Interesting Image

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Interval Progression Before ^{177}Lu-PSMA Mimicking Treatment Failure on Interim PSMA PET/CT

^{177}Lu-PSMA Tedavisi Öncesinde Gözlenen ve Ara Dönem PSMA PET/BT İncelemesinde Tedavi Başarısızlığı İzlenimi Veren Hastalık İlerlemesi

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Abstract

Interpretation of follow-up prostate-specific membrane antigen positron emission tomography/computed tomography (PSMA PET/CT) during lutetium-177-labeled PSMA (^{177}Lu-PSMA) radioligand therapy (RLT) may be misleading if rapid disease progression occurs between baseline PSMA PET/CT and initiation of RLT. A 78-year-old man with metastatic castration-resistant prostate cancer underwent baseline gallium-68-PSMA PET/CT to assess eligibility for ^{177}Lu-PSMA-RLT and was deemed eligible. Interim PSMA PET/CT after 2 cycles showed multiple new lesions and an increased total tumor burden, suggesting progressive disease. However, these lesions were already visible on post-therapy single-photon emission computed tomography (SPECT)/CT after cycle 1, indicating interval progression between baseline PSMA PET/CT and initiation of ^{177}Lu-PSMA-RLT rather than treatment failure. In rapidly progressive disease, cycle-1 post-therapy SPECT/CT may provide a true imaging baseline for response assessment.

Keywords: ^{177}Lu-PSMA, PSMA PET/CT, SPECT/CT, response assessment, prostate cancer, new lesions

Öz

Lutesyum-177 ile işaretlenmiş prostat spesifik membran antijeni (^{177}Lu-PSMA) radyoligand tedavisi (RLT) sürecindeki takip prostat spesifik membran antijeni pozitron emisyon tomografisi/bilgisayarlı tomografi (PSMA PET/BT) incelemelerinin yorumlanması, başlangıç PSMA PET/BT çekimi ile RLT'nin başlatılması arasında hızlı bir hastalık ilerlemesi yaşanmışsa yanıltıcı olabilir. Metastatik kastrasyona dirençli prostat kanseri olan 78 yaşındaki bir erkek hastaya, ^{177}Lu-PSMA-RLT için uygunluğunu değerlendirmek amacıyla başlangıç galyum-68-PSMA PET/BT çekimi yapılmış ve hasta tedaviye uygun bulunmuştur. Tedavinin 2. küründen sonra gerçekleştirilen ara dönem PSMA PET/BT incelemesinde, çok sayıda yeni lezyon ve toplam tümör yükünde artış saptanmış; bu bulgular hastalığın ilerlediğine işaret etmiştir. Ancak söz konusu lezyonların, 1. kür sonrası çekilen tek foton emisyon bilgisayarlı tomografisi (SPECT)/BT görüntülerinde zaten mevcut olduğu görülmüştür. Bu durum, tablonun bir tedavi başarısızlığından ziyade, başlangıç PSMA PET/BT çekimi ile ^{177}Lu-PSMA-RLT'nin başlatılması arasındaki dönemde gerçekleşen bir hastalık ilerlemesi olduğunu ortaya koymaktadır. Hızlı ilerleyen hastalıklarda, 1. kür sonrası çekilen SPECT/BT görüntüleri, tedavi yanıtının değerlendirilmesi için daha gerçekçi bir başlangıç referansı sağlayabilir.

Anahtar Kelimeler: ^{177}Lu-PSMA, PSMA PET/BT, SPECT/BT, yanıt değerlendirme, prostat kanseri, yeni lezyonlar

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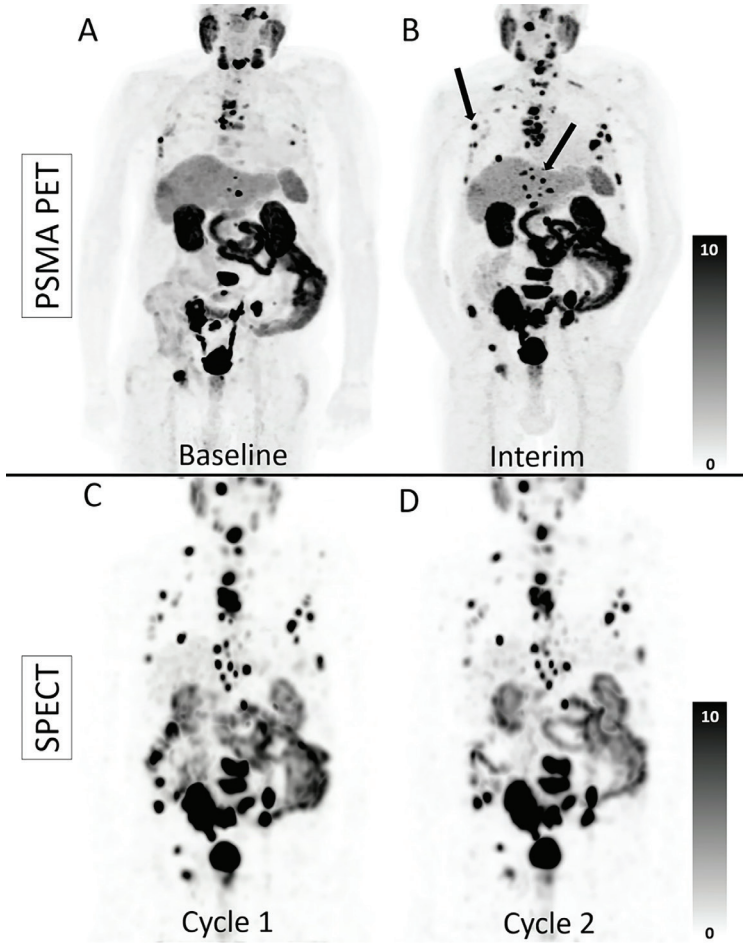


