

Comparison of single-layer continuous or two-layer interrupted pancreatojejunal suture in Frey procedure for treatment of chronic pancreatitis: a prospective randomized study

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ABSTRACT:

Background: Many patients with chronic pancreatitis are elected for surgery when endoscopic interventions are ineffective. Duodenum preserving pancreatic head resection introduced by Charles F. Frey is the most common procedure used for surgical treatment of chronic pancreatitis. However, technical aspects of this procedure have not been studied extensively. Goal Our prospective randomized study is aimed to compare usage of single-layer continuous (I group) and two-layer interrupted sutures (II group) in constructing pancreatojejunostomy after Frey procedure.

Methods and materials: In a period between 2009 and 2016, a total of 103 patients, diagnosed with chronic pancreatitis and determined medical indications for surgical treatment were included into the study and randomized into group I (52 patients) and group II (51 patients). Preoperative, intraoperative patient characteristics and postoperative results were compared between both groups.

Results: Mean duration of surgery was statistically shorter in group I – 210 min, while in group II – 240 min ($p = 0.004$). Pancreatojejunostomy construction time was shorter in group I – 19 (± 6) min versus 51 (± 18) min in group II, $p < 0.001$. No statistically relevant differences were observed in postoperative morbidity: group I – 51.9% and group II – 45.1% ($p = 0.177$) and mortality: group I – 3.8% and group II – 2% ($p = 0.636$).

Conclusions: Frey procedure using single-layer continuous pancreatojejunostomy is safe, fast and less complex method in surgical treatment of chronic pancreatitis.

KEYWORDS:

chronic pancreatitis, Frey procedure, pancreatojejunostomy

ABBREVIATIONS

CBD – common bile duct
CP – chronic pancreatitis
MPD – main pancreatic duct
SD – standard deviation

INTRODUCTION

Chronic pancreatitis (CP) remains the major health care problem in developed countries. With an annual incidence ranging from 4.05 to 4.66 per 100.000 and prevalence of 41.8 per 100.000 persons worldwide [1–3]. In cases when endoscopic interventions such as stenting, lithotripsy and removal of concretions are ineffective, other patients, approximately 47%, will finally require surgical treatment [4]. According to many clinical studies and literature, one of the best choices for surgical CP treatment is the Frey procedure [5, 6], described in 1987 by Frey et al. [7]. This approach combines local resection of the head of the pancreas and longitudinal pancreatojejunostomy, favored by surgeons due its technical feasibility and low surgical risk. There are only a few studies, in which technical aspects of this surgical approach and its influence on operation time, postoperative complications and recovery time have been assessed. The aim of this prospective study was to compare duodenum-preserving pancreatic head resection by Frey with the use of single-layer continuous or two-layer interrupted sutures in forming pancreatojejunostomy and to analyze its results and post-operative outcomes.

MATERIALS AND METHODS

A prospective clinical study was performed in our hospital. A total of 110 patients, aged between 24 and 78 years, who were diagnosed with chronic pancreatitis in 2009–2016 and had medical indications for surgical treatment – duodenum-preserving pancreatic head resection according to Frey, were included in the study. Inclusion criteria were as follows: patient age greater than 18 years, patients diagnosed with chronic obstructive or calcifying pancreatitis along with persistent chronic pain, main pancreatic duct being enlarged by 7 mm or more. Patients with jaundice, pseudocysts, pancreatic ascites were not included.

Our exclusion criteria were as follows: confirmed malignancy during intraoperative biopsy and conversion into pylorus-preserving pancreaticoduodenectomy. All consented patients who matched the criteria were included in the study and randomized. All patients were randomized into group I or II a day before operation by opening an envelope with an assigned operation type. Single-layer continuous suture was used for pancreatojejunostomy in group I and two-layer interrupted sutures in group II. Lithuanian Bioethics Committee approved the study protocol (permission No. L-12-02/1/2/3/4) and all the patients provided written informed consent.

All of the surgeries were performed by two surgeons using original duodenum-preserving pancreatic head resection described in 1987 by Frey et al. [7]. Longitudinal side-to-side pancreatojejunostomy was performed using a 4–0 absorbable monofilament suture. The

anastomosis was begun at the tail of the pancreas and, first applied to the inferior side from tail to head, then repeated on the superior side. Full-thickness suturing was used in the jejunum, and partial thickness was used for the pancreatic parenchyma without incorporating the pancreatic ductal epithelium.

