



## The Utility of the Robot in Pancreatic Resections

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### Keywords

- Robotic surgery • Minimally invasive surgery • Pancreatic cancer
- Pancreatic surgery

### Key points

- Minimally invasive distal pancreatectomy appears to be superior to the open approach.
- Compared with laparoscopic distal pancreatic resections, robotics may reduce conversions and blood loss, and offer better adherence to oncologic principles.
- Few direct comparisons have examined minimally invasive pancreaticoduodenectomy and open approaches.
- The robotic platform appears to be better suited for the complex challenges of the pancreaticoduodenectomy.
- Early data indicate 3 major advantages: reduced blood loss, decrease in conversion to laparotomy, and more widespread adoption by hepato-pancreato-biliary surgeons.

### INTRODUCTION

An established body of literature now supports the safety and feasibility of minimally invasive pancreas resections; more recent reports suggest an advantage over the traditional open approach. Fueled by these reports and the realization that the robotic platform's stereotactic imaging and enhanced instrument dexterity are superior to laparoscopy, data are now emerging suggesting an advantage to the use of robotics in minimally invasive pancreatic surgery. Several studies have now demonstrated that the robotic platform is superior to open and laparoscopic approaches for the distal pancreatectomy, including decreased conversion rates, decreased blood loss, and ability to perform a better oncologic

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resection. Similar advantages can be expected for the more complex pancreaticoduodenectomy as experience matures. In addition, it appears that the robotic platform is more versatile and easily mastered by new adopters of the technology. We review here data supporting the use of the robotic approach to complex pancreatic surgery and offer specific examples in which the robotic platform offers advantages over open and laparoscopic techniques.

## **DISTAL PANCREATECTOMY**

### **Outcomes**

The minimally invasive approach to the distal pancreatectomy is now considered by many to be the preferred method of resection for benign and malignant tumors of the distal pancreas [1]. Table 1 displays the major series of open (ODP), laparoscopic (LDP), and robotic distal pancreatectomy (RDP) published to date [2–13]. Collectively, these data support that LDP and RDP can be performed with superior results to the open approach in patients with benign and malignant disease. Specifically the minimally invasive approach results in shorter hospital stay (LOS), reduced blood loss (EBL), and decreased complication rates. Similar oncologic resections can be accomplished in terms of lymph node dissection and resection margins, although larger reports of long-term survival are still lacking.

An emerging literature suggests that the use of the robot for minimally invasive distal pancreatectomy may offer several advantages over laparoscopy. Table 2 summarizes the series that have directly compared RDP and LDP [9,11,12]. Based on these reports and the author's own experience, use of the robot appears to provide the following advantages.

### *Reduced conversion rate*

At the University of Pittsburgh, we compared our prospectively gathered data from the first 30 cases of RDP (performed between 2008 and 2011) with a historical control group of 94 laparoscopic cases (2004–2007, that is, before the robot became available, and well after the group had established maturity with LDP) [12]. Patients undergoing RDP and LDP demonstrated equivalent age, gender, ethnicity, ASA (American Society of Anesthesiologists) score, and tumor size. No conversions to open surgery occurred in the RDP group compared with 16% in the LDP group ( $P < .05$ ), even though more pancreatic ductal adenocarcinomas (PDA) were approached robotically than laparoscopically (43% vs 15%,  $P < .05$ ). We believe this observation is a true reflection of the platform's superiority for several reasons. First, the conversion rate in the laparoscopic cohort was not significantly higher than published literature. Second, we did not observe a trend toward decreased conversions in the latter portion of the LDP cohort, suggesting that we were well beyond the LDP learning curve. In addition, most of the conversions in the LDP were by our 3 high-volume surgeons. Last, a more recent updated series of more than 83 RDPs demonstrated a persistently low conversion rate of (2%) [8]. It is the authors' belief (as outlined in the section "Specific steps where the robot offers

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