

Update on Thoracic Surgery

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Thoracic Surgery



Major Lung resection

Pleural Disease

Pericardial and cardiac disease

Interventional bronchoscopy

Robotic Surgery

Indications of VATS major lung resection

- Lung cancer
- Congenital lung lesions: CCAM and intrapulmonary sequestration
- Infection: Lung abscess, bronchiectasis

Lung cancer

Early stage non-small cell lung cancer

Tumour < 4cm in size

No significant nodal disease

No endobronchial lesion

Staging of lung cancer

- Endobronchial ultrasound (EBUS) and Endoscopic Ultrasound (EUS) for pre-operative staging (2009)
- Routine PET-CT (2013)



Thoracic Surgery at PWH

- Standard VATS 3-port major lung resection for 18 years.
- 2-port and Uniportal VATS major lung resection since 2012.





Surgical Access for major lung resection

Posterolateral thoracotomy

Muscle sparing thoracotomy

Minithoracotomy

Video-Assisted Thoracoscopic Surgery (VATS)

Robotic-Assisted Thoracoscopic Surgery (RATS)



Definition

VATS lobectomy is defined as individual dissection of bronchus, artery and vein with mediastinal lymph node sampling or dissection using video assistance **without rib spreading.**

VATS lobectomy

- No rib spreading or cutting
- Soft tissue retractor is used





Surgical management of early stage lung cancer

Posterolateral or muscle sparing thoracotomy + lobectomy + mediastinal LN sampling or dissection is the **GOLD STANDARD**

Video-Assisted Thoracic Surgery Major Lung Resection Can Be Safely Taught to Trainees

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Ann Thorac Surg 2008;85:416-419



Table 4. Intraoperative and Postoperative Outcomes

	Consultant Led (n = 51)	Trainee Led (n = 60)	p Value	Mean Difference (95% Confidence Interval)
Conversion, % (no. of cases)	2.0 (1)	5.0 (3)	0.4	NA
Mean blood loss, mL (± 1 SD)	302 (0-686)	236 (0-520)	0.4	65.8 (-85.4 to 217)
Operation time, minutes (± 1 SD)	136 (86.8-184)	162 (112-212)	0.01	-26.9 (-47.1 to -6.6)
Hospital stay, days (± 1 SD)	6.2 (3.0-9.5)	7.3 (0-15.0)	0.4	-1.1 (-3.6 to 1.4)
Duration of chest drainage, days (± 1 SD)	3.8 (1.6-6.0)	3.8 (0.9-6.7)	0.9	-0.07 (-1.3 to 1.1)
Thirty-day mortality	0	0		
Complications, % (no. of cases)*	1.4 (7)	1.3 (8)	1.0	NA

For continuous variables, the independent *t* test is used; for categorical variables, the χ^2 test is used. * Complications included bleeding, pleural space infection, arrhythmia, pneumonia, prolonged air leak, and renal impairment.

NA = not applicable.

Prospective randomized trial Thoracotomy vs VATS lobectomy

The prospective multi-institutional registry study (CALGB 14501) failed to open as there was a lack of funding.

Data limited to two small randomized, a few institutional case series, one prospective cooperative group study (CALGB 39802), two systemic reviews and meta-analyses.



Failure to perform randomized studies

Lag of dissemination of technical skills in many centres.
Poor compliance with randomization schedule.
Unwillingness of patients to be randomized.

Contraindications

Tumour > 4cm

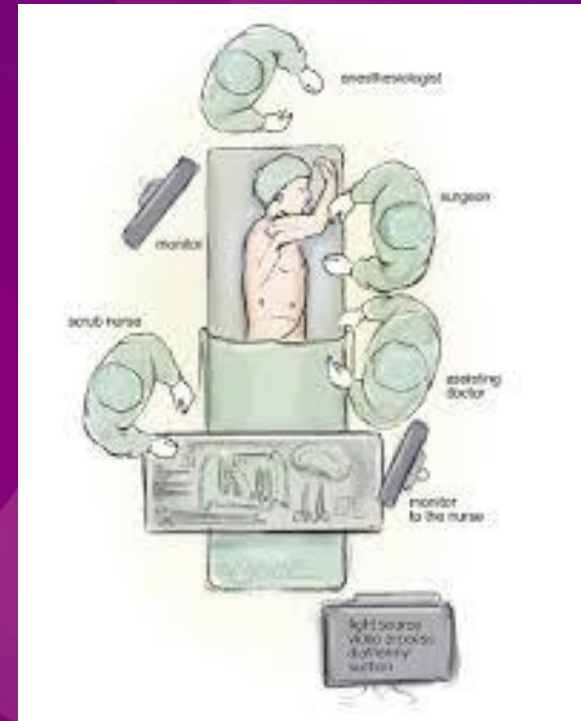
Presence of endobronchial lesion

? Pleural symphysis

? Incomplete fissure

OT set-up

- Lateral decubitus position
- Two TV monitors
- One assistant
- One Scrub nurse



Patient's position

- Lateral decubitus position with “breaking” of the OT table.



