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EVIDENCE VS. PRACTICE IN EARLY DRAIN REMOVAL FOLLOWING PANCREATECTOMY

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Abstract

Background: Early drain removal when postoperative day (POD) 1 drain fluid amylase (DFA) was ≤ 5000 U/L reduced complications in a previous randomized controlled trial. We hypothesized that most surgeons continue to remove drains late and this is associated with inferior outcomes.

Methods: We assessed the practice of surgeons in a prospectively maintained pancreas surgery registry to determine the association between timing of drain removal with demographics, co-morbidities, and complications. We selected patients with POD1 DFA ≤ 5000 U/L and excluded those without drains, and subjects without data on POD1 DFA or timing of drain removal. Early drain removal was defined as ≤ POD5.

Results: 244 patients met inclusion criteria. Only 90 (37%) had drains removed early. Estimated blood loss was greater in the late removal group (190 mL vs 100 mL, p = 0.005) and pathological

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findings associated with soft gland texture were more frequent (97(63%) vs 35(39%), p < 0.0001). Patients in the late drain removal group had more complications (84(55%) vs 30(33%), p = 0.001) including pancreatic fistula (55(36%) vs 4(4%), p < 0.0001), delayed gastric emptying (27(18%) vs 3(3%), p = 0.002), and longer length of stay (7 days vs 5 days, p < 0.0001). In subset analysis for procedure type, complications and pancreatic fistula remained significant for both pancreatoduodenectomy and distal pancreatectomy.

Conclusion: Despite level 1 data suggesting improved outcomes with early removal when POD1 DFA is ≤ 5000 U/L, experienced pancreas surgeons more frequently removed drains late. This practice was associated with known risk factors (EBL, soft pancreas) and may be associated with inferior outcomes suggesting potential for improvement.

Introduction:

Within complex pancreatic surgery, the most significant complication is a post-operative pancreatic fistula (POPF).[1–3] Many modifications have been proposed throughout the years in an attempt to prevent POPF including variations in surgical technique. However, fistulas still occur in 10% of patients and cause significant morbidity.[4] Historically, the use of abdominal drains mitigated that morbidity but a growing appreciation as to the unnecessary or detrimental nature of drains in other operations including splenectomy and gastrectomy called into question the use of drains in complex pancreatic surgery.[4–5]

Recently, concerns that drains may increase post-operative complications rather than mitigate them caused a decline in the usage of prophylactic abdominal drains. A poll of experienced pancreatic surgeons revealed that 27% elected for selective use of abdominal drains with 51% removing them earlier than post-operative day 3 (POD3).[6] Support for this practice stemmed from the idea that drains provide not only a portal of entry for bacteria but also generate considerable negative pressure potentially causing fistula formation. However, post-operative day (POD) 1 drain fluid amylase (DFA) concentration greater than 5000 U/L has been associated with an increased risk of clinically relevant postoperative pancreatic fistula (CR-POPF) and in those patients, the elimination of prophylactic drains would expose them to considerable risk.[7,8] Therefore, the selective use of intra-operative drains with early drain removal in patients with negligible fistula risk provides a potential solution.

However, the current literature evaluating outcomes in pancreatectomy patients after early drain removal is limited. Indeed, early drain removal in selected patients has been associated with reduced postoperative complications after pancreatectomy.[9] Only one randomized prospective trial by Bassi and colleagues has assessed the safety of early drain removal.[9] Despite results showing improved outcomes, many surgeons remain reluctant to remove intraperitoneal drains early in the postoperative period. We hypothesized that in low risk patients (POD1 DFA ≤ 5000 U/L), late drain removal (> POD 5) would be associated with worse outcomes including an increased rate of CR-POPF and intra-abdominal abscess.

Methods:

We queried data from a prospectively maintained pancreas surgery registry at a high-volume academic pancreas center, Baylor College of Medicine, from January 2006 to December

2016. The electronic web-based database contains data on patient demographics, clinical history, past medical history, family and social history, physical exam findings, diagnostic tests and imaging, as well as detailed data on operative interventions and pathologic data. All complications within 60 days of surgery are prospectively recorded and are graded using the Accordion Severity Grading for Surgical Complications[10] and International Study Group on Pancreatic Fistula (ISGPF)/International Study Group of Pancreatic Surgery (ISGPS) definitions for pancreatic fistula and delayed gastric emptying. [11,12] Survival is recorded up to 90 days for all patients and until death for patients with cancer. After obtaining informed consent, data is entered into the database in real time by trained data analysts under the supervision of the surgeons. All data are backed up by source documents and the accuracy of data entered to the electronic database is periodically reviewed.[13] Institutional Review Boards at our institution granted permission to conduct this study (IRB H-38662).

