False Positive GI Bleed on Tc-99m RBC Scintigraphy Due to Ileal Varices

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ABSTRACT

Tc-99m labeled RBC scintigraphy is commonly employed in the evaluation of acute gastrointestinal bleeding. On Tc-99m RBC studies gastrointestinal bleeding is seen as an initial focus of increased radiotracer activity that on subsequent images increases in intensity and changes position in a pattern that conforms to segments of bowel. We report a case of a patient with multiple episodes of hematochezia that presented with lower gastrointestinal hemorrhage. A Tc-99m labeled RBC scan was performed and the findings suggested a GI bleed. However, subsequent angiography revealed prominent ileal varices simulating an acute bleed. Although most varices fill promptly and should not be misinterpreted as a focus of hemorrhage, slow filling varices can simulate an acute bleed and lead to a false positive interpretation.

CASE REPORT

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An 87 year old female with history of type 2 diabetes mellitus, hyperlipidemia, and hypertension presented to the emergency room with chest pain and was diagnosed with acute myocardial infarction. The patient was then medically managed in the cardiac intensive care unit. She subsequently developed multiple maroon colored bowel movements and her hemoglobin dropped from 10.7 to 8.3 g/dL over 2 days. She was then sent for Tc-99m labeled RBC scintigraphy. It is not uncommon for patients at our institution to have a Tc-99m labeled RBC scan as the first-line test for lower GI bleeding. Utilizing 35 mCi of Tc-99m, a dynamic RBC study was performed for 60 minutes which demonstrated an early focus of increased radiotracer activity in the right lower quadrant which appeared to accumulate and ascend the right abdomen in a pattern consistent with small bowel [Figure 1]. There was also milder uptake in the left abdomen that also accumulated throughout the study. In conjunction with the clinical history the scan was determined to be positive for active GI bleed. The patient then went to the Interventional Radiology suite where an angiogram demonstrated prominent ileal varices in the right lower quadrant filling from the superior mesenteric and ileocolic veins [Figure 2]. The extensive varices were then shown to extend into the right upper quadrant. These findings explain the persistent focus of radiotracer activity in the right lower quadrant as well as the tracer "accumulation" into the right upper quadrant on the RBC scan. Moreover, the more subtle tracer activity in the left upper quadrant was also felt to be vascular related and due to collateral vessels. The patient's ileal varices were believed to be due to portal hypertension. A subsequent abdominal ultrasound demonstrated a cirrhotic liver with a recanalized umbilical vein consistent with a diagnosis of portal hypertension [Figure 3]. Interestingly, the diagnosis of cirrhosis was unknown to the patient until the current hospitalization. The gastroenterologists assumed that her underlying liver disease was caused by undiagnosed nonalcoholic steatohepatitis which then progressed to cirrhosis.

In retrospect, the pattern of tracer activity was atypical for a small bowel bleed. There was a persistent focus of tracer activity in the right lower quadrant that did seem to migrate superiorly, but would be an atypical pattern for small bowel. Moreover, the subtle tracer activity in the left abdomen which appeared later in the study did not demonstrate antegrade/retrograde activity that would conform to bowel and was compatible with vascular structures. There are different strategies that would have aided in further evaluation of this patient. A SPECT-CT could have been performed to help

localize the exact location of the tracer activity. Alternatively, delayed views could have aided in differentiating an active hemorrhage from varices as they would have demonstrated persistent tracer accumulation at the right lower quadrant which would have been persistent.

The patient then had an upper endoscopy revealing a large duodenal ulcer with an adherent clot which continued to bleed after removal. This was assumed to be the source of the acute GI bleed and was treated with epinephrine and bipolar probe. There was no evidence of a duodenal source of bleeding on the RBC study likely due to the fact that a clot had already formed over the ulcer. Lab results proved she was Helicobacter pylori positive and triple antibiotic therapy was instituted. She did not have any further episodes of bleeding during her hospital course and remained hemodynamically stable. The patient was then discharged to subacute rehabilitation. At the patient's most recent follow-up appointment, she has been maintained on a proton pump inhibitor and has not had further episodes of GI bleeding.

