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Immediate and Long-Term Results of Original Methods of Longitudinal Pancreatojejunostomy With The Expansion of the Area of Pancreatojejunal Anastomosis

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RELEVANCE The dependency results of draining operations on the efficcacy of drainig of ductal system of the pancreas and adequate outflow of the pancreatic juce through anastomosis are undoubtful, therefore the development of new techniques of longitudinal pancreatojejunostomy (LPJ) extending area of anastomosis is an actual challenge.

AIM OF STUDY To compare the immediate and long-term results of longitudinal pancreatojejunostomy with the expansion of the area of anastomosis in patients with chronic pancreatitis.

MATERIAL AND METHODS We analysed immediate and long-term results of LPJ in 58 patients with chronic pancreatitis with impaired patency of the major pancreatic duct (MPD) without the head enlargement.

RESULTS All patients were divided into two groups: comparison group (n=26, operated up to 2008) and main group (n=32, operated stumps during the MPD diastasis and posterior pancreatic surface (n=3) into anastomosis, with resection of the anterior pancreatic surface in the form of triangular fragments (n=11), with circulation of the small intestine loop during the recovery phase (n=19). The original LPJ in the study group of patients did not lengthened the surgery (160 [135, 185]) and intraoperative blood loss (265 [175, 340]). In the main group of patients there was no postoperative complications and fatal outcomes, but the average duration postoperative hospital treatment (18 [16; 20.5]) exceeded some data of foreign and domestic authors. Pain within 5 years after surgery in patients of the main group exceeded 26.6% and the appearance of diarrheal syndrome with dependance from reception of enzyme preparations was twice lower than in patients og the comparison group. According to questionnaire EORTC QLQ-C30, 5 years after surgery statistically significant differences between groups in terms of scales CF, NV, DY (p=0.03, 0.02, 0.006 respectively), indicating the advantage of intervention performed in the mail group.

CONCLUSIONS 1. An indication for longitudinal pancreatojejunostomy in chronic pancreatitis is impaired patency of the main pancreatic duct in the absence of an increase and inflammatory mass in the pancreatic head. 2. The width of the main pancreatic duct is less than 5 mm and the presence of diastasis between its proximal and distal stumps with the posterior surface of the pancreas preserved, is not a reason for refusing longitudinal pancreatic jujunostomy in favour of the resection method. 3. The expansion of pancreatojejunal anastomosis when performing longitudinal pancreatojejunostomy can improve the immediate and long-term results of surgical treatment for chronic pancreatitis.

Keywords: chronic pancreatitis, main pancreatic duct, pancreatic head, multislice computed tomography, magnetic resonance tomography, longitudinal pancreatojejunostomy

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CHD — coronary heart disease
CP — chronic pancreatitis
LPJ — longitudinal pancreatojejunostomy
MH — mental health
MPD — major pancreatic duct
MRI — magnetic resonance imaging
MSCT — multispiral computed tomography
PH — pancreatic head
PH — physical health

INTRODUCTION

The use of high-precision methods for the diagnosis of chronic pancreatitis (CP), including multispiral computed tomography (MSCT) and magnetic resonance imaging (MRI), influenced the detection and increase in incidence (from 4.4 to 11.9) and prevalence (from 36.9 to 41, 8) per 100,000 population [1, 2]. M. Fernandez et al. (2017) presented a typical image of a patient with CP, based on materials from eight Belgian clinics: mostly male patients (74%) with pain syndrome, mean age 47 years, alcohol abuse (67%), history duration from 3 to 13 years, functional disorders such as diabetes (41%) and steatorrhea (36%) [3]. Almost half of patients with CP are operated on [4, 5]. One of the main indications for surgical treatment of CP, according to many authors, is the disturbed patency of the main pancreatic duct (MPD) [6]. According to C.E. Forsmark (2005), indications for surgery in CP

are: segmental fibrosis of the pancreas, complications from adjacent organs and dilatation of MPD> 5-7 mm [4]. According to the Cambridge classification (1984), obstruction and dilatation of MPD> 2 mm are one of the criteria for diagnosing CP [7-9]. Modern minimally invasive technologies (Extracorporeal Shock Wave Lithotripsy, ESWL), endoscopic pancreatoscopy with laser lithotripsy (POP-LL) or electrohydraulic lithotripsy (EHL) achieve a short-term effect with extremely contradictory long-term results [10-13].