In the current study, we included patients who underwent pancreatoduodenectomy or distal pancreatectomy, for benign and malignant disease, who had a POD1 DFA ≤ 5000 U/L. We excluded patients without intraperitoneal drains and those without available data on timing of drain removal. Baseline demographics and past medical history were obtained from the database. Perioperative characteristics included pancreatic texture, duct size, pathologic diagnosis, EBL, intra-operative transfusion requirement, American Society of Anesthesiologists (ASA) score, and procedure length. Complications were assessed at 60 days. Chi square or Fisher's exact test, when appropriate, was used to analyze categorical variables. For continuous variables, the student's t-test or Mann-Whitney test were used to evaluate continuous variables. A p-value of < 0.05 was considered statistically significant. All statistical analyses were performed using SPSS v24 (IBM Corp. Armonk NY, USA).

Results:

We identified 687 patients in our database who underwent pancreatoduodenectomy or distal pancreatectomy. We excluded 189 patients who did not have intraperitoneal drains placed at the time of pancreatectomy, 146 without data on timing of drain removal, 62 without POD1 DFA value data, and 46 with POD1 DFA > 5000 U/L. This resulted in 244 patients meeting inclusion criteria with a POD1 DFA ≤ 5000 U/L (Fig 1). Of these, 176 (72%) underwent pancreatoduodenectomy and 68 (28%) underwent distal pancreatectomy. Patients were divided into two groups based on timing of drain removal. Early removal was defined as on or before POD5 (90 (37%)), and late removal was defined as after POD5 (154, (63%)). Most drains in the early removal group were removed by POD 4 (POD 3–5 IQR) while in the late group, most were removed by POD 11 (POD 8–17 IQR). As the practice progressed, there was a trend toward earlier drain removal. Prior to 2010, 6.5% of drains were removed early which increased to 46.2% after publication of the Bassi study.[9] Additionally, surgeon experience and case volume did not affect timing of drain removal. Three surgeons were studied of which 1 is junior faculty with 5 years of experience performing an average of 20 complex pancreas surgeries a year, and 2 senior faculty both with 20 years of experience and an average of over 40 cases a year. The junior faculty removed the drain early in 44% of patients while the senior faculty removed the drain in 35% (P=0.204).

The overall median POD1 DFA was 328 U/L (58–1270 U/L IQR). Median POD1 DFA was 176 U/L (37–691 U/L IQR) in the early group and 599 U/L (116–1755 U/L IQR) in the late group (p<0.0001). POD3 DFA data was available for 98% of patients in the early drain removal group and 94% in the late removal group. In those with early drain removal, median POD3 DFA was 21.5 U/L (IQR 10–72.5) among pancreatoduodenectomies and 104 U/L (IQR 46–176) for distal pancreatectomies with only 4 (4%) of patients with a DFA value three times the upper limit of normal. Among the late removal group, median POD3 DFA was 154 U/L (IQR 33.5–389.5) for pancreatoduodenectomies and 236 U/L (IQR 99.5–790) for distal pancreatectomies with 42(27%) with an elevated DFA on POD3.

Table 1 shows the baseline characteristics of the study population. There was no significant difference in age, gender, ethnicity, race, or distribution of comorbidities between the early and late drain removal groups. Patients in the late removal group had greater EBL (190 vs 100 ml, p=0.005) and required intra-operative transfusions more frequently (20(13%) vs 4(4%), p=0.03). The difference in EBL persisted in subset analysis for pancreatoduodenectomy and distal pancreatectomy (Table 2). Patients in the late removal group were also more likely to have a soft pancreatic texture (92(60%) vs 44(49%), p=0.04). This persisted in subset analysis for pancreatoduodenectomy patients but not for distal pancreatectomy. Pre-operative antibiotics were variable but Ertapenem and Meropenem predominated with Ertapenem used significantly more in the late drain removal group (62% vs 77%, p=0.012) and Meropenem used in the early removal group (13(15%) vs 2(1%), p<0.001). Intra-operative octreotide usage was more frequent in the late removal group (43(28%) vs 8(9%), p<0.001) in the overall cohort and in the pancreatoduodenectomy subset (41(35%) vs 6(10%), p<0.001. However, operative technique was not statistically significant between the early and late removal groups in either pancreatoduodenectomy or distal pancreatectomy patients.

