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ORIGINAL ARTICLE

A safe and feasible ''clock-face'' duct-to-mucosa pancreaticojejunostomy with a very low incidence of anastomotic failure: A single center experience of 248 patients

A. Papalampros[a,b], K. Niehaus[a], D. Moris[b,1,*], M. Fard-Aghaie[a,1], G. Stavrou[a], A.-G. Margonis[b], A. Angelou[b], K. Oldhafer[a]

[a] *Department of General and Abdominal Surgery, Asklepios Hospital Barmbek, Hamburg, Germany*
[b] *1st Department of Surgery, University of Athens, Laikon General Hospital, Agiou Thoma 17 street, 11527 Athens, Greece*

KEYWORDS
Pancreatic Fistula;
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Summary
Introduction: Postoperative pancreatic fistula (POPF) is one of the most frequent and serious postoperative complications of pancreatoduodenectomy (PD). We sought to assess the impact of a novel pancreaticojejunostomy (PJ) on the rates of POPF and overall postoperative complications.
Methods: Between 01/2010 and 12/2013, a total of 248 consecutive patients who underwent PD with a modified PJ were identified from our database and retrospectively analyzed. POPF cases were divided into three categories (ISGPF-international study group-guidelines): biochemical fistula without clinical sequelae (grade A), fistula requiring any therapeutic intervention (grade B), and fistula with severe clinical sequelae (grade C). Perioperative outcomes were recorded and analyzed.
Results: The overwhelming majority of patients had no evidence of fistula. Grade A POPF was observed in 9 (3.62%), grade B in 1 (0.40%), and grade C in 0 patients. There were no postoperative deaths. Overall complications occurred in 61 patients (24.59%) of patients after PD.
Conclusions: This modified pancreaticojejunostomy is widely applicable and is associated with very low rates of POPF, low postoperative morbidity and mortality. Overall, it is a feasible and safe novel approach with excellent short-term outcomes.

* Corresponding author. Tel./Fax: +302106440590.
E-mail address: dimmoris@yahoo.com (D. Moris).
[1] Authors equally contributed.

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Introduction

Pancreatic surgery has evolved and expanded significantly in modern era. Surgical technique has been refined thanks to further insights on surgical anatomy, innovative technological advances and the seminal work of pioneering surgeons. Furthermore, substantial improvement in diagnostic imaging has lead to better selection of patients while advances in perioperative care impact significantly on reduced morbidity and mortality after pancreatic resections. However, pancreatic surgery remains a challenging field even for experienced HPB surgeons and high volume tertiary centers.

While postoperative mortality has declined significantly from higher than 29% reported by Whipple et al in 1941 [1] to less than 5% [2] nowadays in tertiary academic centers, postoperative morbidity remains a common clinical problem ranging from 20–40% [3,4]. Contemporary studies report postoperative pancreatic fistula (POPF) incidence that ranges from 4% to 36% after various techniques of pancreaticojejunostomy (PJ) [5,6]. POPF does not impact only on postoperative morbidity but it has been found to be associated with a 5% mortality in a prospective, single institution series [7].

The clinical significance and the adverse impact of POPF in pancreatic surgery have triggered multiple studies assessing various anastomotic techniques [8,9]. Various methods of pancreaticobiliary reconstruction [10,11] have been suggested aiming to reduce the postoperative fistula rate and multiple risk factors for POPF such as small pancreatic duct [12], soft pancreas texture [13] and high body mass index (BMI) [14] have been recognized. Furthermore, pharmacologic interventions [15], topical sealing products [16,17] and pancreatic stents [18,19] have been utilized in an effort to decrease the rate of POPF without much success or consistency except for the recently published promising effects of pasireotide [20]. However, a definitive answer to the clinical problem has not been given and further insights on POPF and its prevention are warranted.

