Laparoscopic distal pancreatectomy for pancreatic ductal adenocarcinoma: Long-term oncologic outcomes after standard resection

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Background. *Surgical resection is the only curative option in patients with pancreatic ductal adenocarcinoma. Little is known about the oncologic outcomes of laparoscopic distal pancreatectomy. This bi-institutional study aimed to examine the long-term oncologic results of standard laparoscopic distal pancreatectomy in a large cohort of patients with pancreatic ductal adenocarcinoma.*

Methods. *From January 2002 to March 2016, 207 patients underwent standard laparoscopic distal pancreatectomy for pancreatic ductal adenocarcinoma at Oslo University Hospital-Rikshospitalet (Oslo, Norway) and Asan Medical Centre (Seoul, Republic of Korea). After the exclusion criteria were applied (distant metastases at operation, conversion to an open operation, loss to follow-up), 186 patients were eligible for the analysis. Perioperative and oncologic variables were analyzed for association with recurrence and survival.*

Results. *Median overall and recurrence-free survivals were 32 and 16 months, while 5-year overall and recurrence-free survival rates were estimated to be 38.2% and 35.9%, respectively. Ninety-six (52%) patients developed recurrence: 56 (30%) extrapancreatic, 27 (15%) locoregional, and 13 (7%) combined locoregional and extrapancreatic. Thirty-seven (19.9%) patients had early recurrence (within 6 months of operation). In the multivariable analysis, tumor size >3 cm and no adjuvant chemotherapy were associated with early recurrence (*P = .017 *and* P = .015*, respectively). The Cox regression model showed that tumor size >3 cm and lymphovascular invasion were independent predictors of decreased recurrence-free and overall survival.*

Conclusion. *Standard laparoscopic distal pancreatectomy is associated with satisfactory long-term oncologic outcomes in patients with pancreatic ductal adenocarcinoma. Several risk factors, such as tumor size >3 cm, no adjuvant chemotherapy, and lymphovascular invasion, are linked to poor prognosis after standard laparoscopic distal pancreatectomy. (Surgery 2017;162:802-11.)*

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Pancreatic ductal adenocarcinoma (PDAC) is the fourth most common cause of cancer-related death in Europe.[1,2] The majority of PDACs are located in the pancreatic head and have an earlier onset of symptoms, thereby increasing the rate of timely diagnosis and chance of curative resection. Conversely, PDACs in the body and tail of the pancreas lack specific symptoms, which result in a later diagnosis and poor survival. Distal

pancreatectomy is the only curative option in these patients. Several studies demonstrate comparable operative outcomes after open and laparoscopic distal pancreatectomy (ODP and LDP, respectively),[3-5] but long-term oncologic outcomes of LDP remain unclear, largely due to a small number of patients (≤30) included in these studies.[6-10]

Our previous report demonstrated a greater recurrence rate and decreased survival after an extended LDP (ie, with en bloc resection of adjacent organs) compared with the standard LDP (SLDP), as defined by the International Study Group of Pancreatic Surgery.[11,12] Furthermore, according to a recent pan-European survey, 60% of HPB surgeons consider tumor involvement of an adjacent organ as a contraindication to minimally invasive distal pancreatectomy.[13]

This study, based on a cumulative experience of 2 academic centers, aimed to examine the long-term oncologic outcomes and prognostic factors in a large proportion of patients with PDAC undergoing SLDP.

METHODS

Design and patients. The study population comprised consecutive patients with PDAC who underwent LDP at the Oslo University Hospital-Rikshospitalet ([OUH] Oslo, Norway) and the Asan Medical Centre ([AMC] Seoul, South Korea) from January 2002 to March 2016. Patients with intraductal papillary mucinous and adenosquamous carcinoma were excluded due to different tumor characteristics and prognosis.[14,15] Neoadjuvant treatment was not a part of the standard management scheme in patients with resectable PDAC, but FOLFIRINOX was preoperatively administered in 2 patients with borderline resectable PDAC that was subsequently operated at OUH. All patients with PDAC in the body and tail of the pancreas operated at OUH within the study period underwent LDP. Initially, patients at AMC could choose between LDP and ODP after receiving thorough information about advantages and disadvantages of each technique. The policy at AMC has changed over time, and currently all patients are treated with LDP, except for those with severe pancreatitis or with lesions abutting major vascular structures (celiac trunk, superior mesenteric artery, or hepatic artery).

