Interesting Image
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Findings of I-131 SPECT/CT, ^{18}F-FDG, and ^{68}Ga-FAPI-04 PET/CT Imaging in a Patient Treated with Radioiodine Therapy for Metastatic Papillary Thyroid Carcinoma

Radyoiyot Tedavisi Alan Metastatik Papiller Tiroid Karsinomlu Bir Hastada I-131 SPECT/BT, ^{18}F-FDG ve ^{68}Ga-FAPI-04 PET/BT Görüntüleme Bulguları

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Abstract

A 50-year-old man undergone total thyroidectomy and histopathology revealed papillary thyroid carcinoma with a tumor size of 4.5 cm. The patient was referred to a nuclear medicine clinic for radioiodine therapy. Since the thyroglobulin level before the treatment was 495 ug/L, low-dose (185 MBq) I-131 scan was performed. In addition to multiple liver metastases, bone metastases were detected in the sacrum and right 7th rib in I-131 whole body scanning and single photon emission computed tomography/computed tomography (CT) imaging at the time of initial staging. We present a case of multiple metastatic papillary thyroid carcinoma whose radioiodine treatment response and clinical outcome were evaluated with ^{18}F-fluorodeoxyglucose and Gallium-68 FAPI-04 positron emission tomography/CT.

Keywords: Papillary thyroid carcinoma, liver metastasis, radioiodine therapy, I-131, ^{18}F-FDG, ^{68}Ga FAPI-04, PET/CT

Öz

Total tiroidektomi yapılan 50 yaşındaki erkek hastada histopatolojik incelemede tümör boyutu 4,5 cm olan papiller tiroid karsinomu saptandı. Hasta radyoiyot tedavisi için nükleer tıp kliniğine yönlendirildi. Tedavi öncesi tiroglobulin düzeyi 495 ug/L olduğundan düşük doz (185 MBq) I-131 taraması yapıldı. İlk evreleme sırasında I-131 tüm vücut taraması ve Tek foton emisyon tomografisi/bilgisayarlı tomografi (BT) görüntülemede çoklu karaciğer metastazlarına ek olarak sakrum ve sağ 7. kostada kemik metastazları saptandı. Klinik ve radyoiyot tedavi yanıtı ^{18}F-florodeoksiglukoz ve Galyum-68-FAPI-04 pozitron emisyon tomografi/BT ile değerlendirilen multipl metastatik papiller tiroid karsinomu olgusu sunulmuştur.

Anahtar kelimeler: Papiller tiroid kanseri, karaciğer metastazı, radyoiyot tedavisi, I-131, ^{18}F-FDG, ^{68}Ga FAPI-04, PET/BT

