

# Incidental Findings On RBC Gastrointestinal Haemorrhage Blood Pool Scintigraphy

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## Abstract

This article provides a brief overview of potential incidental findings on  $^{99m}\text{Tc}$  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  $^{99m}\text{Tc}$  RBC scan of the abdomen includes the vascular organs, major blood vessels and structures accumulating or excreting unbound  $^{99m}\text{Tc}$  pertechnetate ( $_{1,2,3,4}$ ). Vascular organs appearing due to blood pool include the heart, liver, spleen, kidneys, colon, gallbladder, male genitalia and in females, the uterus ( $_{1,2,3,4}$ ). Excretion of unbound  $^{99m}\text{Tc}$  pertechnetate via the renal system results in the appearance of kidney, bladder and ureter in the  $^{99m}\text{Tc}$  RBC study, however, stomach may also appear due to accumulation of unbound  $^{99m}\text{Tc}$  pertechnetate ( $_{1,2,3,4}$ ).

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 ( $_{1,2,3,4}$ ). 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 ( $_4$ ).

As a result of the normal biodistribution of the  $^{99m}\text{Tc}$  RBCs, a number of incidental pathologies might be discovered during evaluation of the acute LGIH patient. Taylor ( $_5$ ) reported the incidental discovery of a hepatic haemangioma while Moreno et al. ( $_6$ ) 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 ( $_7$ ) 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 ( $_7$ ).

Other incidental findings associated with pathological accumulation (or lack of accumulation) of  $^{99m}\text{Tc}$  RBCs should be considered during interpretation. Inflammation (e.g. abscess, appendicitis, gastritis) can cause hyperaemia which may result in a false positive study ( $_{1,8}$ ). The uterus during menses ( $_4$ ), following pregnancy ( $_9$ ) and a fibroid uterus ( $_{10}$ ) have all been reported as potential confounders. An aortic aneurysm may also cause false positive findings ( $_{4,11}$ ).

Swallowed saliva containing unbound  $^{99m}\text{Tc}$  pertechnetate may lead to false positive results if transit is rapid ( $_4$ ). Similarly, free  $^{99m}\text{Tc}$  pertechnetate in the stomach may pass into the colon ( $_{12}$ ). Crook and Currie ( $_{13}$ ) 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 ( $_{2,14}$ ). Furthermore, the spleen may demonstrate activity, including that of accessory spleen, particularly in patients following a blood transfusion ( $_{12}$ ) or a ruptured spleen ( $_{15}$ ).

## 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,

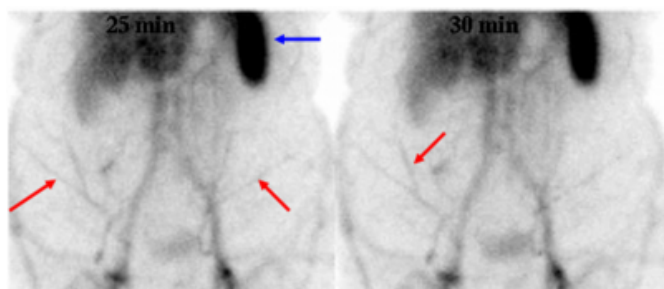
however, that patient follow-up in this retrospective and de-identified population made confirmation of incidental findings impossible. Thus, these observations simply represent a probable explanation of the scintigraphic findings based on available data. Several findings represent benign variations to normal biodistribution that may cause false positive findings for acute LGIH. Others may represent more serious pathology in a population cohort where comorbidity 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).

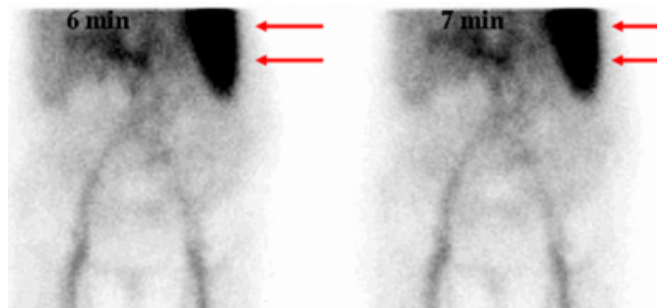
#### Figure 1

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.



