

Surgical management of pulmonary neuroendocrine tumours

A multicentre UK cohort study · 504 patients · 2014–2024 · median follow-up 60 months

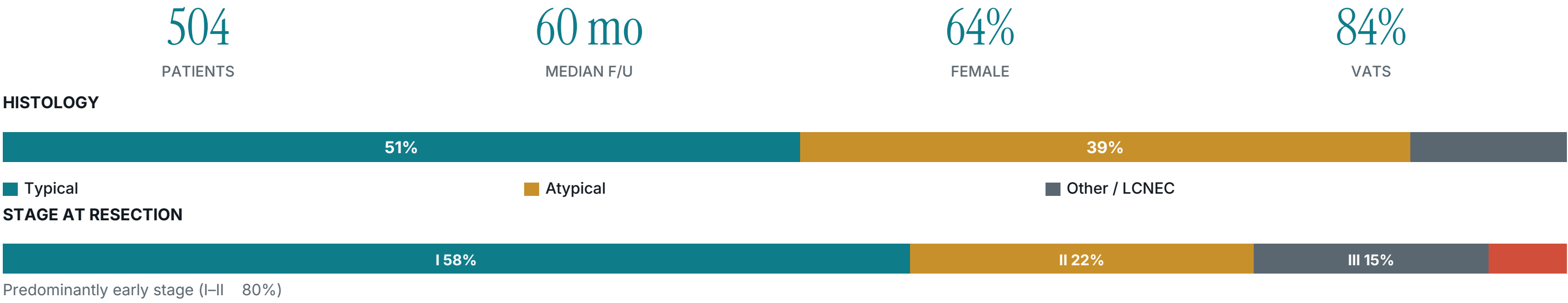
N. Berjaoui, M. Mazcuri, R. Mehdi, A. Abid, U. Zafar, S. Cotton, V. Rogers, B. Naidu, D. Nonaka, S. Hughes, T. Shah, M. Kalkat, A. Patel, A. Bille

 Guy's & St Thomas' NHS Foundation Trust, London, UK · University Hospitals Birmingham, Birmingham, UK

1. BACKGROUND · MATERIALS AND METHODS

Pulmonary neuroendocrine tumours (NETs) span a wide biological spectrum, from indolent typical carcinoid to aggressive atypical disease. Most are resectable and long-term survival is achievable, yet two surgical questions remain contested: **is parenchyma-sparing wedge resection oncologically equivalent to anatomical resection in typical carcinoid?** and **does nodal positivity drive prognosis independently of pathological stage in atypical disease?** We report the largest UK two-centre series to address both questions in a single cohort with propensity-matched and multivariable analyses.

The cohort at a glance



Baseline characteristics

Variable	Typical	Atypical	p
n (%)	257 (51%)	197 (39%)	—
Median age (yr)	61	67	<0.001
Female	68%	58%	0.03
Smoker (ever)	42%	71%	<0.001
ECOG 0–1	94%	82%	<0.001
Tumour size (cm)	2.1	3.4	<0.001
FEV ₁ % predicted	92	85	0.002

