Imaging of upper and lower gastrointestinal bleeding: An update for the radiologist

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Learning objectives

To highlight the importance of correct imaging modality selection for investigation of gastrointestinal bleed. We also review the advances in imaging technology and its impact on the treatment algorithm of gastrointestinal haemorrhage. The spectrum of findings encountered in each modality is illustrated.

Background

Upper and lower gastrointestinal haemorrhage is a common cause of patient morbidity and mortality. Advances in imaging technology and intervention have lead to radiology adopting a central role in its diagnosis and management. A wide range of pathologies can present as both upper and lower gastrointestinal tract haemorrhage. We review the current state of the art and discuss the changing role of radiology in the management paradigm. A pictorial review based on the authors experience is used to present a representative series of various causes gastrointestinal bleeding.

Imaging findings OR Procedure details

Gastrointestinal bleeding (GIB) is still a significant cause of morbidity and mortality in emergency hospital admissions. The anatomic division between upper and lower gastrointestinal bleeding is at the ligament of Trietz. Clinical history may be useful to suggest the site of bleeding, although these are not often specific enough in making the diagnosis.

Upper GIB often presents with haematemesis and / or malaena. Hematochezia (bright red blood or fresh clots per rectum) is usually a sign of a lower GIB. The initial approach to these patients is assessment of haemodynamic stability (shock, orthostatic hypotension, decrease in haematocrit by 6%, transfusion requirements over 2 units of packed red cells) along with resuscitation and stabilisation.

ENDOSCOPY
The mainstay of diagnosis in upper GIB is with upper tract endoscopy which has become widely available. It can identify as well as treat a variety of causes of upper and lower gastrointestinal bleeding. Causes of upper GIB can be broadly divided into erosive (peptic ulcer disease, esophagitis), portal hypertension, arterial/venous/vascular malformation (Osler Weber Rendu syndrome, Dieulafoy's lesion), traumatic/post surgical (Mallory Weiss tear, post surgical anastomosis, aortoenteric fistula) and tumours (benign - leiomyoma, malignant - adenocarcinoma). Endoscopy is highly sensitive and specific for locating and identifying bleeding lesions, and therapeutic endoscopy can achieve hemostasis and prevent recurrent bleeding.

The authors propose the following algorithm in the management of upper GIB centered around the use of endoscopy. Patients with rebleeding after initial successful endoscopic treatment should undergo a second attempt with view to placing clips at bleeding site if haemorrhage continues. Angiography with view to embolisation is the next line of option, failing with surgery being the final resort.
Fig.: The authors proposed algorithm in Upper GI bleeding centered around the use of upper tract endoscopy which has a high success rate in treatment, with angiography being second line and surgery as the last option.

**References:** S. Leong; Radiology, Cork University Hospital, Cork, IRELAND

In cases of lower GIB, the causes of may be grouped into several categories: Diverticulosis (30-50%), Angiodysplasia (20-30%), and others including inflammatory and neoplastic. Like in cases of upper GIB, lower tract endoscopy is the initial examination of choice. Endoscopic diagnosis and treatment of several causes of LGIB including diverticula, angiodysplasia, haemorrhoids, or proctitis. Several potential problems can occur with colonoscopy for these patients. These include poor visualisation in an unprepped colon and risks of sedation in an unstable patient. Another problem in the identification of gastrointestinal bleeding is that it can be intermittent and cease spontaneously. When endoscopy is negative for either overt or occult cases of lower GIB, there are a variety of diagnostic options available to help identify the source of bleeding including Nuclear Scintigraphy, Multidetector Computer Tomography, Catheter angiography and Capsule Endoscopy.

**Multi Detector Computed Tomography**

With the advent of MDCT, it has come into the mainstay of imaging patient especially with lower gastrointestinal bleeding (LGIB). Its advantage lies in the fact that its wide availability, speed, reproducibility and non-invasiveness. Bleeding rates as low as 0.3ml/min can be detected. Imaging protocols usually consists of a control abdomen / pelvis and an arterial phase (2.5ml/sec with 100ml of low osmolar contrast) of the abdomen and pelvis with a delayed series if required. The control phase will allow identification of false positive results such as from suture material, calcium contains tablets or contrast material within the bowel. False negative results may occur because of dilution of injected contrast material within the bowel lumen. After identification of a bleeding site, a decision can be made about further management and if therapeutic embolisation is appropriate.
**Fig.**: Contrast enhanced CT showing arterial blush in the jejunum which was the source of bleeding.

