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Detection of an Adrenal Adenoma on 18F-Fluorocholine PET/CT in a Patient with Prostate Cancer

Prostat Kanserli Bir Hastada 18F-Florokolin PET/BT'de Adrenal Adenom Tespiti

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Abstract

18F-Fluorocholine PET/CT is a valuable imaging tool in prostate cancer evaluation, especially for detecting biochemical recurrence. However, false-positive results, including benign adrenal adenomas, may occur. We present a case of a 62-year-old male with treated prostate cancer, who underwent 18F-FCH PET/CT due to biochemical recurrence. The scan showed focal uptake in the prostatic bed but also unexpectedly identified a 13x14 mm hypodense mass in the left adrenal gland. MRI suggested an adrenocortical adenoma, which was confirmed histologically. While adrenal radiotracer uptake is well-documented with other radiotracers, 18F-FCH role in characterizing adrenal lesions remains underexplored. This case raises the potential for 18F-FCH PET/CT to help distinguish benign from malignant adrenal tumors, warranting further investigation.

Keywords: adrenal adenoma, 18F-Fluorocholine, PET/CT, prostate cancer

Özet

18F-Florokolin PET/BT prostat kanserinin değerlendirilmesinde, özellikle biyokimyasal nüksün saptanmasında değerli bir görüntüleme aracıdır. Ancak, benign adrenal adenomlar da dahil olmak üzere yanlış pozitif sonuçlar ortaya çıkabilir. Bu yazıda, tedavi edilmiş prostat kanseri olan ve biyokimyasal nüks nedeniyle 18F-FCH PET/BT uygulanan 62 yaşında bir erkek olgu sunulmuştur. Tarama prostatik yatakta fokal tutulum gösterdi, ancak beklenmedik bir şekilde sol adrenal bezde 13x14 mm hipodens bir kitle tespit edildi. MRG, histolojik olarak doğrulanan bir adrenokortikal adenomu düşündürmüştür. Adrenal radyotracer tutulumu diğer radyotracerlerle iyi belgelenmiş olsa da, 18F-FCH'nin adrenal lezyonları karakterize etmedeki rolü yeterince araştırılmamıştır. Bu vaka, 18F-FCH PET/BT'nin benign ve malign adrenal tümörlerin ayırt edilmesine yardımcı olma potansiyelini ortaya koymaktadır ve daha fazla araştırmayı gerektirmektedir.

Anahtar kelimeler: adrenal adenom, 18F-Fluorocholine, PET/BT, prostat kanseri

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Introduction

Prostate cancer (PC) is among the most common malignancies in men, underscoring the importance of early detection and surveillance for effective management. Imaging plays a pivotal role in diagnosing, staging, and monitoring PC, particularly in identifying recurrence post-treatment. 18F-Fluorocholine (18F-FCH) PET/CT has emerged as a key modality in this context, leveraging the heightened choline metabolism characteristic of prostate cancer cells. This metabolic shift, driven by upregulated choline transporters and increased choline kinase activity, leads to the accumulation of radiolabeled choline in malignant tissue [1].

18F-FCH PET/CT demonstrates high diagnostic accuracy in detecting local recurrences and distant metastases, especially in patients with rising prostate-specific antigen (PSA) levels, thereby guiding therapeutic decisions [2]. Its superiority over conventional imaging is evident in cases where other modalities fail to identify recurrence [3]. However, false-positive results remain a challenge, as non-malignant conditions such as benign adrenal adenomas can mimic malignancy.

Adrenal incidentalomas, asymptomatic adrenal masses discovered incidentally, are increasingly identified due to widespread cross-sectional imaging use. These lesions occur in up to 10% of the general population, with benign adenomas comprising 50-70% of cases [4]. In PC patients, distinguishing adrenal adenomas from rare metastases is critical, as management differs markedly: benign lesions typically require no intervention, whereas malignancies may necessitate surgery or systemic therapy [5].