VATS instruments

Conventional instrument for thoracic surgery

Long blade diathermy

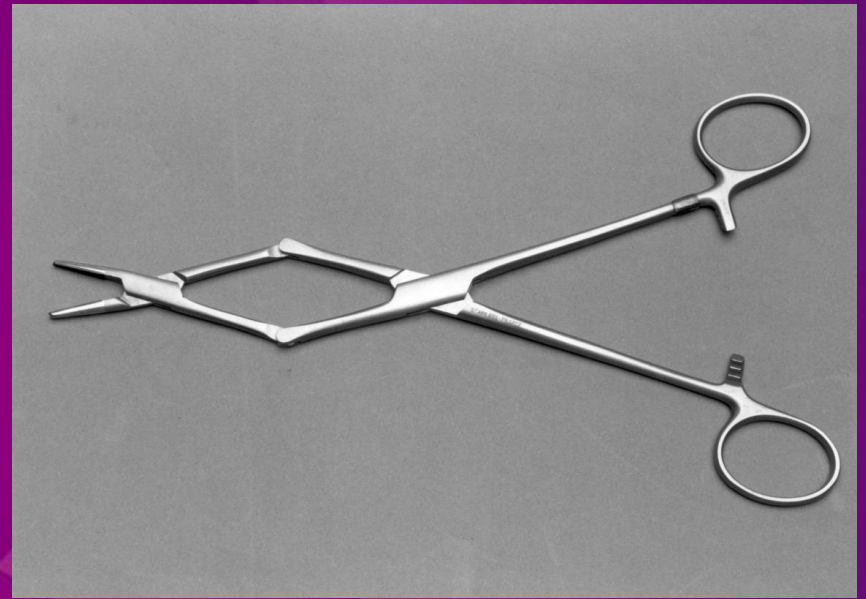
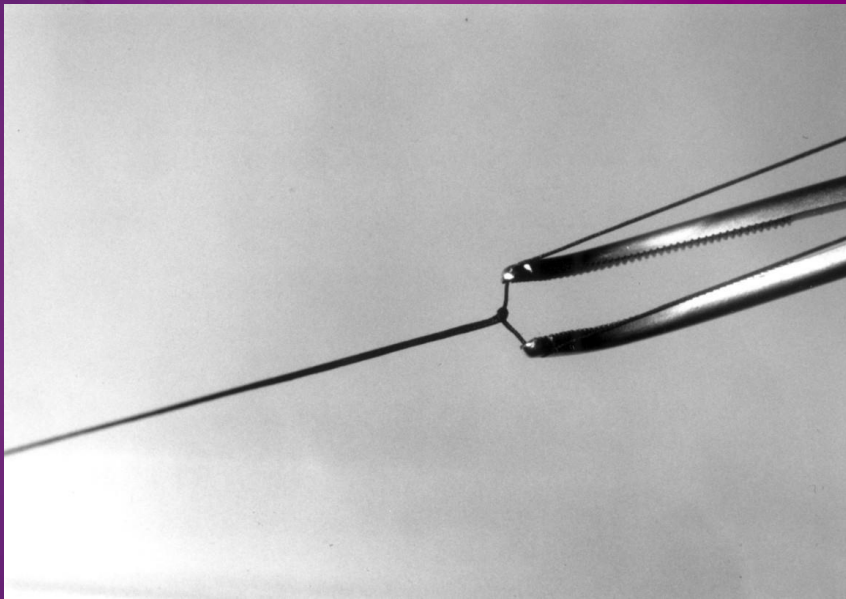
Diathermy forceps

30 degree rod lens (5 mm or 10 mm)

Endoscopic knot pusher

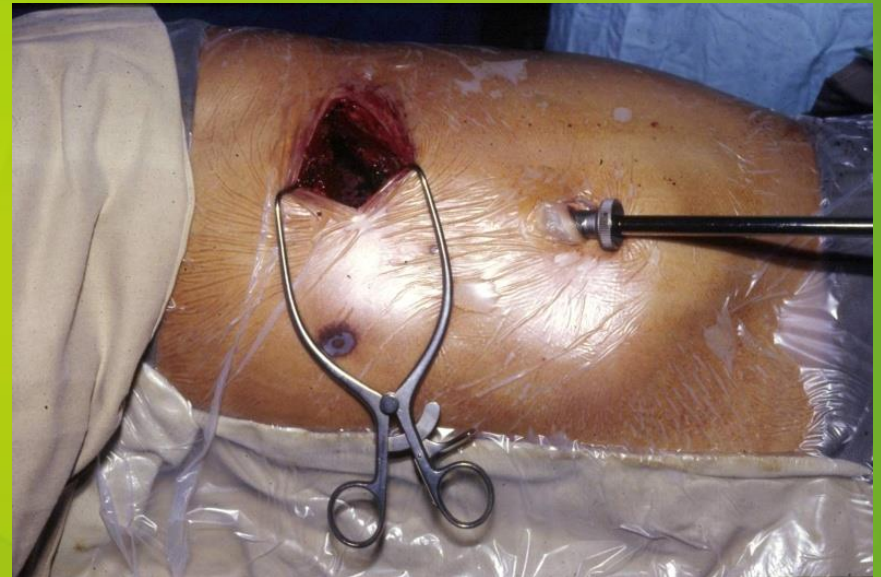
Endostapler

Endoscopic knot pusher and needle holder



Port placement

- Camera port (1cm): 6-7 th ICS mid-axillary line.
- Utility thoracotomy: Upper lobe (3rd or 4th ICS), lower (5th or 6th ICS) anterior axillary line. Usually 3-4 cm in length.
- Posterior port (1cm): Inferior to the tip of scapula 5th to 7 th ICS.



Utility thoracotomy



Exposure

Maintenance of traction on the lung parenchyma to be resected using sponge holding forceps.

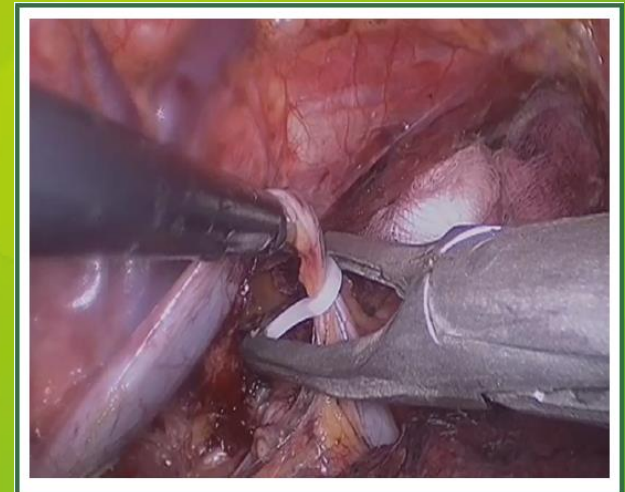
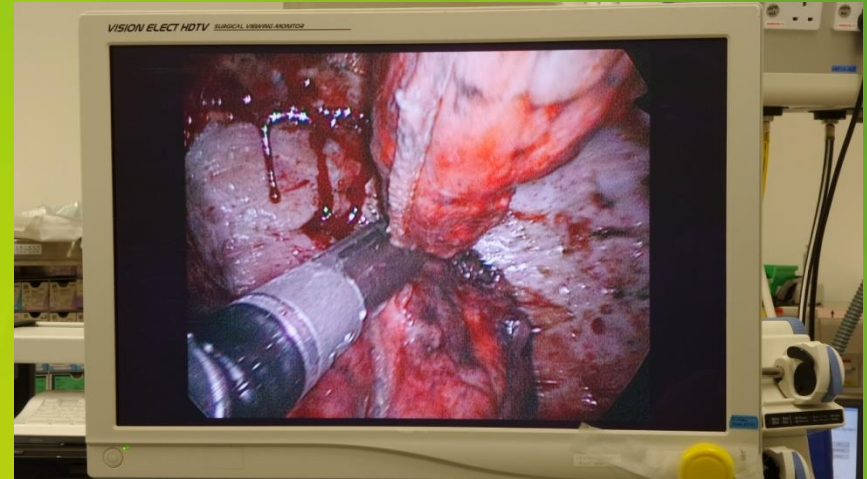
Sharp and blunt dissection of the pulmonary vessels.