Historically, longitudinal pancreatojejunostomy (LPJ) was practically the first adequate surgical intervention in CP [6, 14-17]. The dependence of the results of drainage operations on the efficiency of drainage of the pancreatic duct system, the area of the pancreatojejunal fistula and the adequacy of the outflow of pancreatic fluid through the anastomosis is beyond doubt. The minimum area of the pancreatojejunal fistula in caudal pancreaticojejunostomy was described in 1954 by M.K. DuVal and then R.M. Zollinger and W.P. Longmire in 1956 [18]. A somewhat larger area of anastomosis took place during the operation L. Leger (1974) [16] and C.B. Puestow and W.J. Gillesby (1958), which went down in history as Puestow-I [15–17, 19]. LPJ with a wide pancreatojejunal fistula described by Ch. Puestow (1958), P.F. Partington and R.E. Rochell (1960) is still considered the gold standard of surgical treatment of CP without lesion of the pancreatic head [11, 15-17, 19, 20]. The classic version of LTJ, according to a number of authors, is shown for isolated dilatation of MPD (more often> 7 mm) without enlargement of pancreatic head [20-22]. A narrow MPD, problematic for performing drainage operations, was the reason for the development of various methods with the expansion of the area of the pancreatojejunal fistula, including the methods of A.A. Shalimov (1979), K.W. Warren (1980) [17, 23], then J.R. Izbicki (1998) [15, 18, 21], A.V. Vorobey et al. (2012) [15, 24]. Such modifications of LTJ allowed more radical elimination of intraductal hypertension due to the opening of pancreatic ducts of the 2nd or 3rd order.

Taking into account the general tendency towards organ-preserving operations on the pancreas, one of the tasks of surgical pancreatology is the development of new LPJ methods that expand the area of the pancreatojejunal fistula [15, 17, 25, 26]. There are three ways to perform LPJ: traditional, laparoscopic and robotic. According to modern foreign studies, the advantage of laparoscopic LPJ in CP compared with traditional open surgery remains unclear [27], and the advantage of robotic LPJ, which has not found wide application, is only 3D visualization [28]. Modern authors see a prospect in the development of new LPJ methods in a decrease in the number of postoperative complications and, first of all, from the side of imposed pancreatic anastomoses [19].

The aim of study is to develop and introduce into clinical practice original methods of longitudinal pancreatojejunostomy, expanding the area of the pancreatojejunal fistula and to study the immediate and long-term results of longitudinal pancreatojejunal fistula with the expansion of the area of the pancreatojejunal fistula in patients with CP.

MATERIAL AND METHODS

We have analyzed the immediate and long-term results of treatment of 58 patients operated on in the Regional Clinical Hospital in the amount of LPJ, in whom, according to the data of non-invasive diagnostics (MSCT, MRI), a violation of MPD patency was revealed throughout the entire length without MPD enlargement. Of these, 45 were men and 13 were women. Most of the patients were admitted to the emergency care system with hyperamylasemia (n = 51) and inflammatory changes in blood tests (n = 22). Every third patient (36.2%) was admitted with inflammatory complications (n = 21), which included: suppuration of the pancreatic cyst — 10, perforation of the pancreatic tail cyst — 2, pseudo-aneurysm of the splenic artery — 1, pancreatic fistulas — 8, which was not a contraindication to direct intervention on the pancreas. The presence of adhesions in the abdominal cavity occurred in 23 patients, most of whom (n = 20) had previously been operated on in the volume of external drainage of the pancreas cyst. Previously, 3 patients underwent: terminoterminal pancreatojejunostomy (n = 1), transduodenal virsungoplasty (n = 1) and thoracocentesis (n = 1). Upon admission, 15 patients had secondary diabetes mellitus. According to endoscopy data, 7 patients had stomach compression by a pancreatic cyst; 9 patients underwent endoscopic retrograde cholangiopancreatography; 11 — fistulovirsungography; 56 — MSCT and 4 — MRI. The reason for the formation of pancreatic cysts (n = 21) was both pancreatic trauma and perforation of intrapancreatic cyst outside the pancreatic duct system.

Diastasis between the proximal and distal MPD stumps> 5 cm after dissection of multiple pancreatic cysts of the pancreas was diagnosed in 3 patients. As an alternative to pancreatic resection, we have developed a new "Method of pancreatojejunostomy for diastasis between the distal and proximal stumps of the main pancreatic duct" (RF patent for invention No. 2460468 dated 2012) [29, 30] (Fig. 1).

