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Treatment tactics for patients with borderline resectable and locally advanced pancreatic cancer

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Objective – to evaluate the outcomes of extended pancreatic resections in the treatment of patients with borderline resectable and locally advanced pancreatic cancer and to identify strategies for improving the effectiveness of these procedures.

Materials and methods. Between 2010 and 2023, a total of 874 pancreatic resections were performed for patients with pancreatic adenocarcinoma: 142 distal pancreatosplenectomies (16.2%), 706 pancreaticoduodenectomies (80.8%), and 26 total pancreatectomies (3.0%). The cohort included 388 females (44.4%) and 486 males (55.6%), with a mean age of 57.7 ± 10.5 years (range: 22–81). Extended pancreatic resections were conducted in 202 (23.1%) patients, comprising 130 extended pancreaticoduodenectomies (64.4%), 58 extended distal pancreatosplenectomies (28.7%), and 14 extended total pancreatectomies (6.9%). A total of 144 (71.3%) patients underwent pancreatic resections with venous resections, 13 (6.4%) with arterial resections, 3 (1.5%) with combined vascular resections, and 42 (20.8%) with resections of adjacent organs.

Results. Postoperative complications were observed in 248 patients (36.9%) in the standard resection group and in 84 patients (41.6%) in the extended resection group ($\chi^2 = 1.4$; $p = 0.22$), with no statistically significant difference. The mortality rate was 2.6%, with 23 deaths: 16 (2.4%) after standard pancreatic resections and 7 (3.5%) after extended pancreatic resections, indicating no statistically significant difference ($\chi^2 = 0.71$; $p = 0.39$). Implementation of a personalized treatment algorithm increased the median survival of patients with borderline resectable and locally advanced pancreatic head cancer from 19 to 28 months ($\chi^2 = 1.7$; $p = 0.18$) and the five-year survival from 22% to 28.5%. For patients with pancreatic cancer of the body and tail, median survival increased from 22 to 36 months ($\chi^2 = 1.78$; $p = 0.18$) and five-year survival from 24% to 34% ($\chi^2 = 1.78$; $p = 0.18$).

Conclusions. The results suggest that morbidity and mortality after extended pancreatic resections are comparable to those observed after standard pancreatic resections. Extended resections are feasible and can increase the number of patients eligible for radical surgery. Implementation of the developed treatment algorithm was associated with improved median survival in patients with borderline resectable and locally advanced pancreatic cancer.

Keywords
extended pancreatic resections, pancreatic cancer, borderline resectable pancreatic cancer, locally advanced pancreatic cancer, venous resections, arterial resections.

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Despite advancements in diagnostic and surgical techniques, pancreatic ductal adenocarcinoma (PDAC) remains the fourth leading cause of cancer-related mortality in Europe and the United States, with a persistently low five-year survival rate [12, 18]. Expert projections suggest that pancreatic cancer may become the second leading cause of cancer-related death worldwide within the next decade [20].

The incidence of pancreatic cancer in Ukraine is rising. At the time of diagnosis, only 10–25 % of patients with pancreatic adenocarcinoma have resectable tumours. Approximately 60 % of patients globally present with tumour extension to adjacent organs and vessels. Locoregional progression and early systemic dissemination of malignant pancreatic tumours frequently result in local invasion of major vessels and adjacent organs, thereby limiting resectability [13, 17, 19]. Advances in surgical techniques and systemic chemotherapy have broadened the indications for pancreatic resection to include borderline resectable and locally advanced tumours. Consequently, extended pancreatic resections involving adjacent organs and vessels often represent the only radical treatment option to improve survival in this patient population [2, 9, 11, 22, 23].

Postoperative complication rates after pancreatic resections are among the highest in abdominal surgery, ranging from 30 % to 60 % [20]. The risk associated with extended pancreatic resections, particularly those involving arterial resection, remains substantial. Nevertheless, recent evidence suggests that survival outcomes after extended resections with venous and arterial reconstruction surpass those achieved with palliative surgery and chemotherapy [4, 5, 10, 16]. Therefore, ongoing refinement of surgical techniques and the development of strategies to reduce complications are essential to improve long-term outcomes in patients undergoing extended pancreatic resections for malignant tumours.

