A case of recurrent gastric carcinoma in the portal vein: imaging findings

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Patient: 58 years, male

Clinical History:
A 58-year-old man complained jaundice. He had undergone a gastrectomy for gastric carcinoma. Contrast-enhanced CT showed portal thrombosis with early periportal enhancement in the liver. The periportal region showed prolonged enhancement. The biopsy specimen of the portal tract revealed diffuse infiltration of signet ring cell carcinoma with fibrosis and vessels.

Imaging Findings:
A 58-year-old man was admitted to our hospital due to general fatigue, appetite loss and jaundice for one month. He had undergone a total gastrectomy for advanced gastric carcinoma five years previously. No remarkable findings were pointed out on non-contrast enhanced CT five months previously. Laboratory data on admission were (\(\text{normal range}\)): serum total bilirubin (T-bil) 17.1mg/dl (0.3-1.2), (ALP) 1585 IU/l (115-359), CA 19-9 199 IU/ml (0-36). The previously operated gastric carcinoma was poorly differentiated adenocarcinoma with signet ring cells. Severe lymphatic and vascular invasion were noted. Abdominal ultrasonography (US) showed portal thrombus in the bilateral lobes of the liver. Color Doppler imaging revealed vascular flow surrounding the portal thrombus. No hepatic metastases were detected (Fig. 1). Dynamic contrast-enhanced CT showed early linear enhancement surrounding the portal thrombus. The portal thrombus showed weak enhancement on early images. In the portal and delayed phases, the portal thrombus showed slow enhancement. The surrounding area of portal vein exhibited prolonged strong enhancement (Fig. 2). On MR imaging (MRI), the portal tract showed low signal intensity on a T2-weighted image. On a T1-weighted image, the structure showed low signal intensity. Dynamic study revealed early enhancement surrounding the portal thrombus and prolonged enhancement of the portal tract (Fig. 3). The specimen of needle biopsy from portal tract of the liver showed invasive proliferation of numerous signet-ring cells with edematous fibrous stroma (Fig 4a). Many capillaries were noted (Fig. 4b, blue arrows).

Discussion:
To our knowledge, there are 24 reported cases of gastric carcinoma with tumor thrombosis in the portal venous system that have sufficient information for analysis (including our present case) (Table 1) (1-12). Moderately differentiated adenocarcinoma is the most prevalent histologic pattern in cases of portal thrombosis. 10 cases in these cases had no metastasis in the liver (41.7%). 13 cases showed high serum levels of AFP (54.2%). In previous
reports, 13 cases showed high AFP levels, and their carcinomas showed aggressive growth and poor prognosis. These gastric carcinomas tended to show hepatoid adenocarcinoma, which is characterized by medullary nest or trabecular arrangement of the cancer cells. The hypotheses for the mechanism of portal thrombosis with gastric carcinoma are: 1. Direct invasion from the gastric carcinoma to the portal vein. 2. Invasion from liver metastases (4). 3. Translymphatic spread along the portal tract (13). 4. Hematogenous metastasis via the lymphaticoportal venous anastomosis (Nakata et al. 1998) (10). Venous invasion by cancer cells may be the common necessary condition for gastric carcinoma to metastasize to the liver and to form tumor thrombi in the portal system. However, it remains unclear why gastric carcinoma associated with portal thrombosis is quite rare. Terayama et al. (13) showed histologic growth patterns of liver metastases (Table 2). Gastric carcinoma, gall bladder or bile duct and pancreas carcinomas tend to show portal tract type. Since our case showed severe venous extension and lymphatic permeation, we consider that both translymphatic and venous extensions may have caused the formation of the portal thrombus. On US and CT, hyper vascular flow or early strong enhancement in the periportal region were observed. These findings reflected abundant newly formed vessels in foci of the gastric carcinoma. Delayed prolonged enhancement in the periportal region on CT and MRI reflected severe fibrotic changes.

**Differential Diagnosis List:** Those findings were compatible with recurrence of gastric carcinoma.

**Final Diagnosis:** Those findings were compatible with recurrence of gastric carcinoma.

**References:**


Figure 1

Description: Abdominal ultrasonography (US) shows portal thrombus in the bilateral lobes of the liver.

Origin:

Description: Color Doppler imaging reveals abundant vascular flow in the periportal region. No apparent hepatic metastases are detected.

Origin:
Figure 2

**a**

*Description:* Dynamic contrast-enhanced abdominal CT. An early image shows strong linear enhancement surrounding the portal thrombus. The portal thrombus shows relatively weak enhancement. **Origin:**

**b**

*Description:* In the portal (b) and delayed (c and d) phases, the portal thrombus is slowly enhanced. The area surrounding the portal vein exhibits prolonged strong enhancement, and the enhanced area is widened than that on an early image. **Origin:**
Description: In the portal (b) and delayed (c and d) phases, the portal thrombus is slowly enhanced. The area surrounding the portal vein exhibits prolonged strong enhancement, and the enhanced area is widened than that on an early image.

Origin:
Figure 3

**a**

Description: MRI.

A T2-weighted image shows relatively low signal intensity structure along the portal tract. Origin:

**b**

Description: On a T1-weighted image, the structure shows low signal intensity. Origin:
Description: Dynamic study shows early linear strong enhancement surrounding the portal thrombus (c) and prolonged strong enhancement of the portal tract (d). Origin:
Description: Microscopic examination (Hematoxyline-eosin stain, x200). The specimen of needle biopsy from periportal to portal tract of lateral segment (S3) of the liver reveals invasive proliferation of numerous signet-ring cells with edematous fibrous stroma. Origin:

Description: Many capillaries are noted (blue arrows). Origin:
Figure 5

a

**Description:** Reported cases of gastric carcinoma with tumor thrombus in the portal venous system

**Origin:**
Description: Histologic growth patterns of liver metastases Origin: