Journal of Clinical and Translational Research 2023; 9(5): 327-331

Journal of Clinical and Translational Research

Journal homepage: http://www.jctres.com/en/home

CASE REPORT

Pancreas sparing duodenal resection in colorectal adenocarcinoma with local invasion to the duodenum: a case report and literature review

Si Ying Adelina Ho[1], Thomas Zheng Jie Teng[1,2]*, Vishal G. Shelat[1,2]

[1]Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore, [2]Department of General Surgery, Tan Tock Seng Hospital, Singapore

ARTICLE INFO

Article history:
Received: December 21, 2022
Revised: July 11, 2023
Accepted: July 11, 2023
Published Online: September 23, 2023

Keywords:
Colorectal adenocarcinoma
Duodenal metastases
Pancreatic sparing duodenal resection
Case study

**Corresponding authors*
Thomas Zheng Jie Teng
Tan Tock Seng Hospital, 11 Jalan Tan Tock Seng, 308433 Singapore.
E-mail: zteng004@e.ntu.edu.sg

ABSTRACT

Background: Pancreas sparing duodenal resection (PSDR) is commonly described in patients with familial duodenal adenomatous polyposis, duodenal gastrointestinal stromal tumors, duodenal trauma, or other primary duodenal lesions where the pancreas is not involved. PSDR in patients with metastatic involvement of the duodenum is rarely described. After reviewing the relevant literature, <5 PSDR for duodenal metastases reports were retrieved. Our patient was treated with PSDR for a local recurrence after a right hemicolectomy was performed for right colon adenocarcinoma a year before.
Aim: The aim of the study was to investigate if PSDR is feasible in this patient with recurrence of a locally advanced right colon adenocarcinoma invading the duodenum.
Case Summary: A 74-year-old female patient presented with the right iliac fossa pain and weight loss 1-year post-resection of the primary ascending colon cancer. A surveillance computed tomography scan of the thorax, abdomen, and pelvis showed a mass in the third segment of the duodenum. The decision to carry out a PSDR was made.
Results: The proximal and distal margins of the resected bowel were uninvolved by the invasive carcinoma and metastasis in five out of 12 regional lymph nodes was found. The post-operative course was complicated by a Grade B post-operative pancreatic fistula but recovered well post-drainage.
Conclusions: PSDR can be utilized in the management of duodenal metastases.
Relevance for Patients: PSDR can be performed in patients with duodenal metastases, offering a lower morbidity rate as compared to conventional pancreaticoduodenectomy.

1. Introduction

The pancreas is an unforgiving organ, and surgery involving the pancreas carries a significant risk of morbidity, especially for post-operative pancreatic fistulas (POPF). The incidence of POPF following distal pancreatectomy or pancreaticoduodenectomy is reported in up to 30% of patients [1]. Surgeons resort to centralizing pancreatic surgical services, technical modification of key surgical steps, standardized protocol-driven clinical care, and pharmacological intervention to reduce the morbidity following pancreatic resections [1,2]. One method of reducing morbidity would be to avoid pancreatic resections in, for example, duodenal-only lesions. This is especially relevant as POPF rates following pancreas resection are higher in patients with a soft pancreas texture and non-dilated pancreatic ducts, a typical feature of duodenal-only lesions [3,4]. Thus, pancreas-sparing duodenal resection (PSDR) is an attractive option, and it is no surprise that it is widely reported in patients with familial duodenal adenomatous polyposis, duodenal gastrointestinal stromal tumors, and a myriad of other primary duodenal lesions. Preserving the pancreas keeps the endocrine and exocrine function intact with a low risk of post-pancreatectomy diabetes and alleviates the

DOI: http://dx.doi.org/10.18053/jctres.09.202305.22-00228

need for pancreatic enzyme replacement therapy, with potentially improved quality of life following cancer survivorship [5]. Despite being accepted as a valid option in patients with selected pathologies, PSDR remains an uncommon surgical procedure.

