A Pitfall of Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography: Fecal Peritonitis Mimicking Peritoneal Carcinomatosis

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HUMAN AND ANIMAL RIGHTS
Ethical standards were followed in accordance with the institutional committee and the Declaration of Helsinki, as revised in 2013.

ABSTRACT

Background: Postoperative inflammatory reactions, such as foreign-body responses, can mimic peritoneal carcinomatosis on fluorodeoxyglucose positron emission tomography, potentially leading to misdiagnosis.

Case presentation: A 65-year-old woman with colon adenocarcinoma developed fecal peritonitis after surgery. Rising carcinoembryonic antigen and imaging findings suggested peritoneal carcinomatosis. Repeated biopsies revealed inflammatory tissue with foreign material consistent with prior peritonitis. Follow-up imaging and biomarker normalization confirmed a benign etiology despite persistent uptake.

Conclusion: Interpretation of postoperative fluorodeoxyglucose positron emission tomography requires integration of imaging, histology, and clinical context to avoid unnecessary treatment.

CASE REPORT

BACKGROUND

2-[^{18}F]fluoro-2-deoxy-D-glucose (FDG) positron emission tomography (FDG PET/CT) is widely used for colorectal cancer surveillance but lacks specificity, as both malignant and inflammatory processes show increased uptake. Postoperative complications such as fecal peritonitis may leave residual granulomatous or foreign-body reactions that persist long after recovery. These changes can closely mimic peritoneal carcinomatosis on imaging and, if misinterpreted, may lead to unnecessary interventions. We present a case illustrating this diagnostic challenge and emphasizing the need for clinicopathological correlation.

CASE REPORT

A 65-year-old woman underwent primary and radical right-sided hemicolectomy in April 2023 for adenocarcinoma, staged T4aN1bM0 (proficient mismatch repair and RAS/BRAF wild-type). The immediate postoperative course was complicated by problems with the anastomosis and several re-operations. She had fecal peritonitis affecting all abdominal quadrants (CRP peak 451 mg/L), which was managed by end-to-end anastomosis and ileostomy. After administration of broad-spectrum intravenous antibiotics, CRP levels normalized (Figure 1). The patient subsequently received 12 cycles of adjuvant chemotherapy. In

autumn/winter 2023, rising CEA levels were noted concurrent with normal CRP, asymptomatic clinical status, and a negative contrast enhanced CT scan of the abdomen. Two months later, the patient was referred to an FDG PET/CT scan (head, thorax, abdomen) to rule out recurrence.

Image findings

FDG PET/CT demonstrated markedly increased tracer uptake along the right hepatic margin and in a plaque-like lesion adjacent to the left abdominal wall (Figure 2). Additionally, less intense FDG uptake was noted in smaller carcinomatosis-like foci along the greater curvature of the stomach and anterolaterally towards the right abdominal wall. Corresponding CT findings included irregular soft-tissue elements on the hepatic surface of the right lobe and a few subtle lesions at the anterior abdominal wall. Overall, the combined metabolic and structural findings were interpreted as highly suspicious for peritoneal carcinomatosis.

Management

The case was reviewed at a multidisciplinary conference. The findings were assessed as most likely related to complications of prior surgical interventions, including fecal peritonitis, however, a biopsy was advised to rule out malignancy. Initial biopsy from the right liver lobe surface revealed fibrous stroma with variable inflammation and no sign of malignancy. In the first half of 2024, CEA levels normalized spontaneously. A repeat FDG PET/CT scan demonstrated progression of previously identified lesions in the presence of normal CEA and asymptomatic clinical presentation (Figure 2). Due to the continued image-based suspicion of malignancy, repeat biopsies were performed on two separate time points. Both demonstrated foreign-body/plant material and inflammation with macrophages. These findings were consistent with fecal peritonitis in the regions that had been metabolically and radiologically suspected of carcinomatosis.

Follow-up

The patient was followed with FDG PET/CT and serial CEA measurements. During the reverse ileostomy procedure in August 2024, the suspicion of carcinomatosis was renewed perioperatively. However, due to the history of benign biopsies, it was decided to continue with biochemical and imaging surveillance. FDG PET/CT in December 2024 showed regression of peritoneal lesions (Figure 2). At the most recent clinical follow-up, no evidence of malignancy was detected. CEA was borderline elevated at 6, while CRP remained normal. The patient continues without treatment under surveillance.

