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CASE REPORT

Oncovascular surgery: first two case reports and teamwork perspective

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ABSTRACT

BACKGROUND: Surgical resection remains the cornerstone for the curative treatment of malignant tumors, such as pancreatic adenocarcinomas. Pancreaticoduodenectomy with vascular reconstruction is a promising approach for tumors invading the portomesenteric vein, and an aggressive surgical approach can improve survival in the mid- and long terms. Thus, vascular surgeons have an increasing role in these surgeries. Therefore, we describe our recent and initial experience and efforts to grow as a true team to offer a better and more systematic response to these patients.

CASE REPORTS: We present two cases of 68 and 69-year-old female patients, both with pancreatic head adenocarcinoma. In the first case, during the pancreaticoduodenectomy, a 4 cm long involvement of the portomesenteric vein in 50% of its circumference was denoted. The choice for reconstruction after tumor resection was a primary repair with a Dacron patch. In the second case, the resection was programmed after neoadjuvant chemotherapy, and a circumferential involvement of the portomesenteric vein in a long extension was observed, requiring an extensive venous reconstruction with an interposition graft (Dacron - 8mm) with splenic vein reimplantation.

In both cases, disease-free margins were achieved, and no mortality was registered within 30 days after surgery.

CONCLUSIONS: With these two initial cases, we concluded that good results can be achieved. Our center's team is working to preoperatively delineate our strategy for treating these complex patients, choosing optimal vascular reconstructive options tailored to each patient. Recently, a bovine pericardium patch became available in our institution, which is a good alternative to avoid additional operative time and reduce the infection risk associated with synthetic material use.

Keywords: Pancreatic head adenocarcinoma; Pancreaticoduodenectomy; Oncovascular surgery; Vascular reconstruction.

BACKGROUND

An aggressive surgical approach to locally advanced malignancies is being increasingly used in the absence of distant metastatic disease.[1] Consequently, vascular structures may be injured inadvertently or purposely resected, with or without reconstruction to achieve disease free margins.[2] The need for a systematic approach has been identified and the term oncovascular surgery (OVS) has been developed. In 2011 Ghosh et al. defined this as the use of vascular surgical techniques to enable cancer resection with concurrent ligation or reconstruction of major vascular structures. The concept of OVS gives hope to patients with advanced oncological disease, who, without the option of a vascular reconstruction, would have been offered palliative treatment only.[3]

One of the most common examples of OVS is cancer invasion to the major vessels by the pancreatic cancer.[4]

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Pancreaticoduodenectomy with vascular reconstruction is a promising approach for tumors invading the portomesenteric vein and an aggressive surgical approach can improve survival at mid- and long-terms. Thus, vascular surgeons have an increasing role in these surgeries. The active participation of a vascular surgeon in cancer therapy can improve oncologic outcomes and patient safety.[5] Therefore, we describe our recent and initial experience, and efforts to grow as a true oncovascular team to offer a better and systematic response to these patients.

CASE REPORTS

We present two cases of 68 and 69-year-old female patients, both with borderline resectable pancreatic head adenocarcinoma.

In the first case, during the pancreaticoduodenectomy, a 4 cm long involvement of the portomesenteric vein in 50% of its circumference was denoted. The preoperative venous computed tomography (CT) showed the vein irregularity related to its contact with the tumor, Figure 1. The choice for reconstruction, after en bloc tumor resection, was a primary repair with a Dacron patch, Figure 2.

Figure 1. Pre-operative computed tomography angiography (coronal view), Case 1.



The pancreatic tumor is noted in contact with portomesenteric vein (arrow)

In the second case, the venous CT performed after neoadjuvant chemotherapy showed persistent venous involvement by the tumor, Figure 3. Intraoperatively, a circumferential involvement of the portomesenteric vein in a long extension was observed, requiring an extensive venous reconstruction with an interposition graft (regular Dacron—8mm) and splenic vein reimplantation, Figure 4.

In both cases, disease-free margins were achieved, and no mortality was registered within 30 days after surgery. One month after surgery, the post-operative venous CT showed venous permeability and no complications, Figures 5 and 6. One of the patients died three months after surgery as a consequence of an embolic acute stroke when anticoagulation therapy was interrupted to perform a hepatic lesion biopsy. This patient had a medical history of atrial fibrillation.

Figure 2. Illustration of the portomesenteric vein reconstruction with a Dacron patch.

