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Feeding jejunostomy during Whipple is associated with increased morbidity

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ABSTRACT

Background: Placement of a feeding jejunostomy tube (FJ) is often performed during pancreaticoduodenectomy (PD). Few studies, however, have sought to determine whether such placement affects postoperative outcomes after PD.

Materials and methods: This is a retrospective analysis of the National Surgical Quality Improvement Program (NSQIP) database to determine the 30-d-postoperative mortality rate, major complication rate, and overall complication rate of jejunostomy tube placement at the time of PD. Univariate and multivariate comparison of postoperative outcomes between patients with and without FJ placement during PD was performed on a total of 4930 patients.

Results: Thirty-day-postoperative mortality did not differ between the two groups (4.0% for patients with FJ *versus* 2.7% without, $P = 0.13$), whereas overall morbidity (43.3% with FJ *versus* 34.6% without, $P < 0.0001$) and serious morbidity (29.5% with FJ *versus* 22.8% without, $P < 0.0001$) were significantly higher in patients undergoing FJ placement during PD. The specific complications that occurred more frequently in FJ patients than patients without FJ included deep space surgical site infection, pneumonia, unplanned reintubation, acute renal failure, and sepsis.

Conclusion: Although FJ placement during PD is considered to be routine at many institutions, our analysis of data from NSQIP suggest that FJ placement may be associated with increased postoperative morbidity.

1. Introduction

Although enteral nutrition is strongly preferred to parenteral nutrition in the early postoperative period after pancreaticoduodenectomy (PD), or Whipple procedure, a subset of patients will develop complications such as delayed gastric emptying or pancreatic fistula that preclude or limit their ability to achieve adequate caloric intake orally [1–4]. Because these complications cannot be predicted *a priori*, some surgeons will routinely place feeding jejunostomy (FJ) catheters in all of their PD patients in an effort to ensure that those patients who do go on to develop delayed gastric emptying or pancreatic fistula will still have a route available for enteral nutrition [5]. Given the known constellation of complications that can occur with FJ catheter placement and use, however, it is not clear whether the inclusion of this adjunctive procedure impacts the incidence of early postoperative morbidity associated with PD [6,7]. The objective of our analysis was to compare the early postoperative outcomes of patients undergoing PD with and without concurrent FJ tube placement.

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2. Materials and methods

The American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) participant user files for 2005 through 2009 were used for this retrospective analysis. All patients with a primary Current Procedure Terminology code for PD (48150, 48152, 48153, 48154) and postoperative International Classification of Diseases, Ninth Revision diagnosis codes for non-endocrine malignant (152, 156.1, 156.2, 156.8, 156.9, 157, 157.1, 157.2, 157.3, 157.8, 157.9, or 197.4) or benign (211.2, 211.5, 211.6, or 230.8) neoplasm of the extrahepatic biliary tree, duodenum, ampulla of Vater, or non-islet pancreas were included for potential analysis. Patients were excluded if their procedure was designated as an emergency, or if they underwent a concomitant resection procedure at the time of PD (for example, colectomy, nephrectomy, hepatectomy other than wedge biopsy, or hysterectomy).

The primary outcome measures for our analysis were 30-d-postoperative mortality rate, major complication rate, and overall complication rate. Patients were considered to have sustained a major postoperative complication if they developed one or more of the following: organ/space surgical site infection, wound dehiscence, postoperative neurologic deficit (including stroke or coma greater than 24 h), cardiac arrest requiring cardiopulmonary resuscitation, myocardial infarction, bleeding requiring transfusion, pulmonary embolism, ventilator dependence for greater than 48 h, progressive renal insufficiency, acute renal failure, sepsis, or septic shock. Patients were considered to have sustained any complication if they developed one or more of the following: major complication (defined above), superficial surgical site infection, deep surgical site infection, pneumonia, unplanned intubation, peripheral nerve injury, graft/prosthesis failure, urinary tract infection, or deep venous thrombosis. Secondary outcome measures for our analysis included incidence of specific complications, reoperation rate, and postoperative length of hospital stay.

