CLINICAL CASE - TEST YOURSELF Abdominal Imaging

Loss of consciousness and melaena in a 76-year-old male

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PART A

A 76-year-old male presented to the emergency department because of loss of consciousness twice during the previous 24 hours. He described having precursor symptoms of dizziness, blurred vision and sweating. Physical examination demonstrated a significant decline of his systolic blood pressure in the upright position (20 mm Hg) and signs of melaena with concomitant weakness. Laboratory findings revealed normocytic anaemia. The patient appeared haemodynamically stable upon arrival, while during his stay in the emergency room he experienced sudden hypotension (60/40 mm Hg) and tachycardia. Computed Tomography Angiography (CTA) and endoscopic examination were performed in an acute setting **(Figs. 1-5)**, followed by surgery.

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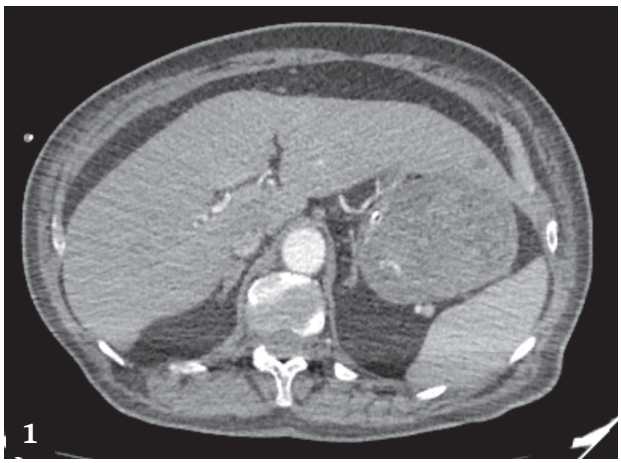
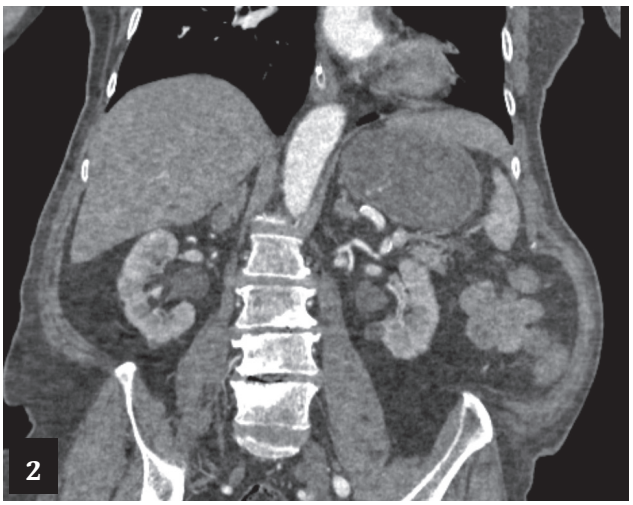
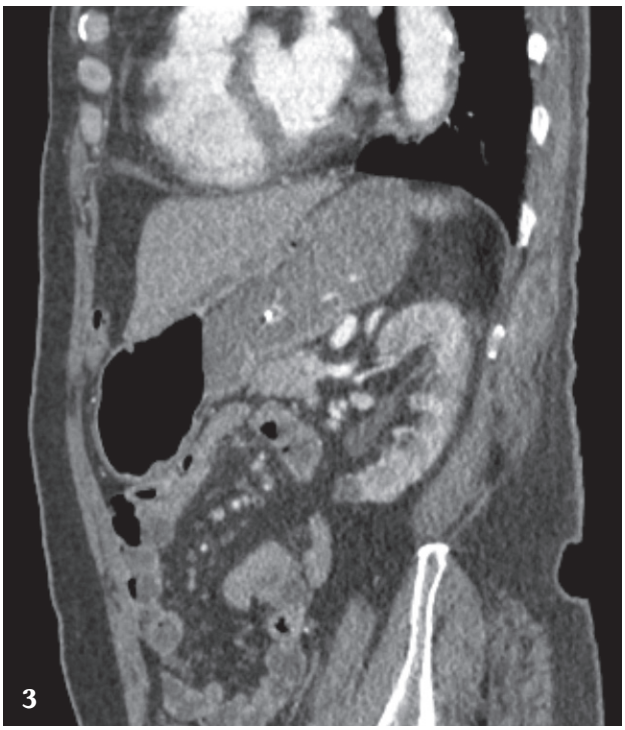