Preoperative and intraoperative patient characteristics and also postoperative results were compared between two groups. All of the postoperative complications were assessed with the Clavien–Dindo classification [8] and pancreatic fistulas were evaluated using the Bassi classification [9].

Gathered data was analyzed using IBM SPSS Statistics 21 statistical analysis software.

Descriptive statistics for qualitative data are presented in frequency tables. For quantitative data, mean values with standard deviations are presented. The Kolmogorov-Smirnov test was used to evaluate normality of quantitative variables. The t-test was applied to independent samples for comparisons of normally distributed quantitative variables. The Non-parametric Mann-Whitney U test was applied for comparisons of two groups of quantitative variables not having normal distribution. The Chi-square or Fisher's exact test was applied to compare qualitative variables in groups. The Spearman's correlation coefficient was calculated in order to assess connection between two quantitative variables.

All presented P-values were intended for the assessment of two-way hypotheses. Statistically significant values were fixed and equal to 0.05.

RESULTS

A total of 110 patients were included in the study in the period from the 1st of January 2009 to the 31st of December 2016. Seven patients were excluded from the study due to malignancies discovered during intraoperative biopsies and due to conversion into the pylorus-preserving pancreaticoduodenectomy.

As many as 52 (50.5%) patients underwent duodenum-preserving pancreatic head resection using a single-layer continuous suture for pancreatojejunostomy, marked as group I. For 51 patients (49.5%) pancreatojejunostomy was performed using two-layer interrupted sutures and they were designated as group II.

Some of the patients – 23 (20.9%) had ineffective endoscopic interventions before surgery.

Patients were aged between 36 and 57 years (mean 46.07 ± 9.43). No statistically relevant differences regarding age, gender and diameters of the main pancreatic and common bile ducts between two groups were determined; data were shown in Tab. I.

Age and pancreatic duct diameter were expressed as mean \pm SD; sex by percents.

Statistically relevant differences of main intraoperative variables were observed: median duration of surgery was statistically shorter in group I – 210 min than in group II – 240 min ($P = 0.004$). Pancreatojejunostomy construction time was shorter in group I – $19 (\pm 6)$ min versus $51 (\pm 18)$ min in group II, $P < 0.001$. In this

Tab. I. Comparison of main preoperative characteristics between two analyzed groups.

	GROUP I N = 52	GROUP II N = 51	P VALUE	
Age	45.05 ± 9.1	47.24 ± 9.7	0.209	
Gender	Males	39 (75%)	39 (76.5%)	0.89
	Females	13 (25%)	12 (23.5%)	
CBD	7.06 ± 3.5 mm	7.16 ± 3.1 mm	0.56	
MPD	8.2 ± 3.3 mm	7.48 ± 3.1 mm	0.16	

Age and pancreatic duct diameter were expressed as mean \pm SD; sex by percents.

Tab. II. Differences between main intraoperative parameters, hospitalization time and postoperative complications.

VARIABLE	GROUP I N = 52	GROUP II N = 51	P VALUE
Duration of surgery (minutes)	210 (140–510)	240 (180–420)	0.004
Length of pancreatojejunostomy (cm)	11.1 ± 2.4	10.4 ± 2.3	0.25
Duration of pancreatojejunostomy construction (minutes)	19 ± 6	51 ± 18	<0.001
Removed tissue mass of the pancreas head (grams)	6.8 ± 3.6 (3.2–25.1)	6.3 ± 4.3 (2.1–32.4)	0.31
Duration of hospitalisation (days)	10.3 (7–42)	10.4 (8–42)	0.6
Postoperative morbidity	27 (51.9%)	23 (45.1%)	0.177
Postoperative mortality	2 (3.8%)	1 (2%)	0.636

The length of pancreatojejunostomy and duration of pancreatojejunostomy construction were expressed as mean \pm SD; duration of surgery and duration of hospitalization – as median (min and max).

Tab. III. Postoperative complications according to the Clavien–Dindo classification.

DEGREE OF COMPLICATIONS (CLAVIEN-DINDO)	GROUP I	GROUP II	P VALUE
I	7 (13.5%)	7 (13.7%)	0.65
II	12 (23.1%)	11 (21.6%)	
IIIa	0	0	
IIIb	6 (11.5%)	3 (5.9%)	
IVa	0	1 (2.0%)	
IVb	0	0	
V	2 (3.8%)	1 (2.0%)	

Tab. IV. Comparison of pancreatic fistulas according to the Bassi classification.