DISCUSSION

Etiology and Demographics

Peritoneal carcinomatosis develops in around 8% of colorectal cancer patients and is a critical determinant of prognosis and treatment planning [1]. Its presence often prompts consideration of cytoreductive surgery and intraperitoneal chemotherapy. Fecal peritonitis, most often following intestinal perforation, is a life-threatening postoperative complication with historically reported mortality rates of 6–63% despite advances in perioperative care [2]. Even after recovery, sequelae such as fibrosis, granulomas, or foreign-body reactions may persist and demonstrate FDG uptake long after the acute infection [3] . Activated macrophages and granulocytes are highly glycolytic and can mimic malignant activity on FDG PET/CT. In our patient, histology showed macrophage infiltration and foreign material, findings consistent with a foreign-body reaction contributing to the pathologic FDG uptake.

Differential Diagnoses

FDG PET/CT is highly sensitive for detecting malignant peritoneal disease but limited in specificity, as uptake reflects metabolism rather than malignancy per se. Postoperative inflammatory and granulomatous changes can closely resemble carcinomatosis [4]. Carcinoembryonic antigen (CEA), although widely used in surveillance, also lacks specificity. A large retrospective study showed that 20% of non-recurrent colorectal cancer patients experienced at least one unexplained postoperative CEA elevation, most of which were modest (<15 ng/mL) or transient [5]. In our patient, transient CEA elevation followed by spontaneous normalization without therapy supported a benign etiology. Thus, neither FDG PET/CT nor biomarkers should be interpreted in isolation. Discriminating factors investigated for FDG PET/CT, such as standard uptake value (SUV) thresholds and dual-time-point imaging, have shown substantial overlap between inflammatory and malignant lesions.[6,7]. When findings remain equivocal, histopathology remains the gold standard.

Treatment and Prognosis

Accurate distinction between peritoneal carcinomatosis and benign postoperative sequelae is essential, as management and prognosis differ significantly. Misinterpreting inflammatory uptake as recurrence may lead to unnecessary systemic therapy or surgery, while under-recognizing carcinomatosis risks delaying potentially life-prolonging treatment. Prognostically, carcinomatosis is associated with poor survival, with median survival of often less than two years despite systemic therapy [8]. In contrast, postoperative inflammatory pseudotumors and foreign-body reactions may regress spontaneously, as seen in our patient on follow-up imaging. Here, histology and clinical surveillance prevented overtreatment and demonstrated benign etiology underscoring the importance of integrating clinical, imaging, and histopathological data.

TEACHING POINT

FDG PET/CT findings in the postoperative abdomen must be interpreted with caution, especially in patients with a history of fecal peritonitis or complicated recovery. Correlation with histopathology, tumor markers, and clinical findings is essential to avoid misdiagnosis.

QUESTIONS

Question 1: On FDG PET/CT, which of the following features limits its specificity for peritoneal disease?

1. FDG uptake reflects glucose metabolism rather than malignancy. (applies)
2. Uptake always indicates a viable tumor.
3. FDG uptake is absent in chronic inflammatory tissue.
4. SUV thresholds clearly separate benign from malignant disease.
5. Dual-time-point imaging reliably distinguishes recurrence.

Explanation for Question 1: FDG uptake reflects metabolism, not malignancy, and overlaps between inflammation and cancer are common [6,7].

Question 2: Which postoperative changes may show increased FDG uptake and mimic recurrence?

1. Fibrosis (applies)
2. Foreign-body granuloma (applies)
3. Activated macrophages (applies)
4. Normal peritoneum without inflammation
5. Scar tissue without cellular activity

Explanation for Question 2: Fibrosis, foreign-body reactions, and activated immune cells can demonstrate FDG uptake mimicking malignancy [4].

Question 3: A patient with prior colorectal surgery shows a transient CEA elevation, but no therapy is given. On follow-up, the CEA normalizes. What is the most likely interpretation?

1. Recurrent carcinoma
2. Laboratory error
3. Benign postoperative change (applies)
4. Carcinomatosis
5. Hepatic metastasis

Explanation for Question 3: Transient, modest postoperative CEA rises that normalize without therapy usually reflect benign changes [5].