Vascular Control

Endostapler

Hemolock

Endoscopic knot tying and suturing



Endoscopic Suturing and Intra-corporeal knot



Airway Control

Endostapler

Endoscopic suturing

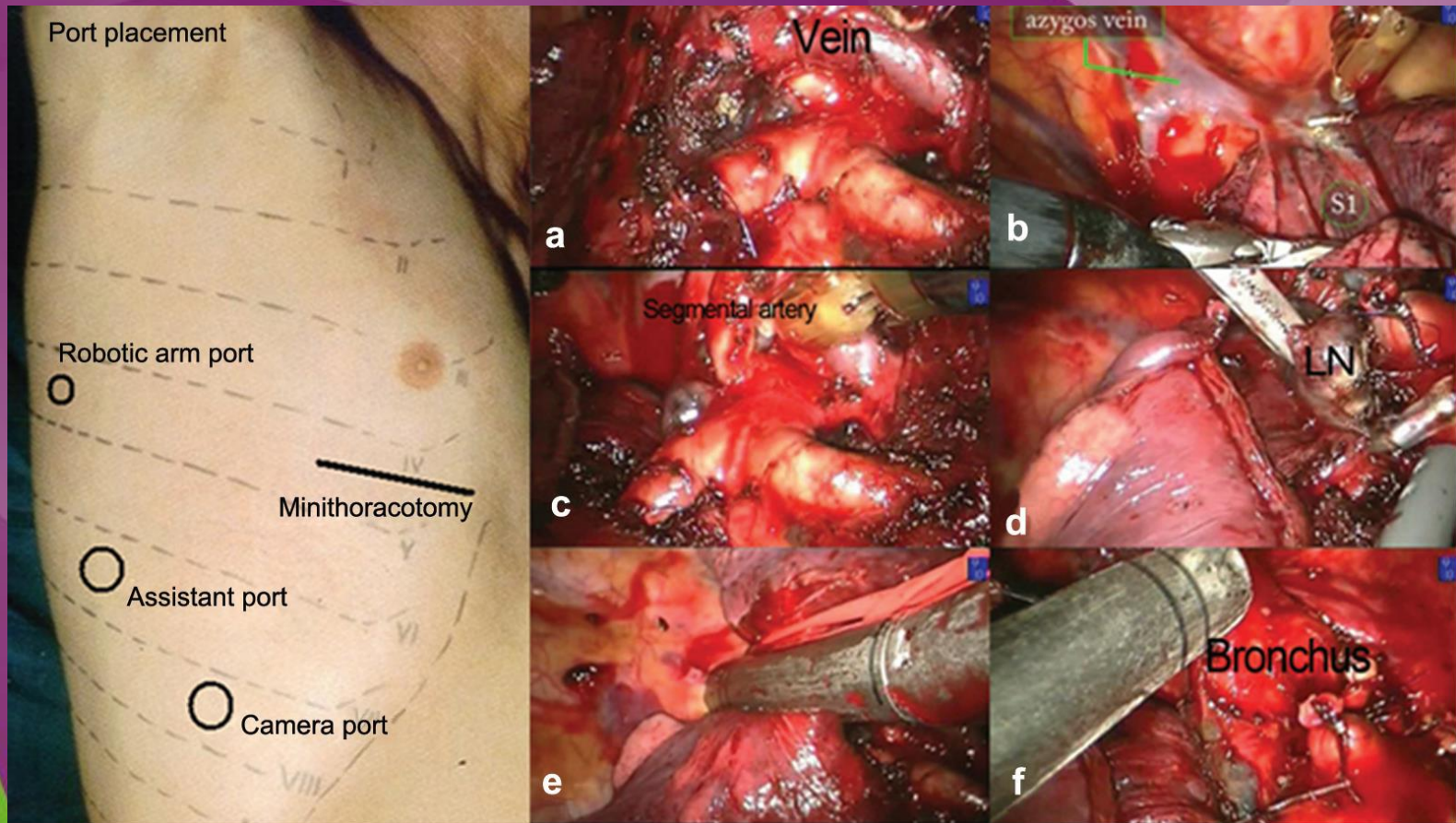
Left upper lobectomy



Can we do better ?

- ? Robotic lobectomy
- ? Uniportal lobectomy

Robotic lobectomy



less wound is better ??

LESS IS ~~MORE~~ BETTER.

