



Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Two case of bilateral approach in laparoscopic pancreas-sparing distal duodenectomy for duodenal neoplasms arising from the distal duodenum

Hideki Nagano¹, Fumihiro Yoshimura¹, Hideki Shimaoka, Kenji Maki, Gumpei Yoshimatsu*, Suguru Hasegawa

Department of Gastroenterological Surgery, Fukuoka University School of Medicine, 7-45-1 Nanakuma Jonanku, Fukuoka, 8140180, Japan

ARTICLE INFO

Article history:

Received 17 January 2021
Received in revised form 7 February 2021
Accepted 7 February 2021
Available online 16 February 2021

Keywords:

Duodenal tumor
Laparoscopic surgery
Pancreas-sparing distal duodenectomy
Bilateral approach

ABSTRACT

INTRODUCTION: Laparoscopic pancreas-sparing distal duodenectomy is a less invasive surgical therapy; however, the anatomical complexity of the duodenum increases the difficulty of laparoscopic procedures. We introduce our technique for laparoscopic pancreas-sparing distal duodenectomy for distal duodenal tumors.

PRESENTATION OF CASES: A first patient was 47-year-old woman who had 30 mm of duodenal tumor which located in third portion of duodenum. A second patient was 66-year-old man who had 35 mm of submucosal tumor which located in the third portion of duodenum. Laparoscopic pancreas-sparing duodenectomy was performed using bilateral approach for both cases. We began by dissecting an avascular area on the right side of the transverse mesocolon to mobilize the second and third portions of the duodenum with the uncinate process of the pancreas. Next, from the left side, the jejunum and the fourth portion of the duodenum were fully mobilized orally from the surrounding tissue, connecting the dissection plane with the right-side area. The jejunum and duodenum were cut with a linear stapler. Intra-corporeal reconstruction was performed in an overlapped manner. We performed this procedure in two patients. Operative time was 326 and 370 min, respectively. Patients were discharged on postoperative days 9–12 without postoperative complications.

DISCUSSION: Duodenal tumors are found increasingly often because of developments in endoscopic technology and techniques; therefore, establishing safe surgical procedures for duodenal tumor excision is imperative. Our surgical approach was simple and safe procedure.

CONCLUSION: Laparoscopic pancreas-sparing distal duodenectomy with a bilateral approach is a useful approach without wide mobilization of duodenum.

© 2021 The Author(s). Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Duodenal tumors have been identified increasingly often because of developments in endoscopic techniques and technology [1,2]; however, laparoscopic surgical resection of distal duodenal tumors (third or fourth portion of the duodenum) is not yet well established because of anatomical complexity and the need for highly-advanced surgical techniques. The distal duodenum is adjacent to the pancreas and hidden behind the transverse mesocolon and superior mesenteric vessels. Regarding distal duodenectomy

to remove the distal duodenum, open laparotomy is the preferred surgical approach [3–5]. The one of reason is to require Kocher's maneuver and Cattell–Braasch maneuver, whose procedure is hard to complete under magnified view of laparoscopy. Our introducing bilateral approach of laparoscopic pancreas-sparing distal duodenectomy (PSDD) was performed and completed for two cases of duodenal tumor arising from third portion of duodenum, and this surgical approach required minimum mobilization of the duodenum, which was preferable for laparoscopic surgery. This case report was reported in accordance with the SCARE criteria [6].

2. Presentation of case

Two patients underwent laparoscopic PSDD. The first patient was a 47-year-old woman who underwent laparoscopic PSDD to excise a 30-mm duodenal tumor located in the third portion of the duodenum (Fig. 1A and B). Pathological examination of a biopsy diagnosed tubular adenoma and we decided to perform laparo-

Abbreviations: EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection; PSDD, pancreas-sparing distal duodenectomy.

* Corresponding author at: Department of Gastroenterological Surgery, Fukuoka University School of Medicine, 7-45-1 Nanakuma Jonanku, Fukuoka 814-0180, Japan.

E-mail address: gyoshimatsu@fukuoka-u.ac.jp (G. Yoshimatsu).

¹ These authors contributed equally to the work.

