



Hepatic artery variations: a case report

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Abstract

Variations in hepatic arteries were noticed in a female cadaver during dissection for undergraduate students. Detailed dissection was carried out to establish branches from celiac trunk. It was observed in our cadaver that common hepatic artery trifurcated to form gastroduodenal, right hepatic and left hepatic arteries. The cystic artery was a branch from left hepatic artery. The right gastric artery was seen to arise from left hepatic artery. In clinical practice the in-depth knowledge of not only “standard” anatomy but variational anatomy is essential to minimize morbidity encountered during hepato-biliary surgeries. The angiogenic pattern seen in our case forms 1-2% of all documented variations.

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Key words [celiac trunk] [common hepatic artery] [gastroduodenal artery] [right hepatic artery] [left hepatic artery]

Introduction

The anatomy of the hepatic artery is of great clinical significance in all hepato-biliary surgeries including liver transplants. Recently, due to the rapid increase in the number of liver transplants and laparoscopic cholecystectomy the importance of hepatic artery anatomy has become apparent. In liver transplants appropriate evaluation of hepatic arteries is essential for reducing operative and post-operative morbidity and mortality in donors and recipients both. As early as 1756 Haller mentions presence of angiogenic variation of hepatic artery in his literature on celiac axis variations [1]. Hepatic artery variation was first described by Michels et al. in the 1960s based on dissection of 200 cadavers [2]. They described 10 basic anatomical variations which was subsequently modified and simplified to 6 types by Hiatt et al. in 1994 based on study of 1000 donor livers that were used for orthotropic transplantation between 1983 to 1993 [3].

The usual arterial supply of the liver comes from the common hepatic artery (CHA), arising from the celiac trunk (CT) and dividing into gastroduodenal artery (GDA) and proper hepatic artery (PHA). PHA divides distally into right and left branches. Modification of this dominant scheme is seen in 25-75% of the cases [3].

Jones et al. stated that when there is one vascular variation, there is higher chance of multiple variations [4].

Both Kemeny et al. and Niederhuber and Ensminger describe a pattern termed trifurcation (common hepatic artery divides to form gastroduodenal, right and left hepatic arteries) which was seen in our case [5, 6].

Our case study will provide an additional data of hepatic artery variation to surgeons performing procedures in and around the porta hepatis.

Case Report

During routine undergraduate dissection, variations in the hepatic arteries were noticed. They were seen in a 45-year-old obese female cadaver. Other six cadavers used by students for dissection were also studied for possible hepatic artery variations. However, rest was seen to follow usual vessel pattern. Thereafter detailed dissection was carried out in the case cadaver to establish branches of the celiac trunk.

Digital photographs were taken with Canon 10MP, x3 optical zoom in auto mode without flash of arterial distribution from celiac trunk in situ (Figure 1). After this the hepato-biliary apparatus was taken out with duodenum and pancreas. These were placed on a white sheet and additional photograph taken.

It was observed in our cadaver that common hepatic artery trifurcated to form gastroduodenal, right hepatic and left hepatic arteries. The cystic artery was found to emerge from

left hepatic artery. The right gastric artery was seen to arise from left hepatic artery (Figure 2).

Discussion

Introduction of laparoscopic cholecystectomy and emergence of liver transplants has stimulated renewed interest in hepatic artery variations. The extra-hepatic arteries must be identified with precision at the time of liver harvest to avoid injuries that might compromise complete artery ligation of the graft [7].

Michel's classic autopsy series of 200 dissections in 1966 defines 10 basic anatomic variations in hepatic arteries [2]. It was modified to 6 types by Hiatt et al. in 1994 [3]. However, it is not all inclusive classification and variants exist beyond this classification. Trifurcation of common hepatic artery into right and left hepatic arteries and gastroduodenal artery with no hepatic artery proper is classified as variant of Type I in Hiatt classification. The knowledge of this variation is important in planning liver transplantation, hepatic artery infusion chemotherapy and transarterial chemoembolization. A preoperative visceral angiogram provides a map for revascularization. The presence of an aberrant vessel can result in incomplete embolization of liver tumors and improper catheter tip placement, causing damage to normal liver parenchyma during chemoembolization or hepatic artery infusion chemotherapy [5, 8].

