

Focal Fat Deposition Developed in the Segment IV of the Liver Following Gastrectomy Mimicking a Hepatic Metastasis: Two Case Reports¹

위절제술 후에 간의 제4분절에서 발생한 간전이를 닮은 국소 지방 침윤: 두 증례 보고¹

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We present two cases of focal fat deposition developed at the posterior area of the segment IV in the liver, following gastrectomy in patients with gastric cancer. There was no focal lesion in this area of the liver at preoperative computed tomography (CT) in both cases, and the aberrant right gastric vein (ARGV) was found on the retrospective review of this CT. After gastrectomy, a focal, low-attenuating lesion was developed in this area on a follow-up CT in both cases, which was confirmed as a focal fat deposition, by other imaging studies. In addition to its typical imaging findings, confirmation of the presence of the ARGV also supported this lesion to be a focal fat deposition. Furthermore, understanding of our cases may be of help to prevent us from unnecessary invasive procedures, such as liver biopsy.

Index terms

Aberrant Right Gastric Vein
Focal Fat Deposition
Gastrectomy
Gastric Cancer

INTRODUCTION

The relation between the focal fat deposition or sparing developed at the posterior area of the segment IV in the liver and the aberrant right gastric vein (ARGV) is well established (1, 2). Currently, late development of the focal fat deposition in this area, following the surgery, especially after the gastrectomy, is not well understood. However, these low-attenuating lesions, found on a computed tomography (CT), have clinical significance, in that they may mimic hepatic metastasis from gastric cancer (3). In the two cases presented here, we demonstrated focal fat deposition in this area on a CT scan, which was developed following a gastrectomy, and discussed the mechanism of

its development.

CASE REPORT

Case 1

A 44-year-old woman, who did not have a significant past medical history, was referred to our hospital for surgical treatment of gastric cancer. On the gastroscopic examination, a 15-mm, nodular lesion was noted at the lesser curvature of the midbody, which was histologically confirmed as the signet ring cell carcinoma. She underwent abdomino-pelvic CT scan prior to the surgery, by using a 16-multi-detector CT scanner, and obtained the arterial and portal venous phase images. There

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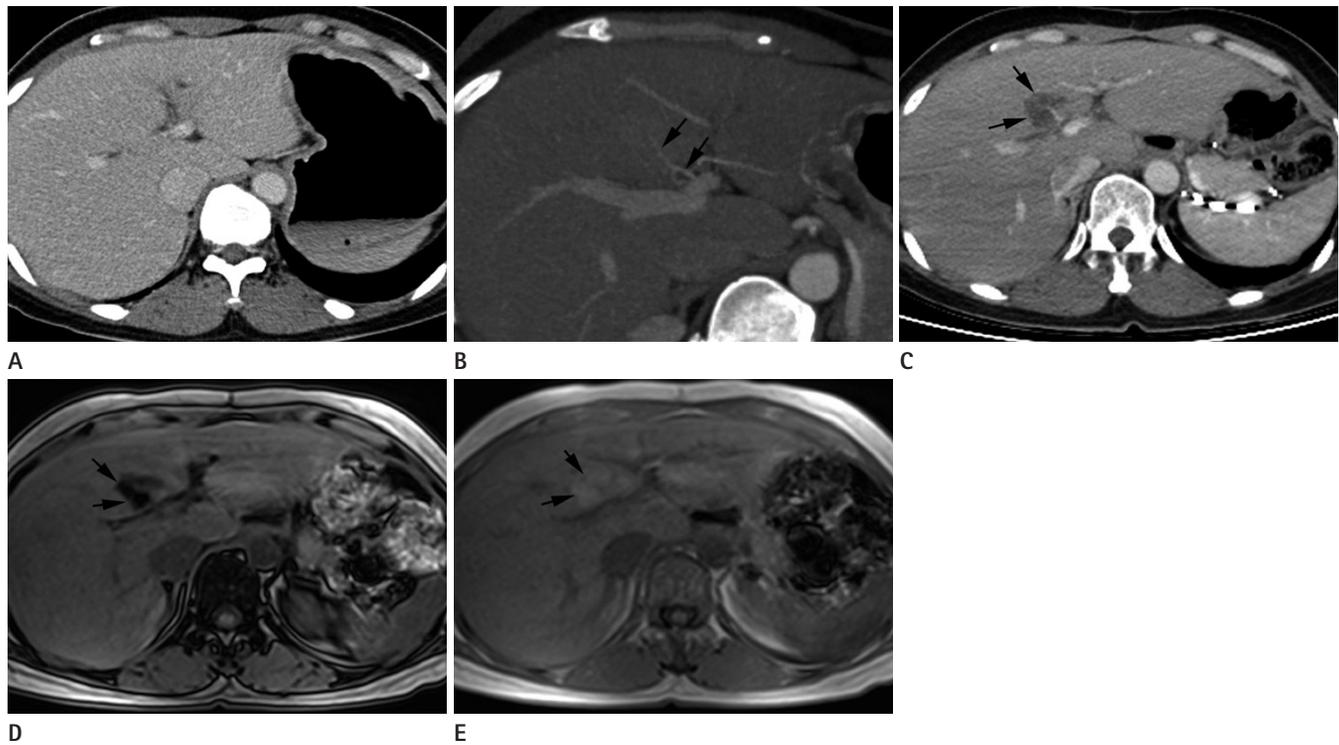


