

**Table S1.** Univariate analysis of preoperative clinical and computed tomography findings in patients with resectable and borderline pancreatic cancer to predict tumor recurrence.

Variables	HR	95% CI	P value
<b>Clinical information</b>			
Age, year	0.996	0.97-1.02	0.767
Gender			
Male <sup>†</sup>			
Female	0.82	0.54-1.24	0.343
BMI	1.01	0.95-1.08	0.680
PNI	0.98	0.95-1.02	0.327
Symptoms at diagnosis	2.23	1.26-3.93	0.006
Preoperative serum CA19-9 (continuous) (U/mL)	1	1.00-1.00	0.021
Preoperative serum CA19-9 $\geq$ 34 U/mL	1.6	0.99-2.59	0.053
Serum total bilirubin at diagnosis (mg/dL)	1.05	1.02-1.08	0.001
Serum albumin at diagnosis	0.72	0.45-1.13	0.145
Type of surgery			
Whipple's operation <sup>†</sup>			
PPPD	1.81	0.73-4.45	0.198
<b>CT findings</b>			
Tumor size (maximum diameter, mm)	1.03	1.00-1.05	0.045
CBD invasion	1.82	1.13-2.94	0.014
Duodenal invasion	1.12	0.74-1.68	0.598
Uncinate process involvement	1.47	0.97-2.21	0.066
Neck involvement	0.85	0.21-3.46	0.822
Peripancreatic fat invasion,	1.02	0.57-1.84	0.949
Positive retroperitoneal margin	1.16	0.54-2.50	0.712
Necrosis	1.53	0.93-2.51	0.093
Tumor hyperenhancement	0.99	0.48-2.05	0.979
Worrisome finding for invasion of major vessels			
CA, SMA, or GDA	0.95	0.30-3.00	0.927
PV	2.5	1.15-5.47	0.021
SMV	1.53	1.01-2.32	0.047
PV or SMV	1.74	1.13-2.59	0.011
LN suspicious for metastasis			
Regional	1.34	0.88-2.04	0.168
Retroperitoneum	1.35	0.75-2.43	0.314
Maximum MPD diameter (mm)	0.995	0.94-1.05	0.864
Pancreatic parenchymal atrophy			
None to mild <sup>†</sup>			
Moderate to severe	0.9	0.60-1.36	0.627
Chronic pancreatitis in the CT	2.57	0.63-10.51	0.188
Associated pancreatitis or pseudocyst	0.71	0.43-1.18	0.186
Radiologists' conclusion for resectability			
Resectable <sup>†</sup>			
Borderline resectable	1.58	1.05-2.38	0.028

<sup>†</sup> Used as the reference category. "Hyperenhancement" means that the tumor is equal or brighter than pancreatic parenchyma in the hepatic venous phase. Worrisome findings for the invasion of major vessels were based on the National Comprehensive Cancer Network criteria. Regional LN larger than 8mm, retroperitoneal LN larger than 10mm, or any LN with round-shape or necrosis was considered abnormal. Chronic pancreatitis was presumed if the underlying pancreas showed at least two of the following features - pancreatic parenchymal calcification, pancreaticolith, irregular dilatation of MPD, and diffuse pancreatic atrophy. HR, hazard ratio; CI, confidence interval; BMI, body mass index; PNI, prognostic nutritional index; CA 19-9, carbohydrate antigen 19-9; PPPD, pylorus-preserving pancreaticoduodenectomy; LN, lymph node; PNI, perineural invasion; LVI, lymphovascular invasion; CBD, common bile duct; AJCC, American Joint Committee on Cancer; CT, computed

tomography; CA, celiac artery; SMA, superior mesenteric artery; GDA, gastroduodenal artery; PV, portal vein; SMV, superior mesenteric vein; MPD, main pancreatic duct.

**Table S2.** Univariate analysis of preoperative clinical and computed tomography findings in patients with resectable and borderline resectable pancreatic cancer to predict overall survival.