Overall morbidity (excluding Grade A pancreatic fistula) was higher in the late removal group for both pancreatoduodenectomy and distal pancreatectomy patients (Table 3). More patients in the late removal group had a pancreatic fistula of any grade (55(36%) vs 4(4%), p< 0.0001), but there was no difference in the rates of CR-POPF (ISGPF Grade B or C). In those with a CR-POPF, 60% (9 of 15) were diagnosed prior to POD7 all of which required late drain removal but only accounted for 5.8% (9 of 150) of patients with late drain removal. Three patients underwent early drain removal but were diagnosed with a CR-POPF in the second to third post-operative week. Delayed gastric emptying was also more prevalent in the late removal group (27(18%) vs 3(3%), p=0.002). This difference persisted after subset analysis based on procedure type (Table 3). The difference in length of stay (LOS) between the two groups was also significant, with longer LOS in the late removal group (7 days vs 5 days; p<0.0001). Overall, there was no difference in rate of intra-abdominal abscess formation. However, on subset analysis for subjects undergoing distal pancreatectomy, late drain removal had a higher incidence of intra-abdominal abscess (5(14%) vs 0, p=0.05)

Discussion:

Early drain removal following pancreatectomy when POD1 DFA was ≤ 5000 U/L resulted in reduced complications in a previous randomized controlled trial.[9] We hypothesized that despite these data, most surgeons continue to remove drains late and that this is associated with inferior outcomes. Our retrospective study showed that experienced pancreatic surgeons removed drains early only 37% of the time when the POD1 DFA was ≤ 5000 U/L despite surgeon experience and volume. This practice was associated with known risk factors for pancreatic fistula, such as increased EBL and soft gland texture, and may be associated with inferior outcomes suggesting potential for improvement.

Drains are placed following pancreatic resection because some surgeons believe they will control a postoperative leak of pancreatic secretions and decrease the incidence of postoperative peripancreatic fluid collections, abscesses, or erosion of retroperitoneal vessels resulting in postoperative hemorrhage. However, some surgeons have questioned this position and believe that drains, particularly if left in place for a prolonged period, can erode into adjacent structures and increase the incidence of postoperative pancreatic fistula (POPF) or serve as an avenue to introduce bacteria into a sterile pancreatic fluid collection, thus increasing the incidence of intra-abdominal abscesses.

Kawai et al. were the first to report improved outcomes with early drain removal after pancreatoduodenectomy.[14] In this prospective cohort study, early drain removal was defined as removal on POD4 and late as on or after POD8, regardless of DFA value. The rates of POPF (3.6% vs 23%, p=0.004) and intra-abdominal abscess (7.7% vs 38%, p=0.003) were significantly lower in the early removal group. The authors also reported a 17% rate of CR-POPF in the late drain removal group compared to 2% in the early removal group.

A subsequent prospective cohort study by Adachi et al. focusing on subjects undergoing distal pancreatectomy also demonstrated improvement with early drain removal.[15] The authors defined early drain removal on POD1 and late removal on ≥ POD5, early removal was once again favored with a 0% incidence of CR-POPF in the early group compared to 16% in the late removal group.

The study by Bassi and colleagues randomized patients undergoing either pancreatoduodenectomy or distal pancreatectomy into early and late removal groups on POD 3.[9] In this study, which provides higher level of evidence, the authors found an association between early drain removal and decreased rates of pancreatic fistula (early 1.8% vs late 26%, p=0.0001; OR 20) and intra-abdominal complications (early 12.2% vs late 53%, p=0.001; OR 7.9).

McMillan and colleagues conducted a multicenter prospective study to evaluate a drain management strategy combining selective and early drain removal in pancreatoduodenectomy patients.[16] They employed the Fistula Risk Score (FRS), which uses intraoperative characteristics including EBL, pancreatic duct size, gland texture, and pathology.[17] The authors abandoned intraperitoneal drain placement in negligible-low risk patients and removed drains early (POD3) in those with moderate-high risk if their POD1 DFA was ≤ 5000 U/L. The authors compared their study population to a retrospective cohort and found the CR-POPF rate to be lower after implementation of the drain management protocol.