**Less photos, better photos.
Less text, better text.
Less steps, better steps.**

Makes things simple

Simplicity is the
ultimate

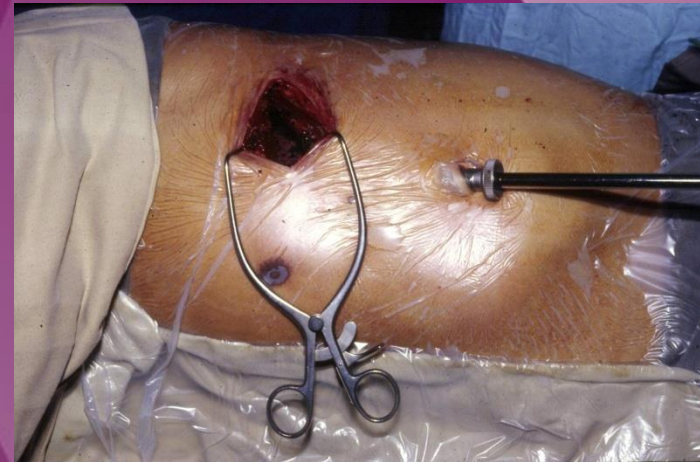
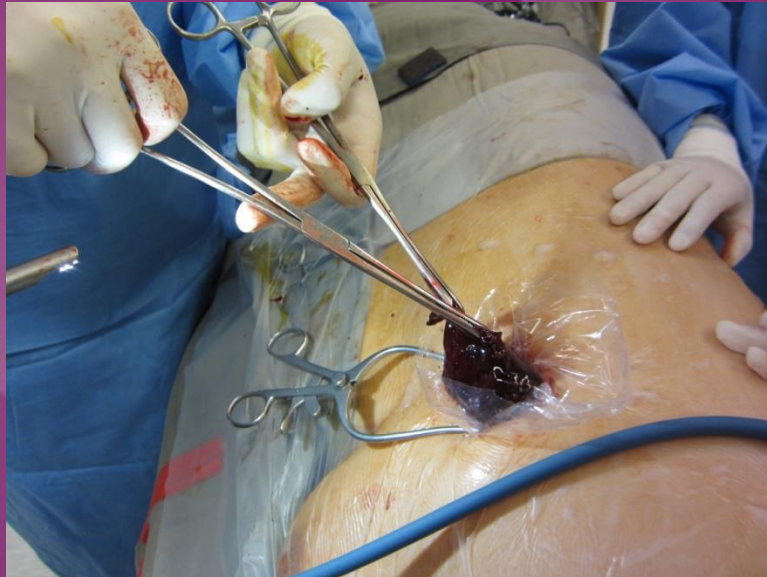
Sophistication

That looks simple

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Are the two extra ports necessary ?





Problems with extra port wounds

Intercostal nerve injury secondary to torquing of instruments.

Multiple levels of post-op chest wall pain.

Long term post-op neuralgia.

Studies in pneumothorax showed that uniportal approach is associated with less wound pain.

Any benefits of avoiding the other two ports ?

Inferior camera port
Posterior port for retraction

Does it make a difference in making less VATS ports ?

Less pain

? Less inflammatory response

? Less long term neuralgia

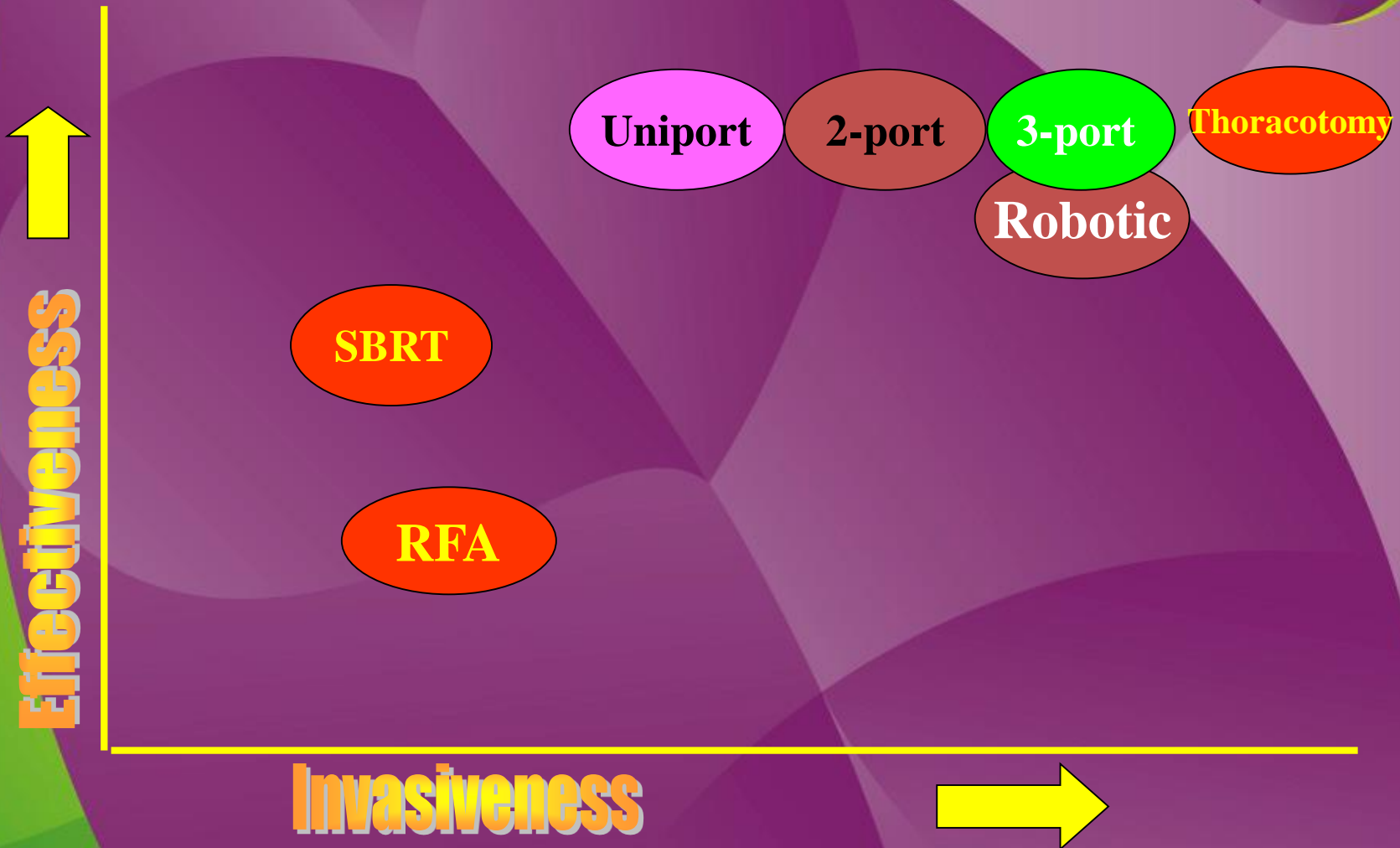
? Better preservation of lung function

If you are good at 3-port VATS lobectomy, do I need to move on to uniportal or robotic lobectomy ?