Figs. 1-3. *CTA: Axial (1), coronal (2) and sagittal (3) images with MIP reconstruction in the arterial phase.*

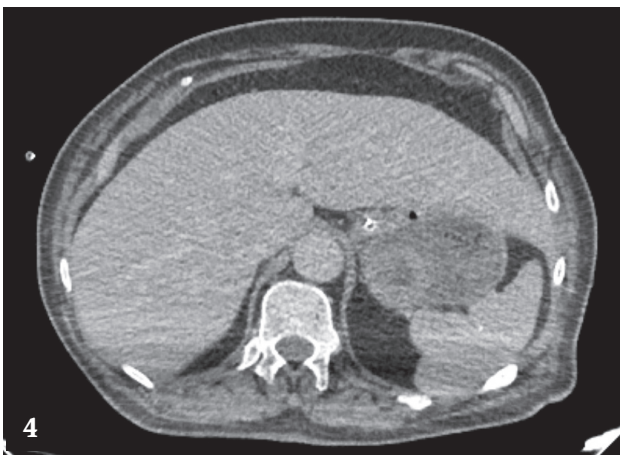


Fig. 4. *CTA: Axial image in the portal venous phase.*

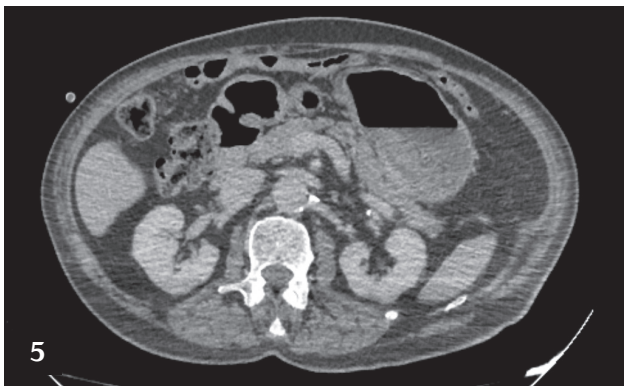


Fig. 5. *CTA: Axial image in the portal venous phase.*

PART B

Diagnosis: Gastrointestinal stromal tumour (GIST) complicated by active bleeding

GISTs constitute a relatively rare pathology, representing up to 1% of all gastrointestinal neoplasms and almost 5% of sarcomas [1]. Furthermore, they account for the majority (80%) of mesenchymal tumours in the digestive tract [1]. While initially described as smooth muscle tumours, GISTs have been recognised in recent literature to originate from precursor cells of Cajal [2]. Histologically, they consist of spindle cells and plump epithelioid cells. Immunoreactivity for c-KIT, a growth factor receptor tyrosine kinase appearing on stem/mast cells and the myenteric plexus of the gastrointestinal tract in adults, is characteristic of the vast majority of GISTs. This discovery is a key factor in recent advances of targeted pharmaceutical therapy [2].

GISTs are divided into sporadic and familial types, the former being the most common [3]. They usually affect the elderly, the average age being 60-year-old [2]. When diagnosed in younger patients, they are associated with non-familial conditions such as Carney triad (extra-adrenal paraganglioma, gastric GIST, pulmonary chondroma) or type I neurofibromatosis (affecting predominantly the small bowel, without KIT mutations) [2, 3]. They may be benign or malignant (up to 30%) depending on their mitotic activity [2].

