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Case report

Malignant tumor, of the gastrointestinal stromal tumor type, in the greater omentum

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We report herein a rare case of gastrointestinal stromal tumor (GIST) type, arising from the greater omentum. A 65-year-old man who had a large abdominal tumor was referred to our hospital. Ultrasonography (US) and computed tomography (CT) scans showed a mass occupying almost the entire abdomen anterior to the bowel loops. Abdominal angiography showed that the main feeding artery of the tumor was the right gastroepiploic artery. The preoperative diagnosis was suspected gastric leiomyosarcoma. Laparotomy revealed a large mass arising from the greater omentum, and the tumor seemed to be completely excised. Histopathological and immunohistochemical studies indicated the tumor had the same characteristics as GIST. Twelve months after the operation, the tumor recurred in the peritoneal cavity at the site of the stomach, and was associated with multiple liver metastases. The patient died of hypovolemic shock. Necropsy revealed that rupture of one of the metastatic liver tumors had resulted in a massive intraperitoneal hemorrhage.

Key words: mesenchymal tumor, greater omentum, immunohistochemistry, gastrointestinal stromal tumor (GIST)

Introduction

Gastrointestinal stromal tumor (GIST) is the designation for the major subset of mesenchymal tumors of the gastrointestinal tract that are different from typical leiomyomas and schwannomas.[1] Primary solid tumors of the omentum, showing immunohistochemical features resembling GISTs (omental GISTs), are very rare. To our knowledge, only 19 omental GISTs have been reported previously.[2–4] We report a case of malignant GIST-type tumor of the greater omentum in a patient who had local recurrence and multiple liver metastases shortly after operation. We also review the literature.

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Case report

A 65-year-old man was referred and admitted to the Iida Municipal Hospital, in June 1998, because of a large abdominal tumor. Ten days before admission, he had visited another hospital with a history of sudden lower abdominal pain. He was 167 cm in height and 60 kg in weight. His vital signs were stable. Physical examination revealed a huge firm mass, extending from the hypogastrium to the epigastrium. Results of hematological and biochemical investigations were normal. Tumor markers, carcinoembryonic antigen (CEA) and carbohydrate antigen (CA) 19-9 were below the detection range. On admission, ultrasonography (US) and computed tomography (CT) scans showed a huge mass, 14 × 13 cm in size, with uniform echogeneity and attenuation occupying almost the entire abdomen anterior to the bowel loops (Fig. 1). Abdominal angiography revealed that the tumor was mainly fed by the right gastroepiploic artery (Fig. 2). The preoperative diagnosis was suspected gastric leiomyosarcoma. A laparotomy was performed, on July 14, 1998, and revealed a large mass arising from the greater omentum. The right gastroepiploic artery and vein were prominent and stretched by the tumor. The stomach, transverse colon, pancreas, and other abdominal organs appeared to be intact. There were no signs of peritoneal dissemination or swelling of lymph nodes. The tumor seemed to be completely resected.

His postoperative course was uneventful and he was discharged on July 30, 1998. However, 12 months after the operation, the tumor recurred in the peritoneal cavity, at the site of the stomach, associated with multiple

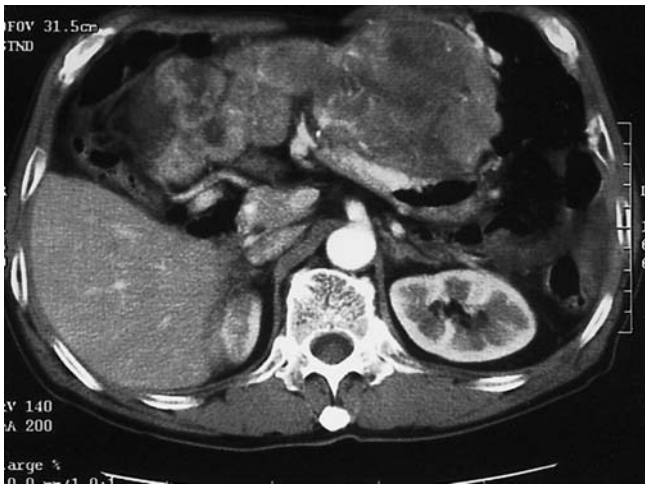

Fig. 1. Computed tomography (CT) scan showed a mass occupying almost the entire space anterior to the bowel loops

