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Case Report

Branching form of celiac artery to be aware of in laparoscopic surgery: A case report using MDCT angiography ☆,☆☆,★

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ABSTRACT

The anomalies of the celiac artery have been reported and reviewed in literature. Hence, it is not uncommon to clinically encounter its various types. This report presents the case of a 76-year-old male who underwent laparoscopic distal gastrectomy. Preoperative abdominal contrast-enhanced computed tomography showed an anomaly of the celiac artery, which was extremely rare, with various other anomalies of the artery.

Introduction

Some anatomical variations may exist in the abdominal arteries. Various types of vascular anomalies in the abdominal cavity, such as the celiac artery (CA), superior mesenteric artery (SMA), and inferior mesenteric artery are often encountered by both the surgeons and radiologists. The normal branching pattern of CA as first described by Haller in 1756, was trifurcation into the left gastric artery (LGA), common hepatic artery (CHA), and splenic artery. The CA was initially classified into 4 types by Lipshutz [1]. Following this, many reports have demonstrated various anomaly patterns of CA and CHA [1–6], and some differences in each classification have already been identified. However, no significant differences were ob-

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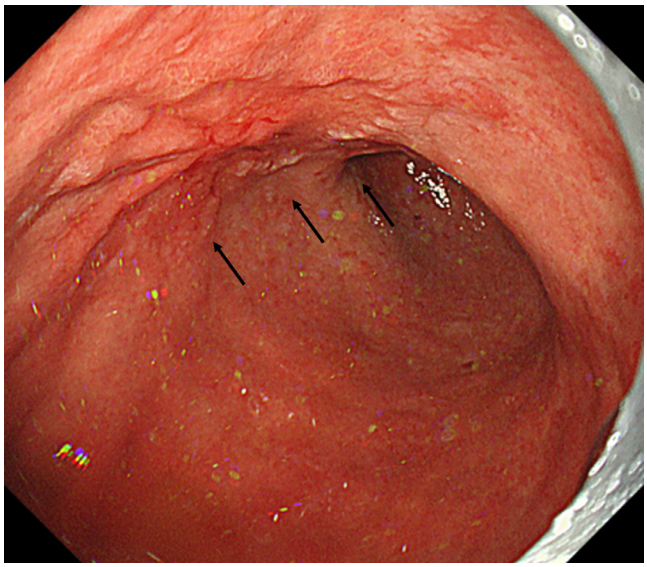

Fig. 1 – Endoscopic findings. A type 0-IIc lesion is noted in the anterior wall of the lesser curvature and low body. The pathological finding of biopsy was moderately differentiated adenocarcinoma.

served according to age and gender [7,8]. Nevertheless, we unexpectedly encountered an extremely rare variant of CA. We present a case of CA with LGA branching from the CHA.

Case report

A 76-year-old male was admitted to the Department of Surgery at our hospital for gastrectomy due to suspected submucosal 2 gastric cancer based on endoscopic findings. He presented with a comorbidity of chronic hepatitis C, and his past history revealed the presence of hepatocellular carcinoma after radiofrequency ablation and early gastric cancer after endoscopic submucosal dissection. He had no anemia and his serum carcinoembryonic antigen and carbohydrate antigen 19-9 levels were not elevated. Endoscopic findings showed a Type 0-IIc lesion in the anterior wall of the lesser curvature and low body (Fig. 1). The pathological findings of biopsy led to a diagnosis of Group 5, moderately differentiated adenocarcinoma. However, on abdominal contrast-enhanced computed tomography (CT), the tumor could not be detected. There were no swollen lymph nodes or metastases. Remarkably, variants of the CA and left hepatic artery (LHA) were identified. The CHA was meandering in the lesser omentum without running on the superior border of the pancreas. The feeding arteries of segments II, III, and IV of the liver were branched from CHA, not as LHA. The LGA originated from CHA (Fig. 2a). Additionally, the inferior pancreaticoduodenal artery (IPDA) developed and continued to the anterior superior pancreaticoduodenal artery. The right gastroepiploic artery branched from the IPDA and anastomosed with the gastroduodenal artery (GDA; Fig. 2b). Although he was diagnosed with early gastric cancer (cT1N0M0 cStage I), curative endoscopic dissection was difficult owing to tumor depth. The patient underwent laparoscopic distal gastrectomy with D1+ lymph node dissection. The CHA was identified in the lesser omentum as per preoperative CT findings and three LGA originated from CHA (Fig. 3). The total duration of surgery was 284 minutes, and the total intraoperative bleeding volume was 30 mL. The clinical course was uneventful, and the patient was discharged on postoperative day 12.

Discussion

CA is the first anterior branch of the abdominal aorta and arises at the T12/L1 levels to the superior border of the pancreas. The normal trifurcation pattern of CA is common, and it is called *tripus Halleri* by Haller. The most common pattern of CA is reported as a normal branching pattern in approximately 90% of cases [8–12]. Considering these studies, results regarding the variant anatomies of CA were detected in approximately 10% cases, thus implicating that it is not unusual to encounter them in clinical practice. Recently, the development of preoperative image diagnosability using multiple detector CT, three-dimensional reconstructed images, and CT angiography have enhanced the understanding of the detailed anatomy [9,10,13,14]. Preoperative recognition of vascular anomalies is critical for planning surgery and preventing intraoperative confusion and complications [15]. Recently, transfusion-related immunomodulation affecting the prognosis of patients who received blood transfusion was reported. Vamvakas et al. reported that red blood cell transfusion is an immune system suppressor, linked to tumor recurrence [16]. The surgeons and interventional radiologists should comprehend the vessel anatomy in detail and safely perform the operation without excess bleeding and transfusion [17].

