

## Factors Influencing Readmission After Pancreaticoduodenectomy: Is there a List of Bad and Very Bad?

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Pancreaticoduodenectomy is the most common operation performed for cancer of the head of the pancreas, periampullary tumors, benign neoplasms and other non-neoplastic conditions such as chronic pancreatitis. Morbidity, mortality, and length of hospital stay after pancreaticoduodenectomy have significantly decreased over recent decades. Despite this progress, early readmission rates after pancreaticoduodenectomy have been reported as high as 50%. Clinical-pathological factors associated with readmission after pancreaticoduodenectomy have been poorly investigated with few studies available on this topic. Recently, a well-powered multicentre study coordinated by the Department of Surgery, University of Cincinnati College of Medicine, Cincinnati, OH, USA, was published with the aim to better understand factors influencing readmission after pancreaticoduodenectomy [1]. The study was retrospective with the medical records of 6 high-volume institutions reviewed for patients who underwent pancreaticoduodenectomy between 2005 and 2010. Data collection included patient characteristics, medical comorbidities, and perioperative factors. Analysis included readmissions up to 90 days after pancreaticoduodenectomy. A total of 1,302 patients underwent pancreaticoduodenectomy across all institutions. The 30-day and 90-day readmission rates were 15% and 19%, respectively. The most common reasons for 30-day readmission included infectious complications (n=65) and delayed gastric emptying (n=29). The most common reasons for readmission after 90 days

included wound infections and intra-abdominal abscess (n=75) and failure to thrive (n=38). On multivariate analysis, factors associated with higher readmission rates included a preoperative diagnosis of chronic pancreatitis, higher transfusion requirements, and postoperative complications including intra-abdominal abscess and pancreatic fistula (all  $P < 0.02$ ). Factors not associated with higher readmission rates included advanced age, body mass index, cardiovascular/pulmonary comorbidities, diabetes, steroid use, Whipple type (standard vs. pylorus preserving pancreaticoduodenectomy), preoperative endobiliary stenting, and vascular reconstruction. These multi-institutional data represent a large experience of pancreaticoduodenectomy without the biases typically of single center studies. Factors related to infection, nutritional status, and delayed gastric emptying were the most common reasons for readmission after pancreaticoduodenectomy. Postoperative complications including pancreatic fistula predicted higher rates of readmission. These data are quite similar to that reported by a previous study utilizing a population-based data set of the California Cancer Registry on readmission data following pancreaticoduodenectomy [2]. In this survey, all patients with pancreatic adenocarcinoma who had undergone pancreaticoduodenectomy, excluding perioperative (30-day) mortality, were identified. All hospital readmissions within 1 year following pancreaticoduodenectomy were analyzed with respect to timing, location, and reason for readmission. The whole cohort included 2,023 patients who underwent pancreaticoduodenectomy for pancreas cancer. Fifty-nine percent were readmitted within 1 year following pancreaticoduodenectomy and 47% were readmitted to a secondary hospital. Readmission was associated with worse median survival compared with those not readmitted (10.5 versus 22 months,  $P < 0.0001$ ). Multivariate analysis revealed that increasing T-stage, age, and comorbidities were associated with increased likelihood of readmission. Diagnoses associated with high rates of readmission comprised progression of

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disease (24%), surgery-related complications (14%), and infection (13%). Diabetes (1.4%) and pain (1.5%) were associated with low rates of readmission. One recent report from China [3] examined 436 patients, who had undergone pancreaticoduodenectomy for malignant diseases in a 10-year period, excluding perioperative (30-day) mortality. All readmissions within one year following pancreaticoduodenectomy were analyzed with respect to timing, location, reasons for readmission and outcome in comparison to patients that did not require readmission. Results showed that 145 patients (33%) were readmitted within 1 year following pancreaticoduodenectomy, for further treatment or complications. In those cases, diagnoses associated with high rates of readmission included radiation and/or chemotherapy (49%), progression of disease (12%), infection (12%), gastrointestinal dysfunction/obstruction (6.2%), surgery-related complications (2.8%) and pain (4.1%). Interestingly, the number of readmission for complications reduced gradually in the first three months, and reached a second peak in the sixth and seventh month.

Summarizing, many factors influence readmission rate after pancreaticoduodenectomy; within the list of the “very bad” factors, some of these cannot be modified or are a preventable consequences of the surgical act while others, such as infections and a poor nutritional status, may be positively influenced by medical intensive interventions.

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