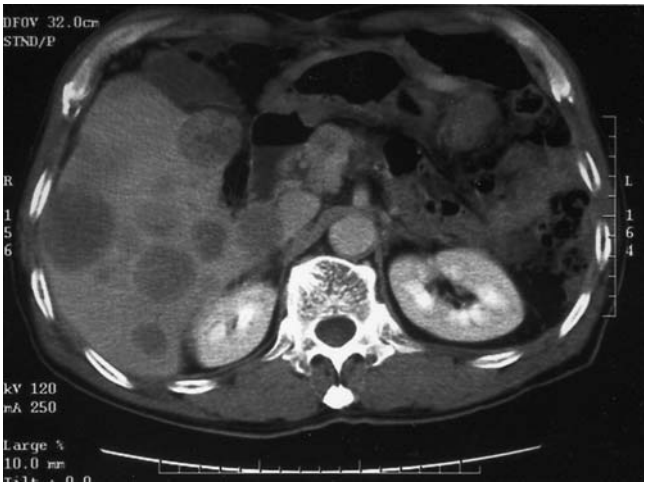

Fig. 3. The tumor recurred in the peritoneal cavity at the site of the stomach, and was associated with multiple liver matastases

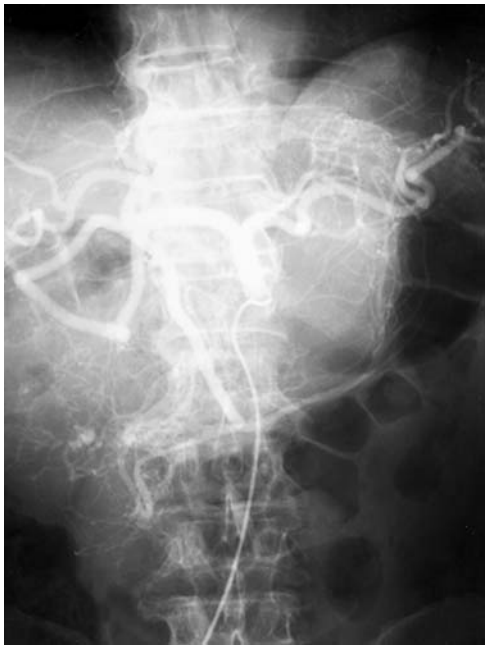

Fig. 2. Abdominal angiography showed that the main feeding artery of the tumor was the right gastroepiploic artery. Feeding vessels to the tumor were identified

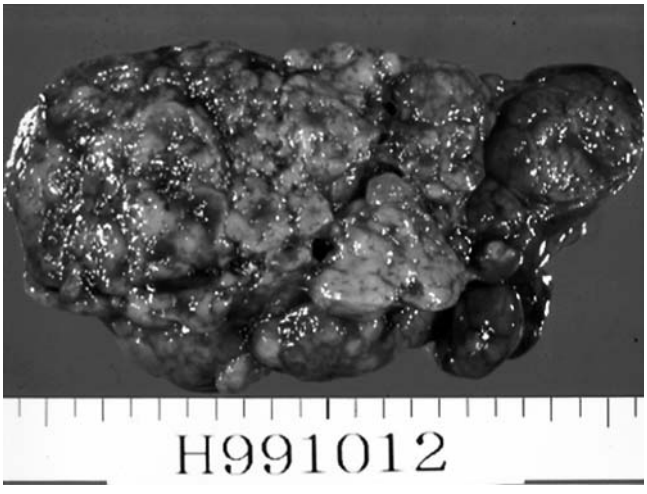

Fig. 4. Grossly, the tumor was 13 × 11 cm in size

liver metastases (Fig. 3). He died 15 months after the operation. Necropsy revealed that rupture of one of the metastatic liver tumors had resulted in massive intraperitoneal hemorrhage.

