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Robotic Sublobar Resection for the Surgical Management of Isolated Pulmonary Nodules

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Robotic Sublobar Resection for the Surgical Management of Isolated Pulmonary Nodules

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Disclosures

- None

Background

Lung Cancer – 2015 United States Estimates

- 221,200 cases (115,610 Male and 105,590 Female)
- More deaths than next four most common cancers combined
  - 158,040 deaths total
  - 86,380 Male
  - 71,660 Female
- 13% of all cancer diagnoses
- From 2007 to 2011 lung cancer incidence rates decreased by 3.0% per year in men and 2.2% in women
- Overall Survival Rates
  - One year: 44%
  - Five Year: 17%
- Early stage Lung cancer (Stage I and II):
  - Percentage of total diagnoses: 14%
  - Percentage of five-year survival: 54%

- Source: *Cancer Facts & Figures 2015*

Background

- The surgical management of benign and malignant lung lesions is an evolving field
- Techniques for anatomic pulmonary resection:
  - Rib-Sparing Thoracotomy (Current standard of care)
  - Video-Assisted Thoracoscopic Surgery
  - Robotic-Assisted Lung Resection

Background

- Video Assisted Thoracoscopic Surgery (VATS) paralleled laparoscopy offering a minimally invasive alternative to thoracotomy
  - Similar mortality rates and long term survival rates with:
    - Less morbidity
    - Less postoperative pain
    - Faster return to work compared to thoracotomy
  - Limitations of VATS
    - Lack of depth perception
    - Rigid instruments
    - High learning curve

Background

- Robotic surgery may offer a minimally invasive technique that is safe, efficacious and easier to learn than VATS
  - Less post-operative pain
  - Shorter hospital length of stay
  - Better early post-operative quality of life scores
- This study assesses the efficacy and perioperative outcomes of robotic-assisted pulmonary sublobar resection.

Methods

- Retrospective chart review at LVHN from October 2011 to June 2014
- All anatomic lung resections evaluated
  - Excluded
    - Open or VATS cases
    - Lobectomies, sleeve lobectomies, pneumonectomies, wedge resections
- 626 lung resections performed
  - 186 robotic pulmonary resections performed
  - 36 robotic segmentectomies
- Perioperative outcomes evaluated:
  - Length of stay
  - Operating room time
  - Estimated blood loss
  - Number of lymph nodes
  - Surgical margins
  - 30-Day Mortality
  - Conversion rate
  - Hospital based complications
  - Tumor size
  - Recurrence
- Robotic segmentectomies that required conversions were excluded from further analysis.

Methods

- All cases were performed by a single surgeon using the Da Vinci Robotic Surgical platform

Results

	Mean	Range
Age	65.4	41 – 83
BMI	27.9	17.9 – 42.3
Operative time	121 min	49 – 315 min
Estimated blood loss	51.9 mL	20 – 150 mL
Tumor size	1.57 cm	0.7 – 3 cm
Lymph Node Stations	3.32	0 – 7
Lymph Nodes	4.85	0 – 10

Results

Outcome	Number	Percentage
Positive margins	0	0%
Recurrence	1	2.94%
Readmission rate	4	11.76%
30-day mortality	0	0%
Conversion Rate*	2	5.56%
Median length of stay	2 days	Range 1-17

*Excluded from overall complication rates

Results

Hospital-based Complication	Number	Percentage
Air leak (>5 days)	4	11.76%
Pleural effusion	2	5.88%
Recurrent pneumothorax	1	2.94%
Atrial fibrillation	1	2.94%
Acute kidney injury	1	2.94%
Acute blood loss anemia	1	2.94%
Discharged with chest tube	7	20.59%

Discussion

- Approximately 20-30% of anatomic lung resections are performed using VATS
  - Technical difficulty of VATS may be barrier to minimally invasive chest surgery

Discussion

- Increased identification of solitary pulmonary nodules
- Controversy regarding sublobar resection of early stage NSCLC
  - Adequate lymph node sampling
  - Preserves lung volume and function
  - Controversy: equivalent oncologic outcomes as a traditional lobectomy

Discussion

- Potential Benefits of Robotic Surgery
  - High definition 3-D camera
  - Wristed instruments with 7 degrees of freedom
  - Dampening of tremor
  - Ability to control camera and up to 3 instruments simultaneously
  - Shorter learning curve compared to VATS

Conclusions

- This study demonstrates the feasibility, safety, and efficacy of robotic-assisted pulmonary sublobar resection for the treatment of isolated lung tumors.

- Further areas of research should focus on comparisons to VATS procedures, cost-benefit analysis and oncologic efficacy.
  - Longer follow-up period is needed to assess long term oncologic efficacy
  - Cost analysis should be performed to evaluate if the higher price of the robotic systems outweigh the possibly decreased OR time and hospital stay.

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Questions?