Beane et al. recently performed a retrospective analysis of the American College of Surgeons-National Surgical Quality Improvement Program (ACS-NSQIP) database on outcomes for early versus delayed drain removal in pancreatoduodenectomy patients.[18] Patients with POD 1 DFA ≤ 5000 U/L whose drains were removed by POD3 were propensity score matched with patients whose drains were removed after POD3. Early drain removal when POD 1 DFA was ≤ 5000 U/L was associated with reduced overall morbidity (35.3% vs 52.3%, p=0.01), length of stay (6 vs 8 days, p<0.01), and CR-POPF (0.9% vs 7.9%, p=0.02).[18] Despite the strengths of the study, important factors including surgeon experience and case volume were not included. A surgeon's practice evolves through experience and newer surgeons with lower case volumes may hesitate to remove a drain earlier due to the concern for complications. Using an institutional database, we were able to perform granular analysis and show that surgeon experience did not contribute to timing of removal.

These previous studies suggest that late drain removal in subjects at a lower risk for fistula may increase the occurrence of complications including fistula and intra-abdominal abscess. However, in the current study, surgeons removed drains late even in the subset of patients with POD1 DFA ≤ 5000 U/L. The overall median POD1 DFA in our study suggests that, if POD1 DFA value was not very low, surgeons may have been concerned about early drain removal as evidenced by a greater percentage of patients with an elevated POD3 amylase levels in the late group (27%) vs the early group (4%). Additionally, patient specific factors such as EBL, soft pancreatic texture, or concerns regarding the pancreatic anastomosis or transection line may have influenced their clinical decision to leave drains in place longer despite a low POD1 DFA. These factors could not be thoroughly assessed in this retrospective study. Another potential bias, given the retrospective nature of this study, is evolution of practice, as time progressed surgeons elected to remove drains early more often. The higher morbidity in the late removal group supports the concept that prolonged use of drains could be detrimental in patients at low risk of pancreatic fistula based on POD1 DFA concentration. An alternative explanation is that, perhaps driven by other patient specific characteristics signifying increased POPF risk, surgeons made wise decisions to leave drains in place since these patients indeed more frequently went on to have complications. The retrospective nature of this study does not allow us to measure all factors that come together in aggregate to influence surgical decision making.

In this retrospective study, we demonstrated that experienced pancreas surgeons frequently choose to remove drains late when POD1 DFA is ≤ 5000 U/L despite level 1 data suggesting improved outcomes with early removal. This practice was associated with inferior outcomes suggesting potential for improvement. We conclude that early drain removal should be encouraged when POD1 DFA is ≤ 5000 U/L. Data from additional multicenter randomized prospective trials may be needed to disseminate this change in surgical practice.

