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# A 61-Year-Old Woman With Locally Advanced Pancreatic Adenocarcinoma Managed With Neoadjuvant FOLFIRINOX, Total Pancreatectomy, Splenectomy, Portal Vein and Common Hepatic Artery Resection, and Combined Vascular Reconstruction Using Splenic Artery Transposition: A Case Report

## Authors' Contribution:

Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
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**Patient:** Female, 61-year-old  
**Final Diagnosis:** Pancreatic cancer  
**Symptoms:** Jaundice  
**Clinical Procedure:** Whipple procedure  
**Specialty:** Surgery  
**Objective:** Unusual setting of medical care  
**Background:** This report describes a 61-year-old patient with locally advanced pancreatic adenocarcinoma involving the portal vein and common hepatic artery, managed with neoadjuvant chemotherapy with leucovorin, fluorouracil, irinotecan, and oxaliplatin (FOLFIRINOX), total pancreatectomy, splenectomy, portal vein and common hepatic artery resection, and combined arterial and portal vein reconstruction.  
**Case report:** The patient presented with progressive jaundice and an elevated carbohydrate antigen 19-9 (CA 19-9) level of 210 U/mL. Endoscopic ultrasound-guided biopsy confirmed pancreatic ductal adenocarcinoma, and imaging demonstrated major vascular involvement without distant metastases. After 12 cycles of FOLFIRINOX, restaging showed persistent portal vein and common hepatic artery involvement without metastatic disease. Total pancreatectomy and splenectomy were performed with resection of a 4-cm portal vein segment and the common hepatic artery. Portal venous continuity was restored by primary end-to-end anastomosis, and hepatic arterial inflow was reconstructed by splenic artery transposition to the proper hepatic artery. Final pathology demonstrated a 1.3-cm moderately differentiated pancreatic ductal adenocarcinoma, with 2 out of 41 lymph nodes involved and negative surgical margins. A postoperative chylous fistula was managed with percutaneous drainage and parenteral nutrition. At 15 months, a solitary pulmonary metastasis was resected. The patient died 27 months after surgery from severe pneumonia without locoregional recurrence.  
**Conclusions:** This case illustrates the technical management of simultaneous portal vein and hepatic artery resection during total pancreatectomy, using primary portal vein anastomosis and splenic artery transposition to restore arterial inflow.  
**Keywords:** Adenocarcinoma • Pancreas • Pancreatectomy • Vascular Surgical Procedures  
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## Introduction

Pancreatic ductal adenocarcinoma (PDAC) is the predominant histologic type of pancreatic malignancy and remains associated with poor long-term survival. Most patients are diagnosed after the age of 55 years, and only a minority have resectable disease at presentation. Clinical presentation varies according to tumor location and disease extent and can include painless jaundice, weight loss, abdominal pain, anorexia, pruritus, and new-onset diabetes [1].

Multidetector computed tomography (CT) is central to diagnosis, staging, and assessment of vascular involvement and resectability. Endoscopic ultrasound can further characterize the pancreatic lesion and allows tissue acquisition when histologic confirmation is required. Management is determined by disease stage and resectability and requires a multidisciplinary approach integrating systemic therapy and surgery. Surgical resection remains the only potentially curative treatment, while neoadjuvant chemotherapy is increasingly incorporated into the management of patients with borderline resectable or locally advanced disease [1-5].

Over the last 2 decades, improvements in systemic chemotherapy and perioperative management have significantly expanded the surgical indications for patients with pancreatic cancer. Modern neoadjuvant chemotherapy regimens, particularly FOLFIRINOX (leucovorin, fluorouracil, irinotecan, and oxaliplatin) and gemcitabine-based protocols, have demonstrated improved tumor response and better patient selection for surgery [2,3,5].

Borderline resectable pancreatic cancer is a particularly challenging clinical scenario. These tumors frequently involve major vascular structures such as the portal vein, superior mesenteric vein, and occasionally arterial structures including the common hepatic artery, superior mesenteric artery, or celiac axis. Historically, vascular involvement—especially arterial involvement—was considered a contraindication to surgical resection [6].

Venous resection during pancreatic surgery has progressively become accepted as a safe and effective technique in specialized centers. Multiple studies have demonstrated portal vein or superior mesenteric vein resection can be performed safely without negatively affecting long-term survival when negative surgical margins are achieved [7].

In contrast, arterial resection during pancreatic surgery remains more controversial. Early systematic reviews reported increased perioperative morbidity and mortality associated with arterial resection [6]. Nevertheless, more recent experiences from high-volume pancreatic surgery centers have suggested that

arterial resection can be feasible in carefully selected patients and can increase the probability of achieving an R0 resection (microscopically margin-negative resection) [8-12].

