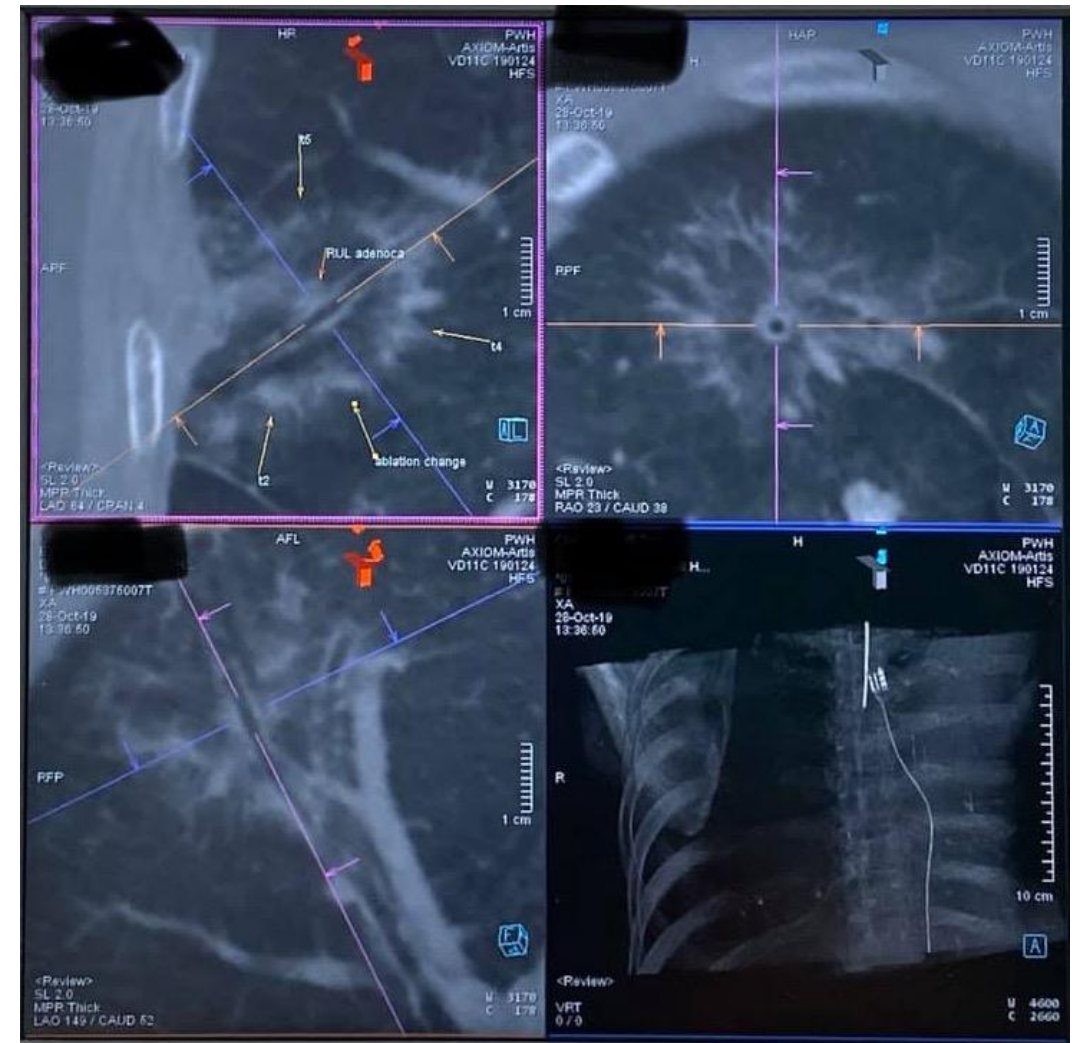
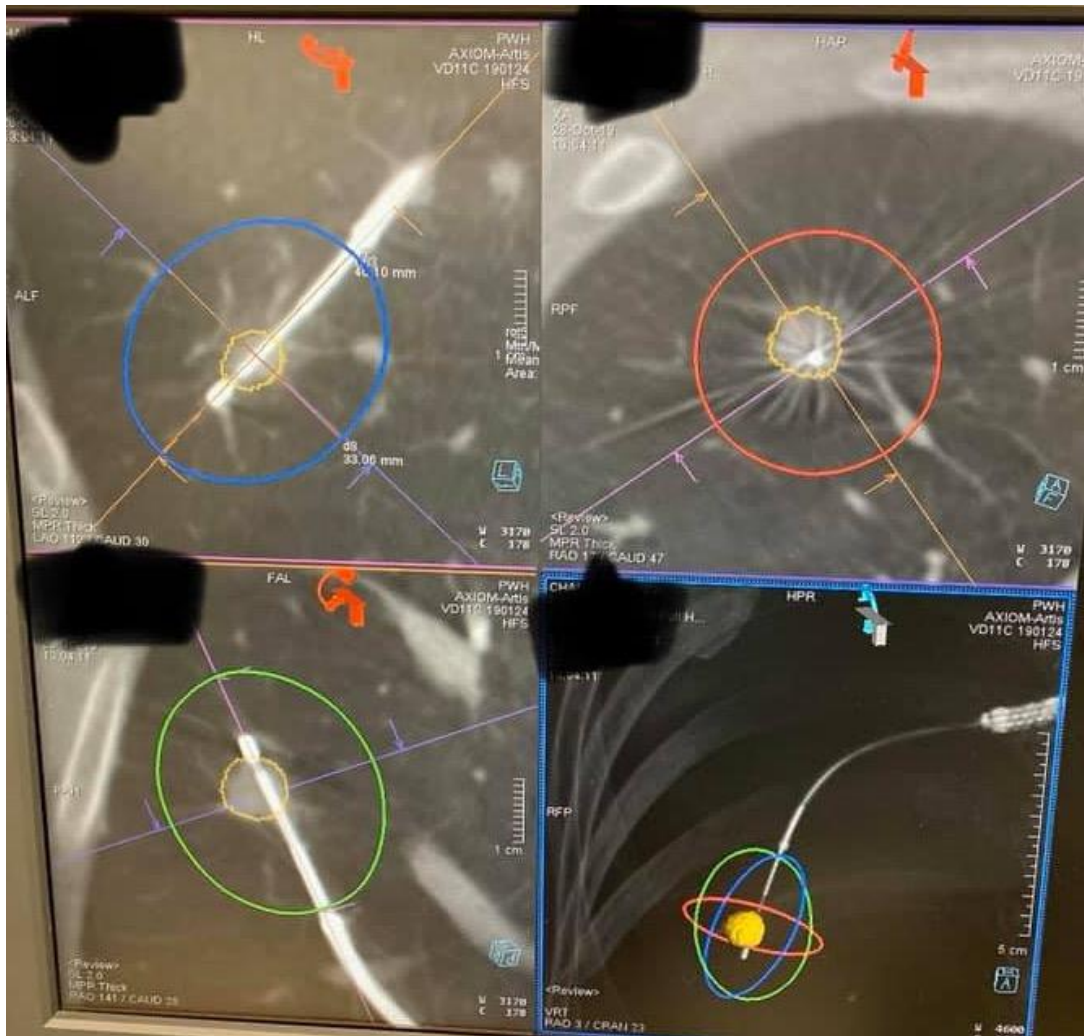
- Direct leading airway
(bronchus sign +ve)
- No near by major blood vessel
- Not too near to the pleura
- Small lesion <2cm and round

