

Lung Conservation Surgery Techniques for Lung Cancer

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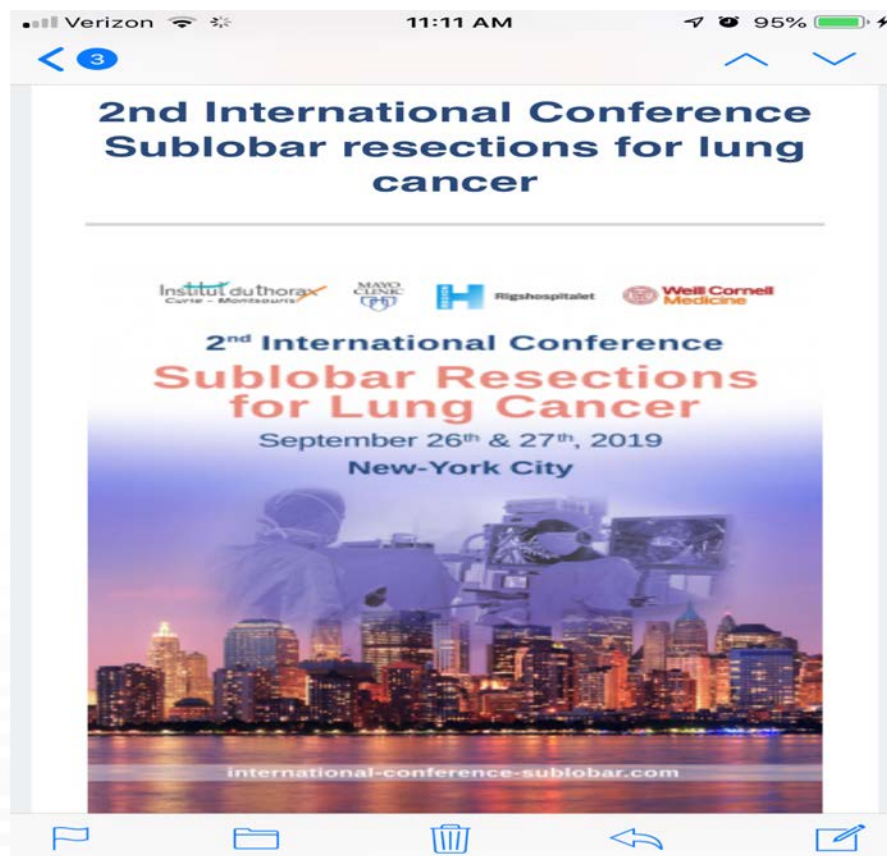


