

P1.145: Prognostic Impact of Tumor Spread Through Air Spaces and Optimal Surgical Extent in Stage I Non-small Cell Lung Cancer After Sublobar Resection

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INTRODUCTION

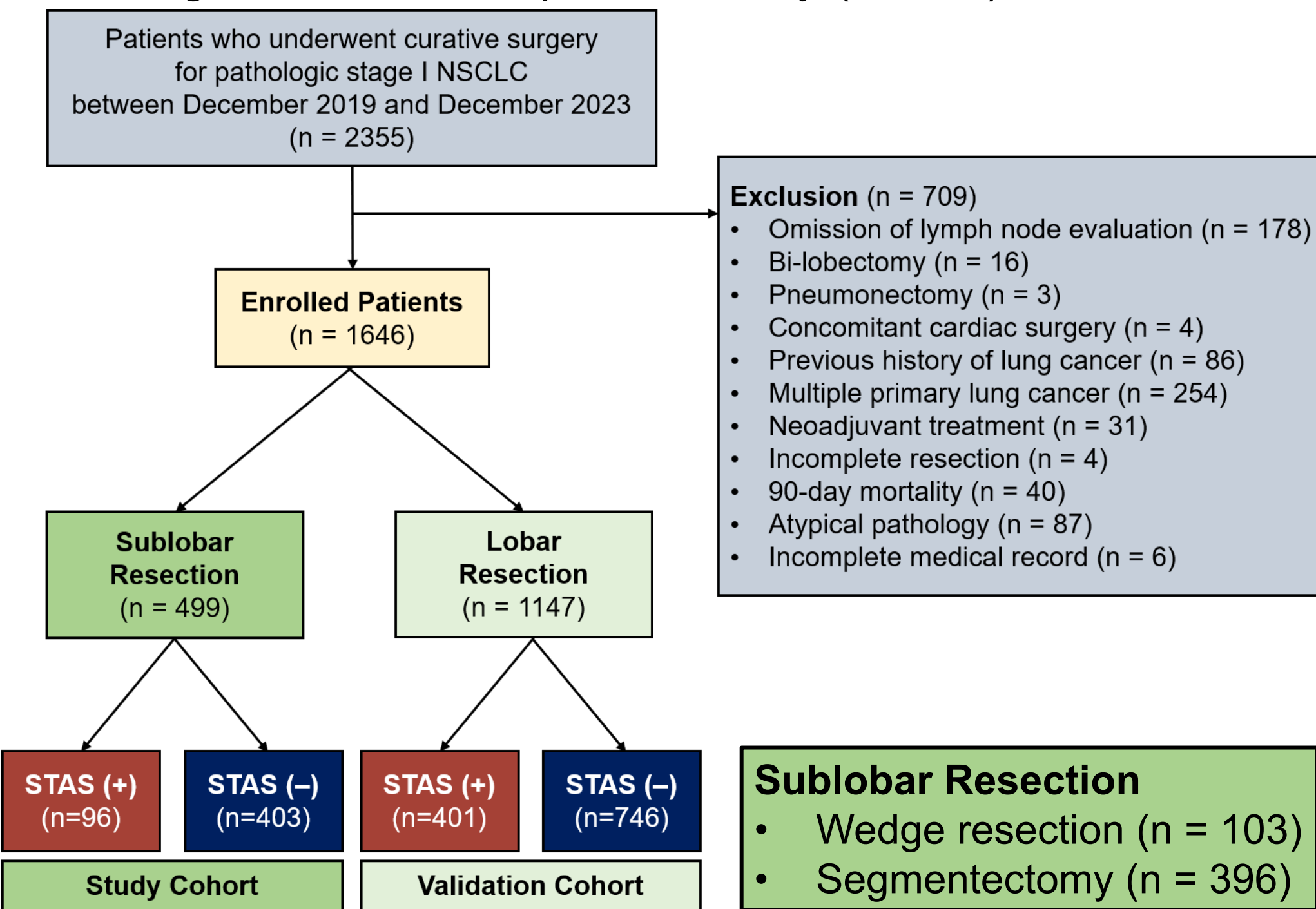
- JCOG0802/WJOG4607L and CALGB/Alliance 140503 established **sublobar resection** as standard for small peripheral non-small cell lung cancer (NSCLC).
- Tumor spread through air spaces (STAS)** is present in 15–40% of early-stage adenocarcinomas and is consistently associated with recurrence after limited resection.
- STAS *cannot* be established reliably *before or during the operation*: frozen section is specific but only 44–56% sensitive, and interpretation is only moderately reproducible.
- While sublobar resection is increasingly adopted, the **optimal surgical extent for STAS-positive** patients remains *unclear*.

→ If the excess risk conferred by STAS reflects inadequate local clearance, then a more extensive resection (lobectomy) should attenuate it.

METHODS

Study Population

- A single center, retrospective study (SNUH)



Endpoints

- Primary: Disease-free survival (DFS)
- Secondary: Locoregional relapse-free survival (LRRFS)

Statistical Analysis

- Propensity score overlap weighting (OW)**
 - Matching variables: age, sex, smoking history, ECOG-PS, FEV₁, DLCO, clinical T stage)
 - Balance: SMD < 0.1
- Kaplan-Meier method, Cox regression models
- Interaction analysis
- Restricted mean survival time (RMST), Number needed to treat (NNT) analysis: ordinal variable (wedge = 0, segmentectomy = 1, lobectomy = 2)

DISCUSSION AND CONCLUSION

Decide on anatomy, not on STAS.

