

P1.132: Segmentectomy Provides Comparable Outcomes to Lobectomy for cStage IA1-IA2 but Not IA3 NSCLC: A Two-Center PSM Study

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INTRODUCTION

Recent phase III trials (JCOG0802 and CALGB140503) have established segmentectomy as a standard of care for peripheral NSCLC ≤2 cm (cStage IA1–IA2).

However, these landmark trials specifically excluded tumors with a solid component of 21–30 mm (cStage IA3).

In real-world practice, segmentectomy is frequently performed for cStage IA3 patients, often as a "compromised" procedure due to poor pulmonary reserve or severe comorbidities.

The long-term safety and survival outcomes of segmentectomy in this specific cStage IA3 population remain unclear.

OBJECTIVE To evaluate the real-world survival outcomes of segmentectomy versus lobectomy in cStage IA NSCLC, with a specific focus on the cStage IA3 subgroup.

METHODS

Study Design: A retrospective, two-center cohort study.

Study Period: January 2004 to January 2024.

Setting: Two regional referral centers (Yamagata University and Yamagata Prefectural Central Hospital). t.

Patients: 1,717 consecutive patients with cStage IA NSCLC who underwent curative-intent lobectomy (n=1,195) or segmentectomy (n=522). Patients who received neoadjuvant therapy or wedge resection were excluded.

Propensity Score Matching (PSM): 1:1 matching (caliper 0.2) was performed using 11 preoperative covariates: age, sex, smoking index, Charlson Comorbidity Index (CCI), clinical stage, tumor diameter, solid component diameter, CEA, operative year, %FVC, and FEV1.0%. This resulted in 422 matched pairs (n=844).

IA3-specific analysis: Because residual covariate imbalance remained within the exploratory matched cStage IA3 subgroup, an IA3-specific overlap-weighted analysis was additionally performed.

Endpoints: Primary endpoint: Overall Survival (OS)
Secondary endpoint: Recurrence-Free Survival (RFS)

DISCUSSION AND CONCLUSION

Actionable Take Away Message

For cStage IA1–IA2 NSCLC, segmentectomy provided long-term outcomes comparable to lobectomy in this real-world cohort.

In the exploratory matched cStage IA3 subgroup, segmentectomy was associated with worse OS and RFS; however, substantial residual covariate imbalance remained within this subgroup.

After IA3-specific overlap weighting, the associations with OS, RFS, recurrence, and death without recurrence were substantially attenuated and were no longer statistically significant, suggesting an important contribution of treatment-selection confounding.

Future Direction for Research

Prospective studies are needed to clarify whether intentional segmentectomy is oncologically appropriate for carefully selected patients with cStage IA3 NSCLC.