FISTULA CLASS	GROUP I	GROUP II	P VALUE
A	12 (23.1%)	6 (11.8%)	0.1
B	3 (5.8%)	2 (3.9%)	
C	1 (1.9%)	1 (2.0%)	

study the overall postoperative morbidity reached 51.9% and 45.1% in group I and II, respectively, and was comparable among both groups, $P = 0.177$. Postoperative mortality was 3.8% and 2% within group I and group II, $P = 0.636$ (Tab. II.).

The length of pancreatojejunostomy and duration of pancreatojejunostomy construction were expressed as mean \pm SD; duration of surgery and duration of hospitalization – as median (min and max).

Postoperative complications were assessed using the Clavien–Dindo classification. There were no statistically relevant differences between group I and group II in terms of the Clavien–Dindo classification ($P = 0.65$) (Tab. III.).

Tab. V. Comparison of pancreatic fistulas according to the Bassi classification.

	SUTURE TECHNIQUE	TIME OF THE OPERATION (MIN)	MORBIDITY %	FISTULAS %	HOSPITAL STAY (DAYS)
Frey et al. Amikura (1994)		–	22	8	13,5
Köninger et al. (2004)	Two-layer interrupted	295	16	4	–
Farkas G. et al. (2010)	Two-layer continues	240	21		12
Kutup A. et al. 2010	Single layer interrupted	183	17	6,3	–
Sudo T. et al. 2014	Single-layer continuous	227	33	17	16

A statistically insignificantly higher rate of pancreatic fistula was in the first group – 16 (30.8%) against 8 (15.7%) in the second group ($P = 0.1$) due to a statistically higher rate of A class pancreatic fistula: in single-layer continuous suture group – 23.1% against 11.8% in two-layer interrupted suture group ($P = 0.025$). The results are shown in Tab. IV.

DISCUSSION

In patients with chronic pancreatitis surgery remains the main therapeutic option when medical and endoscopic treatment methods are ineffective and the inflammatory process of the pancreas with pain syndrome must be treated. Approximately 47% will finally require surgical treatment [4]. According to many clinical studies and literature one of the best choices for surgical CP treatment is Frey procedure due its simple technique and favorable outcomes [5, 6].

Although the operation technique is described quite broadly and there is much discussion on the removal of the pancreatic head, the operative suture techniques of this procedure were not widely analyzed in literature. So far, there are no prospective clinical trials comparing different suturing methods of pancreatojejunostomy.

Various authors present different techniques of anastomotic sewing, duration of surgery, postoperative morbidity, rate of postoperative pancreatic fistulas and hospital stay (Tab. V.).

The postoperative morbidity and rate of pancreatic fistulas presented by these authors are incomparable because they were calculated according to different methodologies [10–14].

According to these data, the time of the operation ranged from 183 to 295 minutes and the median postoperative hospital stay ranged

from 12 to 16 days and these data are similar to ours (time of operation 210–240 min, hospital stay 10.4 days). We found only one article with the number of grams of tissue resected in the head of the pancreas – 5.72 g, and the length of the anastomosis including the head – 10.95 cm [15]. In our case, the number of grams of tissue resected in the head of the pancreas was 6.55 g and the length of the anastomosis, including the head was 10.75 cm.

As we conducted our research, we determined that longitudinal pancreatojejunostomy using single-layer continuous suture significantly shortened the median operative time (210 min versus 240 min) as opposed to two-layer interrupted suture. In addition, pancreatojejunostomy itself was faster when using single-layer suture (19 ± 6 min versus 51 ± 18 min).

We also found that the length of hospital stays, rate of postoperative morbidity, and mortality between groups were similar. A statistically significantly higher rate of A class pancreatic fistulas was observed in single-layer continuous suture group – 23.1% against 11.8% in two-layer interrupted suture group ($P = 0.025$). Nevertheless, no further medical intervention should be taken to treat these fistulas. Thus, the single-layer continuous suture technique does not worsen postoperative outcomes of the Frey procedure in comparison to the two-layer interrupted suture technique, and it is a good choice for pancreatojejunostomy.

CONCLUSIONS

Frey procedure using single-layer continuous pancreatojejunostomy is a safe, fast and less complicated method in the surgical treatment of chronic pancreatitis. It has a good chance of being accepted as a standard technique of treatment of this condition.

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