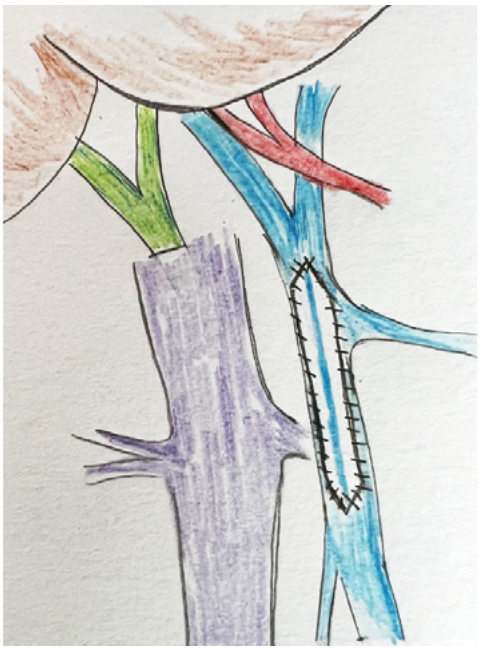
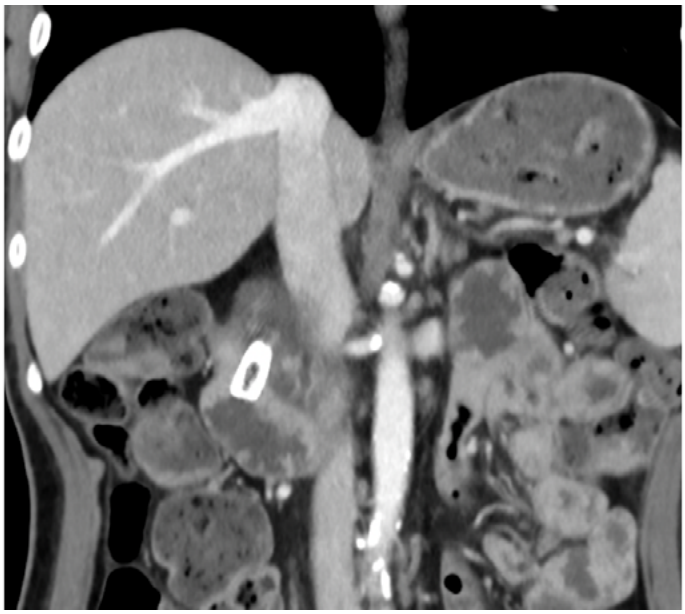


Figure 3. Preoperative venous computed tomography (coronal view), Case 2.

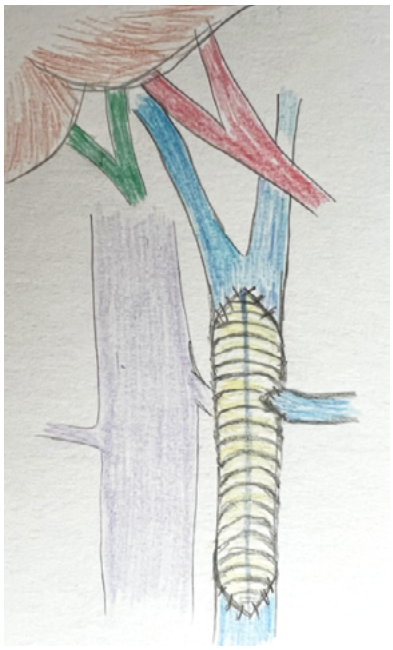


Aspect after neoadjuvant chemotherapy, demonstrating venous involvement by the tumor.

DISCUSSION

Given the close relationship between the pancreas and portal and superior mesenteric veins, tumors originating from the pancreatic parenchyma may invade these venous structures. Although pancreatic cancer involving venous structures was once considered a contraindication to tumor resection, nowadays, the resection and reconstruction of these vessels has been established as a safe and effective method of achieving complete tumor resection in appropriate candidates.[6]