Tandler in 1904 indicated a hypothesis about the morphogenesis of the CA and SMA [18]. He proposed 4 primitive arteries from the dorsal aorta in human embryos. Although these vessels were initially connected to the ventral longitudinal anastomosis, Tandler hypothesized disappearance of this anastomosis in the embryological process with abnormal regression of parts of the primitive artery inducing some variations. However, this hypothesis has not yet been confirmed, and the process of vessel anatomical anomaly remains unclear.

CHA branching from the LGA is one of the CA anomalies. This CA anomaly is classified into Adachi type VI, group 26 [2]. However, there are some classifications that do not contain this CA anomaly. A previous study revealed that the frequency of this anomaly was 0.16% [9], while another study demonstrated the frequency as 0.3% [8]. CHA arising from the LGA is one of the least common anomalies, with extremely rare occurrence in clinical practice.

In our case, the CA form was very similar to the Adachi type VI, group 26. However, 3 LGA arising from the CHA were detected in the operative findings. Additionally, each LGA was thinner than the CHA. We think the LGA branching from the CHA instead of the CHA branching from the LGA. Interestingly, the feeding arteries of segments II, III, and IV of the liver were branched from the CHA. The right gastroepiploic artery

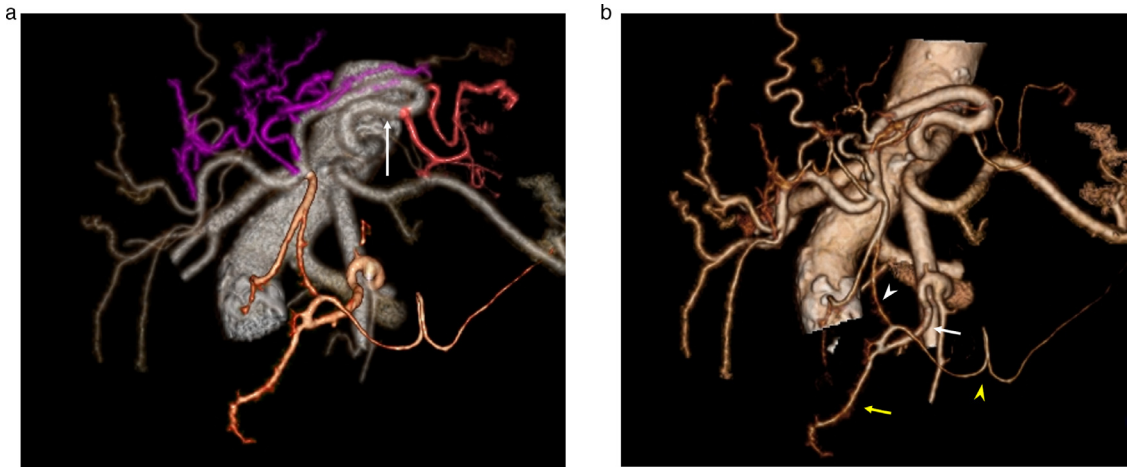

Fig. 2 – Abdominal contrast-enhanced computed tomography (CT) findings. (a) The common hepatic artery (CHA; white arrow) meandering in the lesser omentum without running on the superior border of the pancreas. Each feeding artery of segments II, III, and IV of the liver (purple color) branches from the CHA, not as the left hepatic artery (LHA). The left gastric artery (LGA; red color) originates from the CHA. (b) The developed inferior pancreaticoduodenal artery (IPDA; white arrow) continues to the anterior superior pancreaticoduodenal artery (ASPDA; yellow arrow). The right gastroepiploic artery (RGEA; yellow arrow head) branches from the IPDA and anastomoses with the gastroduodenal artery (GDA; white arrow head).

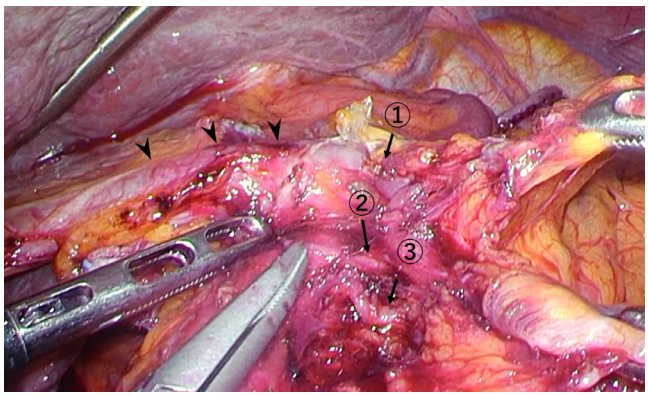

Fig. 3 – Intraoperative findings. The meandering common hepatic artery (CHA; black arrow head) is identified in the lesser omentum and 3 left gastric arteries (LGAs) (black arrow) originate from the CHA.

branched from the IPDA, and anastomosed with the GDA. The IPDA developed and the GDA was thinner than normal, predicting the blood supply vessel to the anterior superior pancreaticoduodenal artery by the IPDA. We noted that a case report on the CHA branching from the LGA was similar to our case [19]. However, we could not find any previous reports on complex branches of the CA and SMA, as in this case; hence, to the best of our knowledge, this is the first reported case.

Conclusions

We identified a rare case of a complex branch pattern of CA and SMA. By recognizing it from preoperative examination, the operation could be performed safely. Therefore, the branching pattern of arteries should be comprehended in detail before operation and intravascular treatment.

Ethics approval and consent to participate

Not applicable.

Consent for publication

This patient consented to the reporting of this case in a scientific publication.

Availability of data and materials

Not applicable.

Authors' contributions

T.B. and T.F. performed the operation. T.B. and T.F. managed the perioperative course. T.B., K.T., and T.F. wrote the manuscript. All the authors read and approved the final manuscript.

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