

An Unusual Appearance of Meckel's Diverticulum as a Site of Bleed on Gastrointestinal Bleeding Scan

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Abstract

Lower gastrointestinal (GI) hemorrhage is a frequently encountered and challenging clinical problem. GI bleeding scans are extremely useful for localizing the source of GI bleeding before interventional radiology procedures. It is essential that physicians understand the numerous possible pitfalls when interpreting these scans. Understanding the potential causes of false-positive scan interpretation eliminates unnecessary procedures for the patient and minimizes costs. We report a rare case of an 8-year-old boy who presented with GI bleeding. Upper and lower GI endoscopy did not reveal a source of bleeding. We emphasize case of Meckel's diverticulum appearing as a proximal jejunum false-positive site of bleed on bleeding scan. In addition, we reinforce the criteria needed for diagnosis of GI bleeding site on the nuclear bleeding scan. A high index of suspicion is the most important diagnostic aid that can prevent the nuclear medicine physicians from misdiagnosing the site of lower GI hemorrhage.

Keywords: Chronological site of bleed, distal ileal bleed, meckel's diverticulum

Introduction

Gastrointestinal (GI) bleeding is a serious emergency, which carries a 2-10% mortality rate, depending on the site and nature of hemorrhage. Angiography can be diagnostic and therapeutic for GI bleeding but only if there is an active hemorrhage at the time of imaging. Because GI bleeding is often intermittent and the clinical signs of active bleeding are often not reliable or may develop after the hemorrhage has ceased, the tagged red cell scintigram has become an important pre-screening tool before angiography. The scintigram has the advantage of being non-invasive and offering prolonged monitoring time, which is more likely to catch the active bleeding, even if it is intermittent. The advantages of Radionuclide scintigraphy include it is safe, highly sensitive, non-invasive, provide continuous monitoring, being well-tolerated, easy to perform, requires no patient

preparation and it provides prognostic information. The origin of the bleed is helpful for determining the initial catheter placement at angiography and is critical for directing a surgical approach if emergency resection is required. The physician may request a nuclear study before angiography is performed to confirm active bleeding, to determine the general location and severity of the hemorrhage. We are presenting an interesting case of distal ileal bleeding but appearing as proximal jejunum as the primary site of bleed on GI bleed scan. Subsequently, it confirmed to be a Meckel's diverticulum as site of bleed on radionuclide Meckel's scan, computed tomography (CT) scan and also intra-operatively. Here, we review the clinical entity of lower GI bleeding for its clinical diversity and diagnostic difficulties.

Case Report

The case is about a patient a 8-year-old boy with a history of intermittent GI bleeding, was referred to our department for red blood cell (RBC) labeled ^{99m}Tc GI bleed scan. He was pale on examination. Upper and lower GI endoscopy did not reveal a source of bleeding.

After *in vivo* labeling of RBC's with 15 mCi of $^{99m}\text{TcO}_4$, dynamic blood flow images followed by sequential static

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images of the abdomen and pelvis were obtained for 24 h, using a dual head gamma camera, equipped with a parallel hole low energy high resolution collimator. At first, dynamic flow images were obtained, 0.5 s per frame for 1 min, then 1 min per frame for 60 min, subsequently static images were acquired every 30-45 min up to 24 h. Flow images [Figure 1] showed abnormal flow of tracer in the left abdomen, jejunum appearing as proximal site of bleed and distal ileum as chronological first site of bleed. The pooling of tracer in the left abdomen increased in subsequent dynamic and static images and moved it to right abdomen [Figures 2 and 3].

After 48 h 10 mCi of TcO₄ was administered and sequential anterior-posterior abdominal images were obtained over the course of 30-60 min, which showed an abnormal focus of tracer in the right lower abdomen [Figure 4]. The patient underwent CT scan [Figure 5], open surgery and diagnosis of Meckel's diverticulum confirmed. Following treatment GI bleeding stopped completely.