Variables	HR	95% CI	P value
<b>Clinical information</b>			
Age, year	1.02	0.99-1.05	0.298
Gender			
Male <sup>†</sup>			
Female	0.69	0.43-1.10	0.121
BMI	0.97	0.91-1.05	0.469
PNI	0.97	0.93-1.01	0.137
Symptoms at diagnosis	1.95	1.04-3.63	0.037
Preoperative serum CA19-9 (continuous) (U/mL)	1	1.00-1.00	0.289
Preoperative serum CA19-9 $\geq$ 34 U/mL	2.3	1.26-4.20	0.007
Serum total bilirubin at diagnosis (mg/dL)	1.035	1.00-1.07	0.074
Serum albumin at diagnosis	0.69	0.40-1.20	0.193
Type of surgery			
Whipple's operation <sup>†</sup>			
PPPD	1.11	0.45-2.76	0.820
<b>CT findings</b>			
Tumor size (maximum diameter, mm)	1.02	0.99-1.05	0.185
CBD invasion	1.01	0.62-1.64	0.965
Duodenal invasion	0.92	0.57-1.48	0.728
Uncinate process involvement	1.11	0.69-1.79	0.666
Neck involvement	1.35	0.33-5.52	0.679
Peripancreatic fat invasion,	1.09	0.57-2.08	0.795
Positive retroperitoneal margin	1.36	0.59-3.16	0.470
Necrosis	2.45	1.46-4.14	0.001
Tumor hyperenhancement	1.55	0.74-3.24	0.248
Worrisome finding for invasion of major vessels			
CA, SMA, or GDA	0.45	0.06-3.27	0.433
PV	2.28	1.04-4.98	0.040
SMV	1.07	0.65-1.76	0.781
PV or SMV	1.25	0.77-2.01	0.367
LN suspicious for metastasis			
Regional	1.37	0.86-2.20	0.186
Retroperitoneum	1.74	0.93-3.25	0.081
Maximum MPD diameter (mm)	1.03	0.98-1.10	0.268
Pancreatic parenchymal atrophy			
None to mild <sup>†</sup>			
Moderate to severe	1.49	0.94-2.37	0.093
Chronic pancreatitis in the CT	2.54	0.61-10.47	0.199
Associated pancreatitis or pseudocyst	0.88	0.52-1.50	0.643
Radiologists' conclusion for resectability			
Resectable <sup>†</sup>			
Borderline resectable	1.19	0.74-1.92	0.462

<sup>†</sup> Used as the reference category. "Hyperenhancement" means that the tumor is equal or brighter than pancreatic parenchyma in the hepatic venous phase. Worrisome findings for the invasion of major vessels were based on the National Comprehensive Cancer Network criteria. Regional LN larger than 8mm, retroperitoneal LN larger than 10mm, or any LN with round-shape or necrosis was considered abnormal. Chronic pancreatitis was presumed if the underlying pancreas showed at least two of the following features - pancreatic parenchymal calcification, pancreaticolith, irregular dilatation of MPD, and diffuse pancreatic atrophy. HR, hazard ratio; CI, confidence interval; BMI, body mass index; PNI, prognostic nutritional index; CA 19-9, carbohydrate antigen 19-9; PPPD, pylorus-preserving pancreaticoduodenectomy; LN, lymph node; PNI, perineural invasion; LVI, lymphovascular

invasion; CBD, common bile duct; AJCC, American Joint Committee on Cancer; CT, computed tomography; CA, celiac artery; SMA, superior mesenteric artery; GDA, gastroduodenal artery; PV, portal vein; SMV, superior mesenteric vein; MPD, main pancreatic duct.

**Table S3.** Univariate analysis of preoperative clinical and computed tomography findings in patients with resectable pancreatic cancer to predict tumor recurrence.