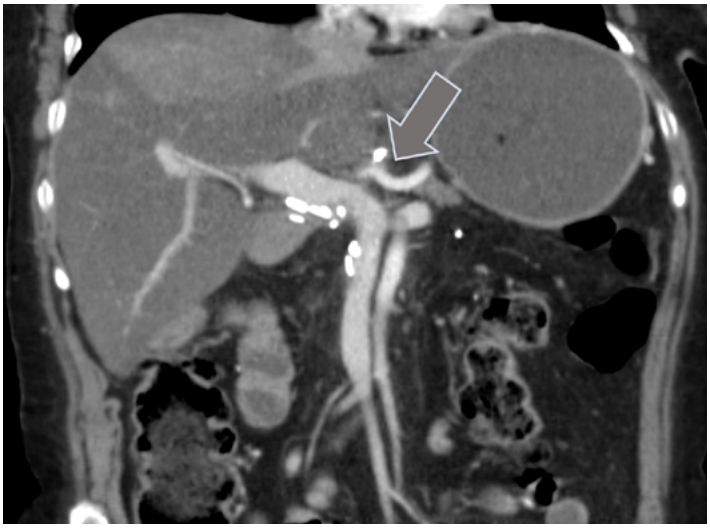
Figure 4. Illustration of the portomesenteric vein reconstruction with an interposition graft and splenic vein reimplantation.



Ductal adenocarcinoma is the most common tumor of the pancreas in 78% of cases. It is an aggressive and devastating cancer, with a 5-year overall survival of approximately 8.5% for all stages combined.[7] Moreover, pancreatic cancers of the body and tail are typically unresectable at presentation, and only 15 to 20% of patients diagnosed with pancreatic head adenocarcinoma have resectable disease at the time of diagnosis.[6]

The non-metastatic pancreatic cancer resectability criteria are based on radiologic findings, according to locoregional extension, resulting in three sub-entities: resectable, borderline resectable, and locally advanced.[8]

Figure 5. Postoperative venous computed tomography (coronal view), Case 1



Good permeability of the venous reconstruction is noted (arrow)

In patients with borderline resectable pancreatic head adenocarcinoma, pancreaticoduodenectomy associated with portomesenteric vein resection and reconstruction is, nowadays, considered a technically feasible option with acceptable morbidity and mortality rates. Recent reports further suggest that complete oncologic resection, including venous resection, is associated with improved survival versus those with residual disease after resection.[6] However, the survival impact of venous resection and reconstruction during pancreatectomy for tumors with venous invasion is unknown and the only current recommendation is to perform an R0 resection (with 1mm of clearance becoming more and more accepted). Future randomized controlled trials comparing the survival outcomes for patients undergoing vein resection and reconstruction or not in cases of pancreatic ductal adenocarcinoma surrounding mesenteric vessels (ressectable or borderline) are highly desirable.[7]

Figure 6. Postoperative venous computed tomography (coronal view), Case 2



Dacron interposition graft permeability is noted (arrow).

An accurate staging with imaging is of the utmost importance at the moment of diagnosis, because it will stratify the patients into potentially curative upfront surgery versus neoadjuvant treatments. A multi-phase contrast-enhanced computed CT is, currently, the best validated method for pancreatic adenocarcinoma staging. However, the accuracy of this exam for assessment of vascular invasion is not very high with a sensitivity of 63% and a specificity of 92%.[7] Therefore, a subset of patients still has venous involvement by the tumor discovered only intraoperatively and intraoperative consultations for venous reconstructions by vascular surgeons are not infrequent.[8]

During the last decade, notable progress has been made in surgical techniques and procedures to improve R0 resection rates and to reduce postoperative complications. According to the NCCN guidelines (2017), an oncologic resection with an aggressive en bloc tumor and venous resection is recommended. After tumor resection, different venous

reconstruction options are available, with different vascular conduits. The adequate decision should be done by surgeons with advanced skills to perform the optimal reconstructive option tailored to the specific patient. Not only anatomic and technical aspects should be considered, but also the patients physiologic state at the moment during the procedure when venous reconstruction is required.[6]

Reconstruction options include lateral venorrhaphy, patch angioplasty, primary end-to-end reconstruction, and interposition graft.[6] The reconstruction technique depends on venous length and circumference involvement by the tumor, and to date, a consensus on the ideal method of vascular reconstruction is lacking.[8]

Patch angioplasty is indicated when 30% to 50% of the venous circumference is involved and when primary end-to-end reconstruction is not technically feasible. The typical circumstance necessitating this method of reconstruction is a long segment of portal and superior mesenteric veins involvement by tumor (>2cm). Various patch materials have been described, including autologous vein, bovine pericardium, and expanded polytetrafluoroethylene (ePTFE). Similar success has been described with all these patch materials.[6] Moreover, the parietal peritoneum has also been described as an excellent substitute.[7]