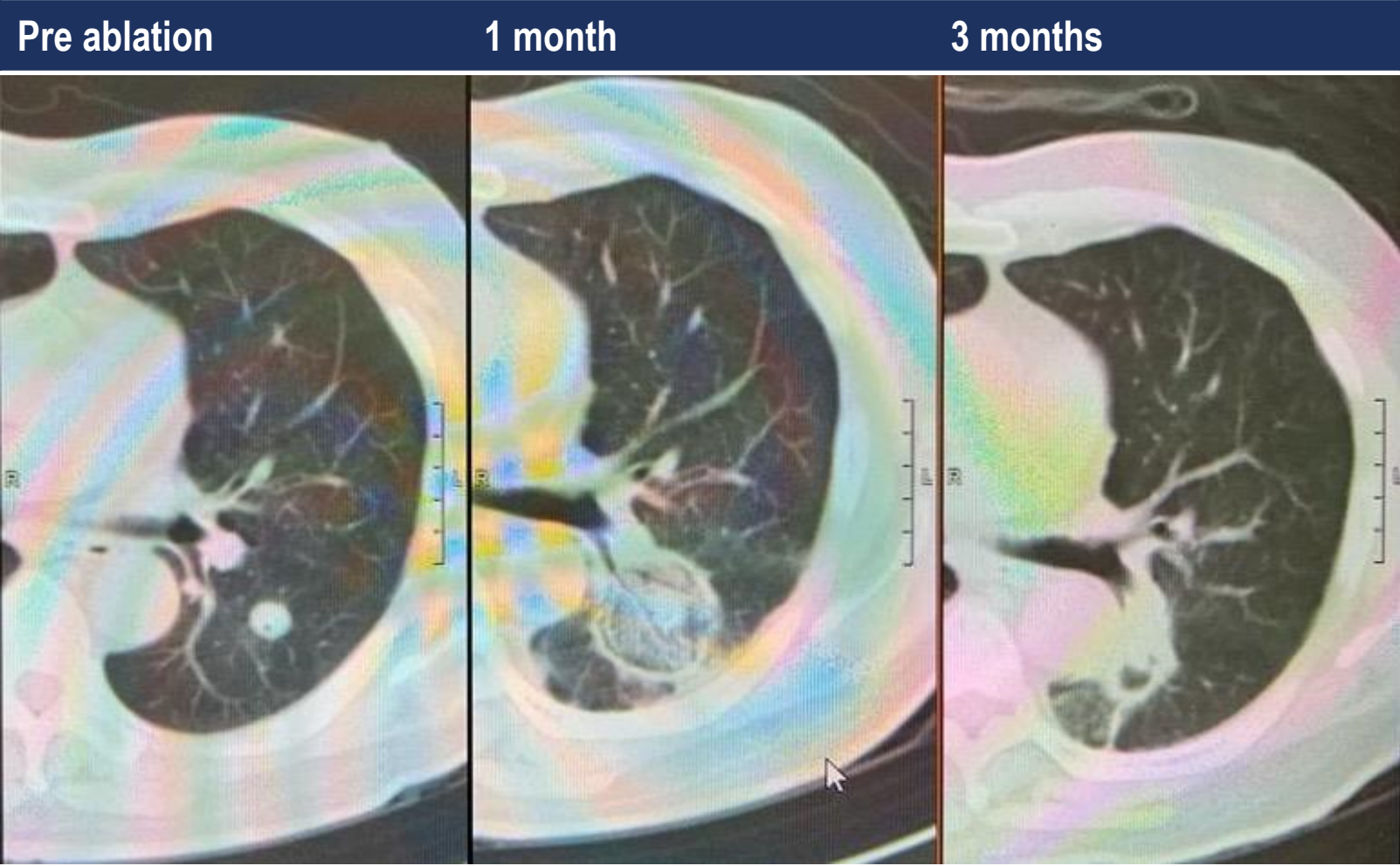


MICROWAVE ABLATION BY ENDOBRONCHIAL ROUTE



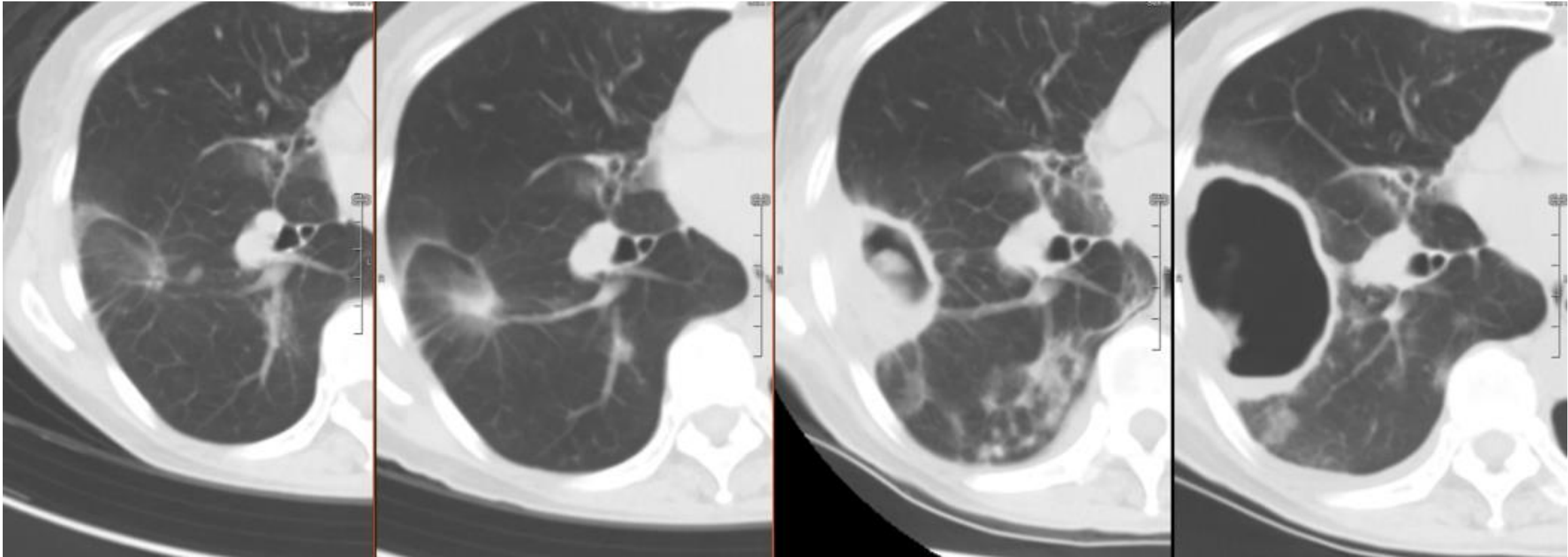
IDEAL ABLATION ZONE ON CT 10MIN AFTER ABLATION AT 100W X 10MIN







1 year 3 month 1 month 2 weeks



DEALING WITH MEGA TUMOURS

Chest wall reconstruction

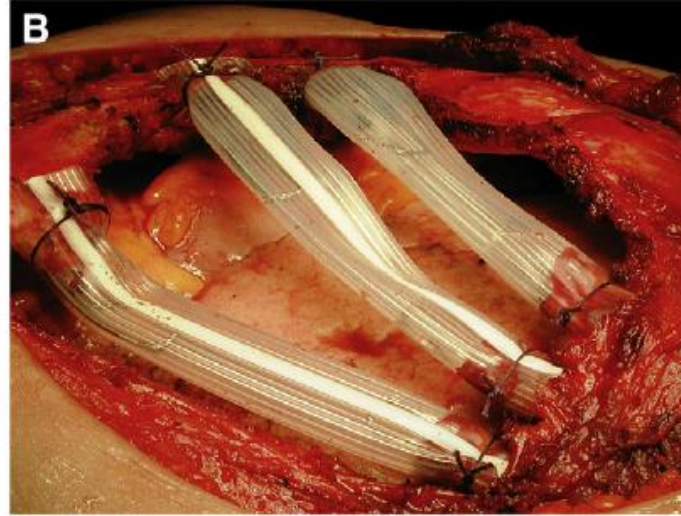
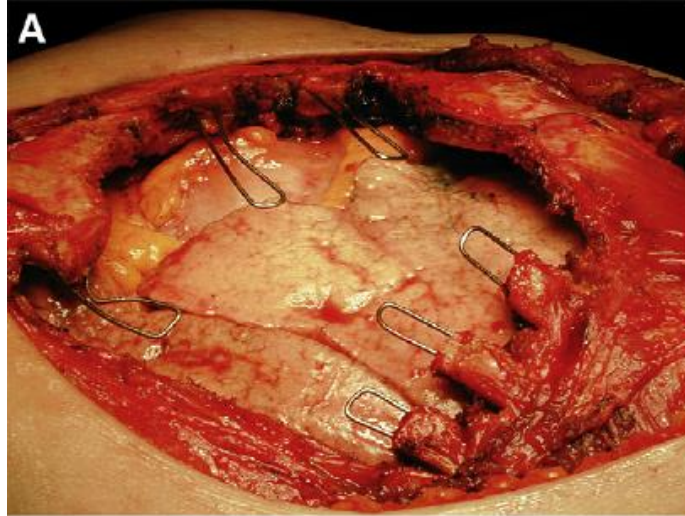
BIG TUMOUR, BIG RESECTION AND BIG DEFECT

Chest wall reconstruction required for quicker recovery
and restore better pulmonary function

METHYL METHACRYLATE (MM) “NEO-RIBS”