Achieving negative surgical margins remains one of the most important prognostic factors influencing long-term survival in pancreatic cancer. Several studies have demonstrated that patients undergoing R0 resection have significantly improved survival compared with those undergoing R1 resection (incomplete microscopic removal) [13-15].

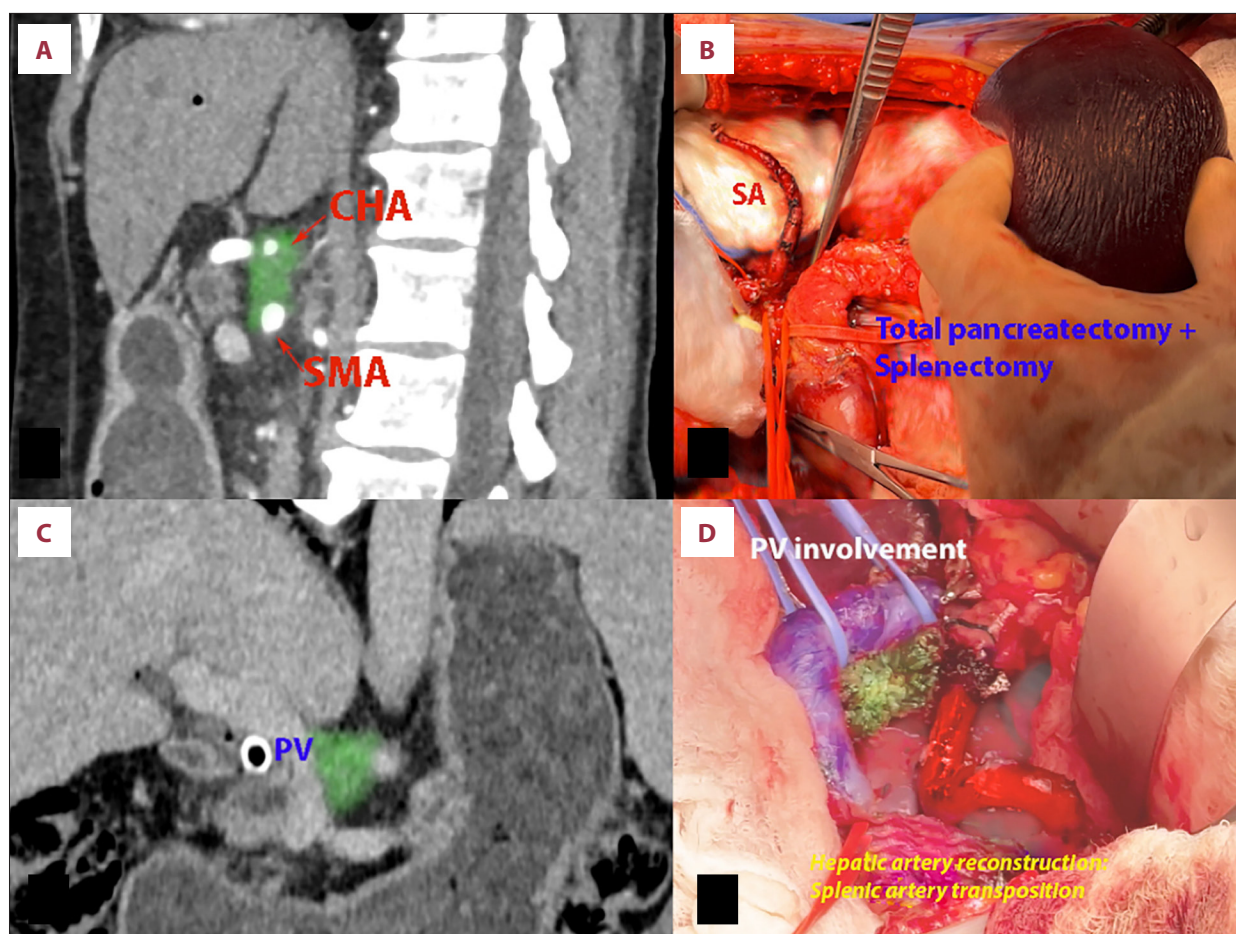
Various techniques have been described for arterial reconstruction following resection of the common hepatic artery during pancreatic surgery. Among these techniques, splenic artery transposition is a technically feasible option when the splenic artery can be preserved with sufficient length and caliber [16]. However, reports describing the use of splenic artery transposition in the setting of combined arterial and venous resection during total pancreatectomy remain extremely limited. In particular, the simultaneous reconstruction of both the portal venous system and hepatic arterial inflow is a technically complex surgical scenario.

