



Spleen-preserving distal pancreatectomy for intraductal papillary mucinous neoplasm

Katsunori Sakamoto[^]

Department of Gastroenterological Surgery, Osaka Saiseikai-Noe Hospital, Osaka, Japan

Correspondence to: Katsunori Sakamoto, MD, PhD, FACS. Department of Gastroenterological Surgery, Osaka Saiseikai-Noe Hospital, 1-3-25 Furuichi, Joto-ku, Osaka 536-0001, Japan. Email: sakamo87@gmail.com.

Comment on: Gorris M, van Bodegraven EA, Abu Hilal M, *et al.* Outcomes after distal pancreatectomy with or without splenectomy for intraductal papillary mucinous neoplasm: international multicentre cohort study. *Br J Surg* 2024;111:znad424.

Keywords: Spleen-preserving distal pancreatectomy (SPDP); intraductal papillary mucinous neoplasm (IPMN); Kimura; Warshaw

Submitted May 06, 2024. Accepted for publication Aug 16, 2024. Published online Sep 06, 2024.

doi: 10.21037/gs-24-150

View this article at: <https://dx.doi.org/10.21037/gs-24-150>

The number of patients diagnosed with intraductal papillary mucinous neoplasms (IPMNs) is increasing due to advances in imaging modalities (1). Several guidelines have suggested the criteria of candidate for surgical resection of IPMNs (2-4). However, there is no consensus regarding an appropriate surgical procedure because the preoperative definitive diagnosis of pathological grading of IPMN is still difficult at present. For IPMNs with low-grade to high-grade dysplasia (carcinoma *in situ*), which show an extremely low rate of lymph node metastases (LNM) (5), lymph node dissection is not required, as only radical tumor resection is sufficient for cure. However, IPMNs suspected to be invasive carcinomas reportedly require pancreatectomy with appropriate lymph node dissection (5). Thus, when the preoperative diagnosis shows no evidence of invasive carcinoma, surgeons often perform organ-preserving pancreatectomy with informed consent. Recent advances in imaging modalities have improved the accuracy of the preoperative diagnosis of IPMN before it progresses to an invasive carcinoma, and the use of organ-preserving pancreatectomy is increasing. Spleen-preserving distal pancreatectomy (SPDP) is a good surgical option, especially for IPMNs without the suspicion of invasive components in the body or tail of the pancreas. In a PubMed search, the number of results on using “spleen-preserving distal pancreatectomy” as key words has increased considerably. However, large-scale

studies demonstrating the feasibility of SPDP for IPMN have rarely been reported. Gorris *et al.* stated that as there is a low rate of LNM (4.3%) detected in patients without suspected malignant IPMN, SPDP can be considered to have oncological safety and favorable short- and long-term outcomes (1).

Meta-analyses have shown that distal pancreatectomy with splenectomy (DPS) is associated with more frequent early postoperative infectious complications, including pancreatic fistula, compared to SPDP (6). In addition, SPDP showed a significantly shorter surgical duration and less intraoperative blood loss than DPS (6). Regarding long-term outcomes, although a study comparing overwhelming postsplenectomy infections has not been published (7), several reports have concluded that patients who underwent SPDP had fewer episodes of the common cold or flu than those who underwent DPS (8,9). Preserving organs and immune function is of great advantage in both young and elderly patients. Therefore, if patients with IPMN are diagnosed as having no malignancy (no invasive carcinoma) preoperatively, we can suggest SPDP for surgical resection to avoid overtreatment. However, it is exceedingly challenging to predict pathology preoperatively. We sometimes encounter patients with IPMN who were diagnosed preoperatively as having no malignancy, but invasive carcinoma is diagnosed postoperatively. Gorris *et al.*

[^] ORCID: 0000-0002-6431-0011.