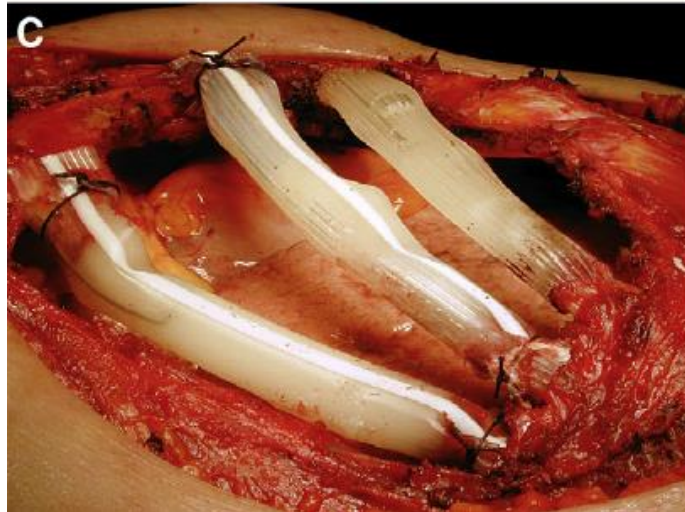


K-wires into rib ends



Silicon molds

MM injected , hardens



molds are split and removed

Allows some tissue in-growth and better fluid drainage

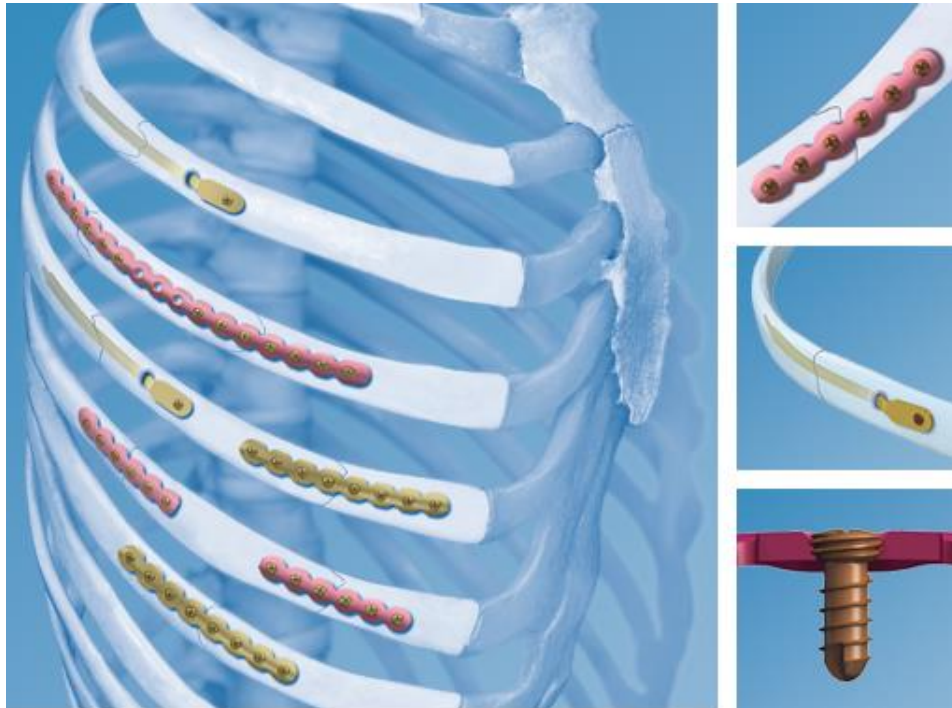
(Dahan et al)

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Pre-contoured Plate

- Plate secured by locking-screws via pre-drilled holes
- Initial indication: fixation of fractured ribs



NEO-PLEURA

Gortex® Neo-pleura

For large defects, several pieces can be rapidly joined by non-cutting stapler



NEO-PLEURA 2.0

PERMACOL SURGICAL IMPLANT

Porcine dermal collagen implant

Cells, cell debris, DNA and RNA are removed

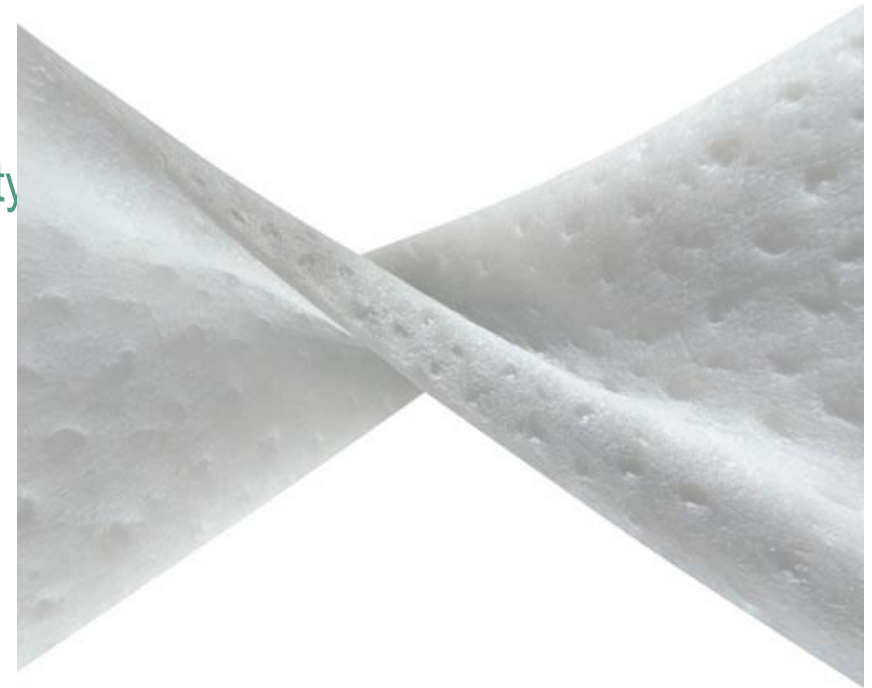
Preserved 3D collagen matrix is then cross-linked for enhanced durability

