Received: 6 September 2021 | Accepted: 22 November 2021
DOI: 10.1002/jso.26762

RESEARCH ARTICLE

Journal of SURGICAL ONCOLOGY WILEY

Falciform ligament tubular graft for mesenteric-portal vein reconstruction during pancreaticoduodenectomy

Silvio M. P. Balzan PhD[1,2,3,4] | Vinicius G. Gava MD[3] | Alexandre Rieger PhD[1,2] | Marcelo A. Magalhães MD[4] | Alex Schwengber MD[4] | Fagner Ferreira MD[4]

[1]Postgraduate Program in Health Promotion (PPGPS), University of Santa Cruz do Sul (UNISC), Santa Cruz do Sul, Brazil

[2]Cancer League, Life Sciences Department, University of Santa Cruz do Sul (UNISC), Santa Cruz do Sul, Brazil

[3]Oncology Center Lydia Wong Ling, Moinhos de Vento Hospital, Porto Alegre, Brazil

[4]Surgical Department, Ana Nery Hospital, Santa Cruz do Sul, Brazil

Correspondence
Silvio M. P. Balzan, PhD, Postgraduate Program in Health Promotion (PPGPS), University of Santa Cruz do Sul (UNISC), Av. Independencia 2293, Santa Cruz do Sul, 96816-501, Brazil.
Email: sbalzan@hotmail.com

Abstract

Background: Portal vein resection and reconstruction in locally advanced pancreatic cancer represents a potentially curative treatment in selected patients without increasing surgical mortality. However, vascular reconstruction after segmental venous resection is challenging. The parietal peritoneum has emerged as a venous substitute but few reports include its use as a tubular graft. We report a retrospective series of portal vein reconstruction using a falciform ligament tubular graft during pancreaticoduodenectomy.

Material and Methods: Technical aspects and short-term morbidity and mortality after pancreaticoduodenectomy with falciform ligament tubular graft interposition were analyzed.

Results: Among 21 patients who used parietal peritoneum for venous substitution between 2015 and 2019, eight underwent pancreaticoduodenectomy with venous resection and reconstruction using interposition of falciform ligament tubular graft. The mean duration of surgery and clamping time were 350 and 27 min, respectively. No perioperative blood transfusion was required. All the grafts were patent the day after surgery. No complication related to venous obstruction was detected during the hospital stay. Two patients had postoperative pancreatic fistula. No further intervention was needed. The 90-day mortality was null.

Conclusions: The use of interposition of falciform ligament tubular graft for portal venous reconstruction during pancreaticoduodenectomy seems to be a reliable, inexpensive, and safe procedure.

KEYWORDS
pancreatic neoplasms, pancreaticoduodenectomy, peritoneum, portal vein

1 | INTRODUCTION

Surgical resection is the only curative option for patients with pancreatic cancer. Extended procedures with en bloc vascular resection have been used to increase the resectability and achieve a better prognosis in locally advanced pancreatic cancers. Resection of the involved portal vein (PV) or superior mesenteric vein (SMV), most commonly during pancreaticoduodenectomy (PD), does not increase surgical mortality and provides better long-term survival than other palliative treatments in specialized centers.[1–7] Venous reconstruction can be performed by lateral venorrhaphy or tangential patch, or end-to-end anastomosis, after lateral or short segmental venous resections, respectively. However, vascular reconstruction can be challenging after more extensive PV/SMV resection, requiring a tubular graft interposition.[8] A range of materials, synthetic or biological, has been used as venous substitutes. Tubular graft options include synthetic grafts (such as polytetrafluoroethylene—PTFE), autologous veins (such as left renal, saphenous, iliac, and internal jugular veins), cadaveric veins cryopreserved, and bovine pericardium.[8–14] Main concerns with the use of these sources include the risk of graft infection (mainly in synthetic grafts) and the need for additional incisions or visceral dissection to harvest autologous veins. Also, in cases where venous resection was not predicted preoperatively some of these options may not be promptly available. Additionally, long-term anticoagulation is usually required. The use of autologous parietal peritoneum had been proposed as an advantageous option of venous substitute since it avoids all the cited concerns. Thus, autologous parietal peritoneum has been more frequently used for venous reconstruction in abdominal surgery, mainly as lateral patches for inferior vena cava and PV/SMV repair with encouraging results.[15–18] However, few cases of autologous parietal peritoneum for tubular graft interposition have been reported.[19,20] After our initial experience with inferior vena cava reconstructions[21] using different grafts of parietal peritoneum—peritoneo-fascial graft (parietal peritoneum backed by posterior rectus sheath) and nonfascial parietal peritoneum (harvested from falciform ligament or other sites), our group standardized the use of falciform ligament tubular graft for PV/SMV reconstruction whenever graft interposition was needed. This study reports a series of patients in whom autologous falciform ligament was used as tubular graft interposition during PD with en bloc PV/SMV resection.