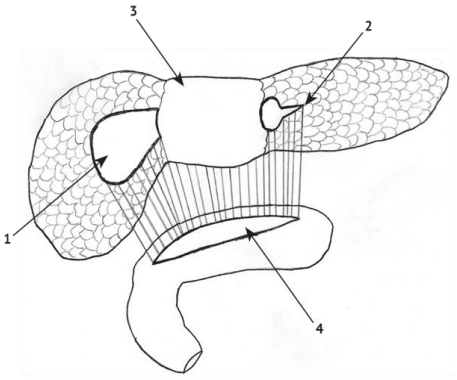

Fig. 1. The design of the original method of pancreatojejunostomy with diastasis between proximal and distal stump of the main pancreatic duct with preserved posterior pancreatic surface (patent of RF № 2460468). The condition for the implementation of the method is the preserved pancreatic surface, consisting of scarred parenchymal and capsular plate. 1 — proximal stump of the main pancreatic duct, 2 — distal stump of the main pancreatic duct, 3 — scarred posterior surface of the pancreas, 4 — the lumen of anastomosed loop of the small intestine

The narrow MPD (with a diameter of 4–5 mm or less) was observed in 18 patients. The study of known methods that allow us to expand the area of the anastomosed surface of the pancreas, led us to the invention of the original "Method of longitudinal pancreatoenteroanastomosis" (RF patent for invention No. 2296517 dated 2007) with excision of triangular fragments from the anterior surface of the pancreas parenchyma [31, 32]. The original LPJ method is schematically shown in Fig. 2.

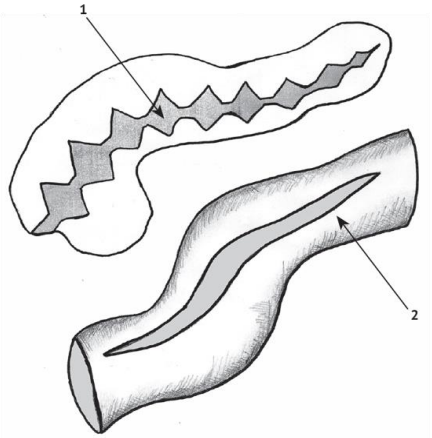

Fig. 2. The process the original longitudinal pancreatojejunostomy with excised and e m anterior surface Podge e ludochnoy gland (patent RF № 2296517). 1 — the lumen of the main pancreatic duct; 2 — the lumen of the anastomosed loop of the small intestine

To improve the outflow of pancreatic fluid through the pancreatojejunostomy, exclude the "blind bag" in the area of the intersected end of the Roux-mobilized small intestine, we offered the original "Method of longitudinal pancreatoenteroanastomosis" with the circulation of the loop of the small intestine leading to anastomosis (RF patent for invention No. 2260388 dated 2005), which is schematically shown in Fig. 3 [33].

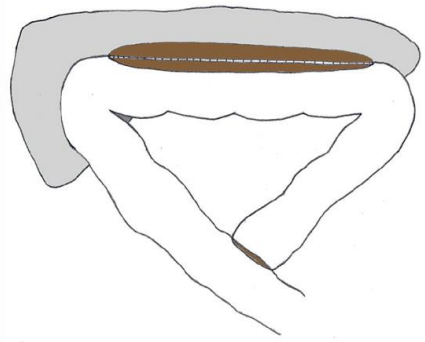

Fig. 3. The design of the original longitudinal pancreatojejunostomy with resection of the anterior pancreatic surface (patent RF № 2260388)

Written voluntary informed consent for a clinical study (prospective controlled) was approved by the ethics committee of the Omsk State Medical University (extract from protocol No. 97 \ 1 dated October 26, 2017) and signed by all patients. Immediate results were assessed by analyzing the mean: duration of surgery (min), intraoperative blood loss (ml), duration of postoperative inpatient treatment (bed-day), number of patients with postoperative complications, number of relaparotomies and postoperative mortality. Long-term results were assessed by analyzing clinical data and quality of life according to questionnaires using the MOS SF-36 and EORTC QLQ-C30 questionnaires. The results of the MOS SF-36 questionnaire of 8 scales are presented by two grouped indicators: “physical component of health” (PH) and “mental component of health” (MH). The results of the EORTC QLQ-C30 questionnaire of 9 scales and 6 separate indicators are presented as: PF (physical well-being), RF (role-based well-being), EF (emotional well-being), CF (cognitive well-being), SF (social well-being), QL (general health conditions), FA (fatigue, weakness), NV (nausea, vomiting), PA (pain), DY (dyspnea), SL (sleep loss), AP (loss of appetite), CO (constipation), DI (diarrhea), FI (financial problems). Statistical processing of the obtained data was carried out using the STATISTICA 10.0 software package: to check the quantitative data of two independent groups, the Mann-Whitney U-test was used, and Fisher's test with a critical level of significance $p = 0.05$ was used to check hypotheses about the equality of general variances.

