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International Journal of Surgery Case Reports

journal homepage: www.casereports.com

A novel intestinal rotation method for digestive reconstruction after combined pancreaticoduodenectomy and extended right hemicolectomy: A case report and surgical technique

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ARTICLE INFO

Article history:

Received 14 July 2017

Received in revised form 29 July 2017

Accepted 30 July 2017

Available online 8 August 2017

Keywords:

Pancreaticoduodenectomy

Right hemicolectomy

Digestive reconstruction

Intestinal rotation method

ABSTRACT

INTRODUCTION: Pancreaticoduodenectomy (PD) combined with extended right hemicolectomy (RH) is a challenging procedure for locally advanced malignancies. However, information concerning the reconstruction method of the digestive system is limited. Here, we present a case and surgical technique of a novel intestinal rotation method for digestive reconstruction after PD combined with RH.

PRESENTATION OF CASE: A 62-year-old man with locally advanced pancreatic cancer received conversion surgery combined with PD and RH after preoperative chemotherapy. With respect to the reconstruction of the digestive system, the entire intestinal mesentery was rotated 180° forward counterclockwise around the axis of the superior mesenteric artery, and then the reconstruction, according to Child's method, was performed. The patient recovered without problems in gastroenterological functions after the operation.

DISCUSSION: With respect to the reconstruction of the digestive system in patients undergoing combined PD and RH, practitioners should pay close attention to twisting of the intestinal mesentery when bringing up the proximal jejunum for pancreatojejunostomy and hepatojejunostomy and the distal ileum for ileocolic anastomosis. This intestinal rotation method enables a smooth and uneventful reconstruction of the digestive system.

CONCLUSION: This is the first detailed description of an intestinal rotation method for digestive reconstruction after combined PD and extended RH. The intestinal rotation method can be an alternative and helpful technical option for digestive reconstruction in patients with combined PD and RH.

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1. Introduction

Pancreaticoduodenectomy (PD) is recognized as the most complicated and technically complex procedure for treating tumors around the head of the pancreas. A tumor developing from the periampullary region often extends beyond the pancreas, directly invading adjacent organs, and infiltrating the transverse colon or its mesentery, resulting in major vascular encasement [1]. Combined multi-organ resection is considered the best therapeutic treatment for patients with locally advanced malignancies. In addition, PD combined with an en bloc extended right hemicolectomy (RH) is

the best radical option to perform complete resection of various periampullary malignancies without distant metastasis.

Previous studies have shown the feasibility and safety of combined PD and RH for locally advanced tumors [1–6]. However, information concerning the reconstruction method of the digestive system is limited. In conventional PD, the proximal jejunum is brought up through a postcolic route to perform pancreatojejunostomy and hepatojejunostomy. The reconstruction of the gastrojejunostomy is then made through an antecolic route [7]. On the other hand, particularly in PD combined with RH, the conventional reconstruction method described by Child is difficult after the resection of the right hemicolon and its mesentery [8]. Major concerns include the locations and routes of the digestive reconstruction, including in ileocolic anastomosis.

In this case report, we describe a case of PD combined with RH for a locally advanced pancreatic cancer and the surgical technique of an intestinal rotation method for digestive reconstruction. This case report has been reported in line with the SCARE criteria [9].

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<http://dx.doi.org/10.1016/j.ijscr.2017.07.063>

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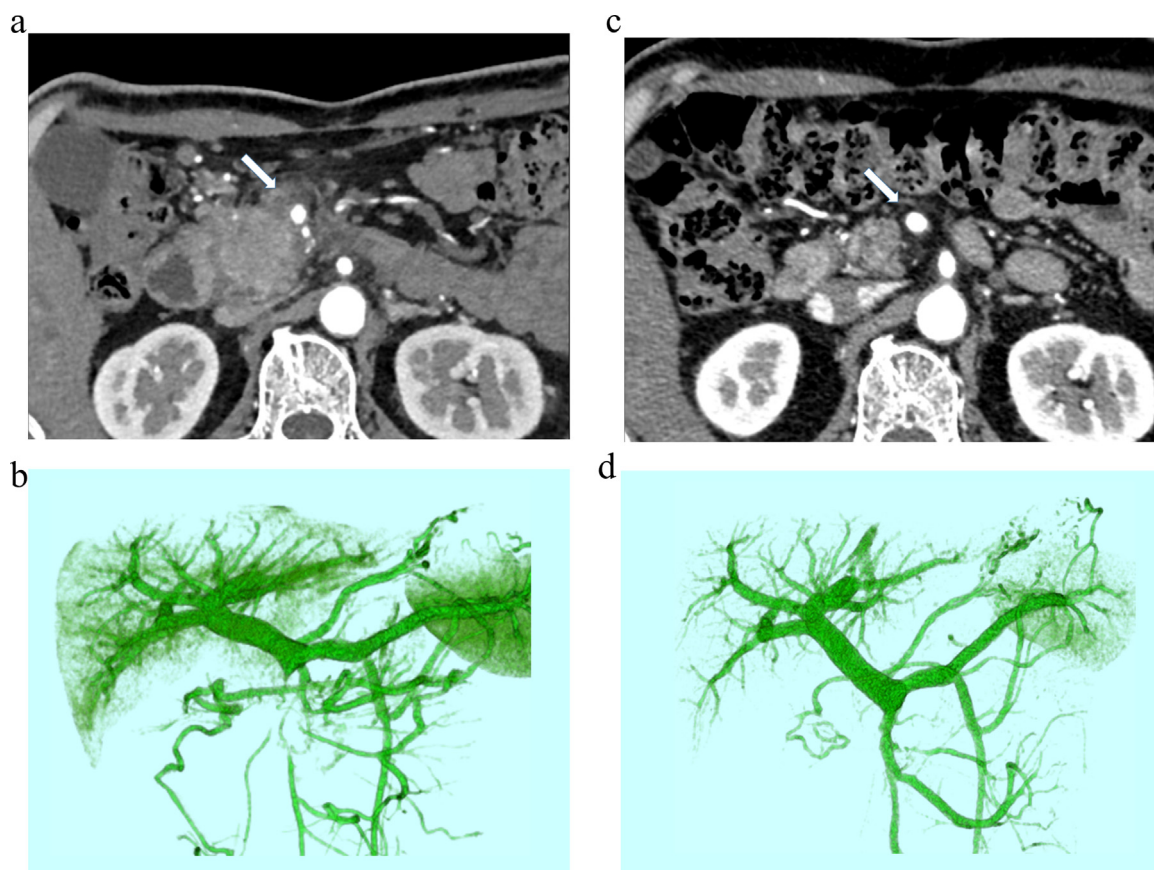


