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CASE REPORT

Enhancing restaging of a colorectal cancer patient: The advantage of [^{99m}Tc]Tc-FAPI-46 over conventional CT in detecting metastases

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ABSTRACT

We report the case of a 73-year-old male with a history of colon adenocarcinoma, diagnosed 18 months prior. The patient underwent total colectomy and chemoradiotherapy 15 months previously. Due to recurrent abdominal pain, a metastatic workup was conducted utilizing both contrast-enhanced CT scan and [^{99m}Tc]Tc-FAPI-46 SPECT/CT. The latter imaging identified three metastatic lesions, while the contrast-enhanced CT scan detected only one peritoneal deposit. The two remaining metastases were small and hidden between the bowel loops and were not obvious on the conventional CT images. This case demonstrates that [^{99m}Tc]Tc-FAPI-46 SPECT/CT offers enhanced sensitivity for the detection of metastatic lesions in the post-operative patients with colorectal cancer when compared to conventional contrast-enhanced CT scans. The use of [^{99m}Tc]Tc-FAPI-46 SPECT/CT has the potential to significantly enhance the sensitivity of metastases detection, thereby influencing clinical decision-making in patients with colorectal cancer.

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INTRODUCTION

Colorectal cancer ranks as the third most prevalent cancer and the leading cause of cancer-related mortality globally among both genders [1]. The overall five-year survival rate from the time of diagnosis is approximately 60%, encompassing all stages of the disease. However, metastatic CRC continues to present a dismal prognosis; despite advancements in treatment, only 14% of patients survive five years post-diagnosis under current standards of care [1, 2]. Accurate detection of metastatic lesions is crucial for effective management and treatment planning. Traditional imaging modalities, such as contrast-enhanced computed tomography (CECT), are commonly applied. However, recent advancements in molecular imaging, particularly with the use of [^{99m}Tc]Tc-FAPI, have shown promise in enhancing sensitivity for detecting metastases. This article presents a case study of a 73-year-old man with a history of colon adenocarcinoma, highlighting the comparative effectiveness of [^{99m}Tc]Tc-FAPI SPECT/CT versus CECT in identifying metastatic lesions.

CASE PRESENTATION

We report the case of a 73-year-old male with a history of colon adenocarcinoma, diagnosed 18 months prior. The patient underwent total colectomy and chemoradiotherapy 15 months ago. Due to recurrent abdominal pain, a metastatic workup was conducted utilizing both contrast-enhanced CT scan and [^{99m}Tc]Tc-FAPI-46 SPECT/CT. The planar whole-body [^{99m}Tc]Tc-FAPI-46 images in anterior and posterior views showed foci of abnormal radiotracer uptake in the abdominal region (Figures 1A and 1B, black arrows). Axial and coronal CECT images revealed a hypodense lesion with heterogeneous enhancement in the left side of the abdomen, anterior and lateral to the psoas muscle (Figures 1C and 1D, blue arrows). The [^{99m}Tc]Tc-FAPI-46 SPECT/CT images showed three distinct foci of peritoneal deposits with FAPI uptake; one adjacent to the left 7th intercostal space (Figures 2A, 2B, 2C and 2D, red arrows), the other one adhered to the left lateral abdominal wall muscles at the level of L2 spine (Figures 2E, 2F, 2G and 2H, green arrows), and another one in vicinity of the left psoas muscle at the level of L3 spine (Figures 2I, 2J, 2K and 2L, yellow arrows), which proved to be metastatic lesions after re-surgery and histologic evaluation. The [^{99m}Tc]Tc-FAPI SPECT/CT imaging revealed three distinct metastatic lesions, while CECT identified only one of these peritoneal deposits. The two remaining metastases were small and hidden between the bowel loops and were not obvious on the conventional CT images.