**References**: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND
Prior to the advent of MDCT, catheter angiography was the main choice in the diagnosis of active gastrointestinal bleeding. This was primarily due to the fact that it offers the option of therapeutic procedure such as embolisation of source if it is seen. Identification rates between 50-72% have been reported. It however, requires a bleeding rate of 0.5ml/min to allow identification. If a bleeding point is not identified, there is the option of administration of provocative agents such as anticoagulants or vasodilators. However this would not be appropriate in the setting of patients' with an unstable GI Bleed.
Fig.: Contrast enhanced CT in another patient showing blush in the small bowel. The patient went on to conventional angiography with a view to embolisation.

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND
Fig.: Conventional angiography showing contrast extravasation in the mid jejunum region. Superselective angiography was performed for embolisation, however, no further extravasation was seen. The patient subsequently stabilised and did not require further treatment. This case highlights an important point that not all LGIH require treatment, and that a certain percentage of cases can resolve following supportive treatment.

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND

Nuclear Scintigraphy
Radioisotope scans still retain a role in investigation of patient with gastrointestinal bleeding. Technetium may be tagged to red blood cells or sulphur colloid and administered intravenously or during angiography. It requires a bleeding rate of 0.1ml/min. Labelled red cells have the advantage of lesser uptake of the liver and spleen allowing better identification of bleeding from the overlying small bowel or colon. Its disadvantages lie in that it only localises bleeding to a general area, and cannot give further information with regards to its cause.

Fig.: Meckel's scan - sequential frames showing ectopic Technetium-99m uptake adjacent to the bladder, similar to that of the gastric uptake. This was proven at surgery to be a Meckel's diverticulum.

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND
Fig.: GI Bleeding scan showing abnormal area of isotope accumulation in the right iliac fossa consistent with a right sided colonic bleed

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND

Capsule endoscopy

This is a new technology, which utilises a wireless video capsule, ingested by the patient ten hours of fasting. Images are captured as the capsule passes through the small bowel and reviewed after 8 hours of transit time. It is very labour intensive, requiring 50-100 minutes to review the images from one examination. The other prohibitive factors or disadvantages include costs, potential complications (impaction) and inability to diagnose lesions beyond the mucosal lining.

Persistent bleeding
In a majority of cases with upper and lower GIB, the bleeding either resolves spontaneously or can be controlled endoscopically. Persistent bleeding would be an indication for angiographic intervention to localise and achieve hemostasis. Arterial GIB can be controlled by selective arterial infusion of vasoconstrictive drugs, embolisation into the bleeding vessel or a combination of these techniques.

**Vasopressin infusion**

Vasopressin use is indicated in patients with documented haemorrhagic gastritis, whose bowel has poor collateral supply or those bleeding from anastamotic ulcers or endoscopic bleeding sites. Most patients will respond to vasopressin infusion of 0.2 pressors/unit which can be increased up to 0.4 pressors/unit and continued for 24-36 hours if bleeding is controlled. Failure to control bleeding with the higher dose of vasopressin is indicative of likelihood of requiring alternative therapies. Rebleeding is a common problem after stopping vasopressin, figures range from 18% in patients with gastric bleeding to 50% in lower GIB. It also has unfavourable side effect profile including myocardial infarction, arrhythmia, hypertension and volume overload.

**Embolisation**

A review by Darcy et al comparing vasofusion to embolisation concluded that the latter was safer because it was quicker to perform, and had lower rebleeding and complication rates. Development of microcatheters, guidewires and embolic material has allowed superselective embolisation. There are many indications for embolisation in cases of acute GIB. These include angiographically visible bleeding which is amenable to vascular access and greater than 0.5 ml/min, contraindication/failed vasopressin infusion, hemobilia, pyloroduodenal bleeding, haemorrhage from visceral artery pseudoaneurysms and haemorrhage into pseudocysts. A variety of embolic agents are available including Gelfoam, PVA and coils. Superselective embolisation has significantly reduced the rate of bowel infarction from 10-20% in the 1980s to almost non-existent in recent times.
Fig.: Contrast enhanced CT showing contrast blush in the descending colon with abnormally thickened and enhancing bowel

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND
Fig.: The patient proceeded onto conventional angiography which revealed a pseudoaneurysm as the cause of the bleeding, this was subsequently embolised.