Fig. 1. A 44-year-old woman who underwent total gastrectomy due to advanced gastric cancer.
A. Preoperative axial CT image obtained during the portal venous phase demonstrates no focal lesion in the segment IV of the liver.
B. Preoperative oblique CT image using the maximum intensity projection technique demonstrates an enhancing vascular structure (arrows) at the posterior area of the segment IV, which was found to originate from the aberrant right gastric vein on the other maximum intensity projection images.
C. Follow-up CT image obtained one year after gastrectomy demonstrates a 2.5-cm, low-attenuating lesion (arrows) newly developed in the segment IV. Note an enhancing vascular structure within this lesion.
D, E. Chemical shift magnetic resonance images confirm that this lesion (arrows) is focal fat deposition by identifying signal drop of this lesion on the opposed phase image (**D**) in comparison with the in-phase image (**E**).

was no evidence of metastasis in the liver or other solid organs on the preoperative CT (Fig. 1A). On the retrospective review of the preoperative CT, a vascular structure was identified at the posterior area of the segment IV of the liver, which was found to originate from the ARGV on the maximum intensity projection images (Fig. 1B).

She underwent total gastrectomy and Roux-en-Y esophagojejunostomy. Postoperative TNM staging was T4aN0M0. Follow-up CT scan was performed after one year, in which a 2.5-cm, low-attenuating lesion was newly developed at the posterior area of the segment IV in the liver, suggestive of hepatic metastasis (Fig. 1C). However, an enhancing vascular structure was also noted in this area, more suggestive of focal fat deposition. The patient underwent hepatic magnetic resonance image (MRI) for further differentiation with a 3.0-T magnetic resonance (MR) system. On the MR images, it was confirmed to be focal fat deposition by signal drop of this lesion on the opposed

phase, in comparison with the in-phase image (Fig. 1D, E).

Case 2

A 69-year-old male, who had a history of hypertension and diabetes mellitus, was referred to our hospital with the diagnosis of advanced stomach cancer. On the gastroscopic examination, an ulcerofungating lesion was noted at the greater curvature of the lower body, which was confirmed to be adenocarcinoma histologically. Preoperative CT scan was performed with the same CT technique as that of Case 1. There was no evidence of metastasis in the liver or other organs on this CT (Fig. 2A). A vascular structure was also identified at the posterior area of the segment IV in the liver, and was found to arise from the ARGV on the retrospective review of the maximum projection images (Fig. 2B).

