

Table 1 Comparison of general information of patients between the two groups

Demographic characteristics	Traning (n=282)	Validation(n=70)	P
Age(years)			
≤ 60	143(50.71%)	39(55.71%)	0.453
>60	139(49.29%)	31(44.29%)	
Sex			
Female	50(17.73%)	8(11.43%)	0.203
Male	232(82.26%)	62(88.57%)	
Tumor site			
Head of pancreas	145(51.41%)	31(44.29%)	0.193
The ampulla of Vater	68(24.11%)	17(24.29%)	
Duodenum	27(9.58%)	13(18.57%)	
Biliary tract	42(14.90%)	9(12.85%)	
Degree of tumor differentiation			
Benign	41(14.54%)	12(17.14%)	0.62
Highly differentiated	23(8.16%)	4(5.72%)	
Highly-moderately differentiated	12(4.25%)	4(5.72%)	
Moderately differentiated	103(36.53%)	26(37.14%)	
Moderately-poorly differentiated	77(27.30%)	14(20.00%)	
Poorly differentiated	26(9.22%)	10(14.28%)	
Blood type			
A	70(24.82%)	26(37.14%)	0.047
B	100(35.46%)	17(24.29%)	
O	68(24.11%)	21(30.00%)	
AB	44(15.61%)	6(8.57%)	
Pian			
No	169(59.93%)	46(65.71%)	0.374
Yes	113(40.07%)	24(34.29%)	
Jaundice			
No	139(49.29%)	41(58.57%)	0.164
Yes	143(50.71%)	29(41.43%)	
Lost weight			
No	111(39.36%)	25(35.71%)	0.589
Yes	171(60.64%)	45(64.29%)	
Gastrointestinal symptoms			
No	233(82.62%)	52(74.79%)	0.112
Yes	49(17.38%)	18(25.71%)	
Drinking history			
No	220(78.01%)	52(74.79%)	0.505
Yes	62(21.89%)	18(25.71%)	
Hypertension			
No	195(69.15%)	49(70.00%)	0.89
Yes	87(30.85%)	21(30.00%)	
Diabetes			
No	228(80.85%)	59(84.29%)	0.507
Yes	54(19.15%)	11(15.71%)	
Hepatitis B			
No	276(97.87%)	68(97.14%)	0.714
Yes	6(2.13%)	2(2.86%)	
Hepatitis C			
No	280(99.29%)	69(98.57%)	0.487
Yes	2(0.71%)	1(1.43%)	

Operative method			
PD	217(76.95%)	56(80.00%)	0.458
LPD	39(13.83%)	6(8.57%)	
LPD+PD	26(9.22%)	8(11.43%)	
Intraoperative bleeding(>500ml)			
No	157(55.67%)	39(55.71%)	0.995
Yes	125(44.33%)	31(44.29%)	
Operation time (>600min)			
No	184(65.25%)	44(62.86%)	0.708
Yes	98(34.75%)	26(37.14%)	
Blood transfusion			
No	169(59.93%)	40(57.14%)	0.671
Yes	113(40.07%)	30(42.86%)	
Minus jaundice measures			
No	224(79.43%)	57(81.43%)	0.71
Yes	58(50.57%)	13(18.57%)	
Vascular resection			
No	250(88.65%)	64(91.43%)	0.503
Yes	32(11.35%)	6(8.57%)	
History of abdominal surgery			
No	202(71.63%)	54(77.14%)	0.354
Yes	80(28.37%)	16(22.86%)	
Invasion outside the primary site			
No	172(60.99%)	40(57.14%)	0.012
Yes	110(39.01%)	30(42.86%)	
Tumor size(≥ 3 cm)			
No	134(47.52%)	30(42.86%)	0.484
Yes	148(52.48%)	40(57.14%)	
Blood vessel invasion			
No	163(57.80%)	45(64.29%)	0.323
Yes	119(42.20%)	25(35.71%)	
Nerve invasion			
No	103(36.52%)	31(44.29%)	0.231
Yes	179(63.48%)	39(55.71%)	
Lymphatic metastasis			
No	198(70.21%)	51(72.86%)	0.663
Yes	84(29.79%)	19(27.14%)	
R1 resection			
No	245(86.88%)	50(71.43%)	0.002
Yes	37(13.12%)	20(28.57%)	
Pancreatic duct dilatation			
No	122(43.26%)	29(41.43%)	0.781
Yes	160(56.74%)	41(58.57%)	
BMI(≥ 25 kg/m ²)			
No	179(63.48%)	42(60.00%)	0.59
Yes	103(36.52%)	28(40.00%)	
HGB(≥ 120 g/L)			
No	101(35.82%)	29(41.43%)	0.384
Yes	181(64.18%)	41(58.57%)	
WBC($\leq 10 \times 10^9$ /L)			
No	28(9.93%)	5(7.14%)	0.474
Yes	254(90.07%)	65(92.86%)	
Neutrophil count($<6.3 \times 10^9$ /L)			

No	55(19.05%)	15(21.43%)	0.718
Yes	227(80.50%)	55(78.57%)	
Lymphocyte count(<3.2*10 ⁹ /L)			
No	5(1.77%)	1(1.45%)	1
Yes	277(98.23%)	69(98.55%)	
PLT(10 ⁹ /L)			
≤ 125	4(1.42%)	*	0.092
125~350	234(82.98%)	52(74.79%)	
≥ 350	44(15.60%)	18(25.71%)	
CA19-9(>25U/ml)			
No	119(42.20%)	30(42.86%)	0.92
Yes	163(57.80%)	40(57.14%)	
PT(s)			
≤ 9	7(2.49%)	2(2.86%)	0.855
9~15	263(93.26%)	66(94.28%)	
≥ 15	12(4.25%)	2(2.86%)	
APTT(s)			
≤ 23	1(0.35%)	1(1.43%)	0.546
23~38	258(91.48%)	64(91.43%)	
≥ 38	23(8.16%)	5(7.14%)	
PT%			
≤ 75	66(23.40%)	7(10.00%)	0.041
75~120	187(66.31%)	53(75.71%)	
≥ 120	29(10.28%)	10(14.28%)	
AST/ALT			
≤ 1	148(52.48%)	42(60.00%)	0.259
>1	134(47.52%)	28(40.00%)	
Albumin(>35g/L)			
No	88(31.21%)	28(40.00%)	0.161
Yes	194(68.79%)	42(60.00%)	
TBIL(>22umol/L)			
No	91(32.27%)	28(40.00%)	0.221
Yes	191(67.73%)	42(60.00%)	
TG (≥ 1.69mmol/L)			
No	126(44.68%)	32(45.71%)	0.876
Yes	156(55.32%)	38(54.29%)	
PCT(<0.05ng/ml)			
No	237(84.04%)	62(88.57%)	0.343
Yes	45(15.96%)	8(11.43%)	

Abbreviations: LPD, Laparoscopic Pancreatoduodenectomy; PD,open pancreatoduodenectomy ; PT,prothrombin time; BMI, body mass index; HGB,hemoglobinopathies; WBC,white blood cells; PLT,platelet; APTT,activated partial thromboplastin time;AST/ALT,The aspartat aminotransferase (AST)/alanin aminotransferase (ALT) ratio;TBIL,total bilirubin.; TG,triglyceride ; PCT ,procalcitonin.