CASE REPORT

Spontaneous Rupture of a Gastric Stromal Tumor Causing Hemoperitoneum

Gun Wha Lee*, Young Seok Kim*, Sang Gyune Kim*, Bong Min Ko*, Moon Sung Lee*, Kyu Seok Cho[†], Seong Jin Park[‡], and Hee Kyung Kim[§]

Departments of *Internal Medicine, [†]General Surgery, [‡]Radiology, and [§]Anatomic Pathology, Soonchunhyang University Bucheon Hospital, Soonchunhyang University College of Medicine, Bucheon, Korea

We describe a 39-year-old man with spontaneous rupture of a gastric stromal tumor causing hemoperitoneum. Ultrasonography showed a large mass broadly abutting the stomach and liver. Computed tomography demonstrated a heterogeneous enhanced mass arising from the stomach and focal perforation of the tumor with hemoperitoneum; endoscopic ultrasonography showed an exophytic heterogeneous mass originating from the gastric muscle layer. Angiography revealed that the right gastric artery was the main artery supplying the tumor. A gastric stromal tumor with bloody fluid in the peritoneal cavity was seen at the laparotomy. The tumor was excised completely, and subsequent histological and immunohistochemical studies indicated that it was a gastric stromal tumor. We report a relatively rare case of gastric stromal tumor causing hemoperitoneum due to spontaneous rupture of the tumor. (*Gut Liver* 2010;4:278-282)

Key Words: Gastric stromal tumor; Hemoperitoneum; Spontaneous rupture

INTRODUCTION

Gastrointestinal stromal tumors (GISTs) constitute a major subset of gastrointestinal tract tumors and may occur anywhere in the entire length of the gastrointestinal tract.¹ Most GISTs have an activating mutation in either the c-kit or platelet-derived growth factor receptor α (PDGFR) gene that results in constitutive, ligand-independent activation of receptor tyrosine kinases. These

gene mutations may play an important role in transforming a GIST progenitor cell into a tumor cell during the early phase of GIST tumorigenesis. However, the precise mechanism of tumorigenesis is not known.²⁻⁵

Gastrointestinal stromal tumors arise from the stomach, and present with abdominal pain, gastrointestinal bleeding, or a palpable mass. Around 20-30% of GISTs are detected during surgery for intestinal obstruction or bleeding. The diverse clinical presentation of stomach GISTs includes spontaneous rupture into the peritoneal cavity leading to peritonitis, extragastric growth, and rupture of a gastric stromal tumor with cystic degeneration presenting as hemoperitoneum.⁶⁻⁸ Gastrointestinal bleeding is usually associated with ulceration of the tumor into the lumen of the gastrointestinal tract, so spontaneous rupture of a gastric GIST presents as gastrointestinal bleeding.^{9,10} By contrast, rupture of the mass into the peritoneal cavity causing hemoperitoneum is very rare.⁶ We describe a case of gastric stromal tumor causing hemoperitoneum.

CASE REPORT

A 39-year-old man was admitted to Soonchunhyang University Bucheon Hospital because of a large abdominal mass. Two days before admission, he had visited another hospital complaining of sudden-onset upper abdominal pain and underwent computed tomography (CT), which revealed a heterogeneous oval 7×4-cm mass in the peritoneal cavity. He had no significant medical or family

Correspondence to: Young Seok Kim

Department of Internal Medicine, Soonchunhyang University Bucheon Hospital, Soonchunhyang University College of Medicine, 1174, Jung-dong, Wonmi-gu, Bucheon 420-767, Korea

Tel: +82-32-621-5095, Fax: +82-32-621-5080, E-mail: liverkys@schbc.ac.kr

Received on June 18, 2009. Accepted on November 4, 2009.

DOI: 10.5009/gnl.2010.4.2.278

Fig. 1. (A) Ultrasound shows a heterogeneous mass with a cyst and intratumoral hemorrhage broadly abutting on the lesser curvature of the stomach and lateral segment of the liver. (B) Color Doppler image shows blood flow in the mass, which is supplied by the gastric vessels.