He underwent subtotal gastrectomy with D2 lymph node dissection. Postoperative TNM staging was T3N0M0. On the

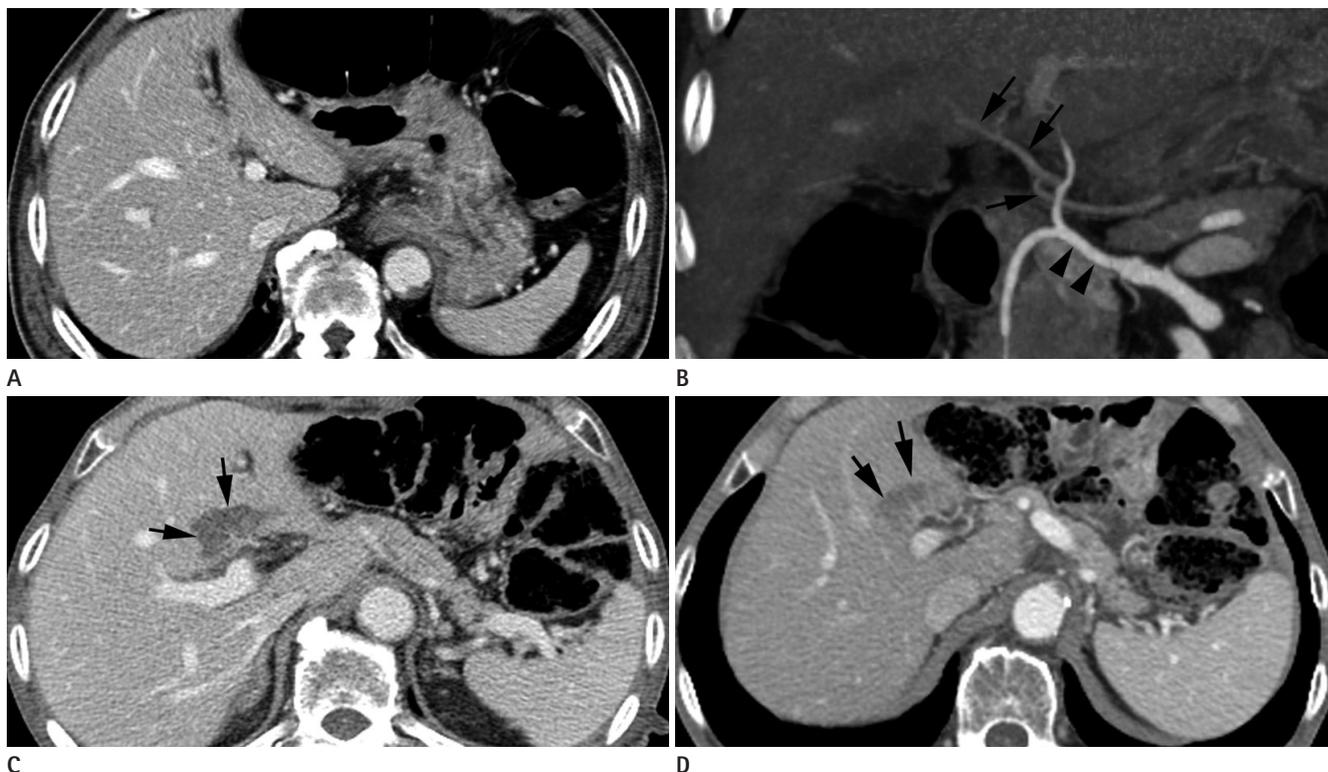


Fig. 2. A 69-year-old man who underwent subtotal gastrectomy due to advanced gastric cancer.
A. Preoperative axial CT image obtained during the portal venous phase demonstrates no focal lesion in the segment IV of the liver.
B. Preoperative coronal CT image using the maximum intensity projection technique demonstrates the ARGV (arrows) that drains into the posterior area of segment IV. The common hepatic artery is also visualized (arrowheads).
C. Follow-up CT image obtained six months after gastrectomy demonstrates a 2.9-cm, low-attenuating lesion (arrows) newly developed in the segment IV. Note an enhancing vascular structure within this lesion.
D. On the one-year follow-up CT image, the lesion becomes to be smaller and less distinct, due to partial recovery of attenuation at the posterior part of the lesion (arrows).
 Note.—ARGV = aberrant right gastric vein

