

Supplementary-material

Supplementary adjusted and diagnostic results

Supplementary Table 1 Claim-focused sensitivity model for overall survival

Covariate	Adjusted (95% CI)	HR	P	Interpretation
Age (per 10 years)	1.048 1.371)	(0.801-	0.733	No statistically significant association
Pathological response (CR/PR vs SD/PD)	0.540 1.280)	(0.228-	0.162	No statistically significant association
N-stage regression (yes vs no)	0.291 0.632)	(0.134-	0.002	Independent association with lower hazard
Postoperative complications (yes vs no)	2.738 6.369)	(1.177-	0.019	Association with higher hazard

OS: $n = 70$; events = 32; EPV = 8.00.

Supplementary Table 2 Collinearity and proportional-hazards diagnostics

Endpoint / Covariate diagnostic	Statistic	P
OS Schoenfeld test Age (per 10 years)	chi-square = 0.042; df = 1	0.837
OS Schoenfeld test T-stage regression	chi-square = 0.063; df = 1	0.802
OS Schoenfeld test N-stage regression	chi-square = 1.811; df = 1	0.178
OS Schoenfeld test Postoperative complications	chi-square = 0.642; df = 1	0.423
OS Schoenfeld test Global	chi-square = 2.849; df = 4	0.583

DFS Schoenfeld test	Age (per 10 years)	chi-square = 0.137; df = 0.712 1	
DFS Schoenfeld test	T-stage regression	chi-square = 0.048; df = 0.826 1	
DFS Schoenfeld test	N-stage regression	chi-square = 0.600; df = 0.438 1	
DFS Schoenfeld test	Postoperative complications	chi-square = 0.003; df = 0.957 1	
DFS Schoenfeld test	Global	chi-square = 1.093; df = 0.895 4	
Primary model VIF	Age (per 10 years)	VIF = 1.125	Not applicable
Primary model VIF	T-stage regression	VIF = 1.103	Not applicable
Primary model VIF	N-stage regression	VIF = 1.103	Not applicable
Primary model VIF	Postoperative complications	VIF = 1.083	Not applicable

Supplementary Table 3 Bootstrap internal validation

Endpoi nt	Events parameters	/ Resample s	Apparent C	Mean optimism	Corrected C
OS	32 / 4	2,000	0.712	0.032	0.680
DFS	33 / 4	2,000	0.713	0.034	0.679

Empirical bootstrap intervals for the corrected C-index distribution were 0.585-0.778 for OS and 0.585-0.771 for DFS. These are descriptive internal-validation intervals, not external-validation limits.

Supplementary Table 4 Claim-focused sensitivity model for disease-free survival

<i>Covariate</i>	<i>Adjusted (95% CI)</i>	<i>HR</i>	<i>P</i>	<i>Interpretation</i>
Age (per 10 years)	0.995 1.292)	(0.766-	0.968	No statistically significant association
Pathological response (CR/PR vs SD/PD)	0.510 1.213)	(0.215-	0.128	No statistically significant association
N-stage regression (yes vs no)	0.323 0.683)	(0.152-	0.003	Independent association with lower hazard
Postoperative complications (yes vs no)	3.101 7.177)	(1.340-	0.008	Association with higher hazard

DFS: $n = 70$; events = 33; EPV = 8.25.

These models directly adjust the N-stage regression estimate for primary pathological response (CR/PR vs SD/PD).

Supplementary Table 5 Joint T/N regression and interaction analysis

Endpo int	Category	n	Age-adjusted HR (95% CI)	P
OS	Neither regression	13	Reference	
OS	T regression only	12	0.838 (0.317-2.215)	0.721
OS	N regression only	13	0.418 (0.145-1.199)	0.105
OS	Both T and N regression	32	0.215 (0.083-0.559)	0.002
DFS	Neither regression	13	Reference	
DFS	T regression only	12	1.078 (0.424-2.736)	0.875
DFS	N regression only	13	0.488 (0.171-1.394)	0.181

DFS	Both T and N regression	32	0.257 (0.100-0.664)	0.005
-----	-------------------------	----	---------------------	-------

Overall four-level likelihood-ratio tests: OS P = 0.007; DFS P = 0.009. T-by-N interaction tests: OS P = 0.507; DFS P = 0.321.

