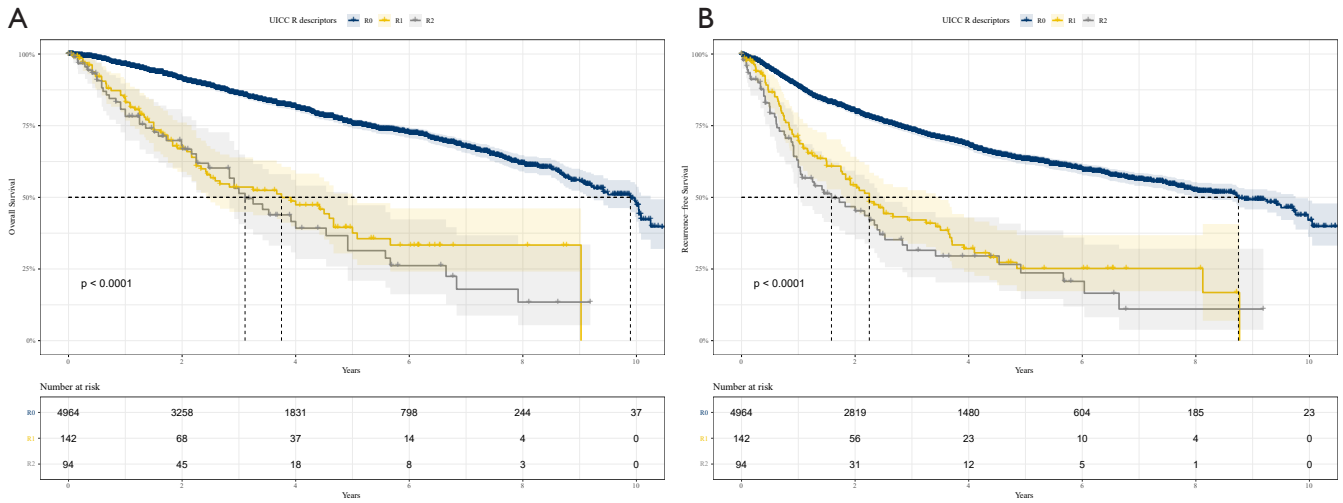


**Table S1** Clinical and pathological characteristics in patients with GGO and solid nodules

Variables	All (n=5,200)	GGO (n=1,609)	Solid nodules (n=3,591)	P value
Sex				<0.001
Male	2,885 (55.5)	611 (38.0)	2,274 (63.3)	
Female	2,315 (44.5)	998 (62.0)	1,317 (36.7)	
Age				<0.001
<60 years	2,478 (47.7)	809 (50.3)	1,669 (46.5)	
≥60 years	2,722 (52.3)	800 (49.7)	1,922 (53.5)	
Smoking				<0.001
Never	3,204 (61.6)	1,281 (79.6)	1,923 (53.6)	
Former/current	1,996 (38.4)	328 (20.4)	1,668 (46.4)	
Pathology types				<0.001
IAC	3,932 (75.6)	1,543 (95.9)	2,389 (66.5)	
SCC	1,223 (23.5)	56 (3.5)	1,167 (32.5)	
Others	45 (0.9)	10 (0.6)	35 (1.0)	
pT stage				<0.001
1a	377 (7.3)	222 (13.8)	155 (4.3)	
1b	1,637 (31.5)	841 (52.3)	795 (22.1)	
1c	1,147 (22.1)	274 (17.0)	872 (24.3)	
2a	1,052 (20.2)	161 (10.0)	891 (24.8)	
2b	379 (7.3)	30 (1.9)	349 (9.7)	
3	366 (7.0)	39 (2.4)	327 (9.1)	
4	242 (4.7)	41 (2.5)	201 (5.6)	
pN stage				<0.001
0	3,639 (70.0)	1,463 (90.9)	2,176 (60.6)	
1	487 (9.4)	52 (3.2)	435 (12.1)	
2	1,066 (20.5)	93 (5.8)	93 (2.6)	
3	8 (0.2)	1 (0.1)	7 (0.2)	
Number of LN resected	18.0±32.3	14.7±26.5	19.5±34.5	<0.001
pTNM stage				<0.001
Stage I	3,127 (60.1)	1,379 (85.7)	1,748 (48.7)	
Stage II	769 (14.8)	96 (6.0)	673 (18.7)	
Stage III	1,304 (25.1)	134 (8.3)	134 (3.7)	
R descriptors				<0.001
R0	3,228 (62.1)	1,052 (65.4)	2,176 (60.6)	
R(un)	1,727 (33.2)	531 (33.0)	1,196 (33.3)	
R1	151 (2.9)	17 (1.1)	134 (3.7)	
R2	94 (1.8)	9 (0.6)	85 (2.4)	

