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ORIGINAL ARTICLE

Treatment of bacteriobilia decreases wound infection rates after pancreaticoduodenectomy

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Abstract

Background: Although mortality following pancreaticoduodenectomy is decreasing, postoperative morbidity remains high. It was hypothesized that culture-directed treatment of bacteriobilia would decrease the incidence of infectious complications following pancreaticoduodenectomy.

Methods: In a retrospective study of 197 pancreaticoduodenectomy patients, those in the control group (n = 128, 2005–2009) were given perioperative prophylactic antibiotics, whereas those in the treatment group (n = 69, 2009–2011) were continued on antibiotics until intraoperative bile culture results became available. Patients with bacteriobilia received 10 days of antibiotic treatment, which was otherwise discontinued in patients without bacteriobilia. Various complication rates were compared using Fisher's exact test for categorical variables, Wilcoxon rank sum test for ordinal variables, and a two-sample t-test for continuous variables.

Results: Demographics, comorbidities, baseline clinical characteristics, and intraoperative and postoperative variables were similar between the two groups. There were higher incidences of elevated creatinine (19% versus 4%; P = 0.004) and preoperative hyperglycaemia (18% versus 7%; P = 0.053) in the control group. Fewer patients in the control group underwent preoperative biliary stenting (48% versus 67%; P = 0.017) and intraperitoneal drains were placed at the time of resection more frequently in the control group (85% versus 38%; P < 0.001). Bacteriobilia was found in 59% of patients. Treatment of bacteriobilia was associated with a decrease in the rate of postoperative wound infections (12% in the control group versus 3% in the treatment group; P = 0.036) and overall complication severity score (1 in the control group versus 0 in the treatment group; P = 0.027).

Conclusions: Prolonged antibiotic therapy for bacteriobilia may decrease postoperative wound infection rates after pancreaticoduodenectomy. A randomized prospective trial is warranted to provide evidence to further support this practice.

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Introduction

In recent decades, modifications in operative technique and perioperative management have decreased the mortality associated with pancreaticoduodenectomy from the 30% reported in the 1940s to current rates of <3% at most high-volume centres. Despite improvements in mortality, rates of postoperative complications remain high.[1] The most common complications following pancreaticoduodenectomy include pancreatic fistula, delayed gastric emptying, wound infection and intra-abdominal abscess. Infectious complications result in longer hospital stays, higher costs, additional invasive procedures and increased patient morbidity. The implementation of measures to reduce infectious complications after pancreaticoduodenectomy would significantly advance the field of pancreatic surgery.

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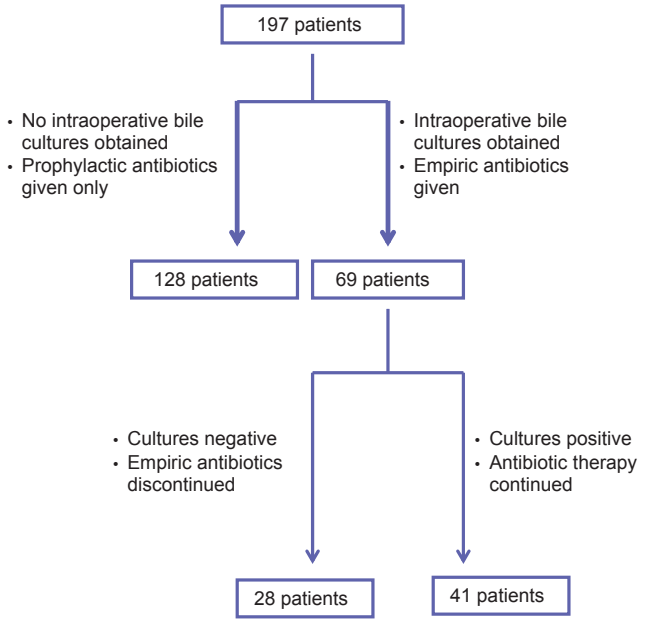

Figure 1 Study design

Preoperative biliary stenting has been associated with an increased risk for various postoperative complications, including wound infections and intra-abdominal abscesses.[2–4] It has been hypothesized that bacteriobilia associated with biliary stenting is responsible for the increase in infectious complications.[3–5] However, many patients undergo biliary stenting prior to being referred to the pancreatic surgeon. Furthermore, bacteriobilia can occur without biliary stenting, particularly after instrumentation of the bile duct.