Preoperative workup, operative technique, and postoperative management of patients have been described meticulously in previous reports from participating centers.[3,11,16,17] Data on patient demographics, clinical presentation, operative outcomes, tumor characteristics, lymph node status, resection margins, and long-term oncologic outcomes were obtained from the prospectively collected databases.

Adjuvant chemotherapy and follow-up. According to the Norwegian guidelines, patients who are fit after operation (aged <75 years, Eastern Cooperative Oncology Group score 0–1 and weight loss ≤15% during the past 3 months) and agree to receive adjuvant chemotherapy are referred to a local oncologist and start treatment within 6 to 8 weeks of SLDP. Patients >75 years old were considered for adjuvant chemotherapy in selected cases. Weight loss >15% only was not considered a contraindication for adjuvant chemotherapy if the weight loss had been stabilized before initiation of adjuvant chemotherapy. Adjuvant chemotherapy included 5-fluorouracil (5-FU) and leucovorin (LV): 5-FU (500 mg/m^2) and LV (60 mg/m^2) on days 1 and 2 every second week for 6 months (12 cycles) or gemcitabine (1,000 mg/m^2 administered intravenously as a single treatment weekly for 3 of 4 weeks in 6 months total) regimens. Before May 2014, chest and abdominal computed tomography (CT) scans were performed at the outpatient clinic every 6 months after operation for the first 5 years.[18] Since May 2014, chest and abdominal CT were performed 6 months after operation. After 6 months, patients underwent surveillance at their local hospital at 3- to 6-month intervals with history, clinical examination, and blood tests; CT was performed if the patients had symptoms, signs, or increased CA 19-9 values suspicious for recurrence.

At AMC, 5-FU or gemcitabine-based adjuvant chemotherapy was administered within the first 6 months after SLDP. For a select group of patients with positive resection margins, adjuvant chemoradiotherapy was given. All patients had a regular ambulatory follow-up after operation, including chest and abdominal CTs and laboratory tests for tumor markers such as CA19-9. They visited the outpatient clinic every 3 months for the first 2 years and every 6 months for the next 3 years. Additional surveillance included annual check-ups.

Definitions. Consensus criteria set by the International Study Group of Pancreatic Surgery were used to define standard, extended, and concomitant LDP (CLDP; ie, noncontiguous organ resection in the setting of pancreatectomy).[12] Patients diagnosed with distant metastases at the time of operation, those undergoing CLDP, and those converted to ODP were not analyzed with SLDP.

The Accordion Severity Grading System was applied to classify postoperative complications.[19]

Postoperative complications grade ≥III were considered severe. Postoperative pancreatic fistula (POPF) was defined and graded according to the International Study Group on Pancreatic Fistula.[20] Grade B and C POPF were considered clinically relevant (CR-POPF). Tumor size was defined as the largest diameter described in the pathology report. Microscopically positive resection margins (R1) were defined in accordance with the seventh edition of the American Joint Committee on Cancer Staging Manual (ie, if tumor cells were detected at the surface of pancreatic transection and/or tangential margins).[21]

Long-term oncologic outcomes included tumor recurrence, recurrence-free survival (RFS), and overall survival (OS). OS was estimated from the date of operation until the date of death. Radiologic evidence of intra-abdominal soft tissue around the operative site and/or distant metastases was defined as tumor recurrence. Tumor recurrence was graded as locoregional, extrapancreatic, and combined locoregional/extrapancreatic. Recurrence within 6 months of SLDP was defined as early. RFS was the time between SLDP and diagnosed recurrence. Patients without recurrence were censored at the last follow-up, whereas those who died from postoperative complications or were lost to follow-up were excluded from further analysis.