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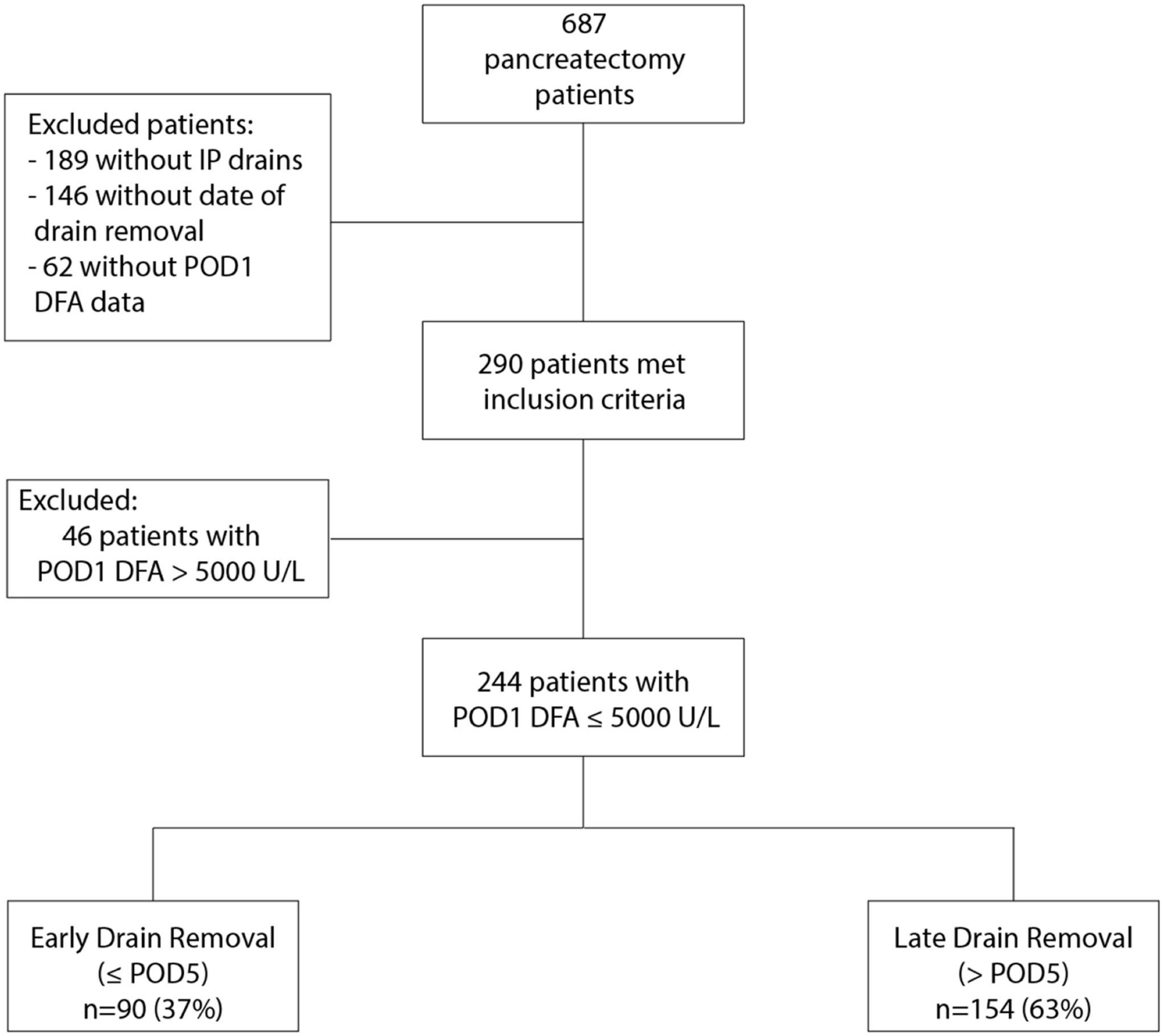

Figure 1.

Patient Selection Strategy

IP: Intraperitoneal

POD: Postoperative day

DFA: Drain fluid amylase

Table 1.

Demographics and Comorbid Conditions

	Overall (n=244)			PD* (n=176)			DP** (n=68)		
	Early Removal (n=90)	**Late Removal (n=154)**	**p-value**	**Early Removal (n=58)**	**Late Removal (n=118)**	**p-value**	**Early Removal (n=32)**	**Late Removal (n=36)**	**p-value**
Age	61 (51–70)	64 (56–73)	0.118	65 (57–71)	65 (57–72)	0.784	54 (46–66)	61 (46–73)	0.212
Gender Female	54(60%)	77(50%)	0.131	29(50%)	60(51%)	0.916	25(78%)	17(47%)	0.009
Ethnicity Hispanic or Latino	11(12%)	12(8%)	0.226	8(14%)	10(8%)	0.247	3(9%)	2(6%)	0.659
Race White Black Asian Alaskan	63(70%) 13(14%) 4(4%) 1(1%)	120(78%) 13(8%) 3(2%) 0	0.240	42(72%) 9(16%) 0 1(2%)	95(81%) 12(10%) 2(2%) 0	0.232	21(66%) 4(13%) 4(13%) 0	25(69%) 4(11%) 1(3%) 0	0.344
BMI	26 (22–30)	27 (23–31)	0.373	25 (22–29)	26 (23–31)	0.095	29 (26–36)	28 (23–32)	0.370
Comorbidities HTN*** COPD**** PVD***** Chronic pancreatitis Renal insufficiency Diabetes	40(44%) 5(6%) 4(4%) 16(18%) 5(6%) 29(32%)	68(44%) 11(7%) 6(4%) 16(10%) 4(3%) 40(26%)	0.970 0.635 1.000 0.096 0.295 0.285	27(47%) 3(5%) 3(5%) 13(22%) 2(3%) 22(38%)	52(44%) 9(8%) 5(4%) 12(10%) 3(3%) 27(23%)	0.739 0.753 0.720 0.055 0.665 0.056	13(41%) 2(6%) 1(3%) 3(9%) 3(9%) 7(22%)	16(44%) 2(6%) 1(3%) 4(11%) 1(3%) 13(36%)	0.498 1.000 1.000 1.000 0.335 0.199
Smoking Current Former Never	17(19%) 24(27%) 45(50%)	23(15%) 57(37%) 72(47%)	0.292	12(21%) 20(34%) 24(41%)	20(17%) 48(41%) 50(42%)	0.720	5(16%) 4(13%) 21(66%)	3(8%) 9(25%) 22(61%)	0.332
Diagnosis PDAC† Cystic PNET†† Ampullary cancer Cholangiocarcinoma Other cancer Other	38(42%) 22(24%) 8(9%) 6(7%) 2(2%) 1(1%) 9(10%)	35(23%) 48(31%) 13(8%) 10(6%) 6(4%) 6(4%) 25(16%)	0.096	28(48%) 7(12%) 4(7%) 6(10%) 2(3%) 1(2%) 8(14%)	30(25%) 30(25%) 6(5%) 10(8%) 6(5%) 5(4%) 21(17%)	0.106	10(31%) 15(47%) 4(13%) - - 0 1(3%)	5(14%) 18(50%) 7(19%) - - 1(3%) 4(11%)	0.275