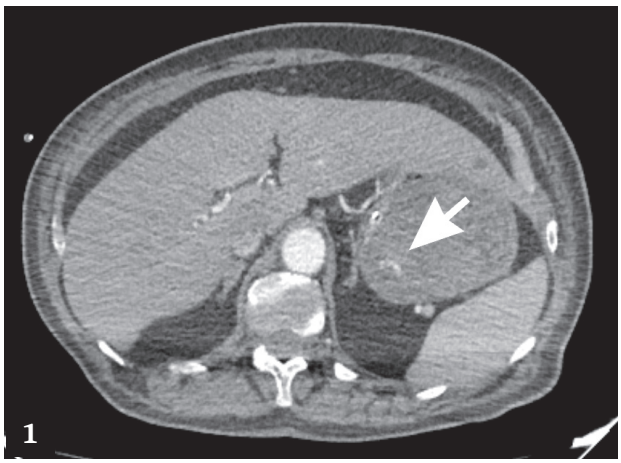
GISTs can be encountered anywhere in the alimentary canal, from the oesophagus to the colon, but are most commonly found in the stomach (60%) whereas mesentery, omentum, urinary bladder and retroperitoneum are other rare locations (extra-gastrointestinal GISTs) [3]. They typically arise from the submucosal or deep muscularis layer of the gastric wall, usually leaving the overlying mucosa intact. They can grow in three patterns: towards the gastrointestinal lumen (current patient case), as an exophytic mass or in a mixed type (dumbbell-like), with their size varying from small intramural tumours to large masses, usually demonstrating areas of haemorrhage or necrosis [4].

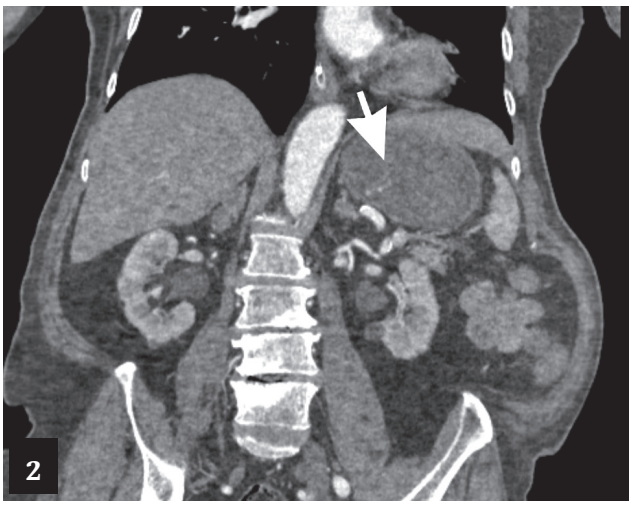
Clinical presentation differs, depending on their size and site [4]. In 20% of cases, GISTs may be asymptomatic and discovered incidentally or have atypical symptoms (abdominal pain, dyspepsia, etc.) [5]. When ulcerated, they usually reveal symptoms and signs of gastrointestinal bleeding (with an incidence of 30-40%) ranging from haematemesis, melaena, iron-deficiency anaemia on chronic presentation [2] to emergency situations, such as bowel obstruction, perforation, rupture [6] or even life-threatening acute blood loss [5, 7]. Metastases can be visible by the time of diagnosis, often located in the liver and peritoneum. Lymph node, lung or bone metastases are relatively uncommon. Follow-up is recommended, as metastases could appear 10-15 years after the first operation [3].

