Glomus Tumor of the Stomach: MRI Findings

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Glomus tumors are mesenchymal tumors, arising from modified smooth-muscle cells of the glomus body, a type of neuromyoarterial receptor that is sensitive to variations in temperature and plays a role in the regulation of arteriolar blood flow [1]. Most of the tumors are located at the subungual regions of the fingertips, the palms, the wrists, and the toes. The tumors have also been reported in the gastrointestinal, urogenital, cardiovascular, and respiratory tracts and in the hepatobiliary system. In the gastrointestinal tract, they occur most often in the stomach. Glomus tumors of the stomach typically appear as a submucosal nodule or mass on the greater curvature side of the antrum. To our knowledge, there has been no previous report regarding the MRI features of a gastric glomus tumor, although the upper gastrointestinal series and CT features of the tumor have been described [2–4]. In combination with the tumor size, location and MR signal intensity can suggest the diagnosis of gastric glomus tumor.

Case Report

A 60-year-old man presented with abdominal discomfort. The upper gastrointestinal barium study revealed a submucosal mass at the greater curvature aspect of the antrum (Fig. 1A). Endoscopy disclosed a gastric submucosal tumor. Triphasic abdominal CT (HiSpeed, GE Healthcare) showed a well-defined hypervascular tumor at the antrum (Fig. 1B). MRI was performed on a 1.5-T MR imager (Magnetom Sonata, Siemens Medical Solutions) using a phased-array coil; the following pulse sequences were performed: a T2-weighted balanced true fast imaging with steady-state free-precession (FISP) sequence (TR/TE, 4.3/2.1; flip angle, 72°); a T1-weighted spoiled gradient-echo sequence (2D fast low-angle shot; 150/1.8; flip angle, 70°) either with or without a saturation pulse for fat signal; a T2- and a heavily T2-weighted turbo spin-echo sequence (2,300/94; flip angle, 150°; and 2,300/180; flip angle, 150°, respectively); and 3D spoiled gradient-echo sequence (3D volumetric interpolated breath-hold examination [VIBE]; 3.15/1.25; flip angle, 15°) for triphasic dynamic enhancement study. The acquisition time for each phase was 13 sec, and the interval between the consecutive phases was 10 sec. At the start of scanning, gadopentetate dimeglumine (Magnevist, Schering) at a dosage of 0.1 mmol/kg was injected manually as a rapid bolus and flushed with 20 mL of normal saline.

A submucosal gastric mass that was approximately 2.0 cm was identified at the greater curvature side of the antrum; it appeared slightly hypointense on T1-weighted (Fig. 1C) and slightly hyperintense on T2-weighted (Fig. 1D) images and was hypervascular and exhibited persistent enhancement on axial (Fig. 1E) and coronal (Fig. 1F) images. Because the differential diagnosis of this gastric submucosal mass included carcinoid, glomus, and gastrointestinal stromal tumor (GIST), laparoscopic gastric wedge resection was performed. The pathology report revealed a glomus tumor of the stomach. Microscopically, it showed uniform small round cells with central nuclei and pale cytoplasm composed of many irregular vascular spaces in the muscular layer of the stomach. Immunohistochemically, the tumor cells were positive for smooth-muscle actin stain and negative for CD34, CD117, S-100 protein, synaptophysin, and chromogranin stain. There was no evidence of mitosis or lymphovascular permeation.

Discussion

Glomus tumors originate in the neuromyoarterial glomus, a normal arteriovenous shunt that is abundantly supplied with nerve fibers and fulfills a temperature-regulating function.

