

Impact of STAS on Surgical Decision-Making: Lobectomy versus Segmentectomy A Retrospective Single-Center Analysis



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INTRODUCTION

Background: Spread through air spaces (STAS) is a histopathological feature in non-small cell lung cancer (NSCLC) associated with poorer prognosis.¹ In the JCOG0802/WJOG4607L trial, STAS was reported with a prevalence of 35.5%.²

Segmentectomy is increasingly used for early-stage NSCLC, but concerns remain that STAS may compromise local control. Its role in surgical decision-making is unclear.

Aim: To assess the impact of surgical resection type and STAS status on oncological outcomes in patients with NSCLC.

METHODS

Design

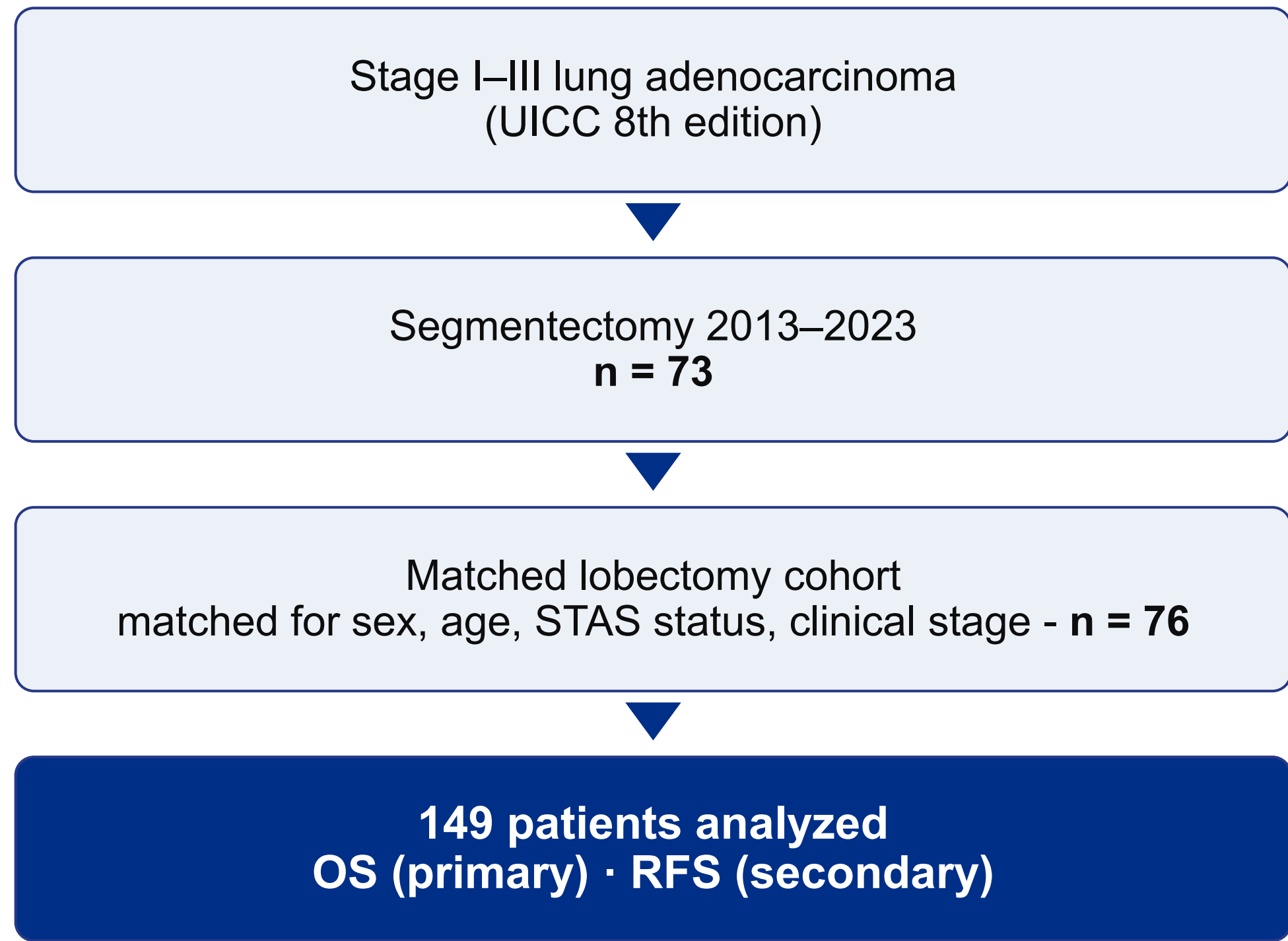
Retrospective single-center study of patients with stage I–III (UICC 9th edition) lung adenocarcinoma.