Discussion

In approximately 5% of all patients with GI hemorrhage standard evaluation with esophagogastroduodenoscopy and colonoscopy will not reveal a specific bleeding site.^[1,2] The source of bleeding in these patients in 9% of cases is the small intestine and the source remains undiagnosed in 6% of patients.^[3] Besides benign unusual site of bleeding, the small intestine is relatively less accessible than are the stomach and colon.^[4] For this reason, any patient with obscure GI bleeding should undergo a thorough evaluation so that a diagnosis can be reached without excessive delay. The clinical findings for active GI hemorrhage are often unreliable

and misleading. Though the common presentations of lower gastrointestinal bleeding (LGIB) are hematochezia, rectorrhagia, melena, hemodynamic instability, anemia and abdominal pain, the patient's age affects the clinical approach to LGIB.

Endoscopy and angiography provide accurate localization of bleeding sites and potentially therapeutic control. The diagnostic accuracy of colonoscopy ranges from 72% to 86% in the setting of LGIB.^[5] Technetium-bleeding scan may be used to diagnose to confirm active bleeding, to determine the general location and severity of the hemorrhage.

Scintigraphy with labeled RBCs is complementary to endoscopy and angiography because it permits continuous monitoring over hours. This is a major advantage since most GI bleeds are intermittent-episodic and therefore frequently missed. Sites of active bleeding are identified by the accumulation and movement of labeled RBCs within the bowel lumen. GI bleeding scintigraphy can detect bleeding rates as low as 0.1-0.35 ml/min.^[6-9] The goals of GI bleeding Scintigraphy are to locate the bleeding site and to determine who requires aggressive treatment versus those who can be medically managed. In some patients, the bleeding site is identified with sufficient confidence for specific surgical intervention. If bleeding is detected, the site is usually localized well enough to direct the next diagnostic test (e.g., endoscopy or arteriography).

There are numerous causes of false-positive and false-negative interpretation of GI bleeding scans. Understanding the full spectrum of potential pitfalls is necessary to avoid bleeding scan misinterpretation. We

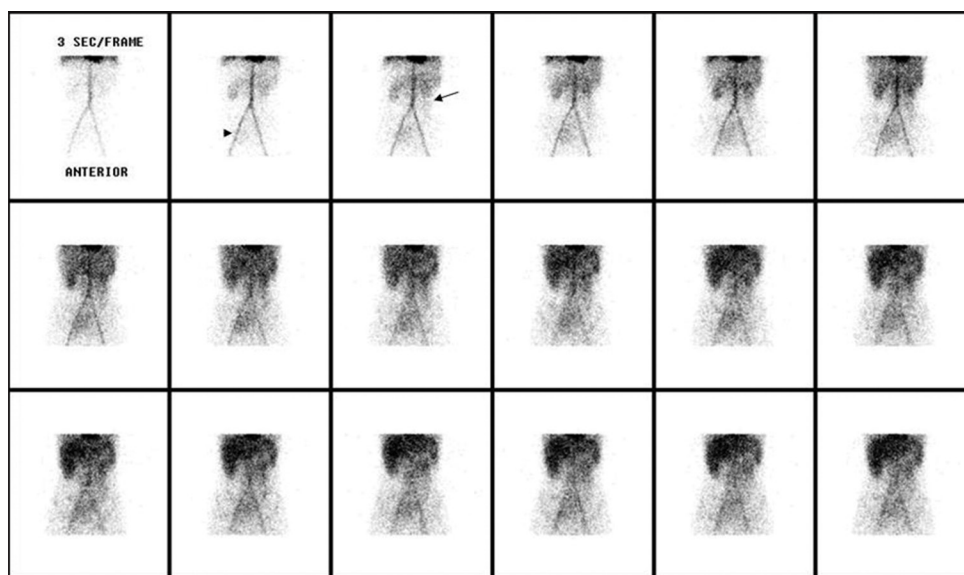


Figure 1: Flow images of red blood cell labeled 99m-Tc gastrointestinal bleed scan: Chronological first site of bleed localized to distal ileum (arrow head) and proximal jejunum as primary site of bleed (arrow)

