Case Report

**CT, MR, and CEUS imaging features of recurrent GIST of the pre-sacral space: A case report**

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**Abstract**

We present the case of a 50-year-old woman affected by a rectal gastrointestinal stromal tumor (GIST), with a recurrence in pre-sacral and pre-coccygeal space after surgery and Imatinib therapy. GISTs are the most common mesenchymal tumors of the gastrointestinal tract and rectal GISTs are rare (only 2% of cases); magnetic resonance and computed tomography are the main imaging techniques for diagnosis and follow-up, while ultrasound and contrast-enhanced ultrasound may be useful to perform a percutaneous biopsy, as in the case presented: the imaging features of the lesion in all these imaging methods are displayed.

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**Introduction**

Gastrointestinal stromal tumors (GISTs) are the most common mesenchymal tumors of the gastrointestinal tract and the organ most frequently involved is the stomach (60%-70%); these lesions arise from the interstitial cells of Cajal, which work as an intestinal pacemaker cell [1].

Computed tomography (CT) and magnetic resonance (MR) of the abdomen and pelvis play a pivotal role in the diagnosis and follow-up. Moreover, imaging is fundamental for the bioplastic sampling, which represents a vital step for the diagnostic and therapeutic management [2,3].

The histologic diagnosis of GIST is performed with immunohistochemistry and electron microscopy, which are able to recognize the presence of staining for tyrosine kinase receptor KIT (CD 117), confirming the presence of the interstitial cells of Cajal [4]. Because of the strong association between GISTs and KIT or PDGFR mutations, there is the possibility to treat these malignancies with biologic targeted therapy, for example, with imatinib mesylate (IM) [5].

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In the 1970s IM therapy was discovered, a selective inhibitor of transmembrane receptor KIT protein tyrosine kinases which inhibits the proliferation of GIST tumor cells that are stimulated by the activation of this receptor [5].

Of all the GISTs, rectal localizations are extremely rare, reported in literature in only 2% of cases, and resection appears curative, with extensive surgery not necessarily required due to the chance of downstaging with IM therapy [6]. However, whereas the appropriate surgical technique is still debated, the importance of a precise imaging follow-up is well established to early diagnose an eventual recurrence and to properly administer the adjuvant therapy [7].

Thus, we present a multi-recurrent rectal GIST located in the pre-sacral/pre-coccygeal space, with an extensive description of CT, MR, ultrasound (US) and contrast-enhanced US (CEUS) imaging features of the recurrent lesion.

**Case presentation**

We describe the case of a 50-year-old woman with a multi-recurrent rectal GIST. In 2000, during a routine gynecological check-up a perineal mass was found. A schwannoma was firstly suspected, but the biopsy established the presence of a rectal GIST, located between the rectum and the vagina, which was surgically removed with a laparoscopic anterior rectal resection (RARR). In 2001, she had a local recurrence and started immunotherapy with Imatinib, with subsequent progressive volume reduction of the mass.

Table 1 – Timetable presenting the different recurrences of the patient.

| Date  | Event                                                                 |
|-------|------------------------------------------------------------------------|
| 2000  | Diagnosis of rectal GIST and subsequent local surgery                  |
| 2001  | First local recurrence treated with Imatinib therapy                   |
| 2003  | Tumoral excision complicated by recto-vaginal fistula                  |
| 2005  | Closure of recto-vaginal fistula                                        |
| 2008  | New Imatinib administration for local recurrence                       |
| 2020  | MR showing expansive solid mass in pre-coccygeal region                |
| 2021  | Re-biopsy of the mass                                                  |

In 2003, the patient underwent a new surgery to remove the local recurrence, complicated by a recto-vaginal fistula. The fistula was surgically treated in 2005, and thereafter started a regular follow-up, without evidence of recurrences for 3 years, until 2008, when due to the evidence of a new local recurrence, she was administered a new cycle of IM.

After several years, a new follow-up MR exam performed at the end of 2020 (Table 1) showed the presence of a new richly vascularized solid mass located in the pre-coccygeal region expanding in the fat tissue of the ischio-rectal fossae with confluent grape-shaped nodules (Fig. 1). The recurrence was treated with IM and a new MR exam performed 6 months later showed the progression of the disease, with volumetric increase of the lesion (mean diameter of 4.5 cm vs 3.9 cm) (Fig. 2).

On March 2022 the Patient was referred to our Interventional Radiology department to perform a reassessment

![Fig. 1 – MR exam performed in 2020, showing a multi-loculated heterogeneous mass with a solid component (thin arrow) hypointense both on T2 (A, D) and on T1 (B), isointense on T1 fat-sat (C), hyperintense on contrast-enhanced T1 fat-sat (E, F); note the cystic component showed by the arrow, with a liquid level, markedly hyperintense on T2 (A, D). Axial TSE T2w (A), axial SE T1w (B), axial vibe T1 (C), sagittal TSE T2w (D), sagittal contrast-enhanced T1 vibe (E), and axial contrast-enhanced T1 vibe (F).](image)
In the Discussion section, it confirmed different logical order of hyperintense and hypointense on contrast-enhanced T1 (G); also in this case there is a cystic component showed by the arrow, with a liquid level, markedly hyperintense in T2 (A, E).

Sagittal TSE T2w (A), axial STIR (B), axial DWI b1000 (C), axial ADC map (D), coronal TSE T2w (E), axial SE T1w (F), and axial contrast-enhanced T1 vire (G).