Endpoints

Overall survival (OS) was the primary endpoint; recurrence-free survival (RFS) was secondary.

Statistics

Kaplan–Meier estimates, log-rank tests and Cox regression; groups compared using chi-square or Fisher’s exact test.



RESULTS

149 patients

73 segmentectomy vs.
76 matched lobectomy

36.2% STAS

STAS-positive: 54/149

85.0

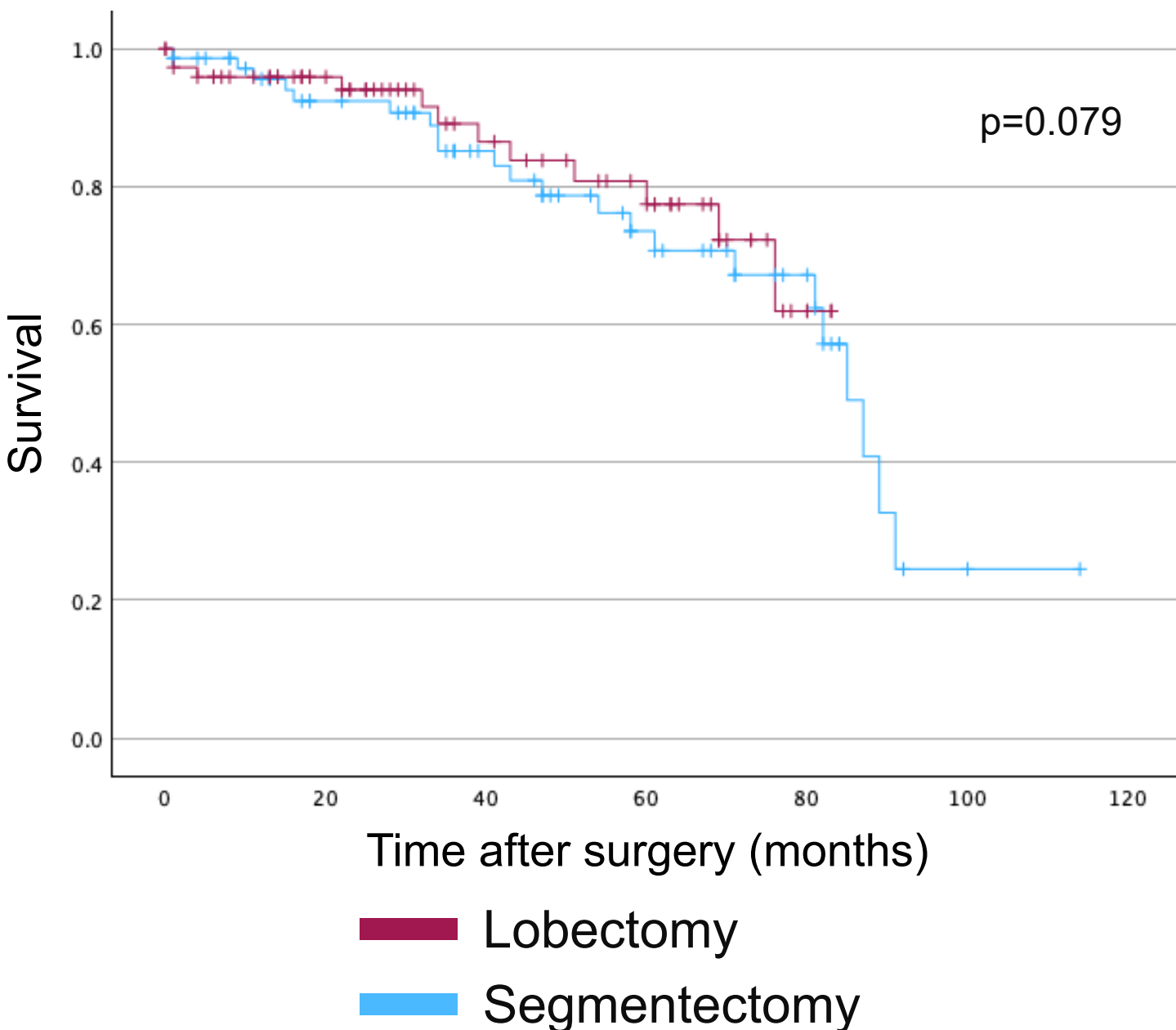
months median overall survival (95%
CI 79.0–91.0)