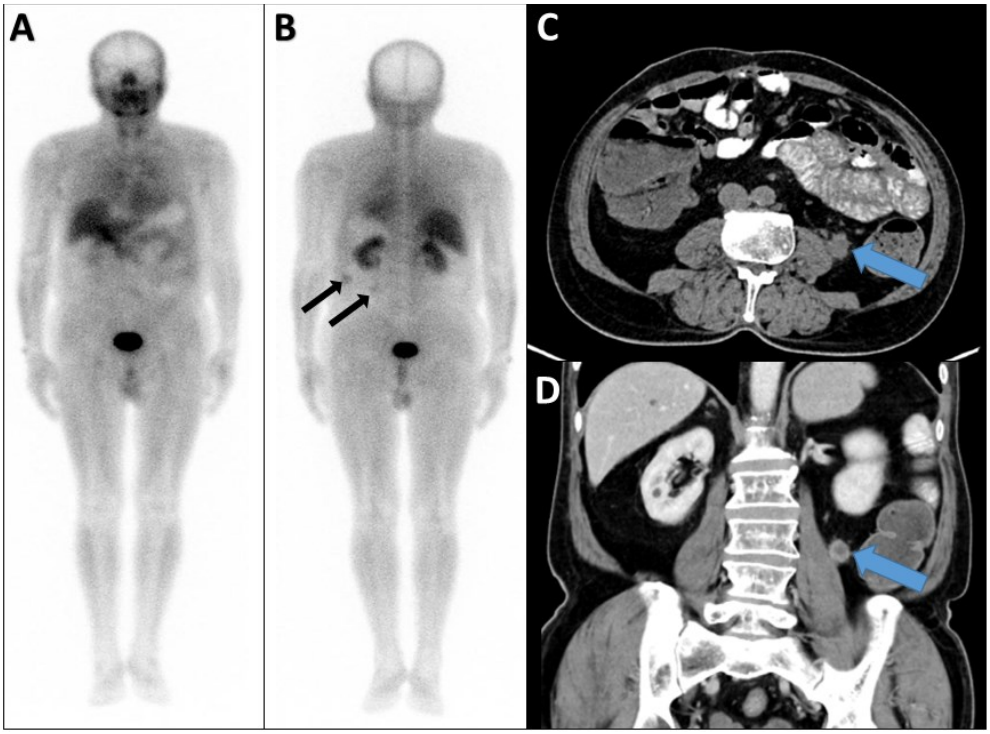

Figure 1. (A and B): Whole body [^{99m}Tc]Tc-FAPI-46 images in anterior and posterior views demonstrating foci of abnormal radiotracer uptake in the abdominal region (black arrows). (C and D): Axial and coronal CECT images revealed a hypodense lesion with heterogeneous enhancement in the left side of the abdomen, anterior and lateral to the psoas muscle (blue arrows)

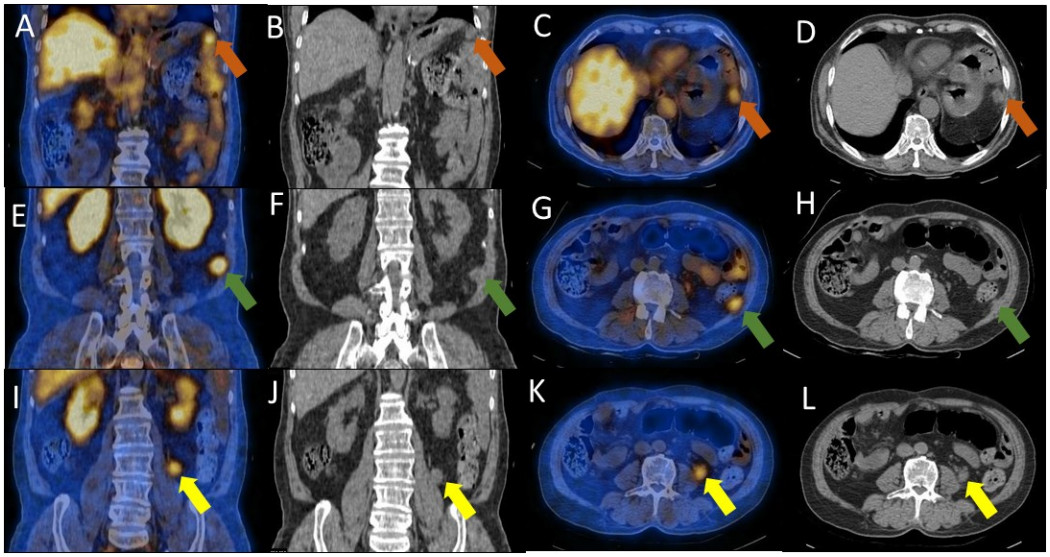

Figure 2. [^{99m}Tc]Tc-FAPI-46 SPECT/CT images showing three distinct foci of peritoneal deposits with FAPI uptake (red, green and yellow arrows).

DISCUSSION

Imaging is essential for the diagnosis, staging, re-staging, metastatic assessment, and treatment monitoring of colorectal cancer [3-5]. In clinical practice, CECT is the standard imaging modality recommended for evaluating postoperative colorectal cancer patients with suspected tumor recurrence or distant metastasis [6, 7]. However, gastrointestinal cancers often exhibit subtle behavior and may present as micrometastases and peritoneal deposits, which are frequently missed by conventional imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI) [8-10]. Fibroblasts of the tumor stroma (activated fibroblasts, myofibroblasts, tumor-associated fibroblasts, or CAFs), are the main cellular constituents of stroma associated with primary and metastatic colorectal cancer [11, 12]. One of Commonly used markers to identify CAFs is fibroblast activation protein (FAP) [13]. Fibroblast activation protein (FAP), a type II transmembrane protease, is expressed in the stroma of over 90% of colorectal cancers [14]. FAP-targeted PET/CT using Gallium-68 or Fluorine-18 labeled FAPI has emerged as a highly promising imaging tool for the diagnosis, staging, and monitoring of recurrence and metastasis in various cancers [15-17]. Studies have demonstrated that [^{99m}Tc]Tc-FAPI PET/CT outperforms CECT and [^{18}F]FDG PET/CT in detecting both primary and recurrent colorectal cancer [18-21]. While Ga-68 PET provides superior image quality compared to Tc-99m SPECT, the latter remains a more cost-effective and accessible option. Consequently, SPECT, as a widely utilized molecular imaging technique, continues to be a valuable choice for tumor diagnosis and treatment follow-up [22-23].

CONCLUSION

In this case [^{99m}Tc]Tc-FAPI SPECT/CT showed higher sensitivity compared to CECT in detecting metastatic lesions in a postoperative patient with colorectal cancer. The integration of [^{99m}Tc]Tc-FAPI as an adjunct imaging modality alongside conventional techniques such as CECT has the potential to enhance staging accuracy and subsequently influence clinical decision-making in patients with colorectal cancer.

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