Detection of Malignant Middle Sacral Vein Tumor Thrombus in a Recurrent Rectal Cancer Case Using ^{18}F-FDG PET/CT

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ABSTRACT

Tumor thrombus represents an uncommon but clinically significant manifestation of malignancy, most frequently associated with renal cell carcinoma and hepatocellular carcinoma. In colorectal cancer, venous tumor thrombus is exceedingly rare and often underrecognized, with potential implications for staging, prognosis, and therapeutic planning. In this report, a case of carcinoma rectum is presented with FDG-avid tumor thrombus, highlighting the diagnostic utility of PET/CT in this unusual clinical scenario. This case demonstrates the distinct diagnostic advantage of 18F FDG PET/CT, where its high sensitivity for metabolic activity uniquely differentiates malignant tumor thrombus from bland post-radiation fibrosis or lymph node—a critical distinction that anatomical imaging alone frequently fails to achieve.

Keywords: Tumor thrombus, colorectal cancer, FDG PET/CT

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INTRODUCTION

Colorectal cancer (CRC) is the third most common cancer worldwide and the second leading cause of cancer-related deaths (1). Venous tumor thrombi are rare in colorectal cancer, found in only 1 to 2% of patients (2). Conventional CT imaging frequently struggles to differentiate between post-treatment fibrosis and active malignancy. ^{18}F-FDG PET/CT is routinely performed for localization, staging and assessing treatment response for many solid cancers. However, incidentally seen are venous clots which are difficult to characterize as tumor associated or bland thrombus. This often impacts tumor staging and treatment approach. ^{18}F-FDG PET/CT can confidently differentiate tumor thrombus (characteristically demonstrate linearly oriented FDG avidity) from non-cancerous non FDG avid thrombus (3).

CASE REPORT

A 63-year-old female patient with history of adenocarcinoma of the rectum (Stage T3bN2Mx) was referred for a whole body FDG PET/CT scan. She underwent 8 cycles of neoadjuvant chemotherapy and 30 fractions of radiotherapy, followed by abdominoperineal excision of rectum (APER) in October 2025. Initial post-operative pathology showed a complete pathological response. However, in February 2026, a CT Urogram revealed a pelvic soft tissue mass causing bilateral moderate hydroureteronephrosis with suspected uterine invasion and a suspicious pelvic lymph node. To further evaluate the metabolic activity of this mass and assess for systemic spread, an ^{18}F-FDG PET/CT scan was advised.

A hypermetabolic (SUVmax 4.8) soft tissue mass was identified in the mid-pelvic/presacral region. The mass encased both ureters and showed loss of fat planes with the posterior uterine wall. Low FDG avid (SUVmax 1.2–2.5) abdominopelvic lymph nodes were also seen. Aside from these findings, a distinct, elongated area of marked FDG avidity (SUVmax: 5.0) was identified along the mid-presacral region, which was anatomically localized to the middle sacral vein, highly suggestive of a malignant tumor thrombus.