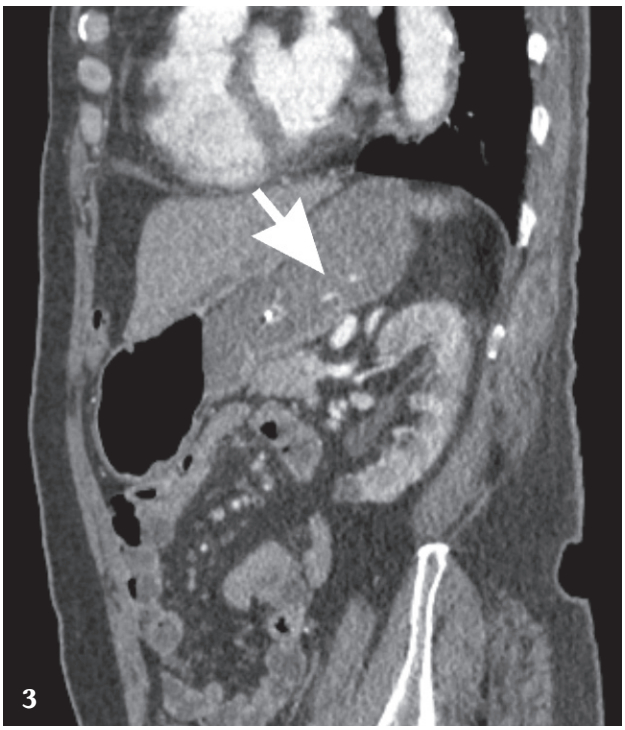
Various diagnostic methods are available. On fluoroscopic double contrast barium studies, smooth mucosal surface is delineated and a mass, forming obtuse angles with the gastrointestinal wall, can be demonstrated, while ulceration or cavitation may be accompanying features [4].

To demonstrate the characteristics of the lesion, its growing pattern, possible invasion of adjacent structures and to perform staging, CT is the most widely used imaging method [2]. CT is performed preferably with negative oral contrast media, water or low-concentration barium sulfate, in order to render the mucosa's enhancement distinguishable. The pattern of enhancement may be homogeneous to heterogeneous, with or without ulceration. GIST typically appears as a soft-tissue mass with peripheral enhancement and central hypodense area due to necrosis, as in the present patient case. These imaging characteristics were also the key criteria that brought GIST to the forefront of our differential diagnosis. Intramural lesions can only be distinguished as gastrointestinal wall thickening [4]. Ulcers are often found in lesions larger than

KEY WORDS
Gastrointestinal stromal tumour; Tomography, x-ray computed; Gastrointestinal Haemorrhage







Figs. 1-3. *CTA: Axial (1), coronal (2) and sagittal (3) images with MIP reconstruction in the arterial phase. At least two different linear arterial "jets" (arrows) are observed in the gastric lumen indicating active bleeding.*

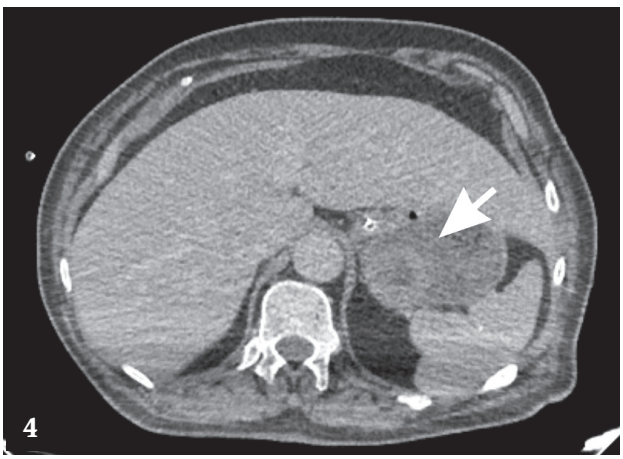


Fig. 4. *CTA: Axial image in the portal venous phase demonstrates an almost spherical mass, with peripheral enhancement and a hypodense center, attributed to central necrosis (arrow), as is typically the case with GISTs.*

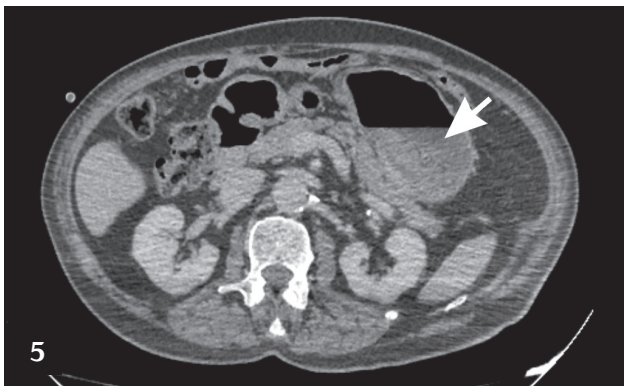


Fig. 5. *CTA: Axial image in the portal venous phase. In the lower part of the gastric body, sedimentation of hyperattenuating material (arrow) due to blood products is shown.*

