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Case Report

Imaging and clinicopathological features of a high-risk gastric stromal tumor: a case report

Xiong Huang[1*], Xingxiang Liu[2*]

[1]Department of General Surgery, Shanghai Eighth People's Hospital, Shanghai 200235, China; [2]Department of Radiology, Shanghai Xuhui District Dahua Hospital, Shanghai 200235, China. [*]Co-first authors.

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Abstract: Objective: To report upon the imaging and clinicopathological characteristics of a high-risk gastric stromal tumor (GST). Methods: A patient diagnosed with a GST at Shanghai Xuhui District Dahua Hospital and Shanghai Eighth People's Hospital in November 2021 was retrospectively analyzed. Clinical data, pathological features, immunohistochemical markers, c-kit/PDGFRA gene mutation status, and CT/MRI findings were collected. Results: A 70-year-old male with a long history of smoking and alcohol use was diagnosed with a GST during a routine physical examination. The tumor exhibited high-risk features: a diameter of 7 cm, a mitotic count of 8/50 high-power fields, and location involving the submucosa and muscular layer. Immunohistochemistry revealed strong positivity for CD117 and CD34, positivity for DOG1, and a Ki-67 index <10%. Gene mutation analysis identified a heterozygous mutation in exon 11 of the c-kit gene (c.1676T>A p.Val559Asp), with no mutations detected in PDGFRA. Histologically, the tumor showed marked atypia with solid and cord-like growth patterns and conspicuous mitotic figures. Imaging demonstrated heterogeneous enhancement, ill-defined borders, irregular gastric wall thickening, calcification, and cystic/hemorrhagic changes. Notably, the patient remained recurrence- and metastasis-free for 4 years following surgical resection and adjuvant imatinib therapy. Conclusion: This case highlights the integration of pathological features, c-kit exon 11 mutation status, and imaging findings in the diagnosis and management of high-risk GSTs. The 4-year recurrence-free survival confirms the effectiveness of risk-stratified adjuvant therapy with imatinib.

Keywords: Gastric stromal tumor, immunohistochemistry, imaging, case report, pathology

Introduction

Gastrointestinal stromal tumors (GISTs) are the most common mesenchymal tumors of the digestive tract, among which gastric stromal tumors (GSTs) are the most typical [1]. Their biological behavior ranges from benign and slow-growing to highly invasive and metastatic [2]. Risk assessment primarily relies on pathological parameters and immunophenotype, while imaging plays an increasingly important role in preoperative diagnosis and follow-up [3]. However, systematic reports on the correlation between imaging features and pathological manifestations of high-risk GSTs remain limited. This case report presents a pathologically confirmed high-risk GST, detailing its imaging, immunohistochemical, and morphological features, along with c-kit mutation analysis and 4-year follow-up data, to enhance understanding and support comprehensive clinical evaluation.

Data collection

All baseline patients data (gender, age, past medical history, comorbidities, and clinical symptoms), pathological gold standard data (maximum tumor diameter, mitotic count, risk grade), and immunohistochemical data (staining intensity of CD117, DOG-1, and CD34; Ki67 index; 0 = no staining, 1 = weak staining, 2 = moderate staining, 3 = strong staining) were collected. Additionally, data on gene mutations in c-kit (exons 9, 11, 13, 17) and PDGFRA (exons 12, 14, 18), as well as CT/MRI findings (location, growth pattern, morphology, border, CT plain scan density, and MRI signal), were obtained. CT images, immunohistochemical images, and hematoxylin and eosin images of the patient were also collected.

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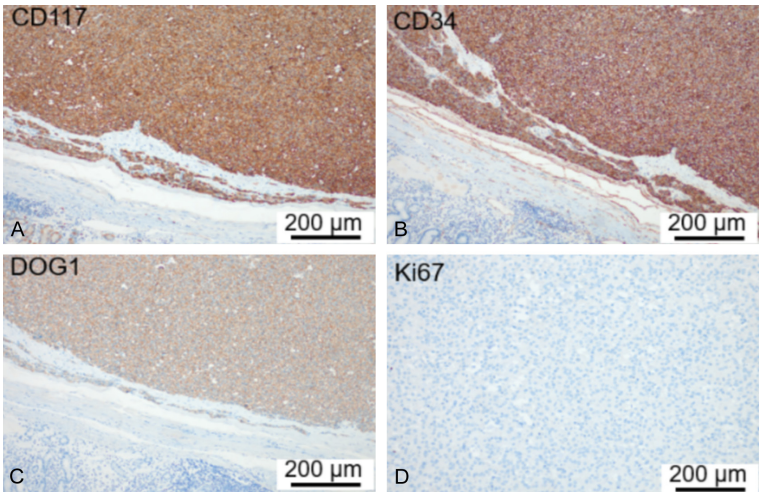

Figure 1. IHC indicator images of the case. The method used was EnVision method.

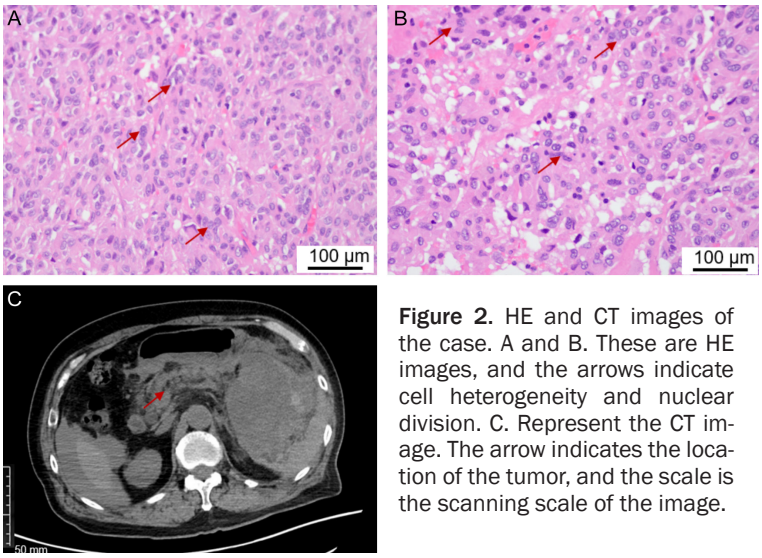

Figure 2. HE and CT images of the case. A and B. These are HE images, and the arrows indicate cell heterogeneity and nuclear division. C. Represent the CT image. The arrow indicates the location of the tumor, and the scale is the scanning scale of the image.

