

## CASE REPORT

## Strategic approach to concurrent aberrant left gastric vein and aberrant left hepatic artery in laparoscopic distal gastrectomy for early gastric cancer: A case report

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### Introduction

The left gastric artery (LGA) is usually ligated and divided at the root for curative lymph node dissection for gastric cancer. An aberrant left hepatic artery (ALHA) arising from the LGA is sometimes observed and is classified as either a “replaced” artery representing a substitute for a normal left hepatic artery (LHA) or an “accessory” artery representing an addition to a normal LHA (1,2). Division of a replaced LHA can reportedly cause not only transient liver dysfunction, but also lethal complications such as liver necrosis or death, so preservation of the ALHA should be considered in such cases (3). In contrast, the left gastric vein (LGV) mostly drains into the portal vein trunk, splenic vein, or the junction of the two. Direct entry of the LGV into the lateral segment of the liver through the hepatogastric ligament, called aberrant left gastric vein (ALGV), is reportedly very rare (less than 1%), and no reports have described severe postoperative complications after division of the ALGV (4).

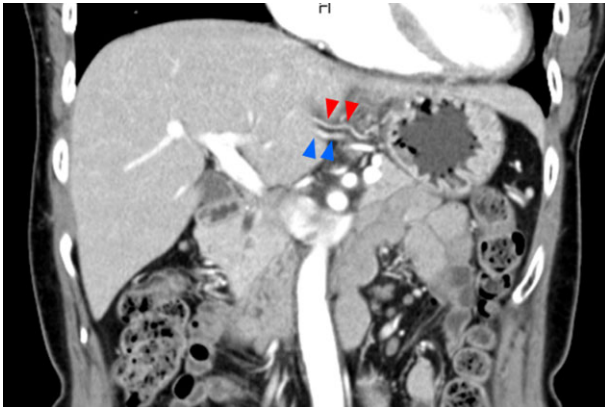
### Abstract

An aberrant left gastric vein (ALGV) directly entering the lateral segment of the liver is a rare variation in the portal vein system, whereas an aberrant left hepatic artery (ALHA) arising from the left gastric artery is observed relatively frequently. Here we report a case in which both ALGV and ALHA were encountered before laparoscopic distal gastrectomy with curative lymphadenectomy for gastric cancer. We accurately diagnosed these vessel anomalies preoperatively on abdominal contrast-enhanced CT. During surgery, we divided the ALGV at the point of entry to the liver and preserved the ALHA by dividing the branches toward the stomach, in consideration of curability and safety. The postoperative course was uneventful overall, although temporary mild liver dysfunction was observed. This case highlights the importance of preoperative evaluation and preparation in a rare case of concurrent ALGV and ALHA.

Here, we report our experience with a patient in whom the ALGV directly entered the lateral segment of the liver alongside the ALHA (suspected to represent a replaced LHA) arising from the LGA. We correctly diagnosed these vascular anomalies before surgery, allowing safe and accurate laparoscopic distal gastrectomy with curative lymph node dissection.

### Case Presentation

A 60-year-old woman was referred to the hospital by her general practitioner for the treatment of early gastric cancer. Endoscopic examination revealed a 2-cm superficial depressed lesion with ulceration in the lower body of the stomach, histologically diagnosed as a signet-ring cell carcinoma. As abdominal contrast-enhanced CT showed no lymph node or distant metastases, early gastric cancer (clinical stage IA; T1N0M0) was diagnosed based on the 14th edition of the Japanese Classification

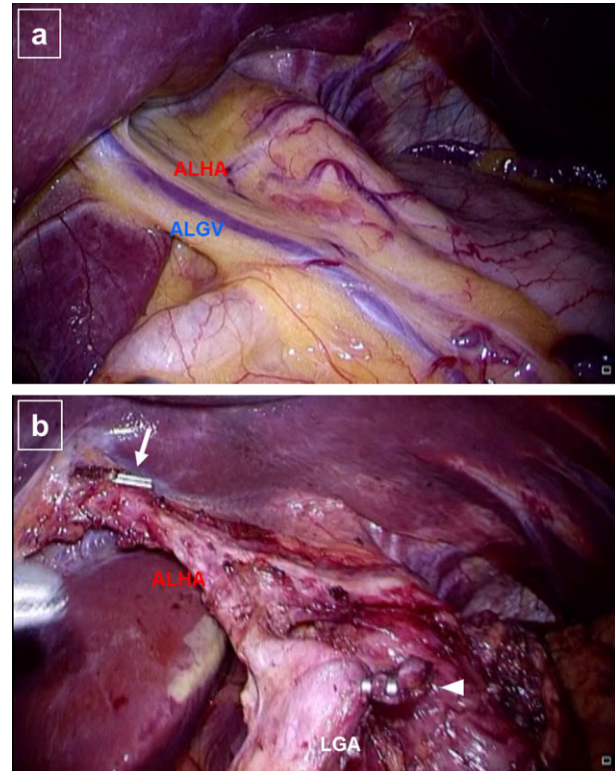


**Figure 1** Findings on abdominal contrast-enhanced CT. The aberrant left gastric vein (blue arrowhead) and aberrant left hepatic artery (red arrowhead) directly enter the lateral segment of the liver across the hepatogastric ligament.

of Gastric Carcinoma (5). CT also showed rare blood vessel anomalies of concurrent ALGV and ALHA entering the lateral segment of the liver in the absence of decent-sized common LGV and LHA (Figure 1). The patient was scheduled for laparoscopy-assisted distal gastrectomy with D1 + lymph node dissection, per the 3rd edition of the Gastric Cancer Treatment Guidelines (6).

