

## Case Report

# Presence of smooth muscle cell differentiation in plexiform angiomyxoid myofibroblastic tumor of the stomach: a case report

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**Abstract:** Plexiform angiomyxoid myofibroblastic tumor (PAMT) is a recently described distinctive gastric mesenchymal entity with a peculiar plexiform pattern, bland spindle cells and a myxoid stroma rich in arborizing blood vessels. In this study, we report a new case of this rare gastric tumor with a subset of tumor cells derived from smooth muscle differentiation. A 32-year-old Chinese man was admitted with a gastric mass. He did not experience any discomfort, and gastroscopy showed an elevated mass in the anterior wall of the gastric antrum. Endoscopic ultrasound examination revealed a focal hypoechoic lesion protruding into the lumen. A partial gastrectomy was performed, and the patient made an uneventful recovery and remains well 3 years later. The tumor in this case depicted all the typical histopathologic and immunochemical features of gastric PAMT, except that a small subset of tumor cells was partially immunoreactive for desmin and H-caldesmon. Based on the findings of this case, we think that PAMT may contain tumor cells derived from smooth muscle differentiation, and therefore this tumor may be more than just purely myofibroblastic in nature.

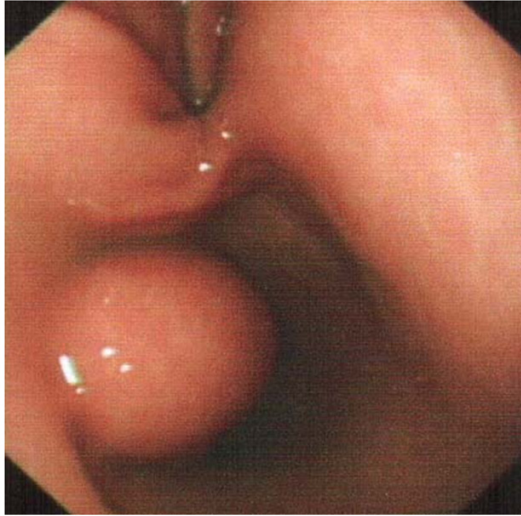
**Keywords:** Plexiform angiomyxoid myofibroblastic tumor, plexiform fibromyxoma, stomach, gastric mesenchymal tumor, myofibroblast

## Introduction

Plexiform angiomyxoid myofibroblastic tumor (PAMT) is a recently described gastric tumor with a peculiar plexiform pattern, bland spindle-shaped myofibroblastic tumor cells, and a myxoid stroma rich in small and thin-walled blood vessels [1], but fibrosis or a collagenous matrix is observed in some cases [2]. This tumor almost exclusively occurs in the gastric antrum, and the myofibroblastic nature of the tumor cells has been confirmed by immunohistochemical and ultrastructural analyses [3]. This is a rare tumor with equal gender distribution and occurs primarily in adults with a wide age range of 7 to 83 years [4, 5]. To date, there have been only 40 reported cases of gastric PAMT in the medical literature [5, 6]. The clinical symptoms are caused by ulceration of the mucosa from the underlying lesions, so hematemesis, anemia and abdominal discom-

fort or distention are most commonly encountered.

There has been some debate about the name of this entity. Takahashi *et al.* described two cases of a unique gastric mesenchymal tumor designated as “plexiform angiomyxoid myofibroblastic tumor (PAMT)” in 2007 [3]. Yoshida *et al.* also reported two cases of similar tumors in 2008, and they used the term “plexiform angiomyxoid tumor” [7]. Then, Miettinen *et al.* described a series of similar tumors in 2009, and they advocated the use of the appellation “plexiform fibromyxoma” [8]. Although the name of this entity is still controversial, and PAMT is used by most researchers, the WHO classification of tumors of the digestive system has designated “plexiform fibromyxoma” as the diagnostic term instead of PAMT [9]. However, we believe that PAMT is a more appropriate diagnostic term as it covers the histogenesis and histological features of this tumor.



