



# Laparoscopic versus open distal pancreatectomy—it's time to shift our focus and randomize our studies

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As minimally invasive surgery techniques continue to evolve and are increasingly employed in hepatobiliary and pancreatic surgery, ensuring the non-inferiority of these techniques as compared to the gold-standard of open surgery is paramount. Both perioperative and long-term outcomes, including oncologic outcomes, require consideration. In their paper, *Laparoscopic Versus Open Distal Pancreatectomy: Comparative Analysis of Clinical Outcomes at a Single Institution*, Jarufe *et al.* compare 36 patients who underwent open distal pancreatectomy to 57 who underwent laparoscopic distal pancreatectomy between 2001 and 2005 at a single institution.

Distal pancreatectomy was initially described in the 1990's as a safe procedure with applications in both benign and malignant pancreatic diseases (1,2). In the late 1990's and early 2000's, the technique of splenic preservation was additionally described as being associated with a reduction in postoperative complications (3,4). Laparoscopic distal pancreatectomy was first described in 1994 and was increasingly performed, initially with hand-assistance and both with and without splenic preservation, over the next decade (5-8). Indications for a laparoscopic approach continued to expand to increasingly complex patients with larger and more proximal tumors, without compromises in oncologic outcomes (9,10). It is now largely accepted that laparoscopic distal pancreatectomy can be considered the standard of care (10,11).

In their study, Jarufe *et al.* compared short-term, perioperative outcomes, as well as overall 1 and 5-year survival for a cohort of 93 consecutive patients undergoing

distal pancreatectomy, 57 laparoscopically and 36 open. The authors note that laparoscopic distal pancreatectomies at their institution have increased since 2008, however, the cohort is not subdivided based on any timeline and the issue of a learning curve for this operation is not addressed. In defining their technique for laparoscopic distal pancreatectomy, they describe transecting the pancreatic parenchyma with either a harmonic scalpel or a 60 mm stapler, and then oversewing the pancreatic stump using silk or polypropylene in both cases. This is somewhat unusual as the technique is generally described as either stapled or hand-sewn, as in the multicenter randomized DISPACT trial, rather than both (12).

The histologies included in this cohort are summarized in Table 4 and are heterogeneous. Only 20 patients of the 93 had adenocarcinoma, and another 18 are classified as having other pathologies which are not specified. An additional 10 patients underwent resection for serous cystadenoma. The only other preoperative characteristics described are age, gender and American Society of Anesthesiologists (ASA) class, all of which are statistically similar between the open and laparoscopic cohorts. Three patients required conversion from laparoscopic to open approach and the noted reason is dense abdominal adhesions.

Statistical differences in perioperative outcomes included significantly shorter hospital stay, lower estimated blood loss and higher rates of splenic preservation in the laparoscopic group. Interestingly, two of the nine patients in the laparoscopic group with adenocarcinoma had splenic preservation performed, as opposed to none of the 11

adenocarcinoma patients in the open group.

Postoperative complications are notable for reoperation in four of the 57 patients in the laparoscopic group, three cases for intra-abdominal abscess and one for peritonitis secondary to a pancreatic fistula. Two of the 36 patients in the open group had operative mortality secondary to intra-abdominal sepsis secondary to a grade C pancreatic fistula.

The overall 1 and 5-year survivals are reported for patients with and without adenocarcinoma in the operative biopsy, and as expected survival is disparate with statistically worse survival in the adenocarcinoma patients in the entire cohort as well as in both the laparoscopic and open groups individually. It is unclear what is meant by operative biopsy, however, and whether this refers to the surgical pathology or to preoperative biopsies. The details of the patients' preoperative workup, including the use of cross-sectional imaging, endoscopic ultrasound, and preoperative biopsy, are not described.

In recent years, studies comparing open and distal pancreatectomy, including multicenter reports, systemic reviews and meta-analyses, have been undertaken. Multicenter studies have demonstrated largely comparable outcomes of laparoscopic and open distal pancreatectomy, with improved outcomes in some areas, including lower blood loss, faster return to diet and shorter hospital stay, with a laparoscopic approach (13-16). A nationwide study was carried out in the Netherlands that included 633 patients at 17 centers over a 14-year period. Laparoscopic and open distal resections were compared with propensity matching, and the study demonstrated that outcomes after laparoscopic procedures were not inferior (17).

Systemic reviews and meta-analyses have echoed the same findings whilst emphasizing the need for randomized trials (18,19). In 2015, Mehrabi *et al.* included 29 observational studies encompassing 3,701 patients in a meta-analysis that showed the superiority of laparoscopic distal pancreatectomy in regard to blood loss, time to first oral intake and hospital stay, and equivalency of all other outcomes (20). They concluded that laparoscopic distal pancreatectomy was a safe and effective alternative to an open approach, and that no further nonrandomized trial were needed to address this topic, instead calling for a large, randomized trial as the next step. Other authors have called for an international consensus on laparoscopic pancreatic surgery (21).

Additional studies have focused on case selection and risk factors in comparing minimally invasive and open approaches to distal pancreatectomy. A recent report by

Klompmaaker *et al.* used the American College of Surgeons' National Quality Improvement Program (ACS-NSQIP) and found that factors such as benign disease, tumor size and body mass index (BMI) influenced the selection of an open versus a minimally invasive approach. This study also demonstrated that these criteria did not impact the risk of major morbidity following surgery, and the authors concluded that they should not be used as a reason to avoid a minimally invasive operation (22). Another NSQIP study by Nassour *et al.* identified risk factors for conversion from minimally invasive to open distal pancreatectomy, such as chronic pancreatitis, large malignant tumors, high BMI, current smoking and low serum albumin. This study also reported lower conversion rates with a robotic approach as compared to a laparoscopic approach (23). A recent multicenter French study by Souche *et al.* examined the effects of laparoscopic distal pancreatectomy in patients older than 70 years, with a reported significant decrease in postoperative confusion and length-of-stay following laparoscopic surgery (24).

New ways of improving the operative approach to laparoscopic distal pancreatectomy as well as the subsequent recovery are being explored and reported. The modified lasso technique by Kawasaki *et al.* in 2017, describes simultaneous division of the splenic artery and vein and the pancreatic parenchyma with a reported decrease in operative time and blood loss (25). Novel ways of closing the pancreatic remnant after distal pancreatectomy, including coverage with a teres ligament patch and the use of a bovine serum albumin-glutaraldehyde sealed hand sutured fish-mouth closure technique, continue to be studied (26-28). Enhanced recovery pathways including measures such as fluid restriction and warming have been shown to be associated with quicker return of gastrointestinal function and shorter hospital stays following distal pancreatectomy (29). Other studies have focused on identifying risk factors for readmission and interventions to prevent this following pancreatic resection (30).

In summary, given the extensive body of literature summarized herein, laparoscopic distal pancreatectomy should be considered a standard of care approach to distal pancreatectomy. Further proof of concept studies are no longer needed. There are many questions and areas of study that remain regarding minimally invasive approaches to distal pancreatectomy, such as clarifying the role of robotic-assisted surgery, understanding the impact of minimally invasive surgical approaches on long-term oncologic outcomes, improving the criteria for patient selection for

different approaches, and innovating new ways to reduce postoperative morbidity.

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