Case presentation

A 70-year-old male with a 40-50 year history of smoking and alcohol use was found to have a gastric mass during a routine physical examination in November 2021. He had no significant past medical history. The patient underwent examinations at Shanghai Xuhui District Dahua Hospital and Shanghai Eighth People's Hospital. This study was reviewed and approved by the Medical Ethics Committee of Shanghai Xuhui District Dahua Hospital (Ethics Approval Number: 2025-03-01).

The tumor was located in the submucosa and muscular layer. According to the Armed Forces Institute of Pathology (AFIP) criteria, it was classified as high-risk, with a tumor diameter of 7 cm and a mitotic count of 8/50 high-power fields. Immunohistochemistry showed CD117 (+++), CD34 (+++), DOG1 (+), and a Ki-67 index of <10% (**Figure 1**). Gene mutation analysis revealed a c-kit exon 11 mutation (c.1676T>A p.Val559Asp), while PDGFRA was wild-type. Serum tumor markers (CA-724, CA-125, CA-199) were within normal ranges.

Histologically, the tumor exhibited marked atypia with solid, sheet-like, or cord-like growth, absence of glandular structures, large hyperchromatic nuclei, loss of polarity, and readily identifiable pathological mitotic figures (**Figure 2A**, **2B**). Invasive growth into the muscular layer was observed.

CT imaging demonstrated a large intramural mass with ill-defined borders, irregular gastric wall thickening, heterogeneous enhancement, calcification, and areas suggestive of hemorrhage and cystic change (**Figure 2C**).

Based on the AFIP high-risk classification and the presence of a c-kit exon 11 mutation, and in accordance with the 2022 ESMO/EURACAN/GENTURIS guidelines [4], the patient received adjuvant imatinib mesylate (400 mg/day) for 36 months after surgery. Regular follow-up with contrast-enhanced CT was performed every 3-6 months for the first three years, and every 6-12 months thereafter. At the 4-year follow-up, the patient remained recurrence- and metastasis-free with good treatment adherence.

Discussion

This report presents a high-risk gastric GIST with comprehensive pathological, immunohistochemical, imaging, and molecular genetic data, along with 4-year follow-up outcomes.

The tumor exhibited classic high-risk features according to the AFIP criteria (size 7 cm, mitotic count 8/50 high-power fields) [5], which correlated with aggressive imaging findings.

The detection of a c-kit exon 11 mutation (c.1676T>A p.Val559Asp) was therapeutically pivotal, as it predicts sensitivity to imatinib [4, 6]. Immunohistochemistry (CD117+, CD34+, DOG1+) further confirmed the diagnosis of GIST. Based on these findings, the patient was recommended to receive adjuvant imatinib (400 mg/day for 36 months) with regular follow-up [7]: contrast-enhanced CT every 3-6 months for the first three years, followed by every 6-12 months thereafter. Although the Ki-67 index (<10%) is not part of the AFIP criteria, it was higher than that typically observed in low-risk lesions (<2%), supporting the high-risk assessment. As of November 2025 (4 years post-surgery), the patient remained recurrence- and metastasis-free with good treatment adherence.

The CT manifestations of this tumor included irregular thickening of the gastric wall, illdefined borders, heterogeneous enhancement, calcification, and areas of cystic change or hemorrhage. Among these, calcification is relatively rare in GISTs. The literature suggests that calcification may be related to slow tumor growth, degeneration, or prior hemorrhage and organization, but it is not an independent high-risk indicator [8]. However, in high-risk GISTs, calcification can occur alongside necrosis or hemorrhage following tissue repair [9]. Cystic change and hemorrhage more directly reflect ischemic necrosis or spontaneous hemorrhage resulting from rapid tumor growth and are closely associated with high-risk biological behavior [10]. Therefore, when obvious cystic change or hemorrhagic foci are detected on preoperative CT, a high index of suspicion for high-risk GIST should be raised, which may aid clinical decision-making.

Several limitations of this case report should be acknowledged. First, as a single-center case, the generalizability of its conclusions is limited. Second, although gene mutation analysis was performed, larger cohort studies are needed to confirm the association between specific mutations and long-term outcomes. Finally, while 4-year follow-up data are presented, longer-term surveillance beyond five years would further strengthen the prognostic assessment. Further studies with larger sample sizes and extended follow-up periods are warranted.

This case fully demonstrates the typical pathological and imaging manifestations of a gastric GIST meeting the AFIP high-risk criteria. The AFIP grading system effectively links diagnosis, risk assessment, and clinical decision-making, highlighting that postoperative adjuvant targeted therapy is an important component of standard management for such patients.

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Disclosure of conflict of interest

None.

Address correspondence to: Xiong Huang, Department of General Surgery, Shanghai Eighth People's Hospital, No. 8, Caobao Road, Xuhui District, Shanghai 200235, China. E-mail: huangxiongmb@hotmail.com

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