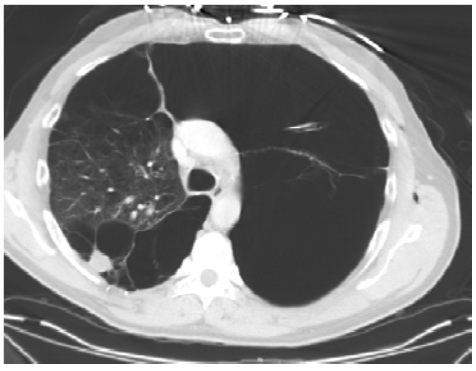
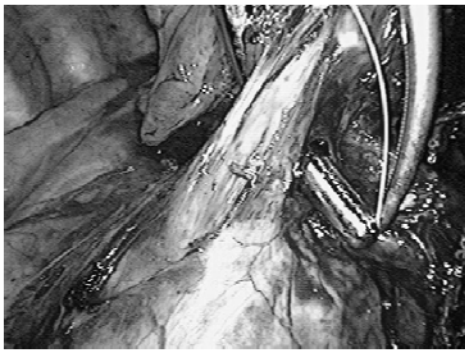
Robotic Thoracic Surgery

Patrick Ross, Jr., MD, PhD
Professor and Chief
Division of Thoracic Surgery
The Ohio State University Wexner Medical Center

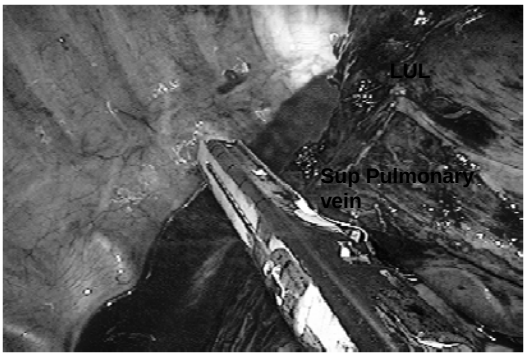
Robotic Thoracic Surgery



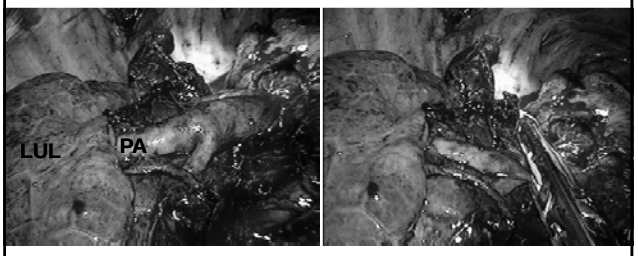
Traction Suture Around the Vein



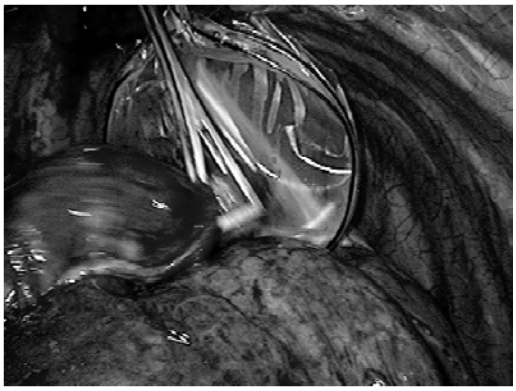
VATS Lobectomy: Dividing the Pulmonary Vein



VATS Lobectomy



VATS Lobectomy: Dividing the bronchus



Compelling Data for VATS

- Published series defining outcomes
- Comparative effectiveness studies
- Added value for minimally invasive surgery
  - More likely to complete adjuvant therapy
  - Less immunologic impact
  - Improved short term outcomes with decreased length of stay and quicker recovery

Maximizing the benefit of minimally invasive surgery

Mohiuddin and Swanson 2013 J Surg Oncol 108:315-319

- MIS is preferable in patients with significant comorbidities
  - Pulmonary impairment
  - Cardiac disease
  - Poor performance status
  - Advanced age
  - Recent or impending major operations
  - Immunosuppression
  - Rheumatologic/skeletal abnormalities

MIS

- Potential Benefits
  - Shorter hospital stay
  - Shorter recovery time
  - Less post operative pain
  - Less immune compromise

