An uncommon variation of the coeliac trunk in an adult patient with a splenic infarct : computed tomography angiography findings

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To the Editor,

In several clinical situations, such as living-donor liver transplantations and surgical treatment of hepatic tumors, the knowledge of the arterial hepatic vasculature is crucial (1-3). The complicated nature of the variable anatomy of the celiac trunk and hepatic arteries may complicate surgical resection. Therefore, accurate knowledge of the vascular anatomy before surgical therapy is required (3). In the present case, the splenic infarct may have been secondary to or favored by the observed arterial arrangement. Computed tomography (CT) angiography offers excellent three-dimensional reformatted images and is a useful noninvasive method for demonstrating the details of vascular structures (4).

A 34-year-old Turkish woman was admitted with sudden onset pain of the left upper abdominal quadrant. An abdominal examination showed a soft, nontender abdomen and no splenomegaly. The results of laboratory tests were unremarkable. Contrast-enhanced CT was performed. The CT scan of the abdomen revealed a massive wedge-shaped infarct area of decreased density in the spleen (Figs. 1A-B). This finding was consistent with a splenic infarction. Probable cause of splenic infarction was the long course and atypical origin of the hepatic artery. On the CT images, the left gastric artery directly arose from the abdominal aorta via a separate root (Fig. 1A). There was no proper hepatic artery, nor common hepatic artery. The axial and coronal reformatted and three-dimensional (3-D) volume-rendered CT angiography images also showed that the right hepatic artery, left hepatic artery, and splenic

artery originated directly from the coeliac trunk and that the gastroduodenal artery arose from the left hepatic artery (Figs.1A-C and Figs. 1D-E). The patient was put on warfarin, and her abdominal symptoms resolved in five days. She reported no pain related to the infarct at a three-month follow-up.

In the English literature, several branching patterns at the celiac trunk level have been described (3-6). The celiacobimesenteric trunk consists of the celiac trunk and superior and inferior mesenteric arteries. Today, Michels's anatomical classification is the most frequently utilized to define hepatic arteries. In cadaveric dissections, Michels described 10 subtypes of configuration for the variant hepatic arteries (4).

However, in surgical series, Hiatt's classification of the hepatic arterial system described six subtypes (5). Recently, in a multidetector-row CT angiography series, Iezzi et al. (6) also described six subtypes of the hepatic arterial system (Table). The present case was different from those described in all earlier series. In our case, the left gastric artery originated directly from the abdominal aorta, and there were no proper hepatic artery, nor common hepatic artery. The right hepatic, left hepatic, and splenic arteries all originated from a single arterial trunk, creating a trifurcation. The gastroduodenal artery arose from the left hepatic artery and passed immediately in front of the portal vein (Fig. 2).

In the examination of the hepatic arterial structures, conventional angiography is the gold standard. However, it is an invasive imaging method and may be associated with severe complications. Due to these limitations, CT angiography, which is an accurate, noninvasive method, has become the method of choice for the visualization of normal and variant arterial anatomies, as well as pathological conditions, of the celiac trunk and its branches (6).

In conclusion, an understanding of the anatomy of the celiac trunk and its variants is essential for accurate preoperative vascular planning in surgical procedures. CT angiography provides high-quality 3-D reconstructed images and allows a noninvasive assessment of the normal and variant anatomy of the celiac trunk and its branches.

Keywords: Anatomic variation, Hepatic arteries, Celiac trunk, Splenic infarct, CT angiography.