2 | METHODS

2.1 | Patients

A retrospective study in a tertiary referral center for pancreatic surgery. All patients who underwent PD with concurrent PV/SMV resection and reconstruction using falciform ligament tubular graft were evaluated. Patients were operated on by the same surgical team. Since 2015 parietal peritoneum is considered the first option for all patients requiring venous patches during abdominal surgeries. During this period, 10 tubular grafts (9 for superior mesenteric-PVs and 1 for inferior vena cava reconstruction) and 11 lateral patches (7 for inferior vena cava, 2 for PV, and 2 for middle hepatic vein reconstruction) were used. Our first two peritoneal tubular grafts (one for PV and another for inferior vena cava reconstruction) were peritoneo-fascial backed by the posterior rectus sheath. Following this initial experience, we made eight additional tubular grafts using the falciform ligament. The use of falciform ligament is described here.

All patients had the diagnosis of nonmetastatic locally advanced ductal adenocarcinoma of the pancreatic head and received neoadjuvant chemotherapy with irinotecan/oxaliplatin or gemcitabine-based protocols for 2–3 months.

The study was previously approved by the institutional ethics committee and registered online (www.plataformabrasil.com; CAAE: 19718819.6.0000.5343)

2.2 | Surgical procedures

2.2.1 | Resection

A Whipple procedure with en bloc PV/SMV resection was performed in all cases. After the need for graft interposition was defined (segmental PV/SMV resection of 3 cm or greater), the parietal peritoneum (falciform ligament) harvesting was carried out and the tubular graft was fashioned. Only after the surgical specimen had been completely dissected and attached merely to the PV and SMV venous clamping and sectioning of the veins for final resection of the specimen were performed.

2.2.2 | Graft harvesting and venous reconstruction

Harvesting of falciform ligament peritoneum is started by sectioning the round ligament close to the anterior abdominal wall. Then the falciform ligament is sectioned close to the round ligament and the liver parenchyma to the triangular ligaments. The falciform ligament is later sectioned close to the anterior abdominal wall and diaphragm to join the previous line of resection (Figure 1). The fat free area of the falciform ligament was used. Careful dissection of the fat from the mesothelium should be done in those cases which the fat free area of the falciform is not enough. The tissue should be handled gently and the inner part of the tube should be the mesothelial surface.

The procedure of peritoneal harvesting should be performed without diathermic tools to avoid thermal injury to the graft. Also, excessive traction should be avoided. Once harvested, the graft is immediately placed in isotonic saline solution.

The tubular grafts were created by wrapping the harvested falciform ligament around a cylinder (anal dilator or syringe) to match the diameter of the PV/SMV (Figure 2). A continuous 5-0 polypropylene suture was used to assemble the graft with the expected length to be replaced. Additional interrupted stitches were placed in case a longer graft was needed. A continuous suture longer than the expected length should not be done as the suture line would be sectioned while fitting the graft.