Fig. 2. Computed tomography showed a heterogeneous mass growing exophytically from the lesser curvature of the stomach. There is also evidence of hemoperitoneum.

history. He was fully conscious and alert with a body temperature of 36.9°C, blood pressure of 130/90 mm Hg, heart rate of 80 beats/min, and respiration rate of 22 breaths/min. The physical examination revealed tenderness in the left upper quadrant. The laboratory findings included white blood count (WBC) 5,500/ μ L, hemoglobin 11.9 g/dL, platelets 223,000/ μ L, total protein 6.9 g/dL, albumin 4.4 g/dL, ALT/AST 19/35 IU/L, LDH/ALP 154/50 IU/L, total bilirubin 1.08 mg/dL, creatinine 1.3 mg/dL, prothrombin time 1.05 INR, alpha-fetoprotein (α FP) 3.2 ng/dL, and C-reactive protein (CRP) 2.62 mg/dL. Serological studies for hepatitis B and C viruses were negative. Urinary protein and sugar were negative. Ultrasonography of the abdomen showed an exophytic mass broadly abutting the lesser curvature of the stomach and liver (Fig. 1A) and color Doppler imaging showed blood flow in the mass coming from the gastric vessels (Fig. 1B). Multi-detector CT showed a heterogeneous 7×4-cm mass growing exophytically from the stomach and fluid collection in the peritoneal cavity (Fig. 2). Upper endoscopy showed no protruding inflammatory mass, although

Fig. 3. Endoscopic ultrasound reveals a large mass originating from the gastric muscle layer. The mass has several anechoic portions, indicating cystic degeneration or hemorrhagic necrosis.

Fig. 4. Angiography performed during the injection of into the right gastric artery produce tumor staining in the upper body of the stomach.

Fig. 5. The resected mass is a well-circumscribed tumor, weighing 49 g and measuring 6.5×5.5×4.0 cm. The cut section shows a pink-gray, fish-flesh appearance with several large blood-filled cysts.

Fig. 6. (A) Histologic examination of the resected specimen reveals proliferation of epithelioid cells with well-defined borders, arranged in nests or sheets (H&E stain, ×100). (B) Immunohistochemical staining is positive for CD117 (×100).

endoscopic ultrasonography showed an exophytic mass growing from the 4th layer of the stomach (Fig. 3). Angiography revealed that the main artery feeding the tumor was the right gastric artery (Fig. 4). At laparotomy, a large tumor was seen arising from the lesser curvature of the stomach that had ruptured into the peritoneal cavity; there were no metastatic nodules. The tumor was resected completely without a gastrectomy. The resected mass was a well-circumscribed tumor, weighing 49 g and measuring 6.5×5.5×4.0 cm. The cut section was pink to gray with a fish-flesh appearance, with several large blood-filled cysts (Fig. 5). Histological examination of the resected specimen revealed proliferating epithelioid cells with well-defined borders, arranged in nests or sheets

(Fig. 6A). The tumor cells had abundant cytoplasm that was eosinophilic or clear. The nuclear atypia was mild with 3 mitoses/50 high-power fields. Immunohistochemical staining was positive for CD117, CD34, and S-100 protein, but negative for smooth muscle actin and desmin (Fig. 6B). Based on these findings, this tumor was diagnosed as an epithelioid gastrointestinal stromal tumor with an intermediate risk of malignant behavior. The risk of GIST was determined according to NIH consensus criteria proposed by Fletcher *et al.* (Table 1).⁹ Postoperatively, he was put on imatinib mesylate 400 mg once daily. The patient was asymptomatic at the 3-month follow-up.