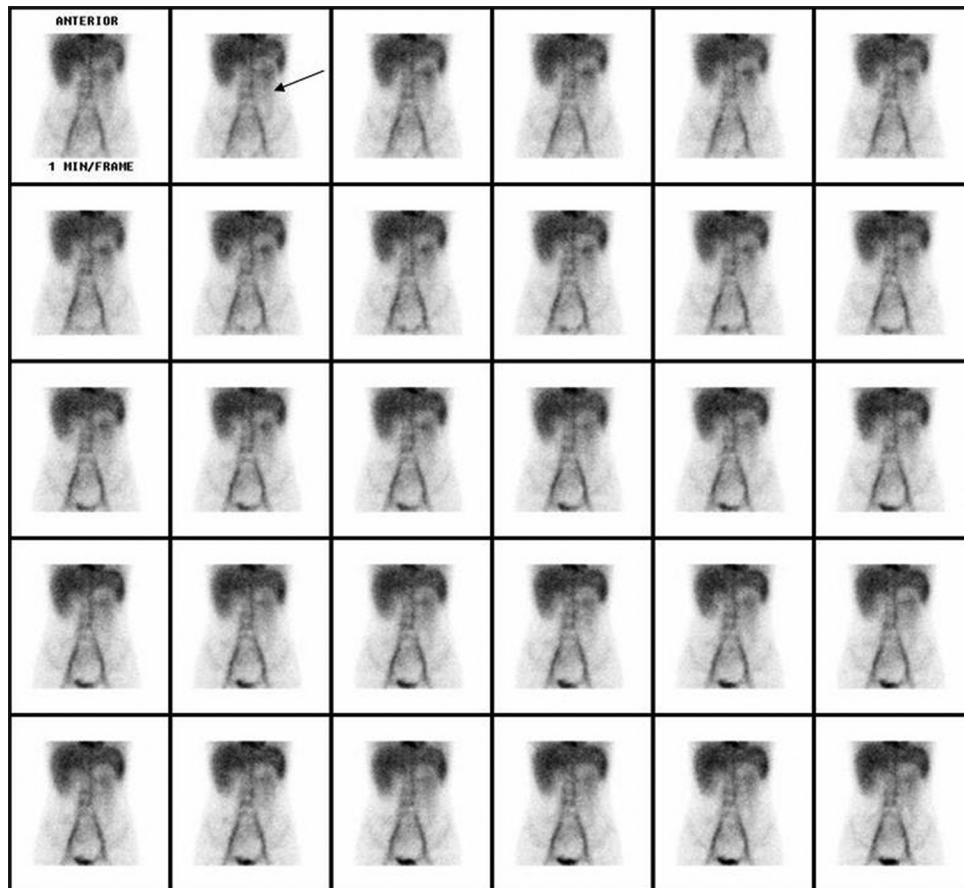


Figure 2: Dynamic blood pool images of red blood cell labeled 99m-Tc gastrointestinal bleed scan: Increase in intensity of bleed in the left abdomen

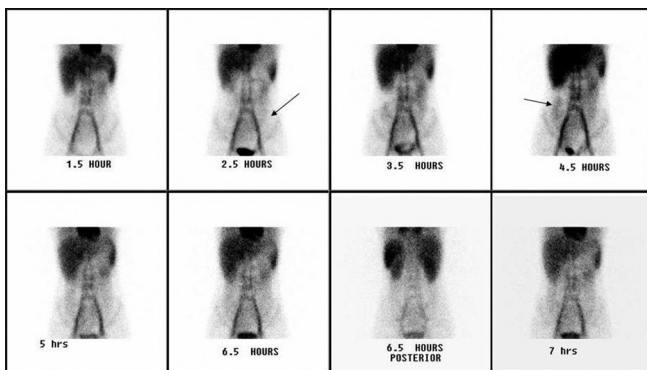


Figure 3: Delayed static images of red blood cell labeled 99m-Tc gastrointestinal bleed scan: Tracer moving distally in the intestine