To analyze the obtained results, the operated patients were divided into two groups: comparisons (retrospective comparative study operated before 2008, $n = 26$) and the main (prospective controlled study operated after 2008 using new methods of surgical operations, $n = 32$). Table 1 shows the type of morphological changes in the pancreas in the studied groups of patients with CP, who underwent LPJ.

Table 1

The morphological changes in the pancreas in patients with chronic pancreatitis who underwent longitudinal pancreatojejunostomy

Morphological changes in set on fire	Main group, n=32	Comparison group, n=26	Total, n= 58	p(F)
Violation of patency of MPD at the level of all departments of the pancreas,	32 (100%)	26 (100%)	58 (100%)	0.57
among them: with diastasis between proximal and distal stump of MPD > 5cm	3 (9.4%)	-	3 (5.2%)	0.16
Virsung's duct lithiasis	24 (65%)	15 (57, 7%)	39 (67.2%)	0.13
MPD width 4-5 mm	6 (18.7%)	5 (19.2%)	11 (19%)	0.09
MPD width 6-10 mm	14 (43.8%)	11 (42.3%)	25 (43.1%)	0.11
MPD width> 10 mm	8 (25%)	7 (26.9%)	15 (25.9%)	0.15
Pancreatic cysts	10 (31.3%)	11 (42.3%)	21 (36.2%)	0.27
of which: bodies	3 (9.4%)	2 (7.7%)	5 (8.6%)	0.59
tail	3 (9.4%)	6 (23.1%)	9 (15.5%)	0.14
multiple location	4 (12.5%)	3 (11.5%)	7 (12.1%)	0.61
with suppuration	7 (21,9%)	3 (11.5%)	10 (17.2%)	0.24
with perforation	1 (3.1%)	1 (3.8%)	2 (3.4%)	0.69
with bleeding (false aneurysm of the pancreatic artery)	-	1 (3.8%)	1 (1.7%)	0.44
Pancreatic fistulas	7 (21.9%)	1 (3.8%)	8 (13.8%)	0.05

Note: p(F) — a statistical difference between groups (exact Fisher's test)

Organ-preserving surgery in the form of an isolated LPJ, when it was combined with resection of the pancreas tail (Puestow-1), failed to be performed in 5 patients (2 from the main group, 3 from the comparison group). The indications for Puestow-1 operation, in addition to impaired MPD patency, were: perforation of the cyst into the left subphrenic space (n = 1) and suppuration of the pancreas tail cyst with the formation of parapancreatic infiltrate (n = 4). For large pancreatic cysts, pancreatocystojejunostomy was performed with partial excision of the cystic cavity to the mouth of the communication with MPD, followed by internal drainage (n = 12).

LPJ in an original way with the inclusion in a single pancreatojejunal anastomosis of the distal stump of MPD, the posterior surface of the pancreas, consisting of the parenchymal capsular plate and the proximal stump of the MPD (RF patent for invention No. 2460468 dated 2012), was performed in 3 patients of the main group. In the main group, 9 patients with MPD width less than 5 mm and two more than 5 mm were treated with an original method of applying LPJ with excision of the anterior surface of the pancreas in the form of triangular fragments (RF patent for invention No. 2296517 dated 2007). Circulation of the loop of the small intestine at the recovery stage of the LPJ (RF patent for invention No. 2260388 dated 2005) was performed in 19 patients of the main group, including two Puestow-I operations.

The immediate results of LPJ in patients of the study groups in a comparative aspect are presented in Table 2.