Arterial resection has been described during pancreaticoduodenectomy, distal pancreatectomy, and total pancreatectomy, and the need for arterial resection can coexist with the need for simultaneous venous resection. In these complex cases, restoration of both portal venous continuity and hepatic arterial inflow may therefore be required following pancreatic resection [17].

A similar complex vascular scenario was reported by Kook et al, who described a patient with locally advanced pancreatic cancer and complete portal vein obliteration treated with neoadjuvant FOLFIRINOX followed by total pancreatectomy, splenectomy, and combined arterial and portomesenteric venous resection and reconstruction. In that case, preoperative percutaneous transhepatic portal vein stenting was performed to maintain portal flow and reduce collateral venous circulation before surgical resection [18].

The main surgical interest of our case is the reconstruction of both vascular territories, with primary end-to-end portal vein anastomosis and restoration of arterial inflow using splenic artery transposition with end-to-end anastomosis to the proper hepatic artery.

This report describes the case of a 61-year-old woman with locally advanced pancreatic adenocarcinoma involving portal vein and common hepatic artery, managed with neoadjuvant chemotherapy with leucovorin, fluorouracil (5-FU), irinotecan, and oxaliplatin (FOLFIRINOX), total pancreatectomy, splenectomy, and portal vein and common hepatic artery resection, followed by combined arterial and portal vein reconstruction.



**Figure 1.** Preoperative imaging and intraoperative findings during total pancreatectomy with combined vascular resection and reconstruction. (A) Preoperative computed tomography (CT), sagittal view, showing the pancreatic tumor (green) and its relationship with the common hepatic artery (CHA) and superior mesenteric artery (SMA). (B) Intraoperative view during total pancreatectomy and splenectomy showing the splenic artery (SA), which was dissected and preserved to provide adequate length for subsequent arterial reconstruction. (C) Preoperative CT, coronal view, showing the pancreatic tumor (green) in close relationship with the portal vein (PV). (D) Intraoperative view after total pancreatectomy and splenectomy demonstrating portal vein involvement requiring segmental resection and the completed hepatic arterial reconstruction using splenic artery transposition. Portal venous continuity was subsequently restored by primary end-to-end anastomosis.

## Case Report

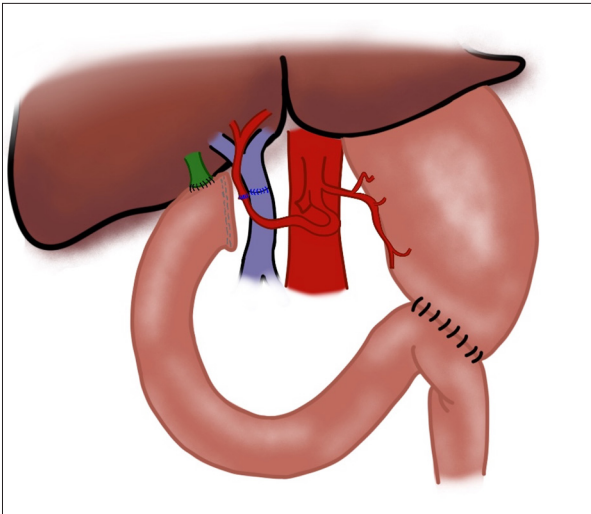
A 61-year-old woman presented with progressive jaundice. Her past medical history included arterial hypertension and a previous pulmonary thromboembolism treated with anticoagulation therapy. She had no family history of pancreatic malignancy and had discontinued smoking more than 20 years prior to presentation.

Initial evaluation included abdominal imaging and laboratory testing. Serum carbohydrate antigen 19-9 (CA 19-9) was elevated at 210 U/mL. Endoscopic retrograde cholangiopancreatography was performed at an external institution, placing a biliary stent to relieve obstructive jaundice. Endoscopic ultrasound with fine-needle biopsy confirmed pancreatic ductal adenocarcinoma.

Cross-sectional imaging demonstrated a pancreatic head and neck tumor with vascular involvement, including portal vein, common hepatic artery, superior mesenteric artery and celiac trunk. No distant metastases were identified (**Figure 1**).

Given the extent of vascular involvement, the patient was considered to have locally advanced pancreatic cancer and was started on neoadjuvant chemotherapy with FOLFIRINOX. She completed 12 cycles of chemotherapy with good tolerance.