Variables	HR	95% CI	P value
<b>Clinical information</b>			
Age, year	1.00	0.96-1.03	0.927
Gender			
Male <sup>†</sup>			
Female	0.71	0.40-1.24	0.229
BMI	0.98	0.89-1.07	0.587
PNI	0.98	0.93-1.03	0.443
Symptoms at diagnosis	3.21	1.27-8.08	0.013
Preoperative serum CA19-9 (continuous) (U/mL)	1.00	1.00-1.00	0.023
Preoperative serum CA19-9 $\geq$ 34 U/mL	2.26	1.10-4.65	0.027
Serum total bilirubin at diagnosis (mg/dL)	1.05	1.01-1.09	0.009
Serum albumin at diagnosis	0.77	0.40-1.45	0.414
Type of surgery			
Whipple's operation <sup>†</sup>			
PPPD	0.99	0.31-3.19	0.991
<b>CT findings</b>			
Tumor size (maximum diameter, mm)	1.03	1.00-1.07	0.042
CBD invasion	1.98	0.96-4.08	0.065
Duodenal invasion	1.58	0.91-2.76	0.105
Uncinate process involvement	1.12	0.62-2.00	0.710
Neck involvement	NA	NA	NA
Peripancreatic fat invasion,	0.89	0.43-1.82	0.739
Positive retroperitoneal margin	0.44	0.06-3.16	0.412
Necrosis	1.86	0.99-3.52	0.056
Tumor hyperenhancement	0.99	0.36-2.75	0.982
LN suspicious for metastasis			
Regional	1.14	0.64-2.03	0.662
Retroperitoneum	1.26	0.54-2.94	0.601
Maximum MPD diameter (mm)	0.99	0.92-1.06	0.752
Pancreatic parenchymal atrophy			
None to mild <sup>†</sup>			
Moderate to severe	0.90	0.52-1.56	0.705
Chronic pancreatitis in the CT	NA	NA	NA
Associated pancreatitis or pseudocyst	0.40	0.16-1.02	0.054

<sup>†</sup> Used as the reference category. "Hyperenhancement" means that the tumor is equal or brighter than pancreatic parenchyma in the hepatic venous phase. Worrisome findings for the invasion of major vessels were based on the National Comprehensive Cancer Network criteria. Regional LN larger than 8mm, retroperitoneal LN larger than 10mm, or any LN with round-shape or necrosis was considered abnormal. Chronic pancreatitis was presumed if the underlying pancreas showed at least two of the following features - pancreatic parenchymal calcification, pancreaticolith, irregular dilatation of MPD, and diffuse pancreatic atrophy. HR, hazard ratio; CI, confidence interval; BMI, body mass index; PNI, prognostic nutritional index; CA 19-9, carbohydrate antigen 19-9; PPPD, pylorus-preserving pancreaticoduodenectomy; NA, not applicable; LN, lymph node; PNI, perineural invasion; LVI, lymphovascular invasion; CBD, common bile duct; AJCC, American Joint Committee on Cancer; CT, computed tomography; CA, celiac artery; SMA, superior mesenteric artery; GDA, gastroduodenal artery; PV, portal vein; SMV, superior mesenteric vein; MPD, main pancreatic duct

**Table S4.** Preoperative parameters to predict disease-free survival and overall survival of patients with 82 resectable pancreatic cancers.

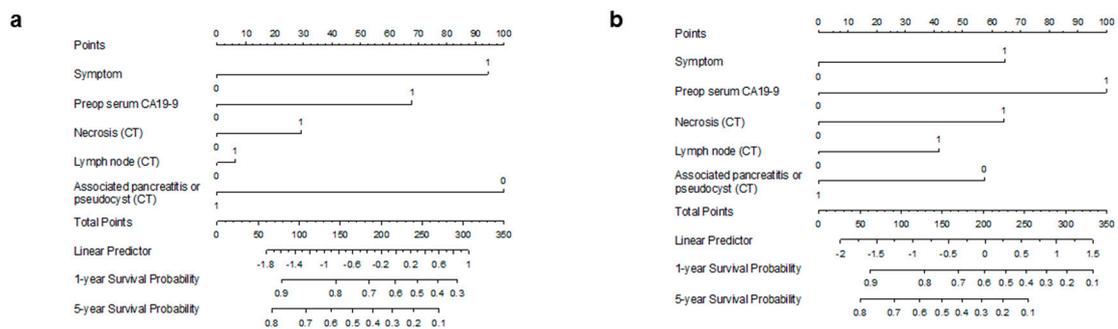
	Disease-free survival			Overall survival		
	HR	95% CI	P value	HR	95% CI	P value
Symptoms at diagnosis	2.93	1.13-7.58	0.027	2.09	0.76-5.71	0.151
Preoperative serum CA 19-9 $\geq$ 34 U/mL	2.17	1.03-4.58	0.043	3.13	1.19-8.21	0.021
Necrosis on CT	1.39	0.72-2.70	0.325	2.08	1.02-4.25	0.045
PV or SMV invasion on CT	Not applicable					
Regional LN suspicious for metastasis on CT	1.07	0.59-1.95	0.520	1.61	0.84-3.09	0.152
Associated pancreatitis or pseudocyst on CT	0.32	0.13-0.82	0.018	0.52	0.22-1.22	0.131
Harrell's c-statistics	0.716 (0.04)			0.668 (0.039)		

Numbers in parentheses are standard errors. HR, hazard ratio; CI, confidence interval; CA 19-9, carbohydrate antigen 19-9; CT, computed tomography; PV, portal vein; SMV, superior mesenteric vein; LN, lymph node.