Partially absorbable

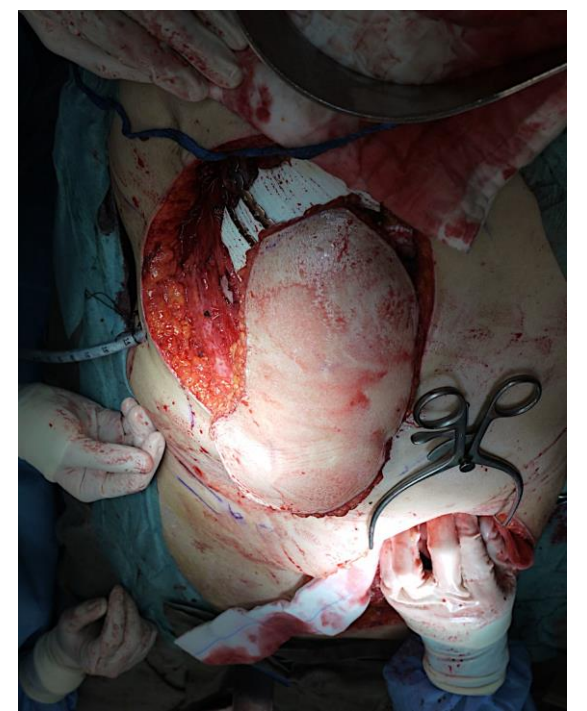
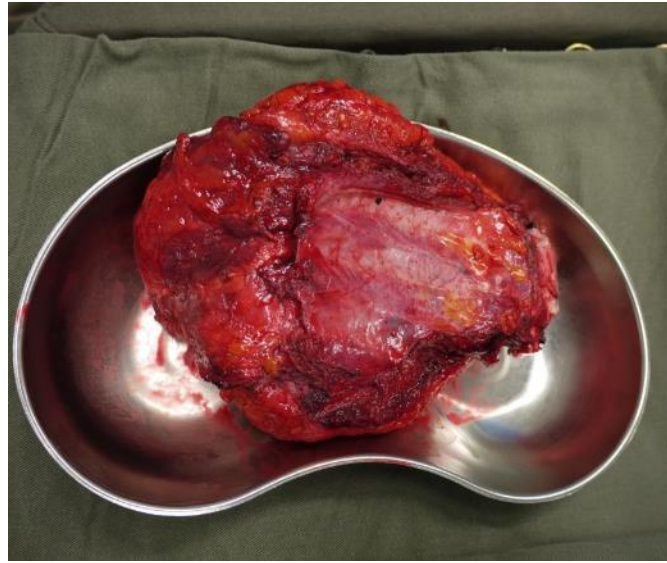
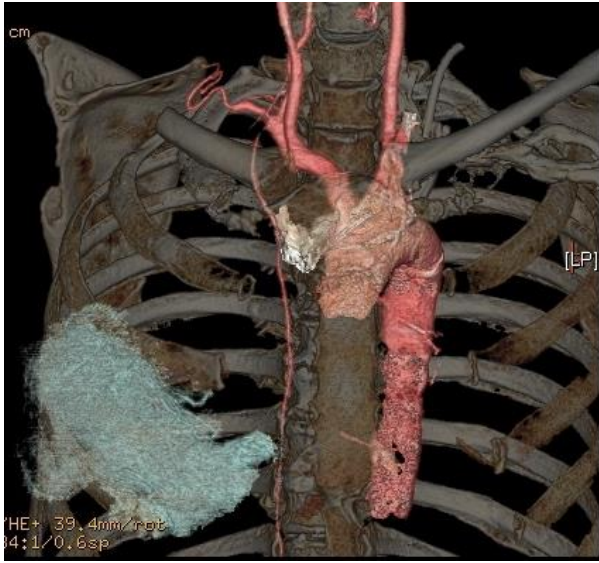
Initially designed for hernia repair

Size up to 28 cm x 40 cm

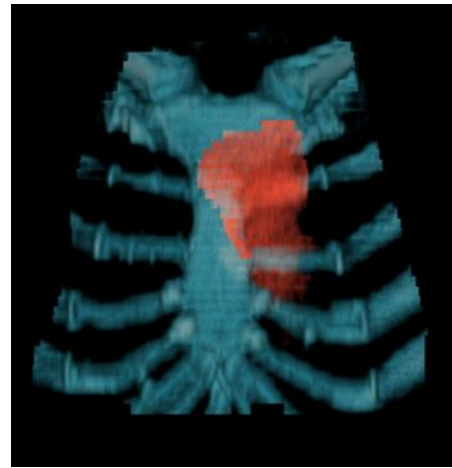