stress strict adherence to the four criteria's necessary for diagnosing bleeding on a nuclear bleeding scan. First, tracer must appear where no tracer was present before. Second, the tracer must persist or increase in intensity throughout the duration of the study. Third, the tracer must move antegrade, retrograde, or both^[10,11] and most important it should be the chronologically first site of bleeding. After bleeding has been identified to occur in the colon, based on motion of the extravasated blood in the lumen, its location in either the small or

large bowel should be determined. The small bowel is centrally located and extravasated blood appears to progress rapidly distally through a series of small curvilinear segments on sequential imaging. In contrast, large bowel bleeding is generally peripheral in location and progresses in a more elongated pattern on sequential imaging, often with visualization of well-defined haustrations. Finally, within the large or small bowel, the precise origin of bleeding should be determined based on identifying the geographic location of the chronologically initial site of bleeding visualized, rather than the most proximal site of blood identified. This distinction is required due to the tendency of blood to move in a retrograde as well as an antegrade direction, stimulated by its cathartic properties. In contrast, static areas of abnormality generally represent other physiologic and pathophysiologic processes, such as varices, excreted renal activity, or areas of inflammation or tumor blush. Occasionally, the static area of abnormality may reveal the underlying pathology responsible for the bleed, although movement of extravasated blood is not seen during the study. In this case, the bleeding scan demonstrates moderately increased tracer concentration in the left upper quadrant of the abdomen (proximal jejunum) at the initiation of imaging and which met all

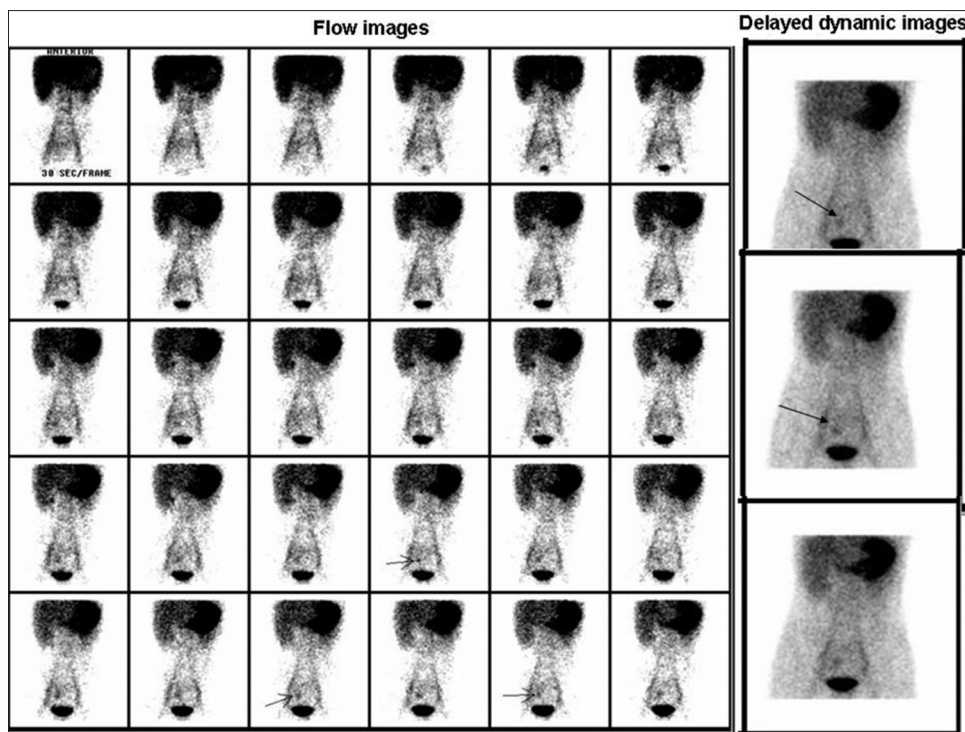


Figure 4: 99m-Tc pertechnetate Meckel's scan images: Abnormal focal tracer concentration visualized in right lower abdomen (arrow) at the same time of stomach visualization and shows increase in intensity in subsequent images