DISCUSSION

Active gastrointestinal bleeding is a common occurrence in emergency rooms. The triage of these patients is important for accurate diagnosis and management. In general, patients suspected to have upper GI bleeding are managed with upper endoscopy. Active lower GI bleeds tend to pose more of a dilemma for clinicians. Various treatment algorithms have been proposed with no clear consensus. Most large volume bleeds should proceed directly to surgery/angiography, however, slower bleeds tend to be managed differently with many patients proceeding directly to colonoscopy if stable. Nuclear Tc-99m labeled RBC scans are routinely employed as a first line study in patients with suspected lower GI bleeding. As in our patient, the study is generally carried out to 60 minutes and may be terminated early if there is definite evidence of an active GI bleed. The study is useful to confirm active bleeding and to aid angiographers/surgeons in localization and treatment planning. They are known to be more sensitive in detecting active lower GI bleeds when compared to angiography and have been reported to be able to detect bleeding at a rate as low as 0.04-0.1 ml/min when compared to a rate of 1 ml/min with angiography [1]. The sensitivity and specificity of RBC scans have been reported to range from 78.6%-97% and 70.4%-100% respectively. Angiography has been reported to have a specificity of 100% but a sensitivity ranging from 30% in a recurrent bleed to 47% in an acute bleed [1,2]. Moreover, on a RBC study only 3 ml of blood needs to pool at a site for positive detection [3]. The ability to view cine rather than static images has also aided in delineating more subtle regions of hemorrhage. The intravascular blood pool images are particularly useful in the detection of intermittent bleeding as patients may be sequentially imaged over a period of 24 hours until the source of hemorrhage is detected. The RBC scan can thus aid in the triage of patients with intermittent lower GI hemorrhage. Positive RBC findings are a focus of radiotracer activity that appears during the course of the study and demonstrates transit in a pattern that conforms to bowel. The activity may move in both an antegrade and/or retrograde direction within the bowel. However, the key to the diagnosis is that it should move in a pattern that conforms to a bowel loop.

Although Tc-99m labeled RBC scintigraphy is accurate, multiple false positives have been described. For instance, as in our case varices mimicking an active GI bleed have been reported in the literature [4-6]. This case illustrates how a varix can simulate a focus of bleeding if the filling is delayed. To obscure the situation further these varices also often have a tendency to bleed resulting in a true active lower GI bleed [7-9]. Thus, it is feasible that a varix seen on RBC scans may actually be the culprit in a patient's GI bleed. Other potential pitfalls which have been reported include abdominal/gluteal hematomas [10,11], aortic aneurysms [12], and hemangiomas [13]. Hepatic hemangiomas are commonly detected incidentally on Tc-99m RBC studies. Their characteristic appearance is a focus of uptake which appears on delayed views. This is due to increased blood pool activity typical of hemangiomas. These should not be confused with other hepatic lesions such as hepatocellular carcinoma, adenoma, or focal nodular hyperplasia as these other processes should not demonstrate increased uptake on delayed imaging. Patients with coagulopathies or on anticoagulation can pose a special challenge as they tend to have hemorrhage in other regions outside the gastrointestinal tract [14]. If the site of the activity is unclear, then SPECT/CT with fusion may be helpful in detecting the location of uptake and aid in the diagnosis [15, 16].

In summary, Tc-99m labeled RBC scans can be extremely useful in the diagnosis of lower GI bleeding. However, as seen in the case presented, nuclear medicine physicians/radiologists should be aware of potential false positives which may decrease diagnostic accuracy.

TEACHING POINT

Tc-99m labeled red blood cell scans are often the first line study used in the evaluation of lower gastrointestinal bleeds and usually lead to the correct diagnosis. However, there are entities including small bowel varices which can simulate gastrointestinal hemorrhage on nuclear scintigrams which physicians should be aware of in order to minimize potential false positive interpretations.

