



# Evolution of minimally invasive pancreatic surgery in Thailand

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**Abstract:** The first minimally invasive pancreatic surgery was initiated 25 years ago. Currently, laparoscopic distal pancreatectomy is accepted as an alternative treatment to open surgery. However, there is still skepticism about the benefit of laparoscopic pancreaticoduodenectomy. Minimally invasive pancreatic surgery in Thailand is in the beginning. The author has successfully developed the new technique of laparoscopic pancreaticoduodenectomy which was performed in 35 patients at Rajavithi Hospital with satisfactory outcome. However, more effort is needed for further progression of minimally invasive pancreatic surgery in Thailand.

**Keywords:** Laparoscopic pancreatic surgery; minimally invasive pancreatic surgery; pancreatic resection; pancreatectomy; pancreaticoduodenectomy; Whipple operation

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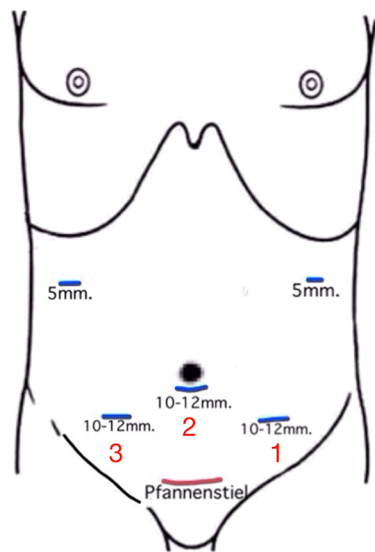
The first minimally invasive pancreatic surgery was performed by Gagner *et al.* in 1993 when laparoscopic distal pancreatectomy was successfully done (1). In 1994, Gagner and Pomp performed the first laparoscopic pancreaticoduodenectomy (2). However, minimally invasive pancreatic surgery was very slowly adopted in surgical community because of difficulty to access by laparoscope due to its retroperitoneal location. Moreover, its unproven benefit led to a high degree of scepticism regarding a major change in practice. Nevertheless, a group of surgeons continued to develop this minimally invasive pancreatic surgery. After Da Vinci robot was introduced, Melvin *et al.* reported the first robotic pancreatic surgery in 2003 (3). The cost of Da Vinci robotic system is a main obstacle to the widespread use of robotic surgery. On the contrary, laparoscopic pancreatic surgery has been accepted as an alternative treatment in many centers (4,5). When single incision laparoscopic surgery was successfully performed in many organs (6-10), this technique was also successfully attempted in pancreatic surgery (11,12). However, single incision laparoscopic is not popular among surgeons because of the highly technical demanding skill and questionable benefit to the patient (13,14).

To date, many studies have shown that the results of

laparoscopic distal pancreatectomy in benign and low grade malignant pancreatic disease are comparable to open distal pancreatectomy with possible better perioperative outcome. Therefore, they are accepted as an alternative to standard surgery in many centers (4,5). Currently, the surgical technique of laparoscopic distal pancreatectomy is settled.

Laparoscopic pancreaticoduodenectomy also has favorable results in comparison to open pancreaticoduodenectomy including oncologic outcome (15,16) and better survival in some reports (17). However, laparoscopic pancreaticoduodenectomy is not widely accepted as an alternative treatment, only few centers adopted this surgery for treatment of periampullary lesions due to the complexity of the operation and the questionable benefit to the patients.

Minimally invasive pancreatic surgery was first done in Thailand at King Chulalongkorn Memorial Hospital when Professor Patpong Navicharern successfully performed laparoscopic-assisted pancreaticoduodenectomy in 2008. One year later, he also successfully performed laparoscopic distal pancreatectomy. The first pure laparoscopic pancreaticoduodenectomy was successfully done by Dr. Araya Khaimook at Hatyai Hospital in 2009. Laparoscopic distal pancreatectomy has been developed as an alternative



**Figure 1** Port placement: camera port in SMA field [1], Central field [2], Right subhepatic field [3].

treatment in most of university hospitals and some tertiary hospitals in Thailand. However, this surgical technique has not gained popularity due to its high cost. In the meantime, laparoscopic pancreaticoduodenectomy was developed in only some centers because complexity of the operation and very steep learning curve. In 2009 when Da Vinci robot was available in Thailand, the first robotic pancreaticoduodenectomy was done at Siriraj Hospital by Professor Anusak Yiengpreuksawan, a visiting surgeon from The Valley Hospital in New Jersey, United States. In contrast to laparoscopic pancreatic surgery, robotic pancreatic surgery has not gained surgical ground due to its very high cost. During 2010–2014 laparoscopic pancreatic surgery slowly gained popularity among university hospitals and super-tertiary hospitals. The new technique of laparoscopic pancreaticoduodenectomy was pioneered in 2014 when the author introduced laparoscopic left posterior approach superior mesenteric artery (SMA) first pancreaticoduodenectomy, which was developed from original technique proposed by Kurosaki *et al.* (18) for open SMA first approach pancreaticoduodenectomy. Since then, laparoscopic pancreaticoduodenectomy with various techniques has been adopted in many centers and become an option for selected patients with periampullary carcinoma.

