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Introduction

Lung cancer is a leading cause of cancer-related mortality. Low-dose CT screening has increased early-stage lung cancer detection. Standard treatment for early-stage NSCLC has been lobectomy, but recent studies suggest sublobar resection may be non-inferior for small tumors. This study evaluates the survival and pathologic staging outcomes of sublobar versus lobar resection in clinical stage T1cN0M0 NSCLC.

Methods

Study Design: Retrospective observational cohort analysis using the National Cancer Database (NCDB) from 2010-2021.

Participants: Patients with clinical T1cN0M0 NSCLC undergoing lobectomy, wedge resection, or segmentectomy.

Outcome Measures:

- Primary: Overall survival
- Secondary: Pathologic staging outcomes (T, N, M stages)

Statistical Analysis:

- Propensity score matching
- Multivariable Cox proportional hazards models
- Kaplan-Meier survival estimates

Table 2: Unadjusted Outcomes of Patients Undergoing Pulmonary Resection for cT1cN0M0 NSCLC, by Treatment Type

	Overall %	Wedge Resection %	Segmentectomy %	Lobectomy %	P-value
Overall Outcomes		11.5%	4.5%	84.0%	
Pathologic Stage					
T Stage					
Downstaged (pT1b or less)	15.8%	21.3%	25.0%	14.6%	<0.001*
Accurately Staged (pT1c)	46.7%	43.1%	42.6%	47.4%	
Upstaged (pT2 or greater)	36.8%	34.2%	32.0%	37.4%	
Unknown	0.7%	1.4%	0.4%	0.6%	
N Stage					
Accurately Staged (pN0)	83.2%	73.1%	88.0%	84.3%	<0.001*
Upstaged (pN1 or greater)	13.6%	5.9%	7.1%	15.0%	
Unknown	3.2%	21.0%	4.9%	0.8%	
M Stage					
Accurately Staged (pM0)	99.5%	98.6%	99.4%	99.7%	<0.001*
Upstaged (pM1 or greater)	0.5%	1.4%	0.6%	0.3%	
Unknown	3.2%	21.0%	4.9%	0.8%	
TNM Stage					
Downstaged (pStage 1A2 or less)	14.0%	16.3%	23.2%	13.2%	<0.001*
Accurately Staged (pStage 1A3)	39.9%	31.9%	37.5%	41.1%	
Upstaged (pStage 1B or greater)	42.4%	30.5%	34.1%	44.5%	
Unknown	3.7%	21.4%	5.2%	1.2%	
Number of Lymph Nodes Resected (median, IQR)	5-15	0-6	3-11	6-15	<0.001*
Time to Definitive Treatment, Days (median, IQR)	14-59	0-59	0-63	17-59	<0.001*

*p value calculated by Kruskal Wallis test
*p value calculated by Pearson Chi square test

Figure 2: Kaplan-Meier Survival Estimates, Propensity Score-Matched Segmentectomy vs Lobectomy