GGO, ground-glass opacity; IAC, invasive adenocarcinoma; SCC, squamous cell carcinoma; pT, pathological tumor; pN pathological node; LN, lymph node; pTNM, pathological tumor-node-metastasis.



**Figure S1** OS and RFS of UICC R descriptors: (A) comparisons of OS between UICC R0, R1, and R2; (B) comparisons of RFS between UICC R0, R1, and R2. The 95% CIs are shown as shaded areas. UICC, Union for International Cancer Control; OS, overall survival; RFS, recurrence-free survival; CI, confidential interval.

**Table S2** Reasons for recategorization

R0 → R(un)	Value (n=1,727)
<b>Summary</b>	
Rigorous LSND/SND not performed	1,179 (68.3)
The highest LN resected (+)	663 (38.3)
CIS at margin	3 (0.2)
<b>Details</b>	
Rigorous LSND/SND not performed only	1,061 (61.4)
The highest LN resected (+) only	546 (31.6)
CIS at margin only	2 (0.1)
Rigorous LSND/SND not performed & highest LN resected (+)	117 (6.8)
Rigorous LSND/SND not performed & CIS at margin	1 (0.1)

Values are presented as n (%). R(un), uncertain resection; LSND, lobe-specific nodal dissection; SND, systematic nodal dissection; LN, lymph node; CIS, carcinoma in situ.

**Table S3** Details of LSND/SND

Not performing rigorous LSND/SND	Value (n=1,179)
N1 samples <3 & N2 samples <3	592 (50.2)
Site-specific LNs not dissected	293 (24.9)
Neither standard met	294 (24.9)

Values are presented as n (%). LSND, lobe-specific nodal dissection; SND, systematic nodal dissection; LN, lymph node.

**Table S4** Univariable and multivariable analysis of OS

Variables	Univariable			Multivariable		
	HR	95% CI	P	HR	95% CI	P
Gender (female vs. male)	0.564	0.494–0.643	<0.001	0.743	0.622–0.887	0.001
Age ( $\geq$ 60 vs. <60 years)	1.428	1.260–1.618	<0.001	1.424	1.256–1.615	<0.001
Smoking history (current/former vs. never)	1.749	1.546–1.978	<0.001	1.031	0.875–1.215	0.717
CT appearance (solid nodules vs. GGO)	3.873	3.167–4.737	<0.001	2.182	1.761–2.705	<0.001
Pathological types						
SCC vs. IAC	1.813	1.594–2.064	<0.001	0.981	0.845–1.138	0.801
Others vs. IAC	1.940	1.039–3.624	0.038	1.085	0.579–2.032	0.799
pTNM stage (stage II/III vs. stage I)	4.195	3.668–4.798	<0.001	2.954	2.554–3.417	<0.001
Proposed R descriptors						
R(un) vs. R0	1.661	1.456–1.895	<0.001	1.400	1.223–1.603	<0.001
R1 vs. R0	4.123	3.209–5.297	<0.001	2.608	2.019–3.368	<0.001
R2 vs. R0	5.164	3.849–6.929	<0.001	3.483	2.587–4.690	<0.001

OS, overall survival; HR, hazard ratio; CI, confidence interval; CT, computed tomography; GGO, ground-glass opacity; SCC, squamous cell carcinoma; IAC, invasive adenocarcinoma; pTNM, pathological tumor-node-metastasis; R(un), uncertain resection.