The Norwegian National Population Registry and hospital records were reviewed to obtain data on long-term oncologic outcomes in patients operated at OUH. Local hospitals were contacted if necessary. Hospital records and follow-up data were collected in patients undergoing SLDP at AMC. Data collection was finalized on May 31, 2016.

Statistics. Continuous data are presented as median (range) or mean (±standard deviation), whereas categorical data are expressed as number (percentage). Differences between the frequencies were examined using the χ^2 and Fisher exact test as appropriate. Two-sample Student t test and Man-Whitney U test were applied for normally and non-normally distributed continuous data, respectively.

Associations between perioperative and oncologic outcomes and tumor recurrence were assessed using logistic regression analysis. Variables with $P < .1$ were included in the multivariable regression model with backward selection.

Median and actuarial survival times were estimated, and survival curves were plotted using the Kaplan-Meier method. Survival is described as median (95% confidence interval), and the log-rank test was applied to compare the survival between the groups. To identify the prognostic factors for OS and RFS, variables significant at $P < .05$ were added to the multivariable Cox regression model with backward selection.

RESULTS

Operative and short-term oncologic outcomes. Of the 262 patients with PDAC who underwent LDP between January 2002 and March 2016, 207 (79%) underwent SLDP, while 47 (17.9%) underwent extended LDP due to tumor invasion to adjacent organ(s). Eight (3.1%) patients underwent CLDP for distant metastases of PDAC detected at the time of operation.

Demographics, clinical characteristics, and perioperative outcomes of patients undergoing SLDP are presented in Table I. One hundred forty-four patients were operated at AMC, and 63 at OUH. Six (2.9%) patients underwent spleen-preserving LDP because PDAC was misdiagnosed preoperatively as a neuroendocrine tumor. Twenty (9.7%) patients developed severe complications postoperatively, whereas CR-POPF was observed in 22 (10.6%) cases. One patient (0.8%) died within 90 days of SLDP due to multiple organ failure.

Ten patients (4.8%) were lost to follow-up. As a result, oncologic outcomes were analyzed in 186 patients (Fig 1). Median tumor size was 3 (0.6–9) cm. Twenty-four (12.9%) patients were found to have positive resection margins, while 97 (52.2%) had pN1 stage at final pathology. Median numbers of detected and positive lymph nodes were 12 (1–46) and 1 (0–13), respectively. One hundred and five (56.5%) patients received adjuvant chemotherapy, while 23 (12.4%) received chemoradiotherapy.

Recurrence. Median follow-up was 18 (1–168) months. Ninety-six patients (51.6%) developed tumor recurrence after SLDP, including 56 (30.1%) extrapancreatic, 27 (14.5%) locoregional, and 13 (7.0%) combined locoregional/extrapancreatic recurrences. Distribution of all anatomic sites and locations of the tumor recurrence were as follows: liver (33%), locoregional (33%), peritoneal carcinomatosis (19%), lungs (11%), and bones (4%).

Median values were used as cut-off points for tumor size and detected lymph nodes. None of the factors was associated with locoregional recurrence (data not shown), while only perineural invasion was a positive predictor for extrapancreatic recurrence (odds ratio [OR] 2.65; 95% confidence interval [CI], 1.0–6.95; $P = .04$).

Table I. Demographics, clinical characteristics, and operative outcomes of SLDP in patients with PDAC

Variable	*SLDP (n = 207)*
Age, mean (SD), y	62.9 (10.6)
BMI, mean (SD), kg/m^2	24 (3.5)
Sex, *n* (%)	
Female	93 (44.9)
Male	114 (55.1)
ASA score, *n* (%)	
1	21 (10.1)
2	155 (74.9)
3	31 (15)
Diabetes mellitus, *n* (%)	58 (28)
Spleen-preserving procedure, *n* (%)	6 (2.9)
Operative time, mean (SD), min	210 (66)
Estimated blood loss, median (IQR), mL	217 (0–3000)
Red blood cell transfusion, *n* (%)	28 (13.5)
Conversion to open operation, *n* (%)	2 (1)
Postoperative complications, *n* (%)	44 (21.3)
Severe complications, *n* (%)	20 (9.7)
CR-POPF, *n* (%)	22 (10.6)
Mortality, *n* (%)	1 (0.5)
Duration of hospital stay, median (IQR), days	8 (2–63)

BMI, Body mass index; *ASA*, American Society of Anesthesiologists.

