Editorial Commentary



# Minimally invasive pancreatic surgery in Japan: current status and future perspectives

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## Introduction

Pancreatic surgery is complex and, even with an open approach, and its morbidity rate is still high. Additionally, because of the Japanese universal health insurance system, it is difficult to aggregate patients in large volume centers, such as is the practice in countries such as the USA, Korea, and China. Thus, introduction and more extensive implementation of minimally invasive pancreatic resection (MIPR) has been delayed in Japan. However, board certification, proctor support systems (1,2), and strict institutional standards have led to MIPR being safe (3) and these procedures are now being performed increasingly often in Japan (4).

## History of MIPR in Japan

According to a questionnaire-based survey (4), both laparoscopic distal pancreatectomy (LDP) and laparoscopic pancreatoduodenectomy (LPD) were first performed in 1992 in Japan. However, ever since then, these procedures have only been performed in a few institutions because surgeons with extensive experience in pancreatic surgery have considered that laparoscopic pancreatectomy was not sufficiently safe and did not achieve optimal oncologic outcomes. In contrast, some young, skillful, laparoscopic surgeons who had been trained in other fields of gastrointestinal laparoscopic surgery have gained expertise in performing laparoscopic pancreatectomy and identifying its potential pitfalls (5-7). Since the introduction of insurance cover for LDP for benign/borderline malignant disease in 2012, the number of LDPs performed has increased dramatically. Furthermore, insurance cover for LDP for malignant disease and LPD for benign/borderline malignant diseases was introduced in 2016. Finally, LPD for malignant disease and robotic distal pancreatectomy (RDP) and pancreatoduodenectomy (RPD) for both benign and malignant diseases have been covered by insurance since 2020.

A prospective preoperative registration and audit system for LPD using Japan's National Clinical Database was introduced in 2016 and a preoperative registration system for both RPD and RDP in 2020, the aim being to monitor the quality and safety of MIPRs. Analysis of these data has demonstrated that MIPRs were performed safely during the introduction period in Japan (3). The data have also been used to expand the eligibility criteria for MIPRs for Japanese health insurance cover (3,8).

## Characteristics of MIPR in Japan

Because Japanese patients are characteristically thin with minimal visceral fat, meaning that the pancreatic neck is usually close to the abdominal wall, laparoscopic resection and subsequent reconstruction through mini-laparotomy were performed in many institutions during the introduction of LPD. This combination of procedures overcame the difficulty of laparoscopic reconstruction after LPD (3,9). Furthermore, laparoscopic resection and robotic reconstruction were also performed in many institutions during introduction of RPD, the aim of this combination being to shorten the operation time and minimize the risk of problematic intraoperative situations.

Another issue is the necessity for prophylactic lymph node dissection for malignant diseases: Japanese pancreatic surgeons perform comprehensive lymph node dissection, even when performing MIPR. Prophylactic lymph node

dissection makes the procedure more difficult and this has become one of the justifications for preventing expansion of indications for MIPR. Relevant to this, recent researches (10,11) have demonstrated that prophylactic lymph node dissection has minimal effects on the prognosis of patients with pancreatic cancer. In the current era of multidisciplinary treatment for malignant diseases, MIPR with a minimal resection range will contribute to maintaining patients' perioperative physical fitness and thereby increase the feasibility of implementing non-surgical treatments such as chemotherapy and/or radiotherapy.

## Assessment of difficulty of MIPR (LDP/LPD)

During the introductory phase of laparoscopic pancreatectomy in Japan, the Japan Society of Hepato-Biliary-Pancreatic Surgery (JSHBPS) conducted research to assess the efficacy and safety of LDP and LPD (9,12). The resultant data will be used to facilitate education and selection of operators and to maximize patients' safety.

Preoperative clinical data and imaging findings in Japanese patients were used to construct a 10-level index of difficulty of LDP. Five of these factors were found to significantly impact the difficulty of LDP, namely type of operation, resection line, proximity of tumor to major vessels, tumor extension to peripancreatic tissue, and left-sided portal hypertension/splenomegaly (12). This scoring system has been externally validated in another country, that study confirming that the Japanese system for scoring difficulty was significantly corelated with operative outcomes (13).