**Table S5** Univariable and multivariable analysis of RFS

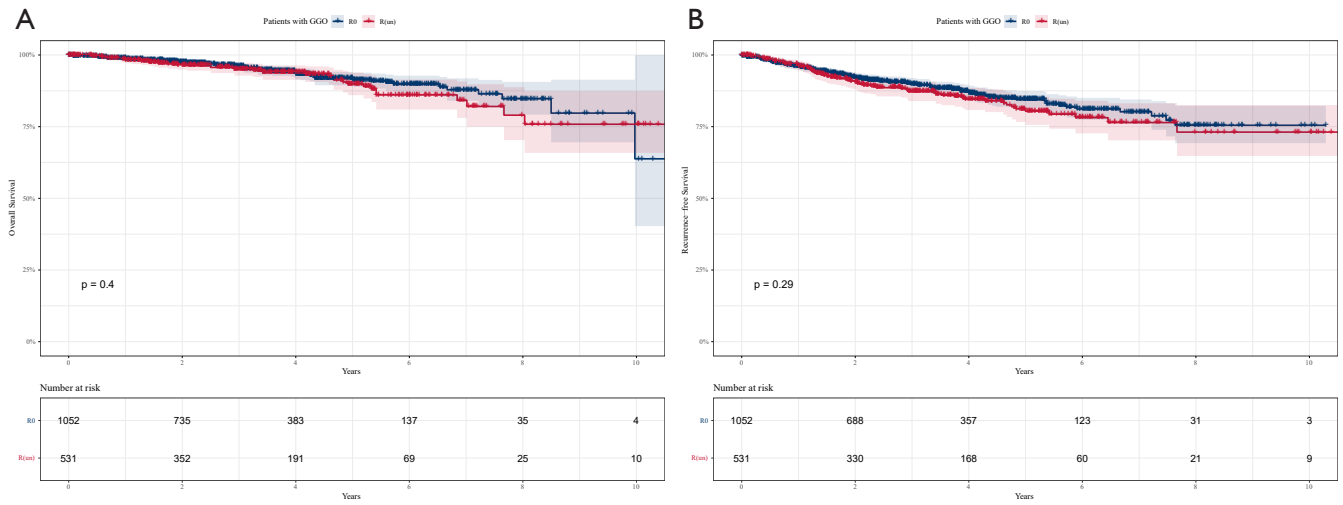
Variables	Univariable			Multivariable		
	HR	95% CI	P	HR	95% CI	P
Gender (female vs. male)	0.658	0.592–0.730	<0.001	0.801	0.695–0.923	0.002
Age ( $\geq$ 60 vs. <60 years)	1.166	1.054–1.290	0.003	1.139	1.029–1.260	0.012
Smoking history (current/former vs. never)	1.570	1.419–1.736	<0.001	1.030	0.899–1.180	0.668
CT appearance (solid nodules vs. GGO)	3.384	2.917–3.927	<0.001	2.263	1.930–2.654	<0.001
Pathological types						
SCC vs. IAC	1.420	1.272–1.586	<0.001	0.758	0.667–0.862	<0.001
Others vs. IAC	1.287	0.728–2.273	0.385	0.681	0.384–1.206	0.188
pTNM stage (stage II/III vs. stage I)	3.597	3.238–3.995	<0.001	2.690	2.398–3.019	<0.001
Proposed R descriptors						
R(un) vs. R0	1.538	1.382–1.712	<0.001	1.285	1.151–1.434	<0.001
R1 vs. R0	3.229	2.587–4.030	<0.001	2.158	1.720–2.707	<0.001
R2 vs. R0	4.151	3.178–5.422	<0.001	2.647	2.021–3.468	<0.001

RFS, recurrence-free survival; HR, hazard ratio; CI, confidence interval; CT, computed tomography; GGO, ground-glass opacity; SCC, squamous cell carcinoma; IAC, invasive adenocarcinoma; pTNM, pathological tumor-node-metastasis; R(un), uncertain resection.

