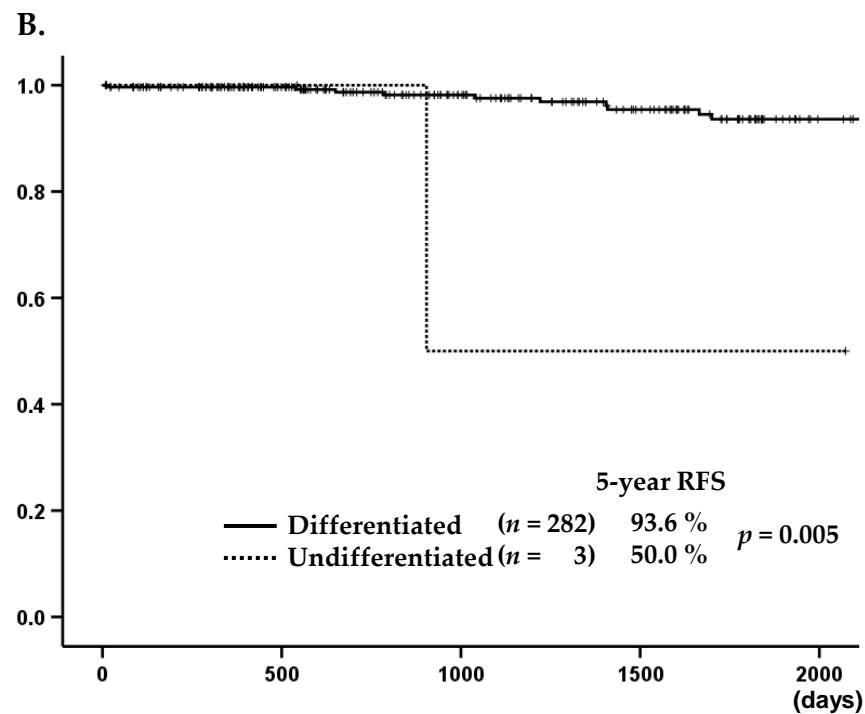
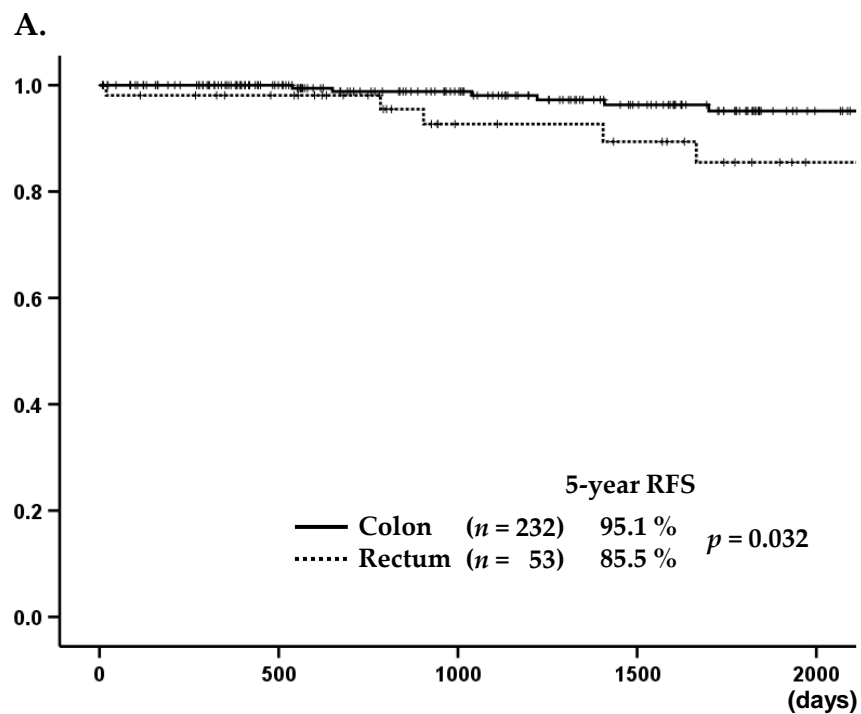