Minimally Invasive Surgery

- Minimally invasive procedures add value to the patient
- Minimally invasive approaches require development of expertise
- VATS procedures are a heterogeneous pool and not a single operation
- Majority of lobectomies are performed with thoracotomy despite thoracoscopy becoming available in 1990's

Initial consecutive experience of completely portal robotic pulmonary resection with 4 arms

Robert J. Cerfolio, MD, FACS, FCCP, Ayesha S. Bryant, MD, MSPH, Loki Skylizard, MD, and Douglas James Minnich, MD, FACS
J Thorac CardiovascSurg 2011;142:740-6

- 168 Pulmonary resections
  - 148 completed robotically
    - 106 lobectomy
    - 26 wedge resection
    - 16 segmentectomy
- 318 open thoracotomy resections

UAB: Robot vs Open 2011

- Morbidity
  - 27% Robot v 38% Open
- Mortality
  - 0%Robot v 3.1% Open
- Length of Stay
  - 2 days Robot v 4 days Open

Open, video assisted thoracic surgery, and robotic lobectomy:review of a national database
Kent et al 2014 Ann Thor Surg 97:236-44

- Time Period 2008 -2010
- Surgical Approach
  - Open thoracotomy 20,238
  - VATS 12,427
  - Robotic 430
- LOS
  - Open 8.2 days
  - Robotic 5.9 days
- Mortality
  - Open 2.0%
  - Robotic 0.2%
- Morbidity
  - Open 54.1%
  - Robotic 43.8%

Ohio State Center for Robotic Surgery

- First robotic procedure: 1999
  IMA (internal mammary artery) takedown
- 9 Surgical specialties utilize the robotic platform
- 10,000th Robotic Procedure: May 2014 (est)

Challenges to the Surgeon

- Learning a new set of instruments
  - Same technique; different platform
- Discomfort associated with being at console not operating table
- Relying on bedside assistant for critical components of operation
- Inefficiencies introduced to operating day
- Longer procedure times
- Additional costs

Development of the Team

- Surgical Team
  - Surgeon/ PA
- Didactic videos/training
- Case observations
- Dry lab
- Cadaver lab
- Building skills in VATS and open cases
- Consistency

- Operating Room
  - Nurses/ Techs
- Case observation
- Dry lab for docking
- Cadaver lab
- Double scrub cases
- In-service training
- Desensitization
- Consistency

Technical Considerations

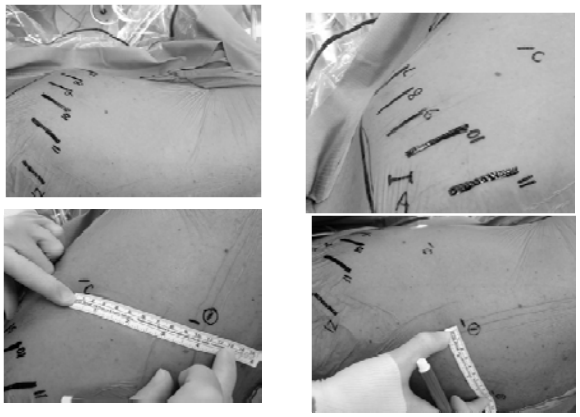
- Think low for camera port
  - 8th or 9th interspace
- Allow adequate space between ports
  8 – 10 cm
- Keep arm ports inferior to fissures
- Place assistant port inferiorly and anteriorly
- Minimize blunt dissection
  - Utilize energy for dissection
- Maintain dry operating field
- Dissect artery, vein, bronchus completely

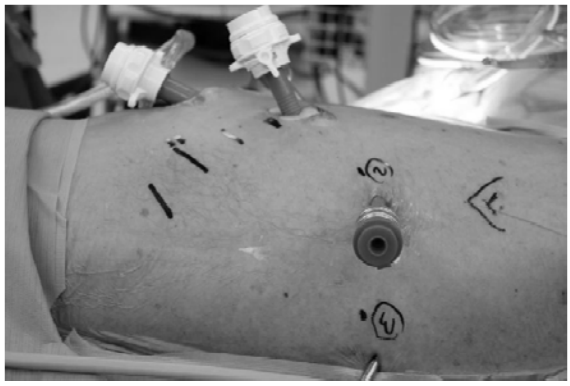
Thoracic Robotic Surgery

- 350 Procedures
- 205 Lobectomy
- 45 Mediastinal
- 25 Esophagectomy
- 75 Sublobar/Wedge Resection