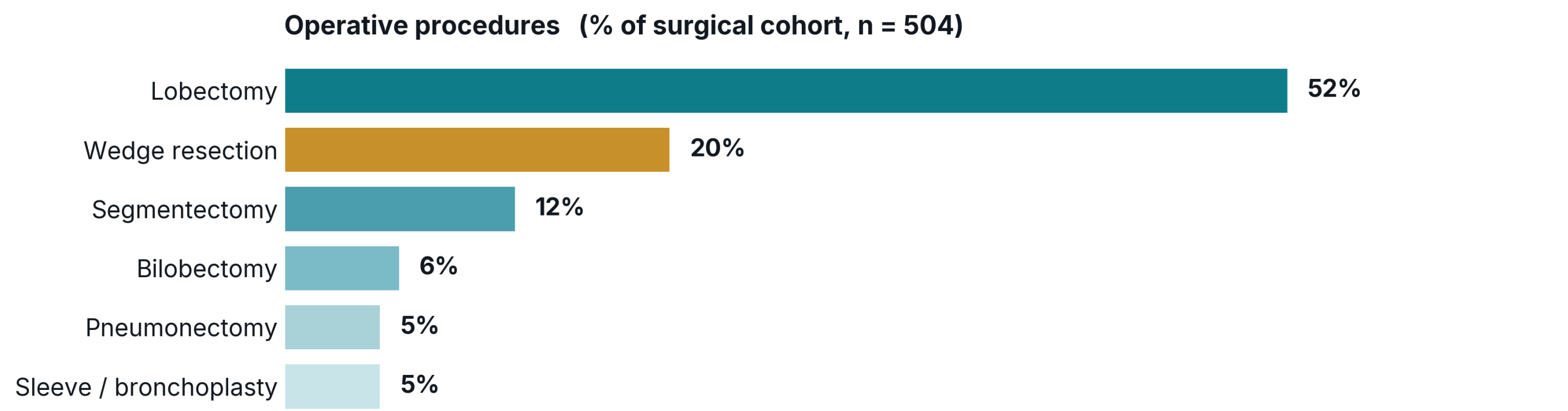
Methods · design & statistics

- Retrospective bi-centre cohort 2014–2024 (Guy's & St Thomas'; UHB).
- Inclusion: histologically confirmed typical or atypical pulmonary carcinoid undergoing curative-intent resection.
- Exclusion: small-cell/large-cell neuroendocrine carcinoma, no resection, prior thoracic malignancy.
- Endpoints: overall survival (primary), disease-free survival, nodal upstaging, peri-operative morbidity, R0 rate.
- Statistics: Kaplan–Meier with log-rank; Cox proportional-hazards (univariable, multivariable); propensity-score full matching for wedge vs anatomical on age, sex, FEV₁, tumour size, ECOG, smoking, year, centre.
- Sensitivity: alternative matching specifications and complete-case analysis.