Uniportal VATS



Approaches to Early Lung Ca



VATS vs Robotic-assisted lobectomy

VATS Lobectomy

- Conventional instruments
- Less expensive
- Tactile feedback
- Shorter operating time
- Three incisions
- LN dissection difficult
- Long term outcome known

RATS Lobectomy

- Robotic instruments
- More expensive
- No tactile feedback
- Longer operating time
- Four incisions
- LN dissection enhanced
- Long term outcome unknown

Three-port vs Uniportal VATS

3-ports VATS Lobectomy

- Conventional instruments
- Less expensive
- Tactile feedback
- Shorter operating time
- Three incisions
- Easy manipulation of instruments
- Long term outcome known

Uniportal VATS Lobectomy

- Conventional + Curved Endoscopic instruments
- Similar expenditure
- Tactile feedback
- Slightly longer operating time
- One incision
- Limited space for manipulation of instruments
- Long term outcome unknown



Uniportal VATS lobectomy

Safe and feasible approach

Learning curve

Need more objective evidence concerning its effect on body's inflammatory response

Long term oncological outcome has to be addressed

Adoptability by majority of thoracic surgeon

Conclusion

Studies comparing outcomes of uniportal vs 3-port VATS lobectomy have to be conducted.

It doesn't matter how many port you use as long as you are doing a good job for your patient

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Major Lung resection

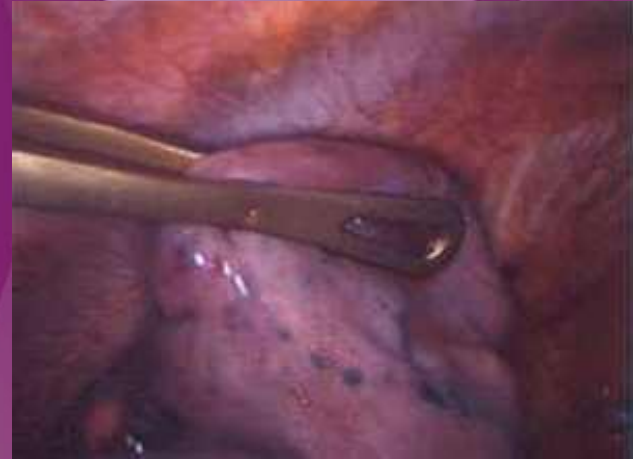
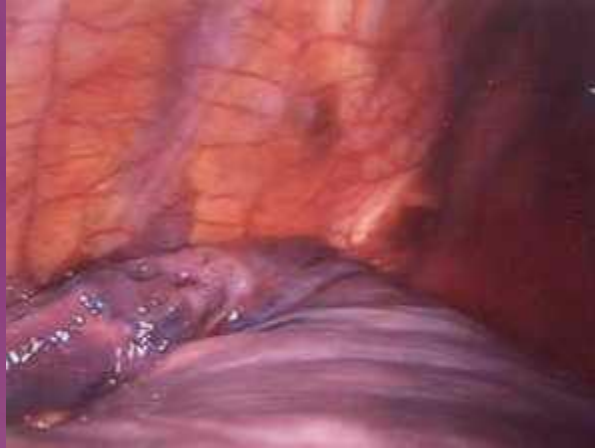
Pleural Disease

Pericardial and cardiac disease

Interventional bronchoscopy

Robotic Surgery

VATS Pleurodesis



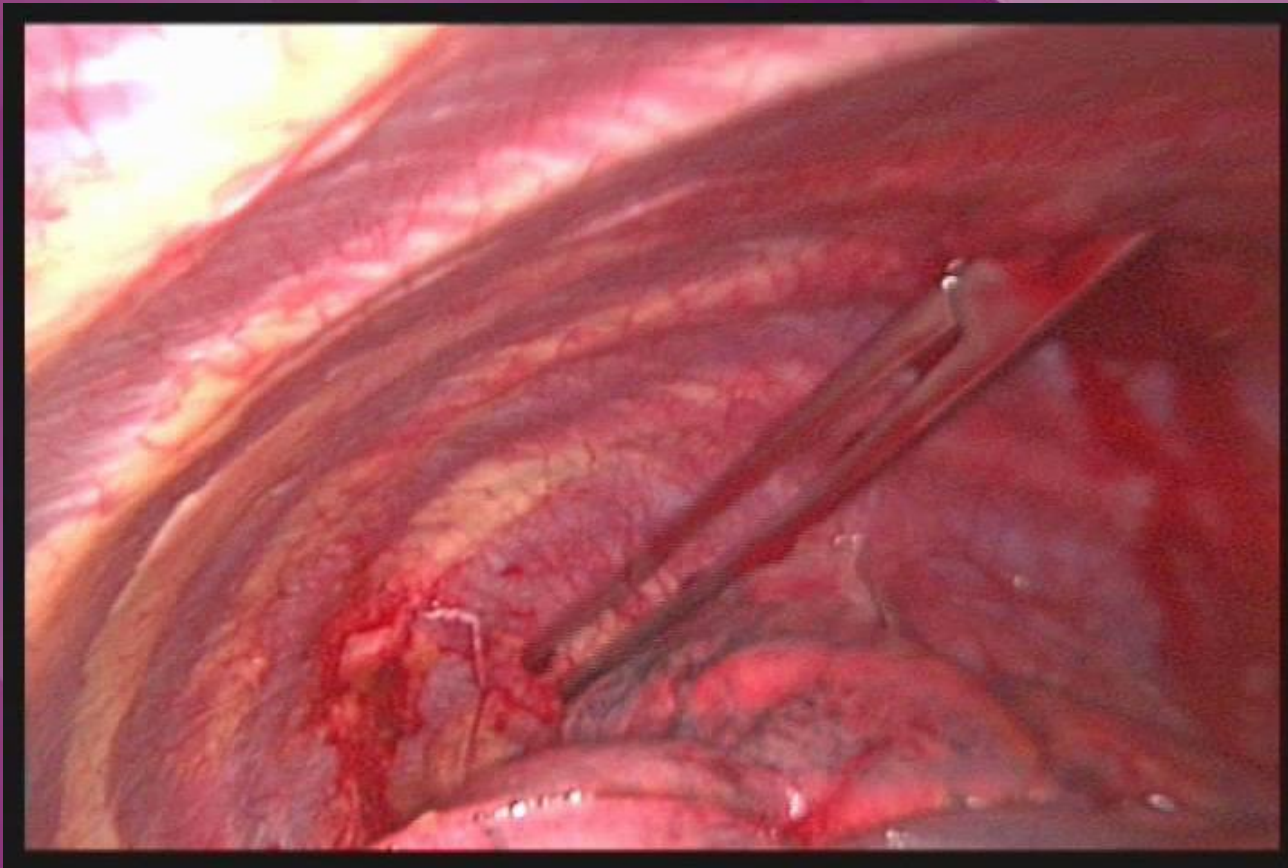
Spontaneous Haemopneumothorax

Life-threatening
Hypovolemia and
ventilatory failure
Young male patients
Usually > 1L fresh
blood from chest drain



Spontaneous Haemopneumothorax

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COPD patients for LVRS

Progressive nature of disease

Type and severity of patient's symptom

Results of pulmonary tests, exercise test and CT thorax result

Patient's own motivation to undergo pulmonary rehabilitation, investigations and major surgery



Which patient will benefit from LVRS ?