Technical Considerations

- Use anterior arm to gain control of bleeding to facilitate posterior thoracotomy
- Use blunt retraction on lung

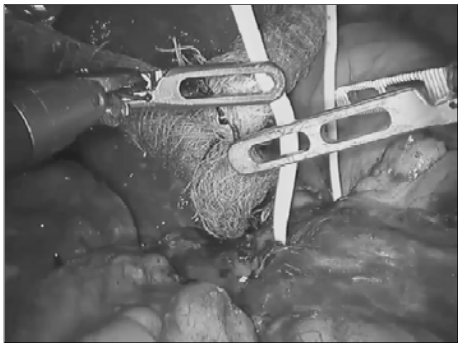




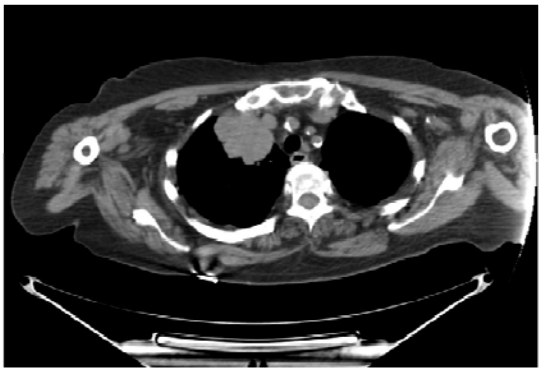
Conversions from Robotic Assisted

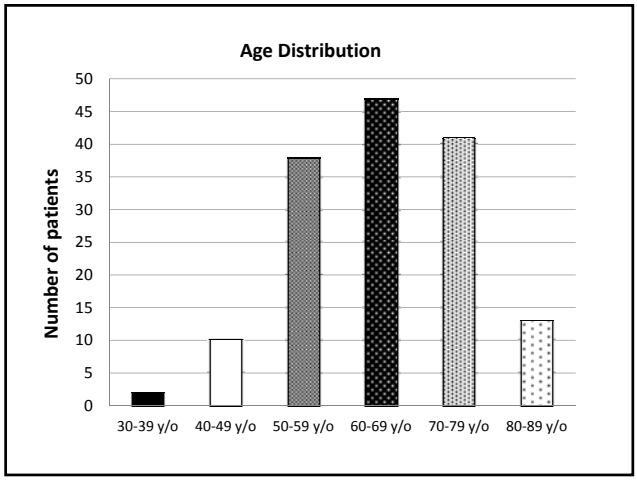
- **8 % conversion rate during lobectomy**
- **50% of conversions occurred in first 35 cases**

