

Is CT useful as a first line investigation in colonic diverticular bleeding?

Colonic diverticular bleeding is the commonest cause of lower gastrointestinal bleeding in adults(1). Over 70% of episodes resolve spontaneously with conservative management(2), but an important minority are severe, even life-threatening, and require therapeutic intervention. Colonoscopy remains the mainstay for determining the aetiology of acute rectal blood loss, and facilitates direct therapeutic interventions, such as clipping or diathermy(3). However, it requires potentially arduous bowel preparation and is invasive; many patients with acute rectal blood loss are elderly and frail and require haemodynamic resuscitation before endoscopy can be attempted. Furthermore, colonoscopy fails to identify the specific point of haemorrhage in over 50% of patients with diverticular bleeding(4).

There is increasing interest in using CT scanning as a first line investigation for suspected diverticular bleeding. CT is non-invasive, already generally established in the management of acute gastrointestinal bleeding, and is very sensitive for detecting colonic diverticular disease. Advocates suggest it can help triage patients into those requiring urgent colonoscopy versus those who can be managed more conservatively, and thereafter increases the diagnostic yield of colonoscopy. However, CT exposes potentially vulnerable patients to the risks of iodinated contrast and could inappropriately delay endoscopic therapeutic intervention.

To date, the studies supporting the role of first line CT in diverticular haemorrhage have been largely retrospective, and therefore risk selection bias. For example, Ichiba et al(5) retrospectively reviewed 257 patients with diverticular haemorrhage undergoing CT prior to colonoscopy. A high proportion (184/257, 71.6%) had stigmata of haemorrhage on CT (either raised intra colonic attenuation precontrast, acute contrast extravasation or rising intracolonic attention on delayed imaging). Colonoscopy identified 130 patients with evidence of acute diverticular haemorrhage and there was concordance of 67.3% (173/257) between CT and colonoscopy in identifying the location of the bleeding. In a similar retrospective study of 124 patients with diverticular bleeding, Sugiyama et al (6) reported that colonoscopy was able to locate the bleeding point in 12/20 (60%) with a preceding

positive CT for extravasation, compared to a detection rate of 31% (11/35) in patients with a negative CT ($p < 0.05$). To date the number of prospective studies is limited and include small patient numbers(7).

In this issue of Radiology, XX et al report the first prospective multicentre study to date investigating the utility of pre -colonoscopy CT in the management of diverticular haemorrhage (ref). The authors recruited 442 patients with hematochezia (defined as passage of bright red blood from the anus) from 10 recruitment sites. Patients were excluded if they were aged over 80 years, had an alternative cause of bleeding other than diverticular disease, or were unable to undergo CT and/or colonoscopy due to medical co-morbidities, leaving a final cohort of 202 patients (mean age 70 years, 134 [66%] male). Recruited patients underwent a CT scan which included a pre-contrast acquisition and then a delayed 90 sec (equilibrium phase) acquisition after an intravenous injection of 90-100ml of iodinated contrast at 2-3mls/second. CT scans were interpreted by a radiologist and gastroenterologist independently with discrepancies resolved via a consensus process with a third observer. A diagnosis of "extravasation positive" CT was made if diverticular disease was identified, together with the presence of extravasated contrast in the lumen (defined as $>90\text{HU}$). Patients subsequently underwent colonoscopy, which was used as the reference standard for diverticular bleeding. A *definitive* colonoscopic diagnosis of diverticular bleeding was made if active bleeding, adherent clot or a visible vessel were identified (so called "stigmata of recent haemorrhage"). If any of these stigmata were found, patients underwent appropriate endoscopic therapy, for example band ligation or injection of saline epinephrine solution. A *presumptive* diagnosis of diverticular bleeding was made in the in the absence of these stigmata, and only if an alternative cause of bleeding was not found following complete colonoscopy and upper gastrointestinal investigations including gastroscopy or capsule endoscopy.