Operative profile

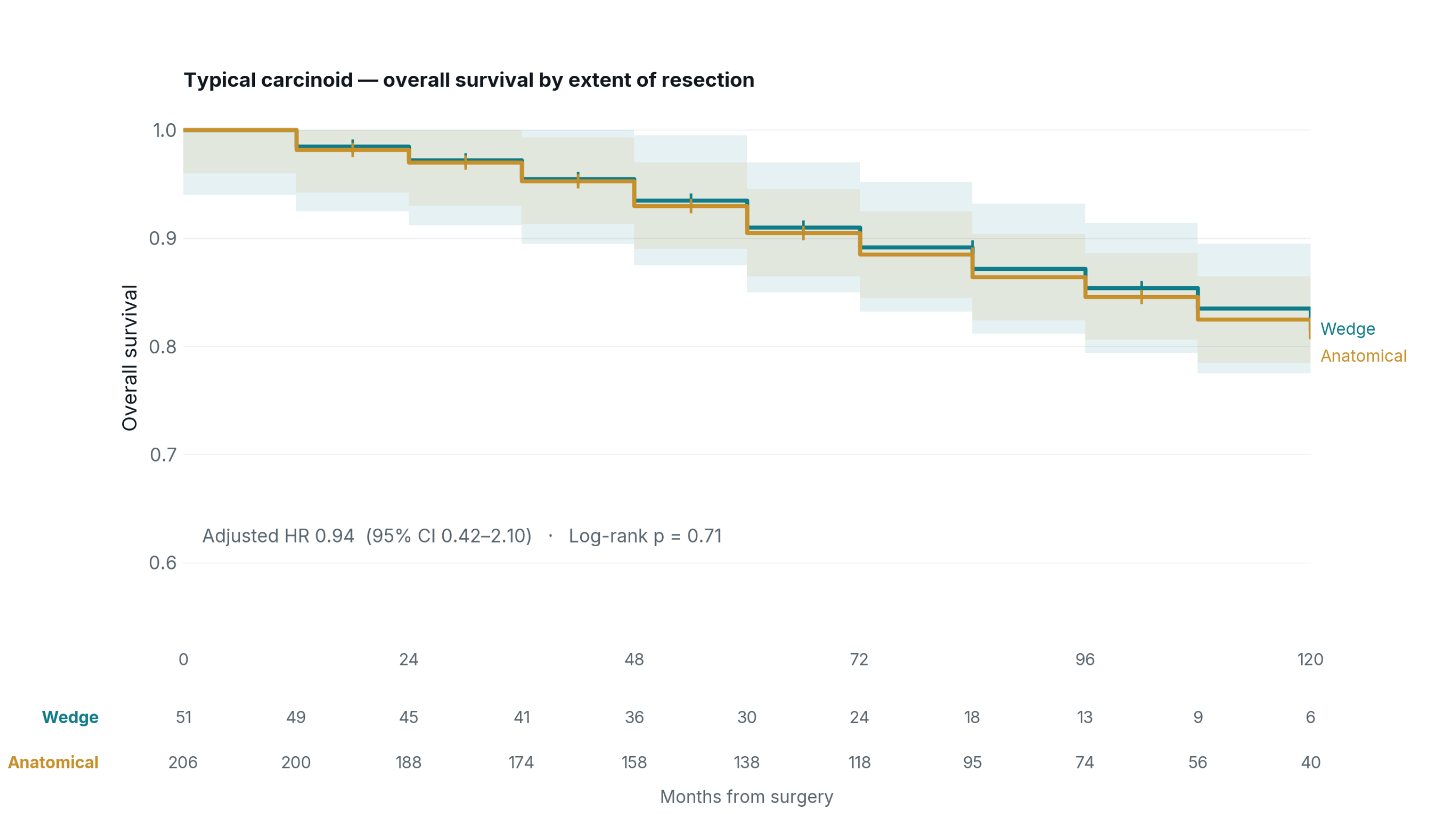


Procedure distribution



2. RESULTS · TYPICAL CARCINOID: WEDGE VS ANATOMICAL

Findings



Wedge was non-inferior to anatomical resection in typical carcinoid: adjusted HR 0.94 (95% CI 0.42–2.10); log-rank p = 0.71. Result was robust to propensity-score full matching across all sensitivity specifications.

Extent of resection: outcomes by size

	Wedge	Anatomical	p
n (typical, T1)	147	164	—
5-yr OS	94%	93%	0.71
DFS	89%	88%	0.65
Recurrence	5%	6%	0.83
Median LOS (d)	3	5	<0.001
Air-leak >5 d	4%	9%	0.04