Immediately before the vascular clamping for the PV/SMV resection, the patient was fully anticoagulated with unfractionated heparin

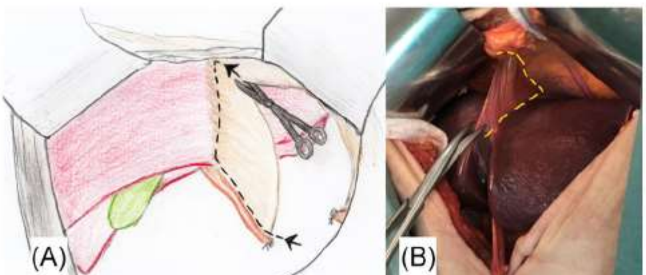

FIGURE 1 (A) Autologous nonfascial parietal peritoneum harvesting from the falciform ligament. Both sides of the graft have mesothelium and can be used as the inner side of the reconstructed vessel. (B) Intraoperative view of falciform ligament harvesting

FIGURE 2 Surgical aspect of a ligament falciform tubular graft being fashioned

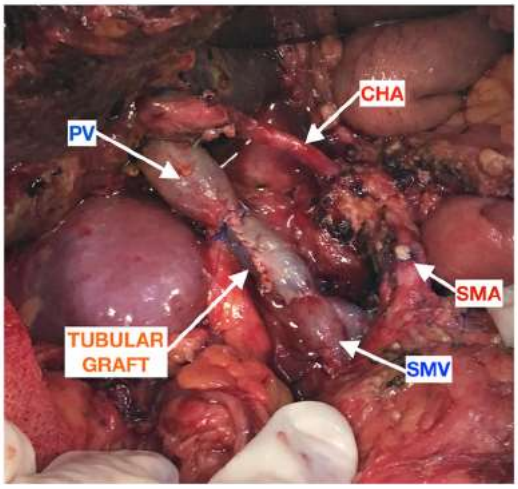

FIGURE 3 Intraoperative aspect of a falciform ligament tubular graft during pancreaticoduodenectomy with portal venous segmental resection. The tubular graft is anastomosed with the superior mesenteric vein (SMV) and the portal vein (PV). Note that the suture line used to the creation of tubular graft is sited anteriorly. The splenic vein was ligated. CHA, common hepatic artery; PV, portal vein; SMV, superior mesenteric vein; SMA, superior mesenteric artery

(activated partial thromboplastin time two times control). First, anastomosis between the tubular graft and the SMV is performed using running polypropylene 5-0 or 6-0 sutures (posterior and anterior) allowing a further diameter increase of approximately 25% (growth factor). The suture line used to create the tubular graft sits anteriorly to facilitate the identification of leakage following revascularization.

Following tubular graft and SMV anastomosis, the tubular graft was clamped and the SMV clamp opened to check for leakages. After that, the anastomosis between the tubular graft and the PV was performed similarly (Figure 3).

FIGURE 4 Schematic representation of falciform ligament tubular graft interposition between the superior mesenteric vein and the portal vein

The tubular graft clamp is removed first to fill the graft with blood avoiding any air embolism and allowing the identification of all possible clots. After removal of the clamps, protamine was used for the reversal of anticoagulation. The splenic vein was ligated and not reconstructed in four cases and preserved in the other ones as illustrated in Figure 4.

2.2.3 | Postoperative care

Postoperative care was standardized with patients monitored at the intensive care unit for 2 days. Subcutaneous administration of unfractionated heparin at a dose of 5000 U t.i.d. was continued postoperatively, until hospital discharge. Anticoagulants were not routinely used following hospital discharge. The patency of the graft was documented at regular follow-up imaging exams.

3 | RESULTS

Patients were four males and four females; mean age was 58 years old.

The mean duration of the surgical procedure was 350 min (300–480 min). The mean clamping time of the mesenteric-portal blood flow was 27 min (21–30 min). No transfusion of red blood cells or fresh frozen plasma was necessary during the perioperative course. Additional information is shown in Table 1.

Duplex scan was routinely performed in the one postoperative day to assure the patency of the graft as early thrombosis can be life threatening, Standard follow-up was based on contrast computed tomography (CT) scan every 3 months for the first 2 years. All the grafts showed to be patent 1 day after surgery at duplex examination. During hospitalization later graft patency was verified only in four patients, with contrast-enhanced abdominal CT for other reasons. However, no complication possibly related to venous obstruction was identified during the hospital stay. The 90-day mortality rate was 0%. Two patients developed postoperative pancreatic fistula grade B. No further surgical or radiological intervention was needed.