**Supplementary Figure S1. Overall survival between endoscopic resection alone and surgical resection**

**A. Low-risk pT1, B. High-risk pT1**

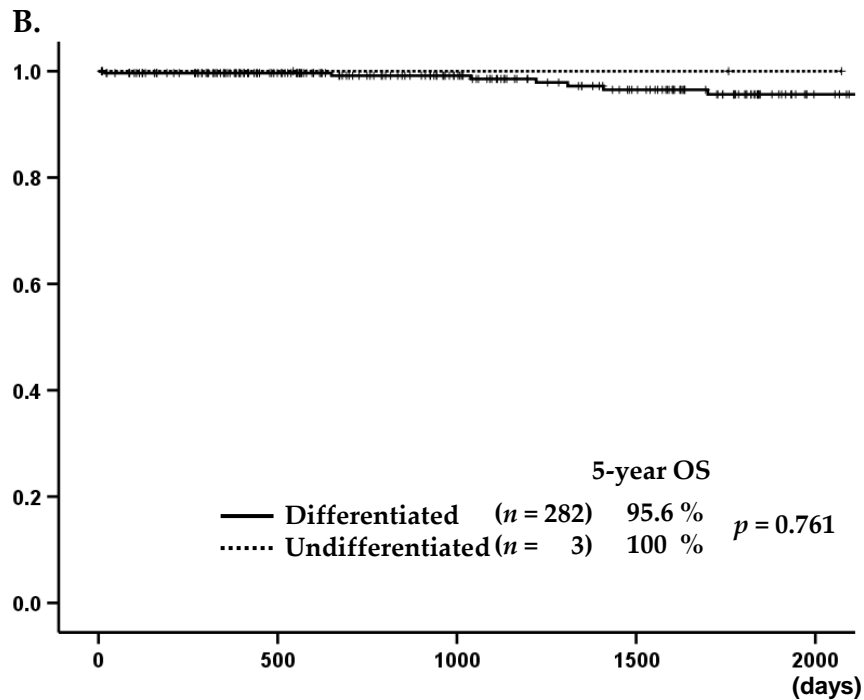
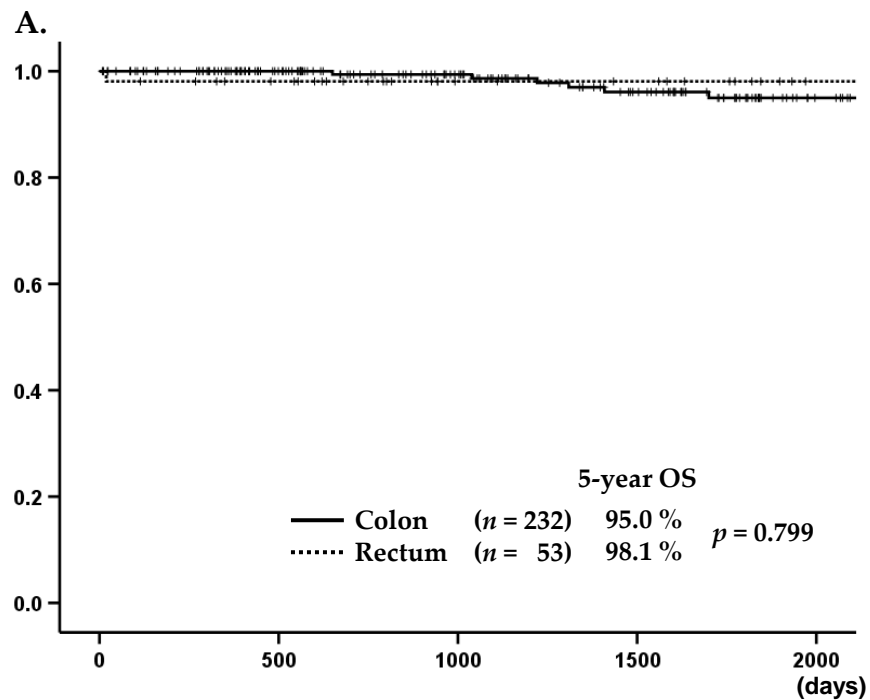
ER, endoscopic resection; 5-year OS, 5-year overall survival rate



