J of Nuclear Medicine Technology, first published online November 10, 2017 as doi:10.2967/jnmt.117.198531

Title: Pelvic Meckel's Diverticulum Mimicking Bladder on Meckel Scan; The Impact of Quality Control and Technical Issues

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Word Count:

We received no financial support. No conflict of interest is declared.

Running title: Pelvic Meckel's Diverticulum Mimicking

Abstract: Quality control and technical issues are essential for high-quality imaging. An important technical parameter of image acquisition is selecting zoom factor according to camera field-of-view dimensions and patient's body size. Here, we present a case of atypically located Meckel's diverticulum mimicking bladder on Meckel scan.

Keywords: Meckel's diverticulum; Meckel scan; technical issue; bladder.

Introduction: Meckel scan is one of the valuable diagnostic procedures in nuclear medicine *(1)*. As other scintigraphic procedures, the quality of performing scan and patient-by-patient selection of appropriate imaging parameters by the technologist are vital and directly influence the final interpretation *(1)*. Here, we present a case of young adult male with intermittent rectal bleeding referred to our department for a Meckel scan. During the acquisition of dynamic phase, because of not covering the entire abdominopelvic region by the detector and atypical location of Meckel's diverticulum, the abnormal hyperactive focus was similar to patient's bladder.

Case report: A 19-year-old male presented with the complaints of abdominal pain and occasional severe rectal bleeding from three weeks before admission to the intensive care unit. At the initial laboratory tests, very low hemoglobin (Hg = 6 gr/dl) was detected. Emergent colonoscopy was performed which was not diagnostic because of excessive blood in the colon. Then, a Meckel scan was requested. The scan was performed with close monitoring of the patient by using an SHG-ADAC gamma camera. Images were obtained from anterior abdomen and pelvis in angiographic and one-hour dynamic phases after intravenous administration of 370 MBq of ^{99m}Tc-pertechnetate. A matrix size of 128*128 and a zoom factor of 1.46 were selected. Angiography (Fig. 1) was unremarkable but one-hour dynamic image (Fig. 2) revealed a focal zone with gradual accumulation of radioactivity in midpelvis which moved slightly and slowly from right to left during the second half of the dynamic phase. After completion of the dynamic scan, anterior and lateral spot views from pelvis were also obtained, in that another

focal zone of intense radioactivity accumulation was noted inferiorly, which was the patient's bladder (Fig. 3). One day later, the patient underwent pelvic surgery for resection of possible Meckel's diverticulum. Pathological investigation confirmed the diagnosis.

Discussion: There are a number of reports of false negative Meckel scans in the literature, of which some causes are technical *(1,2)*. Limited field-of-view is an important technical cause that leads to incomplete coverage of the desired region-of-interest (e.g., thoracic or abdominopelvic region). This issue is more problematic in dynamic studies. As in the present case, a small portion of lower pelvis was out of camera field-of-view. A less experienced technologist or physician may not notice this issue. Therefore, misleading results will occur. Although we are aware that some clues are in the present case that imply the visualized focus is atypical for being the bladder (e.g., very early visualization, gradual movement during the scan and remaining in the same size until the end of the scan).

Meckel's diverticulum is a congenital malformation of gastrointestinal tract resulting from failure of omphalomesenteric duct closure. In about 10%-60% of diverticula contain gastric mucosa which are able to secrete acid and enzymes. Bleeding as a major complication of Meckel's diverticulum, occurs following irritation and ulceration of intestinal mucosa. Bleeding is more common in children but also occurs in adults. In some cases, it can be very severe or even life-threatening *(3,4)*. Although Meckel's diverticulum is mostly found in right lower quadrant of abdomen, it can be located anywhere in the abdomen or pelvis *(5)*.

In this regard, in order to have high-quality images, the technologist must be aware to accurately estimate the boundaries of body regions and to set the zoom factor in accordance with camera field-of-view dimensions and patient's body size, especially in tall adult patients. Taking multiple overlapping static spot views or additional lateral or oblique views can be a solution to this problem in some cases.

Conclusion: This case emphasizes multiple factors including technical ones that are essential to have images of high quality. The technologist must check the image before the patient leaves the department. This will prevent repeat of scan or incorrect interpretation.