Although PSDR is uncommon, it is one of the mainstream procedures for benign duodenal lesions and is widely commented on. Two broad classification systems describe PSDR – one related to duodenal resection (total or partial) and another related to the management of the ampulla of Vater (resection or preservation) [6,7]. Cantalejo-Díaz *et al.* performed a systematic review in 2019 and reported only 30 studies with 211 patients managed by PSDR with total duodenectomy [8]. In a single-center study over 14 years, Mitchell *et al.* reported that only 19 patients had underwent a PSDR with distal duodenectomy for various infra-papillary duodenal pathologies [9]. In a systematic review including 53 patients with locally advanced colon cancer invading the duodenum, Cirocchi *et al.* reported 14 patients managed by synchronous duodenal resection along with colectomy – ten with pedicled ileal flap duodenal reconstruction and four with direct suture repair of the duodenum [10]. As the majority of PSDR reports include primary duodenal pathologies or synchronous duodenal resection along with a colectomy for local duodenal invasion, PSDR in metastatic duodenal pathologies is rare [11-14]. We report a PSDR in a patient diagnosed with local recurrence of a right colon adenocarcinoma with the invasion of the duodenum following a right hemicolectomy performed a year before.

2. Case Presentation

A 74-year-old lady presented with the right iliac fossa pain, unintentional weight loss, and appetite loss on a background of hypertension and diabetes mellitus. She did not smoke nor consume alcohol and had no family history of colorectal cancer. Abdominal physical examination was unremarkable with no masses or organomegaly noted. A colonoscopy noted an ascending colon mass, and histology revealed a colonic adenocarcinoma. A staging computed tomography (CT) scan of the thorax, abdomen, and pelvis showed a 9 × 8 cm ascending colon mass involving the anterior abdominal wall and right adnexa with no distant metastases. Carcinoembryonic antigen was high at 160 μg/L (normal range: 0–2.5 μg/L). An open D2 right hemicolectomy was performed (Figure 1), and the final histology revealed pT4bN1bM0 colon adenocarcinoma with 2/27 positive lymph nodes. All the resection margins were free of the tumor, with the tumor invasion limited to Gerota's fascia. Capecitabine-based adjuvant chemotherapy was started.

A surveillance CT scan of the abdomen and pelvis done at 1 year showed a bulky necrotic tumor with an invasion of the third part of the duodenum (Figure 1 and 2). A magnetic resonance imaging scan of the pancreas confirmed duodenal invasion with the proximity of the tumor to the uncinate process or head of the pancreas (Figure 1). After a discussion with the multidisciplinary team, the decision was made for a PSDR.

The patient was counseled for multi-visceral resection, revision of ileocolic anastomosis, possible stoma creation, and a possible pancreaticoduodenectomy. Patient consented for the procedure and this case report was obtained. At exploratory laparotomy, the recurrence was noted to involve the second and third part of the duodenum and was close to, but not involving, the uncinate process of the pancreas. A PSDR was performed with excision of the recurrent tumor *en bloc*, including the ileocolic anastomosis, along with densely adherent small bowel loop and a cholecystectomy (Figure 1). The second and third parts of the duodenum up to the duodenojejunal flexure were resected, preserving the ampulla of Vater, pancreas, and uncinate process. Most of the small bowel was resected, leaving about 120 cm of the remnant small bowel. Reconstruction was performed by duodenojejunostomy at the junction of the first-second part of the duodenum and a new ileocolic anastomosis.

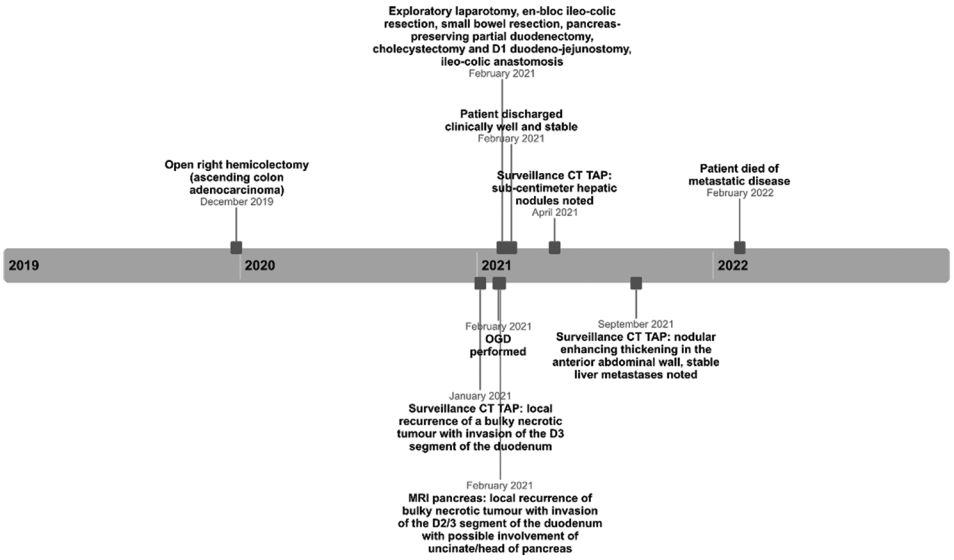

Figure 1. Timeline showing interventions performed on the patient.
Abbreviation: OGD: Oesophago-gastro-duodenoscopy

DOI: http://dx.doi.org/10.18053/jctres.09.202305.22-00228

Figure 2. Surveillance computerized tomography scan of abdomen and pelvis showing the ileocolic anastomosis (white arrowhead) as well as a duodenal invasion (white arrows).