Figure 1. A 78-year-old man with metastatic castration-resistant prostate cancer, previously treated with abiraterone and docetaxel, was screened for lutetium-177-labeled PSMA (^{177}Lu-PSMA) radioligand therapy (RLT) eligibility. Pre-therapy baseline gallium-68 (^{68}Ga)-PSMA positron emission tomography/computed tomography (PET/CT) (A) showed numerous PSMA-avid skeletal metastases (mean standardized uptake value 9.2); therefore, the patient was deemed eligible for ^{177}Lu-PSMA. He received the first cycle (7.6 GBq) 6 weeks after the baseline PSMA PET/CT, when prostate-specific antigen (PSA) had more than doubled (169 ng/mL at baseline PSMA PET/CT→351 ng/mL at cycle 1, +108%). Early interim ^{68}Ga-PSMA PET/CT obtained after 2 cycles (cycle 2: 7.4 GBq; B) revealed multiple new vertebral and costal lesions (black arrows) with increased total tumor burden compared with pre-therapy ^{68}Ga-PSMA PET/CT (287 mL → 732 mL, +155%), suggestive of progressive disease. However, interpretation changed when the interim PET/CT was compared side-by-side with the cycle-1 next-day post-therapy single-photon emission computed tomography (SPECT)/CT (C), which revealed at least 6 additional vertebral and costal lesions not seen on the baseline PSMA PET/CT. The apparently "new" lesions identified on interim PSMA PET/CT were already present at treatment initiation and, therefore, did not represent progression under ^{177}Lu-PSMA-RLT. Cycle-2 next-day post-therapy SPECT/CT (D) showed a relatively stable total tumor burden without new lesions when compared with cycle 1 (786 mL → 802 mL, +2%), supporting stable disease status. ^{177}Lu-PSMA-RLT was therefore continued. This case illustrates a pitfall in response assessment during ^{177}Lu-PSMA-RLT: in rapidly progressive disease, when baseline PET/CT precedes treatment by several weeks, lesions that emerge before cycle 1 may be misclassified as treatment-emergent new lesions on interim PET/CT. The appearance of new lesions strongly influences PSMA-imaging response frameworks, such as Prostate Cancer Working Group 4 and RECIP 1.0 (1,2). In routine practice, the PSMA PET/CT used for treatment selection may precede therapy initiation by several weeks because eligibility confirmation, radiopharmaceutical ordering, scheduling, and treatment planning are time-consuming (3). Importantly, the VISION trial permitted up to 6 weeks from pre-therapy PSMA PET/CT until the first cycle of ^{177}Lu-PSMA-RLT (4). As this case illustrates, such a delay may allow substantial interval disease progression before therapy initiation, potentially leading to misinterpretation of interim PSMA PET/CT. The joint European Association of Nuclear Medicine/Society of Nuclear Medicine and Molecular Imaging (SNMMI) procedure guideline does not mandate a specific interval (5), whereas the SNMMI consensus statement recommends obtaining PSMA PET/CT within 3 months of treatment or since progression on the last therapy (6). Repeating baseline PSMA PET/CT closer to treatment initiation would reduce this pitfall of interval progression; however, this is often limited by logistical constraints in clinical practice. A rapid PSA rise between baseline PSMA PET/CT and cycle 1 likely reflects tumor growth occurring before therapy initiation rather than progression during treatment. In such cases, cycle-1 post-therapy SPECT/CT provides a true imaging baseline, and interim PSMA PET/CT should be interpreted against both scans before classifying any new lesions as progressive disease (7,8).

Ethics

Informed Consent: Informed consent was obtained from the patient for publication of this case and accompanying images.

Footnotes

Authorship Contributions

Surgical and Medical Practices: C.A., P.F., Design: C.A., Data Collection or Processing: M.K., Analysis or Interpretation: M.Z., R.P., Literature Search: R.P., Writing: M.K.

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