Disclosure: We received no financial support. No conflict of interest is declared.

References:

1. Spottswood SE, Pfluger T, Bartold SP, et al. SNMMI and EANM practice guideline for meckel diverticulum scintigraphy 2.0. *J Nucl Med Technol.* 2014;42:163-169.
2. Sfakianakis GN, Conway JJ. Detection of ectopic gastric mucosa in Meckel's diverticulum and in other aberrations by scintigraphy: I. Pathophysiology and 10-year clinical experience. *J Nucl Med.* 1981;22:647-654.
3. Martin JP, Connor PD, Charles K. Meckel's diverticulum. *Am Fam Physician.* 2000;61:1037-1042, 1044.
4. Grady E. Gastrointestinal Bleeding Scintigraphy in the Early 21st Century. *J Nucl Med.* 2016;57:252-259.
5. Uppal K, Tubbs RS, Matusz P, Shaffer K, Loukas M. Meckel's diverticulum: a review. *Clin Anat.* 2011;24:416-422.

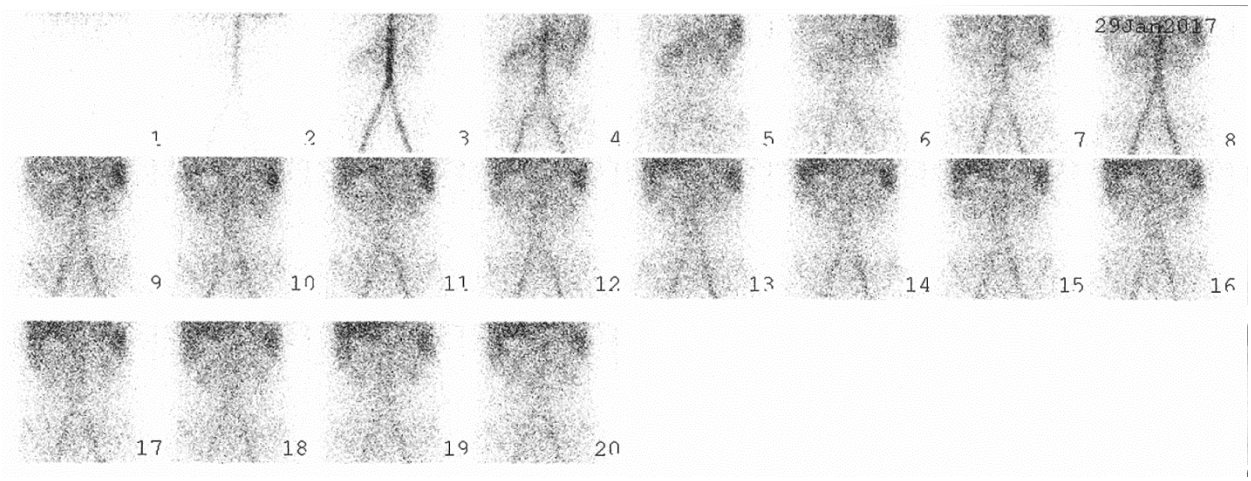

FIGURE 1. Angiography from the abdomen was unremarkable.