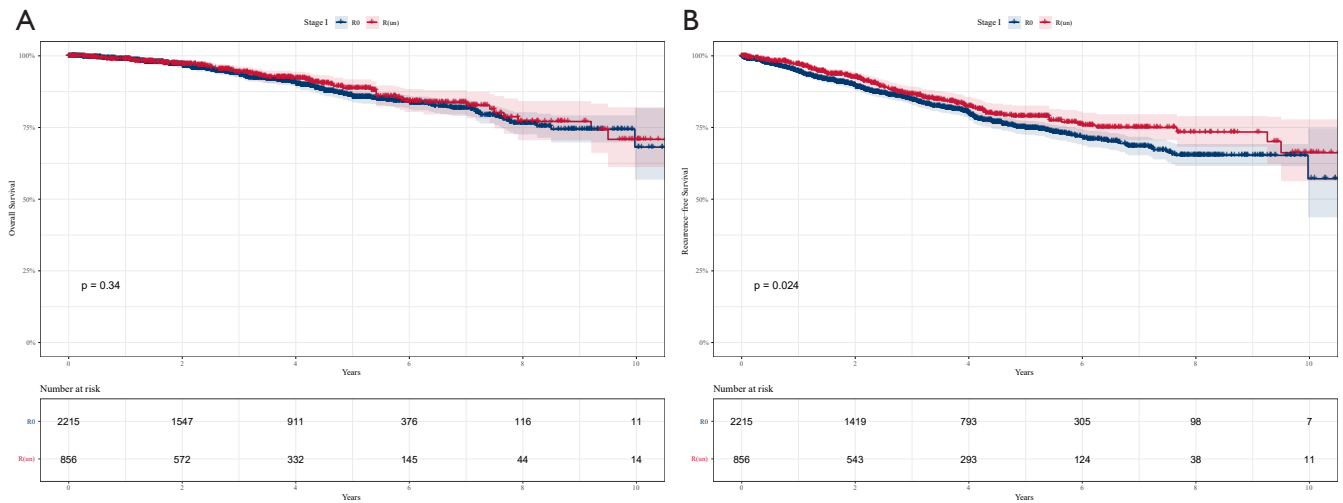
**Table S6** The recurrence pattern between R0, R(un), R1, and R2 groups

Variables	All (n=5,200)	R0 (n=3,228)	R(un) (n=1,727)	R1 (n=151)	R2 (n=94)
Any sites	1,123	595	446	48	34
Thorax	606	344	216	28	18
Neck	44	20	22	1	1
Abdomen	71	35	27	6	3
Bone	204	90	97	9	8
Brain	198	106	84	4	4

