Fine Needle Aspiration Cytology of Gastric Glomus Tumor
– A Case Report –

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Glomus tumors are mesenchymal neoplasms composed of cells that closely resemble the modified smooth muscle cells of the normal glomus body.¹ The vast majority of glomus tumors occur in the distal fingers and toes, particularly the subungual region.¹ Glomus tumors of the stomach are rare and endoscopic ultrasound-guided fine-needle aspiration cytology (EUS-FNAC) is highly accurate and remarkably helpful in the preoperative evaluation of patients with intramural lesions of the gastrointestinal tract.² Moreover, immunocytochemical studies have been helpful in the differential diagnosis of gastric submucosal tumors, including gastrointestinal stromal tumors (GIST), carcinoid tumors, and glomus tumors. Only three reports have previously described the cytologic features of gastric glomus tumors in the English literature.³⁻⁵ This report presents an additional case of a gastric glomus tumor diagnosed by EUS-FNAC with the aid of immunocytochemistry.

CASE REPORT

A 60-year-old woman was admitted to evaluate an asymptomatic gastric lesion that had been detected incidentally 1 month earlier. A physical examination of the abdomen was unremarkable, and laboratory findings including complete blood count, blood chemical analysis, and urinalysis were within normal ranges. EUS demonstrated a 4 × 3 cm-sized, round, isoechoic mass at the fourth layer of the gastric wall. Smears revealed cohesive clusters of small, uniform, round to polygonal cells with scant cytoplasm and round, hyperchromatic nuclei with homogeneous chromatin. Immunocytochemistry by liquid-based cytology was positive for smooth muscle actin. The cytologic diagnosis of a glomus tumor was confirmed by a specimen from the laparoscopic resection. Although the cytologic features of glomus tumors are quite distinctive, an immunocytochemical stain from a liquid-based cytology preparation can further help to ascertain the diagnosis.
Fig. 1. (A) Endoscopic ultrasound findings. A 4 × 3 cm-sized, round, isoechoic mass is located at the fourth layer of the gastric wall and surrounded by a hypoechoic rim. (B-F) Fine-needle aspiration cytology of the gastric glomus tumor. (B) Low power view of conventional smears shows moderate cellularity with a few cohesive clusters of tumor cells, singly scattered cells, and smooth muscle bundles. (C) The tightly cohesive clusters contain tumor cells, red blood cells, and vascular endothelial cells (arrows). The tumor cells show small, uniform, round cells with a small amount of cytoplasm and relatively round nuclei (Papanicolaou). (D) Some tumor cells exhibit a relatively clear cytoplasm with distinct cell borders, mimicking a honeycomb pattern. (E) Intracellular cytoplasmic inclusions are very occasionally noted (arrow, Papanicolaou). (F) Immunocytochemistry for smooth muscle actin reveals strong reactivity for tumor cells provided by a liquid-based cytology preparation.
lular with a few tightly cohesive clusters of tumor cells, singly scattered cells, hyalinized stroma, and smooth muscle bundles (Fig. 1B). Liquid-based cytology revealed more small-sized and loosely arranged tumor cell clusters than those of conventional smears and an increased number of singly scattered tumor cells. Tumor cell clusters contained endothelial cells. In conventional smears and liquid-based cytology, the tumor cells were small, round to polygonal and had small amounts of faintly eosinophilic cytoplasm and ill-defined cell borders. The nuclei were uniform and round to oval in size and shape, and contained homogeneous granular chromatin and indistinct nucleoli (Fig. 1C). However, some tumor cells exhibited relatively clear cytoplasm with distinct cell borders, mimicking a honeycomb pattern (Fig. 1D). Very occasional intranuclear cytoplasmic inclusions were noted (Fig. 1E). No cytologic atypia or mitosis were observed. Furthermore, immunocytochemistry was performed using the liquid-based cytology samples and was strongly positive for smooth muscle actin (SMA) (Fig. 1F). Immunocytochemistry for chromogranin, CD34 and CD117 (c-Kit) was negative. A laparoscopic wedge resection of the stomach was performed subsequent to a cytologic diagnosis of benign perivascular tumor. Macroscopically, the tumor was a relatively well-circumscribed mass, measuring $3.3 \times 2.2$ cm and was located in the muscularis propria (Fig. 2A). Microscopically, the tumor was composed of solid sheets of glomus cells interrupted by irregular, thin-walled vessels of varying sizes. The tumor cells were small, uniform, rounded, and contained centrally-located round nuclei and a lightly eosinophilic cytoplasm (Fig. 2B). Some tumor cells had a distinct cell border and a clear cytoplasm with a hyalinized intervening stroma (Fig. 2C). No necrosis or mitotic fig-