<https://doi.org/10.1016/j.ijscr.2021.02.028>

2210-2612/© 2021 The Author(s). Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

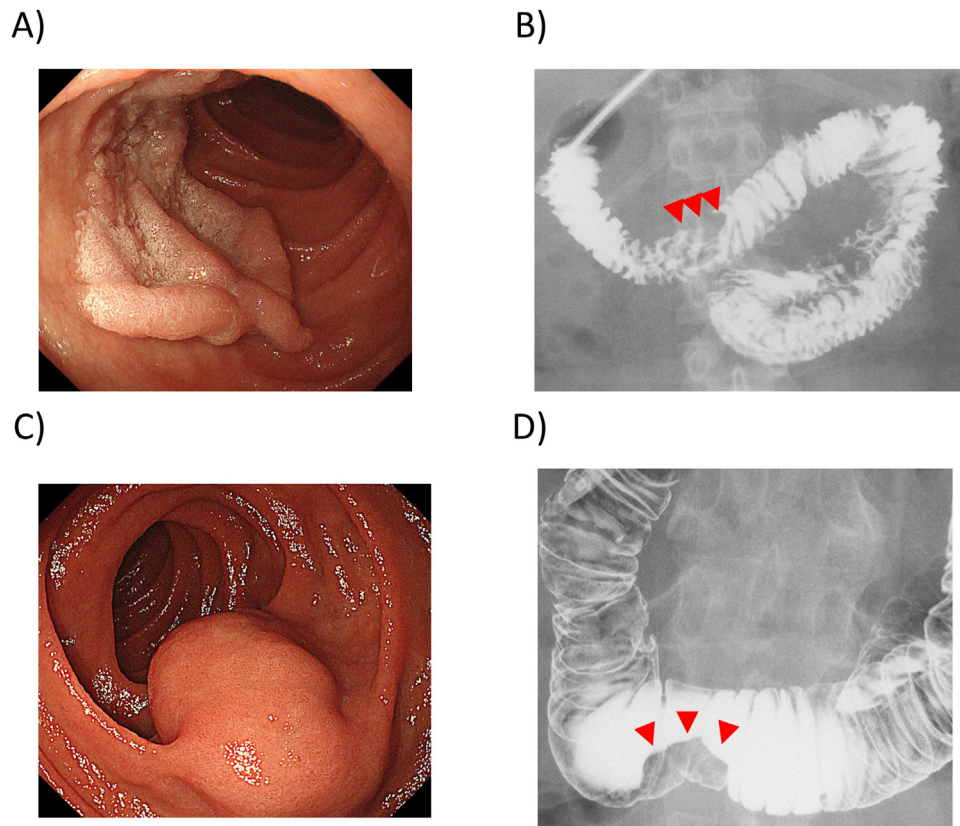


Fig. 1. Preoperative findings for two cases. Case1; A-B) Tumor was located and localized in third portion of duodenum. Case2; C-D) Submucosal tumor was located at third portion of duodenum.

scopic PSDD because the tumor's large size and location required highly skilled-techniques to achieve complete dissection during ESD.

The second patient was a 66-year-old man who was diagnosed with a duodenal submucosal tumor arising from the third portion of the duodenum (Fig. 1D and E). He has no current medication and no past history. Computed tomography demonstrated an approximately 3.5 cm of hypervascular tumor with no pancreatic invasion. The tumor was too large to remove by laparoscopic 'local' resection, therefore gastrointestinal surgeons performed laparoscopic PSDD using bilateral approach.

3. Surgical procedures

The patients were placed in the open-leg supine position under general and epidural anesthesia and a 12-mm trocar was inserted into the umbilical part. Pneumoperitoneum pressure was set to 10 mmHg and we used a flexible scope (ENDO-EYE FLEX; Olympus, Tokyo, Japan). Next, one 5-mm trocar was placed in each of the left and right upper abdomen and the right abdomen and a 12-mm trocar was placed in the left abdomen (Fig. 2A). The operator stood on the right side of the patient. The transverse mesocolon was retracted toward the patient's head and the Treitz ligament, duodenum, and jejunum were identified as shown in the video (Fig. 2B). Additionally, the pancreatic head and the second to third portions of the duodenum were identified by dissecting an avascular area on the right side of the transverse mesocolon (Fig. 2C). First, the transverse mesocolon was incised above the second portion of the duodenum to make the "window" and the second portion and right side of the third portion of the duodenum were separated widely from the transverse mesocolon to expose the structures using a SonoSurg (Olympus) as the "right-side approach" (Fig. 2D). The