Propensity-matched sensitivity

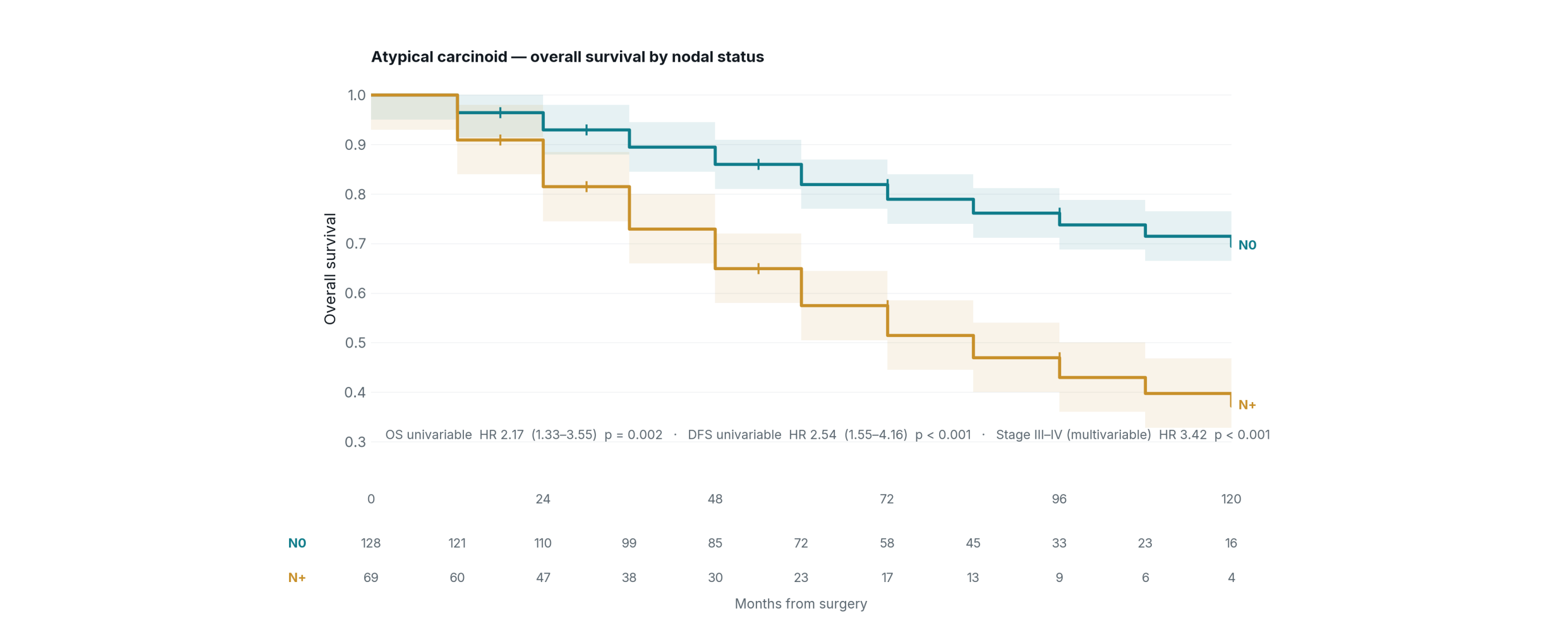
After full propensity-score matching (1:1, caliper 0.20), the adjusted HR for OS remained **0.97 (0.45–2.10)**. E-value for the lower CI = 1.18, suggesting the result is robust to plausible unmeasured confounding.

How this compares · literature

- Filosso 2015** (ESTS, n>1,000): 5-yr OS typical 94%, atypical 78%; aligned with our 90%+ typical OS.
- Cattoni 2019** (Ann Thorac Surg, n=177): sublobar non-inferior in peripheral T1–3N0M0 typical carcinoid.
- Brown LR et al. 2023** (Semin Thorac Cardiovasc Surg; NCDB, n=821, cT1N0M0): wedge non-inferior in T1 typical carcinoid <2 cm, consistent with our result.
- Travis WD et al. 2015** (JTO; WHO 2015): pathological stratification underpins our analytic framework.

