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THE CRITICAL ROLE OF CT ANGIOGRAPHY IN THE DETECTION AND THERAPY OF LOWER GASTRO-INTESTINAL BLEEDING

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Lower gastro-intestinal bleeding (LGIB) is defined as a bleeding site localised in the colon or anorectum. (1) In the past, the diagnosis of LGIB has been a serious challenge for the radiology department because of its possible intermittent character, making it difficult to pinpoint the bleeding site. Patients with a LGIB will typically have undergone a long diagnostic work-up before they end up on the interventional radiology department.
The development of multi-detector computed tomography (CT) has made radiological diagnosis of LGIB easier. CT is not only able to localize the active bleeding site but may also demonstrate the vascular anatomy and the underlying cause, hereby directing further management and guiding therapeutic interventions, as will be illustrated in both of our cases.

Key-word: Intestines, hemorrhage.

Case reports

Patients and initial management

Our first case is a 75-year old male with an important cardiac history (chronic atrial fibrillation with preventive subcutaneous low molecular weight heparin (LMWH) injections and right heart failure) who was directed to the emergency department by his general physician because of massive hematochezia. Clinical evaluation showed a non-tender abdomen with a drop in blood pressure two hours after admission (blood pressure 73/46 mmHg). Blood tests confirmed the presence of LMWH as the activated partial thromboplastin time (aPTT) was prolonged (41.2 sec; 25.6-36.8 sec) and the international normalized ratio (INR) had a normal value of 1.48. A total of 6 units of packed cells were administered. The approach of this acute LGIB started with a colonoscopy that revealed blood in the rectum and sigmoid but more proximal insertion of the endoscope was impossible. The esophagogastroduodenoscopy (EGD) did not show any bleeding site. Since endoscopic evaluation was not able to localize the bleeding site and the bleeding did not stop spontaneously, a computed tomography angiography (CTA) was requested.

In our second case a female patient of 64 years old presented with a post-polypectomy bleeding in the distal third of the sigmoid. Endoscopic coagulation and clipping stopped the bleeding but one hour later the patient presented with a re-bleeding that could not be stopped endoscopically. Although the bleeding site was known from the endoscopic evaluation the radiologist first wanted a CTA to get a look at the vascular anatomy.

Protocols

The patients were scanned using a 64-slice Aquilion scanner of Toshiba (Toshiba medical systems Europe, Zoetermeer, Netherlands). No special patient preparation was demanded other than intravenous placement of an 18 gauge catheter. Pre-contrast abdominal CT scan was performed prior to intravenous contrast administration to exclude possible preexisting radiodensities in the bowel lumen. 100 ml of a non-ionic contrast agent (Xenetix©, Lobitridol 350 mg/ml, Guerbet, Roissy Charles de