* Pancreatoduodenectomy

** Distal pancreatectomy

*** Hypertension

**** Chronic obstructive pulmonary disease

***** Peripheral vascular disease

† Pancreatic adenocarcinoma

†† Pancreatic neuroendocrine tumor

Table 2.

Perioperative Characteristics

	Overall (n=244)			PD (n=176)			DP (n=68)		
	Early Removal (n=90)	**Late Removal (n=154)**	**p-value**	**Early Removal (n=58)**	**Late Removal (n=118)**	**p-value**	**Early Removal (n=32)**	**Late Removal (n=36)**	**p-value**
ASA Class * **1** **2** **3** **4**	- 19(21%) 68(76%) 2(2%)	- 44(29%) 104(67%) 4(3%)	0.412	- 11(19%) 46(79%) 0	- 31(26%) 81(69%) 4(3%)	0.178	- 8(25%) 22(69%) 2(6%)	- 13(36%) 23(64%) 0	0.225
EBL ** (ml) **Median (IQR)**	100 (25–200)	190 (50–325)	0.005	100 (25–250)	200 (75–300)	0.005	75 (25–150)	100 (50–438)	0.019
Transfusion	4(4%)	20(13%)	0.025	3(5%)	16(14%)	0.083	1(3%)	4(11%)	0.357
Intra-operative Octreotide	8(9%)	43(28%)	<0.001	6(10%)	41(35%)	<0.001	2(6%)	2(6%)	0.903
Pre-operative Antibiotics									
Ancef Aztreonam Cefotetan Ciprofloxacin Clindamycin Ertapenem Flagyl Fluconazole Levaquin Meropenem Vancomycin Missing data	3(3.3%) 1(1.1%) 0(0%) 8(9.0%) 1(1.1%) 56(62.2%) 2(2.2%) 2(2.2%) 2(2.2%) 13(14.5%) 0(0%) 2(2.2%)	1(0.7%) 1(0.7%) 1(0.7%) 5(3.2%) 0(0%) 119(77.3%) 0(0%) 3(1.9%) 4(2.6%) 2(1.3%) 4(2.6%) 14(9.0%)	0.143 1.0 1.0 0.0765 0.369 0.012 0.135 1.0 1.0 <0.001 0.299 0.037	2(3.5%) 1(1.7%) 0(0%) 5(8.6%) 1(1.7%) 36(62.1%) 0(0%) 2(3.5%) 0(0%) 10(17.2%) 0(0%) 1(1.7%)	0(0%) 1(0.9%) 1(0.9%) 3(2.5%) 0(0%) 89(75.4%) 0(0%) 2(1.7%) 4(3.4%) 2(1.7%) 4(3.4%) 12(10.1%)	0.107 0.552 1.0 0.117 0.329 0.066 1.0 0.599 0.304 <0.001 0.304 0.063	1(3.1%) 0(0%) 0(0%) 3(9.4%) 0(0%) 20(62.5%) 2(6.2%) 0(0%) 2(6.2%) 3(9.4%) 0(0%) 1(3.1%)	1(2.8%) 0(0%) 0(0%) 2(5.6%) 0(0%) 30(83.2%) 0(0%) 1(2.8%) 0(0%) 0(0%) 0(0%) 2(5.6%)	1.0 1.0 1.0 0.660 1.0 0.052 0.218 1.0 0.218 0.099 1.0 1.0
Operative Technique									
End to Side End to End Missing data Stapled Stapled with seamguard Sutured Fish mouth Missing data				56(97%) 0(0%) 2(3%)	109(92%) 6(5%) 3(3%)	0.282 0.180 0.665	4(13%) 26(81%) 0(0%) 1(3%) 1(3%)	1(3%) 28(78%) 4(11%) 3(8%) 0(0%)	0.180 0.772 0.117 0.616 1.0
Operative time (min)	379 (285–474)	407 (342–475)	0.135	446 (375–534)	438 (372–498)	0.684	254 (187–327)	278 (218–347)	0.2
Soft gland	44(49%)	92(60%)	0.042	18(31%)	69(58%)	<0.0001	26(81%)	23(64%)	0.700
Pancreatic duct ≤ 3mm	42(47%)	63(41%)	0.414	19(33%)	47(40%)	0.382	23(72%)	16(45%)	0.187
Pancreatic adenocarcinoma/pancreatitis	55(61%)	57(37%)	<0.0001	42(72%)	50(42%)	<0.0001	13(41%)	7(19%)	0.045
LOS (days)	5(4–5)	7(6–8)	<0.0001	5(4–6)	7(6–8)	<0.0001	4(3–5)	6(4–8)	<0.0001

