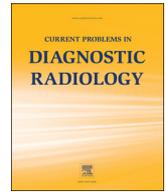




Current Problems in Diagnostic Radiology

journal homepage: www.cpdjournal.com



Gastrointestinal Stromal Tumor of the Jejunum With Active Bleeding Demonstrated on Dual-Energy MDCT Angiography: A Case Report



Abdul Razik, MD^a, Kumble S. Madhusudhan, MD, FRCR^{a,*}, Abhishek Aggarwal, MS^b, Rajesh Panwar, MS, MCh^b, Deep N. Srivastava, MD^a

^a Department of Radio-diagnosis, All India Institute of Medical Sciences, Ansari Nagar, New Delhi, India

^b Department of Gastrointestinal Surgery and Liver Transplantation, All India Institute of Medical Sciences, Ansari Nagar, New Delhi, India

Gastrointestinal stromal tumor (GIST) is the most common mesenchymal tumor of the gastrointestinal tract and may occasionally present with acute gastrointestinal bleed (GIB). Multidetector computed tomography (MDCT) angiography is extremely useful in demonstrating the tumor as well as the presence of active hemorrhage, thereby guiding subsequent interventional or surgical management. We report a case of a 38-year-old man who presented with acute-onset melena and compensated shock, whose source of bleed remained elusive on endoscopy. MDCT angiography performed on a dual-energy scanner showed a jejunal tumor with active intraluminal contrast extravasation. The tumor was subsequently resected and the patient did well on follow-up. This was one of the few instances when MDCT angiography demonstrated active bleeding in a GIST and the first such case demonstrated on a dual-energy scanner.

© 2019 Elsevier Inc. All rights reserved.

Introduction

Gastrointestinal stromal tumor (GIST) is the most common mesenchymal tumor of the gastrointestinal tract. The stomach (30%) is the most commonly involved site, followed by small intestine (20–30%).¹ Most cases present in the sixth or seventh decade of life with chronic gastrointestinal bleeding (GIB) being the most common symptom. Occasionally, the bleeding may be acute and life-threatening, necessitating prompt, protocol-based evaluation to identify the source of bleed and initiate appropriate therapy.² Most centers use endoscopy as the first modality to evaluate the acute GIB and direct interventions once the source is identified. If the source cannot be identified on endoscopy, multidetector CT (MDCT) angiography is resorted to which gives additional information regarding the cause of bleed, thereby helping guide appropriate vascular intervention or surgery.³ Utilization of dual-energy CT helps reduce the radiation dose as the noncontrast scan otherwise used to differentiate blood and contrast can be avoided.⁴ Iodine only and low kilo-voltage peak (kVp) monochromatic images help identify even subtle contrast extravasation, and enhanced bone subtraction helps generate better 3D reconstructed images. We report a case of jejunal GIST in a patient who presented with acute GIB and compensated shock. Multidetector computed tomography (MDCT) demonstrated active contrast extravasation, a finding that has rarely been documented previously and never before on dual-energy CT.

Case Report

A 38-year-old man presented to the emergency department of our hospital with complaints of acute-onset passage of large volume black tarry stools and progressive dizziness over the past 2 days. There was no associated fever, pain on defecation, vomiting, abdominal distension, or recent onset loss of weight and appetite. He gave history of a similar milder episode 2 years back which subsided spontaneously without requiring admission or blood transfusion and hence went unevaluated. There was no history of drug intake or comorbidities such as acid peptic disease, chronic liver disease, bleeding diathesis, and prior malignancies. On physical examination, he was pale with tachycardia (pulse rate of 110/minute). The blood pressure was low normal (100/90 mm Hg). Abdominal and rectal examinations were normal. Hematologic evaluation showed marked anemia (hemoglobin of 5.8 g/dL) with normocytic normochromic picture. After initial resuscitation with intravenous fluids and 5 units of packed red blood cells (PRBC), the patient underwent endoscopy. Both, upper gastrointestinal endoscopy and colonoscopy failed to identify the source of bleed. Subsequently, MDCT of the abdomen was performed on a-128 slice second-generation dual-source dual-energy scanner (SOMATOM Definition Flash, Siemens Healthcare, Forchheim, Germany) in arterial and venous phases with delay of 20 and 50 seconds, respectively, from the time of injection. Dual-energy mode at 100/140 kV with tin filtration was used for the arterial acquisition. No oral contrast was given.