It is further emphasized that once a variation is identified there is likely chance of multiple variations [4]. In our case in addition to trifurcation, the right gastric artery was seen to arise from left hepatic artery instead of hepatic artery proper, and the cystic artery is seen as branch from left hepatic artery instead of the right hepatic artery.

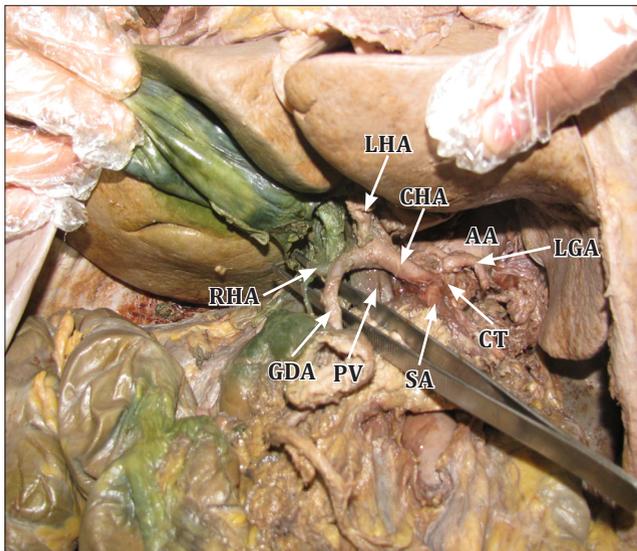


Figure 1. Arterial distribution of celiac trunk in situ. (SA: splenic artery; CT: celiac trunk; AA: abdominal aorta; LGA: left gastric artery; CHA: common hepatic artery; LHA: left hepatic artery; RHA: right hepatic artery; GDA: gastroduodenal artery; PV: portal vein)

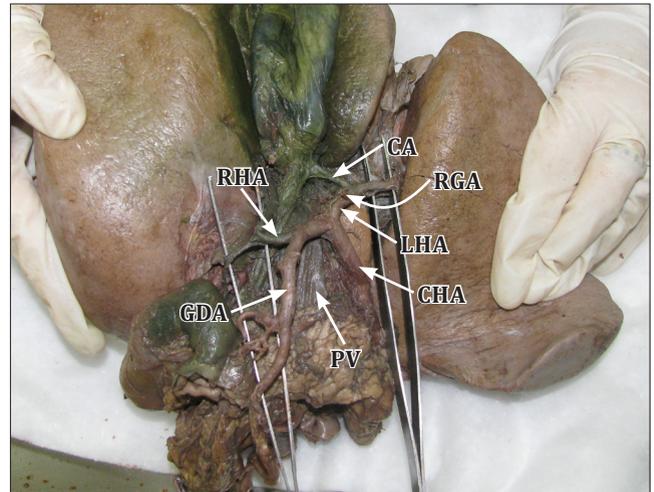


Figure 2. Hepatic artery distribution with hepato-biliary apparatus taken out along with duodenum and pancreas. (CHA: common hepatic artery; LHA: left hepatic artery; RHA: right hepatic artery; GDA: gastroduodenal artery; PV: portal vein; RGA: right gastric artery; CA: cystic artery)

Surgical mistakes from failing to appreciate hepatic artery anatomy continue to be made with serious consequences to the patient which also has medico-legal implications. Our case report will help to augment all existing data with regards to hepatic artery variations and will re-emphasize the importance of identifying the anatomy and variations of the hepatic artery before performing liver transplants, hepatic artery infusions and trans-arterial chemo-embolization.

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