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND
Fig.: Superselective angiography performed by microcatheter use.

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND
**Fig.**: Superselective embolisation performed with microcatheter use.

**References**: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND
**Fig.**: Technically successful embolisation showing no residual filling of the pseudoaneurysm. The patient subsequently had recurrent significant bleeding requiring a left hemicolecction which revealed Crohn's as the underlying disease process.

**References:** S. Leong; Radiology, Cork University Hospital, Cork, IRELAND

The next set of images is from an unusual case of lower right colonic bleeding caused by retroperitoneal portal-renal varices - in a patient with cirrhosis and portal hypertension. This was treated successfully by a TIPS procedure.
**Fig.**: Porto-renal varices (yellow arrows) seen in the retroperitoneum behind the right colon on Contrast enhanced CT

*References*: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND

**Fig.**: Mesenteric angiography showing the portal - renal varices with excessive contrast extravasation around the caecum pointing towards source of Lower GIB

*References*: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND
Fig.: A TIPS procedure was performed with embolisation of the varices to stop recurrent lower GIB.

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND

The authors propose the following algorithm for investigation of patients’ with LGIB which essentially is centred upon the haemodynamic stability at the time of presentation.
Fig.: Proposed algorithm for the management of Acute Lower Gastrointestinal Bleeding

References: S. Leong; Radiology, Cork University Hospital, Cork, IRELAND

Images for this section:
**Fig. 1:** Contrast enhanced CT showing arterial blush in the jejunum which was the source of bleeding.
**Fig. 2:** Contrast enhanced CT in another patient showing blush in the small bowel. The patient went on to conventional angiography with a view to embolisation.
Fig. 3: Conventional angiography showing contrast extravasation in the mid jejunum region. Superselective angiography was performed for embolisation, however, no further extravasation was seen. The patient subsequently stabilised and did not require further treatment. This case highlights an important point that not all LGIH require treatment, and that a certain percentage of cases can resolve following supportive treatment.
Fig. 4: Meckel's scan - sequential frames showing ectopic Technetium-99m uptake adjacent to the bladder, similar to that of the gastric uptake. This was proven at surgery to be a Meckel's diverticulum.
Fig. 5: Contrast enhanced CT showing contrast blush in the descending colon with abnormally thickened and enhancing bowel
Fig. 6: The patient proceeded onto conventional angiography which revealed a pseudoaneurysm as the cause of the bleeding, this was subsequently embolised.
Fig. 7: Superselective angiography performed by microcatheter use.
**Fig. 8:** Superselective embolisation performed with microcatheter use.
Fig. 9: Technically successful embolisation showing no residual filling of the pseudoaneurysm. The patient subsequently had recurrent significant bleeding requiring a left hemicolectomy which revealed Crohn’s as the underlying disease process.
**Fig. 10**: Proposed algorithm for the management of Acute Lower Gastrointestinal Bleeding
**Fig. 11:** GI Bleeding scan showing abnormal area of isotope accumulation in the right iliac fossa consistent with a right sided colonic bleed
Fig. 12: Contrast enhanced CT showing bleeding from an esophageal ulcer

Fig. 13: Porto-renal varices (yellow arrows) seen in the retroperitoneum behind the right colon on Contrast enhanced CT
**Fig. 14:** Mesenteric angiography showing the portal - renal varices with excessive contrast extravasation around the caecum pointing towards source of Lower GIB.

**Fig. 15:** A TIPS procedure was performed with embolisation of the varices to stop recurrent lower GIB.
Fig. 16: The authors proposed algorithm in Upper GI bleeding centered around the use of upper tract endoscopy which has a high success rate in treatment, with angiography being second line and surgery as the last option.
Conclusion

Endoscopy forms the mainstay of diagnosis and treatment in upper gastrointestinal bleeding. Multidetector CT, conventional angiography and embolisation have a central role in the management of patients with lower gastrointestinal haemorrhage.

Personal Information

References


2. Vorburger SA, Candinas D, Egger B. Acute lower gastrointestinal bleeding--an evidence-based algorithm for diagnosis and treatment Ther Umsch. 2006 May;63(5):301-9