location of the preoperatively placed marking-clip near the tumor was confirmed by intraoperative fluoroscopy to determine a division line on the duodenum, as the dissection margin was securely kept during cut the duodenum. Next, the operator moved to stand on the left side of the patient and the fourth portion of the duodenum was separated and exposed from the Treitz ligament as the "left-side approach" (Fig. 3A–C). The inferior mesenteric vein was identified on the left side of the jejunum and preserved (Fig. 3C). The jejunum was cut using an ECHELON FLEX Powered Plus white 45-mm stapler (Ethicon Inc., Somerville, NJ). The jejunal stump was grasped and retracted to the left side and the third and fourth portions of the duodenum were separated from the surrounding tissue from distal to proximal as a tunneling procedure (Fig. 3D–F). After separating the duodenal wall from the surrounding tissue, the duodenal mesentery was sealed and dissected with the marginal vessels and the duodenal wall using a LigaSure™ (Medtronic, Minneapolis, MN), also from distal to proximal. In this procedure, the pancreas, especially the uncinate process and body of the pancreas, must be preserved with the capsule membrane intact to avoid damaging the parenchyma. Subsequently, the isolated third and fourth portions of the duodenum were retracted to the right side through the "window" that was opened in right side of transverse mesocolon previously, and the proximal duodenum was cut between the second and third portions with the ECHELON FLEX Powered Plus white 45-mm stapler and removed out (Fig. 4A–C). Next, we performed the reconstruction using an overlap method, intracorporeally. First, the jejunal stump was moved to near the duodenal stump through the "window" right side via the artificial space that was made during the right-side approach. The antimesenteric edge of the duodenal and jejunal stumps were cut shortly to be able to insert a jaw of a linear stapler into each intestine and the linear stapler was fired to perform antimesenteric side-to-side anastomosis

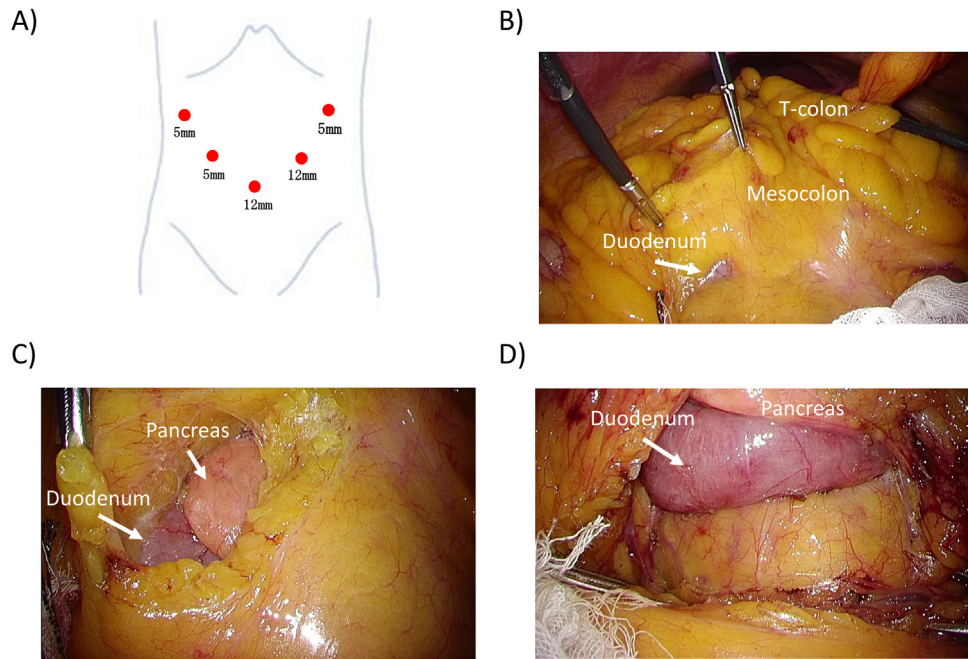


Fig. 2. Port placement and right-side approach for pancreas sparing distal duodenectomy. A) Five ports were inserted as shown by red circles. B) The duodenum is visible through the mesocolon. C–D) We incised the mesocolon, which exposed the pancreatic head and duodenum after separating the duodenum from the surrounding tissue.