*American Society of Anesthesiologists Class

**Estimated blood loss

Table 3.

60-Day Morbidity

	Overall (n=244)			PD (n=176)			DP (n=68)		
	Early Removal (n=90)	**Late Removal (n=154)**	**p-value**	**Early Removal (n=58)**	**Late Removal (n=118)**	**p-value**	**Early Removal (n=32)**	**Late Removal (n=36)**	**p-value**
Patients with any complications	30(33%)	84(55%)	0.001	24(41%)	67(57%)	0.055	6(19%)	17(47%)	0.013
Gastrointestinal CR-POPF** Bile leak Enteric leak Chyle leak DGE*** SBO**** Gastrointestinal bleeding Postoperative hemorrhage	2(2%) 0 0 0 3(3%) 3(3%) 1(1%) 1(1%)	13(8%) 2(1%) 1(0.6%) 5(3%) 27(18%) 1(0.6%) 1(0.6%) 1(0.6%)	0.065 0.541 1.000 0.164 0.002 0.126 1.000 1.000	1(2%) 0 0 0 3(5%) 2(3%) 1(2%) 1(2%)	11(9%) 2(2%) 0 3(3%) 22(19%) 1(0.8%) 0 1(0.8%)	0.108 1.000 - 0.554 0.038 0.217 0.303 0.500	1(3%) 0 0 0 0 1(3%) 0 0	2(6%) 0 1(3%) 2(6%) 5(14%) 0 1(3%) 0	1.000 - 1.000 0.493 0.052 0.491 1.000 -
Infectious complications Seroma Wound infection Wound dehiscence Intra-abdominal abscess UTI Bacteremia/sepsis	1(1%) 5(6%) 1(1%) 2(2%) 2(2%) 1(1%)	2(1%) 10(6%) 0 12(8%) 8(5%) 1(0.6%)	1.000 0.869 0.353 0.146 0.500 1.000	1(2%) 4(7%) 1(2%) 2(3%) 1(2%) 1(2%)	1(0.8%) 9(8%) 0 7(6%) 6(5%) 0	0.508 1.000 0.297 1.000 0.675 0.297	0 1(3%) 0 0 1(3%) 0	1(3%) 1(3%) 0 5(14%) 2(6%) 1(3%)	1.000 1.000 - 0.053 1.000 1.000
Readmission	15(17%)	35(23%)	0.320	10(17%)	26(22%)	0.687	5(16%)	9(25%)	0.375
Reoperation	0	1(0.6%)	1.000	0	1(0.8%)	1.000	0	0	-
Operative mortality	1(1%)	3(2%)	1.000	1(2%)	2(2%)	1.000	0	1(3%)	0.488

* Postoperative pancreatic fistula ISGPS grade A or B or C

** Clinically-relevant postoperative pancreatic fistula ISGPS grade B or C

*** Delayed gastric emptying

**** Small bowel obstruction