Table 2

The comparison of immediate results of longitudinal pancreatojejunostomy in patients with chronic pancreatitis, Me [LQ; HQ]

Direct indicators of LPJ	Main group, n = 32	Comparison group, n = 26	Total n = 58	p(U)/p(F)
Average duration of operation (min)	160 [135; 185]	215 [200; 230]	212.5 [175; 240]	0.001
Average intraoperative blood loss (ml)	265 [175; 340]	345 [300; 400]	265 [200; 440]	0.001
Number of patients with postoperative complications	-	1 (1 2.5%)	1 (4.8%)	0.44
The average duration of postoperative hospital stay	18 [16; 20.5]	21 [18; 24]	20 [17; 23]	0.004
Patients requiring repeated laparotomy (failure of pancreatojejunostomy)	-	1 (3.8%)	1 (1.7%)	0.44
Postoperative mortality	-	-	-	

Notes: p(F) — a statistical difference between groups (exact Fisher's test); p(U) — Mann–Whitney test for quantitative data

Relaparotomy with a favorable outcome was performed in one case from the comparison group for pancreatojejunostomy failure.

Long-term results a year after the operation were studied in 38 patients (65.5%). A year after the operation, 2 patients in the main group died from coronary heart disease (CHD) on the background of alcoholism (n = 1) and gastric bleeding of ulcerative etiology (n = 1). Clinical results in 36 patients with CP (62.1%) of the main and the comparison group 1 year after surgical treatment are presented in Table 3.

Table 3

The comparison of clinical outcomes of longitudinal pancreatojejunostomy in patients with chronic pancreatitis 1 year after surgery

Clinical indicators	Main group, n=22	Comparison group in neniya, n=14	p(F)
elimination or significant reduction of pain *	18 (81.8%)	7 (50%)	0.05
presence of diarrhea requiring admission enzyme preparations **	3 (16.7%)	9 (64.3%)	0.002
continued acceptance of alcohol after surgery	6	5	0, 43
increase in body weight after surgery by more than 3 kg	13	2	0.009
identified diabetes	7	6	0.37
persistent loss of labor ability	5	4	0.49

Notes: * — with the severity of at least 4 points on the developed 10-point scale, and self-esteem symptoms in the last month, ** — a regex and field intensity of more than 4 points n of the developed 10-point scale, and self-esteem symptoms in the last month, p(F) — statistical significanf difference between groups (Fisher's exact test)

Long-term results 5 years after surgical treatment were studied in 31 patients (53.4%). Seven patients died 5 years after the operation. The cause of mortality in a 5-year period after LPJ in patients with the main group was diabetes (n = 1), coronary heart disease against the background of alcoholism (n = 1). Patients in the comparison group: diabetes (n = 1), coronary artery disease with alcoholism (n = 3) and advanced pancreatic cancer (n = 1). In the long-term period after LPJ, 5 patients were operated: one patient from the comparison group was operated on 3 years after LPJ for advanced pancreatic cancer, the other 4 patients were operated for the progression of CP. The volume of reoperations in the main group: subtotal resection of the pancreatic head (n = 1), reconstruction of pancreatojejunostomy for recurrent calculi on anastomotic ligatures (n = 1), in the comparison group:

hepaticojejunostomy for stricture of the terminal common bile duct (n = 1) , distal pancreas resection (n = 1). Clinical results in 24 patients with CP (41.4%) of the main and the comparison group 5 years after LPJ are presented in Table 4.

Table 4

The comparison of clinical outcome of longitudinal pancreatojejunostomy in chronic pancreatitis 5 years after the surgery

Clinical indicators	Main group n = 15	Comparison group, n = 9	p(F)
elimination or significant reduction of pain *	14 (93.3%)	6 (66.7%)	0.13
presence of diarrhea requiring admission of enzyme drugs **	3 (20%)	5 (55.6%)	0.09
continued acceptance of alcohol after operas and tion	4	3	0.54
weight gain after operas and tion of more than 3 kg	9	5	0.58
identified diabetes mellitus	6	6	0.2
complications requiring repeated surgeries	2	3	0.25
persistent loss of ability to work	4	3	0.54

Notes: * — with the severity of at least 4 points on the developed 10-point scale, and self-esteem symptoms in the last month, ** — a regex and field intensity of more than 4 points n of the developed 10-point scale, and self-esteem symptoms in the last month, p(F) — statistical significanf difference between groups (Fisher's exact test)

The comparison of indicators of physical and mental components of health in patients with CP 1 year and 5 years after LPJ, according to the MOS SF-36 questionnaire (points), is presented in Table 5.