Two thickness 1mm or 1.5mm



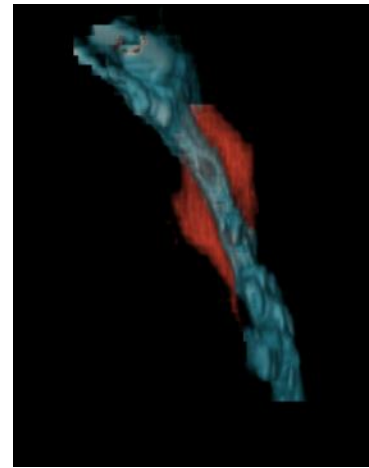




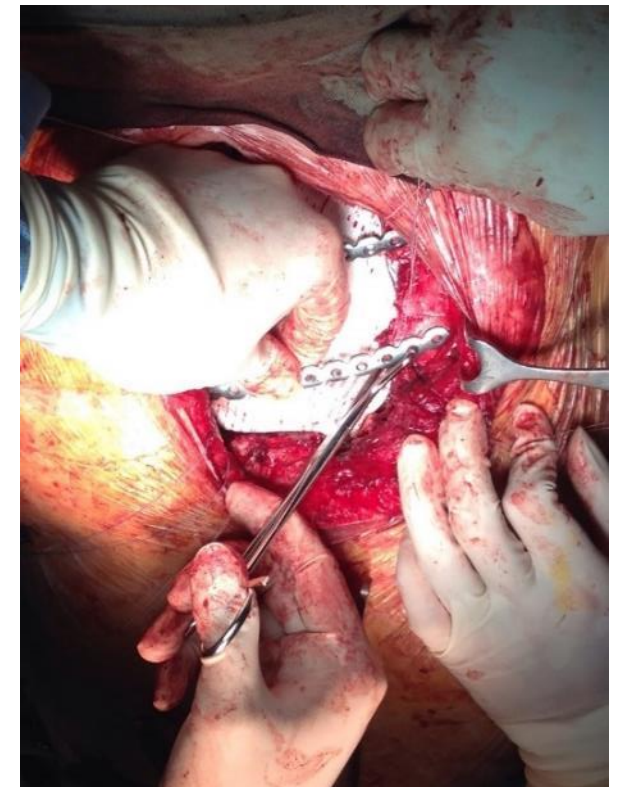
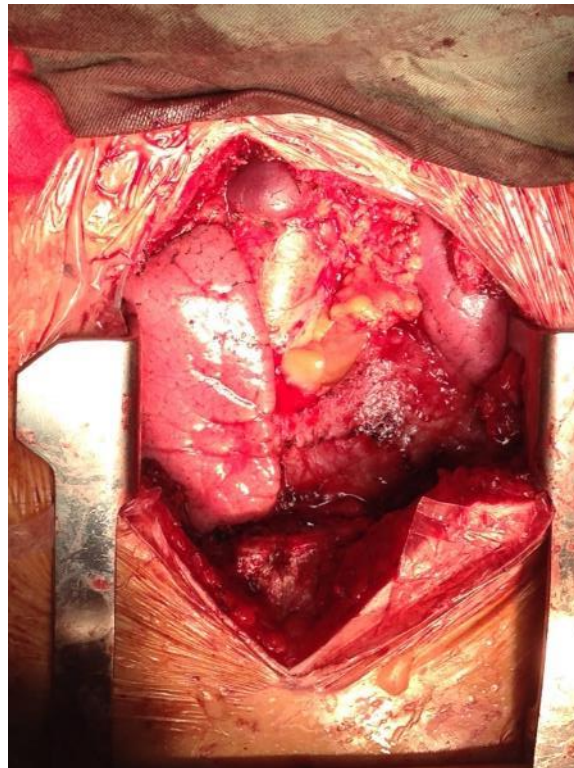
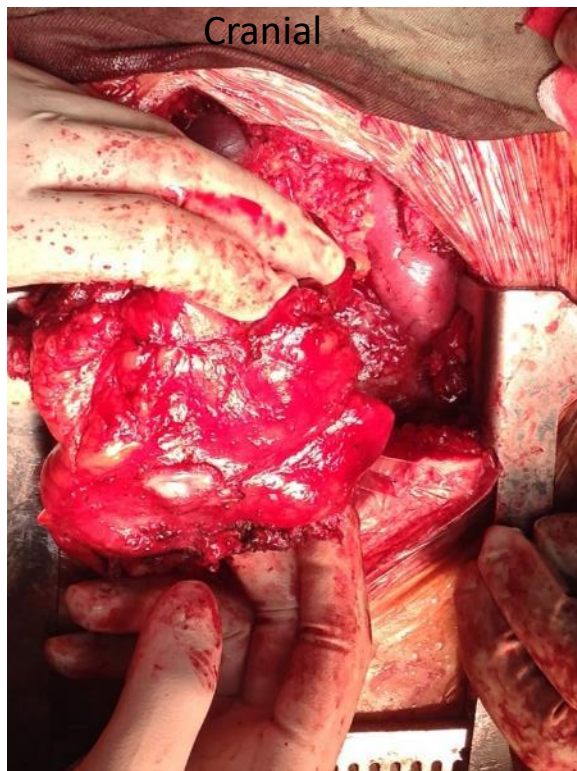
Anterior view