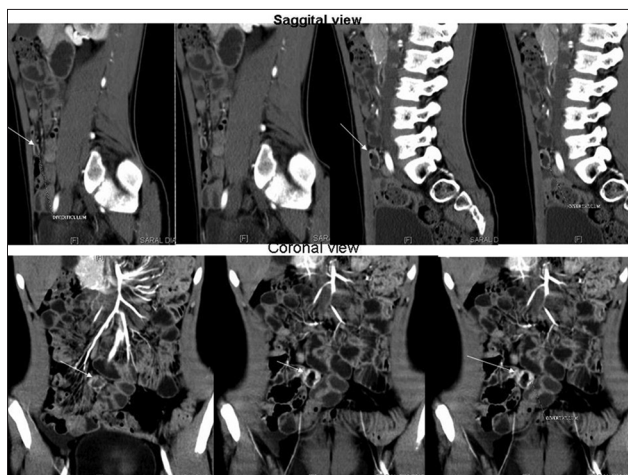


Figure 5: Sagittal and coronal reconstruction of abdominal computed tomography scan shows Meckel's diverticulum (arrow). No other pathological abnormality was diagnosed

initial three criterions but fourth criterion is not met. However, chronologically first site of bleeding was localized to distal ileum. Frequent images (1 images every 10-60 s) will increase the accuracy of localizing the bleeding site. In many current protocols, red cell imaging is performed upto 90 min, based on early clinical studies that suggested that the yield of positive studies will plateau by that time, detecting 83% of all active hemorrhage.^[12] These cells have a half-life of about 24 h and therefore, sequential scans may be performed till 24 h to increase the probability of identifying the bleeding site.

Occasionally bleeding scintigraphy has been combined with anticoagulation to increase diagnostic yield.^[13]

In comparison with radionuclide studies, angiography is approximately 10-fold less sensitive for detecting bleeding. It is an invasive procedure, which can result in complications including contrast-induced renal failure, arterial injury and mesenteric ischemia. The accuracy of this procedure can be quite variable; it detects only active bleeding and may miss lesions that bleed intermittently. When arteriography is used in association with a technetium-99m-tagged RBC, the sensitivity of the arteriogram is increased to 61-72%.^[9] An "immediate blush" (positive scan) on technetium-99m-tagged RBC scans have 60% positive predictive value for an associated positive angiogram.^[14] A "delayed blush" correlated with a predictive value of 93% for a negative angiogram. This finding suggests that a positive "immediate blush" is a good indication for urgent angiography or surgery, while a delayed blush or negative technetium-99m-tagged RBC scan is an indication for observation and elective colonoscopy.^[14,15] Helical CT combined with angiography, capsule endoscopy, push enteroscopy and or barium radiography (small-bowel follow-through or enteroclysis) may have a role in evaluating obscure sources of bleeding.

We highly recommend that any available radiographic imaging modality should be correlated when interpreting bleeding scans. In this case, the technetium-99m

perchnetate Meckel's scan (reported sensitivity, approximately 75-100%),^[16] CT scan and inter-operative findings confirmed Meckel's diverticulum as the cause of bleeding.

In summary, lower GI bleeding is a challenging clinical problem that requires a detailed and systematic approach. We described a patient presenting with bleeding in the lower GI tract and the Meckel's diverticulum was identified as the bleeding source. Radionuclide scintigraphy for detection of GI bleeding leverages nuclear medicine's ability to monitor physiologic and pathologic process in a non-invasive manner. Scintigraphy is an adjunct to endoscopy or angiography methods due to the intermittent nature of GI bleeding and to the difficulty of endoscopic evaluation of acute/massive bleeding. Proper performance and interpretation of images depends on a sound understanding of the principles of the examination, which we have reviewed here. A high index of suspicion is the most important diagnostic aid that can prevent physicians from overlooking the possibility that lower GI hemorrhage may have such an unusual source and nuclear medicine physicians to misdiagnosing the site of bleeding.

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