Accessory Right Hepatic Artery and Its Implications for a Surgeon

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Abstract

Introduction Accessory hepatic artery is an incidental finding during hepatobiliary, pancreatic surgery and may be found during hepatic transplantation surgery on angiogram. This artery should be carefully identified & preserved during these surgeries.

Case report A case of accessory right hepatic artery found incidentally during pancreatoduodenectomy [Whipple's procedure] identified, dissected carefully & preserved.

Discussion Anomalous hepatic vasculature is a rare incidental finding during hepatobiliary-pancreatic surgery. These anomalies or accessory hepatic arteries should be identified, carefully preserved to prevent inadvertent injury, torrential bleeding & hepatic necrosis. Preservation of these anomalous vasculature will not compromise oncological margin.

Keywords Accessory right hepatic artery · Hepato-biliary-pancreatic surgery · Hepatic necrosis · Oncological margin

Introduction

The common hepatic artery usually arises from the celiac trunk (85 % of cases) but may also arise directly from the aorta or from the left gastric, superior mesenteric (3 % of cases), gastroduodenal, right renal, or splenic artery. We discuss an incidental finding of an accessory right hepatic artery arising from a superior mesenteric artery and its implications for an operating surgeon during resection of pancreatic head during Whipple's procedure and its relation to pathological margin.

Case Report

A 52-year-old female was evaluated in our hospital for obstructive jaundice and found to be having periampullary carcinoma. CT scan revealed mass lesion of 37×26 mm in the ampulla/pancreatic head causing obstruction of the common bile duct and pancreatic duct.

Endoscopic retrograde cholangiopancreatography showed periampullary growth with dilation of common bile duct; patients serum total bilirubin level was 4.3 mg/dl on admission. Biopsy from the lesion was reported as adenocarcinoma. In view of periampullary tumor, patient was prepared for Whipple's procedure (pancreatoduodenectomy). During the surgery, dissection of hepatoduodenal ligament revealed a common hepatic artery arising from the celiac trunk. After gastroduodenal branch hepatic artery was found to be dividing into larger left hepatic artery and smaller right hepatic artery giving a cystic artery, both the branches were carefully dissected and preserved. After the division of the stomach and common bile duct and complete Kocherization and mobilization of the duodenum, another vessel (Fig. 1) was identified running posterior to the common bile duct. The artery was arising from superior mesenteric artery running posterior to the pancreas and CBD (Fig. 2), entering directly to the right lobe of the liver. In view of a smaller right hepatic artery arising from the common hepatic artery, this artery was identified as an accessory hepatic artery arising directly from the superior mesenteric artery.

Discussion

Anatomical variation of the hepatic artery (HA) is seen in 20.4 % of liver donors. The common variations include a replaced or an accessory right HA originating from the superior mesenteric artery (6.67 %) and a replaced or an

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Fig. 1 The common hepatic artery with larger left branch and an accessory right hepatic artery arising from superior mesenteric artery running behind the cut end of the common bile duct along the portal vein

accessory left HA originating from the left gastric artery (6.41 %) [1].

Aberrant hepatic arterial anatomy is quite common in 41 % of the population [2]. The commonest anomaly relates to the origin of the right hepatic artery which has been reported in 13–26 % of all cases [2, 3].

Fig. 2 The common hepatic artery dividing into larger left and smaller right branch after giving gastroduodenal artery (ligated end), origin, and course of an accessory right hepatic artery

Aberrant (Variant) Hepatic Arteries

Quite often, the hepatic artery has an incomplete set of branches because one or the other of its usual branches arises from a source other than the proper hepatic artery from the celiac trunk. The variable pattern of arteries can be explained by embryology. The arterial supply to the liver in early gestation life is from three main sources: the left hepatic artery from the left gastric artery, the middle hepatic artery or common hepatic artery from the celiac trunk, and the right hepatic artery from the superior mesenteric artery [4]; as the neonate develops, the blood supply assumes the adult pattern, with atrophy of both the right and left hepatic arteries and the common hepatic artery supplying the whole liver by dividing into right and left hepatic arteries.

An aberrant right hepatic artery (ARHA) originating from the superior mesenteric artery has a close relationship with the head of the pancreas, rendering it vulnerable to damage during pancreatic head resections. Conversely, an attempt to preserve the ARHA can lead to a compromised cancer resection. However, the impact of the presence of ARHA in patients undergoing pancreaticoduodenectomy is not known. Aberrant right hepatic artery are of three types: artery which lies posterolateral to head of pancreas (type I), most common; artery which runs intra parenchymal (type II); and artery which lies in superior mesenteric venous groove (type III).

Variant arterial anatomy must be recognized and appropriately managed (preserved) during hepatobiliary pancreatic surgeries and split liver transplantation to ensure complete vascular supply to both grafts [5]. Care should be taken during dissection behind the portal vein to exclude an accessory segmental right hepatic artery. The common hepatic artery usually arises from the celiac trunk (85 % of cases) but may also arise directly from the aorta or from the left gastric, superior mesenteric (3 % of cases), gastroduodenal, right renal, or splenic artery.

Inadvertent injury or ligation of these arteries leads to torrential bleeding during surgery and may lead to necrosis of the liver. An aberrant right hepatic artery originating from the superior mesenteric artery has a close relationship with the head of pancreas, rendering it vulnerable to damage during pancreatic head resections. It is important to perform precise dissection of the hepatoduodenal ligament and to save the accessory structure and, in particular, the arterial supply of the liver. In case of injury, precise reestablishment of continuity or new reconstruction with neighboring artery must be performed.

The implications of loss of one or more of hepatic arteries in normal liver are less well documented. Loss of the ARHA alone has neither been systematically studied nor reported. Isolated reports of hepatic necrosis and biliary strictures following accidental injury to the right hepatic artery has been documented [6]. The consequences of losing the

hepatic arterial supply in transplanted livers are well documented. In our case, an accessory right hepatic artery arising from superior mesenteric artery was larger than the right hepatic artery of common hepatic artery and was of type I; hence, we decided to preserve the artery. Various literature studies also support the revascularization of ARHA which has completely replaced the right or common hepatic artery or a large-caliber accessory vessel.

Loss of right hepatic arterial supply could lead to an ischemic anastomotic breakdown or a delayed stricture of the hepaticojejunostomy. There are various reports of ischemic cholangiopathy after hepatic arterial ligation. In a jaundiced patient, this could result in a delayed recovery of the liver [7].

We did a retrospective study of all cases of pancreaticoduodenectomy in our institute, from surgical records from 2007 to 2012 and found 40 cases and a single case of a right accessory hepatic artery. Final histopathological study of pancreaticoduodenectomy specimen revealed clear surgical margin. Similar study by Turrini et al., in their study of 471 cases of pancreaticoduodenectomy, found 47 patients (10 %) with ARHA. ARHA was preserved in 44 patients. Preservation of an accessory right hepatic artery did not increase positive pathological margins [8].

Conclusion

In view of variation and anomalies of hepatic arteries, surgeon should have the knowledge of the different variations

and should have eagle's eyes to identify these variations and preserve these anomalies while operating on hepatobiliary pancreatic surgeries. Preservation of an accessory hepatic artery will not compromise the oncological surgical margin.

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