Histology revealed a moderately differentiated adenocarcinoma, suggestive of recurrence of the previously resected tumor, directly invading the duodenum. The proximal and distal margins of the ileocolic resection were uninvolved by the invasive carcinoma, and metastasis in five out of 12 regional lymph nodes was found. The postoperative course was complicated by a Grade B POPF according to the International Study Group of Pancreatic Surgery definition and this was managed with antibiotics and percutaneous image-guided drainage. The patient recovered well. However, a CT scan done at 3 months showed sub-centimetre hepatic lesions suspicious of metastases (Figure 1). Considering patient preferences for omitting intravenous chemotherapy, palliative oral capecitabine was commenced. She died of metastatic disease 28 months after the index surgery (Figure 1).

3. Discussion

PSDRs are uncommon procedures performed for benign, premalignant, or early-stage malignant duodenal lesions. For example, in patients with familial duodenal adenomatous polyposis, PSDR is done with prophylactic intent to reduce the risk of malignant transformation [11-16]. PSDR is anecdotally reported in malignant infiltration of the duodenum from other organs [6,14,15], or local invasion from colon cancer [10], and this is one of the first reports of PSDR for metastatic right colonic adenocarcinoma infiltrating into the duodenum.

PSDR is a technically challenging procedure, and it involves two considerations: Total or partial duodenal resection and management of the ampulla of Vater with its biliopancreatic digestive juices. With regards to the length of duodenal segment resection, Konishi *et al.* described four types of PSDR: (a) Pancreas-sparing total duodenectomy (complete resection of the duodenum, including pylorus), (b) pancreas-sparing subtotal duodenectomy (preserving the pylorus and duodenal bulb), (c) pancreas-sparing proximal duodenectomy (resection of the proximal duodenum), and (d) pancreas-sparing distal duodenectomy (resection of the distal duodenum) [6]. In our patient, pancreas-sparing distal duodenectomy was performed with transection at the level of the ampulla of Vater. With regards to the management of the ampulla of Vater, three types of technical modifications are described [7,17]. Type I includes the preservation of the pancreas's major and minor papilla and the upper or lower portion of the duodenal wall. Type II only preserves the major papilla anastomosed to the jejunum. Type III is an excision of the intraduodenal segment of the major papilla to expose the distal segments of the bile duct and pancreatic ducts before anastomosing them to the jejunum. In our patient, the Type I technique was sufficient for achieving oncological clearance [7,17].

PSDR saves the need for pancreaticoduodenectomies with a reduction in the risk of POPF. Preserving the pancreas allows for shorter surgical time, less intraoperative bleeding, and the omission of a hepaticojejunostomy in an undilated bile duct [8]. Pancreas-sparing procedures allow for the preservation of both endocrine and exocrine function of the pancreas with reduced risk of malabsorption and diabetes mellitus [8]. To note, PSDR is not always technically feasible, and all patients should be counseled for pancreaticoduodenectomy as the final decision rests on intraoperative assessment. In our patient, the uncinate process of the pancreas was in proximity but not directly involved, and thus, we managed to shave the tumor along with the pancreatic capsule, which contributed to a POPF. Cirocchi *et al.* have reported that multi-visceral resections, including synchronous duodenal resections, are safe and feasible in patients with locally advanced colon cancer and should be performed when R0 resection can be achieved [10]. Although the perioperative morbidity was comparable for patients with pancreaticoduodenectomies ($n = 39$) and duodenal resections ($n = 14$), the survival of patients with pancreaticoduodenectomies was superior when compared to local duodenal resection patients. Our patient had underwent duodenal resection for metastatic local recurrence and we decided to perform a PSDR rather than a pancreaticoduodenectomy as we were able to achieve R0 resection.