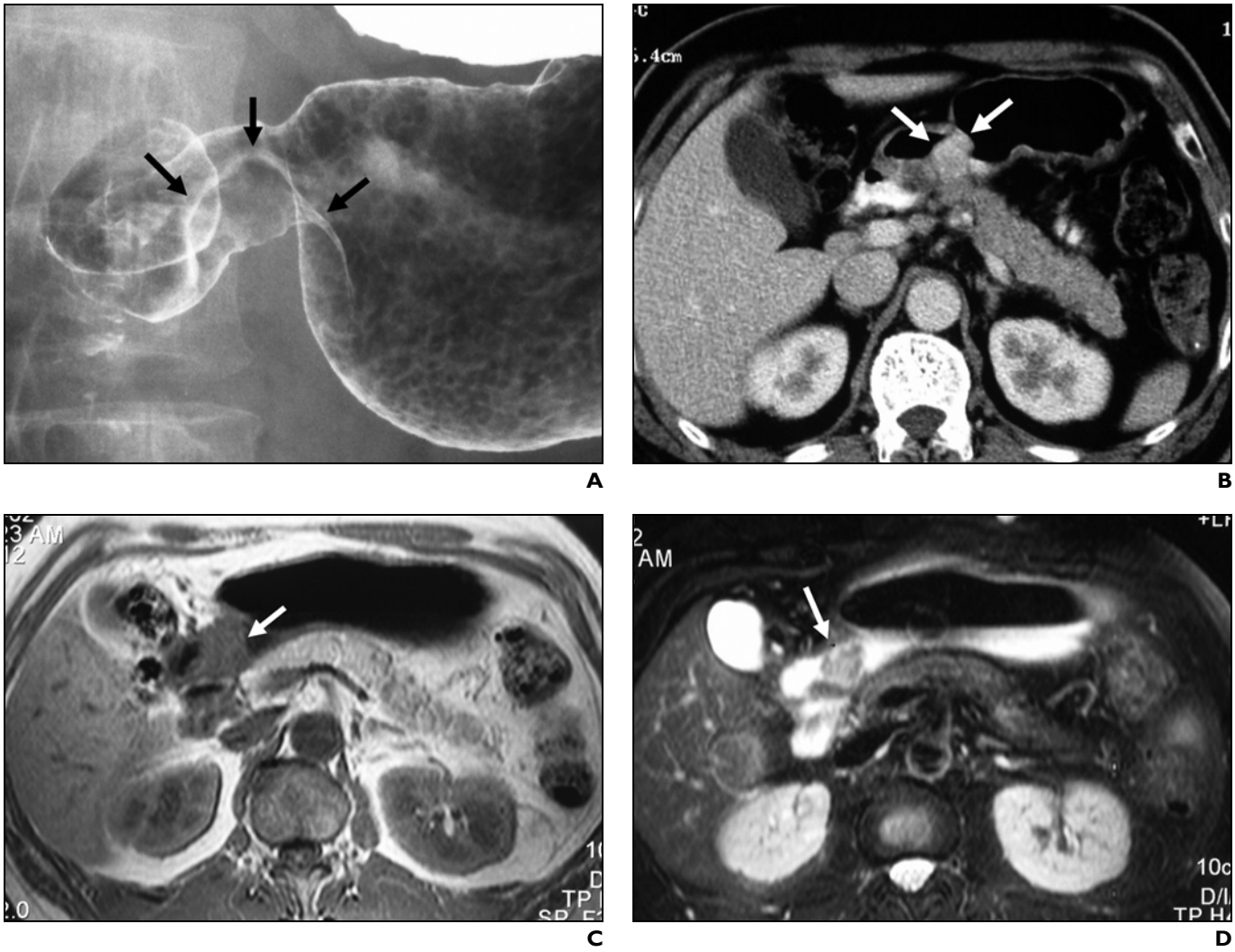
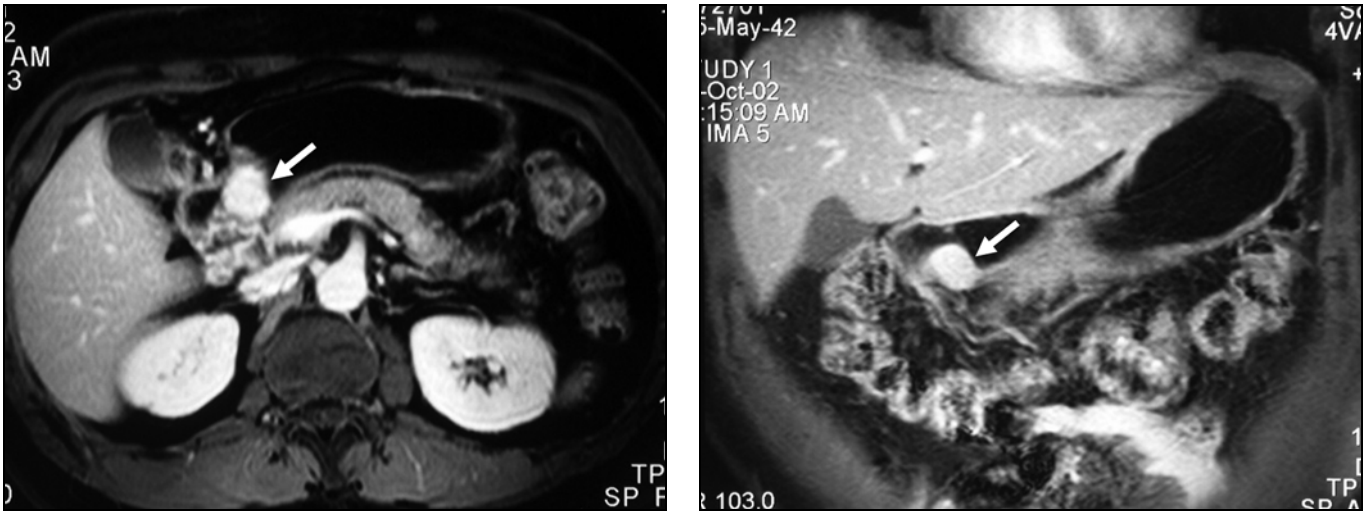