![Fig. 2. Macroscopic and microscopic findings of gastric glomus tumor. (A) The cut surface reveals a relatively well-circumscribed, $3.3 \times 2.2$ cm-sized mass in the muscularis propria. (B) The tumor is composed of irregular, thin-walled vessels and solid sheets of tumor cells that are small, uniform, round cells with a centrally located, round nucleus and lightly eosinophilic cytoplasm. (C) Some tumor cells reveal distinct cell borders and a clear cytoplasm with a hyalinized intervening stroma. (D) Tumor cells show diffuse cytoplasmic immunoreactivity to smooth muscle actin.](image-url)
ures were identified. Tumor cells presented diffuse cytoplasmic immunoreactivity for SMA (Fig. 2D) but were not immunoreactive for c-Kit, CD34, S100 protein, desmin, CD56, or chromogranin. Three months after the operation, the patient remained in good condition with no signs or symptoms of tumor recurrence.

**DISCUSSION**

Glomus tumors of the stomach are rare benign lesions often found as a submucosal or intramuscular mass. They are most frequently present in the prepyloric or antral areas, arise in any age group, have no predilection for gender, and measure an average of 2-2.5 cm in size. Although most of these tumors are benign lesions, cases of atypical or malignant variants have been reported. The World Health Organization classification of malignant glomus tumors is: 1) size > 2 cm with a subfascial or visceral location; 2) atypical mitotic figures; or 3) marked nuclear atypia and any level of mitotic activity. Glomus tumors not fulfilling the malignancy criteria but with at least one atypical feature other than nuclear pleomorphism are diagnosed as glomus tumors of uncertain malignant potential. Because this case was not compatible with the diagnostic criteria of malignant glomus tumor or glomus tumor of uncertain malignant potential, a diagnosis of benign glomus tumor was made.

The preoperative diagnosis of gastric glomus tumors is very important, because the majority of them behave in a benign fashion. However, their deep location may prevent acquiring tissue for diagnosis from an endoscopic biopsy, and their lack of specific clinical or radiological features to distinguish them from other intramural gastric masses may cause difficulty in the diagnosis. In this instance, EUS-FNAC offers a rapid, cost-effective, diagnostic method for identifying gastric glomus tumors.

To date, only three cases of FNAC used for the identification of gastric glomus tumors have been reported. Among them, two cases were misdiagnosed as carcinoid tumors by cytology and only one case was diagnosed as a glomus tumor. No immunocytochemistry or immunohistochemistry was performed on the former two cases, but the latter case was diagnosed after performing cell block immunohistochemistry. As shown in the reported cases, the differential diagnosis of glomus tumor from other submucosal lesions is not easy with cytologic features alone. In such circumstances, immunocytochemistry from cytologic specimens or immunohistochemistry from cell blocks ensures an accurate diagnosis. Unfortunately, a cell block was not prepared in this case because the cellularity was too low in the aspirates to make a cell block. Though a cell block may be also useful in the differential diagnosis using immunohistochemistry, we think that liquid-based cytology specimens are more available for immunostaining than cell blocks in cases of low cellularity in the aspirates.

In this case, liquid-based cytology revealed more loosely arranged clusters of tumor cells than conventional smears, so the morphologic examination was easier using liquid-based cytology than conventional smears. Moreover, tumor cells with a clear cytoplasm and endothelial cells in the tumor cell clusters were frequently identified in the liquid-based cytology, and intranuclear cytoplasmic inclusions were only recognized in the liquid-based cytology. Furthermore, it was an advantage of the liquid-based cytology to perform immunocytochemistry for the differential diagnosis.

The differential diagnosis of gastric glomus tumor includes carcinoid tumor, hemangiopericytoma, and epithelioid GIST. The cells of carcinoid tumors are in gland-like or rosette-like arrangements, and the tumor cells contain more finely granular cytoplasm. Hemangiopericytomas contain tightly packed clusters of oval to spindle-shaped cells radiating out from a central core of basement membrane material. An epithelioid GIST reveals cellular smears of intermediate-sized cells with an abundant eosinophilic cytoplasm, multiple small cytoplasmic vacuoles, variable numbers of nucleoli, and irregular nuclear membranes. Furthermore, the tumor cells are immunoreactive for c-Kit in nearly all cases. Because some tumor cells have distinct cell borders and a clear cytoplasm, they may be misinterpreted as benign glandular cells. However, the close association between tumor cells and endothelial cells was a helpful clue to a vascular rather than epithelial lesion in a previously reported glomus tumor.

In conclusion, EUS-FNAC is a rapid diagnostic method to distinguish glomus tumors of the stomach from other gastric tumors. If possible, liquid-based cytology samples should be prepared, because they may increase the diagnostic accuracy of EUS-FNAC via immunocytochemistry.

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