2 cm. Sometimes a fluid-fluid level is visible. Haemorrhagic elements and necrosis or cystic components are common findings, while calcifications are rare. When acute gastrointestinal bleeding is clinically implied, CTA without the use of any oral contrast agent can demonstrate possible extravasations, provided that the rate of bleeding is between 0.3-0.5 ml/min. A multiphasic study is suggested including unenhanced, arterial and portal venous phases [8], which was also our CT protocol. In our case, since upper gastrointestinal bleeding was suspected, the CTA protocol did not include the use of oral contrast media. This enabled us to identify intraluminal extravasation in the arterial phase and further pooling of the contrast media in the portal venous phase of enhancement.

Endoscopy is a necessary initial diagnostic tool, especially for detecting possible areas of bleeding, as well as providing the means for fine needle aspiration. It is useful to detect varicose veins and exclude this cause of bleeding [3]. In our case, acute endoscopy confirmed bleeding, and biopsy specimens for histological examination were obtained.

Endoscopic Ultrasound provides data about location and expansion of the lesion. MR Imaging can help in the characterisation of a GIST, delineating its cystic degeneration and necrosis as hyperintensity in T2 weighted sequences and detecting acute or recurrent haemorrhagic areas. PET-CT is also a valuable method, as it enables to evaluate the metabolic activity of the tumour and possible metastatic disease, both for diagnosis and follow-up stage [2].

GISTs need to be differentiated from other submucosal, intramural masses of the gastrointestinal tract, such as schwannomas, leiomyomas, leiomyosarcomas and haemangiomas. Morphologic criteria, such as margin and location, in combination with growing pattern and enhancement are helpful. Schwannomas and leiomyomas may also appear as well-defined, rounded, mural masses and be complicated by ulceration, although they typically present homogeneous attenuation and tend to lack cystic changes. Leiomyosarcomas are rare pathologies, usually with a larger exophytic component and ill-defined margins. For ulcerated bull's eye lesions in the stomach, deposits from melanoma or breast cancer must also be excluded. As opposed to GISTs, these lesions demonstrate enhancement in the arterial phase and are rarely solitary. Carcinoid, lymphoma and adenocarcinoma may also mimic GISTs, although they arise from the mucosal layer and are usually combined with coeliac lymphadenopathy [4]. Carcinoid is typically a hyperenhancing lesion with multiple metastases and usually provokes desmoplastic reaction of the mesentery. Unlike GIST, gastric lymphoma is associated with large lymph nodes, often extending infrarenally. Adenocarcinoma on the other hand is more likely to cause gastric outlet obstruction. In addition, both of the latter may acquire a linitis plastica appearance, quite atypical for GISTs [4].

In the management of GISTs, surgery remains the "gold standard" approach. Segmental gastric resection is the preferred technique for the excision of the mass and was performed in our patient. Systemic lymphadenectomy is not generally required. When complicated by acute bleeding, as in our case, the operation must be performed on an emergency basis [6].

Imatinib mesylate is a promising therapeutic alternative for patients with unresectable tumours. It has also been used preoperatively in order to decrease the lesion's size and postoperatively to avoid recurrence or progression of the disease. This targeted therapy shows good response and better outcome in terms of survival. Minimally invasive techniques, such as radiofrequency ablation and embolisation, have also been proposed for the management of metastatic liver disease [2].

Prognosis depends on the mitotic rate, size and site of the lesion. Location in the stomach and size smaller than 2 cm are positive prognostic factors [9]. It is reported that haemorrhage of the digestive tract affects prognosis by increasing the possibility of metastases [10].

It is highly recommended that patients with GISTs, even if proven benign, undergo intensive follow-up, due to the tendency of the lesions to recur. CT scan is usually performed every 3-6 months for the first few years [2]. R

Conflict of interest

The authors declared no conflicts of interest.

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