

Quadrifurcation of coeliac trunk – A case report

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Abstract

During routine dissection of a cadaver in the department of anatomy at Rajarajeswari Medical College and Hospital, we found a very rare type of branching pattern of the Coeliac Trunk (CT). The CT measured 5cm in length and was quadrifurcating into right proper hepatic artery, common hepatic artery, left gastric artery and splenic artery. The right proper hepatic artery had unusual course where it ran behind the portal vein and bile duct to reach the right lobe of liver. The right gastric artery arose from the right proper hepatic artery before it passed behind the portal vein and bile duct. The common hepatic artery bifurcated into left hepatic artery and gastroduodenal artery, the latter in turn gave rise to cystic artery. A complete knowledge of these variations in branching pattern of CT is clinically important for hepatobiliary surgeons and also for radiologists.

Keywords: Coeliac trunk, Quadrifurcation, Right proper hepatic artery.

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INTRODUCTION

Coeliac trunk is a short stump measuring about 1.25cm in length arising from abdominal aorta just below the aortic hiatus of diaphragm opposite the disc between T12 and L1 vertebra. It mainly supplies the foregut part of gastrointestinal tract and associated viscera like liver, spleen, gall bladder and pancreas. The classical description of normal celiac trunk anatomy is that, the main trunk trifurcates into the left gastric, splenic and common hepatic arteries. The common hepatic artery after it gives rise to right gastric artery, divides into gastro duodenal artery and hepatic artery proper. The gastro duodenal artery ends by dividing into superior pancreatico duodenal artery and right gastroepiploic arteries. The hepatic artery proper in the region of porta hepatis bifurcates into larger right and small left hepatic

branches. The right hepatic branch turns laterally to enter the liver via the intersegmental fissure and on its way it gives the cystic branch to the gall bladder and the small left hepatic branch supplies left lobe of liver. The left gastric artery runs in the lesser omentum and supplies the stomach. It also gives 1 or 2 esophageal branches to the terminal part of the esophagus and then anastomoses with right gastric artery along the lesser curvature of stomach. The splenic artery is tortuous and gives off pancreatic, short gastric and left gastroepiploic arteries to supply pancreas, spleen and stomach¹. This most classical type of branching of coeliac trunk is known as trifurcation and was first described by Haller in 1756. This “Tripos Halleri” is still being considered to be the normal branching pattern of coeliac trunk. Additional branches of the coeliac trunk other than its usual branches are referred to as collaterals². Variations in the pattern of branching of the celiac trunk may predispose to iatrogenic injury during surgical procedures of pancreaticoduodenectomy and hepatic artery infusion chemotherapy. Knowledge of this variable anatomy may be useful in planning and executing radiological interventions such as celiacography and chemoembolisation of hepatic tumors.

CASE REPORT

During the routine abdominal dissection of a 60 year old male cadaver in the department of anatomy at

Rajarajeswari medical college and hospital, a rare type of variation in the branching pattern of coeliac trunk was found. It was a very rare case where the length of coeliac trunk itself is longer than usual i.e. about 5 cm in length and in addition it was quadrifurcating into right proper hepatic artery, common hepatic artery, left gastric artery and splenic artery [fig.1]. The right proper hepatic artery had an unusual course where it ran upwards to the right, passing behind the portal vein and bile duct and then terminated into two lobar branches at the right end of

porta hepatis to supply the right lobe of the liver. The right gastric artery arose from right proper hepatic artery. The common hepatic artery after a short course towards the right bifurcated into left hepatic branch and gastroduodenal arteries. The latter gave rise to cystic artery to supply the gall bladder and then had a normal course behind the first part of duodenum and terminated as right gastroepiploic and superior pancreaticoduodenal arteries. The left gastric and splenic arteries were normal in course and distribution.

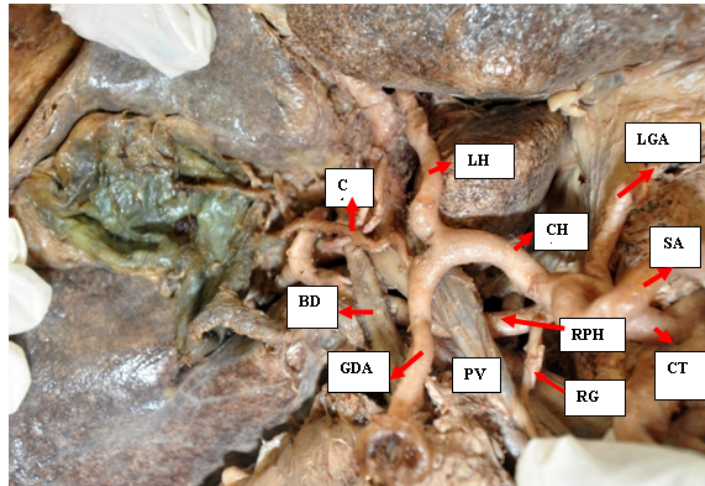


Figure 1: Quadrifurcation of CT; CT=Coeliac Trunk, RPHA=Right Proper Hepatic Artery, CHA=Common Hepatic Artery, LGA=Left Gastric Artery, SA=Splenic Artery, RGA=Right Gastric Artery, LHA=Left Hepatic Artery, GDA=Gastroduodenal Artery, CA=Cystic Artery, BD=Bile Duct, PV=Portal Vein