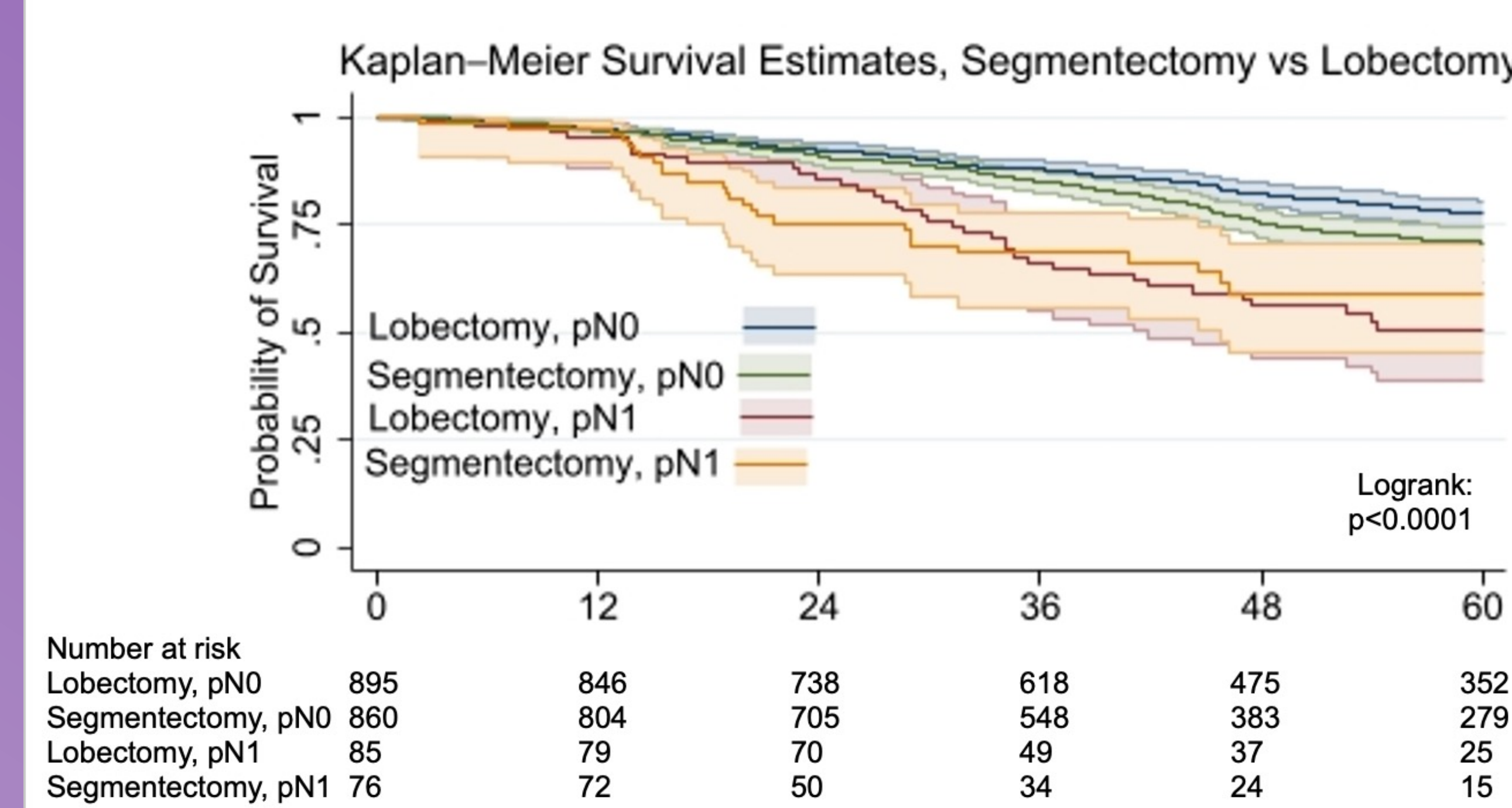


Figure 3: Kaplan-Meier Survival Estimates, Propensity Score-Matched Wedge Resection vs Lobectomy