Restaging imaging demonstrated persistent involvement of portal vein and common hepatic artery but no evidence of distant metastatic disease. The superior mesenteric artery and celiac trunk appeared free of tumor encasement. After multidisciplinary tumor board discussion, surgical resection was recommended.



**Figure 2. Schematic illustration of the vascular and gastrointestinal reconstruction following total pancreatectomy with combined vascular resection.** Original hand-drawn medical illustration created by one of the authors (J.A.G.) using Procreate. Hepatic arterial inflow was restored by splenic artery transposition with end-to-end anastomosis to the proper hepatic artery. Portal venous continuity was restored by primary end-to-end anastomosis following segmental portal vein (PV) resection. Biliary and gastrointestinal continuity were restored with hepaticojejunostomy and gastrojejunostomy, respectively. *This illustration was created exclusively for this case report and has not been previously published.*

Four weeks after the last cycle of chemotherapy and discontinuation of anticoagulation therapy, the patient underwent exploratory laparotomy through a bilateral subcostal incision. Intraoperative exploration confirmed the absence of peritoneal or hepatic metastases. The tumor was located at the pancreatic head and neck with infiltration of the portal vein and common hepatic artery. Given the central location of the tumor and need for combined venous and arterial resection, preservation of the distal pancreas was considered oncologically unsafe. Total pancreatectomy with splenectomy was therefore performed to ensure adequate surgical margins.

The splenic artery was carefully dissected and preserved during pancreatectomy with sufficient length to allow tension-free reconstruction. After completion of total pancreatectomy with splenectomy, without splitting the pancreas, hepatic arterial inflow was restored by transposition of splenic artery and end-to-end anastomosis with proper hepatic artery using running 7-0 polypropylene suture. A 4-cm segment of portal vein involved by the tumor was identified (Figure 1). Segmental portal vein resection was performed, and venous continuity was restored with a primary end-to-end anastomosis using running 6-0 polypropylene suture following systemic heparinization (Figure 2).

After restoration of vascular flow, intraoperative Doppler ultrasound confirmed adequate portal and arterial venous flow with a sharp systolic waveform. The total operative time was 13 hours. No intraoperative blood transfusions were required.

Computed tomography (CT) angiography performed on postoperative day 1 demonstrated patency of both arterial and venous reconstructions. This case was managed in conjunction with the endocrinology team immediately after surgery and the patient required permanent insulin therapy due to her apancreatic state following total pancreatectomy. She received 100 mg of acetylsalicylic acid on postoperative day 1, followed by full anticoagulation with a direct oral anticoagulant at discharge on postoperative day 12.

Within the first 30 postoperative days, she was readmitted with a chylous fistula requiring percutaneous drainage and subsequent management with total parenteral nutrition, corresponding to a Clavien-Dindo grade IIIA complication.

Final pathology demonstrated a 1.3-cm moderately differentiated pancreatic ductal adenocarcinoma with perineural invasion, T1N1M0. Two out of 41 examined lymph nodes were positive for metastatic disease. Portal vein infiltration was confirmed histologically, while the resected hepatic artery demonstrated a treatment effect without viable tumor cells. Surgical margins were negative (R0).

Given the completion of total neoadjuvant therapy before surgery, no adjuvant chemotherapy was administered in the immediate postoperative period. Fifteen months after surgery, surveillance imaging revealed a solitary pulmonary metastasis, which was subsequently resected. The patient died 27 months after surgery due to severe pneumonia without evidence of locoregional recurrence.

## Discussion

The main surgical learning point of this case is the technical management of simultaneous portal venous and hepatic arterial resection during total pancreatectomy. In this patient, portal venous continuity was restored by primary end-to-end anastomosis, while hepatic arterial inflow was reconstructed using splenic artery transposition to the proper hepatic artery. This case illustrates one reconstructive approach to a complex vascular defect encountered during pancreatic resection, without implying that this strategy should be routinely applied to patients with locally advanced pancreatic cancer.

Surgical resection remains the cornerstone of potentially curative treatment for pancreatic cancer [1,2]. However, many patients present with locally advanced disease involving major

vascular structures. Historically, vascular involvement was considered a contraindication to surgery. The development of modern systemic therapy and improvements in surgical technique have significantly expanded the role of surgery in this population [3-5].

Venous resection during pancreatic surgery is now widely accepted. Numerous studies have demonstrated that portal vein or superior mesenteric vein resection can be performed safely and does not negatively impact survival when negative margins are achieved [7-12].