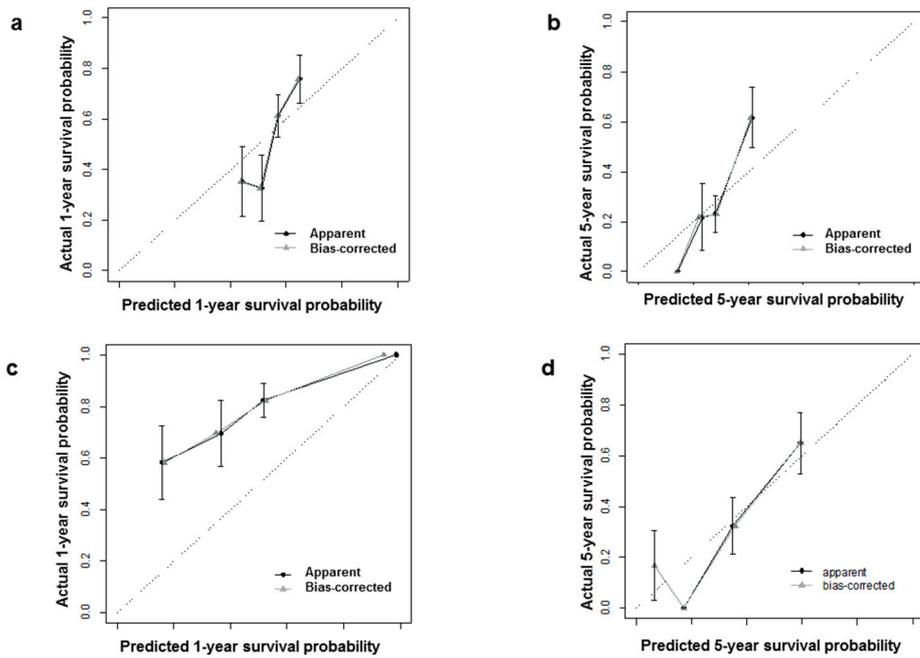
**Table S5.** Univariate and multivariate analysis of preoperative clinical and computed tomography (CT) findings in patients with resectable pancreatic cancer to predict overall survival.

Variables	HR	95% CI	P value
<b>Clinical information</b>			
Age, year	1.03	0.99-1.07	0.212
Gender			
Male <sup>†</sup>			
Female	0.68	0.37-1.27	0.227
BMI	0.96	0.87-1.05	0.359
PNI	0.96	0.91-1.02	0.160
Symptoms at diagnosis	2.95	1.14-7.67	0.027
Preoperative serum CA19-9 (continuous) (U/mL)	1.00	1.00-1.00	0.011
Preoperative serum CA19-9 $\geq$ 34 U/mL	2.95	1.14-7.67	0.027
Serum total bilirubin at diagnosis (mg/dL)	3.55	1.39-9.05	0.008
Serum albumin at diagnosis	1.05	1.01-1.10	0.017
Type of surgery			
Whipple's operation <sup>†</sup>			
PPPD	0.73	0.22-2.36	0.596
<b>CT findings</b>			
Tumor size (maximum diameter, mm)	1.01	0.97-1.05	0.667
CBD invasion	1.07	0.54-2.13	0.837
Duodenal invasion	1.03	0.56-1.88	0.925
Uncinate process involvement	1.22	0.63-2.36	0.560
Neck involvement	NA	NA	NA
Peripancreatic fat invasion,	1	0.46-2.16	1
Positive retroperitoneal margin	1.07	0.26-4.48	0.923
Necrosis	2.90	1.44-5.84	0.003
Tumor hyperenhancement	1.80	0.70-4.61	0.224
LN suspicious for metastasis			
Regional	1.64	0.89-3.02	0.114
Retroperitoneum	2.13	0.94-4.82	0.071
Maximum MPD diameter (mm)	1.03	0.96-1.12	0.375
Pancreatic parenchymal atrophy			
None to mild <sup>†</sup>			
Moderate to severe	1.61	0.87-2.96	0.127
Chronic pancreatitis in the CT	NA	NA	NA
Associated pancreatitis or pseudocyst	0.75	0.33-1.69	0.484