defined solid masses, malignant cytology, and preoperative lymphadenopathy as preoperative findings that raise the suspicion of malignancy (1). Gorris *et al.* reported 4.3% of LNM and 11.3% of invasive carcinoma (1). Since the actual LNM rates were unclear because fewer lymph nodes were harvested in the SPDP group than in the DPS group, some cases might be fatal owing to lymph node recurrences. Detailed data, including the recurrence rate or treatment for recurrence, are important to demonstrate the feasibility of SPDP. Although Gorris *et al.* showed no inferiority of SPDP compared with DPS for IPMN with no suspicious malignancy in terms of long-term outcomes (1), the cause of death in patients who underwent SPDP was not described in their study (1). The establishment of a more accurate diagnosis using high-quality endoscopic ultrasonography or (18)F-fluorodeoxyglucose positron emission tomography (10) might be useful for selecting appropriate candidates for SPDP in patients with IPMN, but further research is needed. In patients with IPMN and suspected malignancy (invasive carcinoma), although the positive prognostic impact of lymph node dissection in invasive pancreatic carcinoma has not been sufficiently demonstrated in large-scale studies, conventional DPS and lymph node dissection is applied at present. Furthermore, we should take into consideration the reoperation for splenectomy with lymph nodes dissection in patient found to have underlying malignancy after SPDP.

SPDP includes two types of procedures: the Warshaw (splenic vessels removal) (11) and Kimura (splenic vessels preservation) (12). The SPDP procedures which Gorris *et al.* performed were approximately half Kimura procedure and half Warshaw procedure (1). Conventionally, the Kimura procedure reportedly requires a longer surgical duration than the Warshaw procedure (13), but recent studies have shown similar outcomes between both procedures (14,15). Furthermore, in a recent study comparing minimally invasive SPDP, both the Kimura and Warshaw procedures revealed equivalent short-term outcomes (16). However, the rate of unplanned splenectomy is reportedly higher in the Warshaw procedure (14,15). In addition, postoperative splenic infarction and gastric varices were more frequent in the Warshaw procedure than in the Kimura procedure in meta-analyses (6,15). Therefore, the Kimura procedure is preferred for SPDP. One of the major issues associated with the Kimura procedure is the location of pancreatic transection, which is determined by the tumor location (17,18). If the pancreas is transected above the portal vein, it should be detached from the splenic vessels

over a long distance during the Kimura procedure. When a tumor is located in the pancreatic tail, the distance to be detached from the splenic vessels is short. Thus, the tumor location is important in clinical practice in terms of surgical difficulty.

Gorris *et al.* did not report long-term postoperative outcomes of gastric varices (1). A recent study that included 335 patients with SPDP showed that perigastric variceal formation detected using postoperative imaging was more frequent in the Warshaw (n=44) group than in the Kimura group (n=291) (14). Furthermore, the postoperative platelet count was significantly lower in the Warshaw group than Kimura group (14). However, the clinical events until 5 years after surgery were similar in both groups. The occlusion rate of preserved splenic veins was approximately 20% in the Kimura group (14). The cause of splenic vein occlusion was unclear, but one possible reason might be inflammation caused by pancreatic fistulas. However, no reports have suggested an association between pancreatic fistula and splenic vessel occlusion. In addition, the relationship between the tumor and splenic vessels might be one of the factors associated with postoperative occlusion of splenic vessels. Further research may clarify the mechanism of splenic vein occlusion after the Kimura procedure. When the factors associated with postoperative occlusion of the splenic vessels are revealed, it would be useful to determine whether the Kimura or Warshaw procedure should be indicated for SPDP.

Korrel *et al.* reported that 217 patients of 1,095 patients who underwent the intended minimally invasive SPDP showed unsuccessful spleen preservation (16). A stepwise strategy is important for the SPDP. Since the Kimura procedure is now preferred for SPDP (15), we first intend to preserve the splenic vessels if there were no oncological issues. However, when severe splenic vessel injury occurs, the surgical option should be changed to a Warshaw procedure. Finally, if we could not preserve the spleen due to uncontrollable bleeding or spleen infarction, we change the strategy to a combined resection of the spleen. Therefore, we should preserve the gastrosplenic ligament until the final stage of operation in the Kimura procedure because we may change the SPDP procedure intraoperatively. Furthermore, in the Warshaw procedure, the left gastroepiploic vessels are important for preventing splenic ischemia (19). Nevertheless, if both the splenic artery and vein cannot be preserved, preserving just the splenic vein may be an option (20).