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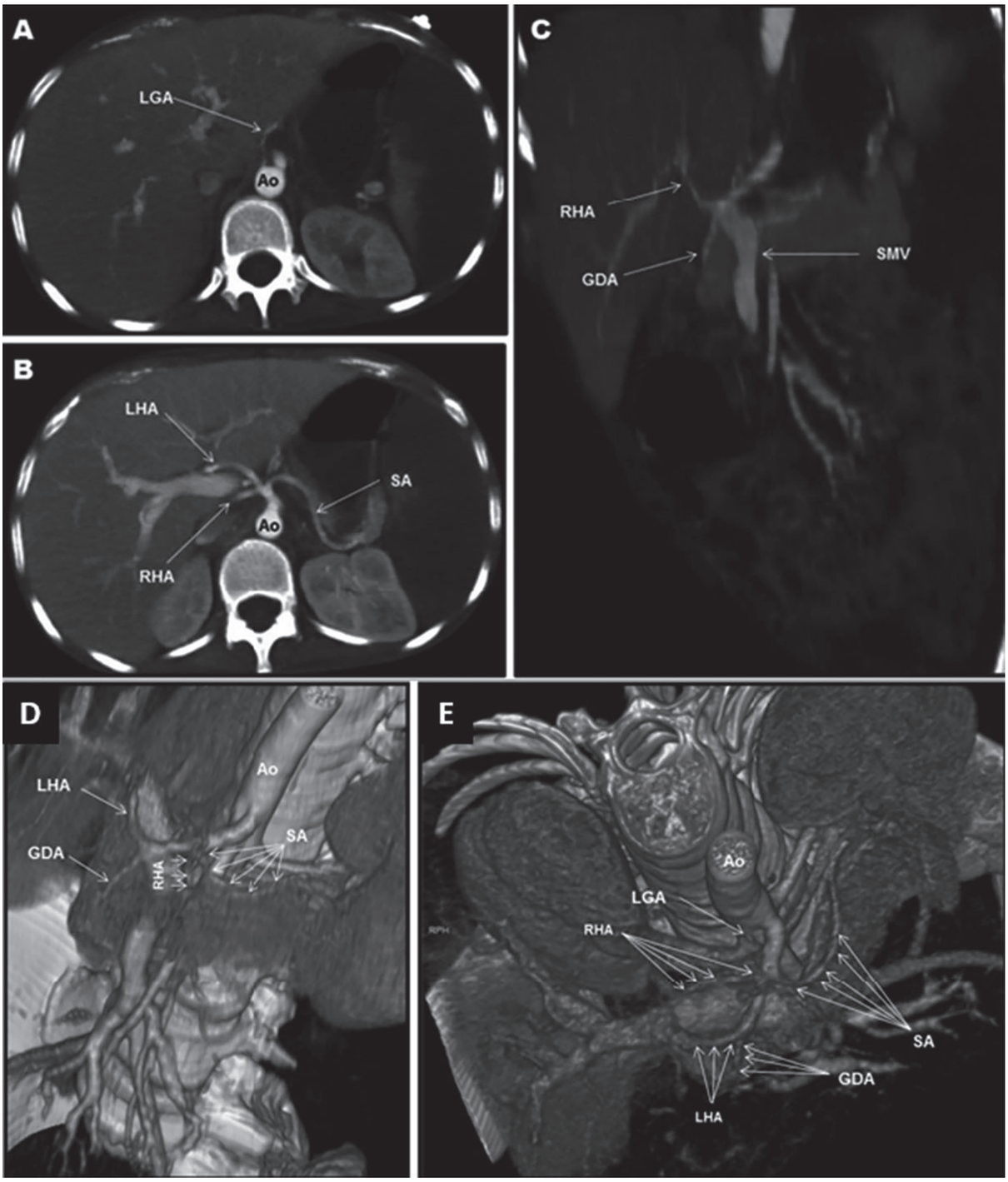

Fig. 1. — Axial (A) maximum intensity projection (MIP) CT image shows the left gastric artery directly originating from the aorta. On a caudal scan, the axial (B) MIP image shows the right and left hepatic and splenic arteries originating from a single arterial trunk. These vessels created a trifurcation. The axial CT images also show a splenic artery infarct. Coronal (C) oblique MIP CT angiography scan shows the gastroduodenal artery arising from the left hepatic artery. Anterior (D) and craniocaudally (E) view volume rendering (VR) images clearly reveal the variant anatomy of the coeliac trunk and hepatic arteries. Ao : aorta, LGA : left gastric artery, LHA : left hepatic artery, RHA : right hepatic artery, SA : splenic artery, GDA : gastroduodenal artery, SMV : superior mesenteric vein, PV : portal vein