STAS cannot be established reliably in the operating room. The actionable rule is therefore independent of STAS: **when a patient can tolerate a segmentectomy, wedge resection should not be preferred** and the cost of preferring it is four times greater if STAS is subsequently reported (NNT 4 vs 14).

Do not escalate to lobectomy.

When STAS is reported following a segmentectomy, escalation to lobectomy is **not supported**. (RMST difference −0.2 months, $P = 0.804$).

STAS defines a population for adjuvant systemic trials, even in stage I NSCLC.

Because the risk conferred by STAS was not attenuated by surgical escalation, STAS defines a population in which adjuvant systemic strategies warrant prospective evaluation.

REFERENCES & ACKNOWLEDGEMENTS

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During the preparation of this work, the authors used Gemini 3.1 Pro and Claude Opus 5.0 for grammatical error correction. After using this tool/service, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

RESULTS

1. Baseline Characteristics

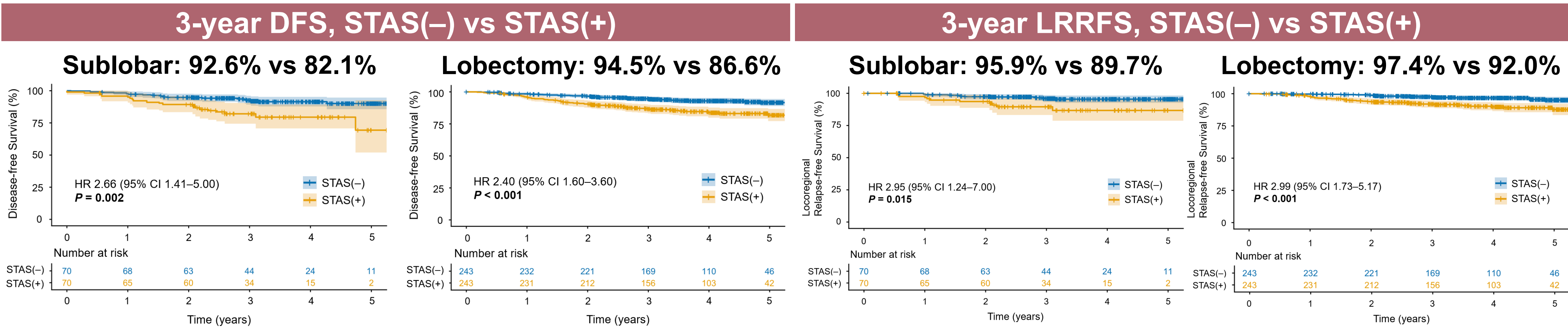
	Sublobar resection (N = 499)			Lobectomy (N = 1,147)		
	STAS(−) n = 403	STAS(+) n = 96	P	STAS(−) n = 746	STAS(+) n = 401	P
Age, year	64.4 (9.6)	67.9 (8.0)	< 0.001	65.0 (9.1)	65.1 (9.2)	0.837
Female, n	213 (52.9)	38 (39.6)	0.019	400 (53.6)	196 (48.9)	0.125
BMI, kg/m ²	24.1 (3.1)	24.6 (3.2)	0.141	23.9 (3.4)	24.0 (3.0)	0.681
Ever-smoker, n	164 (40.7)	48 (50.0)	0.097	302 (40.5)	191 (47.6)	0.020
ECOG ≥ 1, n	28 (6.9)	6 (2.2)	0.807	43 (5.8)	27 (6.7)	0.513
FEV ₁ , % predicted	108.0 (17.3)	102.7 (22.4)	0.034	109.4 (17.0)	109.1 (17.1)	0.721
DLCO, % predicted	97.4 (19.7)	97.0 (20.7)	0.883	100.2 (18.6)	97.4 (17.4)	0.011

* Continuous variables are reported as means with standard deviations.

* Categorical variables are presented as counts with percentages.

- Within the sublobar cohort, STAS positivity was associated with older age, male predominance, and impaired FEV₁.
- After OW applied separately within each cohort, baseline characteristics were well balanced with all SMD below 0.1.

2. STAS is an independent prognostic factor both after sublobar resection and lobectomy



* Kaplan-Meier estimates after OW. Numbers at risk are the sums of overlap weights rather than counts of patients.

3. Lobectomy do not attenuate the STAS-associated risk

STAS × extent-of-resection interaction				
DFS	Crude HR (95% CI)	P	Adjusted HR (95% CI)	P
STAS(+) vs STAS(−)	4.06 (2.21–7.46)	<0.001	2.82 (1.50–5.30)	0.001
Lobectomy vs sublobar resection	0.96 (0.58–1.60)	0.886	0.61 (0.36–1.05)	0.073
STAS × extent (interaction)	0.75 (0.37–1.55)	0.440	0.91 (0.43–1.93)	0.809
LRRFS				
STAS(+) vs STAS(−)	4.10 (1.77–9.50)	<0.001	3.26 (1.37–7.77)	0.008
Lobectomy vs sublobar resection	0.91 (0.45–1.86)	0.802	0.58 (0.28–1.22)	0.154
STAS × extent (interaction)	0.96 (0.36–2.58)	0.934	0.99 (0.36–2.74)	0.982

4. The benefit is confined to the wedge-to-segmentectomy transition and is larger in STAS(+)

