



## Replaced right hepatic artery in cadaveric specimen

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### Abstract

Classically, the right hepatic artery is a terminal branch of the common hepatic artery. This case report identifies and describes the course of a variant replaced right hepatic artery originating from the coeliac trunk, which was discovered on cadaveric dissection.

Knowledge of aberrant hepatic vasculature is essential not only for liver transplant surgeons but also for general surgeons and radiologists.

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**Key words** [hepatic artery] [coeliac axis] [transplant]

### Introduction

The right hepatic artery generally arises from the common hepatic artery, a branch of the coeliac trunk, to supply the right lobe of the liver. Most commonly, the hepatic artery has its origin in the coeliac trunk. It then passes anterolaterally to the first part of the duodenum and bifurcates into the hepatic artery proper and gastroduodenal artery. After passing anterior to the portal vein it ascends to the porta hepatis where it divides into right and left branches. The right hepatic artery usually passes posterior to the common hepatic duct. An accessory or replaced right hepatic artery from the superior mesenteric artery “runs behind the portal vein and bile duct in the lesser omentum” [1]. It is common to have anatomical variations in the hepatic arterial supply due to variant embryological development of the ventral arteries of the foregut and failure of these vessels to regress [2]. Separate studies [3–7] have shown in fact that hepatic vasculature is of the classical “textbook” supply in only 55–76% of specimens. However, the authors believe this is the first photographed and documented course of a replaced right hepatic artery (RRHA) emerging from the coeliac trunk.

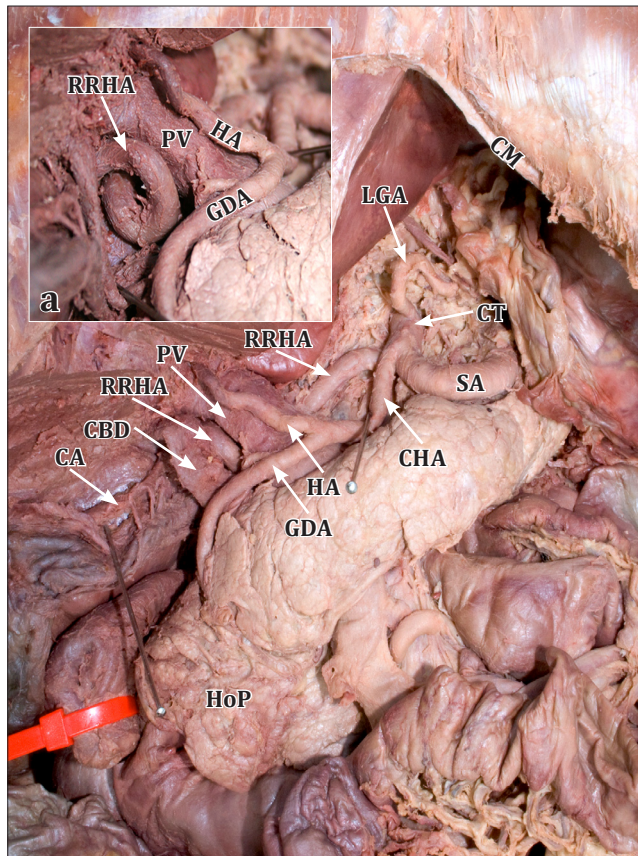
### Case Report

In this cadaveric 100-year-old female, a replaced right hepatic artery was found during abdominal preparation for

prosection. In this dissection, the artery was identified as arising from the coeliac trunk as a trifurcation immediately posterior to the emergence of the common hepatic artery and splenic artery and distal to the left gastric artery (Figure 1). The RRHA coursed posterior and in parallel to the common hepatic artery and passed between the portal vein and inferior vena cava emerging in a tortuous loop. Its course continued deep to the common hepatic duct before branching to a single cystic artery and supplying the right lobe of the liver. All other mesenteric arteries and the gross anatomy of the liver were found to be as usual.