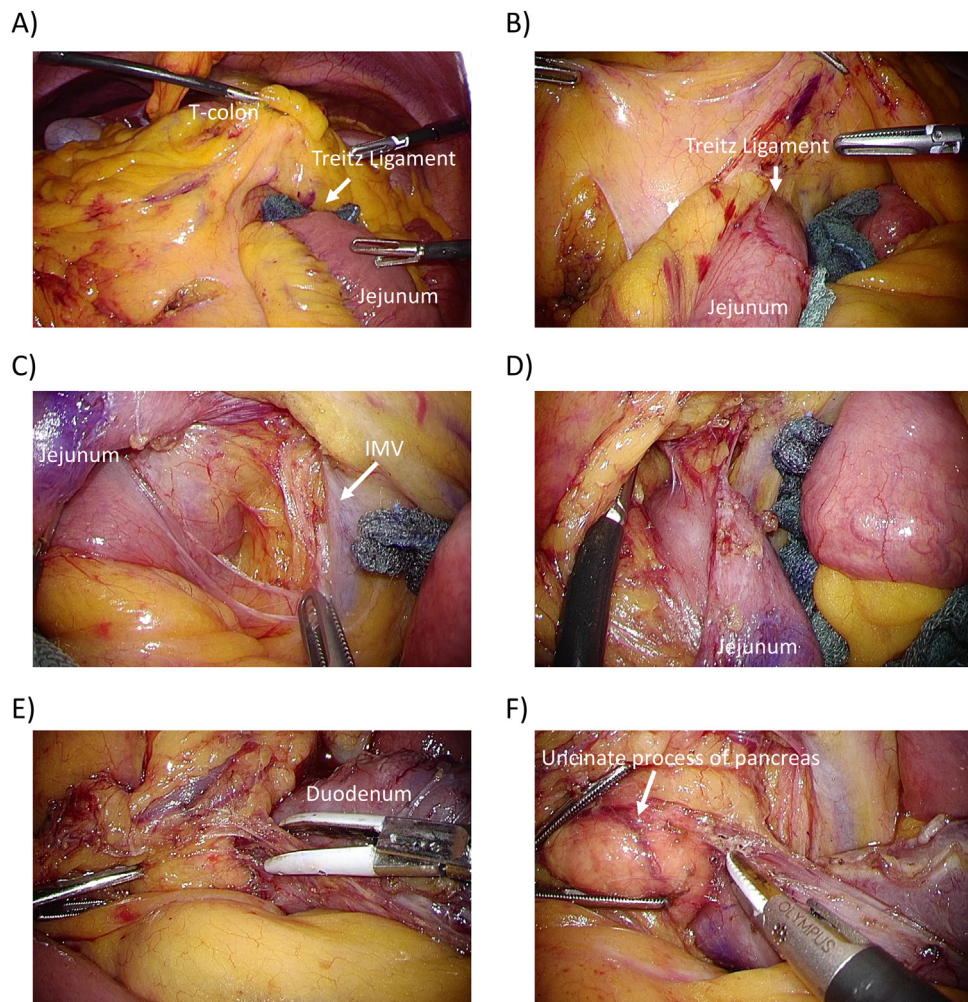


Fig. 3. Left-side approach to dissect the duodenum from the Treitz ligament, transverse mesocolon, and pancreas. A–F) We dissected the duodenum from the Treitz ligament, transverse mesocolon, and pancreas using the left-side approach.

