CASE REPORT

Resection-Reconstruction of Aberrant Right Hepatic Artery During Whipple Procedure (Pancreaticoduodenectomy)

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ABSTRACT
Aberrant hepatic arterial anatomy poses a challenge for the surgeon during Whipple procedure. Intraoperative injury to the aberrant vasculature results in hemorrhagic or ischemic complications involving the liver and biliary tree. We report a case of replaced right hepatic artery arising from the superior mesenteric artery in a patient with periampullary carcinoma of the pancreas, undergoing pancreaticoduodenectomy. The aberrant artery was found to be coursing through the pancreatic parenchyma. This is a rare vascular anomaly. Resection of the arterial segment and end-to-end anastomosis was fashioned. Intrapancreatic course of the replaced right hepatic artery is a rare anomaly and is best managed by pre-operative identification on radiology and meticulous intra-operative dissection and preservation. However, for an intrapancreatic course, resection and reconstruction may occasionally be required.


INTRODUCTION
Although the mortality following pancreaticoduodenectomy has significantly reduced over the last few decades, the morbidity following this procedure remains very high, with the most dreaded complications being post-pancreatectomy hemorrhage and anastomotic leakage.1 Normal hepatic arterial anatomy is seen in 75.7% of all patients.2 Right hepatic artery arising from the superior mesenteric artery is the most common anomaly in reported literature.1,3,4 Injury to the aberrant right hepatic artery may result in liver ischemia or biliary-intestinal anastomotic failure as the right hepatic artery constitutes sole supply to the biliary tree after division of gastroduodenal artery in pancreaticoduodenectomy.2 Any anomalies are best picked up on preoperative imaging in order to avoid inadvertent injury to the aberrant vasculature, which might otherwise result in hemorrhage or inadequate perfusion to the liver or bile duct, with subsequent liver or biliary anastomotic failure.1 The aberrant vessels can be preserved in most cases using meticulous dissection.4,5 However, the artery may require resection for oncological clearance, if it is coursing close to the tumor.4

We present a case report of a rare clinical situation; a replaced right hepatic artery with intrapancreatic course which required resection and vascular reconstruction during Whipple procedure.

CASE REPORT
A 35-year lady with no comorbidities presented to the outpatient clinic with one-month history of upper abdominal pain and jaundice. This was associated with unintentional weight loss. Physical examination revealed a thin emaciated female with scleral icterus and vague mass palpable in the epigastrium. Endoscopic retrograde cholangiopancreatography (ERCP) showed a peri-ampullary growth, and a biopsy revealed adenocarcinoma. The patient was staged with a CT scan and an endoscopic ultrasound, and was found to have a resectable peri-ampullary tumor, with no distant metastases. The CT scan also showed a replaced right hepatic artery originating from the superior mesenteric artery (Figure 1). The left hepatic artery was arising from the celiac axis and gave off the gastroduodenal artery. As per the recommendations of a multi-disciplinary team meeting, the patient was scheduled for elective surgery.

Figure 1: Reconstructed CT images (A) showing the replaced right hepatic artery arising from the superior mesenteric artery (B) axial section showing the artery traversing the pancreatic parenchyma lateral to the portal vein and the common bile duct. RHA replaced right hepatic artery, LHA left hepatic artery, GDA gastroduodenal artery, CA celiac axis, SMA superior mesenteric artery, CBD common bile duct, PV portal vein, SV splenic vein, PP pancreatic parenchyma.
pancreaticoduodenectomy. During surgery, the replaced right hepatic artery was found to be coursing through the pancreatic tissue. It was not possible to complete the pancreaticoduodenectomy without resection and reconstruction of the aberrant artery, which was completed in end-to-end fashion with Prolene 6/0 suture. The patient had an uneventful postoperative course. The reconstructed artery was found to be patent on postoperative CT scan (Figure 2). The histopathology confirmed adenocarcinoma with clear resection margins and no lymph node metastases. The patient has completed 18 months postoperative follow-up and continues to make good progress.

**DISCUSSION**

Aberrant hepatic arterial anatomy is frequently encountered during pancreaticoduodenectomy. A replaced right hepatic artery is not uncommon, in the spectrum of aberrant abdominal vasculature. Most of the time, the aberrant vessel can be preserved using standard dissection technique. However, it is rare for the aberrant vessel to present in a manner which necessitates reconstruction in order to complete pancreaticoduodenectomy.

Hiatt et al. reviewed the hepatic arterial anatomy in 1000 cases and presented a system of classification for aberrant vascular anatomy in 1994, which is considered the basis of defining any vascular anomalies of the hepatic arterial distribution. According to the Hiatt classification (Table I), a replaced right hepatic artery arising from the SMA occurs in 10.6% of the cases.

It is important to identify aberrant vascular anatomy on preoperative imaging, so that the surgeon can take preemptive precautions to safeguard these vessels from inadvertent injury.

A replaced or accessory right hepatic artery can be preserved in most circumstances by meticulous dissection; however, it may require ligation in some cases. The adequacy of hepatic arterial circulation can be detected by palpation or using intraoperative Doppler scan after occlusion of the aberrant vessel requiring resection. In general, if an accessory or replaced right hepatic artery is present, it should be dissected carefully and separated from the resection specimen, after obtaining proximal and distal control, so as to protect it from inadvertent damage. If salvage is not possible, especially if the aberrant vessel has an intrapancreatic course, or is encircled by tumour, it may require transection and reconstruction. In the case presented here, the aberrant artery was coursing through the pancreatic parenchyma, necessitating resection and reconstruction for oncological clearance.

Damage to the right hepatic artery can lead to liver ischaemia or biliary-enteric anastomotic failure. Intrapancreatic course of the replaced right hepatic artery is a rare anomaly which is best picked up preoperatively and may require resection and reconstruction. Surgeons performing pancreaticoduodenectomy should be well versed with the aberrant vascular anatomy and expertise should be available to reconstruct the hepatic artery in case resection is required, since ligation of these vessels is associated with high morbidity.

**REFERENCES**