Thirty-seven (19.9%) patients had early recurrence, including 17 (9.1%) with distant metastases. Perineural invasion and the use of adjuvant chemotherapy were more common in patients with late recurrence (>6 months) compared with those with early recurrence (91.5 vs 75.7%, $P = .03$ and 67.8 vs 10%, $P = .001$, respectively). Morbidity, severe complications, CR-POPF, PDAC >3 cm, histologic grade, number of positive lymph nodes, lymphovascular invasion, and no adjuvant chemotherapy were associated with early recurrence (Table II). In the multivariable analysis, only PDAC >3 cm and no adjuvant chemotherapy resulted in early recurrence.

The relationships between tumor size and histopathologic characteristics of PDAC are presented in Table III. PDAC >3 cm positively correlated with lymphovascular and perineural invasions ($P = .004$ and .02, respectively) and pN1 stage ($P = .001$).

Survival. Median RFS was 16 (95% CI, 9.8–22.2) months, while 3- and 5-year RFS rates were 40% and 36%, respectively (Fig 2). Male sex, morbidity, severe complications, CR-POPF, PDAC >3 cm, ≥2 positive lymph nodes, and perineural and lymphovascular invasion were associated with RFS

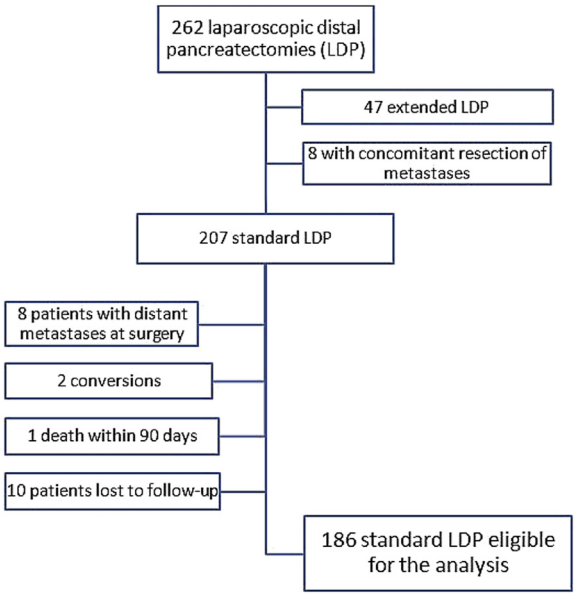

Fig 1. Flow-chart showing the selection of patients included in the analysis.

(Table IV). In the multivariable model, male sex ($P = .03$), PDAC >3 cm ($P = .009$), and lymphovascular invasion ($P = .02$) were linked to poor RFS.

Median OS was 32 (95% CI, 23.1–40.9) months, while 3- and 5-year survival rates were 47% and 38%, respectively. Male sex, severe morbidity, PDAC >3 cm, R1 resection margin, ≥2 positive lymph nodes, and perineural and lymphovascular invasion were significant predictors for OS. OS was not statistically different between the participating centers, although numerically less in patients operated at OUH (1.48; 0.92–2.37, $P = .1$). In the multivariable analysis, only PDAC >3 cm ($P = .04$) and lymphovascular invasion ($P = .005$) were independent predictors of OS. Median survival in patients with PDAC ≤3 and >3 cm was 45 months (95% CI, 25.9–164.1) and 24 months (95% CI, 14.8–27.2), respectively (Fig 3, *A*), whereas median survival times in patients with and without lymphovascular invasion were 21 months (95% CI, 18.3–23.7) and 51 months (95% CI, 11.2–90.2) months, respectively (Fig 3, *B*).