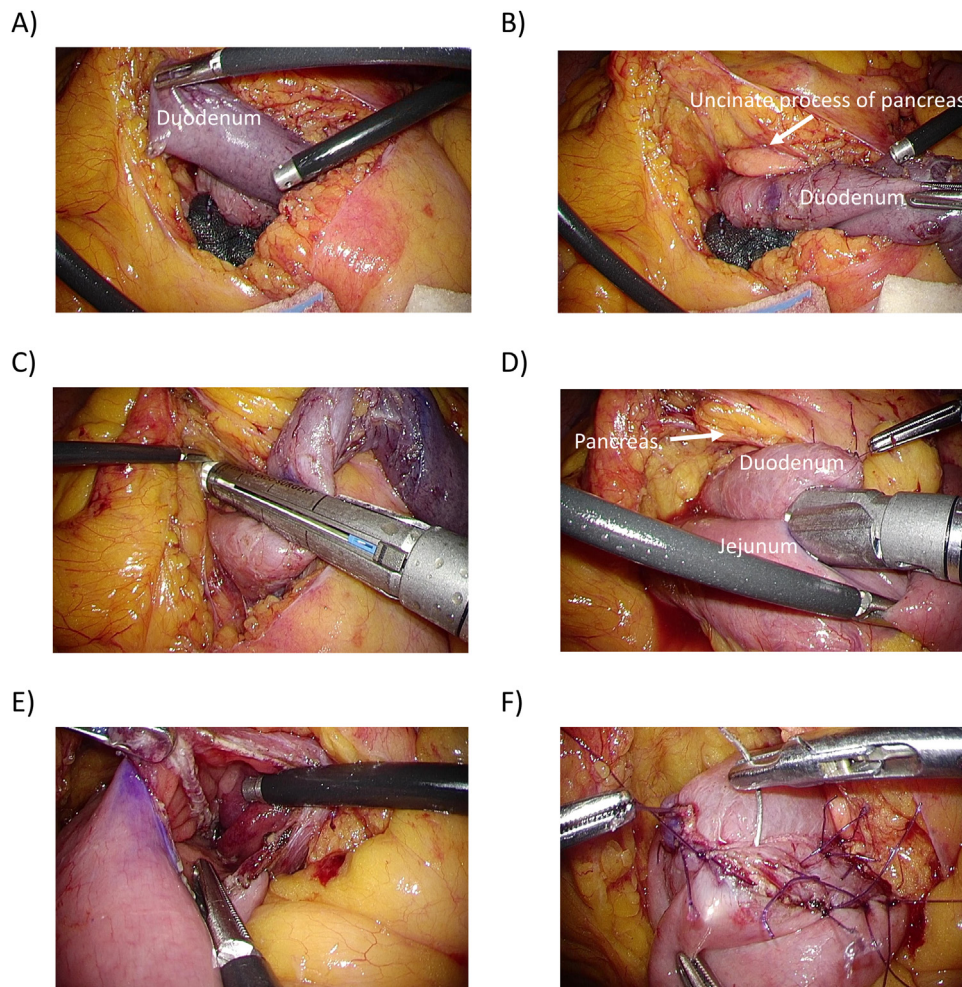


Fig. 4. Pulling the dissected distal duodenum to the right side, and duodenojejunosomy reconstruction using an overlap method. A-C) The distal duodenum is pulled through the tunnel and then removed by transecting the proximal side of the duodenum. D) We inserted one jaw of the linear stapler into each of the duodenal and jejunal limbs and fired the stapler to complete the side-to-side anastomosis. E-F) We manually sutured the hole in the duodenal and jejunal stumps created during the anastomosis.

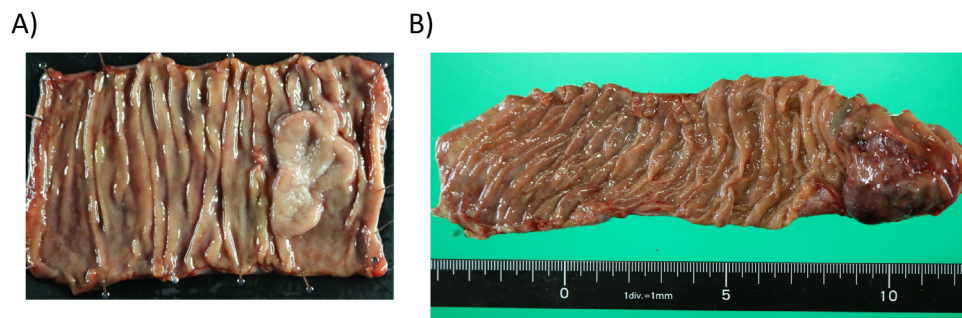


Fig. 5. Resected specimens for two cases. A) Case1; Duodenal tumor was resected with adequate margin. B) Case2; Duodenal submucosal tumor was completely resected.

(Fig. 4D-E). The artificial common hole opening in the duodenal and jejunal stumps was closed with full-thickness intraluminal 3–0 monofilament sutures (Fig. 5F). After suturing the mesenteric defect, the access ports were removed and the skin was closed using a simple interrupted buried intradermal suture.