CT scan revealed a heterogeneously enhancing mass of size 4 × 4 cm arising from the antimesenteric border of proximal jejunum, with larger exophytic component and smaller endoluminal component (Fig 1). Areas of necrosis and calcification were present within the mass. There was hyperdense intraluminal

* Reprint requests: Kumble Madhusudhan, Department of Radiology, All India Institute of Medical Sciences, Ansari Nagar, New Delhi, 110029, India.

E-mail address: drmadhuks@gmail.com (K.S. Madhusudhan).

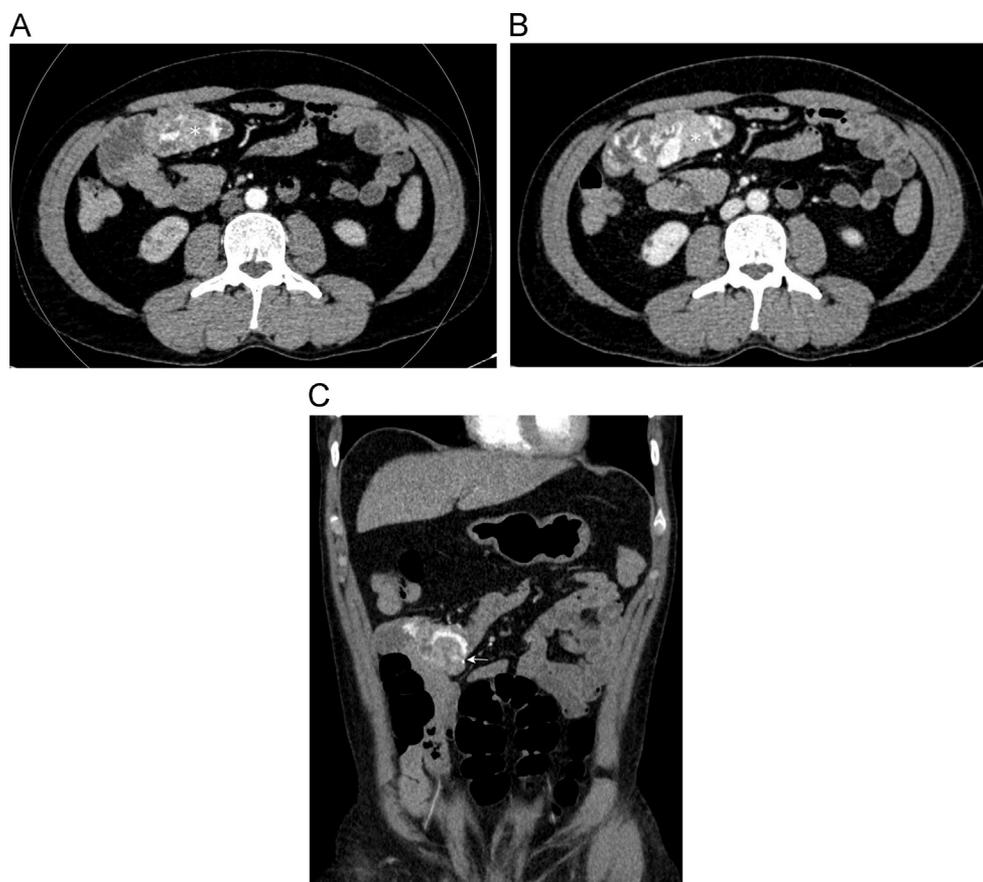


FIG 1. (A) Axial arterial phase image showing the jejunal mass (asterisk) and the associated intraluminal contrast extravasation. (B) Axial and (C) coronal venous phase images better demonstrate the enhancing mass with focus of calcification (arrow). The extent of contrast extravasation has increased in the venous phase compared to the arterial phase.

content suggestive of active intraluminal contrast extravasation from the mass which increased on venous phase images. Analysis of the dual-energy images helped confirm the hyperdense material as contrast material (Fig 2). The distal bowel loops were filled with hyperdense blood clots. There was no hemoperitoneum. A diagnosis of resectable proximal jejunal tumor, likely GIST or neuroendocrine, causing active intraluminal contrast extravasation was made.

At emergency laparotomy, a 4 × 4 cm partially exophytic mass was seen arising from the jejunum, 20 cm from the duodenojejunal flexure (Fig 3A). Small bowel and colon were distended with altered blood. Intraoperative enteroscopy (IOE) confirmed the endoluminal component and active bleed. Short segment bowel resection was done followed by anastomosis.