Initial intraoperative observations after the insertion of five ports showed an ALGV and ALHA directly entering the lateral segment of the liver across the hepatogastric ligament just as seen on the preoperative abdominal CT (Figure 2a). As such, we decided to preserve the ALHA and divide each of its branches toward the stomach with all lymph nodes around the LGA, instead of dividing the LGA at the root, to prevent severe postoperative complications as reported previously (Figure 2b, Figure S1). The ALGV was divided at the point of entry to the liver (Figure 2b). In this case, the LGA alone bifurcated from the abdominal aorta, and another thin LGV draining into the splenic vein was also present (Figure 3). After adequate laparoscopic lymphadenectomy, a Billroth I reconstruction was performed extracorporeally after a 5-cm incision was made in the upper abdomen. The operation time was 204 min and the estimated blood loss was 0 mL. Pathological examination revealed that the tumor was confined to the mucosa with no metastasis in the 30 lymph nodes dissected (pathological stage IA; T1N0M0).

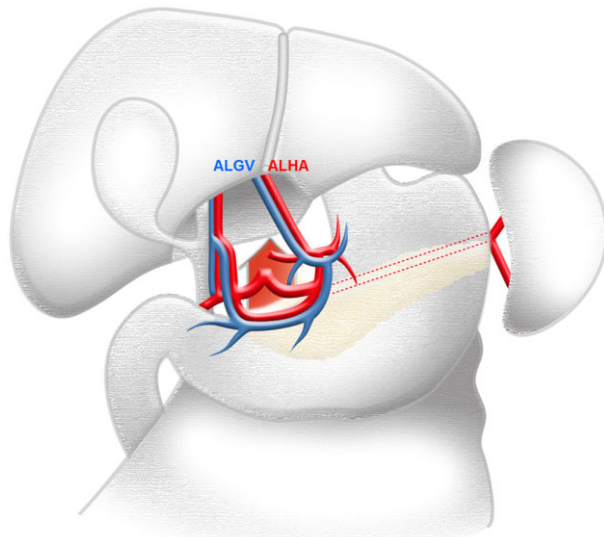
Although mildly elevated levels of hepatobiliary enzymes were observed on postoperative days 1, 3, and 7, the postoperative period was uneventful overall. The patient was discharged on postoperative day 10 and has been followed for 6 months without recurrence.



**Figure 2** Intraoperative findings. (a) The ALGV and ALHA are present in the hepatogastric ligament side by side, as seen on the preoperative CT. (b) The ALGV was clipped and divided at the entry site to the liver (white arrow), while the ALHA was preserved by clipping and dividing only those branches leading to the stomach (white arrowhead). ALGV, aberrant left gastric vein; ALHA, aberrant left hepatic artery; LGA, left gastric artery.

## Discussion

The veins in the lesser curvature of the stomach merge into the portal venous system through the LGV and right gastric vein (RGV). The LGV usually enters the left aspect of the portal vein trunk or the splenic vein, and the RGV commonly enters the right aspect of the portal vein. While variations of the RGV are known to cause either focal fatty infiltration of the liver or focal sparing in fatty liver, variations of the LGV are less frequent and have seldom been reported (7). ALGV, also known as the left portal vein, is considered as a residue of the entry of the left vitelline vein or subintestinal vein into the liver according to embryology, and it drains directly into the lateral segment of the liver across the hepatogastric ligament instead of entering the portal vein trunk or splenic vein (4). Miyaki *et al.* reported the frequency of occurrence and the course of ALGV in a large-scale study in 1987 (8). In that report, ALGV was found in only 2 of 245 cases (0.8%). Of those two cases, one showed a typical RGV in addition to the ALGV, but the other lacked an



**Figure 3** Schematic illustration. The ALGV was the main drainage route for the lesser curvature of the stomach, and a thin left gastric vein and right gastric vein were also present. The ALHA arose from the left gastric artery, which bifurcated alone from the abdominal aorta. ALGV, aberrant left gastric vein; ALHA, aberrant left hepatic artery.

RGV. Our case showed both the RGV and the thin LGV entering the splenic vein, although the ALGV was considered as the main drainage route.

Variations in the hepatic arterial system are more frequent than those in the portal vein system, and ALHA arising from the LGA is a representative example, with a reported incidence of 4%–22% in the literature (1,2). ALHA can be classified as “replaced” or “accessory” based on the presence of a normal LHA, with these subtypes accounting for 55% and 45% of the ALHA population, respectively (9). Some reports have shown that ligation of an ALHA rarely induces severe postoperative liver damage because adequate revascularization occurs immediately intrahepatically or from extrahepatic arterial systems such as the inferior phrenic artery. However, a small number of reports have been raising alerts over routine ALHA ligation to prevent lethal postoperative complications such as liver necrosis or death (2,3,10).

Standard gastrectomy for gastric cancer is defined as resection of at least two-thirds of the stomach with a D2 lymph node dissection, according to the 3rd edition of the Japanese Gastric Cancer Guidelines, and D1 + lymph node dissection is accepted for cT1N0 tumors according to this guideline (6). In either case, the LGA and LGV are generally divided at the root for curative lymph node dissection for gastric cancer. In our case, we diagnosed rare vessel anomalies of concurrent ALGV and ALHA on abdominal contrast-enhanced CT before surgery and

decided to divide the ALGV at the root and preserve the ALHA by dividing only those branches extending toward the stomach in consideration of the balance of curability and safety based on previous reports.

### Acknowledgement

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### Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher’s web-site:

**Figure S1** Intraoperative findings after suprapancreatic lymph node dissection. Curative D1 + lymph node dissection was performed without dividing the LGA at the root. CA, celiac artery; CHA common hepatic artery; LGA, left gastric artery; SA splenic artery.