### Discussion

The occurrence of a replaced or accessory right hepatic artery emerging from the coeliac trunk is rare, accounting for 0.4–0.9% of live specimens in three liver transplant studies [3, 7, 8]. In many other series, its presence has not been identified. Detailed anatomical descriptions are not available and therefore the exact course of the right hepatic artery in these instances is unknown. International classification schemes for hepatic vasculature were devised by Michels [5] and later modified by Hiatt [4]. The RRHA found in this study is not classifiable in either system as it is stipulated that it should emerge from the superior mesenteric artery. The relevance of peri-hepatic vasculature anatomy is of significance not only for harvesting and re-anastomosis of



**Figure 1.** The course of the replaced right hepatic artery (*RRHA*) in the upper abdomen. *RRHA* arises at the trifurcation of the coeliac trunk (*CT*) with the splenic artery (*SA*) and the common hepatic artery (*CHA*), after it has given rise to the left gastric artery (*LGA*). The *RRHA* runs posterior to the portal vein (*PV*) and then loops tortuously (inset panel *a*; lateral view) before branching to give the cystic artery (*CA*) and entering the right lobe of the liver. (*HoP*: head of pancreas; *CBD*: common bile duct; *CM*: costal margin; *HA*: hepatic artery proper; *GDA*: gastroduodenal artery)

orthotopic liver transplants but more commonly to avoid vessel injury in general surgery, particularly laparoscopic cholecystectomies, and vascular radiological procedures. Identifying the presence of a *RRHA* also has a bearing on surgical and interventional radiological planning. In particular,

since it is an end artery, its presence must be recognized when carrying out a pancreaticoduodenectomy procedure or dissecting out the porta hepatis during resection of the liver and preservation of variant vessels during both right lobe liver living donor and split graft transplantation [9]. Equally, pancreatic tumors involving the head or uncinate process where a *RRHA* is identified are not amenable to surgical resection [10].

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#### References

- [1] Standring S, ed. *Gray's Anatomy: The Anatomical Basis of Clinical Practice*. 40th Ed., Edinburgh, Elsevier Churchill Livingstone. 2008;1169–1170.
- [2] Chen H, Yano R, Emura S, Shoumura S. Anatomic variation of the celiac trunk with special reference to hepatic artery patterns. *Ann Anat*. 2009;191: 399–407.
- [3] Gruttadauria S, Foglieni CS, Doria C, Luca A, Lauro A, Marino IR. The hepatic artery in liver transplantation and surgery: vascular anomalies in 701 cases. *Clin Transplant*. 2001; 15: 359–363.
- [4] Hiatt JR, Gabbay J, Busuttil RW. Surgical anatomy of the hepatic arteries in 1000 cases. *Ann Surg*. 1994; 220: 50–52.
- [5] Michels NA. Newer anatomy of the liver and its variant blood supply and collateral circulation. *Am J Surg*. 1966; 112: 337–347.
- [6] Saba L, Mallarini G. Anatomic variations of arterial liver vascularization: an analysis by using MDCTA. *Surg Radiol Anat*. 2011; 33: 559–568.
- [7] Soin AS, Friend PJ, Rasmussen A, Saxena R, Tokat Y, Alexander GJ, Jamieson NV, Calne RY. Donor arterial variations in liver transplantation: management and outcome of 527 consecutive grafts. *Br J Surg*. 1996; 83: 637–641.
- [8] Todo S, Makowka L, Tzakis AG, Marsh JW Jr, Karrer FM, Armany M, Miller C, Tallent MB, Esquivel CO, Gordon RD, Iwatsuki S, Starzl TE. Hepatic artery in liver transplantation. *Transplant Proc*. 1987; 19: 2406–2411.
- [9] Varotti G, Gondolesi GE, Munoz L, Florman S, Fishbein TM, Emre S, Schwartz ME, Miller C. Biliary complications in 96 right lobe living donor liver transplants. *J Gastrointest Surg*. 2003; 7: 271.
- [10] Iezzi R, Cotroneo AR, Giancristofaro D, Santoro M, Storto ML. Multidetector-row CT angiographic imaging of the celiac trunk: anatomy and normal variants. *Surg Radiol Anat*. 2008; 30: 303–310.