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Disclosures

- 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

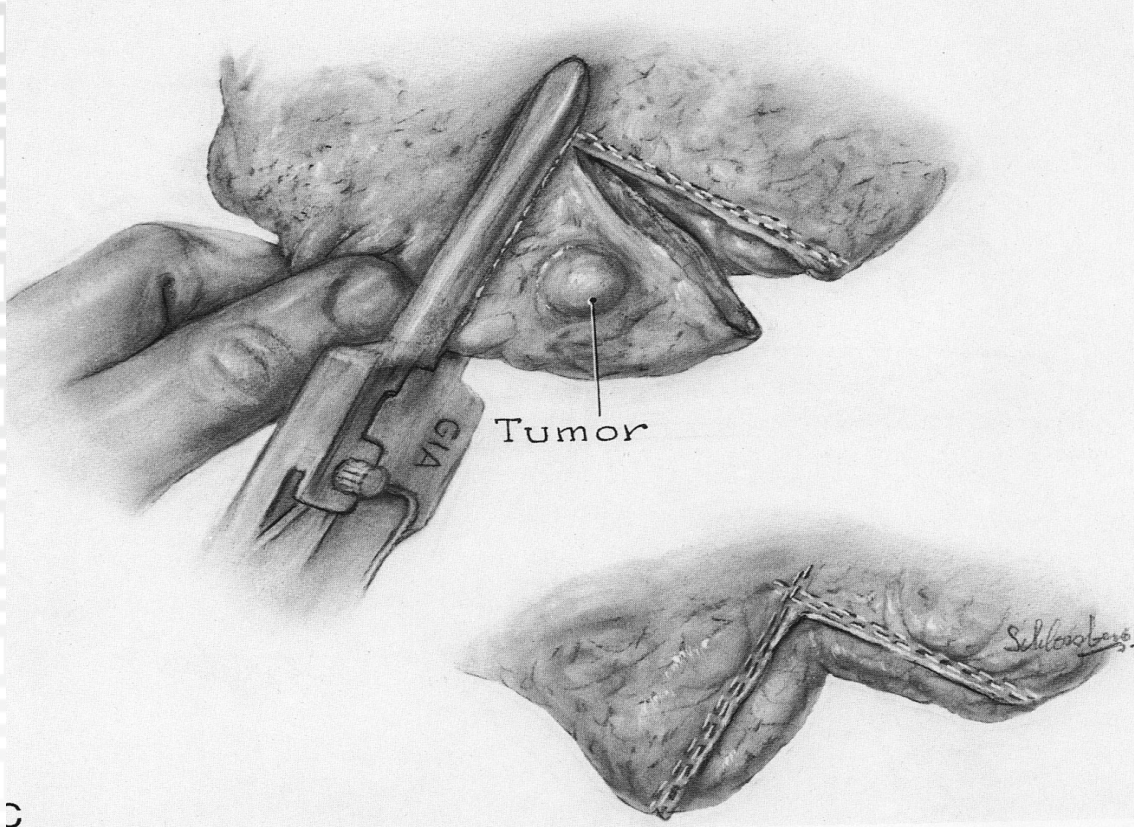
Sublobar resections

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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



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Sublobar resection

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

- A) True
- B) False

Sublobar resection

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

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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 - ~~B) Greater preservation of DLCO~~
 - ~~C) Greater preservation of TLC~~
 - D) None of the above**

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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First Author Year	Design	n		% of W/S patients			Patient Characteristics		% 5-year Survival			% Local Recurrence		
		Lobe	W/S	% Wedge	% able to have lobe	% GGO ^a	Stage	Size (cm)	Lobe	W/S	p	Lobe	W/S	p
Sublobar Resection as an Elective Alternative														
Ginsberg 1995 ^{95,96}	RCT	127	120	32	100	few	Ia	≤3cm	73	56	.06	7	18	0.009
Okada 2006 ⁹⁷	Prosp ^b	260	305	12	100	Many	Ia	≤2cm	89	89	NS	-	-	-
Koike 2003 ⁹⁸	Prosp ^b	159	74	14	100	-	Ia	≤2cm	90	89	NS	1	3	-
Large Database Comparisons														
Kates 2011 ⁹	SEER	1402	688	-	-	-	Ia	≤1cm	HR 1.12	NS	-	-	-	-
Wisnivesky ^c 2010 ¹⁰⁰	SEER	969	196	-	-	16 ^d	Ia	≤2cm	HR 1.10 ^e	NS	-	-	-	-
Case-matched and Selected Uncontrolled Comparisons														
Martin-Ucar ^e 2005 ¹⁰¹	Retro	17 ^f	17	0	0	-	Ia,b	-	64	70	NS	12	0	NS
Iwasaki 2004 ¹⁰²	Retro	55	31	0	-	-	Ia	≤2cm	73	70	NS	4	3	NS
El Sherif 2006 ¹⁰³	Retro	577	207	59	0	-	I	≤3cm	54	40	0.004	8	15	0.02
Wolf 2011 ¹⁰⁴	Retro	172	66	64	-	Few ^g	Ia	≤2cm	80	59	0.003	8	16	NS
Landreneau 1997 ¹⁰⁵	Retro	117	102	100	0	-	I	≤3cm	83	58	NS	9	18	.07
Schuchert 2007 ¹⁰⁶	Retro	246	182	0	most	Few	I	≤3cm	83	82	NS	5	8	NS
Schuchert 2011 ¹⁰⁷	Retro	32	75	71	most	-	I	≤1cm	64	55/73 ^h	NS	3	3	NS
Campione 2004 ¹⁰⁸	Retro	98	22	0	0	-	Ia	≤3cm	65	62	NS	2	19	-
Kilic 2009 ¹⁰⁹	Retro	106	78	0	-	-	Ia,b	-	47	46	NS	4	6	NS
Kodama 1997 ¹¹⁰	Retro	77	64	5	73	-	Ia	≤3cm	88	93/48 ⁱ	NS	1	2/12 ^j	NS/0.02 ^j

Howington, JA CHEST 2013; 143(5)(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