Fig. 1—60-year-old man who presented with abdominal discomfort.
A, Image from upper gastrointestinal series shows well-defined indentation (*arrows*) at greater curvature side of antrum. Mucosa is intact.
B, Triphasic contrast-enhanced CT scan shows well-defined tumor (*arrows*) with persistent hypervascular enhancement. Attenuation values were 28, 108, and 110 H on precontrast, arterial phase, and portal venous phase images, respectively.
C, Axial T1-weighted image without fat saturation shows lesion (*arrow*) with moderately low signal intensity. Image was acquired with spoiled gradient-echo sequence before administration of contrast medium.
D, Axial T2-weighted image reveals tumor (*arrow*) with mildly high signal intensity. Image was acquired with fat-suppressed turbo spin-echo sequence before administration of contrast medium.
(Fig. 1 continues on next page)

The tumors consist of vascular channels lined by normal endothelium surrounded by round glomus cells. However, they should not be confused with tumors of the glomus jugulare or hemangiopericytomas [2]. Glomus jugulare tumors or carotid body tumors (i.e., chemodectomas) are rare tumors arising from the chemoreceptor system in the head and neck region and present as mass effect and are rarely functioning. Hemangiopericytomas are vascular tumors arising from pericytes that surround capillaries and usually present as an intraosseous, soft-tissue, or muscular mass. Glomus tumors were first described by Barre and Masson in 1924, and the classic location of a glomus tumor is the subungual region of a digit, but it may occur anywhere in the body, including the skin, soft tissues, nerves, stomach, nasal cavity, trachea, and liver [3].

Glomus tumors of the stomach are rare lesions, arising in the intramuscular layer, and typically occur as a solitary submucosal nodule in the region of the antrum and pylorus. At barium study, most reported cases are localized at the greater curvature side of the antrum [2–4], and they appear as smooth submucosal masses with or without ulceration. On CT, they manifest as well-circumscribed submucosal masses with homogeneous density on unenhanced study and may contain tiny flecks of calcifications [4]. After contrast medium administration, these tumors show strong enhancement on arterial phase images and persistent enhancement on portal venous phase images. The sonographic findings have been described as a hypoechoic mass in the third or fourth submucosal layers with internal heterogeneous echogenicity mixed with hyperechoic spots and lacking a capsule [5].



E F

Fig. 1 (continued)—60-year-old man who presented with abdominal discomfort.
E, Contrast-enhanced axial T1-weighted image shows tumor (*arrow*) with vivid enhancement. Image was acquired with fat-suppressed spoiled gradient-echo sequence.
F, Contrast-enhanced coronal T1-weighted image shows that tumor (*arrow*) is located at greater curvature side of antrum. Image was acquired with fat-suppressed spoiled gradient-echo sequence.

To our knowledge, this is the first report about the MRI features of glomus tumors of the stomach. The tumor is slightly hypointense on T1-weighted images and slightly hyperintense on T2-weighted images and is hypervascular and exhibits persistent enhancement after gadopentetate dimeglumine administration.

The tumor in our patient was removed by laparoscopic wedge resection; however, endoscopic enucleation using an insulated-tip electrosurgical knife is another alternative [6]. Microscopically, glomus tumors appear as highly vascular tumors with dilated, probably modified capillaries and are covered by nests, strands, or sheets of glomus cells. Because they are derived from modified smooth-muscle cells, the tumor cells are phenotypically similar to peripheral glomus tumors and exhibit a similar immunocytochemical and ultrastructural profile. Nearly all tumors express muscle actin isoforms and vimentin. Expression of desmin is variable, and tumors are negative for chromogranin, neuron-specific enolase, factor VIII–related antigen, keratin, carcinoembryonic antigen, and epithelial membrane antigen [1, 7]. Pathologically the differential diagnosis includes the hemangiopericytoma and epithelioid GIST. The hemangiopericytoma arises from the pericytes, and its morphology is different from that of a glomus tumor. Immunocytochemical stain of actin is negative. The epithelioid GIST may be morphologically similar to glomus tumor, but the negative CD34 and CD117 (c-*kit*) exclude the possibility of GIST.

Although glomus tumor of the stomach is a pathologic diagnosis, it should be included in the differential diagnosis if there is a solitary, hypervascular submucosal tumor at the greater curvature side of the antrum. Other mesenchymal tumors, such as carcinoid tumor, GIST, neurilemmoma, and hemangioma, may show a similar pattern. The incidence of gastric carcinoid tumors is increasing and the tumors may be multiple, from the fundus to antrum. The imaging features of GISTs are variable, ranging from a small nodule with signal changes similar to gastric muscle to a large mass with cystic change, intratumoral hemorrhage, necrosis, or ulceration with air–fluid level. Neurilemmoma has moderately or markedly higher hyperintensity on T2-weighted imaging [8]. The hemangioma shows color change as vessels, blue or red, on endoscopy and may contain phleboliths that are more readily identified on CT. The constellation of tumor size, location, enhanced pattern, and intrinsic soft-tissue content resolution of MRI can help in the diagnosis of gastric glomus tumors.

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