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CASE REPORT

Cephalic pancreaticoduodenectomy with preservation of a right coronary artery bypass graft using the right gastro-epiploic artery: a case report

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ABSTRACT

Introduction: Pancreatic cancer is a rare disease with a high mortality rate, for which complete surgical resection, when possible, is the preferred therapeutic. Pancreaticoduodenectomy represents the surgical technique of choice. Abdominal surgeons can be faced with the challenge of patients with a history of coronary artery bypass graft in which the right gastro-epiploic artery is used.

Case report: We report the case of a patient with an adenocarcinoma of the pancreatic head, stage IIA, having previously undergone a triple coronary artery bypass, one of which being a right gastro-epiploic graft. Our challenge was underlined by the necessity of a complete oncological resection through a cephalic pancreaticoduodenectomy while preserving the necessary cardiac perfusion via the right gastro-epiploic artery.

Conclusion: We have been able to preserve a right gastro-epiploic artery as a coronary bypass during a cephalic pancreaticoduodenectomy for a cephalic pancreatic adenocarcinoma. We have successfully been able to preserve and re-implant the right gastro-epiploic artery to the origin of the gastroduodenal artery while insuring R0 resection of the tumor. A coronary artery bypass using the right gastro-epiploic artery should therefore not be considered as an obstacle to a Whipple's procedure if total oncological resection is obtainable.

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Introduction

Pancreatic cancer is a rare tumor with a high mortality burden. Late diagnosis accounts for high stages of the disease with low rates of complete recovery even when invasive therapy is possible. When feasible, consensus calls for complete surgical resection, known as a pancreaticoduodenectomy. When the cancer is limited to the pancreatic head, the procedure is known as 'Whipple's procedure' or 'cephalic pancreaticoduodenectomy' [1]. Adjuvant therapy such as chemotherapy, radiotherapy or both can be added according to the oncological stage.

As the population ages, physicians are often confronted with patients presenting comorbidities such as multiple coronary artery bypass grafts. While internal mammary arteries are most often used for bypassing the left coronary arteries, the right gastro-epiploic artery (a gastroduodenal artery branch) is a suitable choice for a right coronary artery graft.

As conventional pancreaticoduodenectomy requires the ligation of the gastroduodenal artery, complete oncological resection poses the challenge of maintaining cardiovascular perfusion to the right coronary arteries. We present a cephalic pancreaticoduodenectomy with the re-anastomosis and preservation of a right gastro-epiploic artery graft in a patient suffering from cephalic pancreatic cancer and presenting multiple coronary artery bypass grafts.

The case

We report the case of a 73-year-old male admitted in August 2011 to the emergency ward with jaundice. The patient complained of aggravating jaundice for the past 72 h, darkened urine and discolored stools. The patient was assigned to our gastro-enterology unit where blood analysis, abdominal CT scan (Figure 1), endoscopic ultrasound and histological analysis rapidly lead to the diagnosis of a 13.9 by 14.8 mm well differentiated adenocarcinoma of the pancreatic head. There were no signs of local dissemination, lymphatic invasion or distant metastasis.

Past medical history included type 2 insulin dependent diabetes, hypertension and ischemic cardiomyopathy due to multi-vessel coronary artery disease. The patient was treated 8 years prior to the current event with triple coronary

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Figure 1. Abdominal CT scan showing an adenocarcinoma of the pancreatic head.

bypasses. These included the left internal mammary artery for the distal section of the anterior interventricular artery, the right internal mammary artery for the left inferior marginal artery, and the right gastro-epiploic artery, for the right posterior lateral artery. Preoperative coronography (Figure 2) confirmed patency of the gastro-epiploic graft.

Given the absence of gastro-epiploic invasion by the pancreatic tumor, multidisciplinary consensus was to preserve the bypass in order to maintain cardiac perfusion. Well differentiated adenocarcinoma of the pancreas head with no signs of metastasis called for a cephalic pancreaticoduodenectomy or Whipple's technique with attempt to preserve the gastro-epiploic graft.

The procedure began by an abdominal exploration through a bi-subcostal laparotomy confirming a pulsating right gastro-epiploic artery. The artery was found running anterior to the left hepatic lobe, through a diaphragmatic hiatus reaching the pericardial space. A clamping test of the gastroduodenal and right gastro-epiploic artery confirmed myocardial tolerance to short-term ischemia. After a Kocher manoeuver in order to evaluate the resectability of the tumor, priority was given to isolating the right gastro-epiploic artery. The common hepatic artery as well as the gastroduodenal artery was isolated. The gastro-duodenal artery was clamped and ligated at its origin allowing the section of the vessel. The right gastro-epiploic artery was removed from its origin

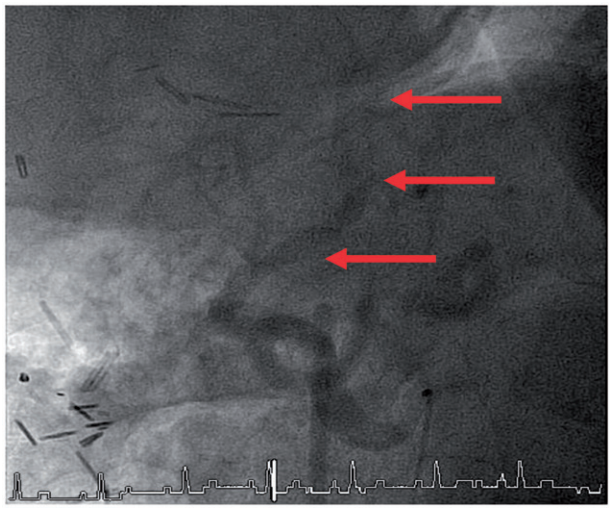

Figure 2. Coronography confirming patency of the gastro-epiploic graft.