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FIGURES

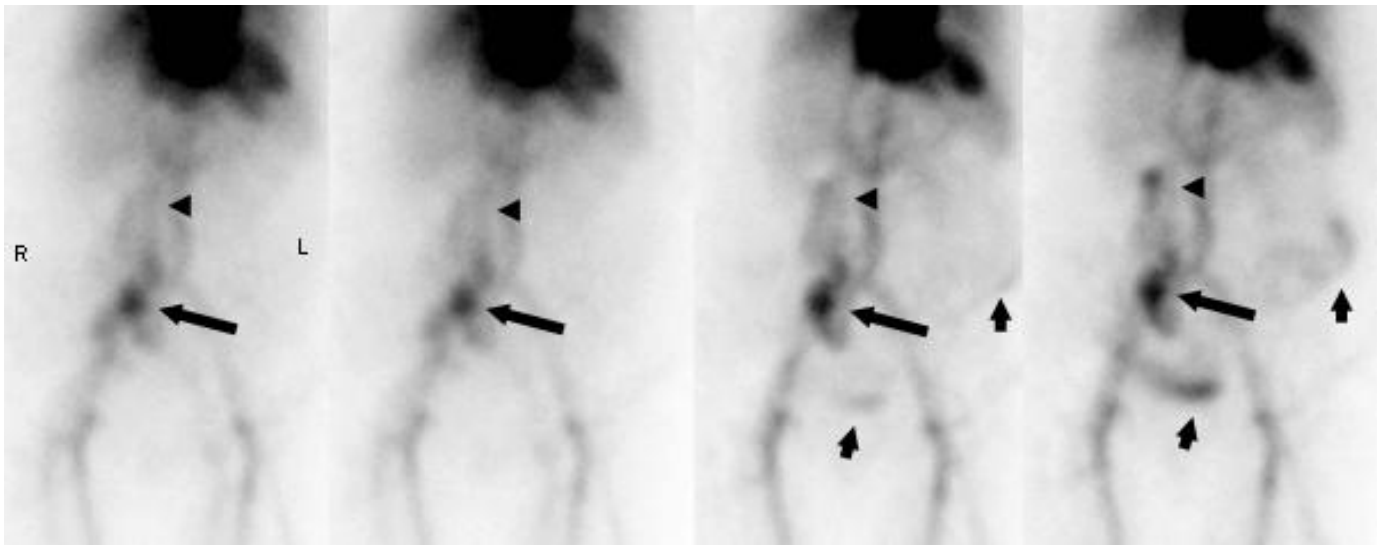

Figure 1: 87 y/o female with hematochezia. Images from dynamic RBC scintigraphy using 35 mCi of Tc-99m demonstrates a focus of increased radiotracer activity in the right lower quadrant (long arrows) which appears to transit in the abdomen in a pattern compatible with small bowel (arrowheads). There was also milder uptake in the left abdomen (short arrows) due to collateral vessels. Tracer accumulation in bladder (white arrows).

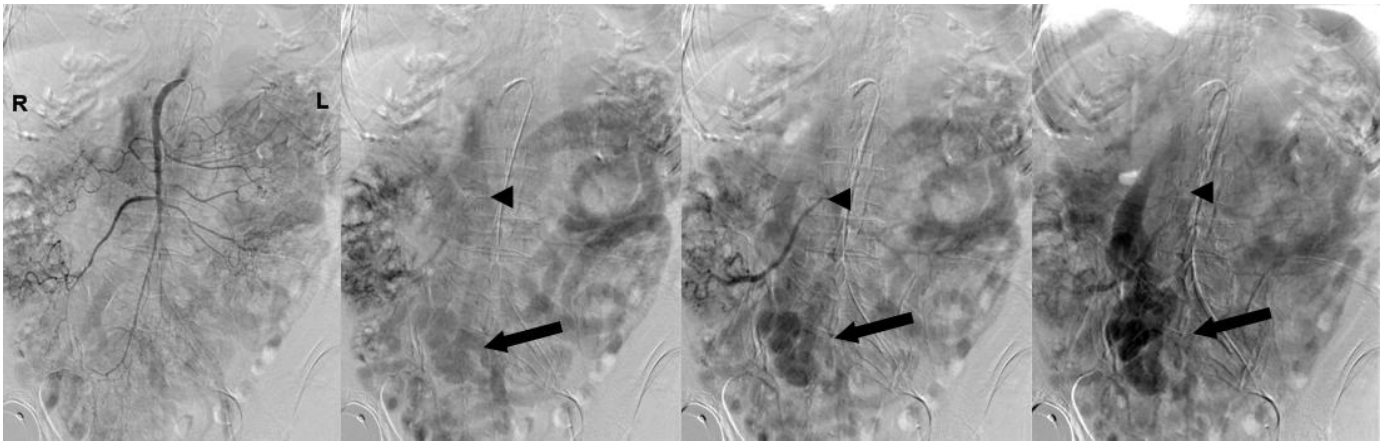

Figure 2: 87 y/o female with hematochezia. Progressive images of a SMA arteriogram demonstrating prominent ileal varices in the right lower quadrant (arrows) on the venous phase. The varices extend into the right upper quadrant (arrowheads). Notice how the contrast enhancement of the varix increases throughout the course of the study and is most intense on the last frame of the angiogram.