**Figure 1.** Gastroscopy image of PAMT in the stomach. An elevated mass can be seen in the anterior wall of the gastric antrum.

Here, we report a rare case of PAMT of the stomach, in which a subset of tumor cells were found to be of smooth muscle origin.

#### Case report

A 32-year-old Chinese man was admitted because of a submucosal mass in the stomach that was detected during a routine health examination. The patient did not experience any discomfort, and the results of the laboratory tests were normal. Gastroscopy revealed a 3.4 × 3.0 cm sessile polypoid mass with a smooth surface in the anterior wall of the gastric antrum (**Figure 1**), and mucosal ulceration was not found. Endoscopic ultrasound examination revealed a focal hypoechoic lesion protruding into the lumen, mainly in the submucosa and muscularis propria. A partial gastrectomy was performed, and the patient made an uneventful recovery. The patient was followed up for 3 years and is currently still healthy.

Gross examination of the stomach showed a well-circumscribed polypoidal tumor measuring 3.4 cm × 3.0 cm × 2.8 cm in the anterior antral wall. The cross-section of the mass revealed a solid, glistening translucent tumor mainly in the submucosa, poorly demarcated from the muscularis propria. Microscopic examination showed an irregular multinodular plexiform pattern in the gastric wall (**Figure 2A**). Spindle-shaped bland tumor cells, without significant nuclear atypia or mitosis, were separated by an

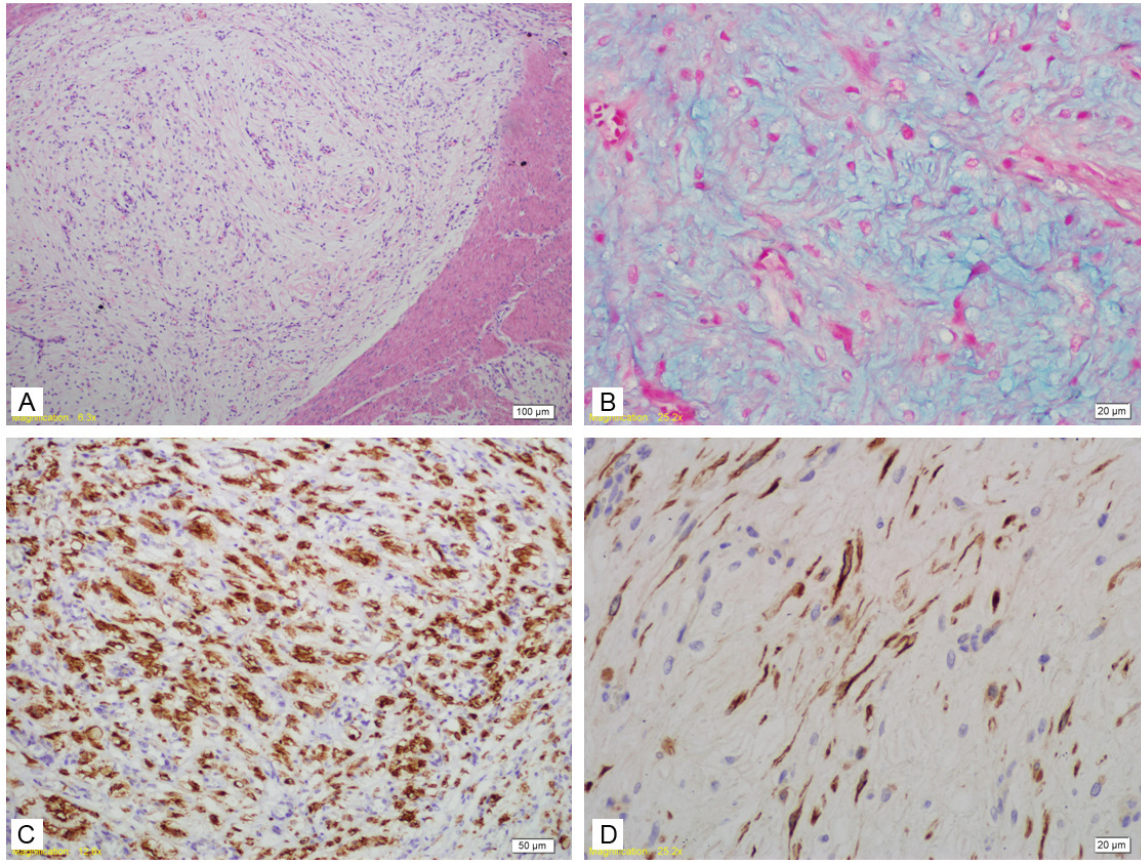
abundant intercellular myxoid matrix that stained positive with Alcian blue (pH 2.5) (**Figure 2B**). Fascicular arrangements of tumor cells were observed in some areas. The tumor cells possessed oval or spindle nuclei and a slightly eosinophilic cytoplasm, which had morphological features reminiscent of smooth muscle cells. The nucleolus was inconspicuous and the cell borders were indistinct. The myxoid matrix was rich in small and thin-walled blood vessels, and arborizing and dilated blood vessels were also observed. Stromal collagenization was also noted. Mast cells were scattered in the myxoid stroma, but infiltration by lymphocytes, plasma cells and eosinophils was inconspicuous. Tumor necrosis was not observed. Immunohistochemical tests showed that the tumor cells were diffusely positive for vimentin and partially immunoreactive for  $\alpha$ -smooth muscle actin (SMA), H-caldesmon and desmin (**Figure 2C** and **2D**), but they were negative for CD117, CD34, DOG1, S-100 protein, anaplastic lymphoma kinase (ALK), and  $\beta$ -catenin. The Ki-67 labeling index was less than 1%. A diagnosis of PAMT with smooth muscle differentiation was made based on the histological features and immunostaining findings. This study was reviewed and approved by our ethics committee.