Cao, J Ann Thorac Surg 2018;105:1483–91

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

Okada M et al. *J Thorac Cardiovasc Surg* 2005;129(1):87-93

Sawabata N et al. *Ann Thorac Surg* 2004;72(2):415-420

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

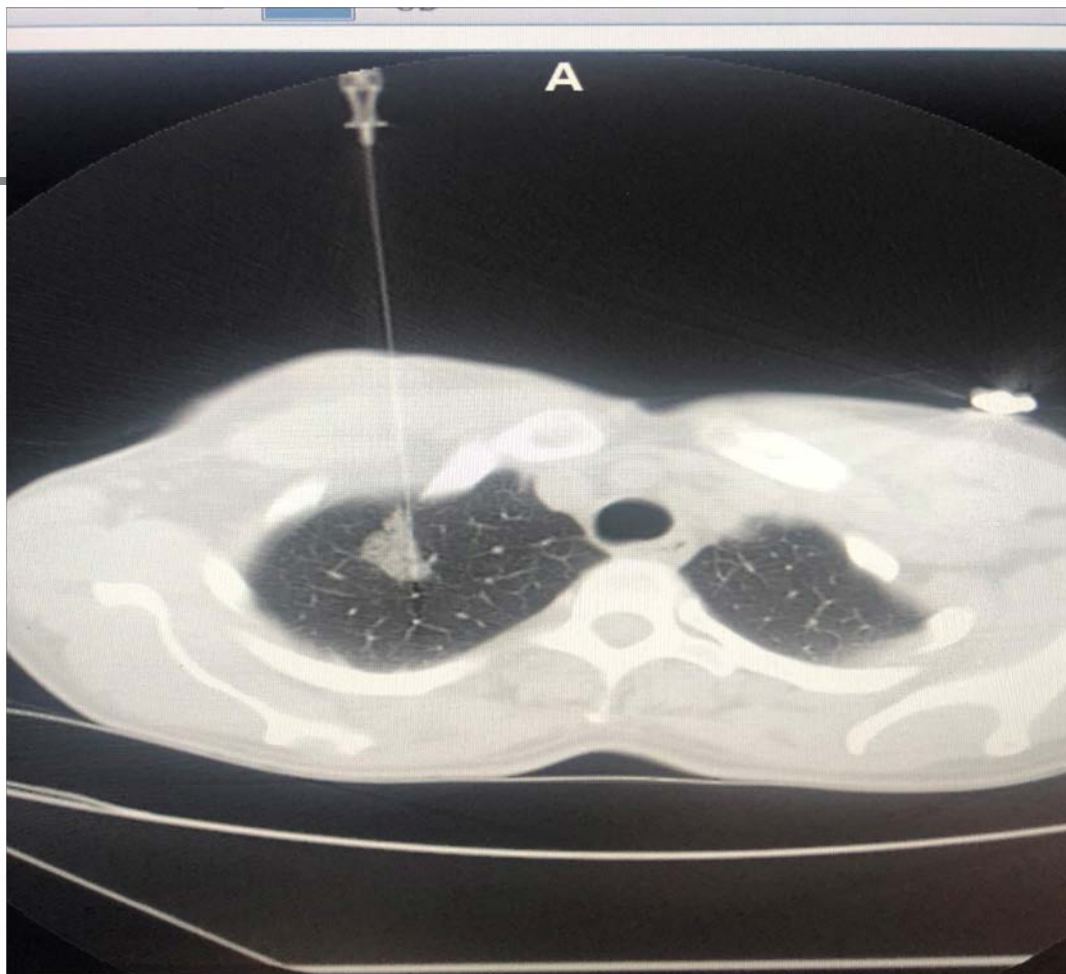
- The next step in treatment is?:
 - A) Follow up repeat CT in 6 months
 - B) Interventional guided CT biopsy
 - C) Surgical resection

Sublobar resection

- The next step in treatment is?:
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Localization

