

## Oncology

## Detection of a Meckel's diverticulum on PSMA PET/CT: A case report



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## ABSTRACT

Meckel's diverticulum is the most common congenital malformation of the gastrointestinal tract. In this report, we present a patient with a Meckel's diverticulum that was incidentally discovered on prostate-specific membrane antigen positron emission tomography/computed tomography (PSMA PET/CT) imaging performed for prostate cancer staging. We discuss hypotheses for why the Meckel's diverticulum showed high uptake of PSMA-targeted radiotracer and the clinical implications of this finding.

## Introduction

Prostate cancer is the second leading cause of cancer-related deaths among men in the United States. The management of prostate cancer depends on accurate staging. Prostate-specific membrane antigen positron emission tomography/computed tomography (PSMA PET/CT) is a functional imaging modality that takes advantage of the highly specific increased PSMA expression by higher-grade tumor cells and has developed an increasingly important role in staging.

Non-specific sources of PSMA PET/CT signal can complicate imaging interpretation. Because PSMA-targeted radiotracers are renally excreted, tracer uptake in the urinary tract is common. Furthermore, signal may be seen in the liver, spleen, and bowel due to low physiological PSMA expression and nonspecific tracer excretion.<sup>1</sup> Given concerns about metastatic prostate cancer during staging, nonspecific PET/CT signal may complicate clinical decision making. Here, we report the case of a patient with prostate cancer who presented with a concerning radiotracer-avid extraprostatic focus on PSMA PET/CT which was later determined to be a Meckel's diverticulum.

## Case presentation

A 67-year-old man presented to his urologist with a PSA of 6.8 while on finasteride for benign prostatic hyperplasia. He was found on biopsy to have Gleason Score 4 + 3 = 7 (Grade Group 3) prostate cancer with ductal features. As part of his disease staging, he underwent PSMA PET/

CT which demonstrated two intraprostatic lesions with high radiotracer uptake (Fig. 1). In addition, PET/CT imaging detected an extraprostatic focus of tracer accumulation in the area of the sigmoid colon which was concerning for local metastasis (Fig. 2).

Flexible sigmoidoscopy was performed which found no mucosal abnormalities, masses, signs of external compression of the organ, or any other lesions in the sigmoid colon that corresponded to the positive signal seen in the sigmoid colon on PET/CT. The only notable findings were diverticulosis throughout the colon and a benign 3 mm hyperplastic polyp in the rectum near the dentate line.

The patient was presumed to have clinically localized disease and was scheduled for robotic-assisted laparoscopic radical prostatectomy, with concern about the extraprostatic PET-positive lesion. Given the radiotracer-avid focus' proximity to the bladder, flexible cystoscopy was performed on the day of the operation to rule out possible PSMA radiotracer accumulation in a bladder diverticulum; cystoscopy showed normal bladder mucosa with no masses, foreign bodies, or diverticula. After completion of the prostatectomy, an extensive search was conducted in the pelvis for the source of the positive PET signal, with no obvious lymph nodes or soft tissue masses on initial inspection correlating to the nodular focus seen on imaging. Upon examination of the small bowel, a diverticulum approximately the size of the PSMA-avid focus was identified and resected. Final pathological analysis of the tissue specimen revealed heterotopic gastric tissue and mucosal erosion consistent with a Meckel's diverticulum. On immunohistochemistry using a mouse monoclonal antibody (Catalog #M3620; Agilent Dako,