Materials and methods

Between 2010 and 2023, a total of 874 pancreatic resections were performed for patients with malignant pancreatic tumours: 142 distal pancreatosplenectomies (16.2 %), 706 pancreaticoduodenectomies (80.8 %), and 26 total pancreatectomies (3.0 %). The cohort included 486 males (55.6 %) and 388 females (44.4 %), with a mean age of 57.7 ± 10.5 years (range: 22–81). Extended pancreatic resections were conducted in 202 (23.1 %) patients, comprising 130 extended pancreaticoduodenectomies (64.4 %), 58 extended distal pancreatosplenectomies (28.7 %), and 14 extended total pancreatectomies (6.9 %).

All patients underwent a planned preoperative examination, which included computed tomography of the chest and abdominal organs with intravenous contrast no later than 4 weeks before determining the treatment tactics and MRI with DWI mode in patients with suspected metastatic liver damage and distant metastases. A blood test for the oncological marker CA 19–9 was mandatory. Using preoperative examination data, the anatomical resectability of the tumour was assessed. The diagnosis was confirmed by morphological examination of the specimens.

Among patients undergoing extended pancreatic resections, 144 (71.3 %) had venous resections, 13 (6.4 %) arterial resections, 3 (1.5 %) combined vascular resections, and 42 (20.8 %) resections of adjacent organs.

Venous resection types were defined based on the International Study Group of Pancreatic Surgery (ISGPS) classification. Tangential venous resection with venorrhaphy (type A) was performed in 64 patients. Tangential venous resection with patch venoplasty (type B) was conducted in 3 patients. Segmental resection with end-to-end venous anastomosis (type C) was performed in 74 patients. Segmental resection, including venoplasty with either an autologous vein or a prosthetic graft (type D) was conducted in 3 patients, with autologous vein grafts used in 2 cases and a prosthetic graft in 1 case.

Arterial resections were performed in 16 patients with borderline resectable or locally advanced pancreatic tumours that exhibited arterial vessel invasion. Among these, 4 patients underwent extended pancreaticoduodenectomy with arterial resection: 1 patient had pancreaticoduodenectomy with segmental resection of the left hepatic artery, 2 patients had pancreaticoduodenectomy with resection of the right hepatic artery, and 1 patient had pancreaticoduodenectomy with resection of the common hepatic artery. In all cases, end-to-end arterial anastomosis was performed. Extended distal pancreatosplenectomy with arterial vessel resection was performed in 11 patients. Of these, 9 patients underwent a modified Appleby operation, with one patient also requiring resection of the portosplenomesenteric confluence (Fig. 1). In 2 patients, combined resections (arterial resections with additional resection of the affected organs) were performed: 1 patient underwent distal pancreatic resection (posterior radical antegrade modular pancreatosplenectomy [RAMPS posterior]) with resection of the left gastric artery and left crus of the diaphragm, while another patient underwent distal subtotal pancreatosplenectomy with resection of the portosplenomesenteric confluence, colonic mesentery, and common hepatic artery.

Extended total pancreatectomies were performed in 14 patients (6.9 %). Among these, one case involved combined arterial-venous resection, specifically the portosplenomesenteric confluence, with resection and reconstruction of the right hepatic artery, which originated from the superior mesenteric artery as a separate trunk. 13 cases involved extended total pancreatectomy with only venous resections. Of these, one included resection of the