Table 5

The comparison of indicators of physical and mental components of health according to the MOS SF-36 questionnaire in patients with chronic pancreatitis 1 and 5 years after longitudinal pancreatojejunostomy (score)

Questionnaire Scales SF-36	Main group			Comparison group			Statistical significance of differencies		
	P25	P50	P75	P25	P50	P75	U	Z	p
in a year, n = 36	n = 22			n = 14					
PH	35.9	41,4	46.2	27.6	38.6	51.0	149.0	0.57	0.57
MH	37.6	44.2	47.3	27.0	44.5	51.5	156.0	0.36	0.72
in 5 years, n = 24	n = 15			n = 9					
PH	36.7	45.1	53.3	34.2	43.7	56.2	65.0	0.15	0.88
MH	39.0	47.3	57.3	36.0	42.4	54.5	53.0	0.86	0.39

Notes: MH — "mental component of health"; PH — "physical component of health"

The comparison of indicators of the quality of life of patients with CP 1 year and 5 years after LPJ according to the EORTC QLQ-C30 questionnaire (points) is presented in Tables 6 and 7.

Table 6

Comparison of scales of the EORTC QLQ-C30 questionnaire in patients with chronic pancreatitis 1 year after longitudinal pancreatojejunostomy (score)

Questionnaire Scale and Symptoms EORTC QLQ-C30	Main group, n = 22			Comparison Group, n = 14			Statistical significance of differencies		
	P25	P50	P75	P25	P50	P75	U	Z	p
PF	58.3	75.0	83.3	33.3	62.5	83.3	116.0	1.57	0.1 2
RF	66.7	83.3	100.0	33.3	50.0	83.3	114.5	1.62	0.10
EF	62.5	75.0	87.5	33.3	62.5	83.3	111.0	1.72	0.08
CF	58.3	83.3	100.0	33.3	58.3	100.0	128.0	1.21	0.2 3
SF	66.7	83.3	100.0	33.3	58.3	100.0	124.5	1.32	0.1 9
QL	50.0	50.0	70.8	16.7	37.5	75.0	136.5	0.95	0.34
FA	33.3	33.3	50.0	22.2	50.0	77.8	144.5	-0.71	0. 48
NV	0.0	16.7	16.7	16.7	33.3	50.0	95.0	-2.21	0.0 3
PA	16.7	16.7	41.7	16.7	41.7	66.7	127.5	-1.23	0.22
Dy	0.0	0.0	33.3	0.0	33.3	66.7	98.0	-2.12	0,03
SL	33.3	33.3	66.7	0.0	33.3	66.7	165.0	0.09	0.9 3
AP	16.7	33.3	33.3	0.0	66.7	66.7	128.5	-1.20	0.23
CO	0.0	0.0	0.0	0.0	0.0	0.0	147.0	0.64	0.5 3
DI	33.3	33.3	33.3	0.0	33.3	66.7	166.0	0.06	0.95
FI	33.3	33.3	66.7	33.3	50.0	100.0	136.5	-0.95	0.34

Notes: AP — loss of appetite; CF — cognitive well-being; CO — constipation; DI — diarrhea; DY — dyspnea; EF — emotional well-being; FA — fatigue, weakness; FI — financial problem; NV — nausea, vomiting; PA — pain; PF — physical well-being; QL — general state of health; RF — role-based well-being; SF — social well-being; SL — sleep loss

Table 7

The comparison of scales of the EORTC QLQ-C30 questionnaire in patients with chronic pancreatitis 5 years after longitudinal pancreatojejunostomy (score)

Questionnaire Scale and Symptoms EORTC QLQ-C30	Main group, n = 15			Comparison group, n = 9			Statistical significance of differencies		
	P25	P50	P75	P25	P50	P75	U	Z	p
PF	58.3	83.3	83.3	25.0	66.7	100.0	56.5	0.66	0.51
RF	66.7	83. 3	100.0	50,0	50,0	83.3	43.0	1.46	0.144
EF	66.7	66.7	91.7	50,0	66.7	66.7	49.0	1.10	0.27
CF	66.7	83.3	100.0	50,0	66.7	66.7	32,0	2.12	0,03
SF	66.7	83.3	100.0	16.7	66.7	100.0	53.0	0.86	0.3 9
QL	50.0	50.0	83.3	16.7	33.3	66.7	46.5	1.25	0.21
FA	22.2	44.4	66.7	11.1	55.6	66.7	67.0	0,03	0.98
NV	0.0	0.0	16.7	16.7	50.0	66.7	28.5	-2.33	0.02
PA	0.0	16.7	33.3	0.0	33.3	50.0	54.0	-0.80	0.42
DY	0.0	0,0	0.0	33.3	33.3	33.3	22.0	-2.71	0.006
SL	33.3	66.7	66.7	0,0	33.3	66.7	51.0	0.98	0.3 3
AP	0.0	33.3	33.3	0,0	66.7	100.0	40.0	-1.64	0.10
CO	0.0	0.0	0.0	0.0	0.0	0.0	58.5	0.54	0.59
DI	0.0	33.3	33.3	0.0	0.0	66.7	52.5	0.89	0.37
FI	0.0	33.3	66.7	0.0	100.0	100.0	52.5	-0.89	0.37