Pathological findings

Grossly, a well-demarcated reddish-gray solid tumor of the greater omentum, 13 × 11 cm in size, showed irregular nodularity (Fig. 4). The cut surfaces were tan-colored and focally necrotic.

Histologically, the tumor was composed of short spindle-shaped and oval cells with abundant eosinophilic cytoplasm and cigar-shaped nuclei without prominent nuclear pleomorphism (Fig. 5a). These cells were arranged in an interlacing pattern. The cellularity was relatively high and the frequency of mitotic figures in these cells was five to eight mitoses per 50 high-power fields (HPFs).

The results of our immunohistochemical studies are summarized in Table 1. Immunohistochemically, the tumor cells were diffusely immunoreactive for CD 117 (Fig. 5b) and vimentin, focally positive for alpha-smooth muscle actin, HHF-35, and neuron-

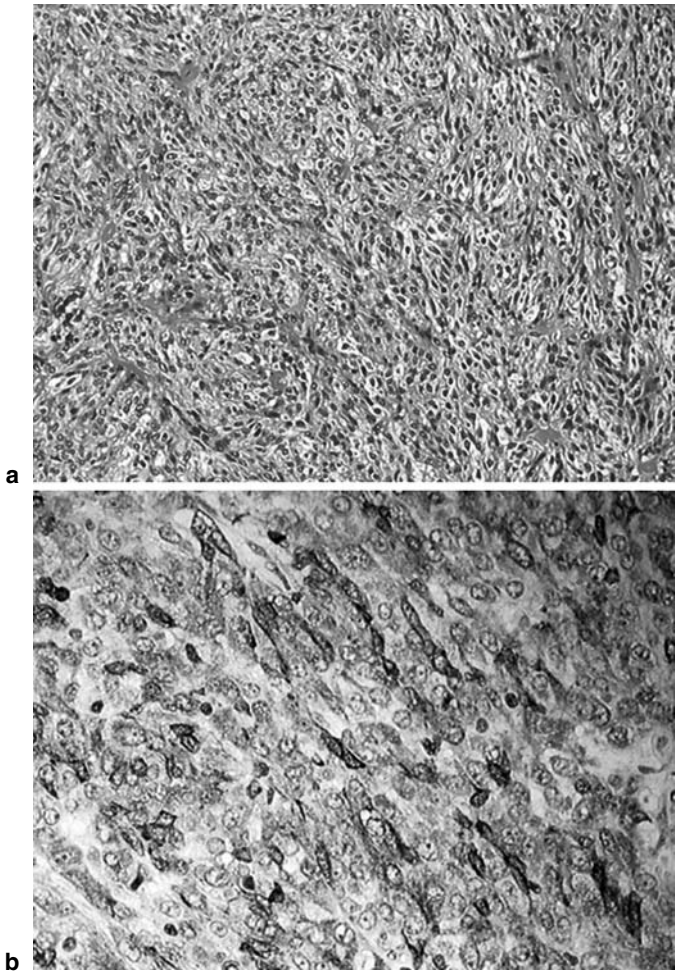

Fig. 5. **a** Histologically, the tumor was composed of short spindle-shaped and oval cells. These cells were arranged in an interlacing pattern. **b** The tumor cells were immunoreactive for CD 117. Staining was strong and diffuse. **a** H&E, ×200; **b** ×400

specific enolase, but negative for CD 34 and S-100 protein.

In addition, the MIB-1 index, defined as the percentage of MIB-1-positive tumor cells counted in 50 randomly selected HPFs, was 13.8%.

Based on these pathological findings, the omental tumor was interpreted as being a malignant GIST.

Discussion

Gastrointestinal stromal tumors (GISTs) are the most common mesenchymal tumors of the gastrointestinal tract, although GISTs originating in the omentum and mesentery have recently been reported.[1–5] To our knowledge, only 19 omental GISTs have ever been reported. The tumors occurred in 8 men and 11, women ranging in age from 31 to 89 years (median, 60 years).