Question 4: When FDG PET/CT findings in the postoperative abdomen are equivocal, which approach best prevents misdiagnosis?

1. Relying on SUV thresholds alone
2. Integrating histopathology when findings are equivocal (applies)
3. Assuming all FDG uptake is malignant
4. Ignoring clinical history
5. Using CEA as the sole discriminator

Explanation for Question 4: Histopathology remains the gold standard when PET/CT findings are ambiguous [3,4].

Question 5: Which statements about prognosis and postoperative FDG uptake are correct?

1. Carcinomatosis carries a median survival of often <2 years despite systemic therapy. (applies)
2. Inflammatory pseudotumors may regress spontaneously. (applies)
3. Misreading inflammation as recurrence may prompt unnecessary systemic therapy. (applies)
4. Under-recognizing carcinomatosis may delay potentially life-prolonging treatment. (applies)
5. FDG PET/CT alone can reliably separate benign from malignant disease.

Explanation for Question 5: Carcinomatosis has poor survival, while benign inflammatory uptake may regress; misinterpretation risks overtreatment or delayed therapy [3,8].

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FIGURES

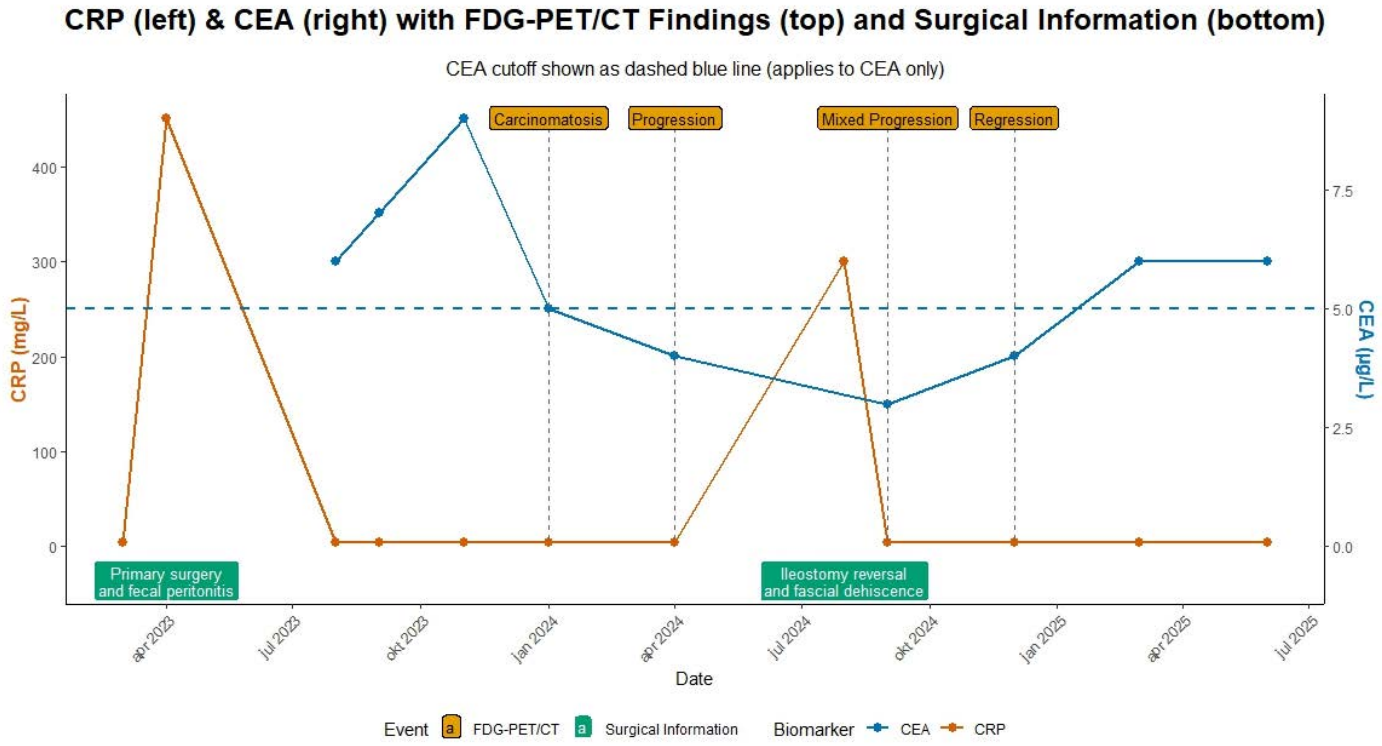