DISCUSSION

This study suggests that SLDP is associated with acceptable long-term oncologic outcomes in patients with PDAC. Nevertheless, more than half of patients were diagnosed with tumor recurrence on a median follow-up period of 18 months. Liver metastases and locoregional recurrence were the most common of types of tumor relapse, which is consistent with previous reports[22,23]; however,

Table II. Uni- and multivariable analyses of risk factors for early recurrence after SLDP for PDAC

Variable	*Univariable*		*Multivariable*	
	OR (95% CI)	P *value*	*OR (95% CI)*	P *value*
Age, y	1.01 (0.97–1.04)	.69		
BMI, kg/m^2	0.99 (0.89–1.1)	.9		
Sex (male)	1.73 (0.82–3.65)	.15		
ASA score 3	1.01 (0.38–2.68)	.98		
Operative time, min	1.0 (0.99–1.01)	.24		
Estimated blood loss, mL	1.0 (1.0–1.01)	.45		
Red blood cell transfusion	0.88 (0.28–2.78)	.83		
Postoperative complications	2.27 (1.01–5.09)	.047	—	—
Severe complications	4.86 (1.69–14.01)	.003	—	—
CR-POPF	3.83 (1.39–10.55)	.009	—	—
Tumor size >3 cm	2.59 (1.22–5.48)	.013	5.92 (1.18–29.69)	.03
Tumor grade (poor differentiated)	2.26 (0.96–5.33)	.06	—	—
R1 resection margin	1.3 (0.39–4.31)	.67		
Detected lymph nodes >12	1.19 (0.58–2.45)	.63		
pN1 stage	1.26 (0.61–2.6)	.53		
No. of PLN	1.18 (1.04–1.34)	.009	—	—
Perineural invasion	0.82 (0.35–1.91)	.64		
Lymphovascular invasion	2.44 (1.16–5.11)	.018	—	—
No adjuvant chemotherapy	11.02 (1.36–89.15)	.025	11.54 (1.4–94.96)	.02

BMI, Body mass index; *ASA*, American Society of Anesthesiologists; *PLN*, positive lymph nodes.

Table III. Histopathologic characteristics in patients with PDAC sized ≤3 cm and >3 cm

Variables	*PDAC ≤3 cm* (n = *100*)	*PDAC >3 cm* (n = *86*)	P *value*
Tumor grade, *n* (%)			.15
High/Moderate	87 (87%)	68 (79%)	
Poor	13 (13%)	18 (21%)	
Resection margin, *n* (%)*			.19
R0	84 (93.3%)	68 (87%)	
R1	6 (6.7%)	10 (13%)	
Detected lymph nodes, median (range)	11 (0–38)	13 (0–46)	.06
pN1 stage, *n* (%)	38 (38%)	59 (69%)	.001
No. of PLN, median (range)	0 (0–9)	1 (0–13)	.001
Lymphovascular invasion, *n* (%)	35 (35%)	48 (56%)	.004
Perineural invasion, *n* (%)	72 (72%)	74 (86%)	.02

*Incomplete data; *PLN*, Positive lymph nodes.

these studies focused mainly on pancreatoduodenectomy, whereas similar data after LDP are limited to small case series.

Tumor size was associated with several histopathologic features of PDAC, as well as a lesser RFS and OS. These findings are in agreement with the literature.[24-27] A multicenter study from Matsumoto et al[28] suggested that larger tumor size increases the likelihood of early relapse after operation. Marchegiani et al[24] observed a linear correlation between survival and tumor size in the dimensional interval from 1 to 4 cm, with almost half of the long-term survivors being diagnosed with PDAC <2 cm. The cut-off value of 2 cm has been used widely in the literature due to the criteria set in the seventh edition of the TNM system by the American Joint Committee on Cancer,[24,25,29,30] but detecting PDAC ≤2 cm seems less likely in the pancreatic body and tail given the late manifestation of the disease. Our results demonstrate that only 18% of patients undergoing SLDP had PDAC ≤2 cm. Thus, a cut-off value of 3 cm seems to be more appropriate when planning a treatment strategy in these patients. In this study, a significant association was found between the tumor size and lymphovascular

