Radioguided Surgery for Meckel Diverticulum

Nuclear Medicine Aspects

Eva Medaer, MD, Marc Miserez, MD, PhD,† Gert De Hertogh, MD, PhD,‡ Koen Van Laere, MD, PhD, DrSc,* and Christophe M. Deroose, MD, PhD**

Abstract: We present the case of a 13-year-old boy with bleeding complications from a Meckel diverticulum (MD), which was scintigraphically confirmed. A first exploratory laparoscopy was unsuccessful in identifying the diverticulum. A new ^{99m}Tc-pertechnetate scintigraphy (including SPECT/CT), 3 years later, suggested the anatomical location and was helpful during the surgical exploration for the MD by radioguided surgery. Radioguidance is helpful in pathologies characterized by small size or variable anatomical location. A MD with ectopic gastric mucosa can be distinguished from the rest of the small bowel based on selective ^{99m}Tc-pertechnetate uptake in the gastric mucosa, with limited background activity.

Key Words: Meckel diverticulum, radioguided, surgery

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From the *Division of Nuclear Medicine and Departments of †Abdominal Surgery and ‡Pathology, University Hospitals Leuven, Leuven, Belgium.
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Correspondence to: Christophe M. Deroose, MD, PhD, University Hospitals Leuven, Herestraat 49, 3000 Leuven, Belgium. E-mail: christophe.deroose@uzleuven.be.

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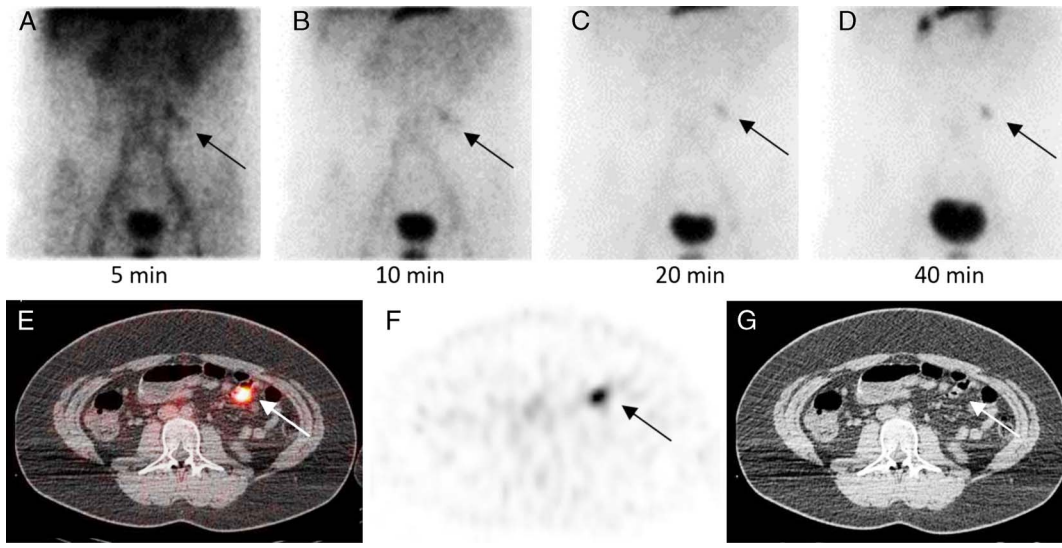

FIGURE 1. We present the case of a 13-year-old-boy with bleeding from a Meckel diverticulum (MD) that was scintigraphically confirmed. A first exploratory laparoscopy was unsuccessful in identifying the diverticulum; hence, a conservative treatment was proposed. Because of recurrent bleeding 3 years later, a new Meckel scintigraphy was performed. Preparation was performed with an intravenous infusion of 50 mg ranitidine over 20 minutes and imaging 1 hour later. The anterior planar images at 5, 10, 20, and 40 minutes after injection of 260 MBq of ^{99m}Tc-pertechnetate (**A**–**D**) showed focal tracer accumulation with increased intensity over time, left of the midline in the umbilical region. Additional SPECT/CT imaging (Symbia T; Siemens, Munich, Germany) (**E**–**G**) localized the focus on an anterior small bowel loop. The lesion-to-background uptake ratio was 10.4. For reference, the gastric-to-lesion uptake ratio was 2.5.

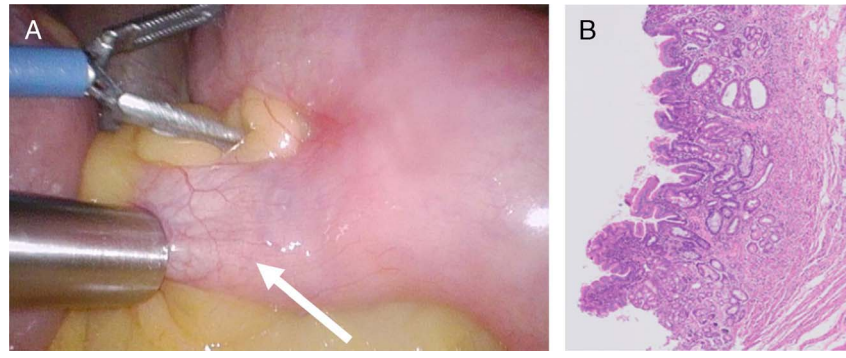

FIGURE 2. This MD was a good indication for radioguided surgery, based on the selective ^{99m}Tc-pertechnetate uptake in the ectopic gastric mucosa, with limited background activity in the small bowel. A radioguided laparoscopy was performed after injection of 250 MBq of ^{99m}Tc-pertechnetate the same day. Upon negative visual inspection, a gamma detection probe for endoscopic use (RadPointer-Gamma; Forimtech SA, Geneva, Switzerland) with a 10-mm outer diameter was used. The stomach, with high physiological ^{99m}Tc-pertechnetate uptake had a count rate of ~4000 counts per second (cps). Along the ileum, ~400 cps were registered. At about 50 cm from the ileocecal valve, a zone with a moderately higher count rate of 1000 to 1200 cps was detected. During further surgical exploration of this area (**A**), a diverticulum was found surrounded by fatty tissue, which masked it from detection at the initial visual inspection. The in vivo lesion-to-background uptake ratio was 2.5. The diverticulum was resected, and the diagnosis was histopathologically confirmed. The diverticulum consisted of all bowel wall layers and contained ectopic corpus-type gastric mucosa, with long gland structures covered with parietal and zymogenic cells, without atypia, as shown by hematoxylin-eosin stain (**B**). The patient was discharged 2 days after surgery and remained asymptomatic to date. The ^{99m}Tc-pertechnetate scan is an established technique for the diagnosis and localization of MD.[1] The use of SPECT/CT can improve diagnostic accuracy of scintigraphy as it is more sensitive (higher signal-to-background ratio) and allows better anatomic location of the lesion, facilitating the surgical approach. Recent advances in gamma probe design have allowed developing laparoscopic probes. Nowadays, there is great interest to use radioguidance for detection of tumoral cells.[2–5] These can also be useful in case of an MD and other types of lesions that are difficult to identify at surgery by their small size or variable anatomical location.[6–9] Laparoscopic radioguided surgery allows in some cases more conservative surgery, with all its known benefits.[10] The major pitfall in detecting an MD is secreted ^{99m}Tc-pertechnetate from the gastric mucosa, which will gradually migrate through the small bowel. This case shows that radioguided laparoscopy can be considered in patients with positive Meckel imaging if previous surgery was unsuccessful.