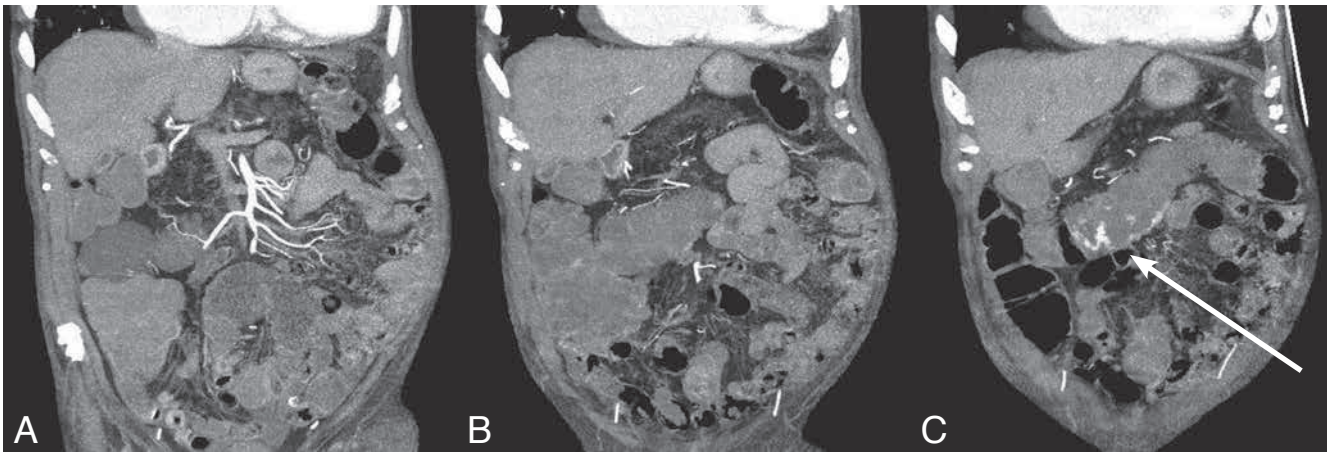

Fig. 1. — Coronal reconstructed maximum intensity projections of CTA images in arterial phase demonstrate the intraluminal contrast agent (arrow) due to bleeding from the medial colic artery, originating from the superior mesenteric artery.

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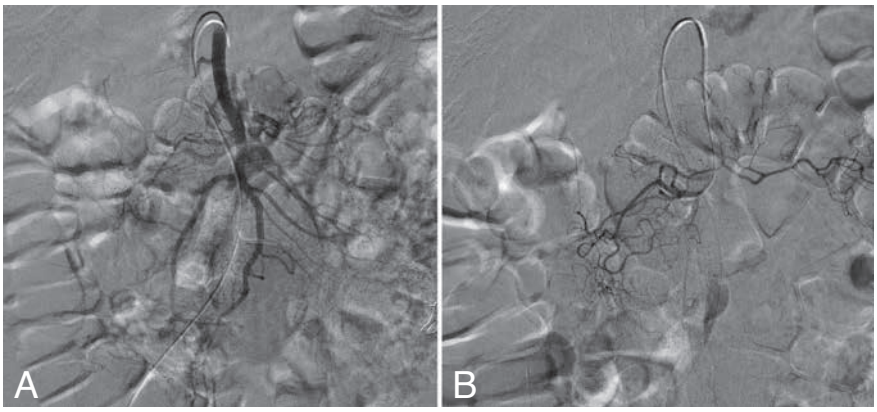

Fig. 2. — Two CA images of different runs, respectively showing injection of contrast in the superior mesenteric artery (A) and (B) the selective injection in the medial colic artery towards the middle third of the transverse colon, revealed no extravasation.