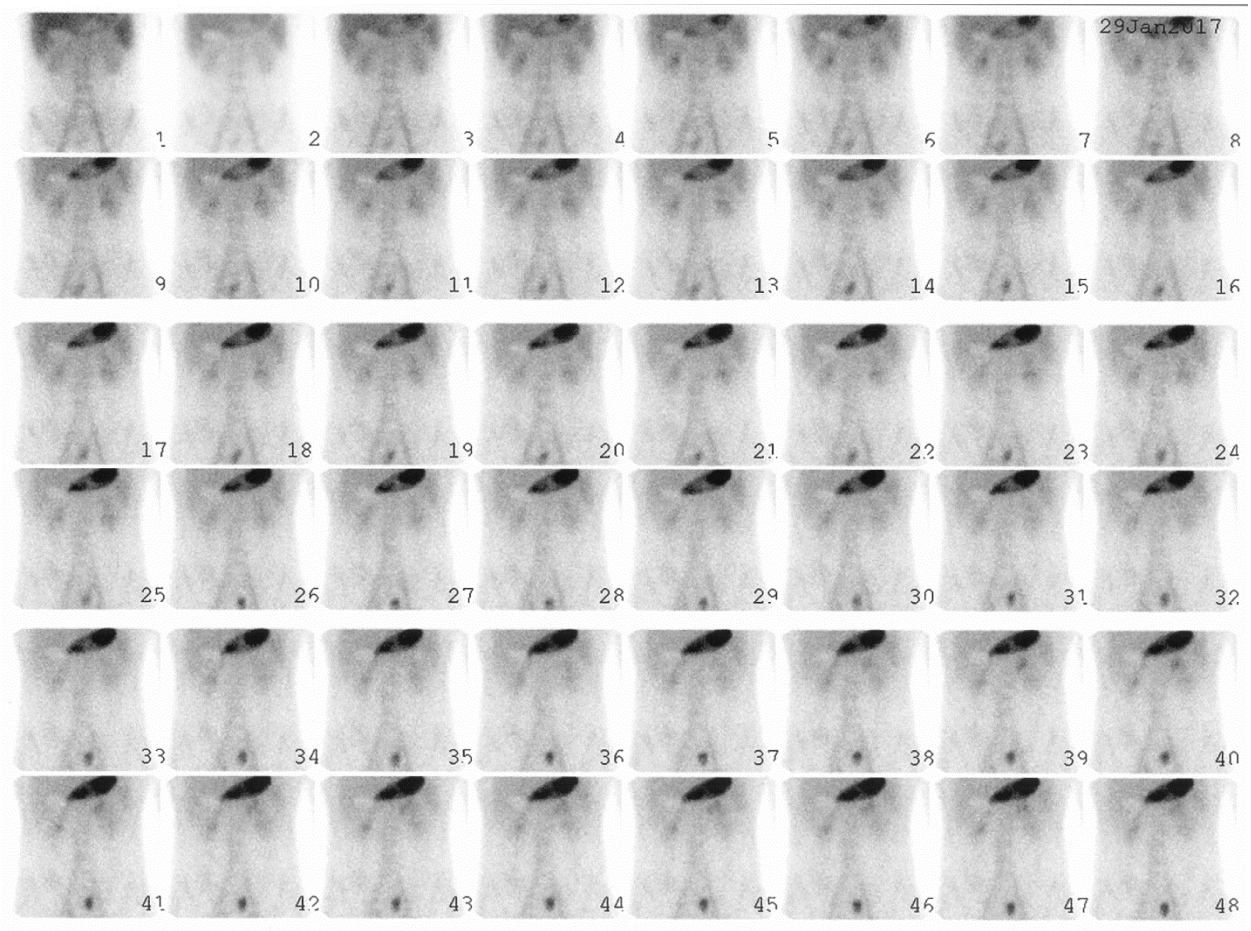

FIGURE 2. Dynamic scan with 1-minute framing rate was acquired for one hour. Note the hyperactive focus in midpelvis.

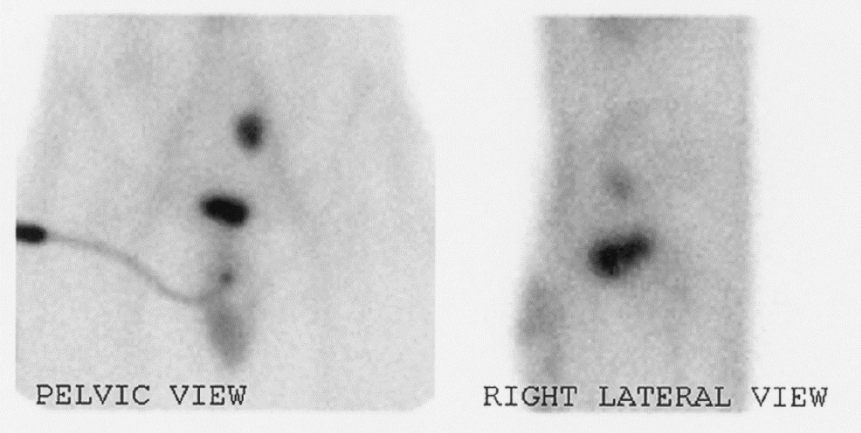

FIGURE 3. Anterior (left) and right lateral (right) images of pelvis; Note the bladder inferior to the mentioned hyperactive focus.