Minimally invasive distal pancreatectomy is a good

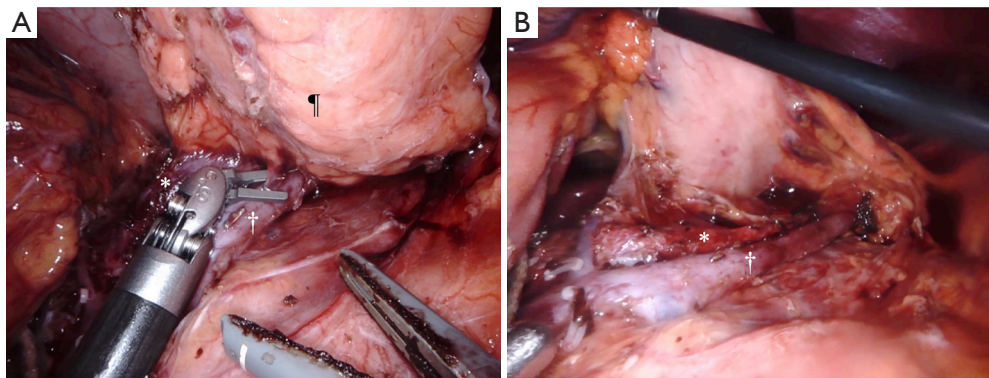


Figure 1 Intraoperative findings of robotic Kimura procedure. (A) Robotic approach enables meticulous approach to splenic vessels. The branches of splenic vessels are easily divided. (B) Splenic vessels are preserved over the entire length. *, splenic artery; †, splenic vein; ‡, pancreas.

option for patients with IPMN located in the pancreatic body or tail. Furthermore, robotic approach may have advantages for spleen preserving procedure (21-23). The robotic approach can facilitate meticulous access to the splenic vessels (*Figure 1*). In addition, robotic approaches for benign pancreatic tumors may have greater potential for minimally invasive pancreatic parenchymal-preserving procedures such as central pancreatectomy (24).

Finally, the spleen should be preserved if the patient can be deemed oncologically and technically safe considering the immune consequences of splenectomy (25). However, no study has reported that SPDP contributes to the prevention of late-onset overwhelming post-splenectomy infections (7). Furthermore, the long-term outcomes of SPDP, including immune function and issues associated with epigastric varices, have not been sufficiently demonstrated by large-scale studies. Further studies, such as randomized controlled trials that evaluate the long-term outcomes of SPDP, are required to demonstrate the feasibility of function-preserving pancreatectomy for patients with less malignant or benign pancreatic tumors.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Gland Surgery*. The article has

undergone external peer review.

Peer Review File: Available at <https://gs.amegroups.com/article/view/10.21037/gS-224-150/prf>

Conflicts of Interest: The author has completed the ICMJE uniform disclosure form (available at <https://gs.amegroups.com/article/view/10.21037/gS-24-150/coif>). The author has no conflicts of interest to declare.

Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for the publication of this Editorial Commentary and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license).