Overall, 50/202 (24.6%) of patients had a positive diagnosis of extravasation on their CT, predominantly in the right colon (29 patients, 58%), of whom 38 (76%) had confirmed diverticular

bleeding with stigmata of recent haemorrhage at colonoscopy. The concordance between CT and colonoscopy for the colonic segmental location of bleeding was 94.7% (36/38). Conversely, significantly fewer of the 152 patients with a negative CT had any stigmata of recent haemorrhage at colonoscopy (28 [18.4%]), ($p < 0.01$). For both CT extravasation positive and negative groups, stigmata of recent haemorrhage at colonoscopy were more frequent if colonoscopy was performed within 24 hours of arrival in hospital (27/33 [81.8%] vs 21/81 [25.9%]) respectively, $p < 0.001$. Overall, CT extravasation had a sensitivity of 57.6% (38/66) and specificity of 91.2% (124/136) for prediction of diverticula with stigmata of recent haemorrhage at colonoscopy.

One important observation was that the positivity rate of CT for extravasation was dependent on the timing of the CT in relation to the last episode of haematochezia (OR 0.966, $p = 0.008$). Of those patients undergoing CT within one hour of the last haematochezia episode, the extravasation rate was 55.6% (5/9) compared to 30% (36/118) if the timing was 1 to 4 hours after the last episode, and just 12% (9/75) if greater than 4 hours after. Overall the prevalence of a positive CT was significantly greater if performed before 4 hours following the last episode of bleeding than if performed more than 4 hours later (41/124 [32.3%] vs. 9/75 [12%], $p < 0.01$). CT performed within 4 hours achieved a sensitivity of 64.7% (33/51) for prediction of diverticula with stigmata of recent haemorrhage at colonoscopy.

Overall, this is an important addition to the literature. A particular strength is the multi centre prospective study design. The results suggest that CT indeed has a useful role as a first line investigation, both for diagnosing diverticular haemorrhage, but particularly in triaging patients: a CT demonstrating extravasation predicts a therapeutic target for colonoscopy in over three quarters of patients, with very few false positives. The findings therefore confirm the observations from previous retrospective studies(5, 6), although are at odds with a smaller prospective study of 52 patients (7) which found no such association. The study by XX et al is however clearly better powered

to delineate the role of CT. An important take home message is the need to perform CT (and indeed colonoscopy) as soon as possible after the last episode of rectal bleeding; extravasation rates are higher if CT is performed within 4 hours of the last bleeding episode. This suggests radiology and endoscopy departments must have efficient and “joined up” pathways in place which are triggered as soon as patient arrives in the emergency room, to minimise delays in investigations. The authors suggest that a negative CT (particularly if it can be performed within 4 hours of the last bleeding episode) could obviate the need for urgent colonoscopy, particularly in frail patients in whom bowel purgation could be problematic, or in hospitals with limited access to acute endoscopy services. This seems a reasonable approach, but it should be remembered that a negative CT still has a positive colonoscopy in just under 20% of patients.

There are a number of limitations to the study which should be acknowledged. The clinical teams were unblinded to the CT findings which may have influenced the timing of colonoscopy (some colonoscopies were performed as long as 7 days after the CT). Interestingly however, there was no significant difference in the timings of colonoscopy in those with a positive or negative CT. The authors used a relatively slow IV contrast injection and delayed equilibrium phase acquisition only. It would have been useful to investigate the utility of an early arterial phase acquisition. Patients aged over 80 were excluded although the utility of CT in this age group could potentially be even greater if colonoscopy can be avoided or delayed. There was a high prevalence of right sided diverticular disease in the patient cohort. Although the study reported that extravasation rates did not differ between the right and left colon, similar results cannot necessarily be assumed in populations with predominantly left sided diverticular disease. Finally, the clinical outcomes were no different between CT extravasation positive and negative patients, although this may be related to study power, and the efficacy of colonic interventions.

In summary this prospective multi-centre study has shown that CT is a useful first line investigation in the patients presenting with diverticular bleeding, particular if within 4 hours of the last bleeding episode. Future work should investigate the impact, if any, of CT on patient outcomes

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8-Contrast-enhanced CT for colonic diverticular bleeding prior to colonoscopy: a prospective multicenter study". XX