#### Discussion

We have reported a rare case of PAMT in which the patient did not present with any of the characteristic symptoms of this tumor, which are hematemesis, anemia and abdominal discomfort or distention. With regard to tumor location, in the present case, it was found in the anterior antral wall lying mainly in the submucosa, poorly demarcated from the muscularis propria. This matched the typical location reported in published cases. However, although PAMT has a strong predilection for the gastric antrum, it may also present in the gastric fundus, body and esophagus [2, 5, 10]. The tumor is usually whitish or reddish in color, and forms a lobulated submucosal or transmural mass. The mucosa may be intact, dimpled or ulcerated. It is not encapsulated and in many cases, it protrudes from the serosa, which often has a granular or nodular appearance.

The histological features of the tumor in the present case were also very similar to the typical characteristics reported. Microscopic exam-

## Rare case of plexiform angiomyxoid myofibroblastic tumor



**Figure 2.** Microscopic findings for the PAMT. (A) A plexiform growth pattern is observed, with spindle tumor cells separated by an abundant intercellular myxoid stroma. (B) The abundant stroma stained positive with Alcian blue. (C) The tumor cells were positive for H-caldesmon and (D) desmin.

ination revealed a uniform spindle cell population with the cells arranged characteristically in a plexiform multinodular pattern. Individual tumor cells had bland oval nuclei and a weakly eosinophilic cytoplasm. The stroma was also typical and ranged from myxoid or fibromyxoid to hyalinized and it stained positive for Alcian blue. The vasculature within the stroma was prominent and varied from small thin-walled vascular channels to ectatic arborizing vessels. Additionally, cytological atypia, necrosis, and a brisk mitotic rate were not observed.