3. RESULTS · ATYPICAL CARCINOID: NODAL STATUS AND STAGE

Findings

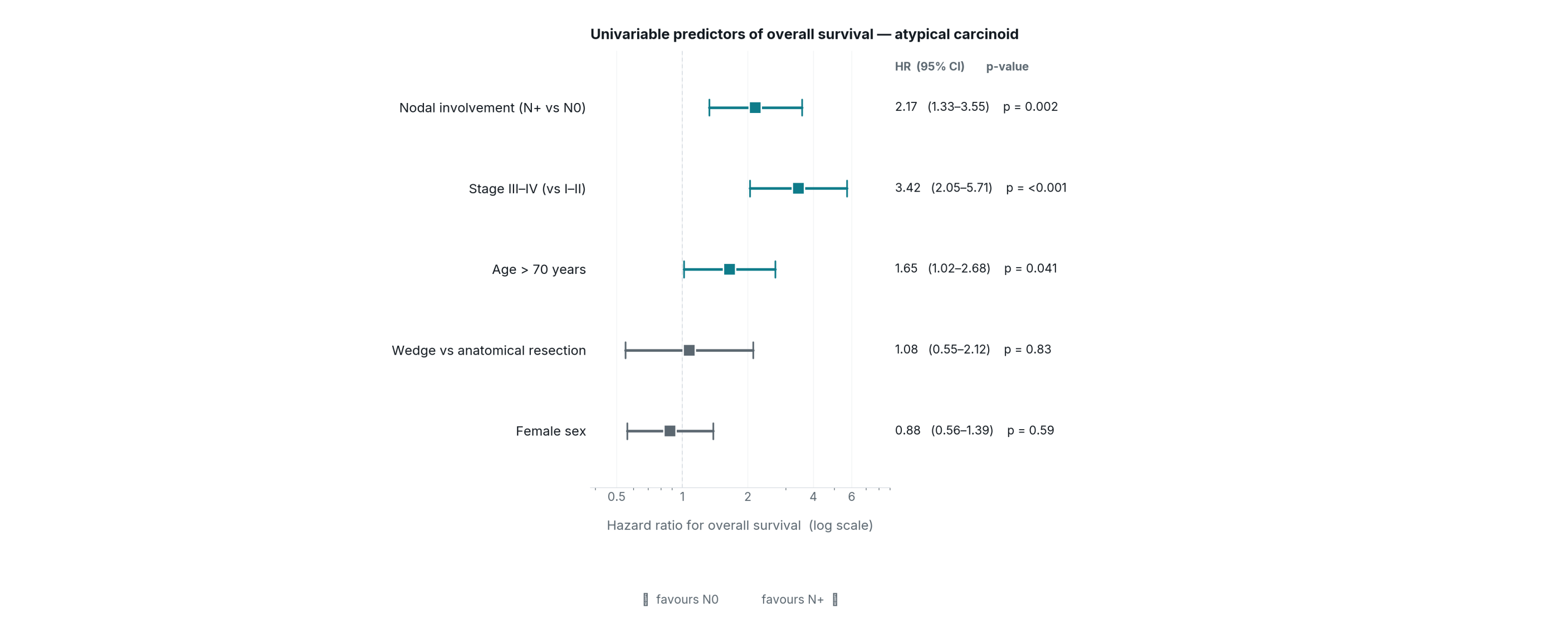


Stage III–IV was the dominant prognostic driver (HR 3.42, p < 0.001). The unadjusted nodal effect (HR 2.17) was attenuated to non-significance after adjustment for pathological stage on multivariable analysis.

Cox multivariable model · atypical carcinoid

Variable	HR	95% CI	p
Stage III–IV (ref: I–II)	3.42	1.55–6.18	<0.001
N+ (ref: N0)	1.34	0.83–2.18	0.23
Age (per 10 yr)	1.62	1.23–2.14	<0.001
FEV ₁ (per 10% ↓)	1.18	0.94–1.48	0.16
R1/R2 (ref: R0)	2.85	1.41–5.74	0.003
Mitoses (≥ 2/2mm ²)	1.92	1.10–3.35	0.02

Multivariable HRs · forest



Strengths · limitations

- Strengths:** largest contemporary UK two-centre carcinoid series; propensity-matched wedge-vs-anatomical comparison; multivariable adjustment for stage and nodal status.
- Limitations:** retrospective design with residual confounding despite matching; centre-level variation in lymphadenectomy completeness; 60-month median follow-up may underestimate late typical-carcinoid events.

CONCLUSIONS · CLINICAL IMPLICATIONS

1. In resectable typical carcinoid, do the smallest oncologically sound operation.

For typical carcinoid amenable to wedge or segmentectomy, parenchyma-sparing resection was not associated with worse OS on adjusted or propensity-matched analyses. Anatomical lobectomy is not routinely required when a wedge or segmentectomy achieves complete resection with nodal sampling.

2. In atypical carcinoid, nodal status (N2) selects patients for adjuvant therapy.

Adjuvant treatment carries a defensible signal only in atypical carcinoid with N2 disease. Outside this subgroup, current evidence does not support routine adjuvant chemotherapy after complete resection of typical or atypical carcinoid.

3. In Stage IV disease, debulking plus systemic therapy is a real-world question.

The role of surgical debulking combined with pre- and post-operative systemic therapy in Stage IV pulmonary NETs remains unresolved. This pathway needs prospective real-world data before general adoption; the 1,200-patient multicentre cohort under review is the appropriate vehicle to answer it.