Upper lobe predominant emphysema on CT thorax
Post-rehabilitation low exercise capacity

LVRS

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Endobronchial Valve

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LVRS vs EBV

LVRS could achieve symptomatic control and prognostic improvement in selected group of patients

EBV is feasible with low complication rate shorter hospital stay and better patient acceptance

However, efficacy is NOT yet proven at present moment with improvement significantly less than LVRS (VENT trial)

Thoracic Surgery



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Pericardial disease

Tumour

Cyst

Pericardial effusion: Malignancy, infection, idiopathic

Pericardial window

Partial pericardial resection to drain pericardial fluid into the pleural or peritoneal cavity

Indications:

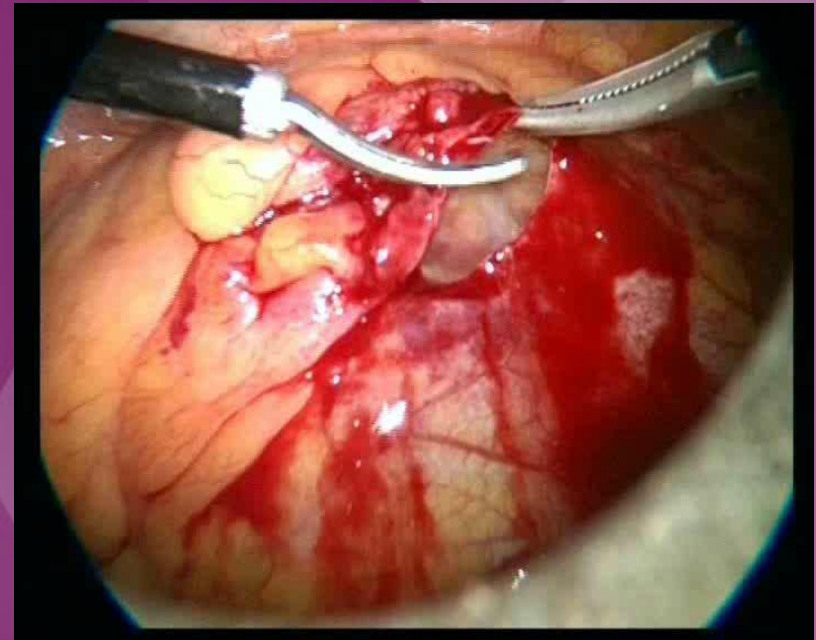
Recurrent pericardial effusion despite tapping

Malignant pericardial effusion

Pericardial biopsy

VATS Pericardial Window

Video-assisted
Thoracoscopy: Drain
into pleural cavity *GA,*
effective, less painful but
requires double lumen
tube



Thoracic Surgery



Lung resection for cancer

Mediastinal Disease

Pericardial and cardiac disease

Interventional bronchoscopy

Robotic Surgery

Interventional bronchoscopy



Debulking of tracheal or bronchial tumour

Treatment of airway stenosis: Benign or malignant narrowing of airway

Effective mode of palliation with Ca lung or trachea with significant airway obstruction

Wan IY et al. Chest 2002; 22: 370-4, Sihoe et al. Sur Oncl. 2004;13: 17-25

Interventional bronchoscopy

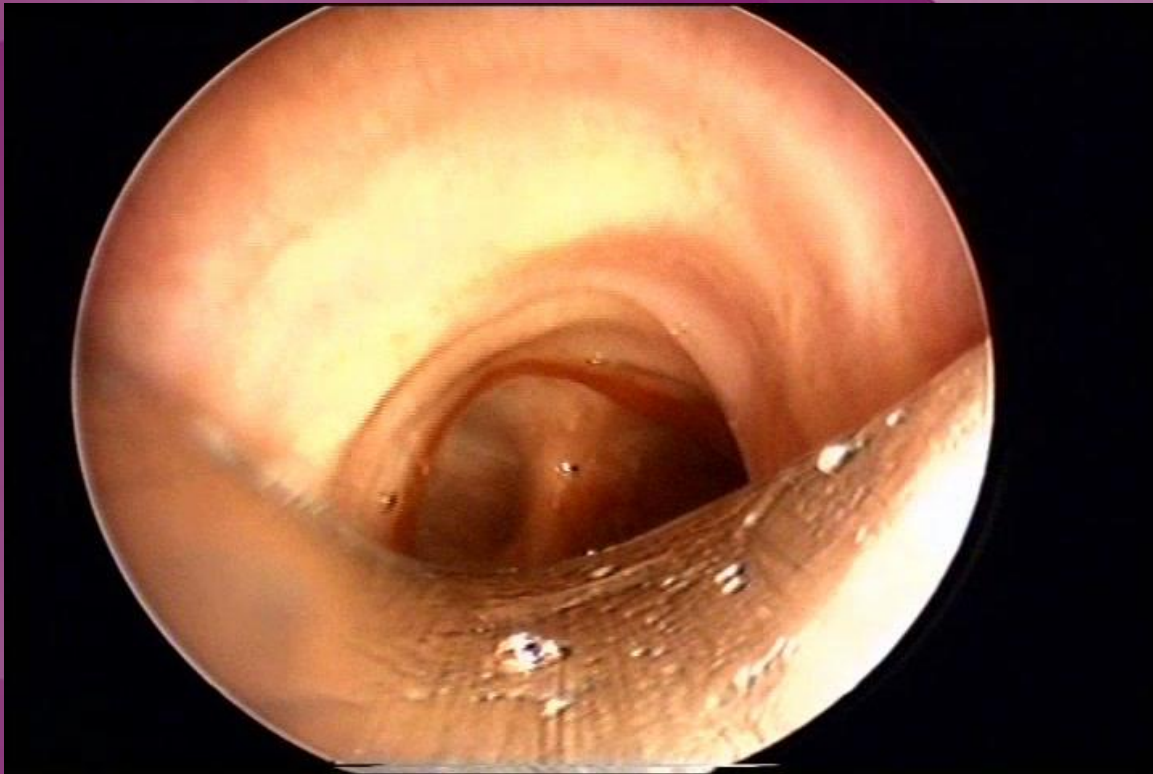
TB tracheobronchial stenosis

Classical treatment: Resection and reconstruction

Rigid bronchoscopy: Dilatation of airway stenosis and placement of airway stents for maintenance of airway patency