Gross evaluation of the resected specimen confirmed the tumor as arising from the muscularis propria with larger exophytic component and smaller endoluminal component (Fig 3B and C). On sectioning, areas of congestion and fibrosis were present. The overlying mucosa and submucosa were uninvolved and there was no serosal breach. Histopathologic evaluation of the specimen revealed spindle cells arranged in interlacing fascicles. Mild pleomorphism was present with a mitotic count of 3–4 per high power field (HPF). The findings suggested the diagnosis of gastrointestinal stromal tumor, low-risk category.

The postoperative period was uneventful, and the patient was discharged 6 days later. He is currently doing well on follow-up.

Discussion

GIST presents with a wide range of symptoms, ranging from being asymptomatic to presenting with abdominal bloating, pain,

vomiting, or gastrointestinal bleeding. In a large systematic review of 46 observational studies which included 4,534 patients, Scarpa et al⁵ observed that gastrointestinal bleeding was the most common symptom (30%) in patients with GIST. The mechanism of bleed depends on the aggressiveness of the tumor. Benign tumors cause ischemia or pressure necrosis and secondary erosion of the overlying mucosa, whereas malignant GIST directly invade the mucosa or undergo central necrosis with subsequent communication with the lumen.^{5,6} In rare cases, the tumor can rupture into the peritoneal cavity resulting in massive hemoperitoneum and shock.^{2,7} Majority of the bleeding in GIST is chronic which present as anemia or melena/hematochezia depending on the location of the tumor.⁸

In the setting of acute GIB, endoscopy is the first investigation. If it fails to identify the source of bleed, multiphasic CT scan is done.^{9,10} In a dual-energy scanner, the noncontrast scan can be avoided since virtual noncontrast (VNC) images can be generated, thereby reducing the total radiation exposure.

Although bleeding from GIST is common, active extravasation has seldom been documented on MDCT or digital subtraction angiography (DSA). One possible reason could be the increased use of endoscopy for detection of active bleed and usage of endoscopic interventions once bleeding is observed. Also, GI bleed is often intermittent and can be missed on both endoscopy and imaging. Chen YT et al¹¹ evaluated 25 patients with small bowel GIST who had acute or subacute GIB on DSA, but could not demonstrate active contrast extravasation in any.

Arterial bleeding in cases of GIST is typically seen on endoscopy as intraluminal blood spurt from the ulcerated or ruptured tumor.^{12–14} On MDCT or DSA, it appears as jet-like extravasation

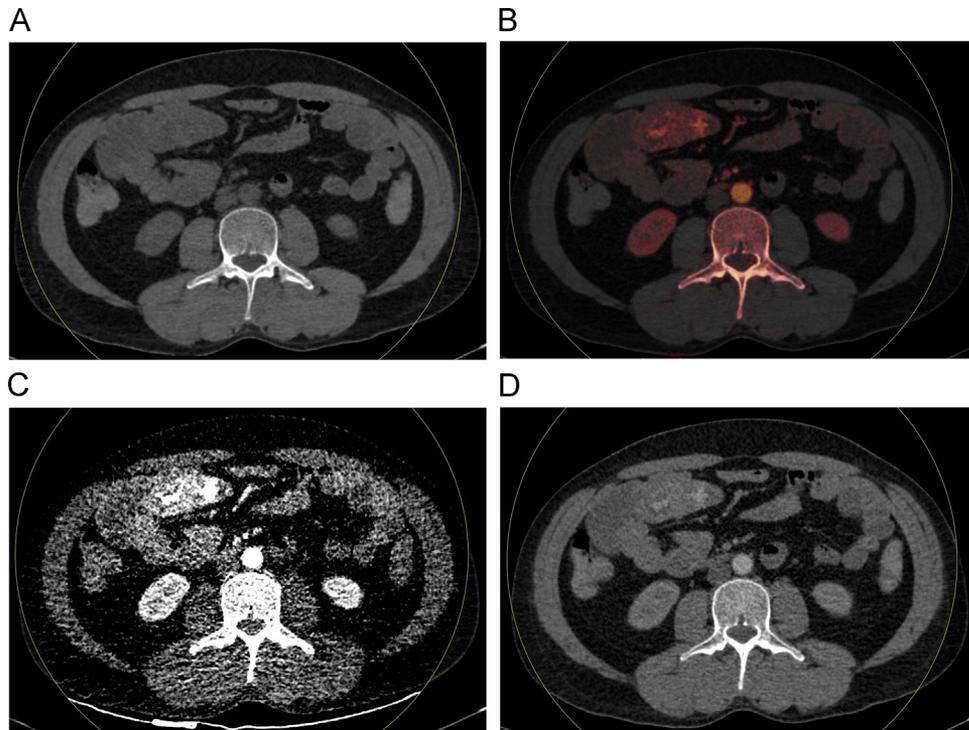


FIG 2. Application of dual-energy CT in confirming the presence of extravasated intraluminal contrast material. On the axial VNC image (A), the intraluminal content is not hyperdense whereas the corresponding iodine overlay image (B; iodine colour coded as orange shade) shows bright intraluminal content consistent with iodinated contrast material. The same is confirmed on the virtual monochromatic images as the intraluminal content shows disproportionately higher attenuation and image contrast at (C) 40 keV than at (D) 100 keV. (Color version of figure is available online.)

