



Editorial: pancreatic resection in the era of laparoscopy: state of art—a systematic review

Daniel Skubleny^{1*}, Shahzeer Karmali^{1,2}

¹Department of Surgery, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Canada; ²Centre for the Advancement of Minimally Invasive Surgery (CAMIS), Royal Alexandra Hospital, Edmonton, Canada

Correspondence to: Dr. Daniel Skubleny. Department of Surgery, Faculty of Medicine and Dentistry, 2D, Walter C Mackenzie Health Sciences Centre, 840-112 Street, University of Alberta, Edmonton T6G 2B7, Canada. Email: skubleny@ualberta.ca.

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Dear Editor,

We appreciate the invitation to comment on the article “*Pancreatic Resection in the era of laparoscopy: State of Art. A systematic review*” published in the *International Journal of Surgery* (1). In this systematic review, pancreaticoduodenectomy, distal pancreatectomy, atypical pancreatic resection and pancreatic enucleation are investigated to determine the utility of laparoscopic surgery for pancreatic disease. The authors conclude that pancreatic surgery, regardless if it is performed open or laparoscopic, should only be undertaken in specialized centres. Furthermore, they argue that high quality comparison data is lacking despite some evidence demonstrating the feasibility and safety of laparoscopic pancreatic surgery.

Laparoscopic pancreatic resection was first performed in 1994 (2). Over the following two decades the application of laparoscopic surgery for the pancreas has increased, especially in regard to distal pancreatectomy (3). Yet it required over two decades of practice until the first randomized control trial comparing laparoscopic to open pancreaticoduodenectomy was published (4). Over this time minimally invasive surgery has been established as equivalent for oncologic outcomes with reduced incidence of wound complications and shorter hospital stay in a number of other gastrointestinal malignancies (5).

The pancreas presents a unique challenge to the surgeon technically and anatomically (6). Laparoscopic pancreatic surgery was first suggested to be an option in non-obese individuals with benign pancreatic head disease (2). Since

then numerous studies have demonstrated the efficacy of laparoscopy for malignant pancreatic disease and disease of the body and tail of the pancreas. The efficacy of laparoscopic pancreatic surgery is variable depending on the underlying disease, anatomic location of the lesion and the concordant indicated surgery.

Currently the most convincing data is in favor of laparoscopic distal pancreatectomy for both benign and malignant disease. Laparoscopic distal pancreatectomy has been shown to have similar margin positivity to the open technique with less post-operative morbidity (7). In addition to advantages of shorter hospital stay and decreased postoperative pain, laparoscopic distal pancreatectomy may also cost less (8). Systematic review and meta-analyses from 2014 and 2016 comprised of retrospective, comparative cohort and registry studies suggested laparoscopic pancreaticoduodenectomy to be feasible with no difference in mortality despite significantly longer operative times (9,10). Similar results, including less intraoperative blood loss and decreased hospital length of stay were demonstrated by a randomized control trial in which 64 patients were randomized to either open or laparoscopic pancreaticoduodenectomy for periampullary tumors (4). Staging laparoscopy is an additional laparoscopic application to pancreatic disease that has been shown to reduce hospitalization, reduce time to chemotherapy and improve overall patient survival (11,12).

Despite these favorable results, the widespread adoption of laparoscopic pancreatic surgery has been questioned.

Significant bias exists within studies as laparoscopic surgery favors less obese patients and smaller tumor size (9,10). An observational study by Adam *et al.* comprised of 7,061 patients from the National Cancer Database found an increased 30-day mortality for minimally invasive pancreaticoduodenectomy (5). Although this study has been criticized for the lack of available data regarding standard postoperative complications and the cause of mortality, the study presents a valid argument that training guidelines and competency targets should be established for this complex procedure. Dokmak *et al.* also demonstrated that laparoscopic pancreaticoduodenectomy was associated with higher morbidity mainly due to complications related to postoperative pancreatic fistula (13). Interestingly, a subgroup analysis for pancreatic adenocarcinoma found no differences in mortality or complications with similar oncologic outcomes. Thus, patient selection may be influenced by the perceived risk of postoperative pancreatic fistula as opposed to oncologic limitations.

It is prudent to approach pancreatic surgery and disease as heterogeneous. It is possible that certain applications of laparoscopy for pancreatic disease will become more mainstream, whereas others will struggle to find enough convincing evidence when rigorously examined. An analogous situation may be that of colorectal cancer where multiple anatomical considerations exist depending on the location of the lesion. Laparoscopic colon resections have been found to be efficacious in the treatment of disease with no difference in oncologic outcome whereas the more difficult total mesorectal excision of rectal cancer has been questioned due to oncologic safety issues (14).

We must also realize that the slow advancement in treatment of pancreatic disease, and in particular malignant disease, is not restricted to surgery. The complex nature and the mortality of pancreatic malignancy limits our ability to adequately study the disease due to the lack of quality and long term clinical and pathologic data (15). Similarly, surgery for pancreatic disease is high stakes and difficult even in the case of benign disease. The authors then adequately make the assessment that additional evidence for laparoscopic pancreatic surgery is required but may not improve.

After two decades of laparoscopic pancreatic surgery questions still remain regarding the future utility of minimally invasive techniques for pancreatic disease. The quality and quantity of evidence has only just recently began to increase with the publication of the first randomized control trial in 2017. Given the well-documented learning

curve associated with minimally invasive pancreatic surgery and decreased mortality in higher-volume centers, the future of laparoscopic pancreatic surgery is dependent on pioneering surgeons practicing in specialized centers to pass on their techniques and pitfalls to future surgical trainees (6,9). Widespread application of laparoscopy for pancreatic surgery will not occur until additional evidence and skill dissemination is acquired.

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