4. Results

In the first case, the total operative time was 326 min and estimated blood loss volume was unmeasurable low volume. Macroscopic examination of the resected specimen showed that

the tumor measured 35 × 25 mm (Fig. 6A). The pathological diagnosis was carcinoma in adenoma limited to the duodenal mucosa. The surgical margins were negative. Oral intake was started on postoperative day 5 and the patient was discharged on postoperative day 9 without intraoperative and postoperative complications. The surgery of second case was completed with a 370-min operative duration. Estimated blood loss volume was unmeasurable low volume. The tumor was 30 × 30 mm (Fig. 6B) and histological findings revealed a low-grade malignant gastrointestinal stromal tumor. Oral intake was started on postoperative day 4 and discharged on postoperative day 12 without surgical complications.

5. Discussion

Duodenal tumors are a relatively rare disease and the prevalence of duodenal epithelial neoplasms is reported as 0.03 %–0.4 % in patients undergoing upper endoscopy [7,8]. Benign tumors such as adenomas are most likely to be resected using endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD) [4]. However, when EMR or ESD is difficult, surgical resection is required, and LECS has recently been introduced for duodenal full-thickness resection and wedge resection [9]. However, most reports of LECS were performed for only ‘partial’ or ‘wedge resection’ of duodenal tumors.

PSDD has mainly been performed during open laparotomy because of the anatomical complexity of the duodenum, which is adjacent to the pancreas, papilla of Vater, transverse mesocolon, jejunal mesentery, and ligament of Treitz, and because the duodenum is hidden by the mesocolon and superior mesenteric artery and vein [3–5,10]. Though a laparoscopic approach would provide better visibility of the dissection line between the pancreas and duodenum with a magnified view and minimal invasiveness, laparoscopic approach for PSDD has been reported in few papers. Bartel et al. described infra-ampullary distal pancreas-preserving partial duodenectomy as a good surgical option for benign lesions not amenable to endoscopic resection and which preserves the pancreas [11]. Poves et al. reported a patient who underwent laparoscopic PSDD using an approach that began with the complete Kocher’s maneuver [12]. However Kocher’s maneuver and Cattell–Braasch maneuver make laparoscopic approach difficult under the magnified view by laparoscopy.

The key points in our procedure using a bilateral approach are as follows: 1. The duodenum and pancreatic head are separated from the surrounding tissue during the right-side approach. 2. The left-side approach is initiated by dissecting the Treitz ligament and jejunum. 3. The duodenum is separated from the fourth portion proximally with the intestinal wall. 4. The separated duodenum is retracted to the right side behind the superior mesenteric artery and vein. 5. The duodenum is adequately separated and transectable within ‘window’ created on the right side of the abdomen. One of the advantages of this approach is that it minimizes dissection around the duodenum; in other words, this approach does not require wide mobilization around the distal duodenum such as in the Cattell–Braasch maneuver, which involves full mobilization of the right colon.

We used an overlap method for the duodenojejunal anastomosis, which provides anterograde peristalsis. In this anastomosis, the jejunal limb is easier to move close to the duodenal second portion and the papilla of Vater is preserved by antimesenteric side-to-side anastomosis. The jejunal limb was moved up through the “window” previously created on the right side. Because the original location of the duodenum behind the superior mesenteric artery and vein can be too narrow, our method is considered simple to perform.

In this article, we introduced the detailed surgical procedures for a bilateral approach, which was never described in previous papers, in laparoscopic PSDD. Establishing a surgical procedure for duodenal tumors located in the distal duodenum is important and essential, and our surgical method is useful when resecting duodenal tumors.

6. Conclusion

Our bilateral approach in laparoscopic PSDD for neoplasms in the distal duodenum was a useful procedure without wide mobilization.

Conflicts of interest

All of authors have nothing to declare in any conflicts of interest.

Funding

This case reports have no funding source.

Ethical approval

Ethical approval has been given.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Hideki Nagano, Fumihito Yoshimura, Hideki Shimaoka and Kenji Maki conducted the surgery. Hideki Nagano and Gumpei Yoshimatsu wrote the manuscript. Gumpei Yoshimatsu and Suguru Hasegawa reviewed the manuscript.