In contrast, arterial resection during pancreatic surgery remains controversial. Early reports suggested high perioperative mortality rates and limited oncologic benefit [6]. Nevertheless, contemporary series from high-volume centers have demonstrated that arterial resection can be feasible in selected patients when performed by experienced surgical teams [11,12].

Similarly, an updated systematic review and meta-analysis evaluating modern studies published between 2018 and 2024 reported that arterial resection significantly increases the likelihood of achieving R0 resection, although it remains associated with increased perioperative mortality [11].

Achieving negative surgical margins remains one of the most important determinants of long-term survival in pancreatic cancer. Several studies have demonstrated that patients undergoing R0 resection have significantly improved overall survival compared with those undergoing R1 resection [10,13,14].

Regarding complete resection of the pancreatic gland, the reported mortality for total pancreatectomy can reach up to 20% [8]. In contrast, our center's experience demonstrates 30-day mortality of 0%, with a 14% incidence of Clavien-Dindo > IIIb complications [19]. These findings show that, although technically demanding, this procedure can be performed safely with acceptable morbidity and mortality rates in a multidisciplinary setting. While total pancreatectomy eliminates the risk of postoperative pancreatic fistula, it is associated with significant metabolic consequences. Therefore, it should be reserved for cases in which oncologic safety cannot be achieved with more limited resections.

Advances in systemic therapy have also played a key role in expanding surgical indications. Total neoadjuvant therapy has emerged as a promising strategy to improve outcomes in patients with borderline resectable pancreatic cancer involving arterial structures [20].

In the present case, hepatic arterial inflow was successfully restored using splenic artery transposition. This technique provides an effective reconstructive option when the splenic artery

can be preserved with adequate length and caliber. Previous reports have demonstrated that this approach can be safely used during pancreatic surgery [16,18].

The present case shares several clinical and surgical features with the case reported by Kook et al. Both patients had locally advanced pancreatic cancer with major vascular involvement, received neoadjuvant FOLFIRINOX, and subsequently underwent total pancreatectomy, splenectomy, and combined arterial and portal venous resection and reconstruction [18]. Our patient initially presented with progressive obstructive jaundice and was diagnosed by endoscopic ultrasound-guided biopsy, with imaging demonstrating major vascular involvement without distant metastases. In contrast, Kook et al described complete portal vein obliteration with extensive collateral circulation, requiring preoperative percutaneous transhepatic portal vein stenting before surgical resection. The vascular anatomy and reconstructive strategy therefore differed substantially. In our patient, portal venous continuity could be restored directly by primary end-to-end anastomosis after segmental portal vein resection, while hepatic arterial inflow was restored using splenic artery transposition to the proper hepatic artery. These differences illustrate how the vascular reconstructive strategy was adapted to the location and extent of vascular involvement in each case.

The particular surgical interest of this case lies in the combination of total pancreatectomy with simultaneous portal vein resection and hepatic artery reconstruction using splenic artery transposition. Although venous and arterial reconstructions during pancreatic surgery have been individually described, the combination of total pancreatectomy, simultaneous portal and hepatic artery resection, and splenic artery transposition is an uncommon and technically complex reconstructive scenario. This case report provides a detailed description of how portal venous continuity and hepatic arterial inflow were restored without the use of vascular interposition grafts.

## Conclusions

This case report illustrates the technical management of simultaneous portal vein and common hepatic artery resection during total pancreatectomy for locally advanced pancreatic cancer. Portal venous continuity was restored by primary end-to-end anastomosis, while hepatic arterial inflow was reconstructed using splenic artery transposition to the proper hepatic artery. This reconstructive approach illustrates the technical management of an uncommon and complex vascular scenario during pancreatic cancer surgery.

## Institution Where Work Was Done

Clinica Santa Maria, Santiago, Chile.

## Patient Consent

Written informed consent for publication of this case report and accompanying images was obtained from the patient's daughter. All patient data were anonymized to protect patient confidentiality.

## AI Disclosure

During manuscript preparation, OpenAI was used solely for English-language proofreading and grammatical correction. The scientific and clinical content, interpretation, and conclusions were developed by the authors. All authors reviewed and approved the final manuscript and take full responsibility for its content.

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This case report was presented as a poster at the E-AHPBA Congress in Lyon, France, 2023. Chapochnick J, Derosas C, Gonzalez J. Splenohepatic Arterial Bypass: A Novel Reconstruction Option of the Common Hepatic Artery after Resection during Total Pancreatectomy. HPB, 25S504. 10.1016/j.hpb.2023.07.648

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