

# Unusual course of the common hepatic artery originating from the celiac trunk

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**Abstract** The knowledge of anatomical variations in hepatic artery is of importance to surgeons in planning effective therapeutic strategies for general surgery. Apart from the different source and number variations, the unusual course was also discovered during the angiography and anatomical dissection. The present case report shows a rare case in which the common hepatic artery arising from the celiac trunk, crossed the portal vein, positioning itself at the back of this structure, found in a male patient undergoing distal partial gastrectomy.

**Keywords** Anatomy · Variation · Hepatic artery · Distal partial gastrectomy

## Introduction

In order to prevent vascular damage with ischemia and tissue necrosis during complicated surgical procedures, the acquisition of the profound knowledge of the potential hepatic artery anatomic variations is mandatory to the

hepatobiliary and gastrointestinal surgeon. This essentially becomes even more important, when the hepatic artery is skeletonized to resect the regional lymph nodes and perivascular lymphatic pathways without preoperative abdominal angiography. The classic textbook description of arterial anatomy of the liver is the common hepatic artery arising from the celiac trunk, passing in front of the portal vein, giving off the gastroduodenal artery and the proper hepatic artery, which then divides into the right and left hepatic arteries at the hilum. This typical normal anatomy is observed in only 53.5–75.5% of the cases [1–4], based on the study of large samples. It is well known that anatomical variations of the hepatic artery are not uncommon, and these variations are classified into ten patterns which served as the benchmark for all subsequent contributions in this area [5]. The common hepatic artery arising from the superior mesenteric artery, running posterior to the portal vein was detected in 0.3–2% of cases [6–8]. The incidence of the unusual course of the common hepatic artery originating from the celiac trunk, however, is very rarely reported in the literature [9].

We, herein, report a case of the common hepatic artery originating from the celiac trunk and passing behind the portal vein, found in a male patient undergoing distal partial gastrectomy (DPG), which seldom appears to have been previously recognized or reported.

## Case report

A 51-year-old man was admitted to West China Hospital presenting epigastric pain for approximately 1 year. During the gastroduodenoscopy, the submucosal eminence with erosion and ulcer at angular incisure was observed; meanwhile multiple biopsies were obtained along with the

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procedure. A diagnosis of antral adenocarcinoma was determined by hematoxylin and eosin (HE) stain. Based on preoperative findings that liver and other distant metastases were not detected, we decided to perform the DPG with Billroth II anastomosis and D2 lymph node dissection.

Elective laparotomy was performed through a midline incision. At laparotomy, the common hepatic artery originating from the celiac trunk was explored and skeletonized to remove lymph nodes at the common hepatic artery (8th lymph node). The remaining two branches of the celiac trunk, which had a normal trifurcation, were the left gastric artery and splenic artery. The left gastric artery ran anteriorly, upward and to the left in a gentle curve and gave off a branch to the cardiac region before supplying the lesser curvature of the stomach. The splenic artery followed the typical course along the superior margin of the pancreas. At the common hepatic artery emergence, near the upper edge of the pancreas, the trajectory of this artery was extremely unusual as it crossed the portal vein, positioning itself at the back of this structure. As the common hepatic artery ran to the right of the portal vein, it gave rise to the gastroduodenal and right gastric artery immediately. As a terminal branch of the common hepatic artery, the proper hepatic artery ran anteriorly and went left to the anterior surface of the portal vein. Then the proper hepatic artery kept ascending in front of the PV on the left side of the bile passage, and further divided into right and left branches and supplied the right and left lobes of the liver, respectively (Fig. 1). The right hepatic artery crossing behind the common hepatic duct, gave off the cystic artery to the gallbladder in the angle between the common hepatic duct and the cystic duct.

Macroscopically, a curative resection was performed and the resected specimen contained a  $2.5 \times 1.5$  cm



**Fig. 1** The stomach has been pulled downward. The left gastric artery has been cut off and double-ligated close to its origin. CHA common hepatic artery, CT celiac trunk, GDA gastroduodenal artery, PHA proper hepatic artery, PV portal vein, SA splenic artery, SV splenic vein

Bormann III lesion on the posterior wall of the antrum. Postoperative microscopic observation revealed that poorly differentiated adenocarcinoma with signet-ring cells had involved the submucosa of the stomach, and metastasis was not found in the 25 resected lymph nodes. Histopathologically, a R0 resection was operated. There has been no sign of recurrence of the gastric cancer in 6 months of follow up.

## Discussion

As mentioned above, anatomic anomalies of the hepatic artery can be found in 25.5–46.5% of the cases. After studying 200 cadavers, Michels [5] classified the variations into ten types, according to the clinical and modern concepts of accessory and replaced hepatic arteries: (1) the normal right, left, and middle hepatic artery (textbook type); (2) replaced left hepatic from left gastric artery; (3) replaced right hepatic from superior mesenteric artery; (4) replaced right hepatic from superior mesenteric artery and replaced left hepatic replaced from the left gastric artery; (5) accessory left hepatic from the left gastric artery; (6) accessory right hepatic from the superior mesenteric artery; (7) accessory right hepatic from the superior mesenteric and accessory left hepatic from the left gastric artery; (8) combination patterns of replaced right hepatic and accessory left hepatic or accessory right hepatic with replaced left hepatic artery; (9) common hepatic derived from the superior mesenteric artery; (10) common hepatic derived from the left gastric artery. This classification was completed by Hiatt et al. [3] in 1994. Apart from the different source and number variations of the common hepatic artery, the unusual course of the common hepatic artery was also discovered during the angiography and anatomical dissection. According to the previously reported cases, variations in the trajectory were associated with at least one other anatomical variation: The similar situation has been described by Adachi [9] with three more additional cases of accessory right hepatic arteries arising also from the celiac trunk and passing behind the portal vein. With a digital subtraction angiography (DSA), Covey et al. [6] identified two cases (0.3%) of the common hepatic artery originating from the superior mesenteric artery and Koops et al. [7] found this situation in 2% of a series of selective celiac and superior mesenteric angiographies. One case of an hepatomesenteric trunk, formed by the common hepatic artery and superior mesenteric artery, was reported by Kahraman et al. [8]. In a computerized tomography series, Sponza et al. [10] observed that the common hepatic artery was replaced by the superior mesenteric artery in 12 (2.0%) patients, and arose as a separate branch of the aorta in

another 12. In an unusual case, the common hepatic artery formed the first branch of the superior mesenteric artery and passed in front of the portal vein [11]. The surgeon must be cautious and aware of common hepatic artery anatomic variations, including different source, number variations and unusual course.

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