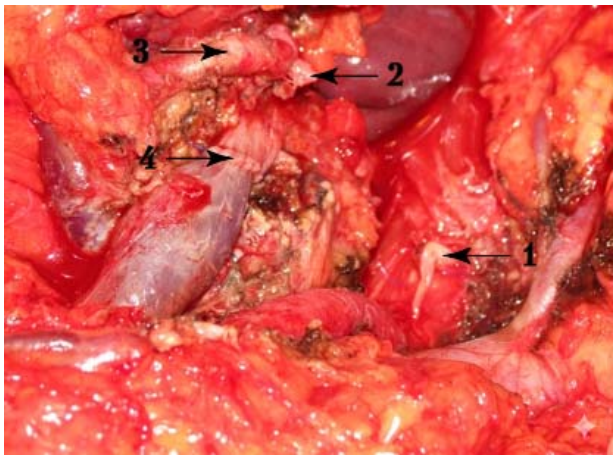

Figure 1. **Intraoperative photo. Modified Appleby operation with additional resection of the portosplenomesenteric confluence:** 1 – stump of the celiac trunk, 2 – stump of the common hepatic artery, 3 – gastroduodenal artery, 4 – end-to-end venous anastomosis

Figure 2. **Intraoperative photo. Pancreaticoduodenal resection with resection of the portosplenomesenteric confluence and end-to-end venous anastomosis, with wedge-shaped resection of the portal vein, and the extension of the incision to the splenic vein confluence**

portosplenomesenteric confluence and the inferior vena cava, and another involved total pancreatectomy with nephrectomy.

Postoperative complications were assessed according to the International Study Group of Pancreatic Surgery (ISGPS) guidelines. Mortality was defined as death occurring in the hospital after surgery.

Specific surgical complications included pancreatic fistula, as defined by the revised criteria of the International Study Group of Pancreatic Fistula [1], as well as postpancreatectomy bleeding and delayed gastric emptying.

Risk factors for postoperative complications were identified, and targeted preventive measures were developed to reduce their incidence.

To minimize intraoperative blood loss during both standard and extended pancreaticoduodenectomy, the inferior pancreaticoduodenal artery was ligated at the initial stage of mobilization of the pancreaticoduodenal complex, when technically feasible. This approach reduced intraoperative blood loss.

In cases of venous invasion, the surgical team employed venous reconstruction techniques. These techniques enabled the reconstruction of venous vessels and the safe formation of venous anastomoses without the use of prosthetic venous grafts. For pancreatic head tumours invading the portal vein, a specific pancreatic head resection method (patent No 95976) was used. This technique involves wedge-shaped resection of the portal vein, extending the incision beyond the splenic vein confluence, and forming a venous anastomosis between the proximal and distal segments of the splenic vein (Fig. 2).

The criteria used to compare standard and extended surgical interventions included complication rate, operative time, blood loss, length of hospital stay, and mortality.

The collected data were digitized and compiled into a unified database. Mathematical methods were used to identify risk factors for postoperative complications. Relationships between factors and complication frequency were analysed using contingency tables and the chi-square test. The Spearman rank correlation coefficient (ρ) was calculated to determine associations between two variables. Differences in mean values were evaluated using the Mann–Whitney test. Long-term treatment outcomes were assessed by calculating actuarial five-year survival rates with the Kaplan–Meier method. All statistical analyses were conducted using MS Excel and Statistica 5.0 software.

Since 2018, new tactical approaches and perioperative management strategies have been implemented to prevent postoperative pancreatic fistula and other complications.

Sarcopenia was detected in patients by computed tomography during preoperative planning. Patients diagnosed with sarcopenia received specialized nutrition to improve their sarcopenic profile. A prerehabilitation programme was implemented. Nutritional status was evaluated with active nutritional support before surgery. Postoperative pancreatic fistula was identified as a primary source of severe postoperative complications. During pancreaticoduodenectomy, the risk of postoperative pancreatic fistula was assessed intraoperatively in all patients using the modified Callery–Kopchak scale

Table 1. **Modified Pancreatic Fistula Risk Scale (M.Callery — V.Kopchak)**

Risk factor	Points
Pathology	
Pancreatic adenocarcinoma or pancreatitis	0
Adenocarcinoma of the major duodenal papilla, distal part of the common bile duct, duodenum, cystic tumours, neuroendocrine tumours	1
Pancreatic duct diameter, mm	
≥ 5	0
4	1
3	2
2	3
≤ 1	4
Intraoperative blood loss, ml	
≤ 400	0
401–700	1
701–1000	2
> 1000	3
Pancreatic fibrosis, %	
< 15	2
15–30	1
> 30	0

(Table 1). Appropriate surgical techniques were used to prevent postoperative pancreatic fistula, including various pancreaticojejunostomy methods.