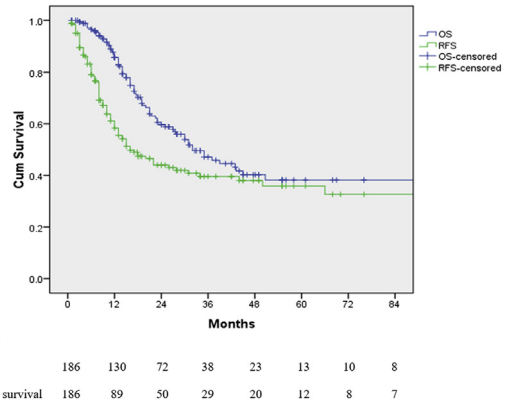

Fig 2. Overall and recurrence-free survival after standard laparoscopic distal pancreatectomy for ductal adenocarcinoma.

invasion. The latter has an important role in tumor cell dissemination through the lymph and blood vessels. Chen et al[31] assume that lymphovascular invasion was responsible for the tumor spread via the lymphatic system resulting in metastases in the lymph nodes and other organs. Our findings suggest that lymphovascular invasion leads to decreased RFS and OS, which is also confirmed by a number of studies.[14,31,32]

In contrast with previous reports, neither an R1 margin nor a pN1 had a significant impact on prognosis. The role of R1 margin remains unclear due to its various definitions used in the literature.[24,33-36] The results vary even in the studies using similar classification of R1.[37,38] A Dutch, multicenter study on distal pancreatectomy for PDAC identified resection margins <1 mm, no adjuvant treatment, postoperative complications, and pT3/T4 stage as predictors for decreased survival.[39] Conversely, a similar French multicenter experience found that only pN1 stage was associated with survival.[37] According to numerous reports, positive lymph nodes negatively affect survival,[14,40-42] but these studies mostly report on pancreatoduodenectomy. In a large, single-center study, Sohn et al[43] found less pN1 (59 vs 73%, $P = .03$), but larger tumor size (4.8 vs 3 cm, $P < .001$) in patients undergoing distal pancreatectomy compared with those undergoing pancreatoduodenectomy. In our series, only 52.2% of patients with SLDP had pN1. Number of positive lymph nodes was associated with OS and RFS in the univariable, but not multivariable, analysis.

Early recurrence detected in 19.9% of patients indicates the aggressive behavior and poor survival with PDAC.[44,45] Six months after operation is the most common definition for early recurrence of PDAC.[28,44-46] Our results suggest that not receiving adjuvant chemotherapy and PDAC >3 cm positively correlate with early recurrence. In contrast, one should bear in mind the possible presence of occult metastases at the time of operation, which could be interpreted as early recurrence. Several studies report that ≤58% of patients with locally advanced PDAC have occult distant metastases at the time of operation.[47-49] In this study, almost half of the patients with early recurrence were diagnosed with distant metastases. Hence, there is a chance that some of those "recurrences" could have already been present at the time of SLDP. Recent studies from the United States report improved survival in patients undergoing neoadjuvant chemoradiotherapy for resectable pancreatic cancer.[50-55] Roland et al[54] suggest that neoadjuvant therapy results in a greater survival and time to local recurrence compared with the "resection first" approach. Moreover, the rate of lymphovascular invasion was less, and tumor size was smaller in these patients. Given the potential benefits of neoadjuvant therapy, it can be useful in patients with unfavorable prognostic features determined at the preoperative stage. Furthermore, the test of time can help to identify patients with occult systemic disease who are less likely to benefit from operation.