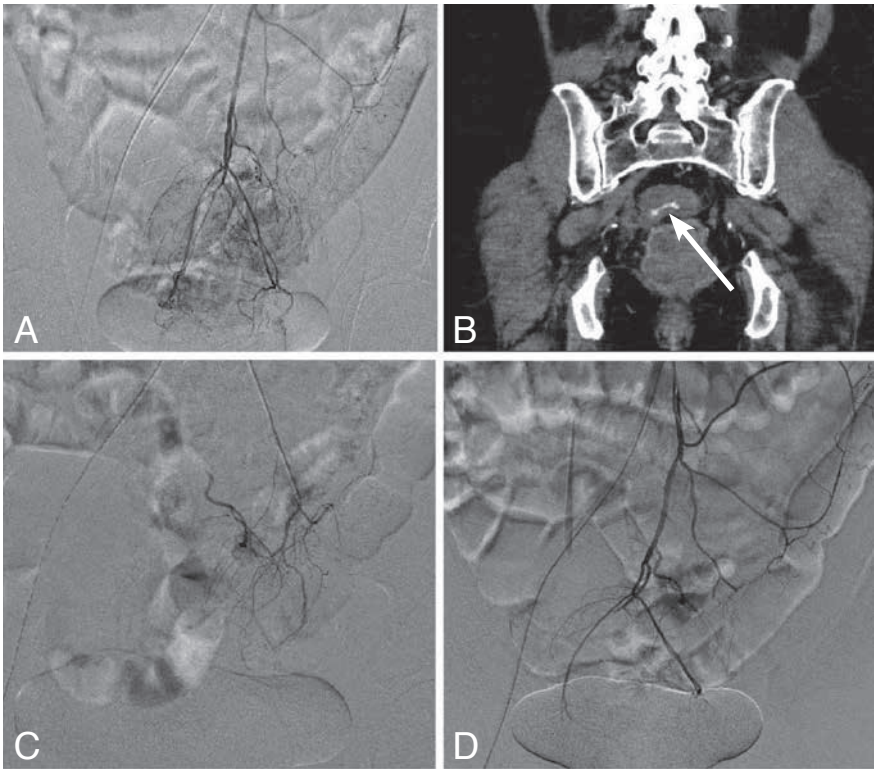

Fig. 3. — A. CA image after injection of contrast in the inferior mesenterior artery without identifiable bleeding site. B. Coronal CTA image in the arterial phase demonstrating the rectosigmoidal bleeding (arrow). C. Selective catheterisation of a sigmoid artery with injection of contrast material did not show the bleeding site. D. CA image after embolisation with contrast injection in the inferior mesenteric artery illustrating the diminished vasculature.

Gaule, France) was injected at 4 mL/s. Two single breath hold scans were performed from above the diaphragm to below the symphysis pubis. The arterial phase scan was triggered with the region of interest in the abdominal aorta just below the diaphragm and with a density of 150 HU above its pre-contrast density. The venous phase was scanned two minutes after start of the injection of contrast agent. Multiplanar reconstructions in the sagittal, coronal and axial plane were made of both fases. In the absence of orally administered contrast agent, the diagnosis of active LGIB was made by looking for the extravasation of intravenous contrast agent into the bowel lumen. After the localisation of the bleeding site multiplanar reconstructions and maximum intensity projections were used to trace the vessel of origin and direct the subsequent conventional angiography (CA).

The CA is performed by digital subtraction angiography technique (Philips MultiDiagnost Eleva, Philips Healthcare, Eindhoven, Netherlands) via a transfemoral Seldinger method. The technical factors were slightly adjusted to the patients' habitus but generally followed standard values: pulse rate of 2 frames/s, 70 kVp and 100 mAs. Because the location of the bleeding as well as the vessel of origin were shown on the CTA, we immediately performed a selective catheterisation using a Simmons catheter (Terumo Europe, Leuven, Belgium). During selective angiography 10 mL of contrast agent was administered during each run (Hexabrix©, Ioxaglate 320 mg/ml, Guerbet, Roissy Charles de Gaule, France) at about 2 mL/s for both cases.

Diagnosis and therapy

The CTA of the first patient revealed the bleeding site in the medial third of the colon transversum (Fig. 1). Subsequently the patient was directly transported to the interventional radiology department and conventional angiography was performed. The time interval between the CTA images and the first images of the CA was 35 minutes.

Selective catheterisation of the medial colic artery towards the colon transversum showed no bleeding although multiple runs were performed (Fig. 2).

At this point there were 2 possibilities, first, we could interrupt the intervention and monitor the patient until we suspected active rebleeding and repeat the intervention. Or, we could, after correlation with the images of the CTA, selectively embolize the vessel of origin with gelfoam particles (Spongostan, Ethicon Incorporated, Somerville, USA). Because we were positive the CTA demonstrated the bleeding site and the vascular anatomy, we chose the second option.