So far, minimally invasive pancreatic surgery has been done in at least eight medical centers in Thailand.

Approximately 180 Thai patients received these minimally invasive pancreatic surgeries including 50 cases of laparoscopic distal pancreatectomy, 60 cases of laparoscopic pancreaticoduodenectomy, 70 cases of laparoscopic assisted pancreaticoduodenectomy, a few cases of laparoscopic enucleation and robotic pancreatic surgery (unpublished data).

Rajavithi Hospital, the largest hospital in Ministry of Public Health, is one of the most active center in laparoscopic pancreatic surgery. As mentioned above, the laparoscopic left posterior approach SMA first pancreaticoduodenectomy was pioneered by the author at this hospital. In 2010, the first laparoscopic pancreatic surgery initiated at Rajavithi Hospital was laparoscopic distal pancreatectomy. Then, in 2013, the first laparoscopic assisted pancreaticoduodenectomy was done. Finally, total laparoscopic pancreaticoduodenectomy was successfully done by left posterior SMA first approach in 2014. So far, there are 60 cases of laparoscopic pancreatic surgery, including 35 cases of laparoscopic pancreaticoduodenectomy by our technique, 24 cases of laparoscopic distal pancreatectomy, and one case of laparoscopic enucleation. However, we do not have experience in laparoscopic middle pancreatectomy (unpublished data).

### Methods: surgical technique

The technique of laparoscopic left posterior approach SMA first pancreaticoduodenectomy, which is routinely used at Rajavithi Hospital, can be described as ‘3 fields of dissection and 2 fields of reconstruction’ using 5 ports (*Figure 1*). The dissection fields are SMA, central and right subhepatic field (*Figure 1*). The reconstruction is done in SMA and right subhepatic field. The surgery is commenced at SMA field by dissection into retroperitoneal space to expose aorta and inferior vena cava (IVC) and to identify SMA root. Then SMA is dissected from left posterior side to free it from uncinate process and surrounding tissue, then the inferior pancreaticoduodenectomy artery (IPDA) is identified and divided. At central field, the lesser sac is widely opened to expose anterior surface of pancreas with mobilization of hepatic flexure of colon, then gastroepiploic vessels and Henle’s trunk are identified and divided. Final stage of dissection is done in right subhepatic field by Kocherization of duodenum, transection of antrum, transection of pancreas and transection of biliary tract to complete the resection. After specimen is removed through Pfannenstiel incision, pancreaticojejunostomy is first done

**Table 1** Diagnosis and conversion of laparoscopic pancreaticoduodenectomy at Rajavithi Hospital

Diagnosis	Number	Conversion	%
Ampullary carcinoma	18	3*	16.7
Cystic tumor (IPMN, SPN, etc.)	5	0	0
Distal cholangiocarcinoma	4	0	0
Pancreatic head CA	3	0	0
Duodenal carcinoma	3	2	66.7
Chronic inflammation	2	2	100
Total	35	7	20

\*, abbreviation; CA, carcinoma; IPMN, intraductal papillary mucinous neoplasm; SPN, solid pseudopapillary neoplasm.

**Table 2** Major morbidity of laparoscopic pancreaticoduodenectomy at Rajavithi Hospital

Morbidity	Number	%
Pancreatic fistula	2	5.7
Biliary leakage	2	5.7
Post pancreatectomy hemorrhage	1	2.8
Pulmonary embolism	1	2.8
Total	6	17.1

follow by hepaticojejunostomy in right subhepatic field. Then the operation is completed with gastrojejunostomy in central field.

## Results

The results of 35 cases of laparoscopic left posterior approach SMA first pancreaticoduodenectomy at Rajavithi Hospital are as follows. There were eleven females and 24 males, the average age was 59.6 years. Average body mass index was  $22.33 \pm 3.05$  kg/m<sup>2</sup>. The most common diagnosis was ampullary carcinoma (*Table 1*). Major morbidity occurred in 6 cases (17.1%) (*Table 2*), mortality 2 cases (5.7%). One mortality occurred from cardiogenic cause and another case had leakage of biliary anastomosis which was complicated by fatal post pancreatectomy hemorrhage. Average operative time was  $599.52 \pm 119.85$  minutes. Average blood loss (including conversion cases) was  $1,512 \pm 1,214$  mL, while blood loss in successful laparoscopic left posterior approach SMA first pancreaticoduodenectomy

cases was  $776 \pm 399$  mL. The explanation for the difference in blood loss is almost all conversion cases (six of seven cases) had injury of branch of portal vein. The outcome was comparable to open technique in our center (unpublished data).