See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Gorris M, van Bodegraven EA, Abu Hilal M, et al. Outcomes after distal pancreatectomy with or without splenectomy for intraductal papillary mucinous neoplasm: international multicentre cohort study. *Br J Surg* 2024;111:znad424.
2. Tanaka M, Fernández-Del Castillo C, Kamisawa T, et al. Revisions of international consensus Fukuoka guidelines for the management of IPMN of the pancreas. *Pancreatology* 2017;17:738-53.
3. Vege SS, Ziring B, Jain R, et al. American gastroenterological association institute guideline on the diagnosis and management of asymptomatic neoplastic pancreatic cysts. *Gastroenterology* 2015;148:819-22; quiz 12-3.
4. European evidence-based guidelines on pancreatic cystic neoplasms. *Gut* 2018;67:789-804.
5. Kimura K, Amano R, Yamazoe S, et al. The Clinical Indications for Limited Surgery of Intraductal Papillary Mucinous Neoplasms of the Pancreas. *World J Surg* 2017;41:1358-65.
6. Nakata K, Shikata S, Ohtsuka T, et al. Minimally invasive preservation versus splenectomy during distal pancreatectomy: a systematic review and meta-analysis. *J Hepatobiliary Pancreat Sci* 2018;25:476-88.
7. Kato H, Asano Y, Ito M, et al. Recent trends in organ-preserving pancreatectomy: Its problems and clinical advantages compared with other standard pancreatectomies. *Ann Gastroenterol Surg* 2024;8:8-20.
8. Choi SH, Seo MA, Hwang HK, et al. Is it worthwhile to preserve adult spleen in laparoscopic distal pancreatectomy? Perioperative and patient-reported outcome analysis. *Surg Endosc* 2012;26:3149-56.
9. Tang CW, Feng WM, Bao Y, et al. Spleen-preserving distal pancreatectomy or distal pancreatectomy with splenectomy?: Perioperative and patient-reported outcome analysis. *J Clin Gastroenterol* 2014;48:e62-e66.
10. Utsunomiya T, Ogawa K, Funamizu N, et al. The tumor-to-liver ratio of the standardized uptake value is a useful FDG-PET/CT parameter for predicting malignant intraductal papillary mucinous neoplasm of the pancreas. *Ann Gastroenterol Surg* 2022;6:695-703.
11. Warshaw AL. Conservation of the spleen with distal pancreatectomy. *Arch Surg* 1988;123:550-3.
12. Kimura W, Inoue T, Futakawa N, et al. Spleen-preserving distal pancreatectomy with conservation of the splenic artery and vein. *Surgery* 1996;120:885-90.
13. Lv GY, Wang GY, Jiang C, et al. Laparoscopic spleen-preserving distal pancreatectomy with or without splenic vessel conservation: a retrospective study of 20 cases. *Hepatogastroenterology* 2013;60:1785-8.
14. Maehira H, Tani M, Mori H, et al. Long-term outcomes after spleen-preserving distal pancreatectomy with splenic vessels preservation or resection: A nationwide survey of the Japanese Society of Pancreatic Surgery. *Surgery* 2024;175:1570-9.
15. Granieri S, Bonomi A, Frassini S, et al. Kimura's vs Warshaw's technique for spleen preserving distal pancreatectomy: a systematic review and meta-analysis of high-quality studies. *HPB (Oxford)* 2023;25:614-24.
16. Korrel M, Lof S, Al Sarireh B, et al. Short-term Outcomes After Spleen-preserving Minimally Invasive Distal Pancreatectomy With or Without Preservation of Splenic Vessels: A Pan-European Retrospective Study in High-volume Centers. *Ann Surg* 2023;277:e119-25.
17. Ohtsuka T, Ban D, Nakamura Y, et al. Difficulty scoring system in laparoscopic distal pancreatectomy. *J Hepatobiliary Pancreat Sci* 2018;25:489-97.
18. Xu J, Ye N, Chen S, et al. Short-Term Outcomes of the Tail-First Approach in Laparoscopic Spleen-Preserving Distal Pancreatectomy: a Single Center Experience. *J Gastrointest Surg* 2022;26:360-6.
19. de Rooij T, Sitarz R, Busch OR, et al. Technical Aspects of Laparoscopic Distal Pancreatectomy for Benign and Malignant Disease: Review of the Literature. *Gastroenterol Res Pract* 2015;2015:472906.
20. Shindo Y, Tokumitsu Y, Nakajima M, et al. Laparoscopic spleen-preserving distal pancreatectomy: A novel technique with splenic artery resection and splenic vein preservation. *Asian J Endosc Surg* 2024;17:e13261.
21. Lin X, Lin R, Lu F, et al. "Kimura-first" strategy for robotic spleen-preserving distal pancreatectomy: experiences from 61 consecutive cases in a single institution. *Gland Surg* 2021;10:186-200.
22. Hwang HK, Kang CM, Chung YE, et al. Robot-assisted spleen-preserving distal pancreatectomy: a single surgeon's experiences and proposal of clinical application. *Surg Endosc* 2013;27:774-81.
23. Şal O, Sakamoto K, Tamura K, et al. Robot-assisted spleen-preserving distal pancreatectomy in a 14-year-old patient with solid pseudopapillary neoplasm. *Turkish J Ped Surg* 2024;38:31-4.
24. Giuliani G, Guerra F, Matarazzo F, et al. Robotic

Ultrasound-Guided Central Pancreatectomy with Main Pancreatic Duct Endoscopy Evaluation for High-Risk, Mixed-Type Intraductal Papillary Mucinous Neoplasm. *Ann Surg Oncol* 2024;31:4634.

25. Timmerhuis HC, Ngongoni RF, Jensen CW, et al. Comparison of Spleen-Preservation Versus Splenectomy in Minimally Invasive Distal Pancreatectomy. *J Gastrointest Surg* 2023;27:2166-76.

Cite this article as: Sakamoto K. Spleen-preserving distal pancreatectomy for intraductal papillary mucinous neoplasm. *Gland Surg* 2024;13(9):1665-1669. doi: 10.21037/gs-24-150