The "Colonial Wig" pancreaticojejunostomy: zero leaks with a novel technique for reconstruction after pancreaticoduodenectomy

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BACKGROUND: Postoperative pancreatic fistula (POPF) remains common and morbid after pancreaticoduodenectomy (PD). A major advance in the study of POPF is the fistula risk score (FRS).

METHODS: We analyzed 48 consecutive patients undergoing PD. The "Colonial Wig" pancreaticojejunostomy (CWPJ) technique was used in the last 22 PDs, we compared 22 CWPJ to 26 conventional PDs.

RESULTS: Postoperative morbidity was 49% (27% Clavien grade >2). The median length of hospital stay was 11 days. In the first 26 PDs, the PJ was performed according to standard techniques and the clinically relevant POPF (CR-POPF) rate was 15%, similar to the FRS-predicted rate (14%). In the next 22 PJs, the CWPJ was employed. Although the FRS-predicted rates were similar in these two groups (14% vs 13%), the CR-POPF rate in the CWPJ group was 0 (*P*=0.052).

CONCLUSION: Early experience with the CWPJ is encouraging, and this anastomosis may be a safe and effective way to lower POPF rates.

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KEY WORDS: pancreatectomy; postoperative pancreatic fistula; fistula risk score; anastomosis; novel surgical technique

Introduction

Postoperative pancreatic fistula (POPF) is one of the most common and troublesome complications following pancreaticoduodenectomy (PD),[1] an increasingly common operation for a variety of benign and malignant periampullary diseases, including cystic and solid lesions, pancreatitis, and, rarely, trauma.[2-6] Furthermore, the increasing age of the population undergoing PD, and the increased awareness of risks associated with cancer surgery in the elderly,[7] have given rise to an enlarging and sometimes controversial literature suggesting that rates of POPF may be even higher among older patients.[8-10] Soft pancreas texture is strongly associated with risk of POPF.[1, 8, 10, 11] Indeed, an increasingly employed, and recently validated, fistula risk score (FRS) predicting POPF has consistently found that soft gland texture, small duct diameter, are among the most powerful predictors of POPF.[12, 13] Although the grading of POPF has become increasingly standardized over recent years, the techniques for pancreatic anastomosis are diverse and there is no standardized operation procedure.

Methods

Patients

We retrospectively reviewed the last 50 consecutive patients who were operated upon by the senior author (CSC) for pancreatic head resections at a high-volume pancreatic surgery program at a community teaching hospital from August 2010 to February 2016. Patients undergoing total pancreatectomy and those having com-

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plications precluding assessment of POPF (e.g., early postoperative mortality) were excluded. Approval of the local Institutional Review Board was obtained.

Patient data included variables used to calculate the FRS[12, 13] (gland texture, pathology, diameter of the pancreatic duct and intraoperative blood loss), the Clavien complication grade[1] (need for any treatment deviating from the modified pancreatectomy pathway[14-16]), and the International Study Group of Pancreatic Surgery (ISGPS) grade of POPF[17, 18] (drain amylase level, length of hospital stay, readmission and reoperation). Computed tomography (CT) scans were performed for suspicion of intraabdominal fluid collections. Drains with outputs low in amylase or volume were removed at the discretion of the surgeon.

Conventional PD

In the first cohort of 26 consecutive PDs from August 2010 to January 2014, the pancreaticojejunostomy (PJ) was performed in either the duct-to-mucosa (n=24) or an end-to-end invaginating technique (n=2) according to standard techniques.[19] In particular, the technique for these first 26 cases was as follows: for duct-to-mucosa anastomoses, an outer interrupted layer of 3-0 silk was placed through the posterior surface of the pancreas, and then through the jejunum in a seromuscular fashion. Next a jejunotomy was created the same size as, and exactly adjacent to, the pancreatic duct. The duct-to-mucosa anastomosis was performed with interrupted 5-0 or 4-0 synthetic absorbable monofilament suture, first the posterior sutures and then the anterior ones. The outer anterior layer was then secured with a row of closely spaced interrupted 3-0 silk sutures in a Lembert fashion. In the other 2 cases (end-to-end invaginating technique), the end of the pancreas was placed into the end of the jejunum for a distance of 5 cm and then the jejunum was secured circumferentially to the body of the gland. This was accomplished by generously mobilizing the end of the pancreas and then by placing stay sutures 2.5 cm from the cut end of the pancreas on the superior and inferior borders. These sutures were then tied, then passed into the end of the jejunum with French eye needles, and then passed out the sides of the jejunum 2.5 cm from its end. When tied, these sutures secured the pancreas, inserted 5 cm into the jejunal lumen. The cut end of the jejunum was then secured hermetically to the body of the pancreas in a circumferential fashion with closely spaced 3-0 silk interrupted sutures.

"Colonial Wig" PJ

In the second cohort (n=22) from March 2014 to February 2016, a novel PJ, the "Colonial-Wig" PJ (CWPJ) was performed as described below.

General principles

PD was performed as previously described.[20] Reasoning firstly that leaks occur not only from the main pancreatic duct, but also from small ductules on the cut surface of the pancreas,[21] we used a compressive U-stitch to securely invaginate the pancreas; reasoning secondly that anastomotic corners are especially susceptible areas for leaking, we developed a technique to both dunk the corners of the pancreas (with stay sutures, using French eye needles), and also to bury the corners deep within a wrapped jejunal buttress (which grossly resembles a namesake "Colonial Wig" [CW]); reasoning thirdly, that an additional tension-free, hermetic layer would be optimal, we took advantage of the redundant cuff of jejunum, resultant following the U sutures (see below), to hermetically suture this cuff to the pancreatic capsule without tension, and then further buttressed with an omental flap. We term this anastomosis the CWPJ.

Detailed technique: sutures and rationale

Prior to division of the pancreatic neck, four 3-0 silk stay sutures are placed in a standard fashion, two at the superior border and two inferiorly, to ligate the longitudinal pancreatic arteries and later to retract the pancreas. After the neck of the pancreas is divided, typically with a scalpel, and the specimen removed, the stapled end of the jejunum is positioned for anastomosis as previously described.[20]

As shown in the Fig., the four sets of sutures, and their rationale, in order of placement, are the following: 1) The two 3-0 silk stay sutures (s) placed prior to division of the pancreatic neck, which during the anastomosis will serve to secure the invagination of the corners of the pancreatic remnant into the jejunum; 2) Two 3-0 silk CW sutures (cw) that wrap the jejunum around the invaginated pancreas, covering the anastomotic corners completely with jejunum and giving the final product the appearance of a colonial wig that the pancreas wears (Fig.); 3) Two 3-0 glycolide/lactide copolymer (or polyglactin) U-sutures (u) that compress the small ducts and securely invaginate the pancreas, similar to the "dunking PJ";[22] and 4) Several very closely spaced 3-0 silk interrupted sutures that provide an outer-layer (o) of additional hermetic sealing between the redundant cuff of jejunum remaining after tying the U sutures, and the pancreatic capsule (Fig.).

The stay sutures (s), having been placed full-thickness through the pancreas prior to division of the neck, are left on Crile clamps initially. Meanwhile, the CW sutures (cw) and the U sutures (u) are placed, but not yet tied (Fig. A, B). The two CW sutures (cw) are placed through the full thickness of the pancreas several centimeters from the cut surface, then passed in a generous seromuscular fashion through the jejunum. One of these will join the inferior border of the pan-