**Supplementary Figure S2. Relapse-free survival in the high-risk CRC with surgical resection**

**A. Tumor location, B. Histology**

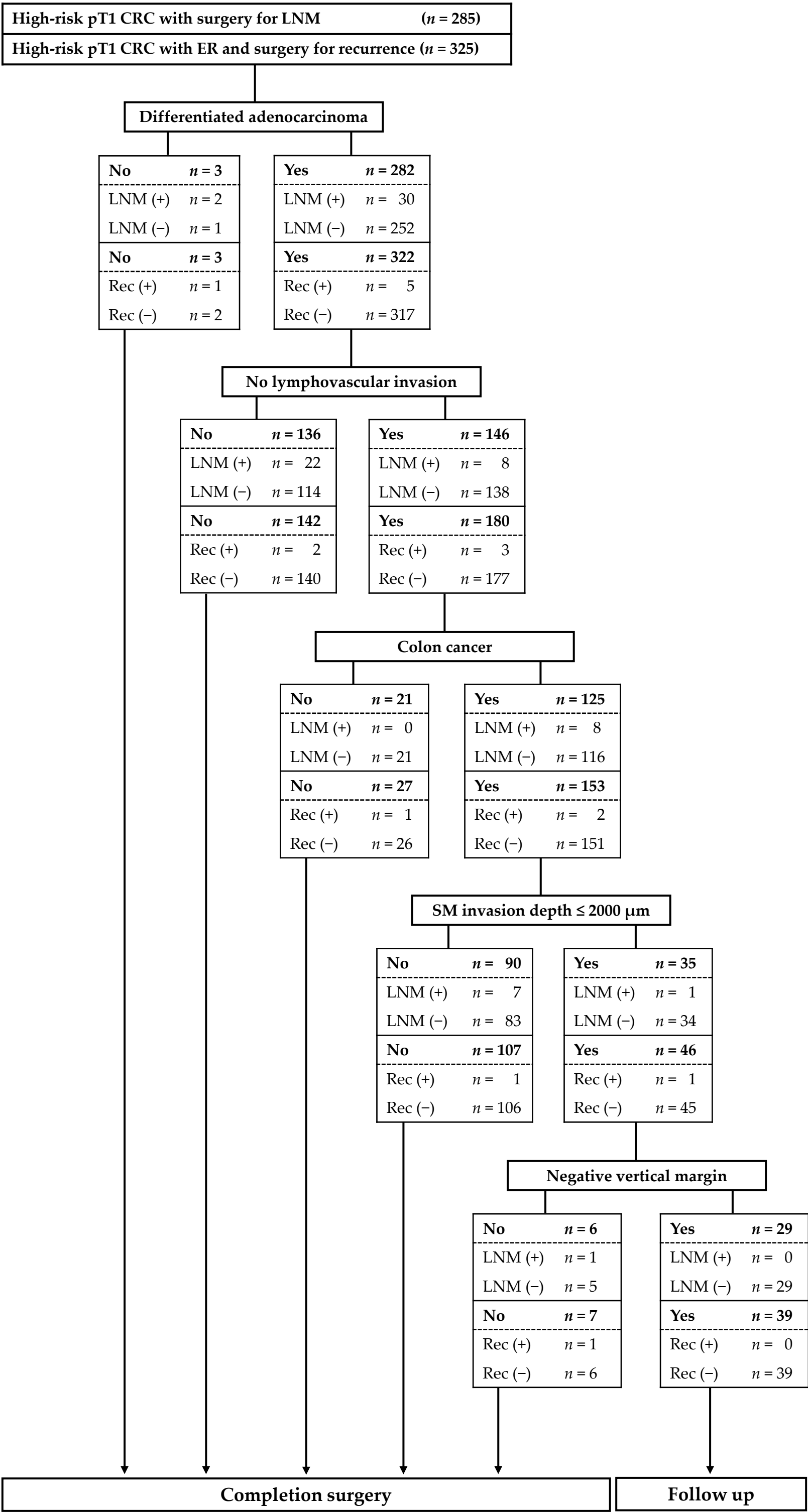
5-year RFS, 5-year relapse-free survival rate