Variable	Total (n = 149)	Segmentectomy (n = 73)	Lobectomy (n = 76)	p
STAS positive*, n (%)	54 (36.2)	27 (37.0)	27 (35.5)	0.853
Age*, years, median (IQR)	67 (60–72.5)	68 (61.5–74)	66 (58.3–72)	0.077
Female sex*, n (%)	74 (49.7)	31 (42.5)	43 (56.6)	0.085
Clinical stage IA1–IA3*, n (%)	125 (83.9)	63 (86.3)	62 (81.6)	0.622†
pN0, n (%)	141 (94.6)	67 (91.8)	74 (97.4)	0.305
pN1, n (%)	3 (2.0%)	2 (2.7%)	1 (1.3%)	0.305
pN2, n (%)	2 (1.3%)	1 (1.4%)	1 (1.3%)	0.305
Vessel invasion V1, n (%)	18 (12.1)	5 (6.8)	13 (17.1)	0.055
Minimum margin, mm, median (IQR)	10 (4–21)	8 (3.5–18)	15 (4–30)	0.013
Micropapillary growth pattern	7 (4.7%)	3 (4.1%)	4 (5.3%)	0.082
Visceral pleura invasion (PL1), n (%)	16 (10.7%)	6 (8.2%)	10 (13.2%)	0.330

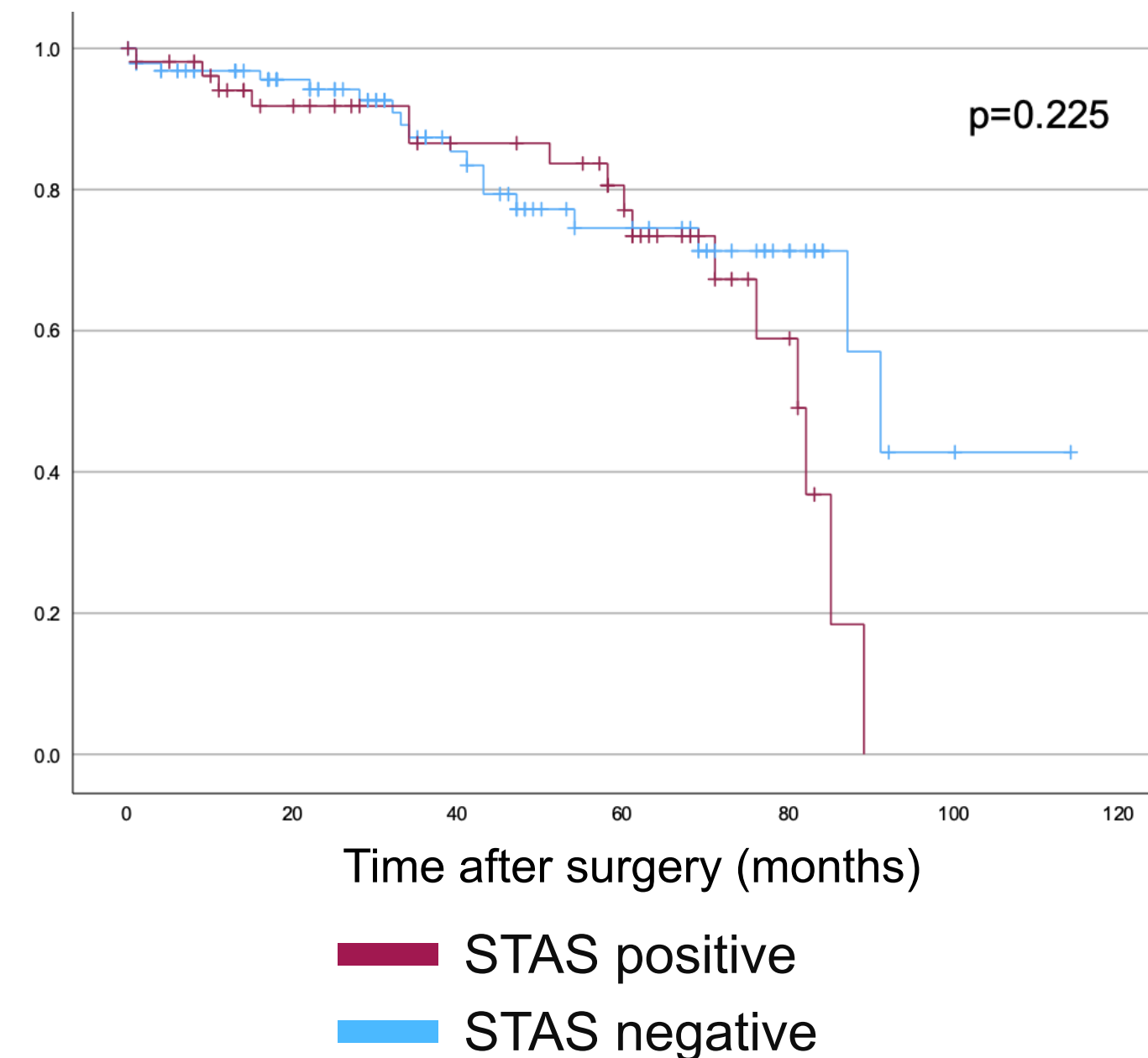
* Matching criteria for the surgical procedure groups. † p value refers to the full clinical-stage distribution. Condensed Table 1.