Immunohistochemistry revealed that the tumor cells in this case were positive for SMA and vimentin, but negative for CD117, CD34, DOG1, S-100 protein, neurofilament, cytokeratins, epithelial membrane antigen, and ALK; these findings indicate that the tumor cells were myofibroblastic in origin. Unlike most cases reported, in which the tumor cells were completely negative for desmin and H-caldesmon, a subset of the tumor cells in our case were strongly immu-

noreactive for these two markers. In general, myofibroblasts are immunoreactive for SMA and negative for desmin and H-caldesmon, while smooth muscle cells are positive for these three markers. In our case, partial immunoreactivity for desmin and H-caldesmon and the presence of a small number of tumor cells showing morphological features reminiscent of smooth muscle cells suggest that PAMT may contain tumor cells arising from smooth muscle differentiation. Similar findings were also reported in some other cases [5, 7]. Thus, as suggested in a previous report, PAMT is not a purely myofibroblastic tumor and may contain tumor cells with fibroblastic or smooth muscle characteristics [1].

Although PAMT demonstrates distinctive pathological features, it should be considered in the differential diagnosis of gastrointestinal stromal tumors (GISTs) and other gastric mesenchymal tumors, such as inflammatory fibroid polyp, leiomyoma, inflammatory myofibroblas-

tic tumor, schwannoma, perineurioma, fibromatosis, and solitary fibrous tumor. The application of an appropriate panel of antibodies and awareness about PAMT should provide the correct diagnosis [6]. The tumor cells in GISTs are arranged in short fascicles in several patterns including storiform, herringbone palisades, and broad sheets, but do not show a plexiform intramural growth pattern. Most GISTs are positive for CD117 and DOG1, and have mutations of the KIT or PDGFRA gene. Thus, GISTs can be distinguished from PAMTs based on morphological characteristics and immunohistochemical findings. Leiomyoma is characterized by the fascicular arrangement of tumor cells that possess spindle-shaped nuclei and a markedly eosinophilic cytoplasm, and is diffusely positive for SMA, desmin and H-caldesmon. Plexiform neurofibromas are positive for S-100 protein. The alteration of hypercellular and hypocellular areas, deposition of dense keloid-type collagen, occurrence of hemangiopericytoma-like areas, and positive immunohistochemical staining for CD34 are the most distinguishing features of solitary fibrous tumors. Inflammatory fibroid polyp is usually in the form of a small submucosal lesion composed of epithelioid to spindle-shaped fibroblasts and inflammatory cells. Desmoid fibromatosis may show some resemblance to PAMT because of its hypocellularity and the presence of bland spindle cells and admixed elongated small vessels. However, it can be differentiated from PAMT by the presence of a single infiltrative mass without a plexiform pattern and long fascicular arrangements of spindle cells and dense collagen deposits, and it often shows nuclear translocation of  $\beta$ -catenin.

Due to its rarity, the true biological potential of PAMT remains unknown. However, the bland nuclear features, low proliferative index and absence of necrosis, vascular invasion, recurrence and metastasis in all PAMT cases reported to date justify its characterization as a benign tumor. Currently, distal or partial gastrectomy remains the treatment of choice.

### Conclusion

PAMT is a very rare gastric tumor of mesenchymal origin. The name of the tumor reflects its distinguishing histopathological characteristics, namely, bland spindle-shaped cells arranged in a multinodular plexiform pattern,

myxoid stroma that stains positive with Alcian blue, and marked proliferation of small vessels. In the present case, the morphological features and immunohistochemical findings suggest that the tumor cells were myofibroblastic in nature with smooth muscle differentiation. Because of the rarity and lack of awareness about this entity, accurate diagnosis of PAMT is difficult, and it is necessary to differentiate it from GIST and other mesenchymal tumors of the stomach. When a myxoid spindle cell lesion is observed in endoscopic biopsy, PAMT should be included in the differential diagnosis.

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Written informed consent was obtained from the patient for publication of this case report and accompanying images.

### Disclosure of conflict of interest

The authors declare no conflicts of interest.

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