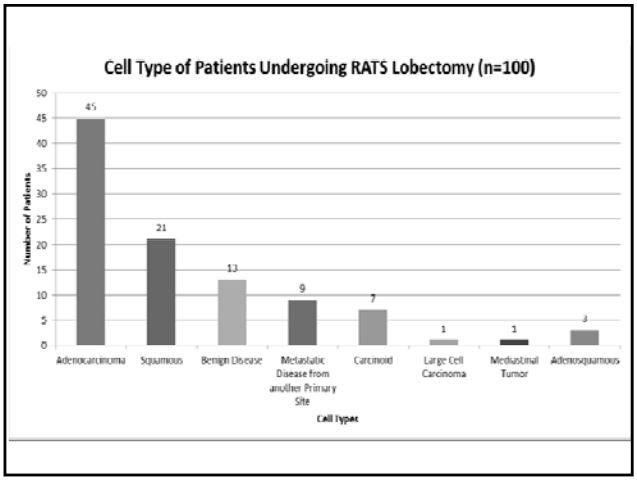
Video of Robotic Thoracic Surgery

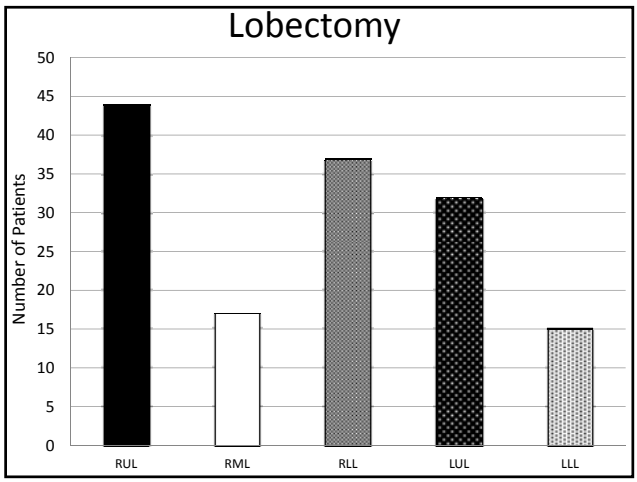


Extrapleural Right Upper Lobectomy

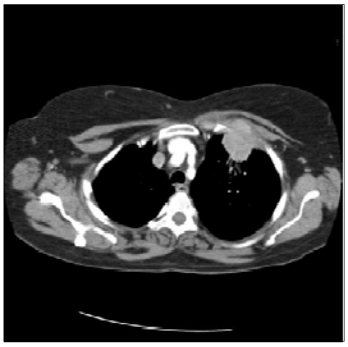


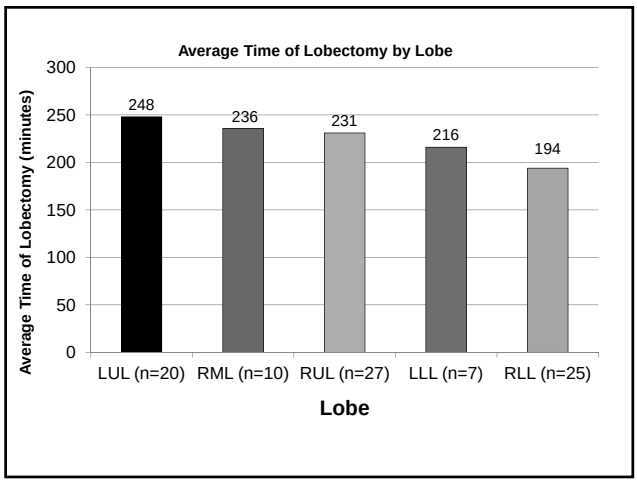


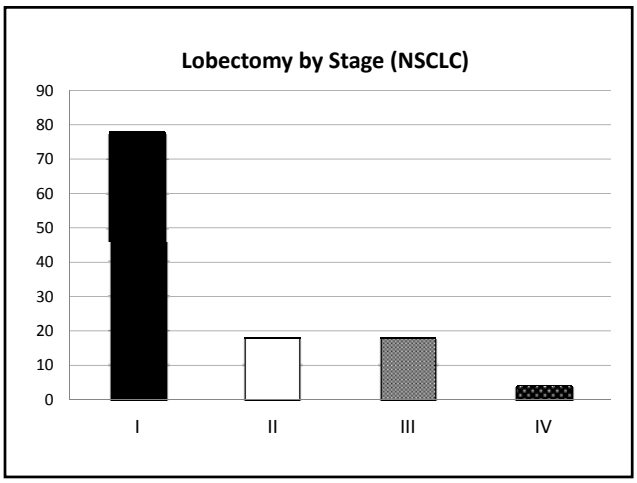




Hybrid Lobe and Chest wall

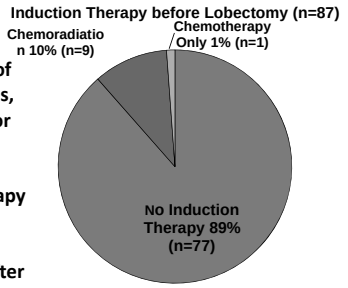


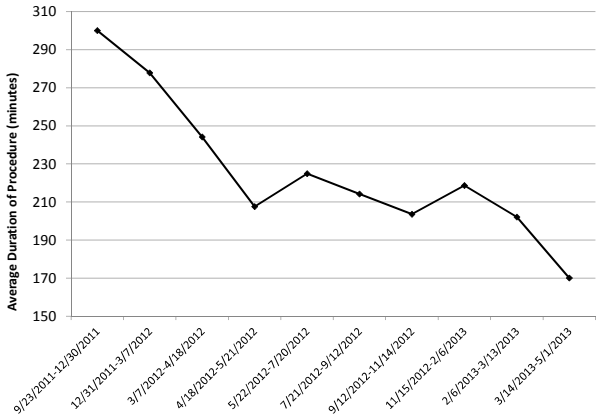




Robotic Surgery: Induction Therapy

- Time of procedure, length of stay, duration of chest tubes, and estimated blood loss for induction patients are no different than for patients who had no induction therapy
- Induction patients had no significant complications after lobectomy
- No 90-day mortality after lobectomy for induction patients





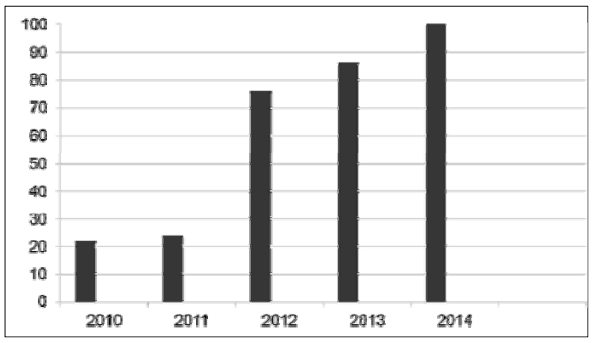
Advantages to Surgeon

- Visualization
- Range of motion
- Precision of dissection
- Two operating hands
- Ambidextrous instrumentation
- Same principles as open procedure
- Patient preference/ patient satisfaction

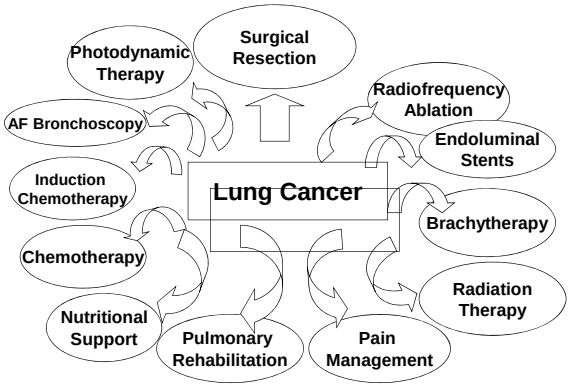