At a 6-months follow-up routine contrast-enhanced CT scans did not show thrombosis in seven (88%) patients, and in one patient

TABLE 1 Patients characteristics and technical details on tubular grafts for portal/mesenteric vein reconstruction

Patient	Age (year)	Sex	Splenic vein status[a]	Lenght of graft (cm)	Surgical time (min)	Intraoperative bleeding (cc)
1	54	Male	Preserved	5	360	500
2	62	Male	Preserved	4	340	450
3	71	Female	Ligated	5	480	600
4	47	Female	Preserved	3	360	600
5	53	Male	Preserved	4	310	400
6	66	Female	Ligated	5	300	300
7	57	Male	Preserved	4	340	450
8	53	Female	Preserved	3	310	300

[a]No splenic vein reconstruction was performed.

partial thrombosis was observed with no clinical manifestation. Mean overall hospital stay was 16 (10–28) days.

4 | DISCUSSION

Pancreatic cancer remains a highly fatal malignancy, with an increasing incidence over the world, and 459.000 new cases worldwide in 2018 according to GLOBOCAN estimates.[22] In the next 20–30 years, pancreatic cancer is projected to become the second leading cause of cancer death in the United States.[23,24]

Locally advanced disease, typically due to vascular involvement, is present in at least one-third of patients. Advancements in surgical technique (mainly improvements in venous and arterial reconstruction) and neoadjuvant chemotherapy offer an opportunity to improve outcomes for these patients.[3]

Pancreatic surgery requiring combined vascular resection is frequently performed in high-volume centers. Its role is well established when associated with perioperative chemotherapy. Postoperative mortality seems to be similar to pancreatic resections without vascular resection. Despite a worse survival, probably related to more advanced disease, pancreatic resection associated with vascular resection in tumors with venous invasion provides better long-term results than other palliative treatments and even the possibility of a cure.[2–7,25–31] The recently published recommendations from the French National Institute of Cancer[32] favors pancreatic resections combined with vascular resection to achieve complete tumor removal. Unlike R1 resections, complete resections can result in increased survival and even be curative.

Venous reconstruction after mesenteric PV resection varies mainly according to the extension of resection. Tangential or short segmental (until 3 cm) resections can usually be reconstructed through a direct suture, lateral patch (with a variety of materials), or end-to-end anastomosis. However, after a more extensive resection, interposition of a tubular graft (prosthetic, homologous, or autologous) is needed to ensure unimpaired blood flow continuity. Usual tubular grafts include prosthetic material (generally PTFE), biological grafts such as cryopreserved venous allograft or bovine pericardium, and autologous veins (mostly renal, iliac, saphenous, or jugular veins). The main disadvantages related to these techniques and materials include high cost, risk of graft infection, low availability, long-term anticoagulation, need for additional visceral dissection or incisions, longer operative time, among others.[8–13]

Recently, the use of the parietal peritoneum as a venous substitute has been reported in some series of patients undergoing vena cava or PV resection.[13,15–18,33] Experimental studies evidenced endothelialization of peritoneal grafts and good patency rate in short tubular inferior vena cava (IVC) grafts,[34,35] lateral patches of IVC,[35] and PV (with a patency rate of 100% and complete endothelialization after 2 weeks).[19,35]

The use of parietal peritoneum as a venous substitute presents several advantages including cheaper cost, no thrombogenic risk (and no need for long-term anticoagulation), great versatility (creation of different size patches), immediate availability, and low risk of graft infection.[18]

Two different types of the peritoneal patches have been described for abdominal venous reconstruction: (i) the peritoneo-fascial graft, harvested from the posterior rectus muscle sheath, and (ii) nonfascial parietal peritoneum, harvested from different sites, such as the diaphragm, the hypochondrium, the subcostal region, the falciform ligament, the parieto-colic gutter, and the prerenal area. The majority of lateral reconstruction of abdominal veins is performed using a nonfascial graft. On the other hand, the majority of venous reconstruction with tubular grafts use a peritoneo-fascial graft.[18] Nonfascial grafts seem to have a greater malleability and lower rigidity than those backed by posterior rectus sheath and, in our point of view, should be preferred for most venous reconstruction, mainly for thin-walled veins, including those using tubular patches. In this setting, falciform ligament represents an excellent option for a tubular graft structure, as it is easily harvested, has a considerable area usually available, both sides are coated by mesothelium allowing its use in the inner side of the tubular graft, and it is easy to handle.