CEUS-guided biopsy, with subsequent molecular studies, in order to evaluate the possibility to start a new targeted biological therapy and to properly differentiate the presence of a different mesenchymal tumor. The pathological examination confirmed GIST histology, with positivity for CD117, DOG1 and CD34 and negativity for SMA and desmin. Molecular exams showed PD-L1 negative, PDGFRA negative and positive mutation of exon 11 of c-kit.

**Discussion**

As above-mentioned, imaging plays a pivotal role in the diagnosis and follow-up of primitive GISTs.

US is not routinely performed for GISTs; however, in our case, we decided to use CEUS as an aid to perform the biopsy. In a recent work, Wronska et al. showed that GIST has 3 main patterns of presentation on US [8]:

- a homogeneously solid mass with low aggressiveness (most common);
- a heterogeneous solid mass, with central necrosis and hemorrhage, usually associated with higher mitosis rate and higher aggressiveness;
- a heterogeneously solid mass with irregular patchy hypoechoic or anechoic areas, also due to necrosis, associated to greater aggressiveness.

The case presented, as seen in the Fig. 3, corresponds to the second pattern described; performing a CEUS-guided biopsy ensure to avoid the necrotic portion of the lesion, with higher accuracy of the histologic sampling.

Typical GISTs CT imaging features consist in the presence of a large, hyper vascular, enhancing mass, often with heterogeneous enhancement due to necrotic and hemorrhagic areas, sometimes directly invading surrounding structures [3]. The unenhanced CT scan performed in 2001 [Fig. 4] showed a heterogeneous mass located in pre-sacral and pre-coccygeal space, with polylobate contours and small calcifications.

Besides, MR is an excellent exam to better characterize the GIST mass composition: it may help to distinguish the presence of hemorrhagic areas, necrosis, or cystic degeneration. Classically, the solid components of the tumor are typically hypointense on T1w, hypo/iso-intense on T2w, and show enhancement after contrast administration [2].

The presence of intra-tumoral cystic areas and solid components with restricted diffusion are predictors of high malignant potential [7]. As seen in the Figs. 1 and 2, the mass was multi-loculated with cystic, necrotic, and solid components, demonstrating the typical features of a locally aggressive malignant tumor, as confirmed by the patient’s history.

Local recurrence tends to have similar imaging features to the primitive tumor, usually presenting as an area of thickening with contrast enhancement, adjacent to the bed of the previous surgical excision.

The behavior of GISTs is mostly driven by mutations in the KIT or PDGFRA genes: Yu et al. [9] observed that KIT mutations have an impact on the recurrence rate after surgery and chemotherapy resistance in GISTs, in particular they demonstrated that exons 13, 17, 9, and in particular exon 11 are associated with a higher recurrence rate and chemotherapy resistance. Our patient had an exon 11 mutation, thus...
Fig. 3 – US and contrast-enhanced US (CEUS) performed from left para-coccigeal scan showing a solid hypoechoic mass with a central hypoechoic area (necrosis), with reduced uptake of contrast media (arrow).

Fig. 4 – Unenhanced axial (A) and sagittal (B) CT scan performed in 2001 showing a well-defined exophytic-growth mass (arrows) located in pre-sacral and pre-coccygeal space.

explaining the resistance to chemotherapy and the high recurrence rate.

As in the case presented, most of primary rectal GISTs are typically managed with surgical resection as the first therapeutic option. In 2008 Hamada et al. [10] reported a case series of recurrent rectal GIST in Japan (33 patients) and concluded that the administration of IM before surgery not only allows a greater chance of complete excision of the tumor with negative margins, but it also reduces post-operative recurrences. Some of the cases reported were also GISTs with multiple cases of recurrence (recurrence rate up to 3), similar to our case.

Even though being still limited, the available data suggest that only 10%-20% of patients with rectal GISTs are completely cured with resection, and moreover, that recurrence represent a potential risk for up to 15 years, as in the case we presented, highlighting the importance of prolonged follow-up.

Lee et al. [11] reported the case of a 54-year-old woman with a GIST located to the rectovaginal septum: the authors considered that in this localization, it is quite difficult to discern the organ of origin between the rectum, the rectovaginal septum or the vagina. Several cases of EGIST are reported in literature, with different location, such as the retroperitoneal space [12], but also the prostate [13] and the pancreas [14]. The recurrence site in our case was the pre-sacral and pre-coccygeal space: EGISTs typically do not arise from the GI tract; however, they histologically and immuno-histochemically resemble their GI counterparts.

Hence, it is difficult to properly classify these tumors as GISTs or extra-GISTs (EGISTs) and further studies are
necessary to evaluate imaging, molecular and eventual prognosis differences between GISTs and EGISTs [11].

To our knowledge, this is one of the first cases of pre-sacral and pre-coccygeal location of GIST recurrence with extensive imaging features in different modalities described.

Conclusion

Rectal GISTs are very rare: a case of multi-recurrent rectal GIST on pre-sacral and pre-coccygeal location is reported, with CT, MR and CEUS imaging features described. More studies are needed to understand the differences between GIST and EGIST about histology, prognosis, treatment, and imaging features.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent for publication

Consent for publication was obtained for every individual person’s data included in the study.

Patient consent

Informed consent was obtained from all individual participants included in the study.

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