

# The current status of laparoscopic pancreaticoduodenectomy for pancreatic cancer in China

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Pancreatic cancer is the fourth leading cause of cancer death worldwide and leads to an estimated 220 000 deaths per year <sup>[1]</sup>. The malignancy is difficult to detect and diagnose, as there are no noticeable signs or symptoms in the early stages of the disease, and the pancreas is located deep in the abdomen. Surgical resection is widely accepted as the only potentially curative therapy for pancreatic cancer. However, the prognosis and 5-year survival rate of patients with pancreatic cancer remain poor.

In recent years, the laparoscopic technique has been applied in many types of operations, and has been beneficial in the selected patients by resulting in reduced length of hospital stay and postoperative morbidity as well as enhanced recovery. Pancreaticoduodenectomy (PD), the main curative surgical procedure for pancreatic cancer, is considered one of the most complicated general surgeries owing to the extensive retroperitoneal

dissection and reconstruction of the alimentary tract. In 1994, laparoscopic PD (LPD) surgery was first reported by Gagner in a patient with pancreatitis <sup>[2]</sup>. However, it was still not universally applied because of the complexity of the procedure, the need for significant laparoscopic skills, or the high cost of the specialized surgical equipment.

As a new strategy, LPD for pancreatic surgery is still in its early stages, and there are few reports comparing the laparoscopic approach to conventional or open PD (OPD). In 2009, Cho *et al* reported a study comparing the LPD approach with OPD <sup>[3]</sup>. Their study recruited 30 patients, of which 15 underwent laparoscopic-assisted PD. They concluded that, compared with OPD, laparoscopic-assisted pylorus-preserving PD showed comparable blood loss, resumption of oral intake, duration of stay, and incidence of complications. The disadvantage of laparoscopic PD is that the operative time is longer than that for conventional surgery. However, as the first

retrospective analysis comparing the two approaches, the present study has significant limitations such as the small patient population and selection of surgical approaches in a nonrandomized manner. All patients in the open group had malignant tumors, while the laparoscopy-assisted group included patients with benign and low-grade malignant tumors. The unmatched histopathological results may lead to bias in the conclusions.

An increasing number of studies on LPD and OPD have been reported in the literature. However, these studies have the limitation of small patient populations.

In 2014, Croome *et al* reported their 5-year study results at the 134<sup>th</sup> American Society of Anesthesiologist (ASA) annual meeting [4]. Their 5-year study included 108 patients who underwent LPD at their institution. As a control group, they included 214 patients who underwent OPD. The results of this study suggested that outcomes using the laparoscopic approach are at least equivalent or better than those obtained using open approaches. Improved recovery in the laparoscopic group was suggested by the shorter hospital stay and reduced delay in initiating adjuvant treatments. The overall complication rate was not different between the two groups. Meanwhile, 75% of both the groups in their study received adjuvant treatment; however, a significantly smaller proportion of patients in the LPD group had a delay of greater than 56 days (8 weeks) between surgery and adjuvant chemotherapy compared with those in the OPD group (27% and 41%, respectively). Progression-free survival in patients with pancreatic cancer was better in the LPD group than in the OPD group.

LPD surgery started being used relatively late in China, since its introduction in 1994. The first report of LPD in China was by Lu *et al* in 2003 [5]. The operative time was 600 min and the patient developed an International Study Group on Pancreatic Fistula (ISGPF) level A pancreatic fistula. With conservative management, the patient was discharged 20 days after surgery. In the 4 months of follow-up, no evidence of recurrence was observed.

Soon after the first LPD surgery, an increasing number of institutions in China reported their experience with LPD surgery. However, in these studies, the patient numbers remain small and the quality of the study is low. Most are case reports and single-center experiences.

A meta-analysis comparing the current evidence on LPD versus OPD demonstrated that no differences were found in mortality or postoperative pancreatic fistula rates. However, LPD was associated with prolonged operative times, but lower intraoperative blood loss, less delayed gastric emptying, and shorter hospital stay. The results of the meta-analysis reflected the distinct advantages and disadvantages of LPD, including better

patient recovery and longer operative time.

The pancreas is a unique organ with a deep retroperitoneal anatomical position. It has a complex relationship with its surrounding tissues. The abundant blood supply of the pancreas, the diverse anatomical planes of the peritoneum, and the complexities of digestive tract reconstruction hindered the development of laparoscopic techniques in pancreatic surgery. Many current laparoscopic systems can magnify the view of the surgical field, enabling precise dissection and separation, especially when anatomizing the superior mesenteric vessels. Meanwhile, with magnified vision, it is possible for surgeons to identify micrometastases in concealed areas of the abdomen and to remove the lymph nodes more carefully.

Improvements in surgery should be aimed towards achieving precision and minimal invasiveness. The emergence and development of LPD represent the pursuit of an accurate and minimally invasive technique. Although LPD has been performed successfully in many centers, some limitations must be addressed. The high cost of the surgical instruments, a steep and long learning curve for mastering the technique, the inconvenience of the surgical field transition, and the lack of sensory feedback play a significant role in preventing LPD from becoming a standard treatment for pancreatic cancer. However, with the unremitting efforts of surgeons and further development of technologies, laparoscopic surgery will have increased applications for pancreatic diseases.

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DOI 10.1007/s10330-016-0199-9

Cite this article as: Zhang H, Qin RY. The current status of laparoscopic pancreaticoduodenectomy for pancreatic cancer in China. *Oncol Transl Med*, 2016, 2: –.