Notes: AP — loss of appetite; CF — cognitive well-being; CO — constipation; DI — diarrhea; DY — dyspnea; EF — emotional well-being; FA — fatigue, weakness; FI — financial problem; NV — nausea, vomiting; PA — pain; PF — physical well-being; QL — general state of health; RF — role-based well-being; SF — social well-being; SL — sleep loss

DISCUSSION

Surgical interventions in CP are divided into draining, resection, denervating and hybrid (resection-draining) [34]. Despite the suggested doctrine of an individual approach to patients with CP [34, 35], most authors consider the presence (or absence) of pancreatic head enlargement with the presence of an inflammatory mass in it as a criterion for the main division of all operations for CP into two main methods — resection and drainage [34, 36], which fully meets the selection criteria for our patients (n = 58).

Most authors consider the classic indication for LPJ to be disturbed patency of MPD with its dilation> 7 mm, and the indication for resection methods is the presence of a narrow MPD (<5 mm) [4, 20-22, 36]. One of the reasons for unsatisfactory long-term results of LPJ is inadequate management of intraductal hypertension in the presence of a narrow MPD, pathological changes in the 2nd order pancreatic ducts, fibrosis, calcification of the pancreatic parenchyma. High-precision diagnostics of CP at the preoperative stage, including the degree of intraductal hypertension, made it possible to avoid mistakes in the choice of indications for LPJ. Thanks to the introduction of original LPJ methods, we were able to apply the draining method of surgical treatment of CP in 31.2% of patients in the main group, most of whom had a narrow (<5 mm) MPD.

Expansion of the area of the pancreatojejunal fistula in the known LPJ methods was achieved by excising the anterior surface of the pancreas [15, 17, 18, 21, 23, 24]. In patients of the main group, to expand the area of the pancreatojejunal fistula, not only excision of the pancreatic parenchyma to open the segmental ducts of the 2nd and 3rd order (n = 11) was performed, but also the method with the creation of a wide pancreatojejunal fistula with diastasis between the distal and proximal MPD stumps (n = 3) [30, 32], which in general increased the number of indications for drainage operations. The main advantage of the original LPJ methods with the expansion of the area of the pancreatojejunal fistula was the protection of the patient from the use of more traumatic resection methods of surgical treatment.

The average duration of the intervention depended on the degree of inflammatory changes in the parapancreatic tissues, the technical features of the operation. Nine patients out of 12 after pancreatocystojejunostomy with large pancreatic cysts were from the comparison group, which influenced the increase in the mean duration of surgery (215 min [200; 230]; p = 0.001) and intraoperative blood loss (345 ml [300; 400]; p = 0.001). The use of original LPJ methods in the main group of operated patients, including the loop circulation at the LPJ recovery stage for pancreatic fluid outflow, despite performing an additional interintestinal

anastomosis, did not increase the mean operation time (160 min [135; 185]) and intraoperative blood loss (265 ml [175; 340]). These indicators were quite comparable with similar foreign ones (2.5–2.9 hours and 181.5 ml, respectively) [37].

The number of postoperative complications of LPJ, according to H.G. Beger (2018), varies within 5.9–40% with postoperative mortality 0–3.8% [38]. According to various authors, the number of postoperative complications of LPJ varies within 10.3% (Y.A. Parkhisenko, 2017), 12% (R.S. Kalashnik, 2017) and 35.7% (C. Vallejo, 2016). In the main group of patients (n = 32) there were no postoperative complications and mortality, however, the average duration of postoperative inpatient treatment in the main group was 18 days [16; 20.5], twice exceeding the data of some foreign authors (7 bed-days) [37] and exceeding figures of some domestic authors by 50% (12.1 ± 3.13 days) [39].