Despite the advantages, reports with the use of falciform ligament for venous reconstruction are very rare, and most deal with lateral patches and not tubular-shaped reconstructions.[20,36–38] This series comprises only tubular autologous falciform ligament grafts as a substitute for PV/SMV reconstruction. Our first case of PV reconstruction using tubular graft was performed with a peritoneofascial graft during PD and was not included in this series. The patient presented PV thrombosis identified 1 month after surgery despite the use of nonfractionated heparin, but with no complications directly related to portal obstruction. All the subsequent superior mesenteric/PV tubular reconstructions (during pancreaticoduodenectomies) were performed using falciform ligament tubular graft. This technique was standardized in our group for PV/SMV reconstruction with tubular graft interposition. Despite the lack of documentation of patency over 6 months in our patients, no complication attributable to PV/SMV postoperative thrombosis was identified during the early postoperative period.

5 | CONCLUSION

Our results suggest that the use of falciform ligament tubular graft for PV/SMV reconstruction during PD is a safe technique and could have some advantages over other methods of graft interposition. Despite the small number of patients, to our knowledge, this is the largest reported series of tubular grafts for PV/SMV using autologous parietal peritoneum.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Silvio M. P. Balzan http://orcid.org/0000-0002-7164-8141

REFERENCES

1. Truty MJ, Kendrick ML, Nagorney DM, et al. Factors predicting response, perioperative outcomes, and survival following total neoadjuvant therapy for borderline/locally advanced pancreatic cancer. *Ann Surg*. 2021;273(2):341-349. doi:10.1097/SLA.0000000000003284
2. Al-Haddad M, Martin JK, Nguyen J, et al. Vascular resection and reconstruction for pancreatic malignancy: a single center survival study. *J Gastrointest Surg*. 2007;11(9):1168-1174. doi:10.1007/s11605-007-0216-x
3. Navez J, Bouchart C, Lorenzo D, Bali MA, Closset J, van Laethem JL. What should guide the performance of venous resection during pancreaticoduodenectomy for pancreatic ductal adenocarcinoma with venous contact? *Ann Surg Oncol*. 2021;28(11):6211-6222. doi:10.1245/s10434-020-09568-2
4. Giovinazzo F, Turri G, Katz MH, Heaton N, Ahmed I. Meta-analysis of benefits of portal-superior mesenteric vein resection in pancreatic resection for ductal adenocarcinoma. *Br J Surg*. 2016;103(Issue 3):179-191. doi:10.1002/bjs.9969
5. Yekebas EF, Bogoevski D, Cataldegirmen G, et al. En bloc vascular resection for locally advanced pancreatic malignancies infiltrating major blood vessels: perioperative outcome and long-term survival in 136 patients. *Ann Surg*. 2008;247(2):300-309. doi:10.1097/SLA.0b013e31815aab22
6. Xie Z-B, Li J, Gu J-C, Jin C, Zou C-F, Fu D-L. Pancreatoduodenectomy with portal vein resection favors the survival time of patients with pancreatic ductal adenocarcinoma: a propensity score matching analysis. *Oncol Lett*. 2019;18(5):4563-4572. doi:10.3892/ol.2019.10822