Our study has several limitations. This is a retrospective study affected by certain inherent biases and relatively short median follow-up. Furthermore, because not all patients with PDAC underwent LDP at AMC during the study period, perioperative and survival data should be interpreted with caution. Due to the lack of standardized pathology protocols applied during the study period, we could not assess tumor invasion to the splenic vessels and ≤1 mm clearance of resection margins. Results on recurrence and RFS should be interpreted carefully given the nonsystematic follow-up in OUH patients operated after May 2014. Finally, we had no control group undergoing ODP to compare with LDP in terms of oncologic outcomes. Although several reports found no differences in long-term oncologic outcomes,[3,8,10,56] randomized controlled trials are essential to overcome the selection bias in retrospective studies.

This bi-institutional study demonstrates that SLDP provides satisfactory long-term oncologic outcomes in patients with PDAC. Tumor size, lymphovascular invasion, and no adjuvant chemotherapy seem to be key determinants of early recurrence and poor survival.

Table IV. Uni- and multivariable analysis of prognostic factors for recurrence-free and overall survival after SLDP for PDAC

	Recurrence-free survival				*Overall survival*			
	Univariable analysis		*Multivariable analysis*		*Univariable analysis*		*Multivariable analysis*	
Variable	*HR (95% CI)*	P *value*	*HR (95% CI)*	P *value*	*HR (95% CI)*	P *value*	*HR (95% CI)*	P *value*
Age ≥70 y	1.0 (0.64–1.59)	.98			1.13 (0.67–1.88)	.64		
BMI ≥25 kg/m^2	0.9 (0.6–1.36)	.62			0.88 (0.56–1.41)	.62		
Sex (male)	1.82 (1.19–2.78)	.006	1.6 (1.05–2.46)	.03	1.91 (1.17–3.1)	.009	1.57 (0.91–2.71)	.11
ASA score 3	1.1 (0.65–1.89)	.72			1.23 (0.69–2.21)	.47		
Red blood cell transfusion	1.13 (0.63–2.03)	.68			0.97 (0.5–1.89)	.93		
Postoperative complications	1.61 (1.02–2.57)	.04	—	—	1.5 (0.9–2.5)	.12		
Severe complications	2.59 (1.4–4.77)	.002	—	—	2.01 (1.03–3.94)	.04	—	—
CR-POPF	1.86 (1.03–3.34)	.04	—	—	1.65 (0.87–3.13)	.13		
T stage								
T1–T2	—				—			
T3	1.04 (0.62–1.72)	.89			0.99 (0.56–1.73)	.96		
Tumor size >3 cm	2.06 (1.37–3.09)	.001	1.74 (1.15–2.63)	.009	2.0 (1.27–3.16)	.003	1.7 (1.03–2.78)	.04
Tumor grade (low)	1.45 (0.87–2.39)	.15			1.03 (0.53–2.01)	.92		
R1 resection margin	1.65 (0.83–3.31)	.16			2.37 (1.13–4.98)	.02	—	—
Lymph nodes ≥12	1.28 (0.86–1.92)	.23			1.27 (0.81–1.99)	.3		
PLN								
0	—	—			—	—		
1	1.35 (0.81–2.23)	.25			1.33 (0.75–2.37)	.33		
≥2	1.94 (1.2–3.12)	.006	—	—	2.37 (1.40–4.02)	.001	—	—
Perineural invasion	2.14 (1.19–3.85)	.01	1.78 (0.98–3.22)	.06	2.05 (1.05–4.0)	.035	—	—
Lymphovascular invasion	2.0 (1.3–3.0)	.001	1.61 (1.07–2.45)	.02	2.33 (1.47–3.67)	.001	2.04 (1.24–3.37)	.005
No adjuvant chemotherapy	1.26 (0.78–2.05)	.34			1.16 (0.69–1.96)	.58		
No adjuvant chemoradiotherapy	1.08 (0.59–1.99)	.79			0.98 (0.52–1.88)	.97		

BMI, Body mass index; *PLN*, positive lymph node.