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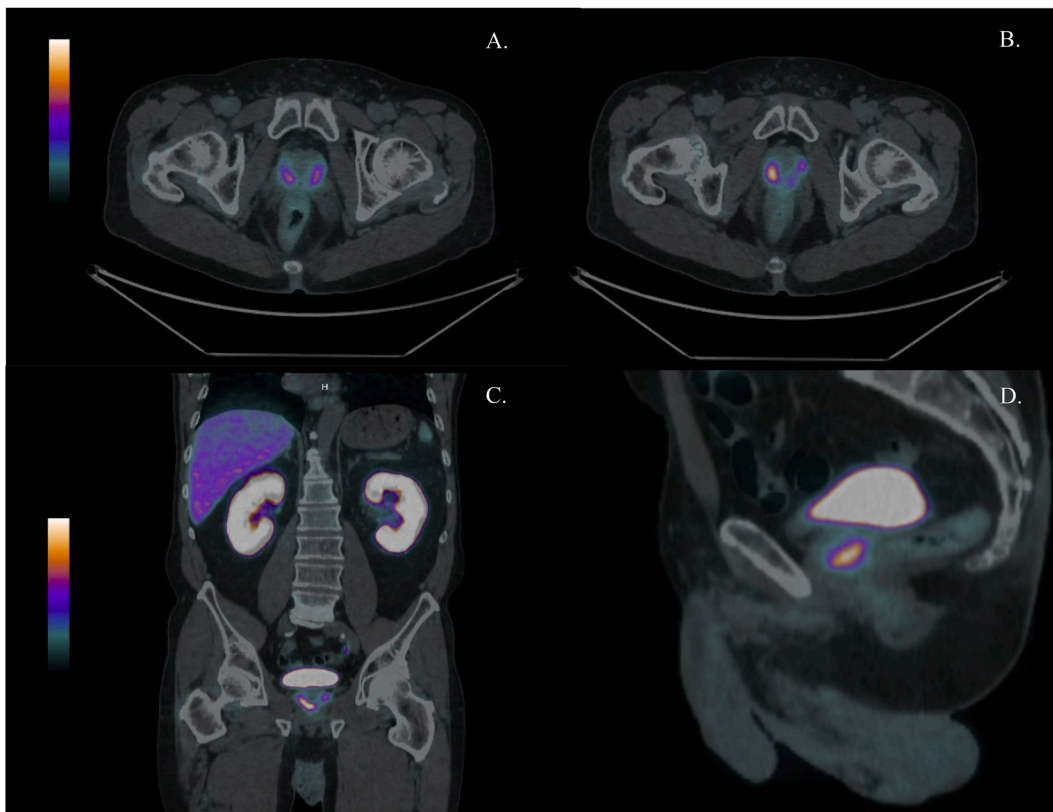
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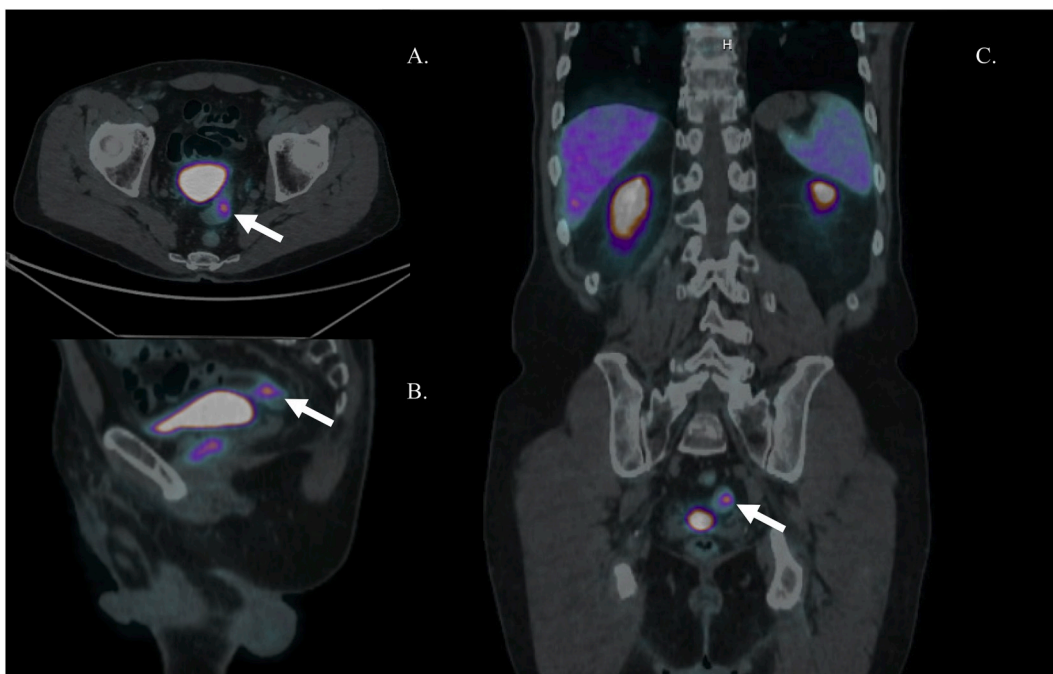
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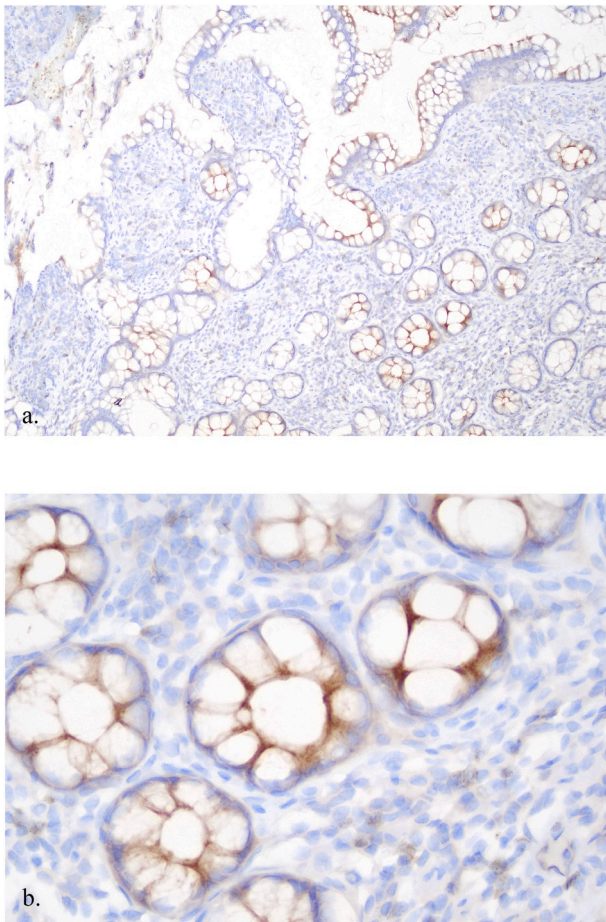
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**Fig. 1.** PSMA PET/CT imaging of prostate lesions. Four cross sections of PSMA PET/CT in axial view (A, B), coronal view (C), and sagittal view (D) showing two prostatic lesions with increased PSMA radiotracer uptake.