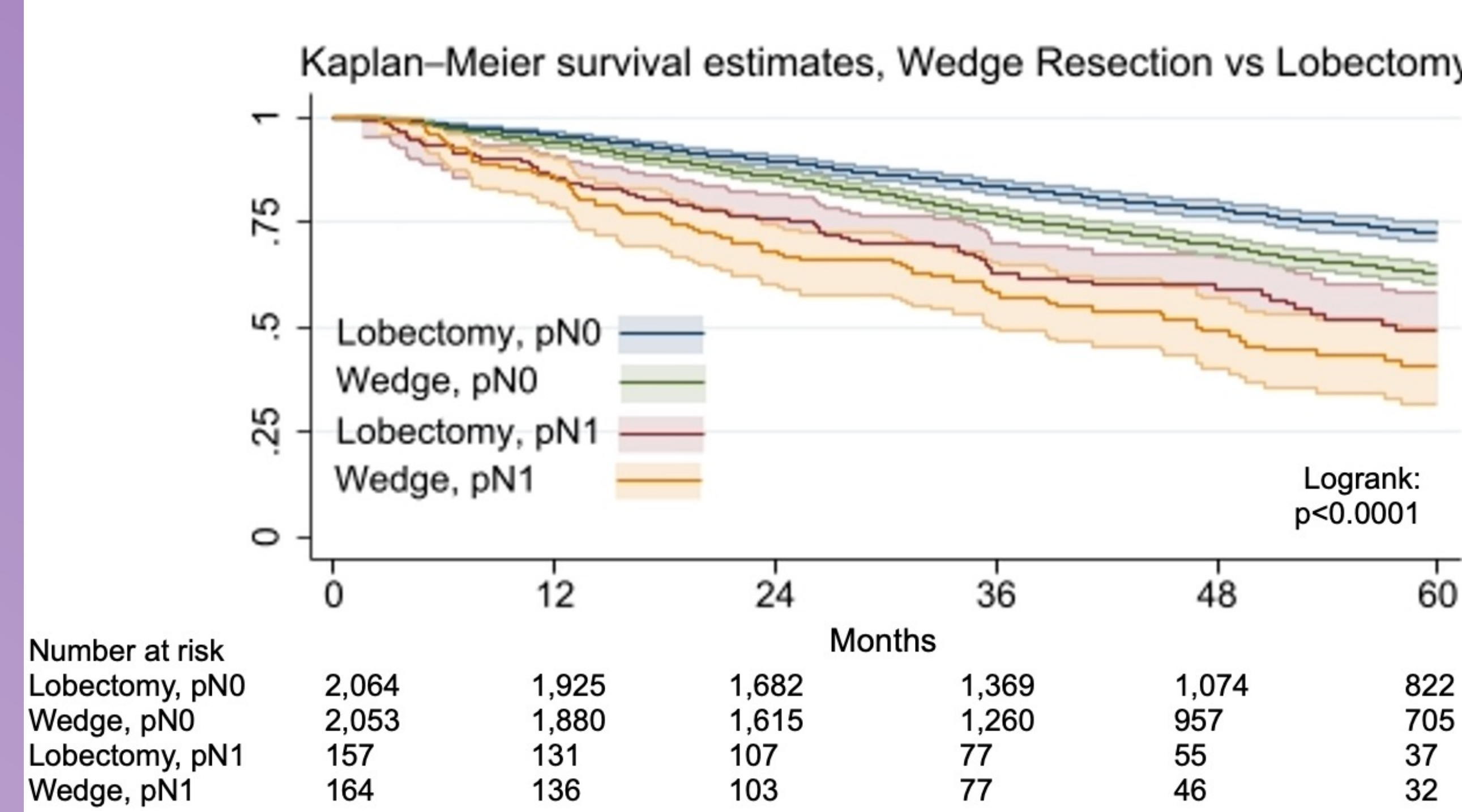


Figure 1: Kaplan-Meier Survival Estimates, Wedge Resection vs Segmentectomy vs Lobectomy

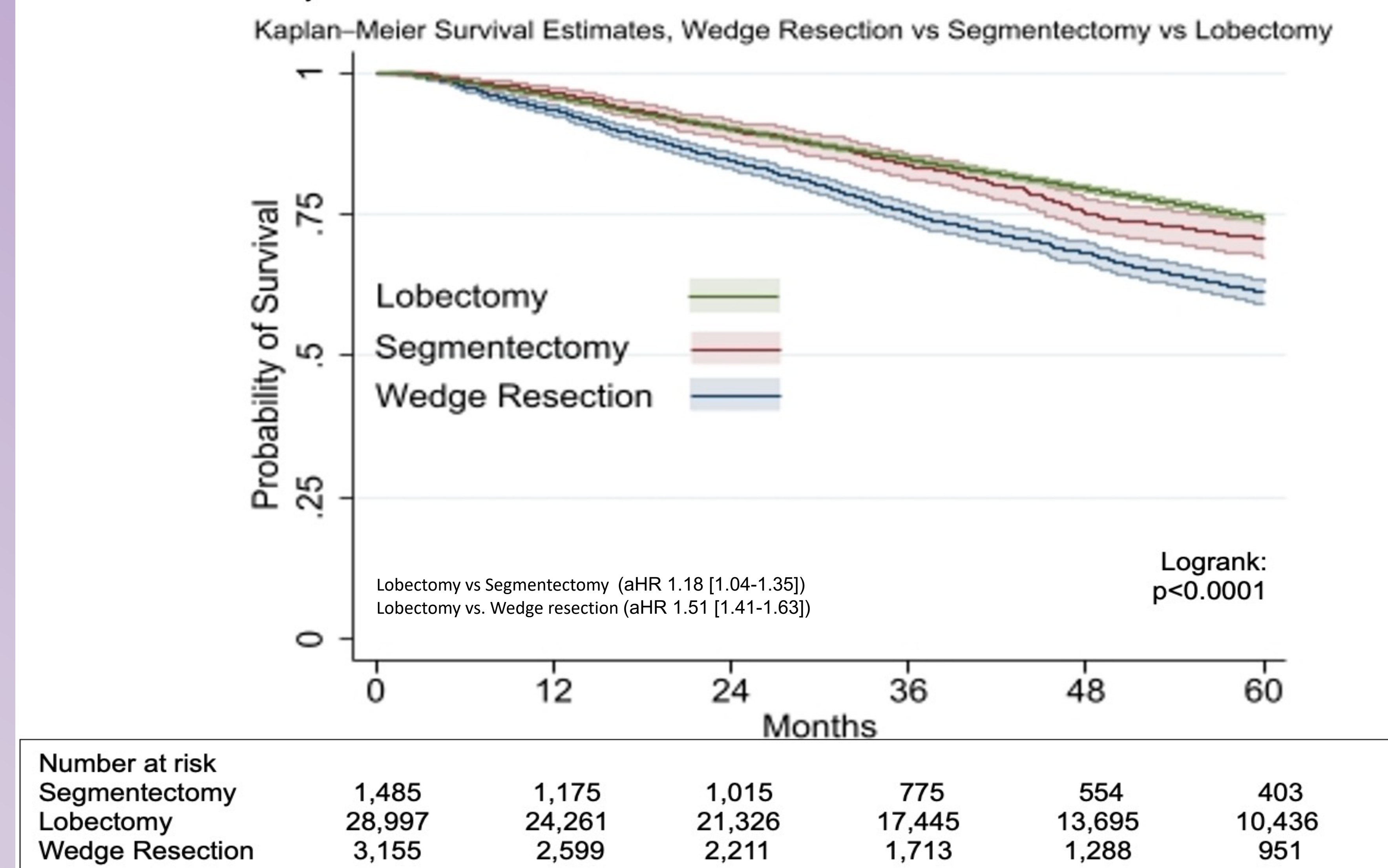


Table 1: Demographic and Clinical Characteristics of Patients Undergoing Pulmonary Resection for Clinical T1cN0M0 Non-Small Cell Lung Cancer, by Treatment Type