In the second case, the CTA demonstrated the known bleeding site as well as the vessel of origin, being a sigmoid artery. CA with selective catheterisation of the inferior mesenteric artery was immediately performed; the time interval between the first images taken at CTA and the first run of CA images was 38 minutes. Even after multiple runs and after catheterisation of other branches, the CA did not reveal the bleed-

ing site (Fig. 3). After correlation with the CTA images, selective embolization of the presumed vessel with polyvinyl alcohol (PVA) particles 500-710 µ (Cook Incorporated, Bloomington, USA) and gelfoam particles was executed.

Outcome

In both cases there was no clinical evidence of rebleeding after the selective embolization procedures. Our first patient was discharged from the intensive care and transferred to the cardiology department after 72 hours because his vital parameters were stable since the embolization.

The second patient with an embolised post-polypectomy bleeding was discharged from the hospital on the next day.

Discussion

Lower gastro-intestinal bleeding (LGIB) is defined as a bleeding site localised in the colon or anorectum (1).

LGIB is most important in the elderly as its frequency increases with age (> 200 fold from 20 to 80 years) (2).

Currently, the standard diagnostic procedures in LGIB are colonoscopy, Technetium-99m (99m-Tc) labelled red blood cell (RBC) scintigraphy and CA, without one being clearly superior to the others (3).

Frattaroli et al compared the diagnostic accuracy of endoscopy and MDCT. He found that CTA revealed not only all bleeding sites that were visualised with colonoscopy but also the bleeding site in all patients that were negative in colonoscopy. Additionally CTA revealed the aetiology of the bleeding in 88.2% of the cases, compared to 52.9% of the cases for endoscopy. There are several reasons why endoscopy was not able to demonstrate the bleeding site: excessive blood in the colon, poor visibility due to insufficient colonic toilet and because the caecum could not be reached (4).

Even though 99m-Tc RBC scintigraphy is the most sensitive method for detecting GIB with a detection rate of 0.1 ml/min and is aiming to identify intermittent bleeding, it has several disadvantages. First, it localises the bleeding only to an area of the abdomen and the intestinal motility moves the intraluminal blood away. Second, it does not allow therapeutic intervention (5). Third, emergency nuclear imaging is not everywhere and always available.

In contrast, CA is more suited for urgent situations and allows immediate therapeutic intervention (6). Disadvantages of this procedure include the risk of adverse reactions to intravenous administered contrast material and catheter induced complications as well as its detection rate of 0.5 ml/min (7). Additionally, false positives may occur in CA since there may be artefacts from peristalsis and bowel gas movement (8).

CTA is a validated technique (9), commonly used in clinical practice (10) and known for several years (11). The detection rate is 0.3ml/min, lower than CA and almost approaching the sensitivity of 99m-Tc RBC scintigraphy. Besides, it is minimally invasive, widely available and the development of multi-detector CT has significantly reduced acquisition times.

Sabharwal et al. compared CA with CTA and proved that CTA has a higher sensitivity to detect active bleeding (12). However, CTA does not allow performing a simultaneous therapeutic intervention. Additionally, LGIB can be intermittent and this can influence the comparison of different modalities for detection (2).

A major advantage of CTA is that besides its accuracy in detecting a bleeding site, it may also reveal the aetiology or the underlying pathology and thus influence the subsequent management (13). In addition to identifying the underlying cause it also illustrates the vascular anatomy and it allows rapid targeted embolization without the need of performing an extensive diagnostic angiography of all vascular territories (13).

In summary, although we know for sure there is a LGIB, CA is limited in demonstrating the bleeding site. As demonstrated in the literature CTA can play an important role in diagnosis and subsequent therapy. The possible contradiction between CTA and CA may cause a dilemma, having to chose between interrupting the interventional radiology procedure and waiting for a rebleeding to continue in a critical patient, or continuing and embolizing the presumed vessel of origin according to the CTA images. Our cases demonstrate the literature findings that CTA can guide subsequent embolization, even in the absence of acute bleeding during the angiographic procedure. CTA is known to have a positive impact on the evolution and the outcome of the patient and hence it should have a primary role in the management of LGIB.

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