six-month follow-up CT images, a 2.6-cm, low-attenuating lesion was newly developed at the posterior area of the segment IV of the liver (Fig. 2C). However, this lesion appeared to have a geographic margin and to contain a nondistorted, enhancing vascular structure within the lesion, representing a high possibility of focal fat deposition. Therefore, we did not perform further evaluation or the treatment, but obtained the follow-up CT scan after one year. This lesion became to be smaller and less distinct on this CT (Fig. 2D). Finally, we could conclude that this lesion was focal fat deposition, considering its typical appearance and location, as well as the stability in the appearance on a follow-up CT scans.

DISCUSSION

Focal fat deposition of the liver is typically subcapsular in lo-

cation, has geographic margins, causes no mass effect, and may contain normal, nondistorted vessels on a CT (4). It can be difficult to rule out the most concerned lesion, such as hepatic metastasis, particularly in cases of hepatic lesions, which are newly developed following an oncologic surgery, like our cases. In such clinical situations, the typical location of focal fat deposition, at the posterior area of the segment IV may be the key to correct diagnosis (5).

As is known, blood flow of the liver is supplied, dually from the hepatic artery and portal vein in most cases. However, the posterior area of the segment IV is often supplied only by the parabiliary venous system, instead of the portal vein. This system is located in the hepatoduodenal ligament anterior to the main trunk of the portal vein, which collects venous blood from the head of the pancreas (pancreaticoduodenal vein), distal part of the stomach (right gastric vein), and bile duct system (chole-

cystic vein) (6). These veins usually join the main trunk of the portal vein, but occasionally enter the liver directly, resulting in isolated perfusion. Among these aberrant veins, the ARGV drains the distal part of the stomach on the side of the lesser curvature to the liver (i.e., the posterior area of segment IV) or to the left portal vein, but not to the main portal vein (1). Thus, the ARGV supplies the systemic venous blood flow to the segment IV, resulting in a portal blood supply of this portion is relatively insufficient (1, 2). The ARGV is bound to be ligated during a total or subtotal gastrectomy for gastric cancer, if it exists. In our two cases, the ARGV was supposed to be ligated and cut during surgery, because it was identified on the retrospective review of the preoperative CT scan.

Yoshimitsu et al. (7) demonstrated a close correlation between the focal fat deposition of the segment IV and the presence of the ARGV. The pathogenesis of abnormal deposition of fat at the posterior area of segment IV, after gastrectomy, remains controversial. The focal fat deposition may be caused by relative ischemia, caused by ligation of the supplying vein (6). Another possible pathogenesis is the increased levels of insulin in the pancreaticoduodenal vein. Insulin is known to cause hepatic steatosis. After ligation of the ARGV, insulin-rich blood flow from the head of the pancreas may directly reach the segment IV through the pancreaticoduodenal vein and residual vessel of the ARGV in this area. However, blood flow in this area cannot be diluted by blood flow from the stomach, after ligation of the ARGV; thus, causing an intense focal fat deposition (8). In our cases, the enhancing vascular structure was identified within the focal fat deposition. It suggests that they drain insulin-rich blood flow through the pancreaticoduodenal vein from the pancreas.