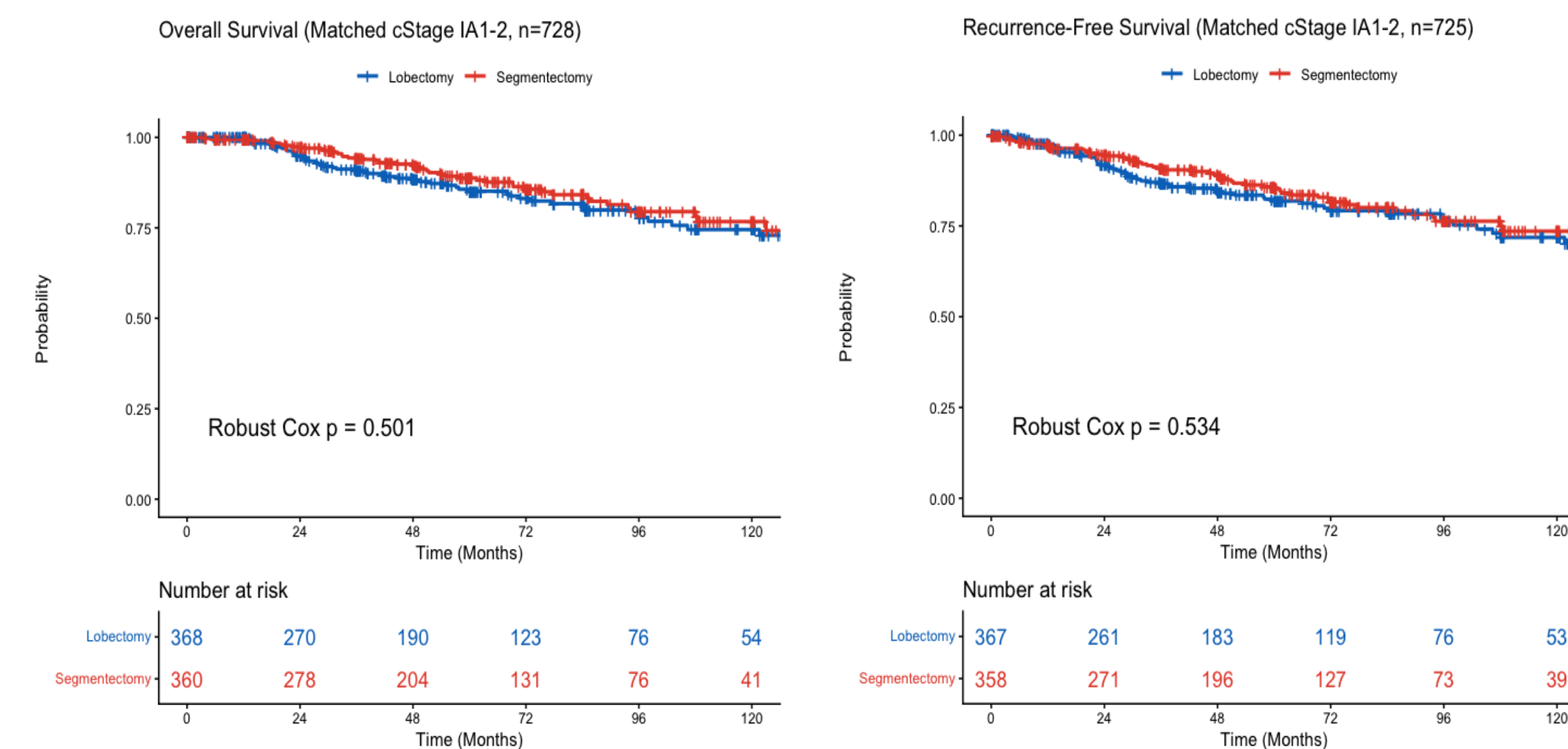
RESULTS

Table 1: Patient Characteristics Before and After Propensity Score Matching

Variable	Lobectomy (n=1,195)	Segmentectomy (n=522)	p	Lobectomy (n=422)	Segmentectomy (n=422)	p	SMD
Age (years)	70.0 [63.0–75.0]	72.0 [67.0–77.0]	<0.001	72.0 [66.0–76.0]	72.0 [66.0–76.8]	0.994	0.000
Male sex	651 (54.5%)	293 (56.1%)	0.814	250 (59.2%)	237 (56.2%)	0.403	0.062
Smoking index (pack-yr)	325 [0–880]	355 [0–940]	0.332	460 [0–1000]	310 [0–900]	0.294	0.094
CCI	1.0 [0.0–2.0]	1.0 [0.0–2.0]	<0.001	1.0 [0.0–2.0]	1.0 [0.0–2.0]	0.731	0.018
Tumor diameter (mm)	22.0 [17.0–26.0]	17.0 [13.0–21.0]	<0.001	18.0 [14.0–22.0]	17.0 [14.0–21.0]	0.103	0.075
Solid component (mm)	18.0 [14.0–23.0]	12.0 [7.0–17.0]	<0.001	14.0 [10.0–18.0]	13.0 [8.0–18.0]	0.076	0.092
CEA >5 ng/mL	216 (18.1%)	73 (14.0%)	0.031	64 (15.2%)	64 (15.2%)	1.000	0.000
SUVmax ≥3.0	630 (55.9%)	138 (31.3%)	<0.001	167 (42.1%)	121 (33.6%)	0.013	0.176
Solid component ≥21 mm	472 (39.5%)	61 (11.7%)	<0.001	56 (13.3%)	61 (14.5%)	0.690	0.092
%FVC	106.0 [95.5–116.1]	104.3 [93.5–115.9]	0.114	104.0 [94.0–115.2]	104.1 [93.6–116.1]	0.965	0.008
FEV1.0%	74.6 [69.2–80.4]	73.8 [66.7–79.1]	0.002	73.3 [67.2–79.0]	74.1 [66.8–79.5]	0.578	0.018
cStage			<0.001			0.116	0.051
IA1	135 (11.3%)	222 (42.5%)		124 (29.4%)	146 (34.6%)		0.069
IA2	562 (47.0%)	232 (44.4%)		244 (57.8%)	214 (50.7%)		0.094
IA3	465 (38.9%)	62 (11.9%)		54 (12.8%)	64 (14.7%)		0.008
Operative year, median [IQR]	2017 [2012–2020]	2017 [2013–2019]	<0.001	2018 [2013–2020]	2017 [2014–2020]	0.032	0.063
Operative year period, n (%)			0.001			0.036	0.051
2004 - 2012	278 (23.3%)	85 (16.3%)		94 (22.3%)	69 (16.4%)		
2013–2024	917 (76.7%)	437 (83.7%)		328 (77.7 %)	353 (83.6%)		

