CASE REPORT

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

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Abstract

**Background.** Pancreas sparing duodenal resection (PSDR) is commonly described in patients with familial duodenal adenomatous polyposis, duodenal gastrointestinal stromal tumours, 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, less than five PSDR for duodenal metastases reports were retrieved. Our patient was treated with PSDR for a local recurrence after a right hemicolecction performed for right colon adenocarcinoma a year before.

**Aim.** 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 right iliac fossa pain and weight loss one year post-resection of the primary ascending colon cancer. A surveillance computed tomography (CT) 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 postoperative course was complicated by a grade B postoperative pancreatic fistula (POPF) 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.

**Keywords:** colorectal adenocarcinoma, duodenal metastases, pancreatic sparing duodenal resection, case study
1. Introduction

The pancreas is an unforgiving organ, and surgery involving the pancreas carries a significant risk of morbidity, especially for postoperative 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 tumours, 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 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.

Though 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-centre 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 R 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 Report

A 74-year-old lady presented with 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 9x8cm ascending colon mass involving the anterior abdominal wall and right adnexa with no distant metastases. Carcinoembryonic antigen (CEA) was high at 160 µg/L (normal range: 0-2.5 µg/L). An open D2 right hemicolectomy was performed, and the final histology revealed pT4bN1bM0 colon adenocarcinoma with 2/27 positive lymph nodes. All the resection margins were free of the tumour, with the tumour invasion limited to Gerota’s fascia. Capecitabine-based adjuvant chemotherapy was started.

A surveillance CT scan of the abdomen and pelvis done at one year showed a bulky necrotic tumour with an invasion of the third part of the duodenum (Figure 1). A magnetic resonance imaging (MRI) scan of the pancreas confirmed duodenal invasion with the proximity of the tumour to the uncinate process or head of the pancreas. After a discussion with the multidisciplinary team, the decision was made for a PSDR.
Figure 1. Surveillance computerized tomography scan of abdomen and pelvis showing the ileocolic anastomosis (white arrowhead) as well as a duodenal invasion (white arrows).

The patient was counselled 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 pancreas sparing duodenal resection (PSDR) was performed with excision of the recurrent tumour en-bloc, including the ileocolic anastomosis, along with densely adherent small bowel loop and a cholecystectomy. 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 duodeno-jejunostomy at the junction of the first-second part of the duodenum and a new ileocolic anastomosis.

Histology revealed a moderately differentiated adenocarcinoma, suggestive of recurrence of the previously resected tumour, 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 (ISGPS) definition and this was managed with antibiotics and percutaneous image-guided drainage. The patient recovered well. However, a CT scan done at three months showed sub-centimetre hepatic lesions suspicious of metastases. Considering patient preferences for omitting intravenous chemotherapy, palliative oral capecitabine was commenced. She died of metastatic disease 28 months after the index surgery.

*OGD – Oesophago-gastro-duodenoscopy

**Figure 2.** Timeline showing interventions performed on the patient.
3. Discussion

Pancreas sparing duodenal resections (PSDR) 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 counselled 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 tumour along with the pancreatic capsule, which contributed to a POPF. Cirocchi R et al has 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], postoperative 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 postoperative 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 postoperative 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].

Another technical consideration would be to perform an ampullectomy alone. In a single-centre 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 three years later with a recurrence infiltrating the hepatic flexure of the colon and second-third part of the duodenum [14]. 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.
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Conflict of interest

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