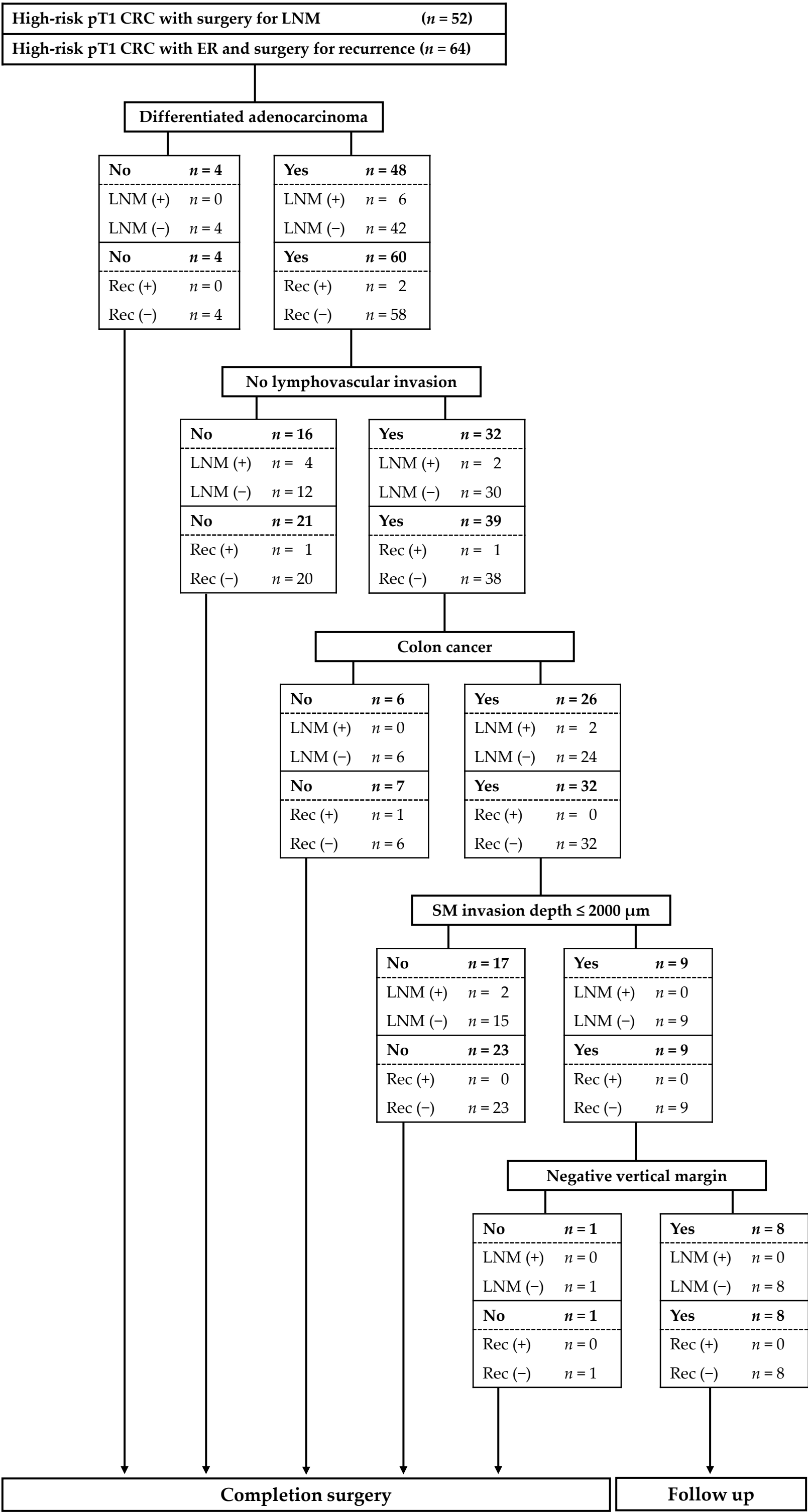
**Supplementary Figure S3. Overall survival in the high-risk CRC with surgical resection**