Although a pancreas-sparing procedure can achieve a lower morbidity rate compared to a standard pancreaticoduodenectomy [8], post-operative morbidity is still significant [18]. A PSDR leads to greater difficulty in reconstruction, with an increased risk of anastomotic leak and stenosis [19]. In a systematic review by Cantalejo *et al.* involving 211 patients, 49.7% of patients who underwent a pancreatic preserving duodenectomy had post-operative complications [8]. The most common complications reported were POPF (36.0%), delayed gastric emptying (15.7%), and wound infection (10.5%) [8]. Thus, even though the number of anastomoses is reduced in PSDR, the morbidity is comparable to a standard pancreaticoduodenectomy. Hence, PSDR is not performed with the intent of reducing post-operative morbidity, but instead to preserve pancreas function. If morbidity is reduced, it is a welcomed by-product. It is also important to consider nodal clearance in surgical decision-making and not only R0 resection. Thus, even though R0 clearance was achieved in most patients, survival after a pancreaticoduodenectomy was superior compared to duodenal resection in patients with locally advanced colon cancer [10].

DOI: http://dx.doi.org/10.18053/jctres.09.202305.22-00228

Another technical consideration would be to perform an ampullectomy alone. In a single-center study spanning over two decades and including patients with benign, premalignant, and early-stage malignant duodenal lesions, Papalampros *et al.* reported 10 patients with PSDR and 14 patients with transduodenal ampullectomies [20]. Although transduodenal ampullectomies were associated with a shorter operative time (145 min vs. 183 min, $P < 0.05$) and blood loss (85 vs. 125 ml, $P < 0.05$) compared to PSDR, overall morbidity was 54.2% [20]. Thus, it appears that morbidity is inherent in the procedure regardless of duodenal preserving approaches (such as ampullectomies) or PSDR. In our patient, the ampulla was not invaded by the malignant recurrence. Thus, the ampulla-preserving method was performed. Cho *et al.* reported treating a 50-year-old patient with duodenal invasion from an exophytic hepatocellular carcinoma with a PSDR involving a proximal duodenectomy [15]. They achieved negative resection margins with the proximal duodenectomy, and we achieved negative margins with a distal duodenectomy. Kimura *et al.* reported a 71-year-old female patient managed with a right nephrectomy for a retroperitoneal sarcoma presenting 3 years later with a recurrence infiltrating the hepatic flexure of the colon and second-third part of the duodenum [14]. The authors reported a PSDR involving a distal duodenectomy, like ours; however, they resected the ampulla and created a Type III reconstruction. The patient had a prolonged hospital stay of 67 days with various complications that did not require a relaparotomy, and no long-term outcome was reported. Overall, while PSDR shows promise as a potential surgical approach for duodenal metastases, its application should be carefully considered on a case-by-case basis, taking into account the patient's specific circumstances and the surgeon's expertise. Further studies and collaborative efforts are needed to expand our understanding of this procedure and optimize its outcomes.

4. Conclusion

PSDR in patients with metastatic colon cancer infiltrating the duodenum is safe and feasible. Pancreatic surgeons have a duty to share their experience to enhance understanding of the oncologic efficiency of this procedure in patients with primary or metastatic non-pancreatic malignancies.

Acknowledgments

None.

Conflicts of Interest

There are no commercial associations that might create a conflict of interest in connection with this manuscript.

Ethics Approval and Consent to Participate

Ethics approval and consent from patient were obtained.

Consent for Publication

Consent from patient has been obtained.

References

[1] Li T, D'Cruz RT, Lim SY, Shelat VG. Somatostatin Analogues and the Risk of Post-Operative Pancreatic Fistulas after Pancreatic Resection-a Systematic Review and Meta-Analysis. Pancreatology 2020;20:158-68.

[2] Serene TE, Vishalkumar SG, Padmakumar JS, Terence HC, Keem LJ, Bei W, *et al.* Predictive Value of Post-Operative Drain Amylase Levels for Post-Operative Pancreatic Fistula. Ann Hepatobiliary Pancreat Surg 2018;22:397-404.

[3] Lu C, Jin W, Mou Y, Shao H, Wu X, Li S, *et al.* Optimal Laparoscopic Management and Oncological Outcomes of Gastrointestinal Stromal Tumors in Duodenum: Pancreaticoduodenectomy or Pancreas-Sparing Duodenectomy? Cancer Manag Res 2020;12:4725-34.

[4] Burasakarn P, Higuchi R, Nunobe S, Kanaji S, Eguchi H, Okada KI, *et al.* Limited Resection vs. Pancreaticoduodenectomy for Primary Duodenal Adenocarcinoma: A Systematic Review and Meta-Analysis. Int J Clin Oncol 2021;26:450-60.