Table 1. — **Iezzi's anatomical classification of hepatic arteries.**

Type	Description	%
I	Normal anatomy	72.1
II	Replaced left hepatic artery originating from the left gastric artery	5.9
III	Replaced right hepatic artery originating from the superior mesenteric artery	9.3
IV	Accessory left hepatic artery originating from the left gastric artery	0.2
V	Common hepatic artery originating from the superior mesenteric artery	3.6
VI	Other	8.7

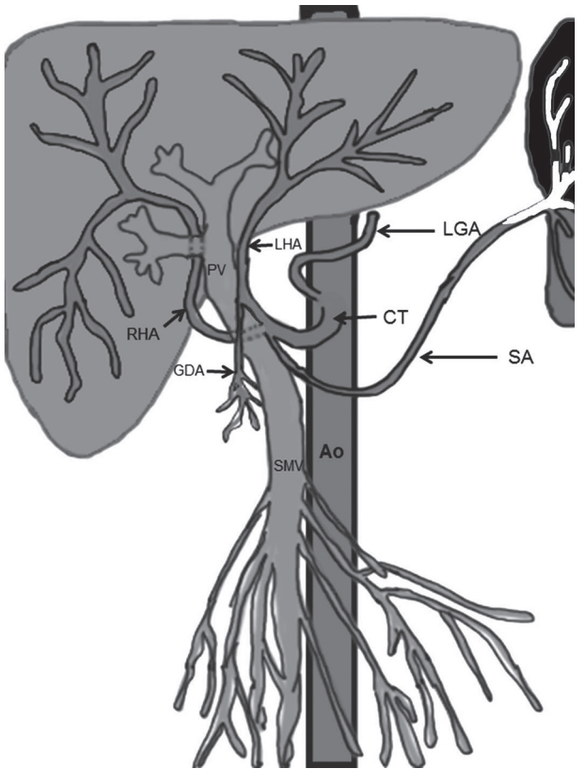

Fig. 2. — Drawing illustrating the complex anatomy of the coeliac trunk and hepatic arteries and a schematic representation of an infarct of the splenic artery. Ao : aorta, LGA : left gastric artery, LHA : left hepatic artery, RHA : right hepatic artery, SA : splenic artery, GDA : gastroduodenal artery, PV : portal vein. SMV : Superior mesenteric vein

References

1. HANTO D.W. Anatomic and technical aspects of hepatic artery reconstruction in living donor liver transplant. *Surgery*, 2006, **140** : 829.
2. MACDONALD D.B., HAIDER M.A., KHAILI K, KIM T.K., O'MALLEY M, GREIG P.D. *et al*. Relationship between vascular and biliary anatomy in living liver donors. AJR. Am. *J. Roentgenol*., 2005, **185** : 247e52.
3. SABA L., MALLARINI G. Multidetector row CT angiography in the evaluation of the hepatic artery and its anatomical variants. *Clin. Radiol*., 2008, **63** : 312-321.
4. MICHELS N.A. Newer anatomy of the liver and its variant blood supply and collateral circulation. *Am. J. Surg*., 1966, **112** : 337-347.
5. HIATT J.R., GABBAY J., BUSUTTIL R. Surgical anatomy of the hepatic arteries in 1000 cases. *Ann. Surg*., 1994, **220** : 50-52.
6. IEZZI R, COTRONEO A.R., GIANCRISTOFARO D, SANTORO M, STORTO M.L. Multidetector-row CT angiographic imaging of the celiac trunk: anatomy and normal variants. *Surg. Radiol. Anat*., 2008, **30** : 303-310.