Fig. 1. Contrast-enhanced computed tomography images: **a.** A tumor of approximately 4.0 cm in the pancreatic head with invasion extending into the plexus nerve around the superior mesenteric artery (SMA) before chemotherapy (arrow); **b.** The tumor occluded the superior mesenteric vein (SMV) completely. The tumor was diagnosed as an unresectable locally advanced pancreatic head cancer; **c.** After chemotherapy, the tumor shrunk substantially, and the invasion into the plexus nerve around the SMA became unclear (arrow); **d.** The SMV became patent. The tumor was diagnosed as a borderline resectable pancreatic cancer.

2. Case report and surgical technique

A 62-year-old male with a previous history of diabetes was referred to our facility complaining of anemia and hyperglycemia. Abdominal contrast-enhanced computed tomography (CT) showed a tumor of approximately 4.0 cm in the pancreatic head with invasion extending into the plexus nerve around the superior mesenteric artery (SMA) (Fig. 1a). The tumor occluded the superior mesenteric vein (SMV) completely (Fig. 1b), but no distant metastasis was found. Endoscopic biopsy revealed adenocarcinoma. Accordingly, the tumor was diagnosed as an unresectable locally advanced pancreatic head cancer.

The patient received combination chemotherapy regimens of 2 courses of FOLFIRINOX (fluorouracil, leucovorin, irinotecan, and oxaliplatin), and 5 courses of gemcitabine plus *nab*-paclitaxel [10,11]. Due to side effects, continuing chemotherapy became difficult. However, these regimens were effective for this patient. The tumor shrunk extremely, and the invasion into the plexus nerve around the SMA became unclear (Fig. 1c). In addition, the SMV became patent (Fig. 1d). We diagnosed the tumor as borderline resectable pancreatic cancer, then decided to perform conversion surgery. Regarding surgical procedures, a CT revealed an invasion to the SMV, and the possibility of invasion to the plexus nerve around the SMA, and infiltration to the middle colic artery (MCA) and ileocecal artery (ICA). Therefore, we planned to perform a subtotal stomach-preserving PD combined with extended RH and SMV reconstruction.

Intraoperative findings showed no liver metastasis and peritoneal dissemination. The first step was performed using the

mesenteric approach [12]. The SMV and SMA were peeled off and the plexus nerve around the SMA was dissected, which showed no malignancy on the intraoperative pathological examination. Once resectability was confirmed, the ICA and MCA arising from the SMA were ligated because of the possibility of tumor invasion into the ICA and MCA. A right colon mobilization was also added, and then the distal ileum approximately 10 cm from the end of ileum and transverse colon were divided. The proximal jejunum was transected approximately 20 cm from the ligament of Trietz, and the stomach was divided at the oral side of the pyloric ring. Next, regarding the cholecystectomy, lymph node dissection, including hepatoduodenal ligament, and resection of the bile duct and gastroduodenal artery were performed. The pancreatic neck was then transected on the SMA, which showed negative margins. After the extended Kocher's maneuver, the portal vein and SMV were resected. Accordingly, resection of the specimen combined with PD, extended RH, SMV resection, and wide lymphadenectomy were completed.

With respect to the reconstruction of the digestive system, we developed an intestinal rotation method for digestive reconstruction. The overview of this technique is shown in Fig. 2. At first, the entire intestinal mesentery was rotated 180° forward counterclockwise around the axis of the SMA (Fig. 3). In conventional reconstruction after combined PD and RH, only the upper proximal jejunum mesentery is rotated around the axis of the SMA and brought up to perform pancreatojejunostomy and hepatojejunostomy reconstruction (Fig. 4). However, our entire intestinal rotation method can make the following reconstruction procedures, according to Child's method, easier: the pancreato-

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