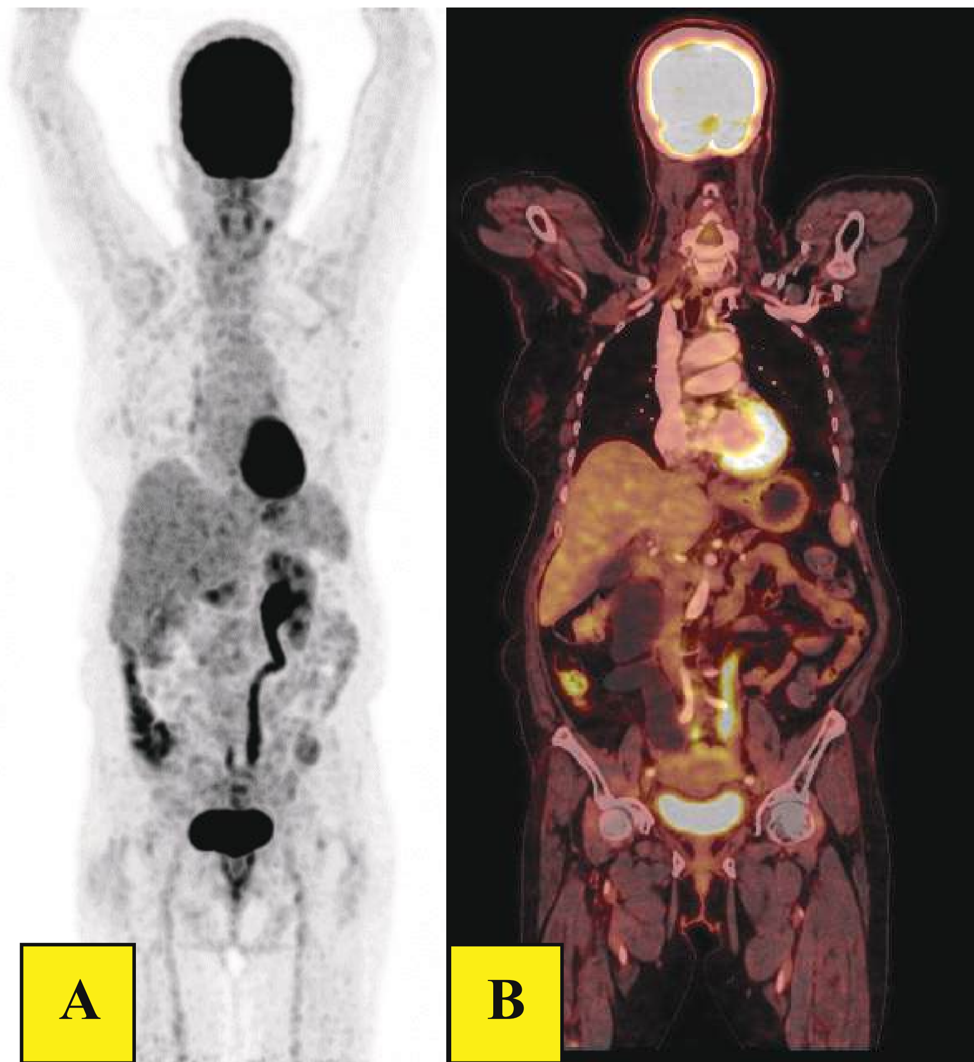

Figure 1: Whole body MIP PET/CT image (A) and coronal views of fused PET/CT images (B).

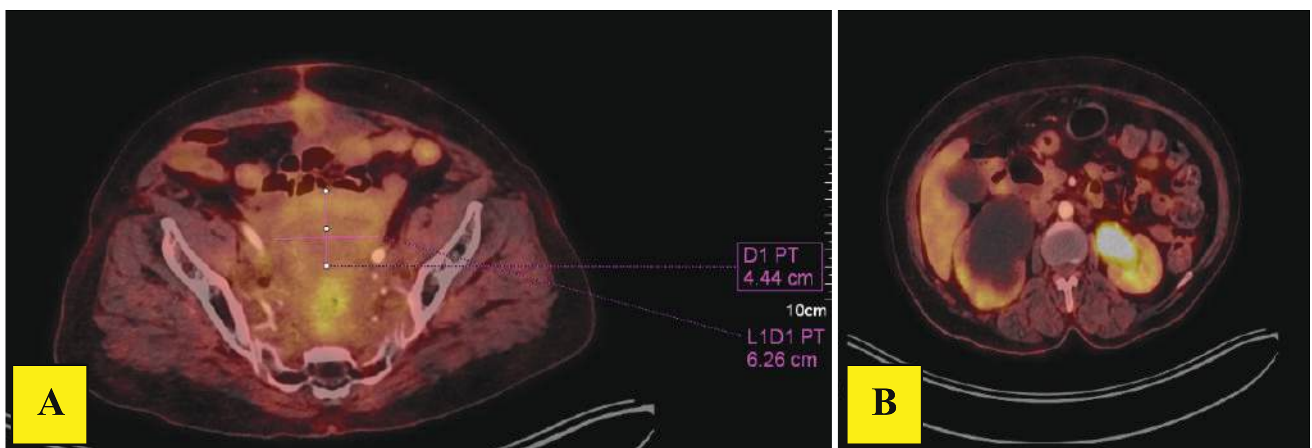

Figure 2: Axial fused PET/CT images showing a pelvic mass lesion measuring about 4.4 x 6.2 cm, with bilateral ureteral encasement & loss of posterior uterine fat plane (A), leading to bilateral hydroureteronephrosis, more pronounced on the right side, with renal parenchymal thinning (B).

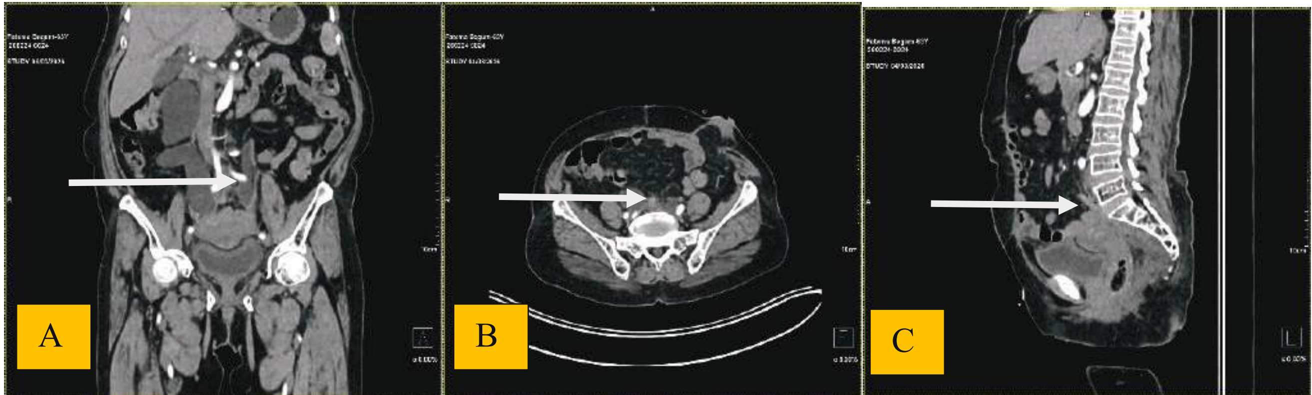

Figure 3: Contrast-enhanced CT images (Fig A: coronal, Fig B: sagittal and Fig C: axial planes) demonstrate markedly distorted pelvic anatomy due to post-surgical and post-radiation fibrosis, limiting evaluation. A definite thrombus is not identified; the observed structure more likely represents a pelvic lymph node.