ND = nodal dissection; VATS = video-assisted thoracoscopic surgery. Values are median [interquartile range] or n (%). p-values were calculated using the Wilcoxon rank-sum test or Fisher's exact test. Major complications were defined as Clavien-Dindo grade ≥III.

Figure 2: Survival outcomes in the propensity score-matched cStage IA1–2 subgroup.



Kaplan-Meier curves for (A) overall survival and (B) recurrence-free survival in patients with cStage IA1 or IA2 disease (n=700; lobectomy, n=353; segmentectomy, n=347). HR = hazard ratio; CI = confidence interval.

Table 2: IA3-specific overlap-weighted sensitivity analysis.

Outcome	Analyzed Cohort (n)	Hazard Ratio (Segmentectomy vs Lobectomy)	95% CI
Overall Survival (OS)	526	1.50	0.95 – 2.37
Recurrence-Free Survival (RFS)	522	1.32	0.84 – 2.05
CI†: Recurrence	522	1.06*	0.54 – 2.07

Overlap weights were estimated using 10 preoperative covariates, including %FVC and FEV1.0%. All measured covariates were well balanced after weighting. OS was analyzed in 526 patients; RFS and competing-risk outcomes were analyzed in 522 patients. HRs and sHRs compare segmentectomy with lobectomy.