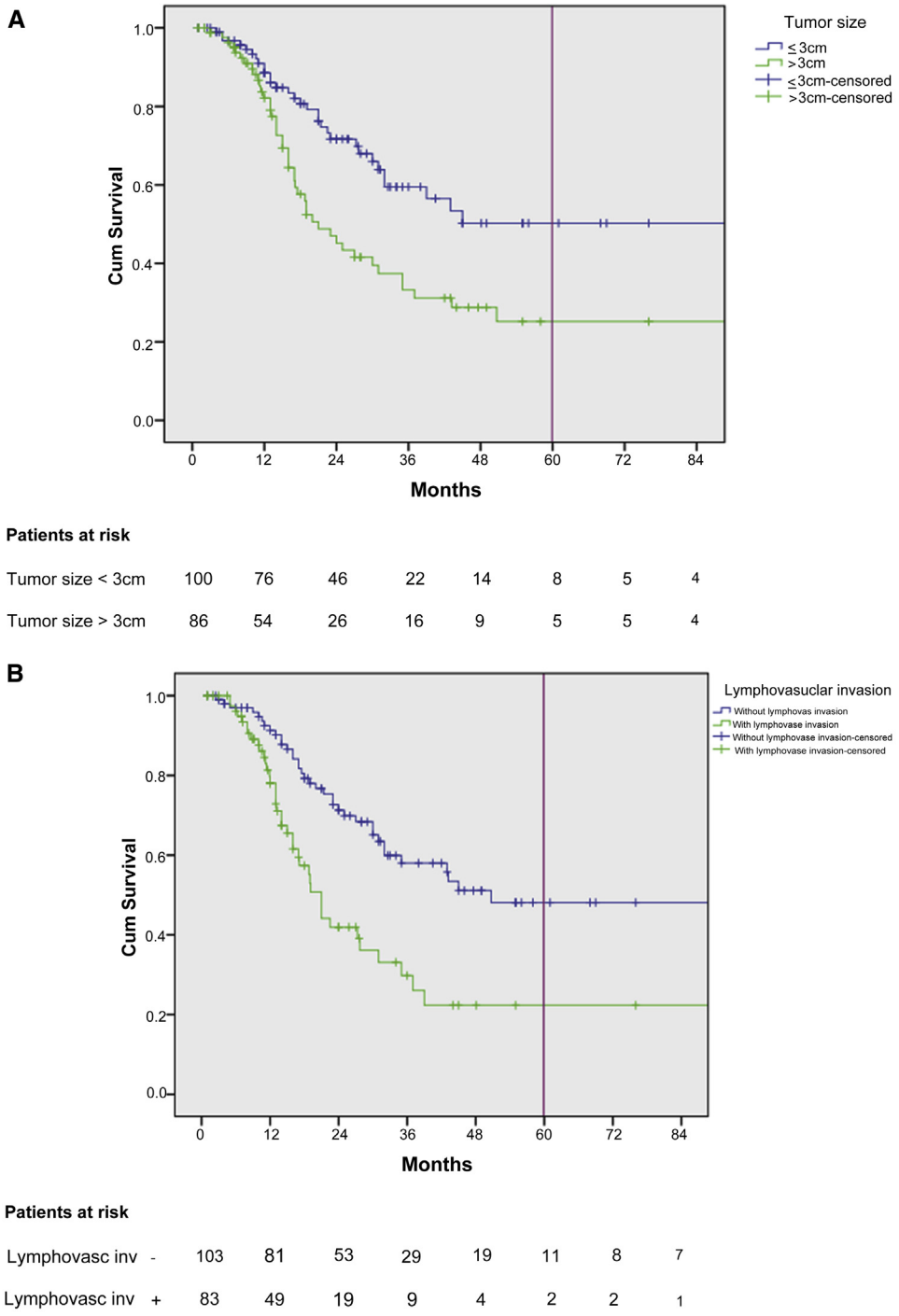

Fig 3. Survival in patients with pancreatic ductal adenocarcinoma ≤3 cm and >3 cm (*A*) and in patients with (+) and without (−) lymphovascular invasion (*B*) after standard laparoscopic distal pancreatectomy.

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