**A. Tumor location, B. Histology**

5-year OS, 5-year overall survival rate



**Supplementary Figure S4. Decision tree to predict lymph node metastasis and recurrence**  
The incidence of LNM was analyzed using the high-risk pT1 CRC with surgery group (*n* = 285).  
The incidence of recurrence was analyzed using all high-risk pT1 CRCs with ER and surgery (*n* = 325).  
ER, endoscopic resection; LNM, lymph node metastasis; Rec, recurrence including metastatic and local intraluminal recurrences



**Supplementary Figure S5. Decision tree to predict lymph node metastasis and recurrence in the validation cohort**  
The incidence of LNM was analyzed using the high-risk pT1 CRC with surgery group (n = 52).  
The incidence of recurrence was analyzed using all high-risk pT1 CRCs with ER and surgery (n = 64).  
ER, endoscopic resection; LNM, lymph node metastasis; Rec, recurrence including metastatic and local intraluminal recurrences

**Supplementary Table S1. Lymph node metastasis stratified according to submucosal invasion depth in the high-risk pT1 CRC**

Risk factor: SM invasion depth alone	<i>n</i>	Lymph node metastasis		Incidence of LNM
		LNM (–)	LNM (+)	
1000 µm ≤ SM ≤ 2000 µm	23	23	0	0 %
2000 µm < SM ≤ 3000 µm	26	24	2	7.7 %
3000 µm < SM ≤ 4000 µm	24	22	2	8.3 %
4000 µm ≤ SM	29	28	1	3.4 %
Total	102	97	5	4.9 %

Lesions with negative vertical margin that had only SM invasion depth as a risk factor were analyzed.  
LNM, Lymph node metastasis; SM, submucosal invasion depth

Risk factor: VM (+)	<i>n</i>	Lymph node metastasis		Incidence of LNM
		LNM (–)	LNM (+)	
SM ≤ 2000 µm	5	4	1	25 %
2000 µm < SM ≤ 3000 µm	8	7	1	12.5 %
3000 µm < SM ≤ 4000 µm	2	2	0	0 %
4000 µm ≤ SM	3	3	0	0 %
Total	18	16	2	11.1%

Lesions with positive vertical margin were analyzed.  
LNM, Lymph node metastasis; SM, submucosal invasion depth; VM (+), positive vertical margin

Risk factor: V/Ly (+) +VM (–)	<i>n</i>	Lymph node metastasis		Incidence of LNM
		LNM (–)	LNM (+)	
SM ≤ 2000 µm	33	28	5	16.7 %
2000 µm < SM ≤ 3000 µm	20	17	3	15.0 %
3000 µm < SM ≤ 4000 µm	11	9	2	18.2 %
4000 µm ≤ SM	22	20	2	9.1 %
Total	86	74	12	14.0 %

Lesions with negative vertical margin that had lymphovascular invasion as a risk factor were analyzed.  
LNM, Lymph node metastasis; SM, submucosal invasion depth; V/Ly (+), positive lymphovascular invasion;  
VM (–), negative vertical margin

