Incidental Findings On RBC Gastrointestinal Haemorrhage Blood Pool Scintigraphy

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Citation

Abstract
This article provides a brief overview of potential incidental findings on $^{99m}$Tc red blood cell (RBC) scintigraphy in acute lower gastrointestinal haemorrhage (LGIH). In a population of 45 patients, 28% demonstrated evidence of incidental findings. A number of case examples of incidental findings are provided.

INTRODUCTION
The normal appearance of a $^{99m}$Tc RBC scan of the abdomen includes the vascular organs, major blood vessels and structures accumulating or excreting unbound $^{99m}$Tc pertechnetate ($^{99m}$Tc pertechnetate). Vascular organs appearing due to blood pool include the heart, liver, spleen, kidneys, colon, gallbladder, male genetalia and in females, the uterus ($^{99m}$Tc pertechnetate). Excretion of unbound $^{99m}$Tc pertechnetate via the renal system results in the appearance of kidney, bladder and ureter in the $^{99m}$Tc RBC study, however, stomach may also appear due to accumulation of unbound $^{99m}$Tc pertechnetate ($^{99m}$Tc pertechnetate).

A number of blood vessels are visualised including the aorta, inferior vena cava, portal vein, splenic vein, mesenteric veins, ovarian vein, renal veins and iliofemoral vessels ($^{99m}$Tc pertechnetate). Veins tend to be more prominent than arteries due to the volume of blood they contain compared to arteries which are generally only a third of the diameter of the corresponding veins ($^{99m}$Tc pertechnetate).

As a result of the normal biodistribution of the $^{99m}$Tc RBCs, a number of incidental pathologies might be discovered during evaluation of the acute LGIH patient. Taylor ($^{99m}$Tc RBCs) reported the incidental discovery of a hepatic haemangioma while Moreno et al. ($^{99m}$Tc RBCs) reported on separate patients a haematoma in the anterior abdominal wall formed from bleeding into the rectus abdominis sheath and a post traumatic intraperitoneal bleed. Zuckier and Patel ($^{99m}$Tc RBCs) documented the incidental discovery of great vessel tortuosity, abdominal aneurysm and occluded iliac vessels; all of which may provide advanced notice of potential angiographic difficulties. Pelvic kidneys, ‘bowel blush’ of causative pathology and a scrotal hernia were also reported ($^{99m}$Tc RBCs).

Other incidental findings associated with pathological accumulation (or lack of accumulation) of $^{99m}$Tc RBCs should be considered during interpretation. Inflammation (e.g. abscess, appendicitis, gastritis) can cause hyperaemia which may result in a false positive study ($^{99m}$Tc RBCs). The uterus during menses ($^{99m}$Tc RBCs), following pregnancy ($^{99m}$Tc RBCs) and a fibroid uterus ($^{99m}$Tc RBCs) have all been reported as potential confounders. An aortic aneurysm may also cause false positive findings ($^{99m}$Tc RBCs).

Swallowed saliva containing unbound $^{99m}$Tc pertechnetate may lead to false positive results if transit is rapid ($^{99m}$Tc pertechnetate). Similarly, free $^{99m}$Tc pertechnetate in the stomach may pass into the colon ($^{99m}$Tc pertechnetate). Crook and Currie ($^{99m}$Tc pertechnetate) reported a case of frank epistaxis that resulted in swallowed radiolabeled blood presenting as a potential false positive finding of LGIH.

Other sources of potential false positive findings include normal abdominal organs and vasculature, vascular tumours (e.g. haemangioma), colonic varices, venous collaterals, AVM, arterial grafts, horseshoe kidney, osseous activity (e.g. bone chips) and gallbladder ($^{99m}$Tc pertechnetate). Furthermore, the spleen may demonstrate activity, including that of accessory spleen, particularly in patients following a blood transfusion ($^{99m}$Tc pertechnetate) or a ruptured spleen ($^{99m}$Tc pertechnetate).

METHODS
A retrospective evaluation of 49 patients referred for scintigraphic evaluation of acute LGIH was undertaken with respect to incidental findings. It should be kept in mind,
however, that patient follow-up in this retrospective and de-
identified population made confirmation of incidental 
findings impossible. Thus, these observations simply 
represent a probable explanation of the scintigraphic 
findings based on available data. Several findings represent 
benign variations to normal biodistribution that may cause 
false positive findings for acute LGIH. Others may represent 
more serious pathology in a population cohort where co-
morbidity is a known risk factor. Of the 49 studies in the 
sample, four were repeat scans on the same patient. Thus, 
only 45 patient studies were evaluated for incidental 
findings.

RESULTS

Incidental pathology was detected in 27.8% of patients 
(17/45). Incidental findings included four patients with 
superficial venous activity (figure 1), four patients with 
splenomegaly (figure 2), three patients with marked uterus 
activity (figure 3), two patients with a distended bladder 
(figure 4) and one patient with each of ectatic vessels (figure 
5), tortuous aorta (figure 5), aortic aneurysm (figure 6), an 
enlarged left lobe of liver (figure 7) and venous stasis. The 
final patient presented with photopaenic areas that most 
likely represent post barium swallow attenuation but may be 
due to residual blood from a large, pre-label bleed or even ascites (figure 8).

Figure 1

Figure 1: An example of one of three patients with marked 
superficial venous activity. In this patient it is also noted that 
the spleen demonstrates marked accumulation.

Figure 2

Figure 2: An example of splenomegaly. Intense Tc RBC 
accumulation in the spleen can be associated with damage to 
the RBCs during the labelling process resulting in splenic 
sequestration. This does not account for the gross 
enlargement of the organ seen in these images.

Figure 3

Figure 3: An example of uterus activity. Note the ‘doughnut 
sign’ consistent with fibroid uterus. Also of note for 
comparison with figures 1 and 2 above is the normal spleen 
activity and size.

Figure 4

Figure 4: An example of a distended bladder. The bladder is 
full at 5 minutes post IV (above left) with little renal 
excretion so a photopaenic area is seen due to background 
attenuation. By 55 minutes (above right) renal excretion has 
dilated activity through the bladder volume to give a 
background appearance rather than the more typical intense 
bladder associated with more concentrated volumes.
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Figure 5
Figure 5: Examples of ectatic blood vessels (left) and a tortuous aorta (right).

Figure 6
Figure 6: Aortic aneurysm with intense localisation that is causing a photopaenic edge.

Figure 7
Figure 7: Enlarged left lobe of the liver or other vascular mass.

Figure 8
Figure 8: This study shows an unusual pattern of non-uniformity. Areas of photopaenia are intertwined with normal background activity. The appearance is consistent with non-uniform attenuation in the abdomen and this is supported by the count truncation of the descending aorta / vena cava through to femoral vessels. First impressions raised the possibility of ascites but the photopaenia appears to follow a convoluted path consistent with small bowel. The attenuation is not as defined on the delayed (45 minutes) image suggesting transit through bowel. This raises the possibility of a massive UGIH immediately preceding the return of labelled RBCs. The changes noted in the stomach 'shadow' might be more suggestive of a barium meal preceding the Tc RBC study.

CONCLUSION
Incidental pathology is commonly observed on $^{99m}$Tc RBC scintigraphy. The biodistribution of $^{99m}$Tc RBCs introduce potential false positive findings for acute LGIH as well as a number of potential interpretive confounders. During interpretation, consideration should be given to potential causative pathology, co-morbidity and/or incidental findings.

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