and an end-to-end re-implantation to the origin of the gastroduodenal artery was made using an 8/0 polypropylene monofilament running suture. With cardiac revascularization restored, a regular cephalic pancreaticoduodenectomy was performed with no complications. Extended lymphadenectomy around the hepatic pedicle, and interaortocaval region was made. Digestive reconstruction was performed by pancreaticojejunostomy, hepaticojejunostomy and gastrojejunostomy using a 'Roux-en-Y' anastomosis.

Pathology evidenced a well differentiated adenocarcinoma of the pancreatic head, locally invading the peri-pancreatic fatty tissue and no lymph node contamination (pT3N0 stage IIA). The post-operative course was uneventful. Early abdominal CT scan and hepatic angiography (Figure 3) confirmed patency of the gastro-epiploic artery. Six years after surgery and six sessions of chemotherapy by Gemcitabine, the patient remains free from neoplastic relapse and has a patent gastro-epiploic vessel.

Discussion

Pancreatic cancer accounts for 3.2% of all new cancer cases [2] in the USA. While this represents a relatively rare cancer, it is estimated that 43,090 people of the 53,670 diagnosed in 2017 will die from this disease evidencing a particularly bleak prognosis [2]. Survival after 5 years is only 8.2% [2]. While better imaging and specific markers allow an earlier diagnosis thereby reducing morbidity and mortality, an R0 surgical approach such as a pancreaticoduodenectomy [3,4] remains the only possible treatment potentially leading to complete remission. As this cancer is most frequently

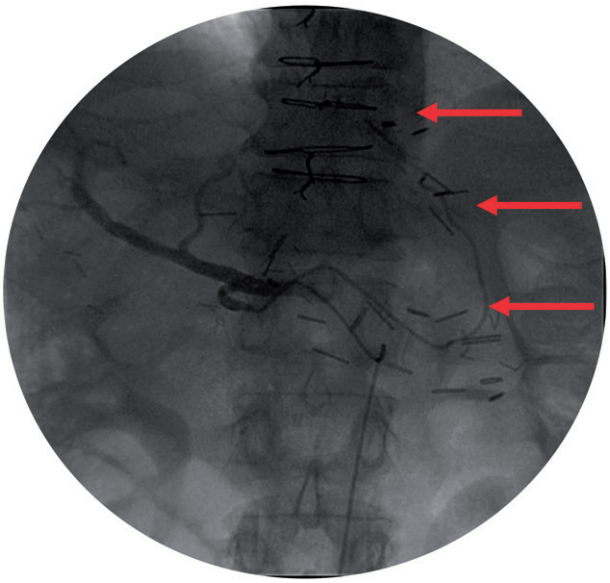

Figure 3. Hepatic angiography confirming patency of the gastro-epiploic graft following cephalic pancreaticoduodenectomy.

diagnosed among people aged 65 and over [2], physicians are susceptible to operate patients with multiple comorbidities such as multiple coronary artery bypass grafts. While the use of internal mammary arteries as left coronary bypasses is frequent, the use of the gastro-epiploic artery to graft the right coronary artery is less frequent. Bypassing the right coronary artery with arteries yields improved mid- and long-term patency compared to saphenous veins [5].

Abdominal CT scans allow precise topographic evaluation of a pancreatic neoplasm and local invasiveness, therefore confirming resectability. Patients with coronary grafts using the right gastro-epiploic artery should undergo a pre-operative angiography to ensure patency of the bypass. Success is underlined by ensuring R0 resection, and conserving the required cardiac perfusion.

Four case reports were published describing pancreaticoduodenectomy after coronary artery bypass using the right gastro-epiploic artery [6–9]. One case described revascularization using another vein graft; two cases were able to preserve the gastro-duodenal artery with no manipulation of the right gastro-epiploic graft. The last case replaced the graft with a coronary stent. All four patients showed no post-operative complications and good myocardial perfusion at time of publication.

Conclusion

Pancreaticoduodenectomy as well as right gastro-epiploic artery grafting as a coronary bypass are well known and referenced procedures. An aging population with increasing comorbidities will lead to more patients needing a pancreaticoduodenectomy with a history of right coronary grafting with a gastro-epiploic artery. We can confirm the possibility of preserving the right gastro-epiploic artery as a coronary bypass in a case of cephalic pancreaticoduodenectomy for cephalic pancreatic adenocarcinoma. Our team has successfully been able to preserve and re-implant the right gastro-epiploic artery to the origin of the gastroduodenal artery while insuring R0 resection of the tumor. Coronary artery bypass using the right gastro-epiploic artery should not be considered an obstacle to Whipple's procedure if total oncological resection is feasible.

Disclosure statement

The authors report no conflicts of interest.

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