**Fig. 2.** PSMA PET/CT imaging of Meckel's diverticulum. Three cross-sections of PSMA PET/CT showing axial (A), sagittal (B), and coronal (C) views of an area of increased radiotracer uptake (white arrow) in the pelvis adjacent to the bladder and in the area of the sigmoid colon, corresponding to the Meckel's diverticulum identified intraoperatively.



**Fig. 3.** Immunohistochemistry for PSMA expression in the mucinous epithelium of Meckel's diverticulum.

Meckel's diverticulum pathological specimen after immunohistochemistry staining for PSMA expression. Membranous PSMA expression (brown stain) was observed in the benign mucinous epithelium (a:100x magnification (a); b: same as "a" 400x magnification. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Santa Clara, CA; dilution 1:100), membranous PSMA expression was detected in the mucosal layer of the Meckel's diverticulum (Fig. 3). This was determined to be the extraprostatic source of increased PSMA uptake seen on initial PSMA PET/CT. His PSA was <0.1 ng/mL at 2 months post-prostatectomy and remained undetectable at 5 months, confirming the absence of overlooked metastatic disease.

### Discussion

Meckel's diverticulum, seen in 2–4% of the population, is the most common congenital malformation of the gastrointestinal tract and arises when the vitelline duct fails to obliterate. It is a true diverticulum, containing all three layers of the bowel wall, and can express a variety of

gastrointestinal tissue.<sup>2</sup> There have been two previous reports of incidentally-detected Meckel's diverticula on PET/CT.<sup>3,4</sup> One of these was similar to our case; they reported a 61-year-old man with Gleason Score 3 + 4 prostate who had a concerning focus on <sup>18</sup>F-fluorocholine PET/CT which was found to be a Meckel's diverticulum.<sup>4</sup>

Here, we presented another case of a Meckel's diverticulum that was incidentally discovered on PET/CT. This is the first reported case of Meckel's diverticulum detection on PSMA PET/CT and of PSMA expression by a Meckel's diverticulum. There are several possible explanations for the observed PSMA expression. First, FOLH1, the gene that encodes the PSMA protein in humans, is widely expressed in the nervous and gastrointestinal systems. It is possible that the Meckel's diverticulum in our patient simply had increased physiologic expression of PSMA by normal bowel tissue. Second, Meckel's diverticula express a range of heterotopic gastrointestinal tissue, including hepatic tissue.<sup>2</sup> Given that moderate intensity PSMA uptake can be seen in the liver, trace amounts of hepatic tissue may have been present in our patient's Meckel's diverticulum.<sup>1</sup> Last, it is possible that PSMA signal originated from the heterotopic gastric tissue identified in our patient's diverticulum. Although increased PSMA expression has been observed in gastric adenocarcinoma,<sup>5</sup> there are no known reports of significant PSMA expression by normal gastric tissue or heterotopic gastric tissue in Meckel's diverticula.

The incidental detection of a Meckel's diverticulum presents a potential pitfall in staging prostate cancer with PSMA PET/CT that may complicate clinical decision making and result in unnecessary ancillary clinical studies.

### Conclusions

In this report, we describe a rare case of incidentally detected Meckel's diverticulum on PSMA PET/CT. Because of the location of PSMA-avidity, there was concern about possible lymph node metastasis or local spread of disease to the bladder or bowel, which was all ruled out by clinical work-up. Given the expanding role of PSMA PET/CT in prostate cancer staging, it is important to recognize that incidental detection of Meckel's diverticulum on PET imaging can complicate imaging interpretation.

### Declaration of competing interest

The authors report no conflicts of interest.

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