Case Report

Common Hepatic Artery Ascending on the Anterior Surface of the Pancreas and Left Renal Vein Running Beneath the Diaphragm

By

Aiji OHTSUKA, Akio KIKUTA and Takuro MURAKAMI

Department of Anatomy, Okayama University Medical School, Okayama, 700 Japan

-Received for Publication, August 15, 1983-

Key Words: Left renal vein, Hepatic artery, Inferior phrenic artery, Celiac trunk, Vascular anomaly.

Summary: Rare vascular anomalies were observed postmortem in a Japanese female (60-year-old). 1) The common hepatic artery arose from the superior mesenteric artery, ascended on the anterior surface of the pancreas, where the right gastro-epiploic and right gastric arteries branched, and continued as a normally-positioned proper hepatic artery. 2) Superior to the inferior phrenic arteries and along the caudal surface of the diaphragm, the left renal vein ran, collecting its usual tributaries; it emptied into the inferior vena cava 4 cm rostral and opposite the right renal vein. The unusual common hepatic artery is thought to be comprised of the anterior branches of the superior and inferior pancreatico-duodenal arteries which enlarged in a compensation for dysgenesis of the usual common hepatic artery. The anomalous left renal vein suggests additional embryological anastomoses between the subcardinal veins rostral or superior to the omphalomesenteric artery.

Recently we observed a rare human anomaly of left renal vein position; the vein ran along the abdominal surface of the diaphragm (Ohtsuka et al., 1983). In this cadaver, arterial anomalies were noted in the upper abdomen, involving the common hepatic artery. The details of these venous and arterial anomalies are described, and the implications for vascular compensation and development are discussed.

Materials and Methods

The anomalies were found in a 60-year-old Japanese female who died in 1981 of gastric cancer. She was fixed conventionally by arterial perfusion of 10% formalin, and subsequently dehydrated with 50% ethanol. Dissection was performed during the 1981 medical student human gross anatomy course at Okayama University Medical School. She had no history of abdominal surgical procedures.

Results

Gross Abdominal Anatomy

Neither metastasis nor infiltration of the gastric cancer into the surrounding tissues and organs, including lymph nodes, was found. The kidneys, adrenal glands, diaphragm, liver, pancreas, spleen, stomach,

*A part of this case was reported in the 88th Annual Meeting of Japanese Association of Anatomists (Ohtsuka et al., 1983).
duodenum, and other abdominal organs were normally shaped and positioned. The greater omentum, lesser omentum and other ligaments and serous membranes were also normally related; no significant pathological adhesions of these ligaments and membranes were noted. Exposure of the vessels was accomplished with a minimum of mechanical manipulation. Positional identification by macroscopic dissection confirmed that the abdominal aorta, inferior vena cava, and portal vein presented the usual coursing and branching patterns, except for the anomalies discussed below.

**Arterial Anomalies**

The right and left inferior phrenic, left gastric, and splenic arteries arose from an unusual common trunk (gastro-lieno-phrenic trunk) which emerged from the anterior aspect of the abdominal aorta 1 cm caudal to the aortic hiatus (Figs. 1–4). At the base of the gastro-phrenic ligament the trunk divided into four branches: the dorsal pancreatic, right inferior phrenic, left gastric, and splenic arteries. The dorsal pancreatic artery (first and smallest branch) descended behind the body of the pancreas, supplying this organ (Figs. 1, 2). The right inferior...
phrenic artery (second branch) passed posterior to the inferior vena cava along the caudal surface of the diaphragm. The artery supplied the right adrenal gland and the right half of the diaphragm (Figs. 3, 4). The left gastric artery (third branch) ran, as usual, in the gastro-phrenic ligament and then descended along the lesser curvature of the stomach. The splenic artery (fourth branch) also retained a normal course; the initial segment was on the dorsal wall of the abdomen adjacent to the upper margin of the pancreas, supplying the tail of this organ, and distally the artery entered the phrenico-lienal ligament ending in lienal branches, left gastro-epiploic artery and brief gastric arteries. From a position at or near the base of the phrenico-lienal ligament, an unusually well developed branch (left inferior phrenic artery) arose from the splenic artery. The enlarged branch ascended on the inferior surface of the diaphragm and supplied the left anterior region of this muscle (Figs. 3, 4).
The common hepatic and superior mesenteric arteries arose from an unusual common trunk (hepato-mesenteric trunk) off the aorta immediately inferior to the gastro-lieno-phrenic trunk (see above) (Figs. 1, 2). The trunk vessel descended behind the pancreas and divided into common hepatic and superior mesenteric arteries at the inferior margin of the pancreas. Distal to this point, the mesenteric artery was normally situated. The common hepatic artery ascended on the anterior surface of the pancreas, passed between the pancreas and the first segment of the duodenum, and continued as the proper hepatic artery. Only this last segment, the proper hepatic artery, running along the anterior surface of the portal vein in the hepatoduodenal ligament, was normally situated. In addition to this, the common hepatic artery gave off the right gastro-epiploic artery, on the anterior surface of the pancreas proximal to the first segment of the duodenum, and the right gastric artery, behind the duodenum in the base of the hepatoduodenal ligament (Fig. 2). These arteries ran, as usual, along the greater and lesser curvatures of the stomach, respectively.
Fig. 4. Schematic representation exhibiting the unusual left renal vein (LRV). A, adrenal gland; ALIPA, accessory left inferior phrenic artery; ALIPV, accessory left inferior phrenic vein; Ao, aorta; E, esophagus; GLP, gastro-lieno-phrenic trunk; IVC, inferior vena cava; K, kidney; L, lumbar vein; LG, left gastric artery; LIPA, left inferior phrenic artery; LIPV, left inferior phrenic vein; LRA, left renal artery; Ov, ovarian vein; RIPA, right inferior phrenic artery; RIPV, right inferior phrenic vein; Sp, splenic artery.
Typical pancreatico-duodenal branches were absent. In their place, several short branches arose from the unusual common hepatic artery as it passed along the lower margin and anterior surface of the pancreas; these supplied the head of this organ and the entire duodenum.