Interventional bronchoscopy

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Major Lung resection

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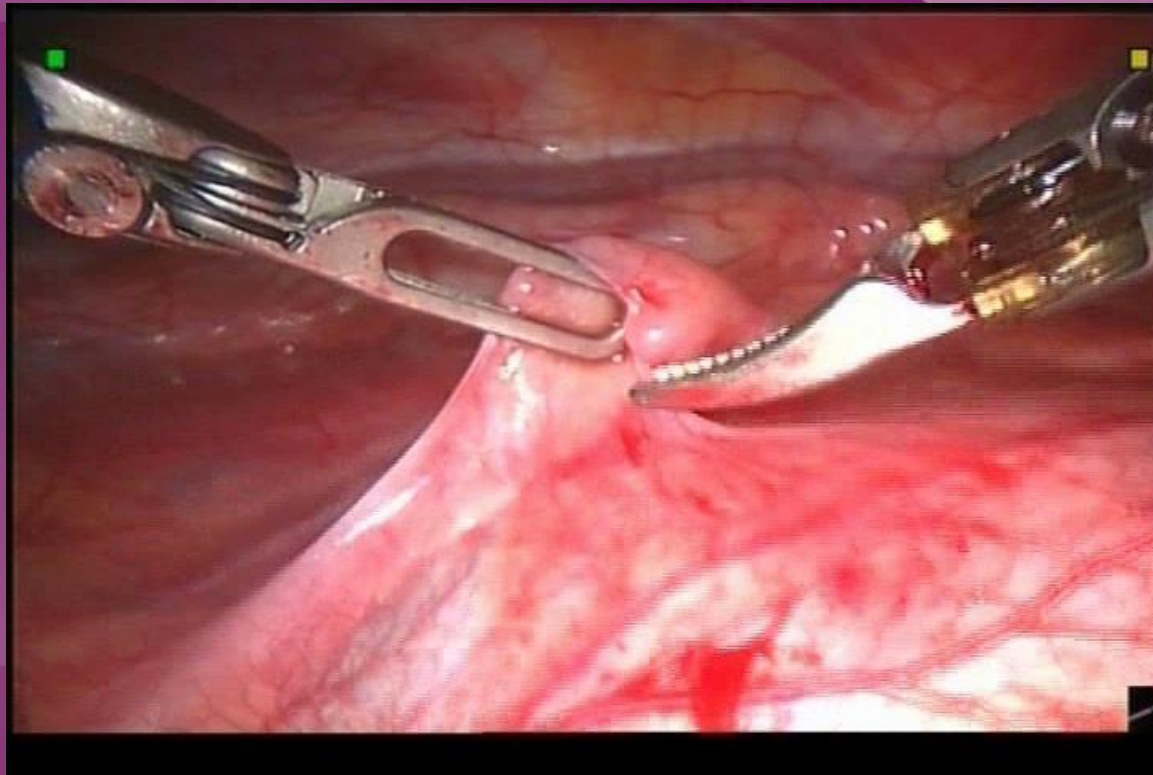
Interventional bronchoscopy

Robotic Surgery

Robotic Thoracic Surgery



Robotic Thymectomy



Minimally Invasive Thoracic Surgery



- Modification of surgical approach and technique.
- Revision of workflow and peri-operative protocol.

Teamwork in minimally invasive thoracic surgery

- Thoracic Surgeon
- Anaesthetist
- Nursing Staff
- Physiotherapist



TEAMWORK
IN A NUTSHELL

Pushing to the limit



How to reach the limit ?