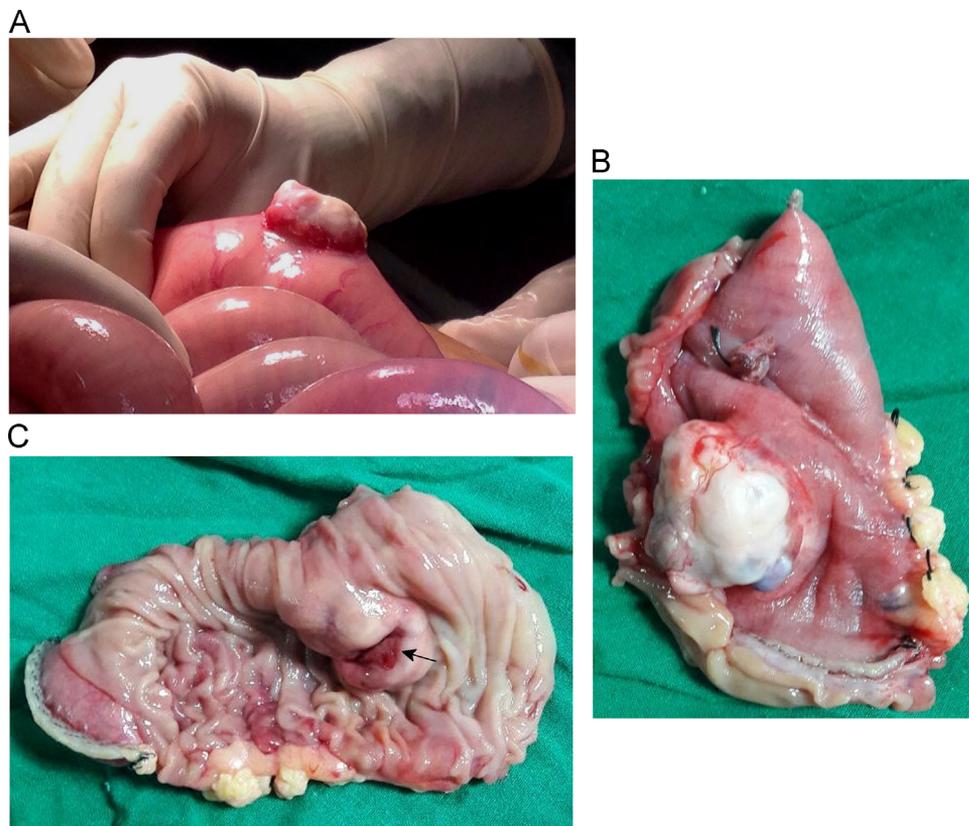


FIG 3. (A) Intraoperative photograph of the involved jejunal loop showing the exophytic component of the mass. Specimen photographs of the (B) serosal and (C) mucosal aspects of the resected segment of jejunum showing the mass as well as the focus of bleed (arrow). (Color version of figure is available online.)

of contrast which increases in density and size with time. Contrast has to be differentiated from clotted blood and this can be done by acquiring a noncontrast images or using dual-energy scanning to generate VNC images.¹⁵ The addition of dual-energy scanning provides iodine only and low kVp monochromatic images, which can help identify even subtle contrast extravasation with higher sensitivity.¹⁶ DSA offers the opportunity for therapeutic embolisation if laparotomy is not immediately planned or available.

To the best of our knowledge, till date, there have been only eight reported cases of GIST which showed arterial bleeding on MDCT angiography.^{7,14,17,18} All but one showed intraluminal contrast extravasation. Ours is the only case which demonstrated active bleeding on a dual-energy scanner. The case appropriately demonstrates the applications of dual-energy CT angiography in acute GIB.

When a bleeding GIST is approachable on endoscopy, endoscopic interventions are the first step in treatment and includes clipping, coagulation (electro, thermo, or laser), banding, or epinephrine injection. However, in a hemodynamically stable patient, if the source of bleeding is not visualized on endoscopy, DSA and transarterial embolization may be attempted.¹⁸ Emergency surgery is reserved only for refractory or life-threatening bleeding as it carries some morbidity and mortality in the emergency setting.¹⁹ In our patient, endoscopy could not identify the lesion, and as the patient was in compensated shock, surgery was performed.

