Introduction

In the anatomy textbooks that are commonly used, the celiac and superior mesenteric arteries arise from the abdominal aorta (1–5). However, variations in the blood supply of the supramesocolonic organs have been frequently reported (6–15). With the development of imaging technology, such as computed tomography (CT), magnetic resonance imaging (MRI), and angiography methods, information regarding vessel variation has become very important. In addition, understanding of vessel variation in the celiac and superior mesenteric arteries is also useful for the surgical treatment and clinical examination of the supramesocolonic organs (16–20). This report aimed at documenting vessel variation throughout the supramesocolonic organs to aid clinical treatment and examination.

Material and Methods

During the dissection course for medical students (42 cadavers), a variation vessel supplying blood to supramesocolonic organs was observed in 1 cadaver (woman; 88 years old; cause of death: acute respiratory failure). After opening the thoracic and abdominal cavity, the main abdominal organs (digestive tract from the esophagus to descending colon, liver, and pancreas with spleen) were removed. First, the esophagus was cut at the collateral vagus nerve in the lower 1/3; then, the inferior vena cava was cut at the low margin of the liver (cranial of the suprarenal vein). The descending colon was cut at the transition with the sigmoid colon. Finally, the celiac and superior mesenteric arteries (generally, it did exist) were cut at the origin(s) from the abdominal aorta. This dissection method is useful for the students to observe all of the vessels that are distributed on the main abdominal organs.

Observations

As shown in Figures, there is only 1 origin of the celiac and superior mesenteric arteries from abdominal aorta. Of note, the branches in this case were as follows:

1) **Celiacomesenteric trunk**: The celiac and superior mesenteric arteries arose with a common short trunk from the abdominal aorta (Fig. 1 and 2).

2) **Left hepatic artery**: The artery arose from the left...
gastric artery, with its origin in the celiacomesenteric trunk (Fig. 2).

3) **Common hepatic artery**: The arterial branch, as a short trunk, arose from the celiacomesenteric trunk (Fig. 2). The cystic, gastroduodenal, and right gastric arteries arose from the arterial branch.

4) **Left and right inferior phrenic arteries**: The left inferior phrenic artery arose from the beginning of the celiacomesenteric trunk and anastomosed with the right inferior phrenic artery. Then, after passing through the diaphragm, it anastomosed with the superior phrenic artery (Fig. 2). The right inferior phrenic artery arose from the right middle suprarenal artery, but not the celiacomesenteric trunk (Fig. 2).

**Discussion**

1. Generally, the celiac and superior mesenteric arteries arise from the abdominal aorta\(^5\)). However, this pattern varies considerably in humans\(^6\)). The reported incidences of a celiacomesenteric trunk are 2.38%\(^7\), 1.00%\(^21\), and 2.70%\(^22\). The incidence in the present study was also 2.38% (1/42 bodies), although this incidence was based on fewer cases.

2. The typical pattern involves the left hepatic artery arising from the proper hepatic artery\(^5\)), but it can also arise from the common hepatic, left gastric, celiac, or superior mesenteric artery\(^6\)). This artery is important to complete the excision of the celiac axis, when necessary\(^16\). The reported incidences are 11%\(^23\), 17.9%\(^6\), 12.0%\(^24\), 3.60%\(^25\), and 16%\(^26\).

3. The typical pattern involves the common hepatic artery arising from the celiac artery\(^5\)), but it can also arise from the superior mesenteric artery, with a reported incidence of 13%\(^24\)). This artery has also been named the medial hepatic artery because of the existence of left and right hepatic arteries\(^16, 27\). Hepatic artery variations originating from the superior mesenteric artery present as 1 of 2 types: the pre-pancreas type and post-pancreas type, with the latter being the most common\(^28\).

4. The left and right inferior phrenic arteries can arise immediately below the diaphragm from the abdominal aorta\(^1-5\); however, this pattern accounts for only 5.62% of cases\(^29\). The frequency of an independent origin of the 2 arteries on each side of the celiac artery is 2.25%\(^29\). The 2 arteries can also arise from the aorta or celiac artery as a common trunk\(^30, 31\). The reported incidences of the right inferior phrenic originating
from the aorta are 57.90%\textsuperscript{32} and 38.00%\textsuperscript{33} and from the celiac artery are 42.10%\textsuperscript{32} and 40.00%\textsuperscript{33}. The origin of the left inferior phrenic artery is from the celiac artery in 47.00% of cases, the aorta in 45.00% of cases, the renal artery in 5.00% of cases, the left gastric artery in 2.00% of cases, and the hepatic artery in 1.00% of cases\textsuperscript{33}. It has also been reported that the 2 arteries can arise from the left gastric (3.70%), renal (15.7%), hepatic (2.10%), or superior mesenteric (0.30%) arteries\textsuperscript{34}. In addition, the 2 arteries also reportedly originate from the spermatic\textsuperscript{35} and posterior suprarenal arteries\textsuperscript{36}.

Moreover, in the present case, the 2 arteries anastomosed with the superior phrenic artery, but this has not been previously described in the majority of reports.

**Conclusion**

Our findings regarding the variation of the celiac and superior mesenteric arteries (celiacomesenteric trunk) indicate the following: 1) the left gastric and common hepatic arteries arise from the celiacomesenteric trunk, and the left hepatic artery arises from the left gastric artery and 2) the left inferior phrenic artery arises from the celiacomesenteric trunk, but the right inferior phrenic artery arises from the right middle suprarenal artery. This information is useful for clinical treatment and examination.

**References**

Abbreviation

AA: abdominal aorta; CA: cystic artery; CHA: common hepatic artery; EB: esophageal branch; GDA: gastroduodenal artery; ICA: ileocolic artery; IVC: inferior vena cava; IMA: inferior mesenteric artery; IPD: inferior pancreaticoduodenal artery; JI(s): jejunal and ileal arteries; LGA: left gastric artery; LGM: left gastroepiploic artery; LHA: left hepatic artery; LIPA: left inferior phrenic artery; LOV: left ovarian vein; LRAs: left renal arteries; LRV: left renal vein; LSAs: left suprarenal arteries; LSV: left suprarenal vein; MCA: middle colic artery; PGA: posterior gastric artery; RCA: right colic artery; RGA: right gastric artery; RGM: right gastroepiploic artery; RIPA: right inferior phrenic artery; RSAs: right suprarenal arteries; SA: splenic artery; SGA: short gastric artery; SPA: superior phrenic artery; SPD: superior pancreaticoduodenal artery;