[5] Chia CL, Lee AY, Shelat VG, Ahmed S, Junnarkar SP, Woon WW, *et al.* Does diabetes Mellitus affect Presentation, Stage and Survival in Operable Pancreatic Cancer? Hepatobiliary Surg Nutr 2016;5:38-42.

[6] Konishi M, Kinoshita T, Nakagohri T, Takahashi S, Gotohda N, Ryu M. Pancreas-Sparing Duodenectomy for Duodenal Neoplasms Including Malignancies. Hepatogastroenterology 2007;54:753-7.

[7] Nagai H, Hyodo M, Kurihara K, Ohki J, Yasuda T, Kasahara K, *et al.* Pancreas-Sparing Duodenectomy: Classification, Indication and Procedures. Hepatogastroenterology 1999;46:1953-8.

[8] Cantalejo-Díaz M, Ramia-Ángel JM, Palomares-Cano A, Serradilla-Martín M. Pancreas-Preserving Total Duodenectomy: A Systematic Review. Dig Surg 2021;38:186-97.

[9] Mitchell WK, Thomas PF, Zaitoun AM, Brooks AJ, Lobo DN. Pancreas Preserving Distal Duodenectomy: A Versatile Operation for a Range of Infra-Papillary Pathologies. World J Gastroenterol 2017;23:4252-61.

[10] Cirocchi R, Partelli S, Castellani E, Renzi C, Parisi A, Noya G, *et al.* Right hemicolectomy plus pancreaticoduodenectomy vs partial duodenectomy in treatment of locally advanced right colon cancer invading pancreas and/or only duodenum. Surg Oncol 2014;23:92-8.

[11] Mackey R, Walsh RM, Chung R, Brown N, Smith A, Church J, *et al.* Pancreas-Sparing Duodenectomy is Effective Management for Familial Adenomatous Polyposis. J Gastrointest Surg 2005;9:1088-93, discussion 1093.

[12] Leite JS, Tralhão JG, Manso A, Fernandes M, Cunha I, Amaro P. Pancreas-and Pylorus-Preserving Duodenectomy for Advanced Familial Duodenal Polyposis. GE Port J

Gastroenterol 2020;27:185-91.

[13] Naples R, Simon R, Moslim M, Augustin T, Church J, Burke CA, *et al.* Long-Term Outcomes of Pancreas-Sparing Duodenectomy for Duodenal Polyposis in Familial Adenomatous Polyposis Syndrome. J Gastrointest Surg 2021;25:1233-40.

[14] Kimura Y, Mukaiya M, Honma T, Okuya K, Akizuki E, Kihara C, *et al.* Pancreas-sparing duodenectomy for a recurrent retroperitoneal liposarcoma: Report of a Case. Surg Today 2005;35:91-3.

[15] Cho A, Ryu M, Ochiai T. Successful Resection, Using Pancreas-Sparing Duodenectomy, of Extrahepatically Growing Hepatocellular Carcinoma Associated with Direct Duodenal Invasion. J Hepatobiliary Pancreat Surg 2002;9:393-6.

[16] Augustin T, Moslim MA, Tang A, Walsh RM. Tailored Surgical Treatment of Duodenal Polyposis in Familial Adenomatous Polyposis Syndrome. Surgery 2018;163:594-9.

[17] Acer-Demir T, Ötgün I, Özçay F. First Report of Treatment with Pancreas-Sparing Duodenectomy in a Child with Primary Intestinal Lymphangiectasia. J Indian Assoc Pediatr Surg 2020;25:106-9.

[18] Sperti C, Pasquali C, Berselli M, Frison L, Vicario G, Pedrazzoli S. Metastasis to the Pancreas from Colorectal Cancer: Is there a Place for Pancreatic Resection? Dis Colon Rectum 2009;52:1154-9.

[19] Cavallaro G, Polistena A, D'Ermo G, Pedullà G, De Toma G. Duodenal Gastrointestinal Stromal Tumors: Review on Clinical and Surgical Aspects. Int J Surg 2012;10:463-5.

[20] Papalampros A, Moris D, Petrou A, Dimitrokallis N, Karavokyros I, Schizas D, *et al.* Non-Whipple Operations in the Management of Benign, Premalignant and Early Cancerous Duodenal Lesions. Anticancer Res 2017;37:1443-52.

DOI: http://dx.doi.org/10.18053/jctres.09.202305.22-00228