One of the reasons for the unsatisfactory results of LPJ in the long-term period is considered to be errors in the indications, when the local lesion of the pancreatic head with pancreatic enlargement was underestimated. The frequency of complications associated with the lesion of pancreas, including strictures of the terminal section of the common bile duct and obstructive jaundice, can be judged on the correctness of the primary choice of indications for isolated drainage surgery. According to foreign authors, repeated operations in the long-term period of LPJ for stricture of the terminal section of the common bile duct and obstructive jaundice are performed with a frequency of 12.5-17.6% [20, 40], which is more than double our 5-year indicators. (6.5%), evenly distributed in the main (n = 1) and comparison groups (n = 1). Pain relief is considered one of the main criteria for the effectiveness of surgical treatment of CP, accounting for 40–94% according to various authors [21, 22, 35, 38, 40, 41]. Despite this, some authors point out the recurrence of pain after LPJ in every third operated patient [34]. A frequent reason for the recurrence of pain and unsatisfactory results after LPJ is the continuation of alcohol intake after surgery [22, 41], which was noted in 29.1% of our patients 5 years after surgery. The 26.6% excess of pain relief in patients of the main group, in relation to the comparison group, 5 years after surgery is an objective indicator that proves the effectiveness of the developed original LPJ methods with an expansion of the area of the pancreatojejunal fistula.

The degree of functional disorders of the pancreas in such cases always depends on the duration of the history of CP and the initial preoperative state, however, diabetes 5 years after LPJ was detected by us in 40% of patients, exceeding the results known from foreign sources (16–29%) [40]. The development of diarrhea with dependence on the intake of enzyme preparations was noted in 20% of patients in the main group, which corresponds to similar indicators in the literature (16–50%) [40] and was two times lower than in patients in the comparison group (55.6%). The absence of loss and even a slight increase in body weight in 60% of patients in the main group can also be considered an objective criterion for the effectiveness of the developed operation.

The frequency of reoperations in the period from 2 to 7 years after LPJ, according to H.G. Beger (2018), reaches 6–25% [38]. The most frequent indications for reoperations are relapse of pain syndrome, obstructive jaundice, less often - duodenal stenosis [39, 40].

According to the EORTC QLQ-C30 questionnaire, 5 years after the operation, statistically significant intergroup differences were found in the indicators of the CF, NV, DY scales ($p = 0.03$; $p = 0.02$; $p = 0.006$, respectively), which indicates the advantage of intervention applied in the main group. According to the MOS SF-36 questionnaire, no statistically significant differences were found ($p > 0.05$).

CONCLUSION

Thus, the surgical treatment of patients with chronic pancreatitis with enlargement of the main pancreatic duct is not an easy task. To determine the type of the upcoming operation, a comprehensive preoperative examination is necessary, including multispiral computed tomography, magnetic resonance imaging, where it is necessary to comprehensively assess the type of changes in the pancreatic parenchyma, the presence and severity of pancreatic hypertension and impaired patency of the main pancreatic duct. Often, the existing inflammatory changes in the pancreatic parenchyma do not allow direct interventions on it. A comprehensive assessment of the state of the pancreatic duct system, taking into account the presence of complications, both from the parenchyma of the organ and from the parapancreatic region, allows you to choose the best option for surgical treatment. At the same time, longitudinal pancreatojejunostomy does not allow eliminating pathological changes in the head of the pancreas, therefore, it has limited indications for the surgical treatment of patients with chronic pancreatitis. But even in the absence of an inflammatory mass in the head of the pancreas, longitudinal pancreatojejunostomy does not always allow to eliminate pain syndrome and intraductal hypertension due to the impossibility of adequate drainage of the pancreatic duct system, therefore, original methods of performing this operation (longitudinal pancreatojejunostomy) aimed at expanding the area of the pancreatic joint are offered. The study shows that a full preoperative examination, a balanced approach to determining the indications and method of surgical intervention, the use of the developed methods of longitudinal pancreatojejunostomy with an expansion of the area of the pancreatojejunal fistula do not lead to an increase in the duration of the operation and intraoperative blood loss, the level of peri- and postoperative complications and mortality, but most importantly, they improve the long-term results of treatment.

1. Indication for longitudinal pancreatojejunostomy in chronic pancreatitis is disturbed patency of the main pancreatic duct in the absence of an increase and inflammatory mass in the head of the pancreas.

2. The width of the main pancreatic duct is less than 5 mm and the presence of diastasis between its proximal and distal stumps with the preserved posterior surface of the pancreas is not a reason to abandon the longitudinal pancreatojejunostomy in favor of the resection method.

3. Expansion of the area of the pancreatojejunal fistula when performing longitudinal pancreatojejunostomy allows to improve the immediate and long-term results of surgical treatment of chronic pancreatitis.

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