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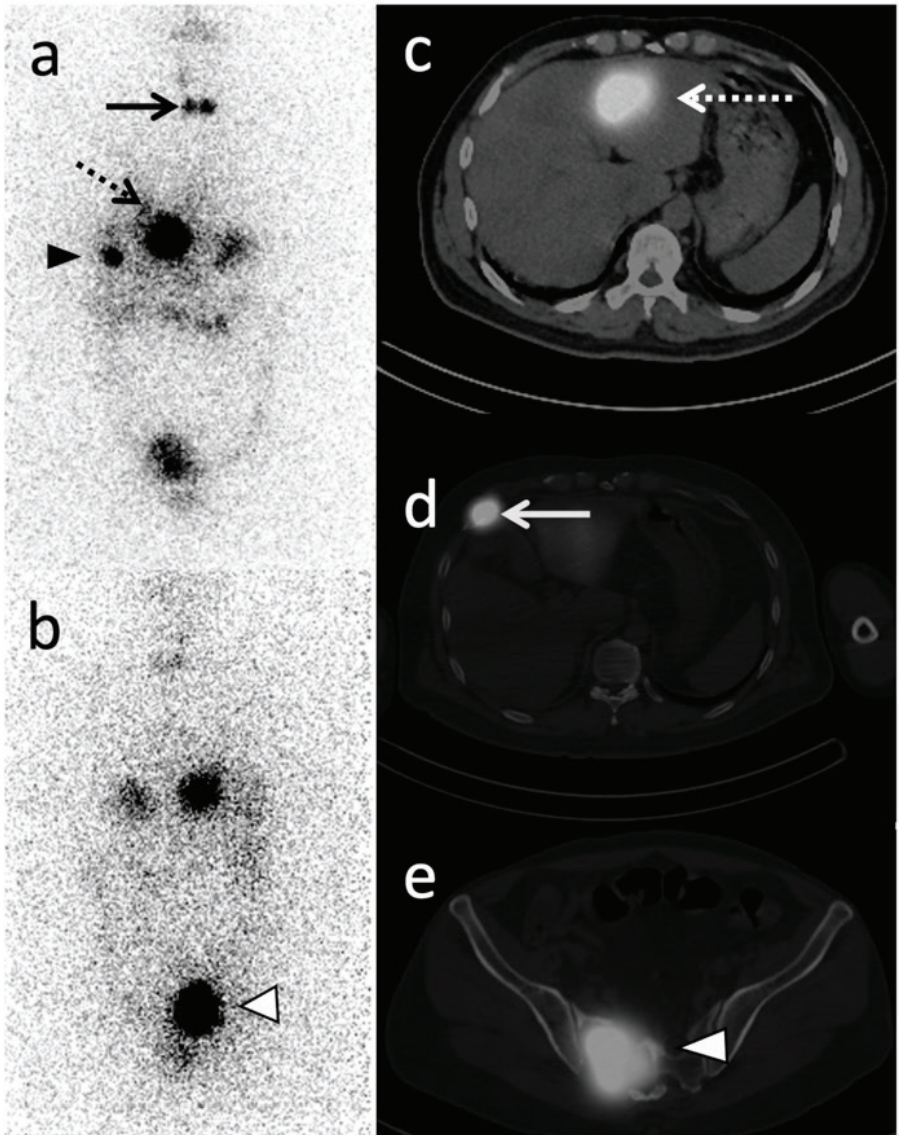

Figure 1. Anterior (a) and posterior (b) view of whole-body scan (WBS) with 185 MBq (5 mCi) I-131 were performed due to elevated stimulated thyroglobulin (Tg) (higher than 495 ug/L, anti Tg: 1.7 IU/mL) and serum liver enzymes (alanine transaminase: 112 U/L and aspartate transaminase: 70 U/L). Remnant tissue uptake was observed in the thyroid bed (arrow), and four metastatic foci in the liver (dashed arrow), right half of the sacrum (arrowhead), and right anterior 7th rib of the thoracic skeleton (black arrowhead) were also observed. 9250 MBq (250 mCi) radioiodine therapy was applied. Post-therapy WBS and single photon emission computed tomography/computed tomography (CT) axial fusion images showed intense iodine accumulation in the metastatic lesions as described on low-dose WBS (c, d, e).