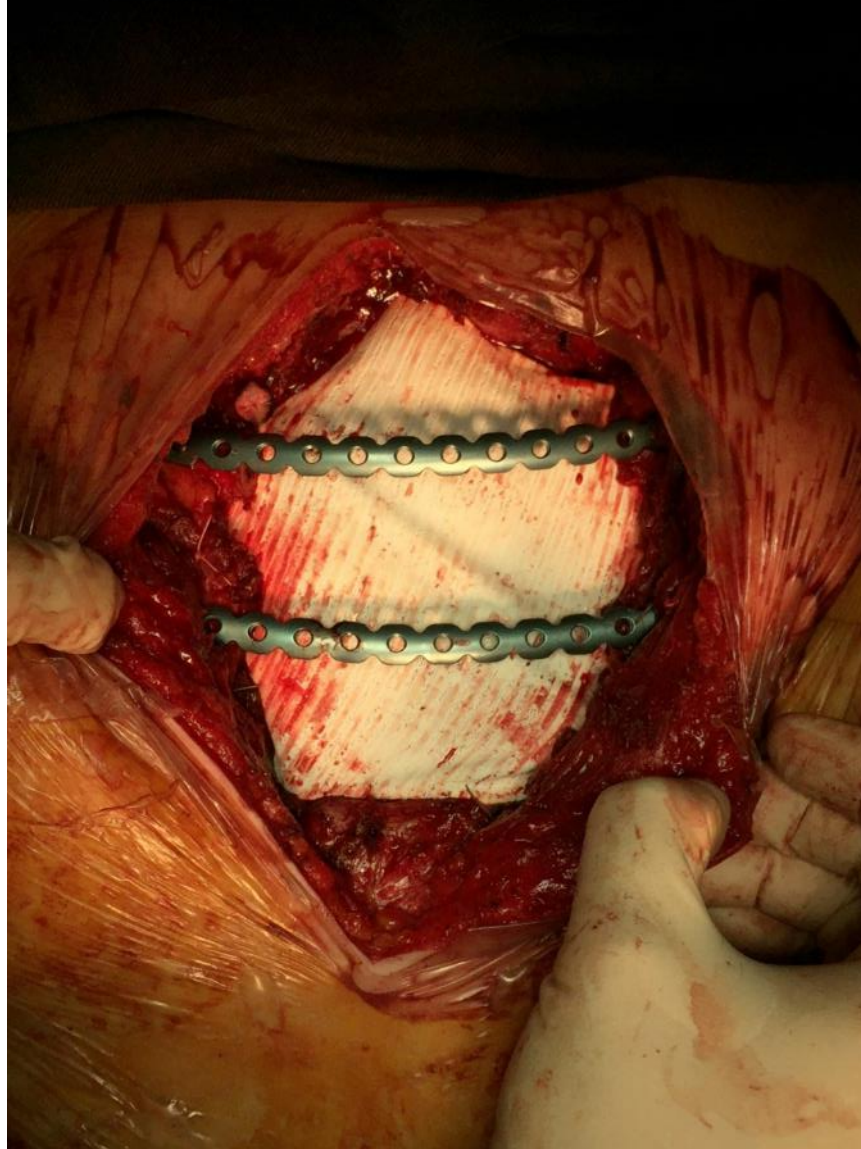
Cranial



Lateral view



MatrixRib in sternal reconstructions





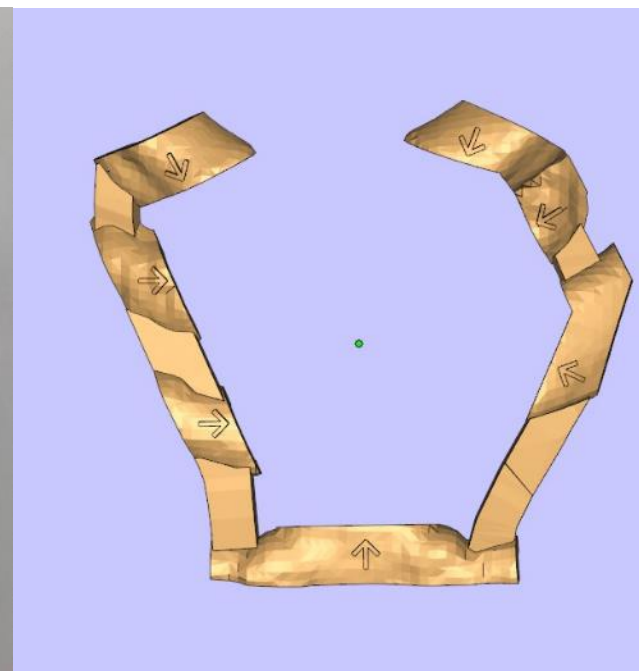
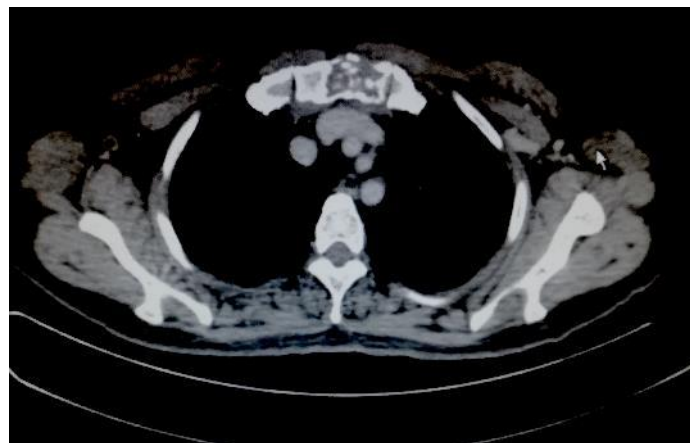