DISCUSSION

GIST is a generic name for a mesenchymal tumor originating in the muscular wall of hollow viscera that express the c-kit proto-oncogenic protein. The expression of this protein distinguishes it from other mesenchymal tumors.^{1,11} The majority of GISTs occur in the stomach (60-70%) and small intestine (20-30%).⁹ Stomach and small intestinal stromal tumors are usually associated with abdominal pain and gastrointestinal bleeding, although 10-30% of patients with GIST may be asymptomatic.¹²

Spontaneous rupture of gastric GIST is infrequent, and the most common site of tumor rupture is the gastrointestinal lumen. Rupture into the peritoneal cavity causing massive intra-abdominal bleeding and peritonitis have also been reported.^{5,8,10} A KoreaMed search of the literature revealed eight cases of GISTs with spontaneous rupture and bleeding since 2000 (Table 2). Two cases arose from the stomach with intraperitoneal hemorrhage. One was a 71-year-old woman presenting with nausea and se-

Table 1. NIH Consensus Conference Approach for Defining Risk of Aggressive Behavior in Gastrointestinal Stromal Tumors

	Tumor size	Mitosis count
Very low risk	< 2 cm	<5/50 HPF
Low risk	2-5 cm	<5/50 HPF
Intermediate risk	< 5 cm	6-10/50 HPF
	5-10 cm	<5/50 HPF
High risk	< 5 cm	>5/50 HPF
	> 10 cm	Any mitotic rate
	Any size	>10/50 HPF

vere abdominal pain who was successfully treated with a subtotal gastrectomy. The mass was attached to the lesser curvature of the stomach, measured 6×8 cm, and was positive for CD117. Microscopically, severe nuclear atypia was seen under low power. The other patient was a 38-year-old man who also presented with abdominal pain and hemoperitoneum. The 10×9×6-cm tumor was attached focally to the gastric wall and was c-kit positive with borderline mitotic activity (4/50 HPF). Both tumors were larger than 5 cm. Nevertheless, Franquemont⁵ reported a GIST of the stomach measuring 4.5×2.5 cm with intraperitoneal hemorrhage. Microscopically it was of intermediate risk. Therefore, small GISTs also have a risk of bleeding, and it is impossible to establish a relationship between histologic aggressiveness and rupture.

Computed tomography and magnetic resonance imaging (MRI) are useful for diagnosing GISTs and demonstrating the tumor tendencies.³ Due to the high soft tissue contrast, MRI will identify a tendency toward necrosis and hemorrhage in GIST. In particular, hemorrhage observed in large tumors is associated with large areas of necrosis.¹³ Since a GIST can rupture and result in hemoperitoneum, any hemorrhage inside or outside the tumor should be detected. Our patient underwent an urgent laparotomy because of the hemoperitoneum, but not MRI.

The mechanism underlying hemoperitoneum might be bleeding in the tumor leading to a hematoma and rupture of the capsule, or transudation of blood components from the tumor. In our case, bleeding in the tumor leading to rupture of the capsule might have caused the hemoperitoneum. We do not know the precise reason for spontaneous rupture of the GIST. However, we believe that rup-

Table 2. Summary of Eight Cases of Spontaneously Ruptured Gastrointestinal Stromal Tumors in Korea

	Author	Age/Sex	Symptoms	Year	Tumor location	Tumor size, cm	Site of rupture	Histologic feature
1	Kim MI	87/M	Melena	2000	Duodenum	4.8×4.5×4.5	GI lumen	Low risk
2	Seo GD	32/M	Melena	2001	Stomach	4.5×4.0×3.5		No mitosis
					Prox. jejunum	4.5×3.5×3.5	GI lumen	Low risk
3	Cho EY	71/M	Nausea/ Abdominal pain	2003	Stomach	6×8	Peritoneal cavity	No mitosis High risk Severe nuclear atypia
4	Cheon YK	34/M	Abdominal pain	2003	Stomach	10×9×6	Peritoneal cavity	High risk <4/50 HPF
5	Shin JA	72/F	Bloody stool	2005	Rectum	4.8×4.5	GI lumen	Intermediate <4/50 HPF
6	Jhu IK	53/M	Melena	2005	Duodenum	4.5×3.5×2.4	GI lumen	Low risk <5/50 HPF
7	Jung HS	52/M	Melena	2007	Small intestine	4.5×3	GI lumen	Low risk <5/50 HPF
8	Lee JH	84/M	Melena	2007	Stomach	14×10	GI lumen	High risk No mitosis