Figure 1: Laboratory values for C-reactive protein (CRP) and carcinoembryonic antigen (CEA) for a 65-year-old woman with adenocarcinoma of the colon, initially staged T4aN1bM0. FDG PET/CT findings are in the top (orange boxes) and surgical information in the bottom (green boxes). The dashed blue line is depicting the CEA cut off value of 5 µg/L. CRP values are depicted as the maximum CRP value per month.

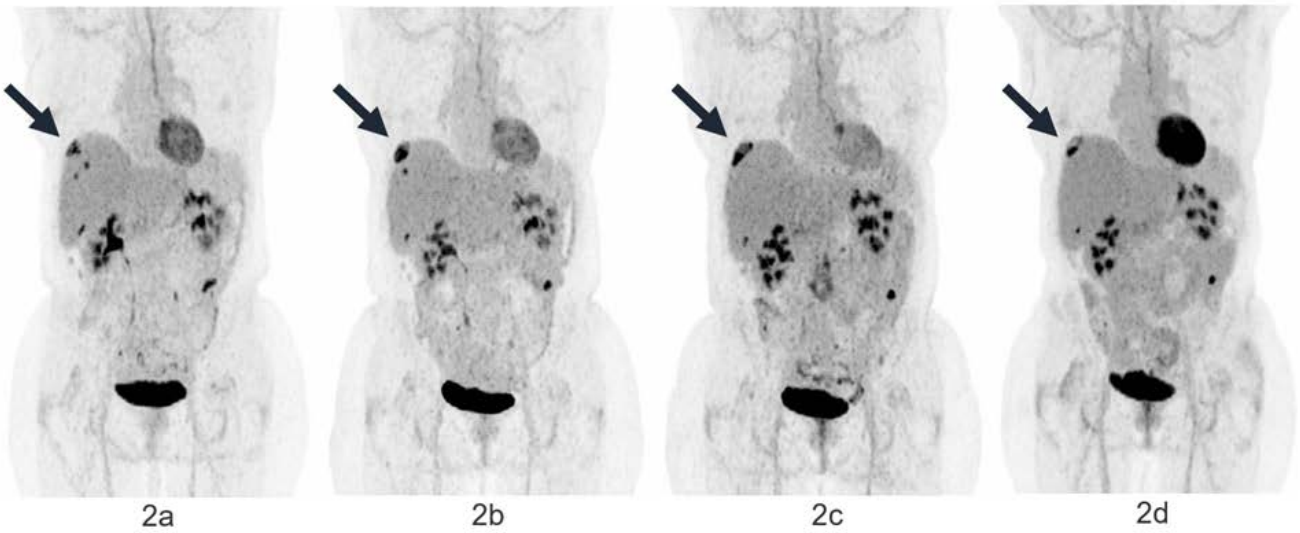

Figure 2: 65-year-old woman primarily operated for adenocarcinoma of the colon. The figures (2a-2d) show four follow-up FDG PET scans. The dosage of FDG is body-weight based and was between 270-280 MBq. Timing and findings were as follows:

2a: January, 2024. Elements of suspected carcinomatosis on the right liver surface. Arrow points to the biggest lesion.

2b: April, 2024. Progression of the biggest lesion (arrow).

2c: September, 2024. Mixed progression.

2d: December, 2024. Regression.

KEYWORDS

Peritoneal carcinomatosis; Fecal peritonitis; FDG PET/CT; Colon adenocarcinoma; Carcinoembryonic antigen

ABBREVIATIONS

BRAF = B-Raf Proto-Oncogene, Serine/Threonine Kinase
CEA = Carcino Embryonic Antigen
CRP = C-reactive Protein
FDG PET/CT = Fluorodeoxyglucose Positron Emission Tomography Computed Tomography
SUV = Standard Uptake Value

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