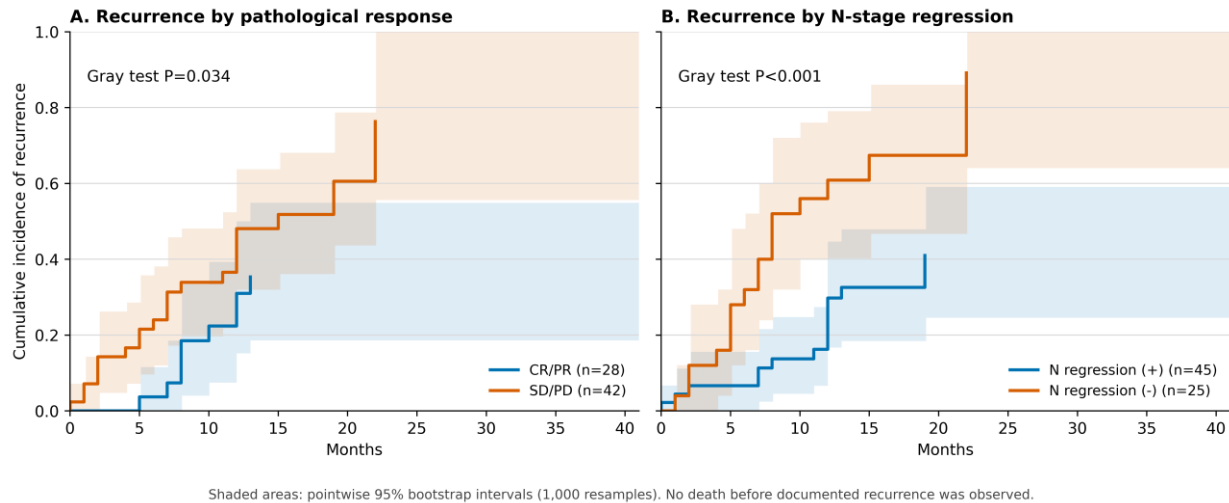
Supplementary Table 6 Fine-Gray-equivalent subdistribution hazard model for recurrence

Covariate	Subdistribution HR (95% CI)	P
Age (per 10 years)	0.919 (0.712-1.187)	0.518
T-stage regression (yes vs no)	0.623 (0.289-1.344)	0.228
N-stage regression (yes vs no)	0.314 (0.147-0.669)	0.003
Postoperative complications (yes vs no)	3.189 (1.335-7.621)	0.009

Because no death occurred before recorded recurrence, the Fine-Gray risk sets and estimates are identical to the corresponding Cox model. This is a property of the observed event structure, not evidence that competing risks are universally unimportant.

Software. Python 3.12 with pandas 2.2.3, NumPy 2.3.5, and SciPy 1.17.0. Cox models used a supplied Efron partial-likelihood implementation; the primary-model coefficients were independently cross-checked against lifelines 0.30.0 (maximum absolute log-HR difference < 0.000007). All calculations are reproducible from the deidentified analysis script and original spreadsheet.

Recurrence cumulative incidence



Supplementary Figure 1 Cumulative incidence functions for recurrence by pathological response and N-stage regression

Aalen-Johansen estimates with death before recurrence specified as the competing event. Shaded bands are 95% bootstrap intervals (1,000 resamples). No death before documented recurrence was observed; therefore, the CIF equals 1 minus the recurrence-free Kaplan-Meier estimate. Gray's test: pathological response $P = 0.034$; N-stage regression $P < 0.001$.



This presentation was created in BioRender

To access the original source of this presentation, visit:

<https://app.biorender.com/illustrations/69f9b85242c6e1386227a2e0>

Sign up for your own BioRender account at www.biorender.com



Get the BioRender Add-in for PowerPoint

Our integration allows you to unlock the power of BioRender, right inside PowerPoint:

- Export your BioRender presentation as an editable .PPTX file.
- Edit BioRender figures without leaving your PowerPoint slides.
- Sync updates from BioRender with just one click.
- Effortlessly manage sharing and permissions with your team.
- Access your entire BioRender library at your fingertips.
- Need a transparent background? Toggle it on or off, anytime.

BioRender for PowerPoint is hosted safely and securely in the Microsoft AppSource.

Get the add-in now:

https://appssource.microsoft.com/en-us/product/office/wa200060387arc-product&mktpid=pptx_export