In conclusion, minimally invasive pancreatic surgery has been developed for more than two decades but it has been slowly accepted. Finally, laparoscopic distal pancreatectomy is accepted as an option for benign and low grade malignant tumor. However, laparoscopic pancreaticoduodenectomy is still in the developing process and is an option in only few centers. In Thailand, minimally invasive pancreatic surgery is in the beginning phase, only few hundred cases are treated with this technique. Nevertheless, Rajavithi Hospital is one of most active hospital in this minimally invasive pancreatic surgery, and the author has successfully developed technique of laparoscopic left posterior approach SMA first pancreaticoduodenectomy with comparable results to open technique. Laparoscopic distal pancreatectomy should be a standard treatment for all pancreatic body and tail lesions in the near future. However, for laparoscopic pancreaticoduodenectomy being accepted as a standard treatment, more studies will be needed to prove the benefit to the patients.

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## References

- Gagner M, Pomp A, Herrera MF. Early experience with laparoscopic resections of islet cell tumors. *Surgery* 1996;120:1051-4.
- Gagner M, Pomp A. Laparoscopic pylorus-preserving pancreaticoduodenectomy. *Surg Endosc* 1994;8:408-10.
- Melvin WS, Needleman BJ, Krause KR, et al. Robotic resection of pancreatic neuroendocrine tumor. *J Laparoendosc Adv Surg Tech A* 2003;13:33-6.
- Kim SC, Park KT, Hwang JW, et al. Comparative analysis of clinical outcomes for laparoscopic distal pancreatic resection and open distal pancreatic resection at a single institution. *Surg Endosc* 2008;22:2261-8.
- Nakamura M, Wakabayashi G, Miyasaka Y, et al. Multicenter comparative study of laparoscopic and open distal pancreatectomy using propensity score-matching. *J Hepatobiliary Pancreat Sci* 2015;22:731-6.
- Piskun G, Rajpal S. Transumbilical laparoscopic cholecystectomy utilizes no incisions outside the umbilicus. *J Laparoendosc Adv Surg Tech A* 1999;9:361-4.
- Remzi FH, Kirat HT, Kaouk JH, et al. Single-port laparoscopy in colorectal surgery. *Colorectal Dis* 2008;10:823-6.
- Reavis KM, Hinojosa MW, Smith BR, et al. Single-laparoscopic incision transabdominal surgery sleeve gastrectomy. *Obes Surg* 2008;18:1492-4.
- Ponsky LE, Cherullo EE, Sawyer M, et al. Single access site laparoscopic radical nephrectomy: Initial clinical experience. *J Endourol* 2008;22:663-6.
- Misawa T, Sakamoto T, Ito R, et al. Single-incision laparo-scopic splenectomy using the “tug-exposure technique” in adults: Results of ten initial cases. *Surg Endosc* 2011;25:3222-7.
- Barbaros U, Sümer A, Demirel T, et al. Single incision laparoscopic pancreas resection for pancreatic metastasis of renal cell carcinoma. *JLS* 2010;14:566-70.
- Kuroki T, Adachi T, Okamoto T, et al. Single-incision laparoscopic distal pancreatectomy. *Hepatogastroenterology* 2011;58:1022-4.
- Wong JS, Cheung YS, Fong KW, et al. Comparison of Postoperative Pain Between Single-incision Laparoscopic Cholecystectomy and Conventional Laparoscopic Cholecystectomy: Prospective Case-control Study. *Surg Laparosc Endosc Percutan Tech* 2012;22:25-8.
- Ma J, Cassera MA, Spaun GO, et al. Randomized Controlled Trial Comparing Single-Port Laparoscopic Cholecystectomy and Four-Port Laparoscopic Cholecystectomy. *Ann Surg* 2011;254:22-7.
- Asbun HJ, Stauffer JA. Laparoscopic vs open pancreaticoduodenectomy: overall outcomes and severity of complications using the Accordion Severity Grading System. *J Am Coll Surg* 2012;215:810-9.
- Boggi U, Amorese G, Vistoli F, et al. Laparoscopic pancreaticoduodenectomy: a systematic literature review. *Surg Endosc* 2015;29:9-23.
- Croome KP, Farnell MB, Que FG, et al. Total laparoscopic pancreaticoduodenectomy for pancreatic ductal adenocarcinoma: oncologic advantages over open approaches? *Ann Surg* 2014;260:633-40.
- Kurosaki I, Minagawa M, Takano K, et al. Left posterior approach to the superior mesenteric vascular pedicle in pancreaticoduodenectomy for cancer of pancreatic head. *JOP* 2011;12:220-9.

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