However, so many factors affect the difficulty of LPD that it was considered that the learning curve and other relevant factors were necessary to be incorporated to create a more reliable system for scoring the difficulty of LPD. A further study showed that more than 30 experiences of LPD contributed to stable LPD. In particular, it was concluded that patients with abundant visceral fat and concomitant pancreatitis should not undergo LPD during the early part of the learning curve (9).

## Precision anatomy for MIPR

Various crucial anatomical structures, including blood vessels, neural plexuses, and fusion fascia, are more readily identifiable in thin patients, facilitating oncologically adequate, bloodless, and safe surgical procedures. In 2021, JSHBPS conducted an international study of precision anatomy for minimally invasive hepato–biliary–pancreatic surgery (PAM–HBP surgery). They systematically reviewed precision anatomy and surgical approaches during MIPR and reported various specific anatomical findings related to operative procedures and their variations, types of surgical approach, and surgeons' preferences (14-19). Of note, many of the articles concerning the above topics were from Japan.

An important step during minimally invasive distal pancreatectomy is identification of the root of the splenic artery. There are two major approaches for achieving this, namely superior and posterior. Many Japanese surgeons prefer the superior approach; however, the morphology of the splenic artery affects the difficulty of this step (14-16). Identification of the optimal dissection layer for the posterior margin requires knowledge of the fascia and variations in the paths of the left renal artery and vein (15).

The approach to the superior mesenteric artery (SMA) is a critical step during minimally invasive pancreatoduodenectomy (MIPD). The inferior pancreatoduodenal artery, a key branch of the SMA, must be ligated to reduce arterial blood supply to the pancreatoduodenal region and thus minimize congestive bleeding. This also enables achievement of an adequate surgical margin and lymph node dissection (18). Approaches to the SMA include right, anterior, posterior, and left. The characteristics and limitations of MIPD have resulted in the right approach being the most commonly used (18).

## Board certification system

There are two major types of board-certified surgeons in Japan, namely expert surgeons certified by the JSHBPS (2) and surgeons with well-developed endoscopic surgery skills certified by the Japanese Society of Endoscopic Surgery (JSES) (1). Both certification systems require full video examinations to assess the quality of the applicant's surgical skill. The annual pass rates of the JSHBPS and JSES are 20–30% and 40–50%, respectively. Most Japanese surgeons who perform MIPR have been certified by both boards and are expected to maintain the quality of their surgery as well as educate young surgeons. It has been demonstrated that perioperative outcomes are better when board-certified surgeons are in attendance than when they are not (1,2). There is also a proctor system for supporting introduction of RPD/RDP, these proctors all being board-certified surgeons.

Unfortunately, the lack of incentive provided for board-certified surgeons by the Japanese insurance system hinders

motivation and recruitment of young surgeons to all fields of minimally invasive gastrointestinal surgery, including pancreatic surgery.

## Education

Because gastric cancer previously had a high prevalence in Japan, most current experts in MIPR had experience of both open and laparoscopic gastrectomy before starting their career as a pancreatic surgeon. It is well known that pancreatectomy and gastrectomy have many processes in common (20), accounting for the fact that the first MIPRs in Japan were performed by gastric surgeons (5,21). In contrast, because the incidence of gastric cancer has decreased (22) and there have been advances in endoscopic treatment, the number of gastrectomies being performed is decreasing (4). In addition, because robotic gastrectomy is also in an introductory phase in Japan, pancreatic surgeons have very little opportunity to perform gastrectomies, whether via an open or minimally invasive approach. Establishment of education appropriate to the current situation in Japan is urgently needed.

## Future perspective

Most Japanese institutions are now in the introductory phase of RPD/RDP. As previously described, the strict institutional facility standards and difficulty in accumulating candidates for MIPR to the institutions with greatest experience have slowed the implementation of RPD/RDP in Japan. The first generation has only just started to educate the second generation in Japan and a system for educating younger surgeons who are not experienced in gastrectomy or open pancreatectomy about MIPR has not yet been established. Nevertheless, we believe that Japanese pancreatic surgeons will succeed in overcoming these difficulties.

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