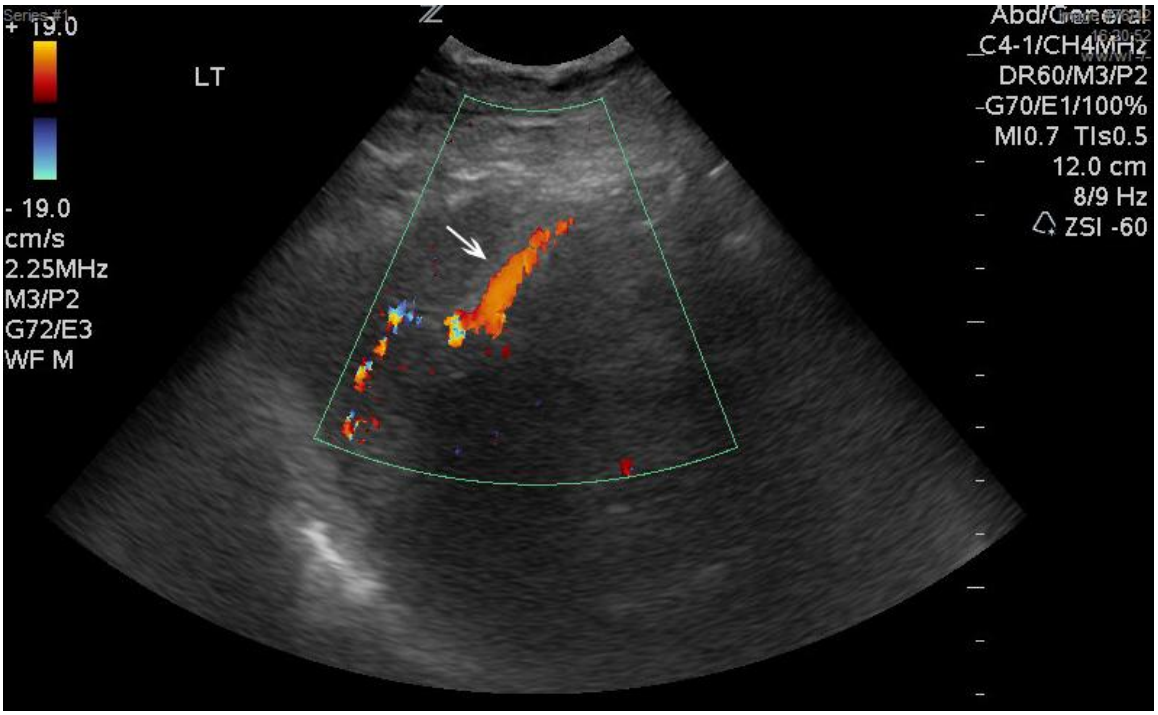

Figure 3: 87 y/o female with hematochezia. Single color Doppler ultrasound image of the liver using a curved array transducer (4MHz) centered in the region of the falciform ligament demonstrates flow consistent with a recanalized umbilical vein (arrow). This is indicative of portal hypertension, the likely etiology of the varices.

Etiology	Multiple etiologies from diverticulosis, angiodysplasias, ischemia, neoplasm, inflammatory bowel disease, radiation colitis, hemorrhoids, Meckel's diverticulum.
Incidence	20.5 patients per 100,000
Gender ratio	Slightly more common in men
Age predilection	Incidence greater in elderly
Risk factors	Coagulopathy, anticoagulants
Treatment	Conservative, angiographic intervention, endoscopic intervention, surgery
Prognosis	Depends on amount of bleeding
Findings on Imaging	Tc-99m RBC- increased focus of radiotracer Multiphase CT with contrast - progressive accumulation of contrast within bowel lumen Angiography - contrast extravasation on arteriogram SPECT/CT - increased focus of radiotracer

Table 1: Summary table for lower GI bleed

Disease	**Scintigraphy**	**Angiography**	**CT with contrast**	**SPECT/CT**
Lower GI bleed	Progressive accumulation of radiotracer activity that follows bowel contour	Contrast extravasation on arteriogram	Progressive accumulation of intraluminal contrast	Focus of increased radiotracer within the bowel lumen
Varices	Increased focus of radiotracer that does not progressively increase or conform to bowel peristalsis	Prominent vessels with +/- collateral circulation	Contrast within prominent vasculature	Focus of radiotracer within vasculature
Hematoma (abdominal / retroperitoneal)	Increased focus of radiotracer that does not increase or conform to bowel peristalsis	Extravasation of contrast into hematoma if there is active bleed. Mass effect due to hematoma.	Fluid collection/mass in retroperitoneum or abdominal wall	Radiotracer activity in fluid collection outside of bowel in retroperitoneum or abdominal wall
Aneurysm	Focus of radiotracer activity that does not increase or follow bowel peristalsis	Dilated aorta or iliac arteries	Dilated abdominal aorta or iliac arteries	Radiotracer activity in dilated aorta or iliac arteries
Hemangioma	Early focal defect with delayed persistent filling. Does not conform to bowel.	Dense opacification with pooling of contrast. May retain contrast beyond venous phase	Early peripheral enhancement with progressive centripetal filling of liver lesion.	Radiotracer activity within a liver lesion.

Table 2: Differential table for increased focus of tracer activity on Tc-99m RBC scan.

ABBREVIATIONS

CT - computed tomography
GI - gastrointestinal
RBC - red blood cell
SMA - superior mesenteric artery
SPECT - Single photon emission computed tomography
Tc-99 - technetium 99

KEYWORDS

Varices; gastrointestinal bleed; Tc-99m; portal hypertension