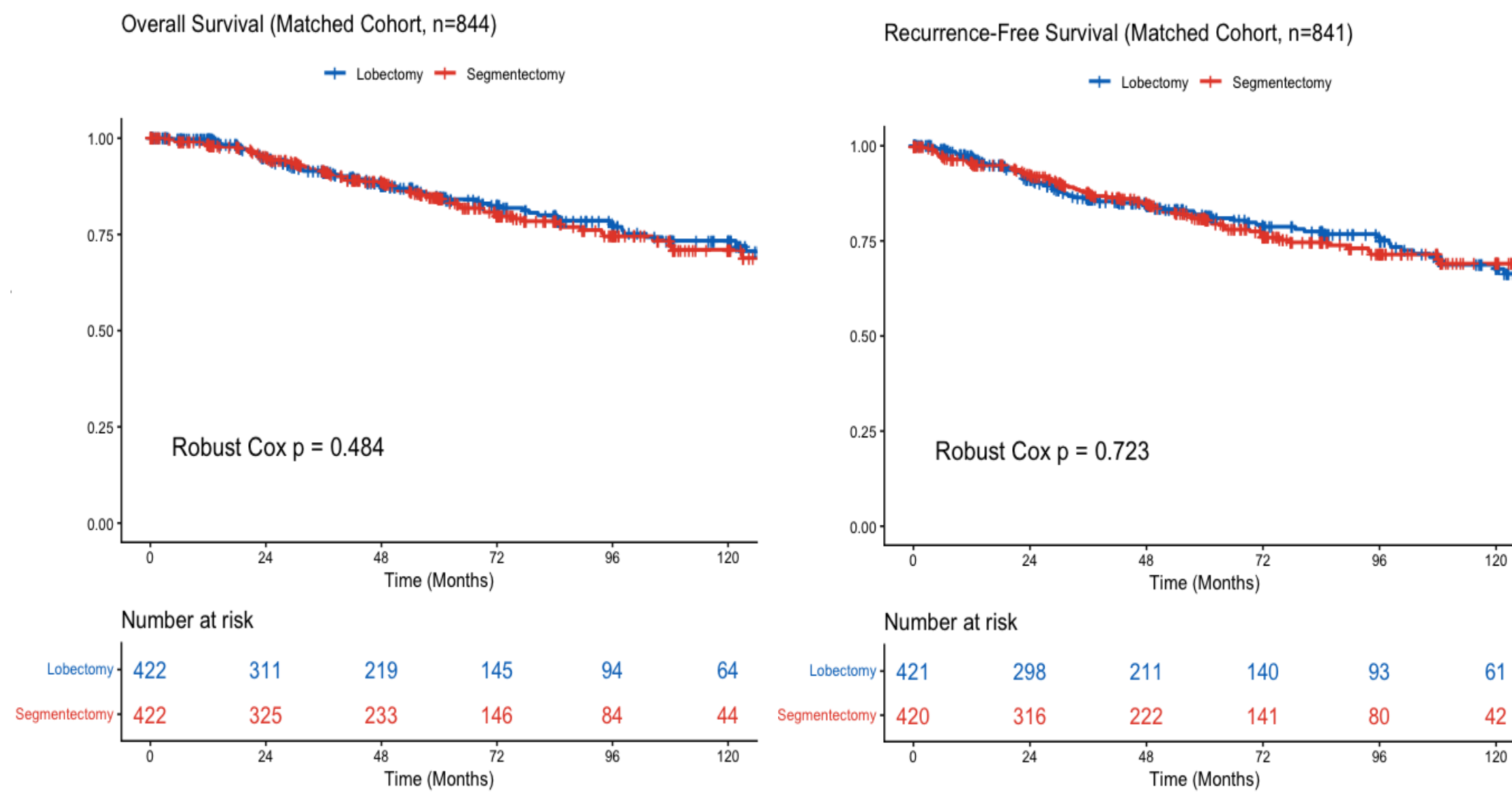
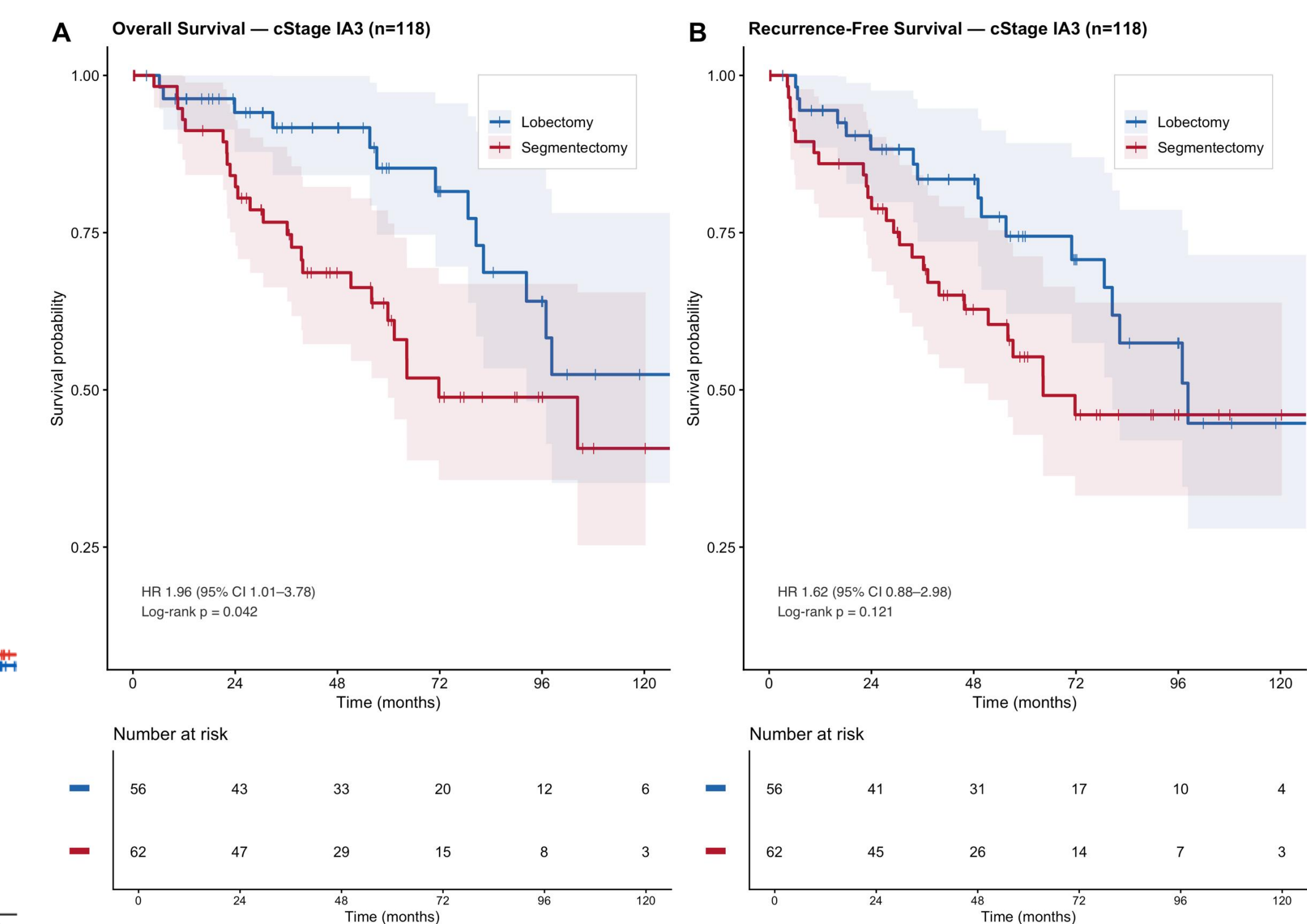