Overall survival

OS by surgical procedure

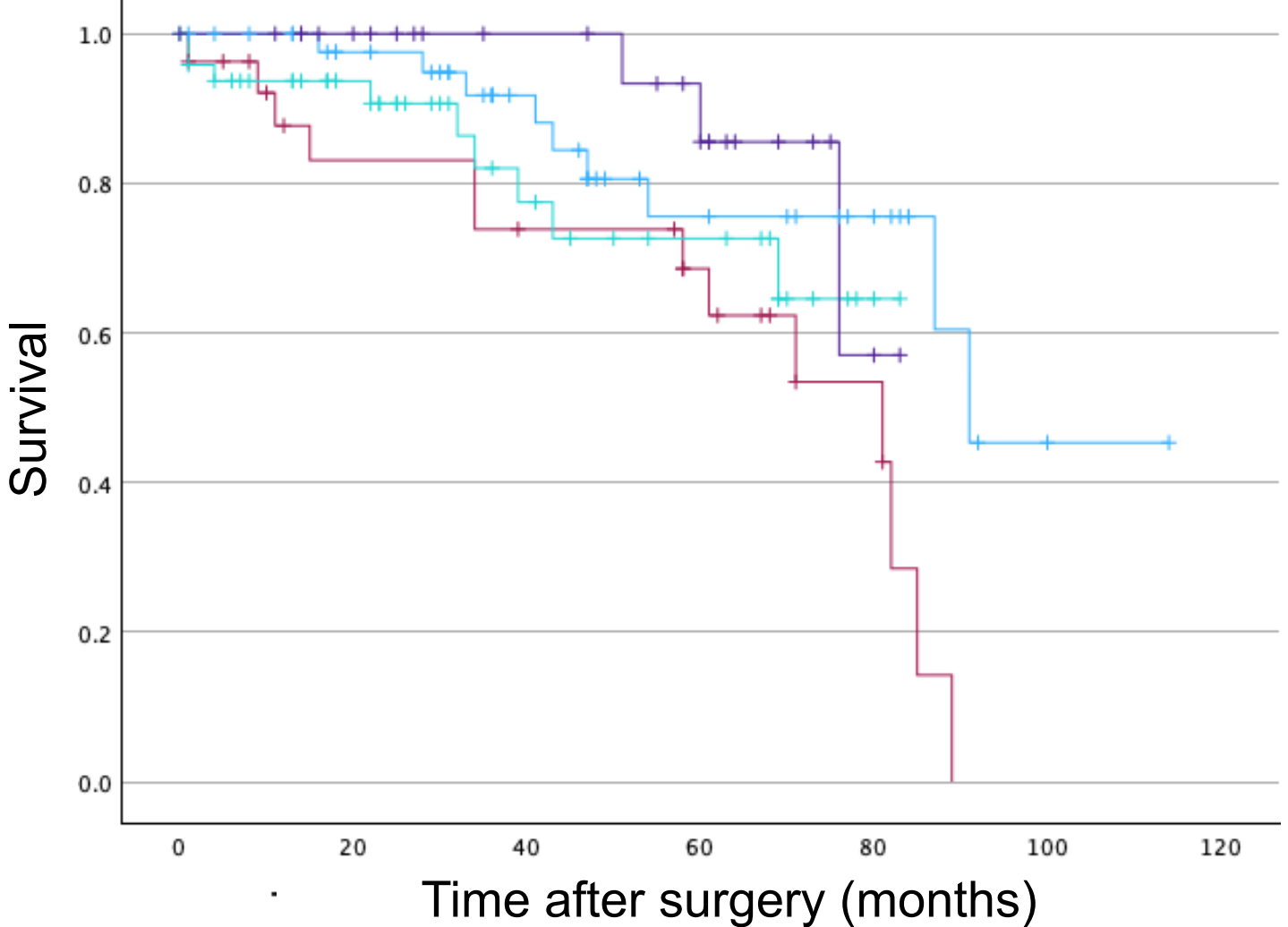


OS by STAS status



- Overall, 34 deaths (22.8%) occurred.
- Segmentectomy showed a higher proportion of deaths (30.1% vs. 15.8%) but was not independently associated with OS (HR 2.57, 95% CI 0.90–7.33, p=0.079).
- Recurrence occurred in 18 patients (12.1%) and was more common after segmentectomy (17.8% vs. 6.6%, p=0.039).
- Neither the type of procedure (HR 5.92, 95% CI 0.83–42.49, p=0.077), nor the STAS status (HR 0.30, 95% CI 0.04–2.54, p=0.267) was independently associated with recurrence-free survival in multivariable analysis.

Overall survival by surgical procedure and STAS status



Group	n	Events, n (%)	Median OS (95% CI) (months)	2-year OS (95% CI) (%)
Segmentectomy STAS–	46	9 (19.6)	91.0 (NE)	97.6% (92.9–100)
Segmentectomy STAS+	27	13 (48.1)	81.0 (53.4–108.6)	83.1% (67.8–98.4)
Lobectomy STAS–	49	9 (18.4)	NR	90.9% (82.3–99.5)
Lobectomy STAS+	27	3 (11.1)	NR	100%*

Global log-rank p=0.025; post hoc Segmentectomy STAS– vs. STAS+ p=0.008. Colours match the curves in panel B. NE: not estimable; NR: not reached.*no events observed before 24 months

CONCLUSION

Key Messages

- Segmentectomy and lobectomy showed comparable overall survival in early-stage lung adenocarcinoma, supporting limited resection in selected patients.
- While STAS alone was not independently associated with outcomes, its combination with segmentectomy was linked to worse survival. This difference was already apparent by 2 years (83.1% vs 97.6% OS). STAS may therefore be relevant when tailoring surgical strategy, with lobectomy potentially preferred in STAS-positive tumors.
- The reported prevalence of STAS was consistent with previous studies, such as the JCOG0802/WJOG4607L trial (35.5%).²

Future Directions

Further prospective studies are needed to confirm the role of STAS in clinical decision-making — in particular whether intraoperative STAS assessment should prompt conversion from segmentectomy to lobectomy.

REFERENCES

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- Y. Yatabe M.B., Beasley M.-S., Tsao A., et al., **PL03.16 Spread Through Airways (STAS) and Prognosis in the Phase III JCOG0802/WJOG4607L Trial of Segmentectomy vs Lobectomy in NSCLC.** J Thorac Oncol, 2025.

