Lung Conservation Surgery
Techniques for Lung Cancer

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Disclosures

- None
Overview

- Sublobar resections:
  - Wedge resection
  - Segmentectomy

- Sleeve resection
Sublobar resections

- The main difference between a wedge resection and a segmentectomy?

A) Only one can be done via minimally invasive techniques
B) Only segmentectomy is equivalent to lobectomy for lung cancer
C) Segmentectomy requires vascular and bronchial isolation
D) Only wedge resection requires lymph node dissection
Sublobar resections

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Sublobar Resection

- **Wedge**: Removal of a non-anatomic portion of lung containing tumor. Cuts across lymphatic, vascular, and bronchial structures.

- **Segmentectomy**: Removal of an anatomic pulmonary segment (artery, vein, bronchus) containing tumor.

- Both resections can be done using minimally invasive and standard surgical techniques.
Sublobar resection

- Sublobar resection for lung cancer has a reduced morbidity and mortality compared with lobectomy

A) True  
B) False
Sublobar resection

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A) True
B) False
Operative outcomes

- Anatomic surgical resection and mediastinal lymph node dissection or sampling remains the standard treatment for early stage lung cancer.

- **STS database review, June 2014:**

  - **Mortality**
    - Lobectomy: 1-2% 55-64yrs, 2-3% 65-80yrs
    - Pneumonectomy (<15% of cases): 4-15%
    - Sublobar resection: 0.5-1%

  - **Prolonged Hospital Stay (>14 days)**
    - 5%- 55-64yrs  6%- 65-80yrs
Sublobar resection

Studies of post-operative pulmonary function following sublobar resection for lung cancer compared with lobectomy have consistently shown which of the following:

A) Greater preservation of FeV1
B) Greater preservation of DLCO
C) Greater preservation of TLC
D) None of the above
Sublobar resection

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Sublobar resection

Post-operative lung function results are not consistent

- Variation in amount of lung resected
- Variation in patient pre-op cardiopulmonary function status
- Variation in method of resection (VATS vs. Thoracotomy)
- Variation in amount and location of COPD

Kouritas et al  *Ann Transl Med* 2017;5(7):169
Sublobar resection

- When compared with lobectomy for lung cancer, sublobectomy is:

A) Is equivalent in cancer specific survival
B) Can be used for all localized/early stage tumors
C) Requires adjuvant radiation to prevent local recurrence
D) Has an increased overall tumor recurrence rate
Sublobar resection

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Howington, JA CHEST 2013; 143(S)(Suppl):e278S–e313S
Sublobar resection

- Prospectively collected database of Stage IA lung cancers underwent either lobectomy (146) or segmentectomy (46)
- Propensity matched comparison
- Lobectomy had more lymph nodes
- No difference between by technique for RFS or CSS
- Segmentectomy is equivalent to lobectomy for carefully selected cT1N0 lung cancers
- Additional lymph node sampling did not translate into increased survival

Sublobar resection

- SEER database review of 16,819 patients undergoing resection for Stage IA lung cancer
- For tumors <1.0cm: no difference in LCSS between lobectomy, segmentectomy and wedge resection
- For tumors 1.1-2.0cm: no difference in LCSS between lobectomy and segmentectomy but both were superior to wedge resection
- For tumors 2.1-3.0cm: lobectomy had superior LCSS to both segmentectomy and wedge resection

Sublobar resection

- ACCP Guidelines (2013):

- For patients with clinical stage I and II NSCLC who are medically fit for surgical resection, a lobectomy rather than sublobar resection is recommended (Grade 1B).

- For patients with clinical stage I NSCLC who may tolerate operative intervention but not a lobar resection due to decreased pulmonary function or comorbid disease, sublobar resection is recommended over nonsurgical therapy (Grade 1B).

- During sublobar resection of solid tumors in compromised patients, it is recommended that margins greater than the maximal tumor diameter for lesions less than 2 cm should be achieved; for tumors larger than 2 cm at least 2 cm gross margins should be sought to minimize the likelihood of a positive margin and/or local recurrence (Grade 1C).
Sublobar resection

- ACCP Lung Cancer Guidelines (2013):

- In patients with major increased risk of perioperative mortality or competing causes of death (due to age related or other co-morbidities), an anatomic sublobar resection (segmentectomy) over a lobectomy is suggested (Grade 2C).

- For patients with a clinical stage I predominantly ground glass opacity (GGO) lesion 2 cm, a sublobar resection with negative margins is suggested over lobectomy (Grade 2C).
Sublobar Resection: Selection Criteria

- Tumor size: <2cm ideal (peripheral)
- Segmentectomy > wedge resection
- Margin: margin to tumor ratio > 1
- Histology: MIA, AIS, synchronous primary
- Mediastinal lymph node dissection/sampling

Noguchi M et al. Cancer 2007;75(12):2844-2852
Patient

- 56 year old AF female
- Hx: Hypertension
  - Gerd (Barrett’s esophagus)
  - Smoking
- Low dose CT chest for screening 1/20/16 shows no lung nodules
- Repeat CT chest 3/23/17 shows new 1.2cm GGO with 9mm solid component
- PET/CT shows no uptake in nodule, mediastinum or extra-thoracic tissues
- Excellent performance status and PFT
Sublobar resection

- The next step in treatment is?:
  A) Follow up repeat CT in 6 months
  B) Interventional guided CT biopsy
  C) Surgical resection
Sublobar resection

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Localization

- Pt brought to IR suite and underwent CT guided placement of parenchymal coils to aid in localization
Surgery

- Brought to OR and underwent Right VATS with upper lobe sub-lobar resection and mediastinal lymph node dissection
Pathology

- Minimally invasive adenocarcinoma 4mm
- All margins negative for tumor
- All lymph nodes (10) negative for tumor
- Stage T1aN0M0 (stage Ia)

Follow up

- At one year, CT scan shows no evidence of recurrent tumor
Sleeve resections

- Bronchial sleeve resections are defined as removal of a segment of a main bronchus, typically in conjunction with the involved lobar or segmental bronchus and associated lung tissue with subsequent construction of a bronchial anastomosis.
- Allows for preservation of uninvolved lung tissue and thus lung function
- Technically demanding and may also require vascular sleeve resection
- Can be done via VATS or Robotic applications
Sleeve resections
Sleeve resections

- Prospective, multicenter observational trial
- 51 Sleeve resection, 68 Pneumonectomy (included induction Rx)
- No difference in 5 year survival and overall recurrence rate
- Loco-regional recurrence rate higher in sleeve resections
- Lymph node involvement and right sided operations were risk factors for loco-regional recurrence with sleeve resection

Sleeve resections

- ACCP Lung Cancer Guidelines (2013):
- For patients with clinical stage I or II central NSCLC in whom a complete resection can be achieved, a sleeve or bronchoplastic resection is suggested over a pneumonectomy (Grade 2C).
Conclusions

- Lung preservation techniques (sublobar and sleeve resections) can be used in properly selected lung cancer patients with comparable oncologic results.
- Lung preservation techniques can be applied using minimally invasive platforms with subsequent reduced morbidity and hospital stays.
- In the era of lung cancer screening, the potential for use of these techniques may increase and potentiate lung cancer survival improvement.
Thank you!