3D PRINTING FOR CHEST WALL TUMOUR

Tumour model for pre-op planning and patient education

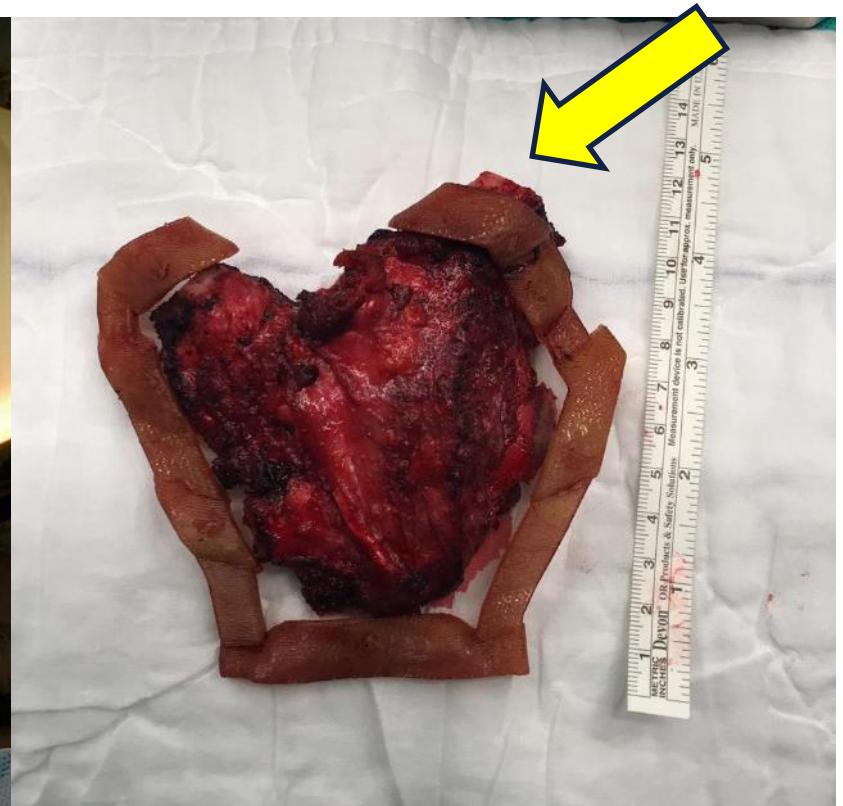
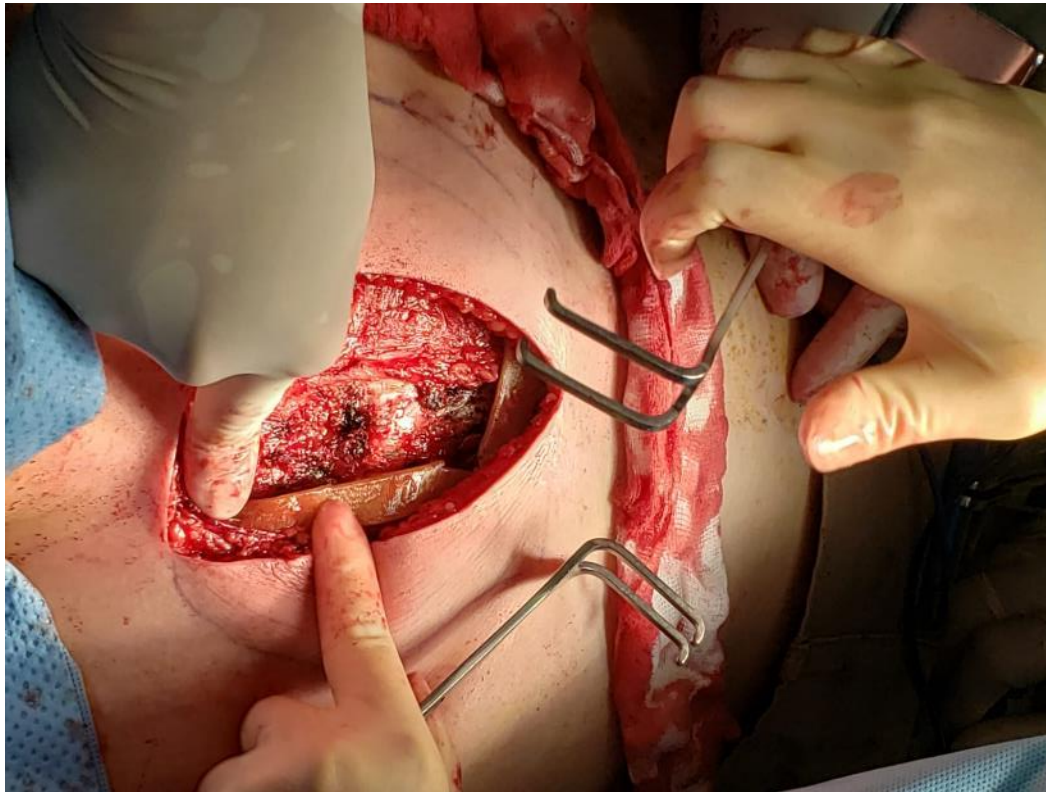