For high-risk patients (7–10 points) at the reconstructive stage after pancreaticoduodenectomy, pancreaticojejunal anastomosis with external drainage of the main pancreatic duct was performed. In moderate-risk patients (4–6 points), pancreaticojejunal anastomosis with invagination was conducted. Preliminary data indicate that this approach was associated with the lowest incidence of postoperative pancreatic fistulas. In low-risk patients (0–3 points), the choice of anastomosis was determined by the surgeon. To minimize postoperative blood loss, ligation of the inferior pancreaticoduodenal artery was implemented during the initial stage of pancreaticoduodenectomy, resulting in a significant reduction in intraoperative blood loss from 450.7 ± 184.3 ml to 356.25 ± 197.4 ml ($p = 0.003$).

All patients diagnosed with malignant tumours in the left anatomical segment of the pancreas underwent radical antegrade modular pancreatosplenectomy.

The results of extended pancreatic resections, median survival, and five-year survival rates were compared between two periods: 2010–2017 and 2018–2023, the latter reflecting the implementation of newly developed methods and algorithms. The patient groups were comparable with respect to comorbidities, disease stage, and the number of extended pancreatic resection variants performed.

Results

Table 2 presents data on postoperative complications after standard and extended pancreatic resections.

Postoperative complications were observed in 248 patients (36.9 %) in the standard resection group and in 84 patients (41.6 %) in the extended pancreatic resection group; this difference was not statistically significant ($\chi^2 = 1.4$; $p = 0.22$). A total of 23 patients (2.6 %) died: 7 (3.5 %) after extended pancreatic resections and 16 (2.4 %) after standard pancreatic resections. Patients who underwent extended pancreatic resections had higher mortality, though the difference was not statistically significant ($\chi^2 = 0.71$; $p = 0.39$).

Table 2. **Comparative characteristics of standard and extended pancreatic resections**

Parameter	Pancreatoduodenectomy		Distal pancreatosplenectomy		Total pancreatectomy	
Resection	**Standard (n = 576)**	**Extended (n = 130)**	**Standard (n = 84)**	**Extended (n = 58)**	**Standard (n = 12)**	**Extended (n = 14)**
Operative time, min	366 ± 78	387 ± 72	253 ± 60	305 ± 71	361 ± 78	396 ± 56
p	0.03 (U = 6515)		0.0006 (U = 343.0)		0.56 (U = 19)	
Blood loss, ml	420 ± 229	627 ± 556	513 ± 333	610 ± 330	649 ± 460	950 ± 459
p	0.10 (U = 6462)		0.32 (U = 1617)		0.26 (U = 15)	
Complication rate	164 (28.4 %)	38 (29.2 %)	18 (21.4 %)	17 (29.3 %)	45 (41.7 %)	6 (42.8 %)
p	0.10 ($\chi^2 = 0.26$)		0.30 ($\chi^2 = 1.1$)		0.50 ($\chi^2 = 0.3$)	
Length of hospital stay, days	18.7 ± 13.7	20.4 ± 11.7	13.6 ± 6.9	20.5 ± 14.4	16.0 ± 5.3	12.0 ± 7.4
p	0.87 (U = 8660)		0.25 (U = 755.0)		0.19 (U = 16.5)	

Complications were reported in 64 patients (44.4 %) after venous resections, a rate higher than that observed after standard resections (248 patients, 36.9 %). However, this difference was not statistically significant ($\chi^2 = 2.8$; $p = 0.09$). In the venous resection group, 5 patients (3.5 %) died. This group had higher mortality, though not statistically significant ($\chi^2 = 0.56$; $p = 0.45$), compared to the standard resection group (16 patients, 2.4 %). Thus, no statistically significant difference in the incidence of complications or mortality was identified between extended pancreatic resections with venous resections and standard resections.