Figure 1. Survival outcomes in the overall propensity score-matched cohort. (A) Overall survival (n=844) and (B) recurrence-free survival (n=841). Cox proportional hazards models used robust variance estimators clustered by matched pair.

Figure 3: Survival outcomes in the exploratory propensity score-matched cStage IA3 subgroup.



Exploratory survival and competing-risk analyses in the matched cStage IA3 subgroup (n=118). (A) Overall survival, (B) recurrence-free survival, (C) cumulative incidence of recurrence, and (D) cumulative incidence of death without recurrence. Cox and Fine-Gray models used robust variance estimators clustered by matched pair. Residual covariate imbalance remained within the IA3 subgroup; therefore, these analyses were considered exploratory.

Table 3: Cause of Death and Recurrence Status in the Unmatched cStage IA3 Cohort (n=527)

Outcome / Status	Lobectomy (n=486)	Segmentectomy (n=63)
Total Deaths	115 (23.7%)	26 (41.3%)
Lung cancer-related death	51 (10.5%)	11 (17.5%)
Other malignancy	15 (3.1%)	7 (11.1%)
Other non-cancer disease	38 (7.8%)	8 (12.7%)
Unknown cause	11 (2.3%)	0 (0.0%)
Vital and recurrence status*		
Alive without documented recurrence	331 (67.9%)	35 (57.1%)
Alive with documented recurrence	41 (8.4%)	1 (1.6%)
Death with documented recurrence	55 (11.3%)	11 (15.9%)
Death without documented recurrence	59 (12.1%)	16 (25.4%)