Advantages to Patient

- Smaller incisions; true port surgery
- Less pain acutely
- Less chronic pain
- Quicker return to lifestyle
- Improved ability to tolerate adjuvant therapy
- Better oncologic outcome?

Percentage of Minimally Invasive Lobectomies



Comprehensive Thoracic Oncology



Robotic Operations for Abdominal Cancers

Carl Schmidt, MD, FACS
Associate Professor of Surgery
Division of Surgical Oncology
The Ohio State University Wexner Medical Center

Abdominal/Pelvic Cancers

Cancer	Estimated deaths in 2014
Colorectal	50,310
Pancreas	39,590
Prostate	29,480
Liver and bile duct	23,000
Ovary	14,270
Esophagus	12,450
Bladder	11,170
Uterus	8,590
Kidney	8,900

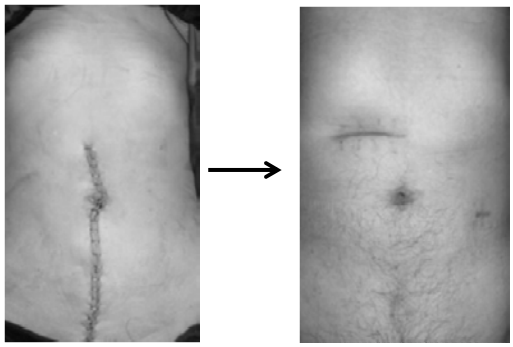
Total – 197,760 deaths

Cancer Statistics, 2014, American Cancer Society

Minimally-Invasive Surgery

- Laparoscopic or robotic procedures for most abdomen/pelvis cancers
- Benefits include
  - Small incisions
  - Less pain medication
  - Quicker return of bowel function
  - Hospital length of stay
  - Earlier return to work and usual activity