Case

A 62-year-old male with a history of prostate cancer was referred to our department for evaluation of biochemical recurrence following a progressive rise in PSA to 2.53 ng/mL. The patient had undergone radical prostatectomy in 2015, with a pathological staging of pT2cN0M0 and a Gleason score of 7 (3+4). His preoperative PSA was 14 ng/mL. The initial postoperative PSA was undetectable. However, in 2016, a biochemical recurrence was detected, prompting treatment with adjuvant external beam radiation therapy. Following this intervention, PSA levels remained stable and undetectable until 2023, when a new elevation was observed, suggestive of recurrent disease. The patient had no significant comorbidities and no clinical signs of metastatic spread. In this context, an FCH PET/CT was performed due to its local availability and the patient's PSA level being above 2 ng/mL, a threshold at which FCH PET/CT has demonstrated good sensitivity for the detection of recurrent prostate cancer. After intravenous administration of 240 MBq of 18F-FCH and a 60-minute uptake period, imaging from the skull base to mid-thigh revealed a focal area of increased radiotracer uptake in the prostatic bed (SUVmax:8.2), consistent with local recurrence. No evidence of distant metastases was observed in typical sites (lymph nodes, bones), suggesting localized disease amenable to targeted therapy.

Notably, the scan also identified an incidental 13×14 mm hypodense mass in the left adrenal gland with moderate 18F-FCH uptake (SUVmax:5.1) **(Figure 1).** While this finding raised suspicion for malignancy, adrenal metastases from

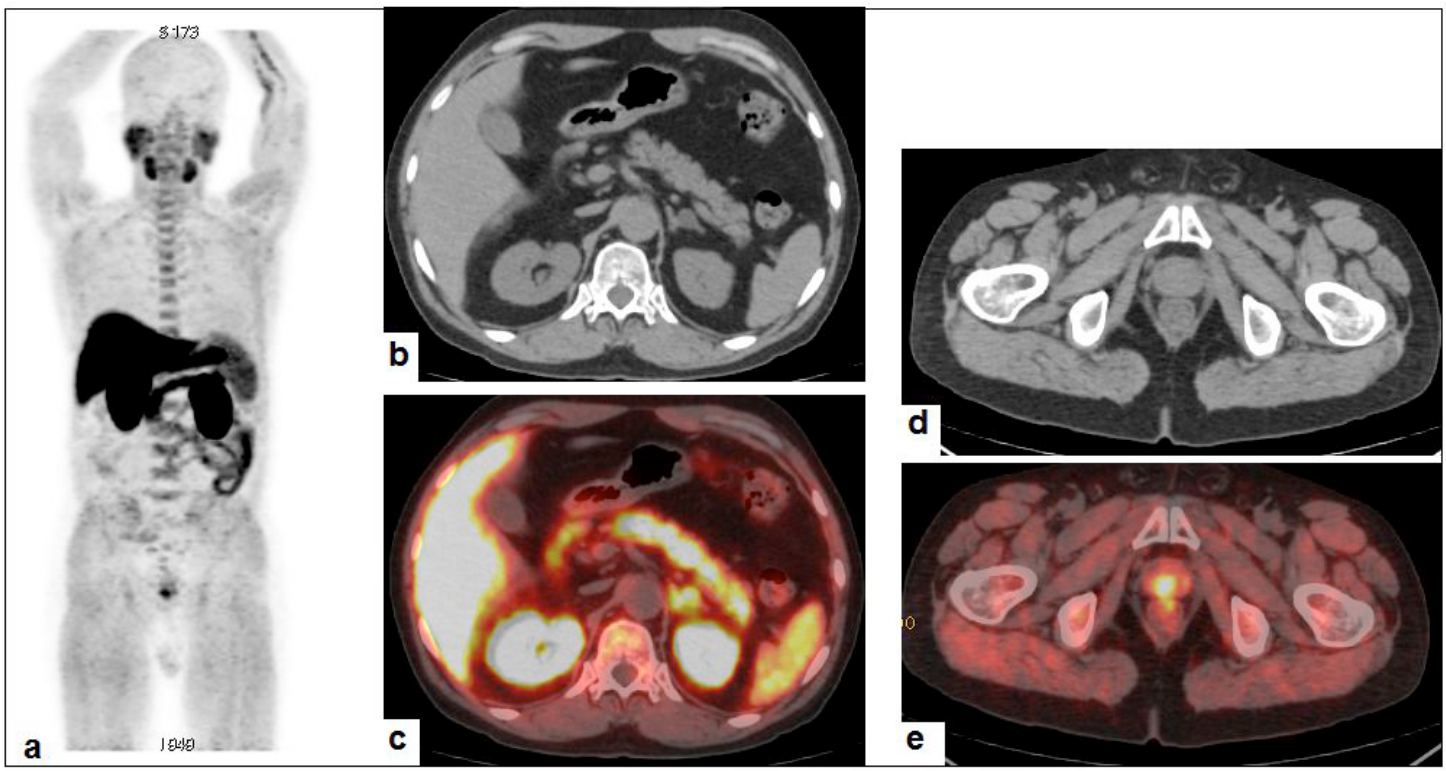

Figure 1. An incidental hypodense mass measuring 13×14 mm in the left adrenal gland