As described in Cases 1 and 2, the presence of focal fat deposition of our cases was not histologically confirmed. However, MRI can be used to confirm the presence of a fat component, by using the chemical shift technique, as shown in our Case 1 (9). Unfortunately, the presence of focal fat deposition was not confirmed by either histology or MRI in our Case 2. Nevertheless, we could conclude that the low-attenuating lesion in the segment IV was focal fat deposition only with CT findings, since it showed typical appearance and location of focal fat deposition, as well as the stability in appearance during a one-year follow-up period.

In conclusion, we present two cases of focal fat deposition developed at the posterior area of the segment IV in the liver, following gastrectomy in patients with gastric cancer. In addition to the above-mentioned typical imaging findings, confirmation of the presence of the ARGV may support this lesion to be a focal fat deposition. Furthermore, understanding our cases may be of help to prevent us from unnecessary invasive procedures, such as liver biopsy.

REFERENCES

1. Matsui O, Takahashi S, Kadoya M, Yoshikawa J, Gabata T, Takashima T, et al. Pseudolesion in segment IV of the liver at CT during arterial portography: correlation with aberrant gastric venous drainage. *Radiology* 1994;193:31-35
2. Matsui O, Kadoya M, Takahashi S, Yoshikawa J, Gabata T, Takashima T, et al. Focal sparing of segment IV in fatty livers shown by sonography and CT: correlation with aberrant gastric venous drainage. *AJR Am J Roentgenol* 1995;164:1137-1140
3. Yates CK, Streight RA. Focal fatty infiltration of the liver simulating metastatic disease. *Radiology* 1986;159:83-84
4. Yoshimitsu K, Honda H, Kuroiwa T, Irie H, Aibe H, Shinozaki K, et al. Unusual hemodynamics and pseudolesions of the non-cirrhotic liver at CT. *Radiographics* 2001;21 Spec No:S81-S96
5. Yamagami T, Arai Y, Takeuchi Y, Sueyoshi S, Inaba Y. Focal fatty change in segment IV of the liver occurring after gastrectomy. *Br J Radiol* 1998;71:888-891
6. Lee JW, Kim S, Kwack SW, Kim CW, Moon TY, Lee SH, et al. Hepatic capsular and subcapsular pathologic conditions: demonstration with CT and MR imaging. *Radiographics* 2008;28:1307-1323
7. Yoshimitsu K, Irie H, Kakihara D, Tajima T, Asayama Y, Hirakawa M, et al. Postgastrectomy development or accentuation of focal fatty change in segment IV of the liver: correlation with the presence of aberrant venous branches of the parabiliary venous plexus. *J Clin Gastroenterol* 2007;41:507-512
8. Sohn J, Siegelman E, Osiason A. Unusual patterns of hepatic steatosis caused by the local effect of insulin revealed on chemical shift MR imaging. *AJR Am J Roentgenol* 2001;176:471-474

9. Mitchell DG, Kim I, Chang TS, Vinitiski S, Consigny PM, Saponaro SA, et al. Fatty liver. Chemical shift phase-difference and suppression magnetic resonance imaging

techniques in animals, phantoms, and humans. *Invest Radiol* 1991;26:1041-1052

위절제술 후에 간의 제4분절에서 발생한 간전이를 닮은 국소 지방 침윤: 두 증례 보고¹

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위암으로 위절제술을 받은 후 간의 제4분절에 국소 지방 침윤이 발생한 증례를 두 개 보고한다. 수술 전 전산화단층촬영에서 간의 국소 병변은 없었으나, 두 증례 모두 수술 후 추적검사서 간의 제4분절에 국소적으로 낮은 감쇠를 보이는 병변이 새로이 발생하였다. 낮은 감쇠를 보였던 간의 국소 병변은 자기공명영상의 화학변위영상이나 추적 전산화단층촬영을 통하여 국소 지방 침착으로 확인되었다. 우리는 두 증례 모두에서 수술 전에 시행한 전산화단층촬영을 다시 검토하여, 이상우위정맥이 존재하였음을 확인하였다.

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