Small incisions



Robotic Surgery

- A tool for minimally-invasive operations
- 3D binocular vision – zooms in for tight spaces
- Increased degrees of freedom at wrist
- Longer OR time
- Increased cost

Robotics and Surgical Oncology

- Encouraged by experience of urologists and GYN-oncologic surgeons
- Four surgical oncologists began using the robot in 2010 – first with colorectal and adrenal cancers
- Future potential versus “falling behind”

OSU Robotic Surgical Oncologists

Sherif Abdel-Misih
Colorectal, gastric, GI

Mark Bloomston
Pancreas and GI

John Phay
Adrenal cancers

Carl Schmidt
Liver and GI

Total 165 robotic abdominal and pelvic operations to date

Key Factor to Success is Teamwork

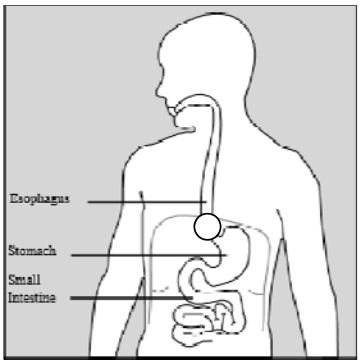
Problem-Solving

Fun

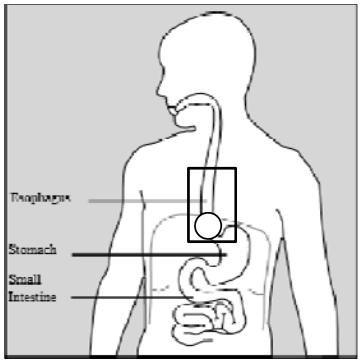
Esophagus Cancer

- **Adenocarcinoma type increasing dramatically due to acid reflux and other causes**
- **Aggressive cancer with high rate of mortality**
- **Many patients are treated with surgery, radiation and chemotherapy**

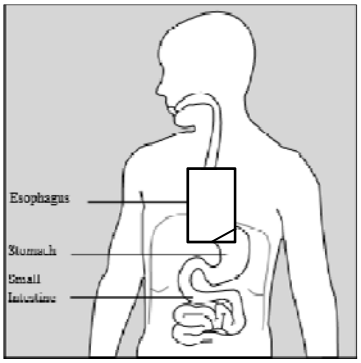
Removal of esophagus cancer



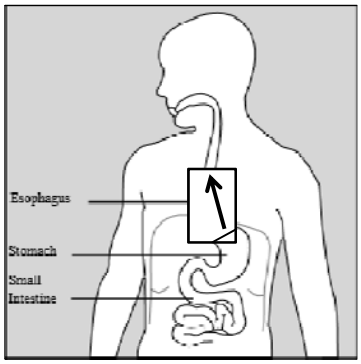
Removal of esophagus cancer



Removal of esophagus cancer

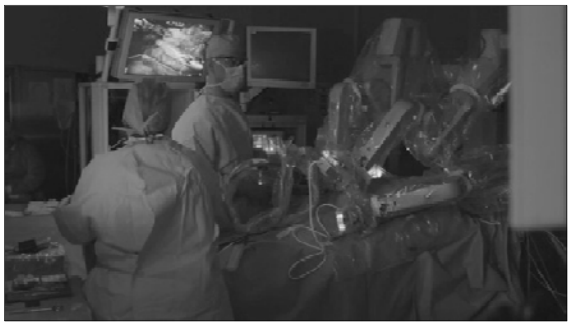


Removal of esophagus cancer



Robotic esophagectomy – Ed Kassis

Video Showing Robotic Surgery Team



Robot esophagectomy at OSU

- 20 operations in first year
- 95% treated first with chemoradiation
- Two required conversion to open technique
- Two tumors were not removable
- OR time average almost 10 total hours
- Hospital stay about 8 days
- 18% leak rate – no perioperative deaths

Final Thoughts

- **Our outcomes after abdominal and pelvic cancer operations depend mostly on cancer stage and complications**
- **It will be a good day when the main concern of any cancer patient is the size of a scar**
- **Robotic technology is helping us do better operations but proof is required**