ture may occur in a weakened area in the wall of the mass; this may be due to cystic degeneration within the mass. The patient's normal activity or a physical blow may trigger the rupture of the weakened wall.⁸ Although no peritoneal metastasis was seen in our patient, we should watch for tumor recurrence because the tumor ruptured. Our patient is alive, without disease, 16 months after surgery.

In conclusion, spontaneous rupture of a gastric stromal tumor is a very rare presentation of stomach GIST. We reported the case of a man with a large gastric stromal tumor that ruptured spontaneously causing hemoperitoneum. Physicians must be aware that a large GIST may cause hemoperitoneum after spontaneous rupture. A thorough clinical examination and timely investigation can provide a diagnosis of this rare complication.

REFERENCES

1. Miettinen M, Lasota J. Gastrointestinal stromal tumors: definition, clinical, histological, immunohistochemical, and molecular genetic features and differential diagnosis. *Virchows Arch* 2001;438:1-12.
2. Burkill GJ, Badran M, Al-Muderis O, et al. Malignant gastrointestinal stromal tumor: distribution, imaging features, and pattern of metastatic spread. *Radiology* 2003;226:527-532.
3. Levy AD, Remotti HE, Thompson WM, Sobin LH, Miettinen M. Gastrointestinal stromal tumors: radiologic features with pathologic correlation. *Radiographics* 2003;23:283-304, 456; quiz 532.
4. Zivkovic V, Katic V, Nagorni A, et al. Gastrointestinal stromal tumors (GISTs): definition, clinical, histological, immunohistochemical, and molecular genetic features, and predictors of malignant potential and differential diagnosis. *Arch Oncol* 2002;10:267-271.
5. Franquemont DW. Differentiation and risk assessment of gastrointestinal stromal tumors. *Am J Clin Pathol* 1995;103:41-47.
6. Kitabayashi K, Seki T, Kishimoto K, et al. A spontaneously ruptured gastric stromal tumor presenting as generalized peritonitis: report of a case. *Surg Today* 2001;31:350-354.
7. Kimura H, Yoshida T, Kinoshita S, Takahashi I. Pedunculated giant gastrointestinal stromal tumor of the stomach showing extragastric growth: report of a case. *Surg Today* 2004;34:159-162.
8. Cheon YK, Jung IS, Cho YD, et al. A spontaneously ruptured gastric stromal tumor with cystic degeneration presenting as hemoperitoneum: a case report. *J Korean Med Sci* 2003;18:751-755.
9. Fletcher CD, Berman JJ, Corless C, et al. Diagnosis of gastrointestinal stromal tumors: a consensus approach. *Hum Pathol* 2002;33:459-465.
10. Emory TS, Sobin LH, Lukes L, Lee DH, O'Leary TJ. Prognosis of gastrointestinal smooth-muscle (stromal) tumors: dependence on anatomic site. *Am J Surg Pathol* 1999;23:82-87.
11. Orosz Z, Tornoczky T, Sapi Z. Gastrointestinal stromal tumors: a clinicopathologic and immunohistochemical study of 136 cases. *Pathol Oncol Res* 2005;11:11-21.
12. Mehta RM, Sudheer VO, John AK, et al. Spontaneous rupture of giant gastric stromal tumor into gastric lumen. *World J Surg Oncol* 2005;3:11.
13. Miettinen M, Sarlomo-Rikala M, Lasota J. Gastrointestinal stromal tumors: recent advances in understanding of their biology. *Hum Pathol* 1999;30:1213-1220.