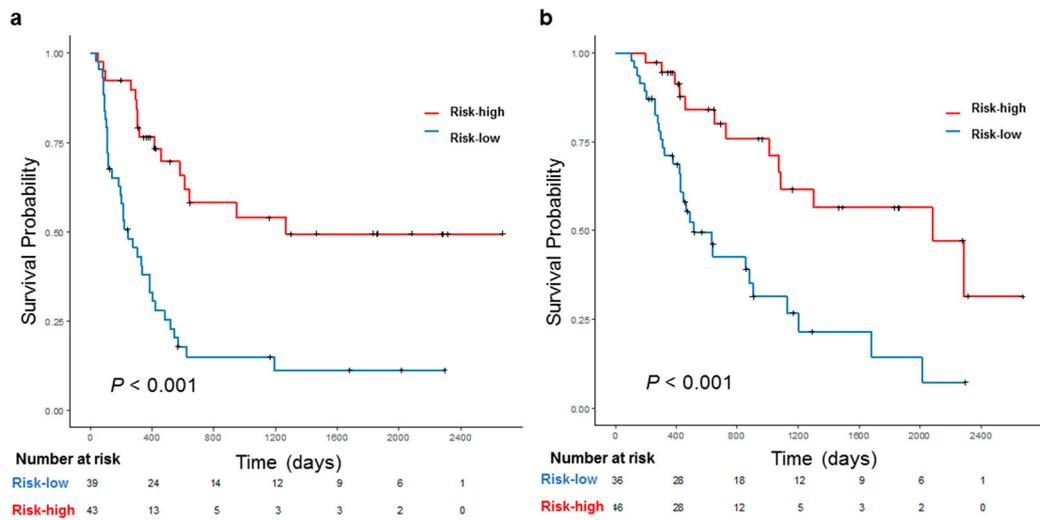
† Used as the reference category. “Hyperenhancement” means that the tumor is equal or brighter than pancreatic parenchyma in the hepatic venous phase. Worrisome findings for the invasion of major vessels were based on the National Comprehensive Cancer Network criteria. Regional LN larger than 8mm, retroperitoneal LN larger than 10mm, or any LN with round-shape or necrosis was considered abnormal. Chronic pancreatitis was presumed if the underlying pancreas showed at least two of the following features - pancreatic parenchymal calcification, pancreaticolith, irregular dilatation of MPD, and diffuse pancreatic atrophy. HR, hazard ratio; CI, confidence interval; BMI, body mass index; PNI, prognostic nutritional index; CA 19-9, carbohydrate antigen 19-9; PPPD, pylorus-preserving pancreaticoduodenectomy; LN, lymph node; PNI, perineural invasion; LVI, lymphovascular invasion; CBD, common bile duct; AJCC, American Joint Committee on Cancer; CT, computed tomography; CA, celiac artery; SMA, superior mesenteric artery; GDA, gastroduodenal artery; PV, portal vein; SMV, superior mesenteric vein; MPD, main pancreatic duct



**Figure S1.** Nomogram predicts probability of (a) disease-free survival and (b) overall survival 1 year and 5 years after curative-intent surgery for radiologically resectable pancreatic head cancer. The points of each predictor found on the uppermost point scale are added up and the total sum projected on the bottom point scale indicates the probability of (a) disease-free and (b) overall survival for each time point. The serum CA19-9 was dichotomized at 34 U/mL by the log-rank test; CA 19-9, carbohydrate antigen 19-9; CT, computed tomography; 0, Negative; 1, Positive



**Figure S2.** Calibration plots comparing predicted and actual 1- and 5-year (a, b) disease-free survival and (c, d) overall survival of patients with radiologically resectable pancreatic head cancer. The ‘apparent’ curve was calculated directly from the dataset. The ‘bias-corrected’ curve was adjusted by bootstrap with 200 resamples.



**Figure S3.** Risk stratification according to the calculated probability of 5-year (A) disease-free survival and (B) overall survival of patients with radiologically resectable pancreatic head cancer. High- and low- risk groups are dichotomized at 50% of the nomogram-based calculated probability of recurrence.