Flange Gastroenterostomy Results in Reduction in Delayed Gastric Emptying after Standard Pancreaticoduodenectomy: A Prospective Cohort Study

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BACKGROUND: Delayed gastric emptying (DGE) is a common serious problem after pancreaticoduodenectomy (PD). Flange gastrojejunostomy (FL-GE) is a previously described technique that creates an internal flange in a hand-sewn gastroenterostomy. Results of FL-GE on incidence and severity of DGE after PD are presented.

STUDY DESIGN: Data were extracted from a prospective database of PD. Standard PD with antrectomy were performed with flange gastroenterostomy (FL-GE) or other techniques (NonFL-GE) at a single institution. The International Study Group of Pancreatic Surgery (ISGPS) definition of DGE was used, and DGE severity was graded based on the ISGPS grading system and the Modified Accordion Grading System (MAGS).

RESULTS: There were 215 standard PDs performed. Sixty-eight (32%) were FL-GE and 147 (68%) were NonFL-GE. Delayed gastric emptying rates in FL-GE and NonFL-GE were 9% and 23%, respectively ($p = 0.012$). Differences in severity of DGE were even more prominent: 29% of DGEs in the NonFL-GE group were ISGPS grade C vs 0% in FL-GE. Also, 35% of DGEs in the NonFL-GE group were MAGS 3 vs 0% in FL-GE. Because of some differences in sex and inflammatory complications between groups, a propensity score analysis was performed, creating 57 matched patients in the FL-GE and NonFL-GE groups. The incidence of DGE remained significantly different in the groups (5% in FL-GE vs 18% in NonFL-GE; $p = 0.039$).

CONCLUSIONS: In this cohort study, the flange technique was associated with a marked reduction in the incidence of DGE after PD. (J Am Coll Surg 2017;225:498−507. © 2017 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

Delayed gastric emptying (DGE) is seen in 20% to 40% of patients after pancreaticoduodenectomy (PD) and significantly affects quality of life in the immediate postoperative period.[1,2] Delayed gastric emptying not only contributes to patient discomfort, prolonged length of hospital stay, malnutrition, and increased readmission rates,[3,4] but can also predispose to pneumonia from aspiration, which has been shown to increase the risk of postoperative death.[5] The exact etiology of DGE after PD is unclear, and proposed risk factors have included underlying diabetes mellitus and malnutrition, disruption of the peri-gastric vagal nerves, antro-duodenal ischemia, decreased plasma concentration of motilin, gastric dysrhythmia from peripancreatic inflammation, aggressive lymphadenectomy, and pancreatic fibrosis.[3-9] Studies have also examined the techniques of surgical resection (pylorus preserving vs standard PD with antrectomy) and reconstruction (ante-colic vs retro-colic and

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Abbreviations and Acronyms

ASA = American Society of Anesthesiologists
DGE = delayed gastric emptying
FL-GE = standard pancreaticoduodenectomy with flange gastroenterostomy
ISGPS = International Study Group of Pancreatic Surgery
MAGS = Modified Accordion Grading System
NonFL-GE = standard pancreaticoduodenectomy with nonflange gastroenterostomy
OSI = organ space infection
PD = pancreaticoduodenectomy
POPF = postoperative pancreatic fistula
SPD = standard pancreaticoduodenectomy

isoperistaltic vs retroperistaltic), without convincing evidence that one technique is superior to the other in preventing DGE.[3,4,10,11] However, there are data suggesting that inflammation in the postoperative period from pancreatitis, postoperative pancreatic fistula (POPF), or organ space infection (OSI) can contribute to DGE by promoting anastomotic edema and gastric atony.[6-9]

Several years ago we presented a new technique of gastroenterostomy for the Whipple procedure. Its aim was to reduce DGE, and preliminary results suggested that it might be effective.[12] The technique has been named flange gastroenterostomy (FL-GE). This study is a review of our experience with flange gastroenterostomy and its impact on postoperative DGE incidence and severity.

METHODS

Study design

All patients having pancreaticoduodenectomy on our hepato-pancreatico-biliary (HPB) service are reviewed weekly at a conference to determine complications and their grades according to the Modified Accordion Grading System (MAGS).[13-15] These are entered into a prospectively maintained database. For this study, data were extracted from this database for a 3-year period (2013 through 2015). During this period, 262 consecutive patients underwent pancreaticoduodenectomy (PD) for benign and malignant conditions, and 47 of the 262 patients (18%) had pylorus-sparing PD. The remaining 215 patients had standard PD with antrectomy. The latter were divided into 2 groups based on the technique used for gastroenterostomy: 68 (32%) had standard PD with gastroenterostomy performed using the flange technique (FL-GE), while 147 (68%) had gastroenterostomy performed by other hand-sewn techniques according to surgeon preference. These are termed "non-flange gastroenterostomies" (NonFL-GE) (Fig. 1). One surgeon did all operations in the FL-GE group; 4 surgeons performed PDs in the NonFL-GE group. All 5 surgeons were hepato-pancreatico-biliary surgeons highly experienced in PD. Outcomes were compared between the 2 groups. Approval for the study was obtained from the Washington University IRB.

The primary outcome of interest was incidence and severity of DGE after standard pancreaticoduodenectomy (SPD). Preoperative data included patient age, sex, ethnicity, BMI, American Society of Anesthesiologists (ASA) grade, medical comorbidities (including history of diabetes), preoperative serum albumin and total bilirubin levels, preoperative biliary drainage, and neoadjuvant chemotherapy. Operative data included estimated intraoperative blood loss and blood transfusion need for concomitant vascular resection or reconstruction, and type of gastroenterostomy. Postoperative variables studied included incidence and severity of DGE, postoperative pancreatic fistula (POPF), OSI, other complications, length of hospital stay, pathologic analysis, 30-day readmission rate, and 90-day mortality rate.

Delayed gastric emptying was graded prospectively by the system of the International Study Group of Pancreatic Surgery (ISGPS)[2,16] and was also graded by the Modified Accordion Severity Grading System (MAGS) of surgical complications.[13-15] The MAGS was used because it indicates the invasiveness of interventions used to treat DGE and allows comparison between the severity of DGE and other complications of PD, all of which can be graded by MAGS.

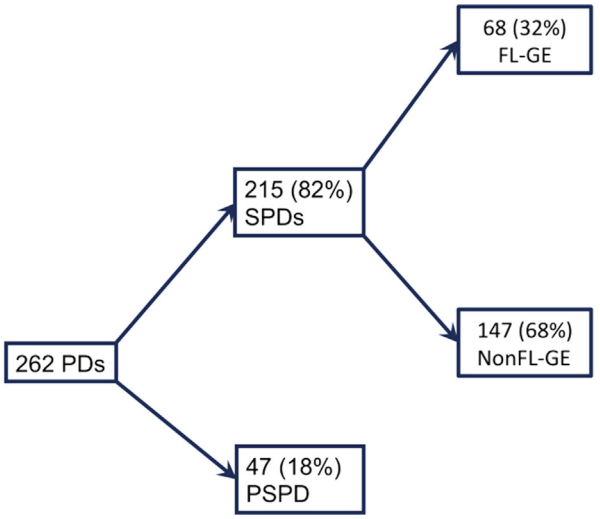

Figure 1. Breakdown of PDs performed during the study period. FL-GE, flange gastroenterostomy; NonFL-GE, nonflange gastroenterostomy; PD, pancreaticoduodenectomy; PSPD, pylorus-sparing pancreaticoduodenectomy; SPD, standard pancreaticoduodenectomy.