Role of CT enterography in obscure gastrointestinal bleeding

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Abstract  Background: Obscure gastrointestinal bleeding is a radiological challenge where in almost half of the patients; the origin of the blood loss remains unexplained.

Aim: To highlight the use of dual phase CT enterography for the detection of obscured gastrointestinal bleed.

Patient and methods: Twenty consecutive patients (11 men and 9 women) with OGIB were included in this study; their age ranged from 28 to 67 years (mean age 45.6 years). CT enterography was performed first with a non-contrast scan, followed by biphasic contrast-enhanced CT at 35 and 70 s at a rate of 4 mL/s.

Results: On CT enterography, 12 patients (60%) were negative while 8 patients (40%) had positive findings as follows: one patient (5%) had celiac disease, 1 patient (5%) had active Crohn’s disease and another patient (5%) had ischemic bowel changes. Five patients (20%) had small bowel neoplasms as follows: (1 patient had ileal angiolipoma, 1 patient had ileal hypervascular GIST, 1 patient had duodenal GIST, 1 patient had duodenal carcinoid and 1 patient had jejunal villous adenoma).

Conclusion: MDCT enterography has a good diagnostic accuracy in the evaluation of patients with OGIB and can reliably indicate the source of GI bleeding and guide subsequent therapy.

1. Introduction

Obscure gastrointestinal bleeding (OGIB) is defined as gastrointestinal bleeding with no source identified at upper and lower endoscopy (1). Despite a thorough endoscopic examination, the origin of the blood loss remains unexplained in up to 52% of patients (1).

Investigation of the small bowel for a bleeding source can be performed by using several modalities. Extended endoscopy may help identify a lesion in about one third of patients but is...
often unable to reach the distal small bowel. Barium small-bowel examinations have traditionally been a mainstay in the evaluation of small-bowel disease but lack sensitivity in the evaluation of OGIB (2–4).

Recently, wireless capsule endoscopy has been effectively used in the evaluation of OGIB. The sensitivity of capsule endoscopy ranges from 42% to 80% for detection of small-bowel lesions that cause gastrointestinal (GI) bleeding (5–11). While highly effective in the evaluation of small-bowel disease, capsule endoscopy has technical limitations (12,13).

Computed tomographic (CT) enterography is a recently developed diagnostic tool for the evaluation of small-bowel disease. This technique uses multi-detector CT combined with luminal distention of the small bowel by using neutral enteric oral contrast material. Image acquisition after intravenous contrast material administration is timed to optimize bowel wall enhancement. The ability to exquisitely depict bowel wall abnormalities, as well as extra-intestinal disease, has made it an important tool in the evaluation of small bowel disease, particularly inflammatory bowel disease (14–17).

The source of OGIB may be attributable to any number of different causes, including missed lesions in the upper and lower GI tract. The age of the patient is an important factor in the differential diagnosis of a small intestinal source of OGIB (18).

Determining the origin of the bleeding source in OGIB is a challenging clinical problem. Approximately 5% of patients presenting with GI bleeding have no source identified at esophago-gastro-duodenoscopy and colonoscopy; most of these patients will have small bowel disease identified (19,20).

Small bowel vascular lesions are the most common cause. The most common pathologic lesions in this group are angiodyplasias, found in 30%–60% of examinations (21). Small

Fig. 1 Celiac disease: A 35 year old male presenting with diarrhea, malabsorption and OGIB. (A) Edematous jejunal loops with blunted mucosal pattern. (B) coronal: Jejunized ileal mucosa, blunted edematous jejunal mucosa, and mesenteric adenopathies.

Fig. 2 Active Crohn’s with SMA thrombus: A 49 year old male presenting with obscure GI bleeding. (A) Active ileal Crohn’s shown as water halo sign, mesenteric fat haze, and comb sign. (B) Coronal view. (C) Sagittal: SMA thrombosis due to hypercoagulability in Crohn’s.
bowel tumors are the next most common small bowel lesion causing OGIB and account for about 5%–10% of cases of small bowel bleeding (22). Other less common causes of bleeding include small bowel ulcers (e.g., Crohn’s disease, use of non-steroidal anti-inflammatory drugs, Meckel diverticulum), vasculitis, small bowel diverticula, aortoenteric fistulas, and caliber-persistent arteries of the stomach (Dieulafoy lesion) (23).

2. Aim of work

To highlight the use of dual phase CT enterography for detection of the cause of bleeding in obscured gastrointestinal bleed.

3. Patients and methods

3.1. Patients

Twenty consecutive patients with OGIB who were referred by gastroenterologists at our institution for clinically indicated dual-phase CT enterography were included in this study. The studied group included 11 men and 9 women with their age ranging from 28 to 67 years (mean age 45.6 years) seen during an 8-month period between April 2011 and January 2012. Informed consent was waived in this study. Still, confidentiality of patients’ records is respected.

3.2. Methods

The equipments used were:

- Toshiba Aquillon 16-MDCT unit; kV/effective mAs/rotation time (s): 120 kV/225 effective mAs/0.5 s; slice thickness of 1 mm (15 patients).
- Toshiba Aquillon 128-MDCT unit kV/effective mAs/rotation time (s): 120 kV/225 effective mAs/0.35 s; slice thickness of 0.5 mm (5 patients).

After a 4-h fast, patients were given a total of 1800 mL of iso-osmotic mannitol divided into four 450-mL oral doses.

Fig. 3  MVO: A 65 year old male with a history of cardiac disease, presenting with obscure GI bleeding. (A) SMA Thrombus. (B) Ischemic small bowel showing water halo sign.