Risk factor: BD (+) + VM (–)	<i>n</i>	Lymph node metastasis		Incidence of LNM
		LNM (–)	LNM (+)	
SM ≤ 2000 µm	8	8	0	0 %
2000 µm < SM ≤ 3000 µm	9	8	1	11.1 %
3000 µm < SM ≤ 4000 µm	3	3	0	0 %
4000 µm ≤ SM	5	5	0	0 %
Total	25	24	1	4.0 %

Lesions with negative vertical margin that had budding as a risk factor were analyzed.  
LNM, Lymph node metastasis; SM, submucosal invasion depth; BD (+), positive budding;  
VM (–), negative vertical margin

**Supplementary Table S2. Risk factors for overall survival in the high-risk group with surgical resection**

		Univariate analysis	
		5-year OS	<i>p</i>
Age	≤70 years	96.8 %	0.768
	>70 years	94.1 %	
Gender	Male	95.0 %	0.072
	Female	96.5 %	
Location	colon	95.0 %	0.799
	rectum	98.1 %	
Tumor size	≤20 mm	95.9 %	0.698
	>20 mm	95.3 %	
Morphology	Protruded	96.1 %	0.600
	Flat/Flat elevated	97.2 %	
	Depressed	94.9 %	
Histology	differentiated	95.6 %	0.761
	undifferentiated	100 %	
SM invasion depth	≤2000 μm	98.4 %	0.211
	>2000 μm	95.48%	
Vascular invasion	(−)	95.8 %	0.470
	(+)	95.0 %	
Lymphatic invasion	(−)	97.7 %	0.757
	(+)	93.2 %	
Budding	(−)	94.1 %	0.193
	(+)	100 %	
Horizontal margin*	HM0	95.1 %	0.442
	HM1/X	93.8 %	
Vertical margin*	VM0	97.9 %	0.111
	HM1/X	90.0 %	
Number of dissected LN	<12	94.7 %	0.662
	≥12	99.0 %	
Lymph node metastasis	(−)	95.2 %	0.195
	(+)	100 %	

SM invasion depth, submucosal invasion depth  
HM, Horizontal margin; VM, vertical margin; LN, lymph node

\*, Total number that assessed vertical and horizontal margins was consisted of 104 patients with endoscopic resection before surgery.

Supplementary Table S3. Validation cohort of the high-risk pT1 CRC

		High-risk with ER alone ( <i>n</i> = 12)	High-risk with surgery ( <i>n</i> = 52)
Age (years)	Median (range)	76 (45-92)	65 (25-87)
Gender	Male	7	32
	Female	5	20
Location	Colon	10	41
	Rectum	2	11
Tumor size (mm)	Median (range)	11 (8-25)	18 (6-35)
Morphology	Protruded type	9	30
	Flat or Flat elevated type	0	0
	Depressed type	3	22
Pathological risk factors	Undifferentiated histology	0 (0 %)	4 (7.7 %)
	SM invasion depth ≥1000 μm	12 (100 %)	48 (92.3 %)
	Vascular invasion	1 (8.3 %)	9 (17.3 %)
	Lymphatic invasion	4 (33.3 %)	12 (23.1 %)
	Budding	1 (8.3 %)	11 (21.2 %)
Surgical resection	ER alone	12	0
	ER followed by curative surgery	0	25
	Curative surgery	0	27
Horizontal margin	HM0/HM1/HMX	12/0/0	24/0/1
Vertical margin	VM0/VM1/VMX	12/0/0	20/4/1
Number of examined lymph nodes	Median (range)	–	15 (2-47)
Lymph node metastasis		–	6/52 (11.5%)
Recurrence	local	0/12 (0 %)	0/52 (0 %)
	metastasis	0/12 (0 %)	2/52 (3.8 %)

High-risk, lesions with any of pathological risk factors; SM invasion depth, submucosal invasion depth; ER, endoscopic resection