prostate cancer are rare, and 18F-FCH uptake in adrenal lesions is nonspecific. Further evaluation with contrast-enhanced MRI demonstrated a classic washout pattern (50% delayed-phase washout), favoring a benign adrenocortical adenoma. Percutaneous biopsy confirmed the lesion as a benign adrenal adenoma, characterized histologically by well-differentiated cortical cells without malignant features.

Discussion

Adrenal incidentalomas are increasingly encountered in clinical practice due to the widespread use of advanced modalities like PET/CT, CT, and MRI. These lesions pose a significant diagnostic challenge, particularly in patients with a history of malignancy, as they necessitate differentiation between benign entities and rare malignancies. This diagnostic dilemma is exemplified in the case of a PC patient undergoing 18F-FCH PET/CT for biochemical recurrence, where a metabolically active adrenal adenoma initially raised suspicion for metastasis. Adrenal incidentalomas occur in up to 10% of the general population [4], with benign adenomas comprising 50-80% of cases [6]. However, in cancer patients, their discovery demands careful evaluation to exclude metastasis. In PC, adrenal metastases are rare compared to bone or lymph node involvement, yet their possibility in advanced disease underscores the need for thorough characterization [7]. While 18F-FCH PET/CT is highly sensitive for detecting PC recurrence (leveraging cancer cells' upregulated choline metabolism via choline kinase/transporters), its specificity for adrenal lesions is limited. Benign adenomas may exhibit radiotracer uptake due to metabolic activity linked to lipid turnover or membrane synthesis, creating overlap with malignancy. This ambiguity necessitates a multimodal approach: CT and MRI provide critical anatomical and functional data, while biopsy remains definitive for inconclusive cases [8].

Imaging features help distinguish benign from malignant lesions. Benign adenomas typically appear well-circumscribed and homogeneous on CT, with rapid contrast washout, whereas malignancies often display irregular margins, heterogeneous enhancement, and delayed washout [9]. Despite moderate 18F-FCH uptake in the presented case, the adrenal mass's hypodense CT appearance and 50% MRI washout favored a benign adenoma, later confirmed histologically. Management of adrenal incidentalomas in cancer patients hinges on lesion size, functionality, and imaging characteristics. Small (<4 cm), non-functional lesions with benign features can be monitored, while suspicious lesions may require resection [10]. In this case, conservative management sufficed, avoiding unnecessary surgery. The growing role of 18F-FCH PET/CT in oncology highlights its dual utility and limitations: while invaluable for detecting PC recurrence, its nonspecific adrenal uptake underscores the need for complementary techniques. Future research should prioritize integrating advanced MRI with PET/CT and elucidating molecular mechanisms of radiotracer uptake in adenomas to refine diagnostic specificity. Such advances could mitigate diagnostic uncertainty and optimize patient outcomes in this evolving clinical landscape.

Conclusion

This case highlights the necessity of a multimodal diagnostic approach for evaluating adrenal incidentalomas, particularly in oncology patients. While 18F-FCH PET/CT is highly sensitive for detecting recurrent prostate cancer, its specificity in characterizing adrenal lesions remains limited, with inherent risks of false-positive interpretations. Accurate diagnosis requires integrating functional imaging with anatomical modalities such as contrast-enhanced CT and MRI, alongside histopathological confirmation when ambiguity persists.

In prostate cancer patients, adrenal masses demand meticulous clinical and imaging evaluation to distinguish metastatic disease from benign etiologies like adenomas, a critical step to avoid unnecessary interventions. Multidisciplinary collaboration, guided by evidence-based protocols, ensures balanced decision-making, optimizes patient outcomes, and minimizes risks of misdiagnosis or overtreatment.

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