Table 1. Summary of immunohistochemical findings

Antibodies	Results
Vimentin	+++
CD 34	−
CD 117	+++
Alpha-smooth muscle actin	+
HHF 35	+
Neuron-specific enolase	+
S-100 protein	−

+++, diffusely and strongly positive; +, focally positive; −, negative

The tumor diameters ranged from 2.5 to 36 cm (median, 16 cm).

Macroscopically, most tumors were large, solid masses, with cystic change in only one case, and necrosis in none. The mitotic rate was generally very low, with fewer than five mitoses per 50 high-power fields (HPFs) in 15 of 19 patients. Two patients had 19 and 26 mitoses per 50 HPFs.

Immunohistochemically, most of the tumors had similar features. All omental GISTs were positive for CD 117 (c-kit protooncogene protein product), a sensitive marker for GISTs.[6] CD 117 is present in the interstitial cells of Cajal (ICCs), which are important for gastrointestinal tract motility as pacemaker cells.[7,8] In 1998, Sarlomo-Rikala et al.[9] immunohistochemically evaluated the presence of CD 117 in a large number of GISTs and other mesenchymal tumors, and demonstrated that CD 117 was the most specific marker for the GISTs. In 1999, Miettinen et al.[2] presented a series of primary solid tumors occurring in the omentum, and showed that most of these tumors were similar to GISTs, showing fairly consistent CD 117 expression. Omental GISTs have been considered to consist of uncommitted mesenchymal cells that are precursors of ICCs.[2,8] In 2001, Sakurai et al.[5] identified an ICC-like, kit-positive cell in the omentum and showed that GIST can occur not only in the gastrointestinal tract but also in the omentum.

CD 34 was detected in 17 of the 19 reported tumors. Of these tumors, 9 showed alpha-smooth-muscle actin reactivity. None of these tumors showed reactivity for desmin or S-100 protein. Both alpha-smooth-muscle actin and neuron-specific enolase were focally positive in only the present case. In 1996, GISTs were subclassified by ultrastructural examination and immunohistochemical analysis using 13 antibodies.[10] The tumors were classified as follows: GISTs with myogenic features (smooth-muscle GISTs), GISTs with neural features (gastrointestinal autonomic nerve tumors), GISTs with both myogenic and neural features (mixed GISTs), and GISTs lacking differentiation (uncommitted GISTs). According to this classification, the present case was considered to be a mixed GIST.

No postoperative recurrence of omental GISTs has ever been reported.[2–4] It is only in the present patient that omental GIST, with multiple liver metastases, had a poor outcome, despite complete resection of the tumor. In most cases, the clinical behavior of a GIST can be predicted with relative accuracy based on a combination of tumor size and mitotic activity.[11] Intestinal GISTs that either have more than five mitoses per 50 HPFs or are larger than 5 cm have a high risk for liver metastasis.[12,13] For gastric GISTs, the size limit for high risk is set at 10 cm.[14] According to the criteria for intestinal and gastric GISTs, the omental GIST in the present patient was considered to have been malignant, based on the tumor size and mitotic activity.

Many other factors, such as cellularity,[1,2,4] invasive growth,[10,11] hemorrhage, necrosis,[12,13] and primary lesion[2,15] have also been found to be helpful in predicting the malignant potential of GISTs. Histologically, omental GIST is classified as spindle-cell type or epithelioid-cell type,[2] but no correlation between these cell types has been reported. Recently, it has been shown that the MIB-1 index is a simple, reproducible, and reliable method for obtaining information on the proliferative capacity of a tumor.[15,16] MIB-1 is a monoclonal antibody to Ki-67 antigen. According to two studies, tumors with more than 10% of nuclei positive for MIB-1 developed metastases.[17,18] In the tumor in the present patient, 13.8% of nuclei were positive for MIB-1.

Clinical data on tumor-related death and disease-free survival in patients with omental GIST are sparse, because of the short-term follow up and small number of cases.[2–5,11–14] A low mitotic rate is not considered to rule out malignant behavior in GISTs.[1,2,11] Despite the low mitotic count tumor in the present patient, the patient died of the disease 15 months after tumor resection operation.

The establishment of treatment for omental GISTs by the accumulation of more clinical experiences is essential.

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