The primary predictor variable for our analysis was placement of an FJ tube during PD, as indicated by the inclusion of CPT codes 44300 or 44015. Other predictor variables included malignant *versus* benign tumor, patient age, sex, body mass index, American Society of Anesthesiologists (ASA) physical status classification of 3 or greater, diabetes mellitus requiring therapy with non-insulin agents or insulin, current smoker within 1 y of operation, greater than two drinks of ethanol per day in the 2 wk prior to admission, dyspnea upon moderate exertion or at rest, partially or totally dependent functional status prior to surgery, ascites, esophageal varices, congestive heart failure, chronic obstructive pulmonary disease, coronary artery disease (including history of myocardial infarction within the past 6 mo, prior percutaneous coronary intervention, prior cardiac surgery, and/or history of angina within 30 d prior to surgery), peripheral vascular disease (including history of revascularization or amputation for peripheral vascular disease and/or rest pain/gangrene), renal disease (including acute renal failure within 24 h prior to surgery and/or need for dialysis within 2 wk prior to surgery), neurologic disease (including impaired sensorium, coma, hemiplegia/hemiparesis, history of transient ischemic attacks, stroke with neurologic deficit, tumor involving central nervous system, paraplegia/paraparesis, and/or quadriplegia/quadriparesis), preoperative wound infection, disseminated cancer, steroid use within 30 d prior to surgery for a chronic medical condition, chemotherapy for malignancy within 30 d prior to surgery, radiotherapy for malignancy within 90 d prior to surgery, or preoperative systemic inflammatory release syndrome (SIRS), sepsis, or septic shock. Several intraoperative variables were included as potential predictors of outcomes because of their potential reflection of overall procedure complexity. These variables included need for intraoperative transfusion, operative time, and incisional wound classification.

Using the entire sample of NSQIP patients undergoing PD for neoplastic disease, analysis of the preoperative and intraoperative characteristics of patients undergoing PD with and without concomitant FJ tube placement was performed using Pearson χ^2 tests for categorical variables and Mann-Whitney rank sum tests for continuous variables. To account for the possibility that the decision to place an FJ tube was not random, one-to-one propensity matching techniques without replacement were used to create a cohort of PD patients with and without FJ tubes who were matched for known preoperative and intraoperative variables. Specifically, a nonparsimonious logistic regression model was created to estimate the likelihood of having an FJ tube placed intraoperatively. Both preoperative patient characteristics and intraoperative procedural characteristics were included as predictor variables in this model in order to adjust for patient condition and complexity of the index PD procedure. A propensity score for placement of an FJ tube ranging from 0 to 1 was then calculated for each patient using the logit coefficients for the predictors of FJ tube placement. These propensity scores were then used to create two groups of patients matched on their propensity for having an FJ tube placed, using a caliper matching algorithm with a caliper distance of 0.005 and with controls being used only once in the matching. Comparison of the preoperative and intraoperative characteristics of the matched cohort of patients was then performed using Wilcoxon signed rank tests for continuous variables and McNemar χ^2 tests for categorical variables. Primary and secondary outcome measures between the matched cohorts were compared in a similar manner. All statistical analyses were performed using Stata version 11.0 (StataCorp, College Station, TX).

3. Results

A total of 4930 patients meeting our inclusion and exclusion criteria were included for analysis: 633 (11.9%) who had an FJ tube placed during PD (FJ group) and 4297 (87.2%) who did not (No FJ group). As shown in Table 1, there were many significant differences between patients with and without FJ tubes when analyzing the entire NSQIP sample of PD patients. Patients in the FJ group were more likely to be nonwhite, more likely to have preoperative renal dysfunction, more likely to have a final diagnosis of a benign tumor, and more likely to require intraoperative transfusion. There was no significant difference