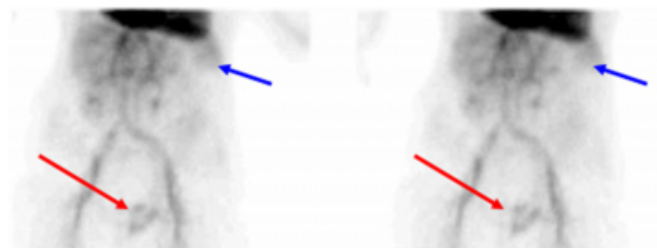
#### Figure 2

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.



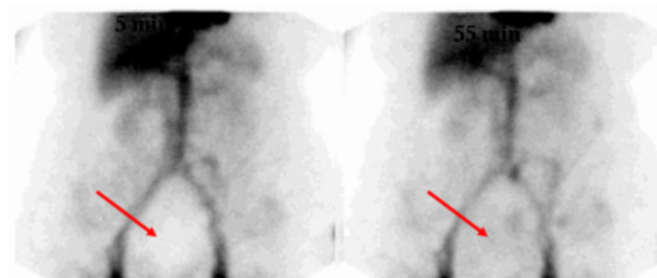
#### Figure 3

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.



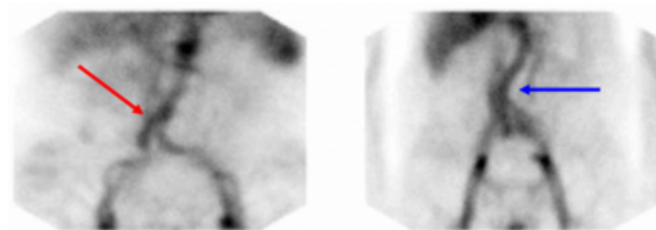
#### Figure 4

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 diluted activity through the bladder volume to give a background appearance rather than the more typical intense bladder associated with more concentrated volumes.



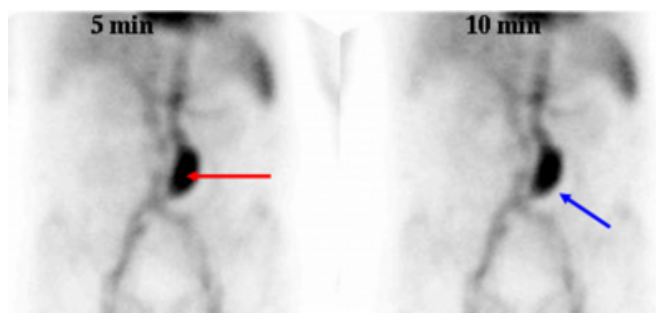
**Figure 5**

Figure 5: Examples of ectatic blood vessels (left) and a tortuous aorta (right).



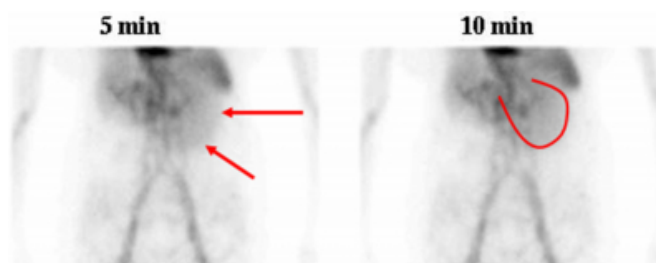
**Figure 6**

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



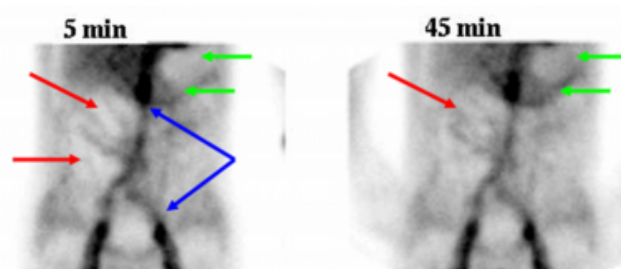
**Figure 7**

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's 'shadow' might be more suggestive of a barium meal preceding the Tc RBC study.



## CONCLUSION

Incidental pathology is commonly observed on <sup>99m</sup>Tc RBC scintigraphy. The biodistribution of <sup>99m</sup>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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