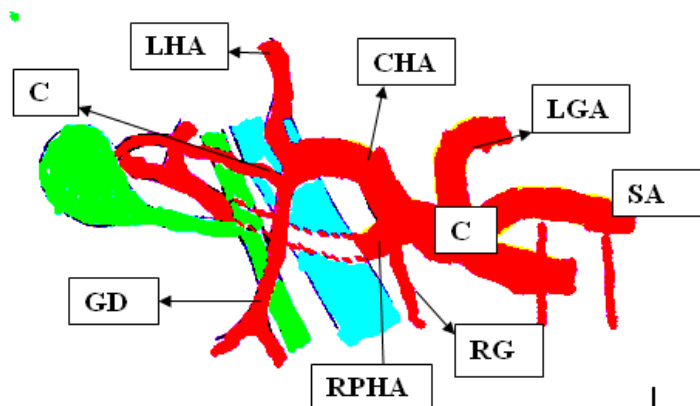


Figure 2: Schematic diagram showing the branching pattern of CT

DISCUSSION

Anatomical variations in the branching pattern of the celiac trunk are of considerable importance in the liver transplants, laparoscopic surgeries, abdominal radiological interventions and in penetrating injuries to the abdomen. Previous investigations reported many variations in the branching pattern of CT. [3]

Michels⁴ classified the branching of CT into 6 different types.

Type-1: Usual branching (Trifurcation)

Type-2: Hepatosplenic trunk, left gastric from aorta

Type-3: Hepatosplenoenteric trunk, left gastric from aorta

Type-4: Hepatogastric trunk, splenic artery from superior mesenteric artery

Type-5: Splenogastric, common hepatic from superior mesenteric artery

Type-6: coeliacomesenteric trunk, common hepatic, splenic, left gastric and superior mesenteric artery form a common trunk.

The present findings do not confirm to any of the above mentioned classification of Michels. Depending on the number of divisions made, the branching pattern of coeliac trunk can also be classified as bifurcation, classical and nonclassical trifurcation,^[2] quadrifurcation^{5,6}, pentafurcation⁸, hexafurcation⁹. Sateesha Nayak⁵, reported quadrifurcation of the celiac trunk into common hepatic, left gastric, left hepatic and splenic arteries. Sathidevi⁶ reported another quadrifurcation of CT into gastroduodenal artery, common hepatic artery, left gastric artery and splenic arteries. The present case confirms with the findings of SatishNayak and Sathidevi only regarding the quadrifurcation, but the pattern of quadrifurcation [fig.¹ differs in that the right proper hepatic artery is present in place of left hepatic artery (Satissha Nayak) and gastroduodenal artery (Sathidevi). It also differs by its unusual course that right proper hepatic artery runs behind the portal vein and bile duct [fig.]. According to the study by Suman Tiwari⁷, the length of coeliac trunk ranges from 1.3-1.8cm with a maximum length about 2.5 cm. According to the author the coeliac trunk with longer length showed trifurcation – in 84%, bifurcation- in 2%, quadrifurcation- in 8% and pentafurcation- in 6%. In the present case CT measured 5cms from its origin from aorta till its quadrifurcation Ronald Bergmann^[10] reported out of 165 specimens, about 0.8% the right hepatic artery arose directly from coeliac trunk where its course was anterior to the bile duct in 64%, anterior to portal vein in 0.1% and posterior to portal vein in 9%. In the present study the course of right proper hepatic artery was observed behind the portal vein and bile duct. Preoperative knowledge of interposition of hepatic artery variations can be important in guiding the surgical approach to the gallbladder, liver, pancreas, stomach, and portal system. A retro portal course of right hepatic proper is surgically significant during portocaval shunt. Vascular variations are usually asymptomatic. They may become important in patients undergoing coeliacography for gastrointestinal bleeding, celiac axis compression syndrome, prior to an operative procedure or transcatheter therapy; chemoembolization of pancreatic and liver tumors. Careful identification and dissection of coeliac trunk branches is therefore important to avoid iatrogenic injury.

CONCLUSION

Though various types of quadrifurcations are reported, this rare variation of quadrifurcation of CT into right proper hepatic, common hepatic, left gastric and splenic arteries becomes utmost importance. A thorough knowledge of presence and course of right proper hepatic artery is important for proper pre operative diagnosis and planning during liver transplants, laparoscopic surgeries, and also for interventional radiologists performing ateriography. Presence of arterial variations may result in erroneous interpretation of angiograms. Hence the knowledge of variations of CT is very useful and should be kept in mind to avoid intra operative and post operative complications.

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