The left renal artery, normally positioned, presented an accessory left inferior phrenic artery which arose in a common trunk with the suprarenal artery. The accessory artery terminated in the left posterior region of the diaphragm (Fig. 4).

**Venous Anomalies**

The left renal vein was formed by four venous radicles emerging from the left kidney. It ran successively, anterior to the left renal artery, the left suprarenal artery and the accessory left inferior phrenic artery, between the abdominal aorta and the gastro-lieno-phrenic trunk (see above), and joined the inferior vena cava 4 cm higher than the right renal vein (Figs. 3, 4). The point of fusion was 5 cm caudal to the vena caval foramen. The left renal vein received the normally located left ovarian and lumbar veins in front of the renal artery, and the normally positioned left suprarenal vein as it passed anterior to the aorta. The accessory left inferior phrenic vein, which accompanied the accessory left renal vein just centripetal to the draining point for the left suprarenal vein.

The right inferior phrenic vein, which accompanied the right inferior phrenic artery, joined, as usual, the inferior vena cava just beneath the vena caval foramen. The left inferior phrenic vein also joined, as usual, the inferior vena cava at the same level as that of the right one (Fig. 4).

**Discussion**

This case is characterized by two rare anomalies: 1) the common hepatic artery arising from the superior mesenteric artery and ascending on the anterior surface of the pancreas, 2) the left renal vein adjacent to the diaphragm, rostral to the inferior phrenic arteries. As far as we know, these two anomalies have not been reported by the previous authors (for discussion of abdominal vasculature see: Tandler, 1904; Piquand, 1910; Eaton, 1917; Adachi, 1928, 1940; Bergmann, 1933; Morita, 1935; Michels, 1942, 1949; Pick and Anson, 1940a, b; Reis and Esenther, 1959).

The arteries of the upper abdomen (including the inferior phrenic arteries), supplying the diaphragm, liver, spleen, pancreas, stomach, duodenum and other organs, show a wide variety of origins and branching patterns (Tandler, 1904; Eaton, 1917; Adachi, 1928; Pick and Anson, 1940a; Michels, 1942, 1949). Separation of this series into two trunks (gastro-lieno-phrenic and hepato-mesenteric trunks), as reported herein, does occur (Tandler, 1904; Eaton, 1917; Adachi, 1928; Pick and Anson, 1940a; Michels, 1942, 1949).

Usually the common hepatic artery, regardless of origin, runs in the right gastro-pancreatic plica and, in or near the hepato-duodenal ligament, divides into the proper hepatic, right gastric, and right gastro-epiploic arteries (Adachi, 1928). The common hepatic artery anastomoses with the superior mesenteric artery via the pancreatico-duodenal cascade (Adachi, 1928). The normal architecture suggests a model for the genesis of the anomalous common hepatic artery. The segment of common hepatic artery normally situated in the right gastro-pancreatic plica disappeared, and the anterior inferior pancreatico-duodenal branch of the superior mesenteric artery and the anterior superior pancreatico-duodenal branch of the usual common hepatic artery enlarged in compensation. The new vessel continued into the remaining segments of the common hepatic artery:
proper hepatic, right gastric, and right gastro-epiploic arteries. The anomalous common hepatic artery was distinguished easily from the right accessory hepatic artery which ascends behind the portal vein and the pancreas (Adachi, 1928). It was considered different from a previously reported common hepatic artery which arose at the upper margin of the pancreas from the superior mesenteric artery and ascended in front of the portal vein (Adachi, 1928). We have designated this vessel “A. hepatica accessoria (dextra) anterior” (Ohtsuka et al., 1983).

The left renal vein routinely passes anterior to the aorta, just inferior to the superior mesenteric artery (Adachi, 1940; Pick and Anson, 1940b; Reis and Esenther, 1959). This is seen even in unusual cases. The antero-aortic segment of the circum-aortic left renal vein (Pick and Anson, 1940b; Kramer, 1978), the terminal segment of the left inferior vena cava (Adachi, 1940; Pick and Anson, 1940b; Kami and Morishita, 1983), and the suprapancreatic vein (remnant of the usual left renal vein) in the case of the post-aortic renal vein (Kitamura et al., 1979) coursed anterior to the aorta and inferior to the superior mesenteric artery. The antero-aortic segment of the left renal vein is derived from anastomoses between the right and left subcardinal veins which appear caudal or inferior to the omphalomesenteric artery in the 10 mm embryo (McClure and Butler, 1925; Reis and Esenther, 1959). The post-aortic left renal vein is considered to be a remnant of anastomoses between the right and left supracardinal veins (McClure and Butler, 1925; Reis and Esenther, 1959). The anomalous left renal vein rostral to the gastrolieno-phrenic trunk (see above) suggests the embryological presence of anastomoses between the subcardinal veins rostral or superior to the omphalomesenteric artery.

The left inferior phrenic artery originated from the splenic artery is a rare anomaly which was observed by few previous authors (Michels, 1942). It is possible that this anomaly represents a well developed remnant of inconsistent parietal branches of the splenic artery. The accessory left inferior phrenic artery originated from the left renal artery is also rare anomaly (1%) (Pick and Anson, 1940a). The right inferior phrenic artery originated from the gastrolieno-phrenic trunk (see above) or celiac trunk is a well known anomaly (40%) (Pick and Anson, 1940a). We are at a loss to explain the origins of these two arteries.

References