Risk factors for pancreatic leakage include general patient-related risk factors (age, gender, jaundice, and malnutrition), disease-related risk factors (pancreatic pathology, pancreatic texture, pancreatic duct size, pancreatic juice output), and procedure related factors (operative time, resection type, anastomotic technique, intraoperative blood loss). In addition, surgeons experience has been shown to correlate with pancreatic anastomotic leakage rate and in some reported cases the prophylactic use of somatostatin.

The present study was undertaken to provide contemporary statistical analysis to assess the POPF rate, using the ISGPF-international study group-definition [21] in patients undergoing pancreatic surgery with an innovative pancreaticojejunostomy for both malignant and benign indications. Secondary endpoints included the following short-term clinical outcomes: 90-day in hospital mortality, length of postoperative hospital stay, reoperation rates and overall complications as defined and graded by Clavien-Dindo classification [22].

Materials and methods

Study design

Two hundred and forty-eight consecutive patients who underwent curative intent pancreatic resection with a modified pancreaticojejunostomy between January 2010 and December 2013 at Asklepios Hospital Barmbek, Germany were identified from our institutional computer-based database and retrospectively analyzed. Four senior surgeons and a HPB-fellow performed all pancreatic anastomoses.

Standard demographic and clinical-pathological data were collected, including gender, age. The indication for pancreatic resection was recorded for each patient. Intraoperative data included operative time. Operative notes provided information on treatment-related variables, such as indication for resection and specific type of resection. Clavien-Dindo classification system [22] was used to record the perioperative complications with a major complication classified as $\geq$ grade 3. In case a patient had two or more complications, the most severe one was taken into account. The length of hospital stay for each patient was recorded. From the date of pancreas resection, perioperative 90-day mortality was calculated. Extensive data on pancreatic fistula formation were collected.

Definition of POPF and other short term outcomes

In an effort to standardize definitions, a consensus [21] defined POPF as the drain output of any measurable amount of fluid (around 10 mL) occurring on or after postoperative day 3 with amylase content at least three times that of serum amylase levels. A fluid collection was identified through CT scan or US as the presence of fluid greater than 5 cm in diameter, with or without clinical relevance; acute pancreatitis was defined as a threefold increase of normal plasmatic amylase or lipase values from the 4th postoperative day, confirmed by CT scan findings and clinical course; early postoperative hemorrhage was defined according to the International Study Group of Pancreatic Surgery (ISGPS). Postpancreatectomy hemorrhage (PPH) was defined as intra-abdominal or intestinal bleeding according to the criteria of the ISGPS [23]. The definition of PPH is based on three parameters: onset (early $\leq$ 24 h, late > 24 h), location (intraluminal or extraluminal) and severity (mild or severe). Continuous variables were described as medians with interquartile range (IQR). Categorical variables were described as totals and frequencies.

Operative technique

The pancreas is transected with the monopolar electrocautery. Hemostasis at the resection surface is achieved with 5-0 or 6-0 PDS sutures. The transected jejunal limb is brought in a retrocolic fashion to the right of the middle colic vessels in order to construct an end-to-side anastomosis. After pancreatectomy, the cut end of the distal pancreas is mobilized for approximately 2 cm of the spleno-portal axis to allow the placement of a ''running'' 4-0 PDS double-armed suture between the posterior surface of the pancreas and the seromuscular layer of the jejunum in a vertical fashion. Care must be taken not to place any of those stitches through the main pancreatic duct, but also to include the pancreatic capsule. The pancreatic duct is then carefully dilated with a fine curved, locking clamp. We imagine the pancreatic duct hole as a clock, where the anterior border of the duct constitutes the 12 o'clock and the posterior the 6 o'clock. No magnification device was used.

The ''duct-to-mucosa'' anastomosis begins by placing the 5-0 or 6-0 PDS sutures in a clockwise fashion through the pancreatic duct; the first stitch is placed in 12 ''o'clock'', then a stitch is placed in 2 and a last one in 3 ''o'clock''.

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