A total of 11 patients (68.7 %) who underwent arterial resections had a higher complication rate than that observed after standard pancreatic resections; this difference was statistically significant ($\chi^2 = 6.3$; $p = 0.01$). The arterial resection group had higher (1 patient, 6.2 %), though not statistically significant ($\chi^2 = 1.68$; $p = 0.2$), mortality compared to the standard resection group (2.4 %, 16 patients).

No statistically significant difference in the incidence of complications or mortality was observed between extended pancreatic resections involving resection of adjacent organs and standard resections.

The most clinically significant complications are pancreatic fistula, post-pancreatectomy haemorrhage, and delayed gastric emptying.

Pancreatic fistula occurred in 27 patients (13.4 %) after extended resections and in 87 patients (12.9 %) after standard resections; this difference was not statistically significant ($\chi^2 = 0.02$; $p = 0.8$). Post-pancreatectomy haemorrhage was observed in 17 patients (8.4 %) and 39 patients (5.8 %), respectively; this difference was not statistically significant ($\chi^2 = 1.76$; $p = 0.2$). Gastrostasis developed in 9 patients (4.5 %) and 23 patients (3.4 %), respectively; this difference was not statistically significant ($\chi^2 = 0.4$; $p = 0.5$). Therefore, no statistically significant difference was found in the overall or specific rates of postoperative complications, including pancreatic fistula, post-pancreatectomy haemorrhage, and delayed gastric emptying, between standard and extended resections. Extended resections are feasible when performed in specialized centres with substantial experience in these surgical procedures.

A comparison was conducted regarding the incidence of clinically significant postoperative pancreatic fistula (grades B and C), total complications, and mortality after pancreaticoduodenectomy in 280 patients treated between 2018 and 2023 and 426 patients treated between 2010 and 2017. The patient groups were comparable with respect to comorbidities, the number of extended pancreaticoduodenectomies performed, and disease stage.

Implementation of the newly developed method for preventing postoperative pancreatic fistula resulted in a significant reduction in its incidence in the main group (31 cases, 11.1 %), which is nearly half the rate observed in the comparison group (91 cases, 21.8 %; $\chi^2 = 12.5$; $p = 0.0004$).

A statistically significant reduction in the total complication rate was observed, decreasing from 43.7 % to 27.1 % ($\chi^2 = 19.7$; $p = 0.0001$). However, a reduction in the mortality rate from 2.1 % (9 of 426 patients in the comparison group) to 1.4 % (4 of 280 patients in the main group) was not statistically significant ($\chi^2 = 0.4$; $p = 0.5$).

Comparison of extended pancreatic resections across the two periods demonstrated a statistically significant reduction in postoperative complications in the main group from 46.1 % to 28.6 % ($\chi^2 = 6.64$; $p = 0.009$), whereas a decrease in mortality from 4.8 % to 2.0 % was not statistically significant ($\chi^2 = 1.15$; $p = 0.28$).

The implementation of a personalized diagnostic and treatment algorithm, which incorporated a comprehensive approach, differentiated treatment strategies based on risk factors for postoperative complications, and targeted preventive measures, resulted in an increase in median survival for patients with locally advanced pancreatic head tumours from 19 to 28 months ($\chi^2 = 1.7$; $p = 0.18$) and five-year survival from 22 % to 28.5 %. For patients with malignant tumours of the body and tail of the pancreas, median survival increased from 22 to 36 months ($\chi^2 = 1.78$; $p = 0.18$), and the five-year survival rate improved from 24 % to 34 % ($\chi^2 = 1.78$; $p = 0.18$).

Discussion

Recent advances in polychemotherapy and the development of new surgical techniques, including extended pancreatic resections with venous and arterial resections and reconstructions, have enabled patients with initially unresectable pancreatic tumours to become candidates for surgical intervention at high-volume pancreatic surgery centres [1, 4, 5, 10, 15, 16, 22, 24].

Retrospective analyses by international authors indicate that extended pancreatic resections are associated with significantly longer operative times and increased blood loss [8, 24]. However, the rates of postoperative complications and mortality are comparable to those observed with standard techniques [8, 20, 24].

The present study indicates longer operative time, though not statistically significant, for extended pancreaticoduodenectomy and extended distal pancreaticosplenectomy compared to standard

resections. No statistically significant differences were observed in blood loss, length of hospital stay, complication rates, or mortality.