7. Fancellu A, Petrucciani N, Porcu A, et al. The impact on survival and morbidity of portal–mesenteric resection during pancreaticoduodenectomy for pancreatic head adenocarcinoma: a systematic review and meta-analysis of comparative studies. *Cancers*. 2020;12(7):1976. doi:10.3390/cancers12071976
8. Kleive D, Berstad AE, Sahakyan MA, et al. Portal vein reconstruction using primary anastomosis or venous interposition allograft in pancreatic surgery. *J Vasc Surg Venous Lymphat Disord*. 2018;6(1):66-74. doi:10.1016/j.jvsv.2017.09.003
9. Jara M, Malinowski M, Bahra M, et al. Bovine pericardium for portal vein reconstruction in abdominal surgery: a surgical guide and first experiences in a single center. *Dig Surg*. 2015;32(2):135-141. doi:10.1159/000370008
10. Miyazaki M, Shimizu H, Ohtuka M, et al. Portal vein thrombosis after reconstruction in 270 consecutive patients with portal vein resections in hepatopancreatobiliary (HPB) surgery. *Am J Surg*. 2017;214(1):74-79. doi:10.1016/j.amjsurg.2016.12.008
11. Chan KS, Srinivasan N, Koh YX, et al. Comparison between long and short-term venous patencies after pancreatoduodenectomy or total pancreatectomy with portal/superior mesenteric vein resection stratified by reconstruction type. *PLOS One*. 2020;15(11):0240737. doi:10.1371/journal.pone.0240737
12. Garnier J, Traversari E, Ewald J, Marchese U, Delpero J-R, Turrini O. Venous reconstruction during pancreatectomy using polytetrafluoroethylene grafts: a single-center experience with standardized perioperative management. *Ann Surg Oncol*. 2021;28:5426-5433. doi:10.1245/s10434-021-09716-2
13. Lee DY, Mitchell EL, Jones MA, et al. Techniques and results of portal vein/superior mesenteric vein reconstruction using femoral and saphenous vein during pancreaticoduodenectomy. *J Vasc Surg*. 2010;51(3):662-666. doi:10.1016/j.jvs.2009.09.025
14. Labori KJ, Kleive D, Khan A, Farnes I, Fosby B, Line PD. Graft type for superior mesenteric and portal vein reconstruction in pancreatic surgery—A systematic review. *HPB (Oxford)*. 2021;23(4):483-494. doi:10.1016/j.hpb.2020.11.008
15. Chin PT, Gallagher PJ, Stephen MS. Inferior vena caval resection with autogenous peritoneo-fascial patch graft caval repair: a new technique. *Aust N Z J Surg*. 1999;69(5):391-392. doi:10.1046/j.1440-1622.1999.01579.x
16. Pulitanó C, Crawford M, Ho P, et al. The use of biological grafts for reconstruction of the inferior vena cava is a safe and valid alternative: results in 32 patients in a single institution. *HPB*. 2013;15(8):628-632. doi:10.1111/hpb.12029
17. Dokmak S. Pancreaticoduodenectomy with reconstruction of the mesentericoportal vein by the parietal peritoneum: 'Safi dokmak vascular graft. *Ann Surg Oncol*. 2015;22(S3):343-344. doi:10.1245/s10434-015-4635-8
18. Lapergola A, Felli E, Rebiere T, Mutter D, Pessaux P. Autologous peritoneal graft for venous vascular reconstruction after tumor resection in abdominal surgery: a systematic review. *Updates Surg*. 2020;72(3):605-615. doi:10.1007/s13304-020-00730-9
19. Dokmak S, Aussilhou B, Sauvanet A, Nagarajan G, Farges O, Belghiti J. Parietal Peritoneum as an autologous substitute for venous reconstruction in hepatopancreatobiliary surgery. *Ann Surg*. 2015;262(2):366-371. doi:10.1097/SLA.0000000000000959
20. Zhiying Y, Haidong T, Xiaolei L, et al. The falciform ligament as a graft for portal–superior mesenteric vein reconstruction in