Culturing the bile at the time of surgery can diagnose bacteriobilia, determine which organisms are present, and identify antibiotic sensitivities. In the present study, it was hypothesized that treatment of positive intraoperative bile cultures would reduce infectious complications following pancreaticoduodenectomy.

Materials and methods

This study was approved by the institutional review board (IRB) of Baylor College of Medicine and its affiliated hospitals. Subsequently, a retrospective cohort study was performed with 197 consecutive patients who underwent pancreaticoduodenectomy carried out by a single surgeon between the years 2005 and 2011 (Fig. 1). The control group (n = 128) comprised patients who underwent pancreaticoduodenectomy during 2005–2009. All of these patients received a single prophylactic dose of preoperative antibiotic (carbapenem 1 g) and one postoperative dose on the first postoperative morning. Patients who were penicillin-allergic were given ciprofloxacin 500 mg and metronidazole 500 mg. No intraoperative bile cultures were obtained as this practice was not performed routinely during pancreatic resections between 2005 and 2009. Beginning in 2009, intraoperative bile cultures were obtained and infections were treated with culture-directed antibiotics. The treatment group (n = 69) therefore consisted of patients who underwent pancreaticoduodenectomy from 2009 to 2011. This group received prophylactic doses of preoperative antibiotics and were continued on antibiotic therapy until intraoperative bile culture results were available. Patients with bacteriobilia received postoperative antibiotics for a total of 10 days. A 10-day regimen was pursued because culture data results are not normally available for 3 days. Therefore, treatment was empiric initially, but tailored when culture data became available. If treatment was modified, patients received appropriate antibiotic therapy for at least 7 days. In patients with negative bile cultures, antibiotics were promptly discontinued. Intravenous antibiotics were used in the immediate postoperative period and oral antibiotics were continued at the time of discharge. Patients with fungi cultured from the bile were treated with fluconazole for 10 days.

Outcomes were recorded in a prospectively maintained database and data compared with Fisher's exact test for categorical variables, the Wilcoxon rank sum test for ordinal variables, and a two-sample t-test for continuous variables. A trained data analyst entered data into an IRB-approved prospective database under the supervision of the surgeon. All data were confirmed by source documents and the accuracy of data entered into the electronic database was periodically reviewed.

Demographic information including patient age and gender were obtained from the medical record. A stated medical history of, or presence in the medical record of a history of diabetes mellitus, chronic obstructive pulmonary disease, obesity, smoking, preoperative neoadjuvant chemotherapy or radiation, and preoperative laboratory values including haematocrit, serum creatinine and albumin were recorded. Obesity was defined as a body mass index (BMI) of ≥30 kg/m^2. Tobacco status was recorded according to whether the patient had never been, ever been or was currently a smoker. Preoperative anaemia was defined by a haematocrit value of <36%. Renal insufficiency was defined as preoperative serum creatinine of ≥1.2 mg/dl. Hypoalbuminaemia was defined as serum albumin of <3.2 mg/dl. The American Society of Anesthesiologists (ASA) class was obtained from the anaesthesia record. The presence of preoperative biliary stenting was also recorded.

Intraoperative characteristics recorded from the anaesthesia record included administration of preoperative antibiotic within 1 h of incision, intraoperative blood transfusions and operative time, defined as the time from incision to the application of the final wound dressing. Intraoperative hypothermia was defined as a single temperature recording of <36.5 °C. Intraoperative hyperglycaemia was defined as a single blood glucose reading of ≥200 mg/dl. Intraoperative estimated blood loss (EBL) was also obtained from the anaesthesia record, not from the surgeon's operative report. The presence or absence of vein resection and drain insertion were obtained from the surgeon's operative