Multiple studies have demonstrated no significant difference in long-term survival, postoperative complications, or mortality between patients with and without venous resection [1, 7, 15, 20]. The present findings are consistent with these results. The venous resection group had higher mortality, though not statistically significant, compared to the standard resection group. Resection of affected major venous vessels did not have a statistically significant impact on postoperative complication rates or mortality compared to standard resections.

An increased incidence of complications and mortality after arterial resections and reconstructions has been observed both in high-volume pancreatic surgery centres and in the present study.

Historically, arterial resections in pancreatic cancer surgery were considered inappropriate due to the high risk of postoperative complications and mortality associated with extended pancreatic resections involving arterial vessels. However, recent studies have demonstrated significant survival benefits for patients undergoing these procedures compared with those receiving palliative operations, with a median survival of 6–8 months [4, 9, 10, 13, 16]. In the present study, the arterial resection group (6.2 %) had higher mortality, though not statistically significant ($\chi^2 = 1.68$; $p = 0.2$), compared to the standard resection group (2.4 %).

Following two pancreaticoduodenal resections with right hepatic artery resection, patients survived for 18 and 31 months, respectively. In the present study, a patient who underwent distal resection (RAMPS posterior with resection of the left gastric artery and left crus of the diaphragm) survived for 12 months without recurrence. Another patient who underwent a modified Appleby operation (distal subtotal pancreatic resection with resection of the celiac trunk) with portosplenomesenteric confluence resection and end-to-end anastomosis survived for 14 months without recurrence.

Postoperative pancreatic fistula is among the most serious complications of pancreatic surgery and can precipitate other life-threatening conditions [1]. Risk assessment for postoperative pancreatic fistula is a critical initial step in pancreatic surgery to prevent its occurrence and mitigate adverse outcomes. An ideal method of pancreaticojejunal anastomosis that completely prevents fistula formation has not yet been established. One preventive approach involves pancreaticojejunal anastomosis with external drainage of the main pancreatic duct. However, studies have not consistently demonstrated the benefits of main pancreatic duct stenting [14]. B. L. Ecker and M. T. McMillan reported that stent use reduces the incidence of clinically significant postoperative pancreatic fistulas [6]. Y. Dai et al. found that stent implantation may benefit patients with a non-dilated pancreatic duct or those with a main pancreatic duct stent and external drainage [3]. Ying Sun et al., in an analysis of 20 randomized controlled trials (1117 patients after pancreaticoduodenectomy with pancreaticojejunostomy), found that only external, not internal, stents were significantly associated with reduced incidence of clinically significant grade B and C pancreatic fistulas compared to no stents. Additionally, stenting in patients with a main pancreatic duct diameter ≤ 3 mm, but not in those with a diameter > 3 mm, was associated with a significantly reduced incidence of clinically significant grade B and C pancreatic fistula compared to no stent [21]. In the present study, pancreaticojejunostomy with main pancreatic duct stenting and external drainage significantly reduced the incidence of postoperative pancreatic fistulas of grade B and C, as well as overall postoperative complications and mortality. Surgical tactics to reduce postoperative pancreatic fistulas and other complications should be continually refined for both standard and extended pancreatic resections.

In the context of modern multidisciplinary management of malignant pancreatic tumours, radical extended pancreatic resection with venous and arterial resections is justified and should be performed in specialized expert centres.

Conclusions

The rates of total postoperative complications, postoperative pancreatic fistula, gastrostasis, postpancreatectomy haemorrhage, and mortality after extended pancreatic resections are comparable to those observed after standard resections. Extended pancreatic resections are feasible and oncologically justified. Their implementation increases the number of radical surgical interventions, without a statistically significant increase in complication or mortality rates.

By implementing surgical tactics to prevent postoperative pancreatic fistulas and other complications, the incidence of postoperative complications in patients undergoing extended pancreatic resections was reduced from 46.1 % to 28.6 %, and mortality decreased from 4.8 % to 2.0 %.