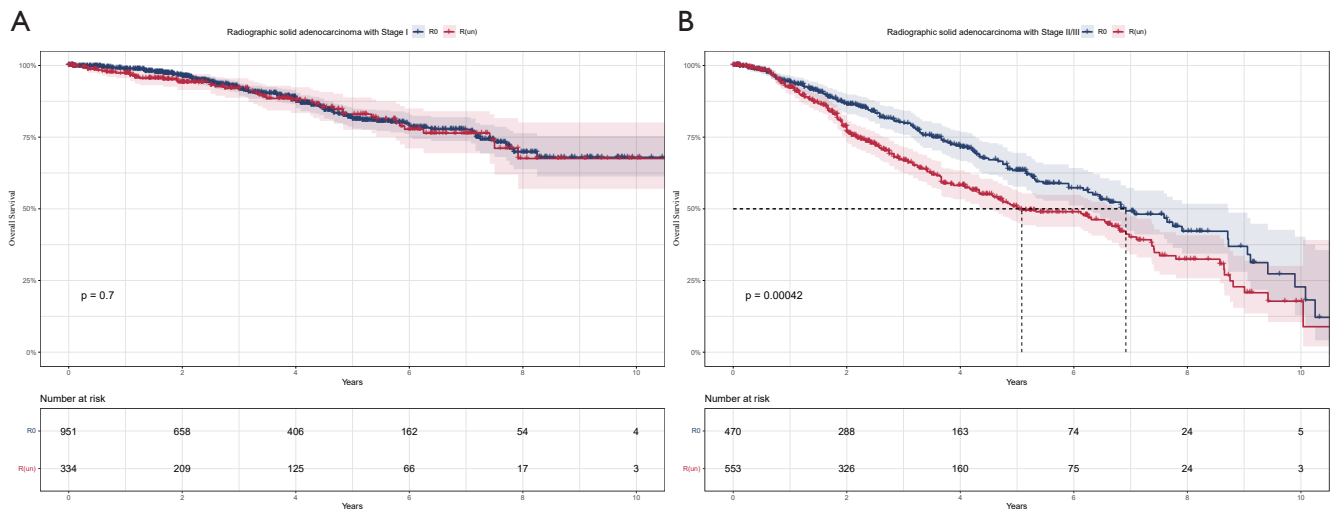
R(un), uncertain resection.



**Figure S2** Comparisons of survival in patients with GGO. (A) OS; (B) RFS. The 95% CIs are shown as shaded areas. R(un), uncertain resection; GGO, ground-glass opacity; OS, overall survival; RFS, recurrence-free survival; CI, confidential interval.



**Figure S3** Comparisons of survival in patients with TNM stage I. (A) OS; (B) RFS. The 95% CIs are shown as shaded areas. R(un), uncertain resection; TNM, tumor-node-metastasis; OS, overall survival; RFS, recurrence-free survival; CI, confidential interval.



**Figure S4** Comparisons of survival in radiographic solid adenocarcinoma patients with TNM stage I and with TNM stage II/III. The 95% CIs are shown as shaded areas. R(un), uncertain resection; TNM, tumor-node-metastasis; CI, confidential interval.

**Table S7** HR, 95% CI, and P value of performing rigorous LSND/SND on multivariable analysis in different subgroups

Different subgroups	Multivariable analysis of OS		
	HR	95% CI	P
<b>CT appearance</b>			
GGO	NR	NR	NR
Solid	NR	NR	NR
<b>Pathology types</b>			
IAC	1.138	0.941–1.376	0.182
SCC	1.290	1.014–1.641	0.038
<b>pTNM stage</b>			
I	N0	N0	N0
II/III	1.314	1.098–1.571	0.003

NR means not reaching the criteria of P value <0.1 in univariable analysis; N0 means highest LN resected (-). HR, hazard ratio; CI, confidence interval; LSND, lobe-specific systematic nodal dissection; SND, systematic nodal dissection; OS, overall survival; CT, chest tomography; GGO, ground-glass opacity; IAC, invasive adenocarcinoma; SCC, squamous cell carcinoma; pTNM, pathological tumor-node-metastasis; LN, lymph node.

**Table S8** HR, 95% CI, and P value of highest LN resected (+) on multivariable analysis in different subgroups

Different subgroups	Multivariable analysis of OS		
	HR	95% CI	P
<b>CT appearance</b>			
GGO	2.182	1.248–3.817	0.006
Solid	1.689	1.441–1.980	<0.001
<b>Pathology types</b>			
IAC	1.138	1.354–1.981	<0.001
SCC	1.679	1.286–2.192	<0.001
<b>pTNM stage</b>			
I	NR	NR	NR
II/III	1.650	1.419–1.918	<0.001

NR means not reaching the criteria of P value <0.1 in univariable analysis. HR, hazard ratio; CI, confidence interval; LN, lymph node; OS, overall survival; CT, computed tomography; GGO, ground-glass opacity; IAC, invasive adenocarcinoma; SCC, squamous cell carcinoma; pTNM, pathological tumor-node-metastasis.