Interposition grafting of the portomesenteric vein is generally required when the tumor involvement exceeds 50% of vein's circumference and > 2cm of vein's length. A wide variety of conduits have been described for interposition grafting, including autologous vein graft, cryopreserved homografts, and synthetic grafts including Dacron and ePTFE.[6]

During venous reconstruction, concomitant splenic vein ligation may be necessary depending on the method and extent of reconstruction required, particularly when end-to-end reconstruction and interposition grafting are performed. Splenic vein ligation may, rarely, result in sinistral hypertension with concomitant esophagitis and/or gastritis and gastrointestinal bleeding.[6] Whatever venous reconstruction is used, the portal-clamping time should be minimized and ideally limited to 30 min to avoid segmental portal hypertension, intestinal ischemia, coagulation disorders, and biologic and hemodynamical disturbances.[7]

Long-term outcomes in patients undergoing venous reconstruction are limited primarily by the natural history of pancreatic cancer rather than complications resulting specifically from the method of reconstruction. Although portomesenteric vein reconstruction has been demonstrated to improve overall survival in selected patients in whom no residual tumor is present, the overall survival in these patients remains poor.[6]

The role of neoadjuvant therapy in borderline resectable pancreatic head adenocarcinomas is not clearly established due to a low level of evidence but is increasingly used and even recommended.[7] The management of borderline resectable pancreatic head adenocarcinomas is dramatically changing, reinforcing the importance of multidisciplinary teams to delineate the ideal management of these patients from the moment of diagnosis until the postoperative surveillance.

In our center, in the last two years, approximately ten patients were submitted to pancreaticoduodenectomy to treat these tumors per year, with 20% of them requiring venous reconstruction. Most of the venous reconstruction performed in these patients was lateral venography, and oncological surgeons performed it. During this period, only two cases required the consultation of the vascular surgeon to perform extensive venous reconstruction, and it was done during the surgery. The operation was already prolonged by the time of vascular reconstruction, and no previous venous mapping had been performed. These conditions influenced our decision to perform the reconstruction using synthetic graft material. In both cases, the patient was physiologically stable with insignificant blood loss, and we opted for the administration of intravenous heparin (70/Kg) before venous clamping. However, we have found conflicting information about this issue in the literature.

With these two initial cases, we understand the importance of building a multidisciplinary team interaction to plan an OVS procedure. Nowadays, our oncovascular multidisciplinary team is composed by oncological surgeons, vascular surgeons, radiologists and oncologists. Our major goal is to uniformize and offer the better treatment approach to these patients, focusing in obtaining tumor R0 resection with better outcomes.

To optimize and uniformize the treatment approach of these patients, individually, an important work is done before initiating the treatment. The radiologists, oncological surgeons and oncologists select the patients that are candidates for neoadjuvant treatment and plan the surgery with the vascular surgeon. If the tumor involves the portomesenteric vein in an extensive length (> 2cm) and in more than 30% of its circumference, we discuss preoperatively our possible options to reconstruct the vein. We have decided, recently, to use parietal peritoneum patch if venoplasty is necessary and to use spiral graft with bovine pericardium patch (acquired recently) when more extensive reconstruction is needed. Our preference is to use intraoperative administration of heparin before venous clamping in patients physiologically stable and with insignificant blood loss at the time of venous reconstruction. Postoperatively, usually, we maintain anticoagulation during at least six months after surgery, and after this period we decide according to postoperative imaging.

CONCLUSION

With continued advances in medical and surgical oncology, the indications for resection of pancreatic head adenocarcinomas are expanding, and vascular surgical expertise is in greater demand. Different areas in the approach to the treatment of these tumors are experiencing profound changes, and only a multidisciplinary team will integrate these advances to achieve the ideal treatment to optimize the survival of these patients.

With these two initial cases, we concluded that good results can be achieved. In our center, we are working as a team to delineate our strategy for treating these complex patients preoperatively, choosing optimal vascular reconstructive options tailored to each patient.

However, additional work will probably be needed regarding the development of consensus documents and clinical practice guidelines to cover important aspects of these complex surgeries and optimize and uniformize the therapeutic approach to these patients pre-, intra-, and postoperatively.

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