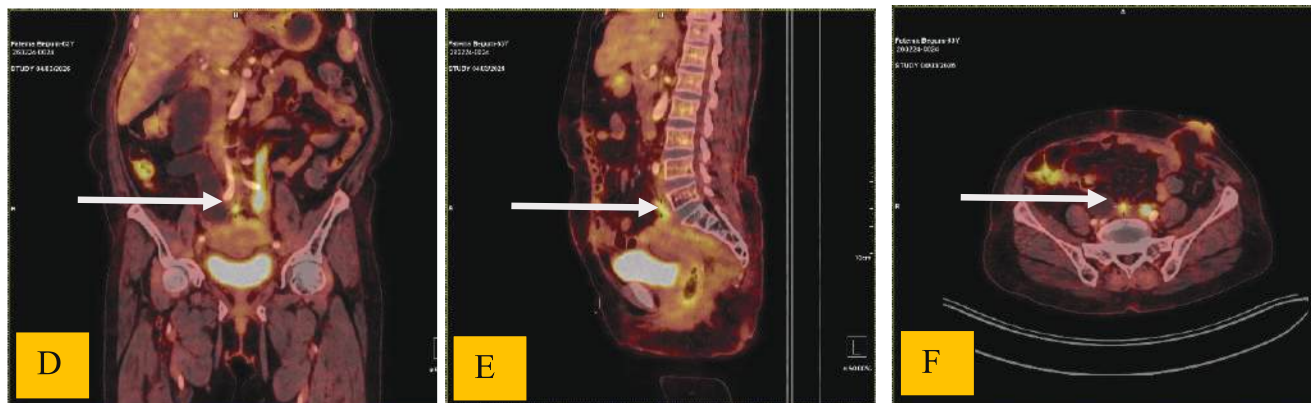

Figure 4: Fused PET/CT images (axial, coronal, and sagittal planes) demonstrate a focal area of hypermetabolic activity in the pelvic region (blue arrow) in figure: A, anatomically corresponding to the mid sacral vein (blue arrow) in figure C and figure E; suggestive of tumor thrombus.

DISCUSSION

The primary clinical significance of this case lies in the rare identification of a middle sacral vein thrombus. On conventional CT, small pelvic veins are often collapsed or obscured by surgical clips and fibrotic tissue. 18F-FDG PET/CT plays an important role in the detection of tumor thrombosis by high metabolic demand of tumor cell and the most common thrombotic pattern in different tumors was linear FDG uptake, similar to the present case.

Most recurrences of colorectal cancer occur within five years after curative resection, and the guidelines recommend a 5-year post-operative follow-up (4). FDG-PET has been reported to be useful in the diagnosis of recurrent cancer, including colorectal cancer (4). Flanagan et al. reported that, in 22 colorectal cancer patients with abnormal postoperative CEA levels but negative results on conventional imaging studies, the positive predictive value of FDG-PET was 89 % (15 of 17) and the negative predictive value was 100 % (5). Integrated 18F-FDG provides a decisive diagnostic advantage by metabolically characterizing indeterminate pelvic masses and mapping occult vascular invasion, thereby directly informing the management of aggressive local recurrences that escape detection on conventional anatomical imaging.

As the middle sacral vein is a small-caliber vessel, thrombosis at this site is often clinically silent, as

observed in our patient. However, it may lead to serious complications if the thrombus propagates, particularly in the form of deep vein thrombosis or pulmonary embolism, which can significantly worsen the patient's clinical condition. The annual incidence of venous thrombo embolism in cancer patients is currently estimated to be 0.5%, compared to 0.1% in the general population. Active cancer contributes to 20% of the overall incidence of VTE (6). In rectal carcinoma, the presence of tumor thrombus represents vascular invasion and is associated with disease progression, often resulting in upstaging and a change in management from potentially curative locoregional surgical treatment to systemic or multimodal therapy depending on disease extent (7).

CONCLUSION

18F-FDG PET/CT is a powerful tool in the surveillance of rectal cancer, particularly when conventional imaging is ambiguous due to post-operative changes. Clinicians should maintain a high index of suspicion for pelvic venous tumor thrombus in patients with presacral recurrence, and PET/CT provides superior sensitivity for these small but clinically vital vascular findings.

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