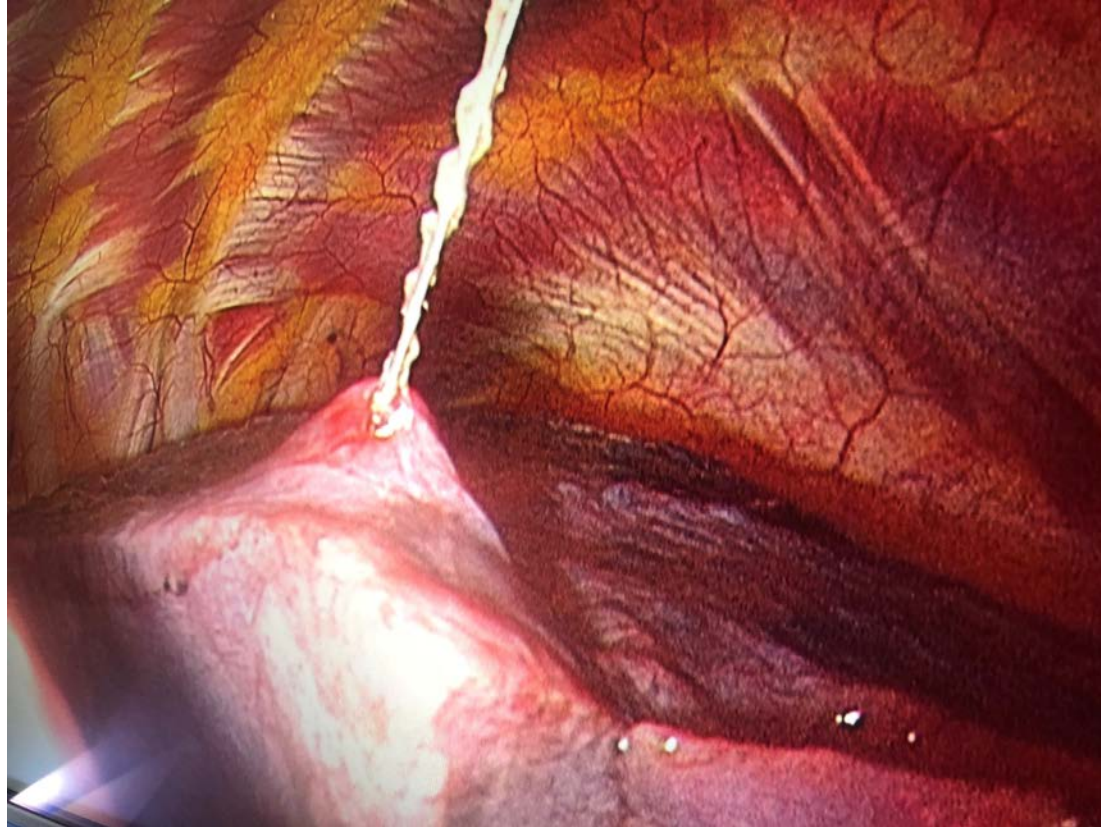
- Pt brought to IR suite and underwent CT guided placement of parenchymal coils to aid in localization



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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)

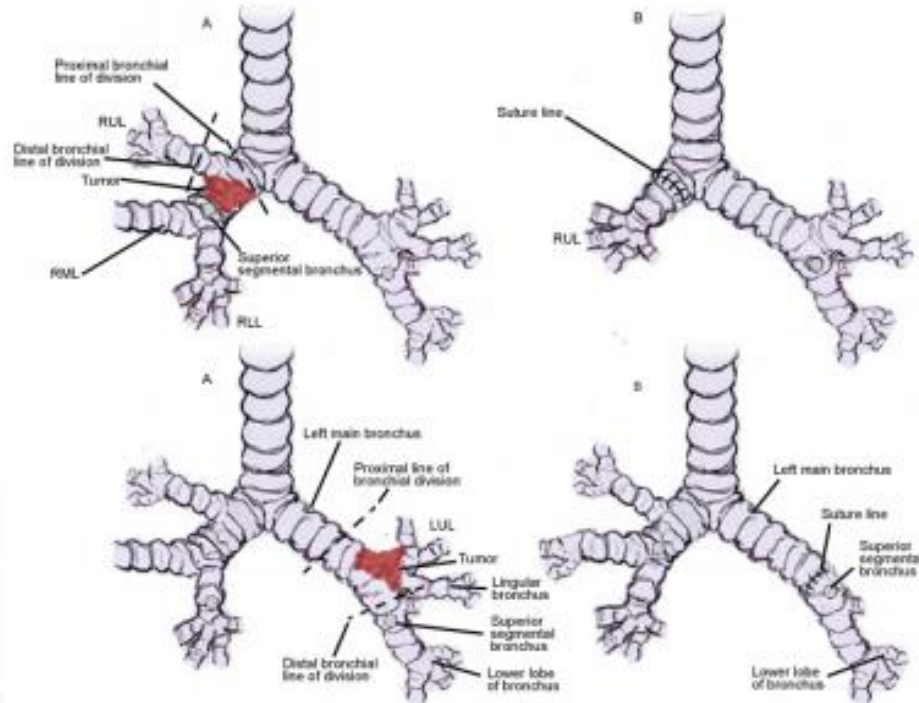
Follow up

- 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

Cusumano, G Ann Thorac Surg 2014;98:975–83

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!