In conclusion, active contrast extravasation, the CT sign of active arterial bleed, is rarely seen in GIST and necessitates urgent management. Application of dual-energy CT helps avoid a non-contrast scan and offers features that enable better interpretation of the images.

References

1. Connolly EM, Gaffney E, Reynolds JV. Gastrointestinal stromal tumours. *Br J Surg* 2003;90(10):1178–86.
2. Sorour MA, Kassem MI, Ghazal AE-HA, El-Riwini MT, Abu Nasr A. Gastrointestinal stromal tumors (GIST) related emergencies. *Int J Surg* 2014;12(4):269–80.
3. Artigas JM, Martí M, Soto JA, et al. Multidetector CT angiography for acute gastrointestinal bleeding: technique and findings. *Radiographics* 2013;33(5):1453–70.
4. Wortman JR, Landman W, Fulwadhva UP, et al. CT angiography for acute gastrointestinal bleeding: what the radiologist needs to know. *Br J Radiol* 2017;20170076.
5. Scarpa M, Bertin M, Ruffolo C, et al. A systematic review on the clinical diagnosis of gastrointestinal stromal tumors. *J Surg Oncol* 2008;98(5):384–92.
6. Atolagbe A, Oloruntobi R, Adeyemi O, et al. Upper gastro-intestinal bleeding in the young—gastric GIST tumor or peptic ulcer disease? *Int J Surg Med* 2015;1(2):72.
7. Bucher P, Poletti P, Myit S, et al. Spontaneous rupture of a gastrointestinal stromal tumour associated with life-threatening nontraumatic hemoperitoneum. *Can J Surg* 2008;51(2):E38–9.
8. Rammohan A, Sathyanesan J, Rajendran K, et al. A gist of gastrointestinal stromal tumors: A review. *World J Gastrointest Oncol* 2013;5(6):102–12.
9. Yoon W, Jeong YY, Shin SS, et al. Acute massive gastrointestinal bleeding: detection and localization with arterial phase multi-detector row helical CT. *Radiology* 2006;239(1):160–7.
10. Gaba S, Aslam M, Iqbal A. A jejunal gastrointestinal stromal tumour: an unusual cause of massive acute gastrointestinal haemorrhage with emphasis on pre intervention MDCT. *J Radiol Case Rep* 2009;3(5):21–4.
11. Chen Y-T, Sun H-L, Luo J-H, et al. Interventional digital subtraction angiography for small bowel gastrointestinal stromal tumors with bleeding. *World J Gastroenterol* 2014;20(47):17955–61.
12. Huang Y-W, Siao F-Y, Yen H-H. Life-threatening bleeding from gastrointestinal stromal tumor: successful embolization with subsequent laparoscopic surgery. *Am J Emerg Med* 2014;32(9):1150.e3–4.
13. Yoshida H, Mamada Y, Taniai N, et al. Spurt bleeding from a calcificated gastrointestinal stromal tumor in the stomach. *J Nippon Med Sch* 2005;72(5):304–7.
14. Shimazaki J, Tabuchi T, Nishida K, et al. Emergency surgery for hemorrhagic shock caused by a gastrointestinal stromal tumor of the ileum: a case report. *Mol Clin Oncol* 2016;5(1):103–6.
15. Willmann JK, Roos JE, Platz A, et al. Multidetector CT: detection of active hemorrhage in patients with blunt abdominal trauma. *Am J Roentgenol* 2002;179(2):437–44.
16. Aran S, Daftari Besheli L, Besheli LD, et al. Applications of dual-energy CT in emergency radiology. *AJR Am J Roentgenol* 2014;202(4):W314–24.
17. Yuval JB, Almogy G, Doviner V, et al. Diagnostic and therapeutic approach to obscure gastrointestinal bleeding in a patient with a jejunal gastrointestinal stromal tumor: a case report. *BMC Res Notes* 2014;7:695.
18. Koo HJ, Shin JH, Shin S, et al. Efficacy and clinical outcomes of transcatheter arterial embolization for gastrointestinal bleeding from gastrointestinal stromal tumor. *J Vasc Interv Radiol* 2015;26(9):1297–304 [e1].
19. Clarke MG, Bunting D, Smart NJ, et al. The surgical management of acute upper gastrointestinal bleeding: a 12-year experience. *Int J Surg* 2010;8(5):377–80.