Registration of research studies

- 1 Name of the registry: NA.
- 2 Unique identifying number or registration ID:
- 3 Hyperlink to your specific registration (must be publicly accessible and will be checked):

Guarantor

Gumpei Yoshimatsu, Associate Professor.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Acknowledgement

We thank Jane Charbonneau, DVM, from Edanz Group (www.edanzediting.com/ac) for editing a draft of this manuscript.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ijscr.2021.02.028>.

References

- [1] K. Goda, D. Kikuchi, Y. Yamamoto, K. Takimoto, N. Kakushima, Y. Morita, H. Doyama, T. Gotoda, Y. Maehata, N. Abe, Endoscopic diagnosis of superficial non-ampullary duodenal epithelial tumors in Japan: multicenter case series, *Dig. Endosc.* 26 (Suppl 2) (2014) 23–29.
- [2] M. Esaki, S. Suzuki, H. Ikehara, C. Kusano, T. Gotoda, Endoscopic diagnosis and treatment of superficial non-ampullary duodenal tumors, *World J. Gastrointest. Endosc.* 10 (2018) 156–164.
- [3] W.K. Mitchell, P.F. Thomas, A.M. Zaitoun, A.J. Brooks, D.N. Lobo, Pancreas preserving distal duodenectomy: a versatile operation for a range of infra-papillary pathologies, *World J. Gastroenterol.* 23 (2017) 4252–4261.
- [4] F.J. Garcia-Molina, F. Mateo-Vallejo, D. Franco-Osorio Jde, J.L. Esteban-Ramos, I. Rivero-Henandez, Surgical approach for tumours of the third and fourth part of the duodenum. Distal pancreas-sparing duodenectomy, *Int. J. Surg.* 18 (2015) 143–148.

- [5] S. Yamashita, Y. Sakamoto, A. Saiura, J. Yamamoto, T. Kosuge, T. Aoki, Y. Sugawara, K. Hasegawa, N. Kokudo, Pancreas-sparing duodenectomy for gastrointestinal stromal tumor, *Am. J. Surg.* 207 (2014) 578–583.
- [6] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, S. Group, The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020) 226–230.
- [7] J.M. Jepsen, M. Persson, N.O. Jakobsen, T. Christiansen, E. Skoubo-Kristensen, P. Funch-Jensen, A. Kruse, P. Thommesen, Prospective study of prevalence and endoscopic and histopathologic characteristics of duodenal polyps in patients submitted to upper endoscopy, *Scand. J. Gastroenterol.* 29 (1994) 483–487.
- [8] S.H. Jung, W.C. Chung, E.J. Kim, S.H. Kim, C.N. Paik, B.I. Lee, Y.S. Cho, K.M. Lee, Evaluation of non-ampullary duodenal polyps: comparison of non-neoplastic and neoplastic lesions, *World J. Gastroenterol.* 16 (2010) 5474–5480.
- [9] D. Ichikawa, S. Komatsu, O. Dohi, Y. Naito, T. Kosuga, K. Kamada, K. Okamoto, Y. Itoh, E. Otsuji, Laparoscopic and endoscopic co-operative surgery for non-ampullary duodenal tumors, *World J. Gastroenterol.* 22 (2016) 10424–10431.
- [10] K. Shimizu, D. Hashimoto, S. Abe, A. Chikamoto, H. Baba, Pancreas-preserving partial duodenectomy of the distal region for large duodenal adenoma: report of a case, *Surg. Today* 45 (2015) 390–393.
- [11] M.J. Bartel, R. Puri, B. Brahmbhatt, W.C. Chen, D. Kim, C.R. Simons-Linares, J.A. Stauffer, M.A. Buchanan, S.P. Bowers, T.A. Woodward, M.B. Wallace, M. Raimondo, H.J. Asbun, Endoscopic and surgical management of nonampullary duodenal neoplasms, *Surg. Endosc.* 32 (2018) 2859–2869.
- [12] I. Poves, F. Burdio, S. Alonso, A. Seoane, L. Grande, Laparoscopic pancreas-sparing subtotal duodenectomy, *JOP* 12 (2011) 62–65.

Open Access

This article is published Open Access at [sciencedirect.com](https://www.sciencedirect.com). It is distributed under the [IJSCR Supplemental terms and conditions](#), which permits unrestricted non commercial use, distribution, and reproduction in any medium, provided the original authors and source are credited.