3D PRINTING FOR CHEST WALL TUMOUR

Surgical guide – manubrium metastasis from breast cancer

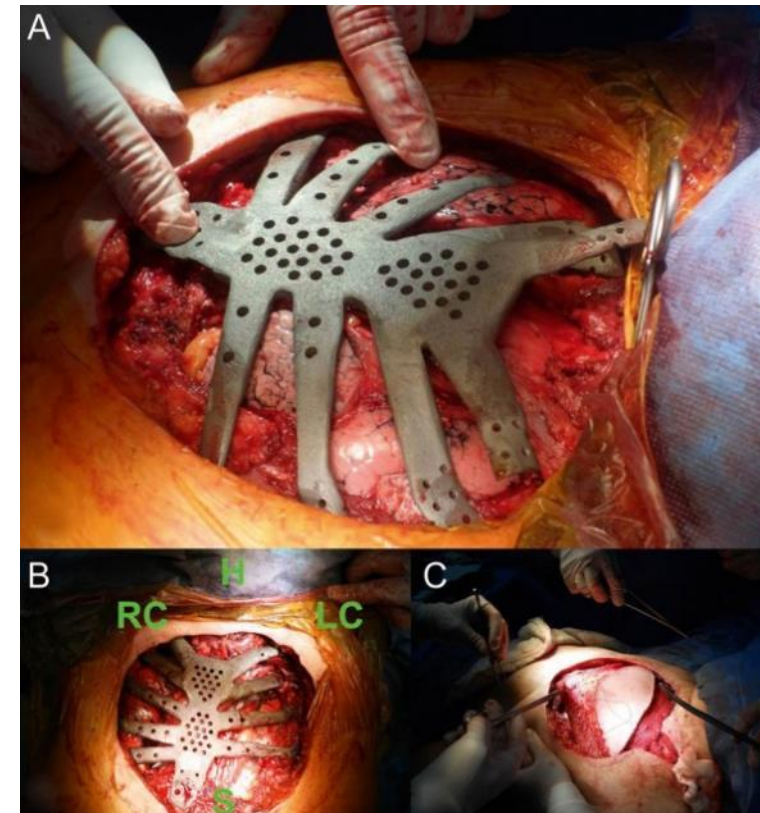
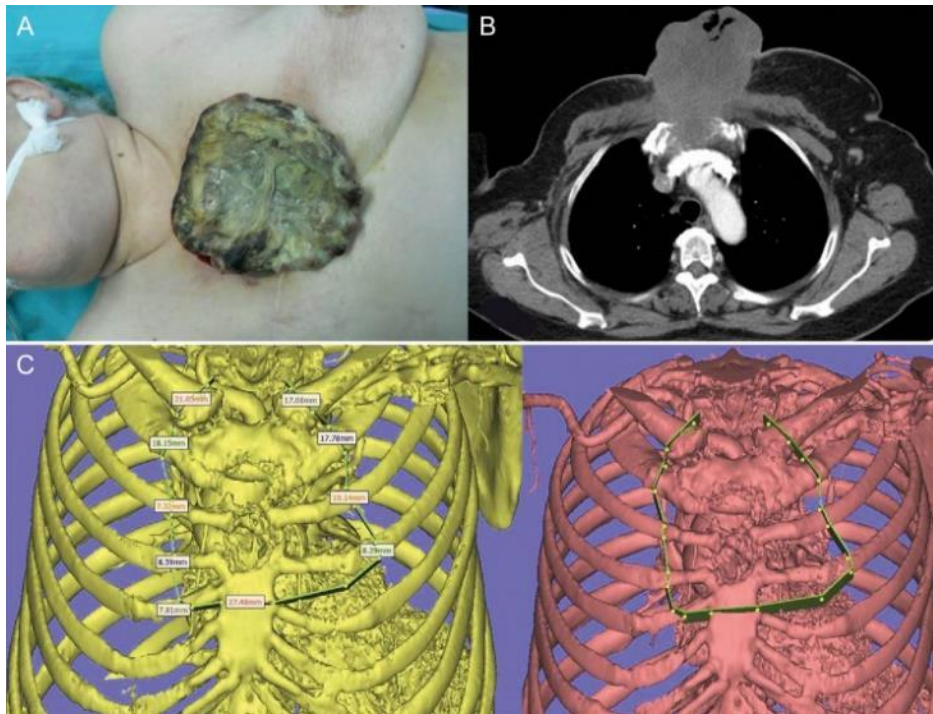


Fernandez RAS, Lau RWH, Yu PSY, Chan JWY, Wan IYP, Lee APW, **Ng CSH** . Use of 3-D Printed Surgical Guide for Manubrio-sternal Resection of Solitary Breast Cancer Metastasis. Thorac Cardiovasc Surg (submitted)



Fernandez RAS, Lau RWH, Yu PSY, Chan JWY, Wan IYP, Lee APW, **Ng CSH** . Use of 3-D Printed Surgical Guide for Manubrio-sternal Resection of Solitary Breast Cancer Metastasis. Thorac Cardiovasc Surg (submitted)

FUTURE PERSONALIZED PROSTHESES → EXACT SHAPE & SIZE FIT PRE-OP 3D-CT SCAN → CUSTOM MADE IMPLANTS - PERSONALIZATION



Turna et al. Reconstruction with patient-specific titanium implant after a wide anterior chest wall resection.
Interact Cardiovasc Thorac Surg. 2014;18:234

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Functional Chest Wall Reconstruction With a Biomechanical Three-Dimensionally Printed Implant



Javier Moradiellos, MD, Sergio Amor, MD, Mar Córdoba, MD, Gaetano Rocco, MD,
Mercedes Vidal, MD, and Andrés Varela, MD, PhD

Thoracic Surgery Department, Quirónsalud-Madrid University Hospital, Madrid, Spain; and Istituto Nazionale Tumori, IRCCS,
Pascale Foundation, Naples, Italy

Ann Thorac Surg 2017;103:e389–9



IMPORTANCE OF MDT