Fig. 4  Bowel angiolipoma: A 47 year old female presenting with abdominal pain and OGIB. (A) Luminal ileal enhancing mass lesion. (B) Secondary intussusception. (C) Coronal.
given every 20 min, beginning 60 min prior to scanning. The last dose was administered with the patient on the CT table just prior to scanning. Anti spasmodic (visceralgine or Buscopan) (0.5 mg) was administered intravenously just before intravenous contrast material injection to maximize bowel distention and minimize bowel motion artifact.

The CT examination was performed first, with a non contrast scan of the abdomen, followed by a biphasic contrast-enhanced CT at 35 and 70 after an injection of 120 mL of nonionic contrast medium (350 mg I/mL) given at the antecubital vein at a rate of 4 mL/s, to catch the late arterial and portal venous phases respectively.

The data acquired were transferred to a workstation (Vitrea or Osirix software) for multiplanar reconstruction.

4. Results

The main presenting symptoms were abdominal pain, diarrhea and anemia.

All patients were suffering from obscure GIT bleeding either melena, bleeding per-rectum or occult blood in the stool with negative upper and lower GIT endoscopy.

On the performed dual phase MDCT enterography, 12 patients (60%) were negative while 8 patients (40%) had positive findings.

Among the eight patients with positive findings, one patient had celiac disease expressed as blunted edematous jejunal mucosa, jejunized ileal mucosa and mesenteric adenopathies (Fig. 1).

One patient (5%) had inflammatory bowel disease (active Crohn’s disease), involving a distal ileal loop not reaching the ileo-cecal junction (so it was not visible on colonoscopy), shown as mural thickening with mucosal hyper-enhancement and sub-mucosal edema giving water halo sign, associated with mesenteric fat haze, and comb sign. This was associated with SMA thrombosis that was attributed to hypercoagulability in Crohn’s (Fig. 2).

One patient (5%) had ischemic bowel changes with water halo sign at an ileal loop in the right iliac fossa with occluded SMA (Fig. 3).

Five patients (20%) had small bowel neoplasms as follows:

- One patient had ileal angiolipoma shown as intra-luminal ileal enhancing mass lesion with secondary intussusception (Fig. 4).
- One patient had ileal hypervascular GIST expressed as arterially enhancing mass lesion related to the ileal loops at the right iliac fossa with enhancing vascular pedicle (Fig. 5).
- One patient had duodenal GIST shown as enhancing lesion at the third part of the duodenum.
- One patient had duodenal carcinoid expressed as heterogeneously enhancing lesion at the third part of duodenum that showed central necrosis and was associated with desmoplastic reaction at the related mesentery with engorged mesenteric vessels.

**Fig. 5** Hypervascular GIST: A 44 year old female presenting with obscure GI bleeding. (A) This case highlights the hypervascular nature of a GIST, shown as arterially enhancing mass lesion related to the ileal loops at the right iliac fossa. (B) A vascular pedicle is seen.

**Fig. 6** Jejunal villous adenoma: A 42 year old male presenting with obscure GI bleeding. (A) Enhancing polypoidal lesion within the lumen of the proximal jejunum. (B) coronal.
5. Discussion

The role of CT in the diagnosis of causes of gastrointestinal bleeding continues to grow because of improvements in scanning technology and favorable diagnostic outcomes in many articles (24–28). Several studies, however, vary with the type of scanning performed, that is single phase (3), dual phase (4,29,30), or triple phase (2).

Our study focused on the use of dual phase CT enterography for the detection of an obscure gastrointestinal bleed.

We included twenty patients with OGIB in the current study, 11 men and 9 women with the age range of 28–67 years (mean age = 45.6 years). The main presenting symptoms were abdominal pain, diarrhea and anemia.

All patients were suffering from obscure GIT bleeding either melena, bleeding per-rectum or occult blood in the stool with negative upper and lower GIT endoscopy.

Eight patients (40%) had positive findings on CT enterography while 12 patients (60%) were falsely negative.

In agreement with our results, Jain et al. (30) evaluated 21 patients with OGIB by 4 and 16-section biphasic CT enterolysis. Potential causes of GI bleeding were identified in 10 of 21 patients (47.6%).

Huprich et al. (31) studied 28 patients with OGIB using 64-section triphasic CT enterography. They showed positive findings in 10 of 22 patients (45%).

Zhang et al. (32) compared capsule endoscopy (CE) and 16-section biphasic (arterial and 60 s delayed phases) CT enterography in 123 patients (mean age 54.88 years, age range of 17–87 years) with overt OGIB. The positive rate of detection was 30.08% for MDCT enterography and 57.72% for CE. Moreover, the positive rate for the combined examinations was 65.86% (81/123).

Hara et al. (33) reported on 48 patients with OGIB who had undergone 16-section or 64-section triphasic CT enterography. The overall sensitivity and specificity of MDCT enterography were 33% and 89%, respectively. The most common missed lesions were ulcers and vascular lesions.

Lee et al. (34) examined 65 patients with OGIB using 16-section biphasic (arterial and 72 s delayed phases) CT enterography, which allowed identification of potential sources of bleeding in 16 patients (24%).

In a recent report, Huprich et al. (35) described their experience in 58 patients (mean age 65 years, age range of 23–86 years) with OGIB. The sensitivity of 64-section or 128-section triphasic CT enterography was significantly better than that of CE (88% vs. 38%, respectively, P = 0.008), as it depicted more small bowel masses (100% vs. 33%, respectively, P = 0.03).

6. Conclusion

MDCT enterography has a good diagnostic accuracy in the evaluation of patients with OGIB and can reliably indicate the source of GI bleeding and guide subsequent therapy. Negative MDCT enterography results cannot reliably exclude the presence of clinically relevant small bowel lesions as MDCT diagnosis of superficial ulcers or erosions and vascular abnormalities remain challenging.

References