The implementation of a personalized diagnostic and treatment algorithm, which incorporated a comprehensive approach, differentiated treatment strategies based on risk factors for postoperative

complications, and targeted preventive measures, resulted in an increase in median survival for patients with locally advanced pancreatic head tumours from 19 to 28 months ($\chi^2 = 1.7$; $p = 0.18$) and five-year survival from 22 % to 28.5 %. For patients with malignant tumours of the body and tail of the pancreas, median survival increased from 22 to 36 months ($\chi^2 = 1.78$; $p = 0.18$), and the five-year survival rate improved from 24 % to 34 % ($\chi^2 = 1.78$; $p = 0.18$).

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Declaration of interests

The authors declare no conflict of interest.

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Authors contributions

Conception and design — V. M. Kopchak, L. O. Pererva; data acquisition, analysis and interpretation of data, statistical data processing, drafting the article — L. O. Pererva, O. V. Duvalko, V. V. Khanenko, V. I. Trachuk, V. Y. Bondar, Z. Y. Holobor.

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Наша тактика лікування хворих з гранично-резектабельними та місцево поширеними пухлинами підшлункової залози

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Мета — оцінити результати виконання розширених резекцій підшлункової залози у хворих із гранично-резектабельними та місцево поширеними пухлинами підшлункової залози.

Матеріали та методи. У 2010—2023 рр. виконано 874 радикальних резекції підшлункової залози в пацієнтів з аденокарциномою підшлункової залози. Серед хворих чоловіків було 486 (55,6 %), жінок — 388 (44,4 %). Середній вік становив — (57,7 ± 10,5) року (від 22 до 81 року). Дистальні панкреатоспленектомії виконані в 142 (16,2 %) хворих, панкреатодуоденектомії — у 706 (80,8 %), тотальні панкреатектомії — у 26 (3,0 %) хворих. Розширені резекції підшлункової залози проведені 202 (23,1 %) хворим: розширені панкреатодуоденектомії — 130 (64,4 %), розширені дистальні панкреатоспленектомії — 58 (28,7 %), розширені тотальні панкреатектомії — 14 (6,9 %), розширені резекції підшлункової залози з резекцією венозних судин — 144 (71,3 %), з резекцією артеріальних судин — 13 (6,4 %), з комбінованою артеріовенозною резекцією — 3 (1,5 %), з резекцією суміжних органів — 42 (20,8 %).

Результати. Післяопераційні ускладнення виникли в 248 (36,9 %) хворих після стандартних резекцій підшлункової залози та у 84 (41,6 %) хворих після розширених резекцій ($\chi^2 = 1,4$; $p = 0,22$). Померли 23 (2,6 %) пацієнти: після розширених резекцій — 7 (3,5 %), після стандартних резекцій підшлункової залози — 16 (2,4 %), вірогідної різниці за рівнем летальності не виявлено ($\chi^2 = 0,71$; $p = 0,39$). Розроблена нами персоніфікована лікувальна тактика дала змогу збільшити медіану виживаності пацієнтів із гранично-резектабельними та місцево поширеними пухлинами голівки підшлункової залози з 19 до 28 міс ($\chi^2 = 1,7$ $p = 0,18$) та 5-річну виживаність — з 22,0 до 28,5 %, медіану виживаності у хворих зі злоякісними пухлинами тіла й хвоста підшлункової залози — з 22 до 36 міс ($\chi^2 = 1,78$ $p = 0,18$) та 5-річну виживаність — з 24 до 34 % ($\chi^2 = 1,78$ $p = 0,18$).

Висновки. Рівень післяопераційних ускладнень і летальність після розширених резекцій підшлункової залози порівнянні з такими після стандартних резекцій. Розширені резекції є можливими. Їхнє виконання може збільшити кількість радикально прооперованих хворих. Завдяки застосуванню розробленої нами лікувальної тактики підвищилася медіана виживаності хворих із гранично-резектабельними та місцево поширеними злоякісними пухлинами підшлункової залози.

Ключові слова: розширені резекції підшлункової залози, злоякісні пухлини підшлункової залози, місцево поширені пухлини, венозні резекції, артеріальні резекції.

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