pancreatectomy. *J Surg Res*. 2017;218:226-231. doi:10.1016/j.jss.2017.05.090
21. Balzan SMP, Gava VG, Pedrotti S, et al. Prevalence of hepatic arterial variations with implications in pancreatoduodenectomy. *Arq Bras Cir Dig*. 2019;32(3). doi:10.1590/0102-672020190001e1455
22. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018;68(6):394-424. doi:10.3322/caac.21492
23. Mizrahi JD, Surana R, Valle JW, Shroff RT. Pancreatic cancer. *The Lancet*. 2020;395:2008-2020. doi:10.1016/S0140-6736(20)30974-0
24. Khalaf N, El-Serag HB, Abrams HR, Thrift AP. Burden of pancreatic cancer: from epidemiology to practice. *Clin Gastroenterol Hepatol*. 2020;19:876-884. doi:10.1016/j.cgh.2020.02.054
25. Snyder RA, Prakash LR, Nogueras-Gonzalez GM, et al. Vein resection during pancreaticoduodenectomy for pancreatic adenocarcinoma: patency rates and outcomes associated with thrombosis. *J Surg Oncol*. 2018;117(8):1648-1654. doi:10.1002/jso.25067
26. Wang X, Demir IE, Schorn S, Jäger C, Scheufele F, Friess H, Ceyhan GO. Venous resection during pancreatectomy for pancreatic cancer: a systematic review. *Translational Gastroenterology and Hepatology*. 2019;4:46–46. doi:10.21037/tgh.2019.06.01
27. Murakami Y, Satoi S, Motoi F, et al. Portal or superior mesenteric vein resection in pancreatoduodenectomy for pancreatic head carcinoma. *Br J Surg*. 2015;102(7):837-846. doi:10.1002/bjs.9799
28. Yu XZ, Li J, Fu DL, et al. Benefit from synchronous portalsuperior mesenteric vein resection during pancreaticoduodenectomy for cancer: a meta-analysis. *Eur J Surg Oncol*. 2014;40(4):371-378. doi:10.1016/j.ejso.2014.01.010
29. Miyazaki M, Yoshitomi H, Takano S, et al. Combined hepatic arterial resection in pancreatic resections for locally advanced pancreatic cancer. *Langenbecks Arch Surg*. 2017;402(3):447-456. doi:10.1007/s00423-017-1578-5
30. Wang WL, Ye S, Yan S, et al. Pancreaticoduodenectomy with portal vein/superior mesenteric vein resection for patients with pancreatic cancer with venous invasion. *Hepatobiliary Pancreat Dis Int*. 2015;14(4):429-435. doi:10.1016/S1499-3872(15)60400-3
31. Michelakos T, Pergolini I, Castillo CF, et al. Predictors of resectability and survival in patients with borderline and locally advanced pancreatic cancer who underwent neoadjuvant treatment with FOLFIRINOX. *Ann Surg*. 2019;269(4):733-740. doi:10.1097/SLA.0000000000002600
32. Delpero JR, Sauvanet A. Vascular resection for pancreatic cancer: 2019 French recommendations based on a literature review from 2008 to 6-2019. *Front Oncol*. 2020;10:40. doi:10.3389/fonc.2020.00040
33. Dokmak S, Aussilhou B, Sauvanet A, Nagarajan G, Farges O, Belghiti J. Parietal peritoneum as an autologous substitute for venous reconstruction in hepatopancreatobiliary surgery. *Ann Surg*. 2014;262:366-371. doi:10.1097/SLA.0000000000000959
34. Ribbe EB, Alm P, Hallberg E, Norgren LE. Evaluation of peritoneal tube grafts in the inferior vena cava of the pig. *Br J Surg*. 1988;75(4):357-360. http://www-ncbi-nlm-nih.ez127.periodicos.capes.gov.br/pubmed/3359
35. Akimaru K, Onda M, Tajiri T, et al. Reconstruction of the vena cava with the peritoneum. *Am J Surg*. 2000;179(4):289-293. doi:10.1016/S0002-9610(00)00332-9
36. Malinka T, Klein F, Denecke T, Pelzer U, Pratschke J, Bahra M. The Falciform ligament for mesenteric and portal vein reconstruction in local advanced pancreatic tumor: a surgical guide and single-center experience. *HPB Surg*. 2018;2018:2943879. doi:10.1155/2018/2943879
37. Shao Y, Feng J, Jiang Y, et al. Feasibility of mesentericoportal vein reconstruction by autologous falciform ligament during pancreaticoduodenectomy—cohort study. *BMC Surg*. 2021;21(1):4. doi:10.1186/s12893-020-01019-9
38. Shao Y, Yan S, Zhang QY, et al. Autologous falciform ligament graft as A substitute for mesentericoportal vein reconstruction in pancreaticoduodenectomy. *Int J Surg*. 2018;53:159-162. doi:10.1016/j.ijsu.2018.03.045

How to cite this article: Balzan SMP, Gava VG, Rieger A, Magalhães MA, Schwengber A, Ferreira F. Falciform ligament tubular graft for mesenteric-portal vein reconstruction during pancreaticoduodenectomy. *J Surg Oncol*. 2021;1-6. doi:10.1002/jso.26762