Early National Experience with Laparoscopic Pancreaticoduodenectomy for Ductal Adenocarcinoma: A Comparison of Laparoscopic Pancreaticoduodenectomy and Open Pancreaticoduodenectomy from the National Cancer Data Base

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BACKGROUND: There is considerable debate about the safety and clinical equivalence of laparoscopic pancreaticoduodenectomy (LPD) and open pancreaticoduodenectomy (OPD) for pancreatic ductal adenocarcinoma (PDCA).

STUDY DESIGN: We queried the National Cancer Data Base to identify patients undergoing LPD and OPD for PDCA between 2010 and 2011. Chi-square and Student's *t*-tests were used to evaluate differences between the 2 approaches. Multivariable logistic regression modeling was performed to identify patient, tumor, or facility factors associated with perioperative mortality.

RESULTS: Four thousand and thirty-seven (91%) patients underwent OPD. Three hundred and eighty-four (9%) patients underwent LPD. There were no statistical differences between the 2 surgical cohorts with regard to age, race, Charlson score, tumor size, grade, stage, or treatment with neoadjuvant chemoradiotherapy. Laparoscopic pancreaticoduodenectomy demonstrated a shorter length of stay (10 ± 8 days vs 12 ± 9.7 days; $p < 0.0001$) and lower rates of unplanned readmission (5% vs 9%; $p = 0.027$) than OPD. In an unadjusted comparison, there was no difference in 30-day mortality between the LPD and OPD cohorts (5.2% vs 3.7%; $p = 0.163$). Multivariable logistic regression modeling predicting perioperative mortality controlling for age, Charlson score, tumor size, nodal positivity, stage, facility type, and pancreaticoduodenectomy volume identified age (odds ratio [OR] = 1.05; $p < 0.0001$), positive margins (OR = 1.45; $p = 0.030$), and LPD (OR = 1.89; $p = 0.009$) as associated with an increased probability of 30-day mortality; higher hospital volume was associated with a lower risk of 30-day mortality (OR = 0.98; $p < 0.0001$). In institutions that performed $\geq$10 LPDs, the 30-day mortality rate of the laparoscopic approach was equal to that for the open approach (0.0% vs 0.7%; $p = 1.00$).

CONCLUSIONS: Laparoscopic pancreaticoduodenectomy is equivalent to OPD in length of stay, margin-positive resection, lymph node count, and readmission rate. There is a higher 30-day mortality rate with LPD, but this appears driven by a surmountable learning curve for the procedure. (J Am Coll Surg 2015;221:175−184. © 2015 by the American College of Surgeons)

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Abbreviations and Acronyms

LOS = length of stay
LPD = laparoscopic pancreaticoduodenectomy
NCDB = National Cancer Data Base
OPD = open pancreaticoduodenectomy
PD = pancreaticoduodenectomy
PDCA = pancreatic ductal adenocarcinoma

Despite growing evidence demonstrating the benefits of the laparoscopic approach, laparoscopic distal pancreatectomy has only recently become widely used to treat benign conditions in the left pancreas, and is used only selectively as treatment for adenocarcinoma in the pancreatic tail.[1-5] Concern about the technical challenges likely to be encountered with laparoscopic pancreaticoduodenectomy (LPD) and legitimate questions about the ability of a minimally invasive approach to provide comparable oncologic resection for pancreatic head tumors have even more profoundly impaired the application of minimally invasive approaches to pathology in the pancreatic head in general, and to pancreatic head cancer in particular.

Very few centers have committed to supporting the development of minimally invasive pancreaticoduodenectomy (PD). The reported national experience with LPD to date consists primarily of case reports or small, single-institutional series with <25 evaluated procedures.[6-12] There have been very few reports examining outcomes of LPD specifically for ductal adenocarcinoma of the pancreatic head (PDCA) and similarly, even fewer studies comparing outcomes for LPD and open pancreaticoduodenectomy (OPD) for pancreatic head cancers.[13-15] As a result, substantial evidence supporting the oncologic equivalence of the laparoscopic approach to the established standard of OPD is lacking. In an effort to compare LPD for pancreatic adenocarcinoma to the gold standard of OPD with regard to early perioperative and early oncologic outcomes, we evaluated the population of PD from the National Cancer Data Base (NCDB) for the years after the NCDB began tracking surgical approach.

METHODS

Data source

The NCDB is a joint project of the Commission on Cancer of the American College of Surgeons and the American Cancer Society. The database is a nationwide, facility-based, comprehensive clinical surveillance resource oncology dataset; it captures information from approximately 1,500 Commission on Cancer accredited hospitals and >70% of all newly diagnosed malignancies in the United States. It contains specific details about patient demographics, facility type and location, tumor characteristics, treatment course, and outcomes. All data within the NCDB are deidentified of specific patient factors and are compliant with the Health Insurance Portability and Accountability Act.

Study population

The NCDB was queried to identify all patients 18 years and older diagnosed with pancreatic adenocarcinoma who underwent an LPD or OPD between January 2010 and December 2011. Our objective was to compare perioperative outcomes between patients who underwent total LPD with those who underwent OPD. One hundred and

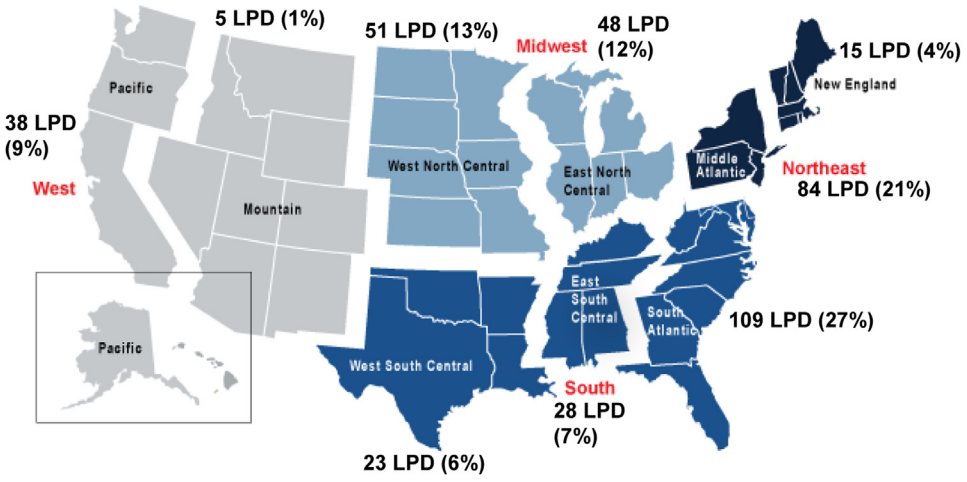

Figure 1. US Census 2010 regions and number of laparoscopic pancreaticoduodenectomies (LPDs) performed per region. Map showing US Census 2010 regions obtained from http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2011/crime-in-the-u.s.-2011/area-definitions.