	Overall %	Wedge Resection %	Segmentectomy %	Lobectomy %	P-value
Overall		11.5%	4.5%	84.0%	
Demographics					
Age (median, IQR)	61-74	64-77	64-76	61-74	<0.001*
Charlson-Devo Comorbidity Score					
0	53.0%	46.6%	48.5%	54.1%	<0.001*
1	29.1%	29.9%	30.7%	28.9%	
2 to 3	17.9%	23.5%	20.9%	17.0%	
Facility Location					
New England	5.8%	8.0%	8.4%	5.3%	<0.001*
Middle Atlantic	16.0%	19.9%	23.2%	15.1%	
South Atlantic	24.0%	21.2%	21.4%	24.5%	
East North Central	18.0%	15.9%	14.7%	18.4%	
East South Central	8.5%	8.8%	6.1%	8.6%	
West North Central	8.0%	8.7%	5.7%	8.1%	
West South Central	6.7%	4.5%	4.3%	7.1%	
Mountain	3.3%	3.8%	4.7%	3.1%	
Pacific	9.8%	9.2%	11.7%	9.8%	
Clinical					
Annual Surgical Volume					
First Quartile (<6.5)	24.7%	28.7%	23.5%	24.2%	<0.001*
Second Quartile (6.5 to <12.75)	25.2%	24.8%	23.7%	25.3%	
Third Quartile (12.75 to <20.58)	24.5%	23.0%	20.8%	24.9%	
Fourth Quartile (≥20.58)	25.6%	23.5%	32.1%	25.6%	

IQR: interquartile range; LVI: lymphovascular invasion; VATS: video-assisted thoracoscopic surgery

*p value calculated by ANOVA
*p value calculated by Pearson Chi square test

Key Findings & Discussion:

- Lung cancer leading cause of cancer-related mortality in US
- Recent trials for ≤2 cm tumors showing non-inferiority of disease-free survival in sublobar resection compared to lobar resection^{1,2}
- Investigation of acceptable oncologic extent of resection for 2-3 cm tumors (cT1cN0M0) needed
- Objectives: 1) compare pathologic staging outcomes for patients with cT1cN0M0 NSCLC undergoing lobectomy versus segmentectomy versus wedge resection and 2) compare survival outcomes for patients with cT1cN0M0 NSCLC
- Unknown surgical treatment strategy for what should be done if pathologic nodal upstaging encountered for cT1cN0M0 tumors
- 35,567 patients analyzed (84.0% lobectomy, 11.5% wedge resection, 4.5% segmentectomy).
- Pathologic nodal upstaging was more common after lobectomy compared to sublobar resection (15% vs 7.1 and 5.9%, p < 0.001).
- Segmentectomy with pathologic nodal upstaging showed similar survival to lobectomy with nodal upstaging (aHR 0.93 [0.56-1.53]).
- Wedge resection with pathologic nodal upstaging was associated with worse survival compared to lobectomy with pathologic nodal upstaging.
- Interpretation:**
- Lobectomy remains the preferred surgical option for clinical T1cN0M0 NSCLC.
- Segmentectomy may be a viable alternative for patients with pathologic nodal upstaging.
- Wedge resection is associated with worse outcomes and should be considered cautiously

Conclusions

Main Takeaway: Lobectomy is the standard of care for T1cN0M0 NSCLC, but segmentectomy could be considered for patients with specific needs. Wedge resection shows poorer outcomes and should be limited to selected cases.

Future Directions: Further prospective randomized trials are needed to refine the criteria for selecting patients for sublobar resection.

References

- 1.) Saji H, Okada M, Tsuboi M, et al. Segmentectomy versus lobectomy in small-sized peripheral non-small-cell lung cancer (JCOG0802/WJOG4607L): a multicentre, open-label, phase 3, randomised, controlled, non-inferiority trial. *Lancet*. Apr 23 2022;399(10335):1607-1617. doi:10.1016/s0140-6736(21)02333-3
- 2.) Altorki N, Wang X, Kozono D, et al. Lobar or Sublobar Resection for Peripheral Stage IA Non-Small-Cell Lung Cancer. *N Engl J Med*. Feb 9 2023;388(6):489-498. doi:10.1056/NEJMoa2212083