New Protocol for VATS Surgery



(Surgery) Clinical Pathway – Lung Resection		Operation Date: _____		
Admission / pre-op Day	OT day	Post op Day 1	Post op Day 2-4	Post op Day 5
Diagnostic tests <input type="checkbox"/> Type & screening <input type="checkbox"/> CBC, RFT, LFT, Clotting <input type="checkbox"/> CXR, ECG <input type="checkbox"/> Lung Function Test result <input type="checkbox"/> CT film & report <input type="checkbox"/> PET film & report Interventions <input type="checkbox"/> Fasting regime <input type="checkbox"/> 123 Surgical safety 123 <input type="checkbox"/> Informed consent Medication / I V Therapy <input type="checkbox"/> IVF as ordered <input type="checkbox"/> Pre-op medication <input type="checkbox"/> Continue usual medications	Post-op Mx: <input type="checkbox"/> +/- DAT & IVF as prescribed <input type="checkbox"/> IV antibiotics <input type="checkbox"/> start analgesic or PCA <input type="checkbox"/> Free from nausea & vomiting, anti-emetic prn	Diagnostic tests <input type="checkbox"/> CBP, RFT, LFT <input type="checkbox"/> CXR Interventions <input type="checkbox"/> Observe vital signs & drains <input type="checkbox"/> Remove drain if indicated <input type="checkbox"/> DAT Medication / IV Therapy <input type="checkbox"/> Continue antibiotic until all drains are removed <input type="checkbox"/> Adjust analgesic or PCA <input type="checkbox"/> Free from nausea & vomiting, anti-emetic prn <input type="checkbox"/> Off IVF if tolerate diet well <input type="checkbox"/> Resume usual medications	Diagnostic tests <input type="checkbox"/> CXR Interventions <input type="checkbox"/> Remove CD Medication / IV Therapy <input type="checkbox"/> Stop antibiotic if not necessary <input type="checkbox"/> +/- adjust analgesic <input type="checkbox"/> Continue usual medications	<input type="checkbox"/> Arrange FU <input type="checkbox"/> Prescribe medications for discharge
<input type="checkbox"/> General nursing Assessment * <input type="checkbox"/> BW, BH <input type="checkbox"/> Advise patient to stop smoking <input type="checkbox"/> Pre-op showering & shampooing <input type="checkbox"/> Bowel open a day before OT, D/S prn <input type="checkbox"/> Pre-op talk	Pre-op preparation: <input type="checkbox"/> Pre-op Checklist - Fasting - T&S - Pre-op Ix <input type="checkbox"/> Pre-op medication <input type="checkbox"/> Remove removable items <input type="checkbox"/> Empty bladder <input type="checkbox"/> Bring chest drain (CD) boxes to OT Post-op: <input type="checkbox"/> Double check with recovery room nurse for patient's identification, documents, condition, wounds, lines & drains, post-op orders <input type="checkbox"/> Haemodynamic monitoring Q1H <input type="checkbox"/> Check temperature Q4H <input type="checkbox"/> Pain monitoring <input type="checkbox"/> Elevate Head of bed 30° -45° <input type="checkbox"/> Keep dressing intact <input type="checkbox"/> O ₂ therapy & keep SaO ₂ >95% <input type="checkbox"/> Connect CD to suction as prescribed <input type="checkbox"/> Check for any air leakage, correct it if possible <input type="checkbox"/> Inform if drain output >100ml/hr <input type="checkbox"/> Self urinary voiding	<input type="checkbox"/> Haemodynamic monitoring Q4H <input type="checkbox"/> Check temperature Q4H <input type="checkbox"/> Wean O ₂ & keep SaO ₂ >95% <input type="checkbox"/> Pain monitoring <input type="checkbox"/> Drain care & Keep CD to suction as prescribed <input type="checkbox"/> Check for any air leakage, correct it if possible <input type="checkbox"/> Inform if persistent high CD output <input type="checkbox"/> Monitor H'stix for DM patient <input type="checkbox"/> Wound care <input type="checkbox"/> Sit out of bed <input type="checkbox"/> Bed bath <input type="checkbox"/> Participate in ADL <input type="checkbox"/> Psychological support	<input type="checkbox"/> Haemodynamic & pain monitoring <input type="checkbox"/> Wean O ₂ & keep SaO ₂ >95% <input type="checkbox"/> Monitor H'stix for DM patient <input type="checkbox"/> Wound & Drain care <input type="checkbox"/> +/- Check for any air leakage, correct it if possible <input type="checkbox"/> Sit out of bed <input type="checkbox"/> Participate in ADL <input type="checkbox"/> Psychological support	<input type="checkbox"/> Advice on discharge: <input type="checkbox"/> Remove all dressings & spray all wounds with Op-site spray <input type="checkbox"/> Advice on discharge pamphlet given <input type="checkbox"/> Advise patient to have CXR before CTS
<input type="checkbox"/> Pre-op Chest Physiotherapy <input type="checkbox"/> Arrange pre-op physio talk	<input type="checkbox"/> Deep breathing & coughing exercise with Triflow	<input type="checkbox"/> Early post-op chest physiotherapy BD <input type="checkbox"/> Encourage Triflow exercise 10 times half-hourly	<input type="checkbox"/> Chest physiotherapy BD <input type="checkbox"/> Encourage Triflow exercise 10 times half-hourly <input type="checkbox"/> Early mobilization	<input type="checkbox"/> Arrange discharge talk
<input type="checkbox"/> Patient and relatives understand the diagnosis, planned operation, risk and	<input type="checkbox"/> Patient and relatives well aware of post-op progress & outcome	<input type="checkbox"/> Patient demonstrates improving independent ADL	<input type="checkbox"/> Review discharge plan by case MO <input type="checkbox"/> Preparatory for discharge arrangement	<input type="checkbox"/> FU CTS 1-2 weeks <input type="checkbox"/> Patient and relatives

Pre-operative preparation

- Pre-op talks by nursing staff and physiotherapist.
- Interviewed and consent by surgeons with patient /family education.
- Video-show



Intra-op measures



- Pre-emptive analgesia
- Inter-costal nerve block
- Paravertebral block
- Minimize intercostal nerve damage at port sites

Post-op measures

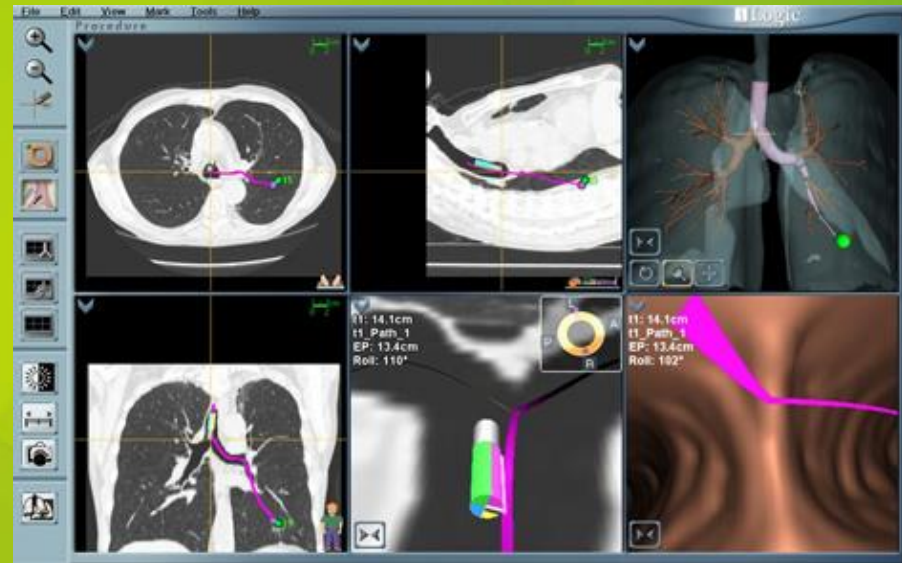


- Adequate analgesia
- Early mobilization
- POD 1 : Sit out, off suction, Mobilization
- POD 2-3: Drain out
- POD 3-4: Home

Incentive Spirometry



Navigational Bronchoscopy



Navigational bronchoscopy hybrid procedure

- Hook-wire placement
- Fiducial placement
- Pleural Dye marking



Summary

- A minimally invasive thoracic surgery programme involves modification techniques together with revision of peri-operative protocol.

Thank You