

Accessory right hepatic artery and its significance for a surgeon: A case report

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ABSTRACT

Right hepatic artery (RHA) is a branch of the common hepatic artery; however, there are cases documented in the literature showing anatomical variations. Accessory RHA is an incidental finding during hepatobiliary and pancreatic surgery. This artery should be identified, carefully separated, and preserved during these surgeries. We encounter the variation while doing Whipple's procedure in a 61-year-old patient diagnosed with carcinoma of the head of the pancreas. Intra-operatively, accessory RHA was present which was arising from the superior mesenteric artery. It was identified, carefully separated, and preserved. Variations in the origin of the artery may make it vulnerable to injuries during surgical procedures if due care is not taken.

Key words: Celiac trunk, Common hepatic artery, Right hepatic artery, Superior mesenteric artery, Whipple's procedure

The common hepatic artery (CHA) usually arises from the celiac trunk (85% of cases), but in some cases, it may arise directly from the aorta or from the left gastric, superior mesenteric (3% of cases), gastroduodenal, right renal, or splenic artery [1]. The right hepatic artery (RHA) is a branch of CHA that usually passes posterior to the common bile duct (CBD) where it gives off a cystic artery that enters the Calot's triangle to supply the gall bladder. Numerous variations in the origin of RHA have been documented. The accessory RHA may be injured during resections of the pancreatic head because the artery lies in close proximity to the portal vein.

We present a case with an incidental finding of an accessory RHA arising from a superior mesenteric artery (SMA) and its significance for an operating surgeon during the resection of the pancreatic head in Whipple's procedure.

CASE REPORT

A 61-year-old male presented to our hospital with a history of painless progressive jaundice for the past 1 month. It was associated with a history of significant weight loss and loss of appetite. A history of generalized itching, high-colored urine, and clay-colored stool was present.

On general physical examination, icterus was present. On per abdomen examination, there was a palpable gall bladder lump in the right hypochondrium. The patient was


diagnosed with carcinoma head of the pancreas after a thorough workup.

Computed tomography scan revealed a mass lesion of 31×28 mm in the pancreatic head causing external compression of the CBD up with dilatation up to 15 mm and pancreatic duct up to 7 mm showing double duct sign highly suspicious for carcinoma of the head of the pancreas. The total bilirubin level of the patient was 8.0 mg/dL.

The patient was taken up for Whipple's procedure. Intra-operatively, during dissection of the hepatoduodenal ligament, CHA was seen arising from the celiac trunk. After giving gastroduodenal artery, CHA was dividing into the right and left hepatic arteries. Cystic artery was arising from the RHA. After the division of the stomach and CBD, another vessel was identified running posterior to the CBD. The artery was arising from the SMA, running posterior to the pancreas, and CBD entering directly to the right lobe of the liver. This branch was carefully separated and preserved (Fig. 1).

DISCUSSION

Variability in hepatic arterial anatomy is quite common in 41% of the population [2]. The anomalies related to the origin of the RHA are the most common and have been reported in 13–26% of all cases [2,3]. The incidence of replaced or an accessory RHA originating from the SMA is 6.67% and a replaced or an accessory LHA originating from the left gastric artery is 6.41% [4].

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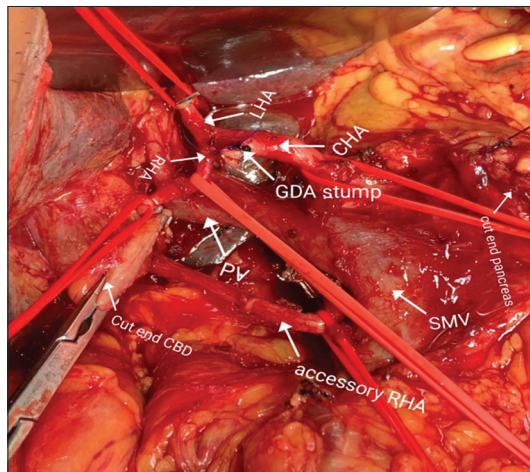


Figure 1: Intraoperative photograph showing accessory right hepatic artery arising from superior mesenteric artery

This variability in the origin of the hepatic artery can be explained by embryology. In early gestation life, the liver is supplied by three main arteries as follows: the LHA arising from the left gastric artery, CHA arising from the celiac trunk, and the RHA arising from the SMA [5]. As the neonate develops, there will be atrophy of both the right and left hepatic arteries and the CHA supply the whole liver by dividing into right and left hepatic arteries.

Miyaki's study also reported that the frequency of the right accessory hepatic artery was 18.3% in human fetuses which was more as compared to adults [6]. Zahoi *et al.* described the frequency of this vessel in cadavers as 5% [7]. Covey *et al.* analyzed 600 angiographies of the hepatic arterial tree and found the right accessory hepatic artery in 2.5% of patients [8]. Michel defines 10 basic anatomic variations in hepatic arteries in his classic autopsy series of 200 dissections in 1966. It was modified to 6 types by Hiatt *et al.* in 1994. Nayak *et al.*, in 2012, reported a case, in which the coeliac trunk was divided into four arteries, the common hepatic, splenic, left gastric, and left hepatic arteries [9]. In 2013 Ford and Parson reported a case of replaced RHA which originated from the coeliac trunk as a trifurcation immediately posterior to the emergence of the CHA and splenic artery and distal to the left gastric artery [10]. Sethi *et al.*, in 2014, reported a case of accessory RHA which originated from the coeliac trunk along with its usual three branches, namely, the splenic artery, left gastric artery, and CHA [11].

Knowledge of this variation is also important in the case of liver transplantation, hepatic artery infusion chemotherapy, and transarterial chemo-embolization. Due to the presence of an aberrant vessel, there is incomplete embolization of liver tumors and it can also damage normal liver parenchyma during hepatic artery infusion chemotherapy and chemoembolization [12,13].

The accessory RHA arising from the SMA lies very close to the head of the pancreas, making it vulnerable to injury during pancreatic head resections in hepatobiliary and pancreatic surgeries. Variability in arterial anatomy must be recognized and

appropriately managed during hepatobiliary pancreatic surgeries and split liver transplantation to ensure complete vascular supply to both grafts [14]. Care should be taken during dissection behind the portal vein to exclude an accessory segmental RHA. Accidental injury or ligation of these arteries leads to excessive bleeding during surgery and may lead to necrosis of the liver. It is important to perform a precise dissection of the hepatoduodenal ligament and to save the accessory structure and the arterial supply of the liver. Loss of the right hepatic arterial supply could lead to an ischemic anastomotic breakdown or a delayed stricture of the hepaticojejunostomy.

According to Michel's classification, our patient is having type VI variation where an accessory RHA is present, and according to a recent review of the literature including 19,013 hepatic artery variants, the incidence of this variation is 1.6% [15].

CONCLUSION

Knowledge of the variation and anomalies of the hepatic artery is important while doing resection of the pancreatic head in hepatobiliary and pancreatic surgeries. Accessory RHA if present, should be identified, carefully separated, and preserved. This is essential to avoid excessive bleeding from the injured RHA during surgery and prevent postoperative complications. Preservation of an accessory hepatic artery will not compromise the oncological surgical margin.

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