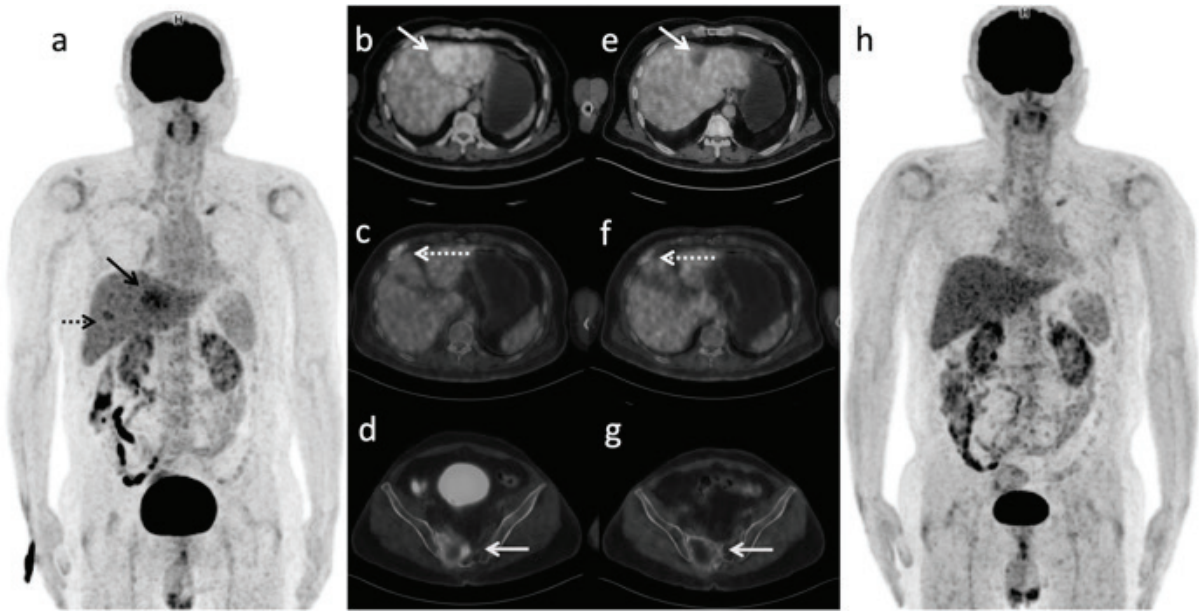

Figure 2. ^{18}F-fluorodeoxyglucose positron emission tomography (PET)/CT was performed 8 months after the radioiodine therapy to evaluate response and determine if there are other foci with ^{18}F-FDG positivity. Images of maximum-intensity projection (a) showed only one hypermetabolic metastatic mass-like lesion in the left lobe medial segment of the liver [maximum standardized uptake value (SUV_{max}): 6.5] (arrow), anterior part of the right 7th rib (dashed arrow), and lytic destructive hypermetabolic metastatic bone lesion with central necrosis (SUV_{max}: 4.0) in the right half of the sacrum (d) without additional lesions to the I-131 scan. Ten months after the first radioiodine therapy, the second therapy with 9250 MBq (250 mCi) was applied and radioiodine avid known metastasis was visualized in post-therapy I-131 scan. Four months after the second radioiodine therapy, the second ^{18}F-FDG PET/CT scan showed complete metabolic response in the liver (e) and partial response was observed in bone lesions (f, g). Serum Tg level decreased to 168 µg/L and liver enzymes returned to normal.

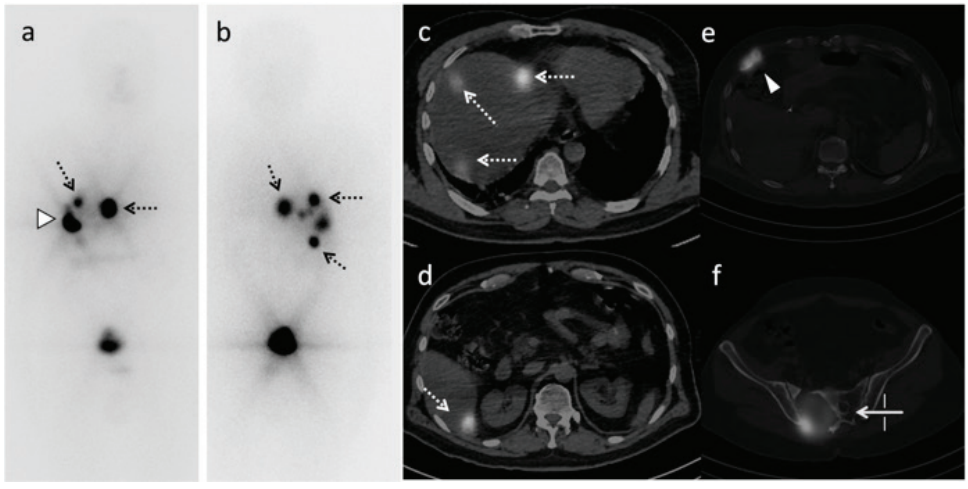

Figure 3. Eight months after 2nd radioiodine therapy, a third dose with 9250 MBq (250 mCi) I-131 was given (2750 MBq achieved) and multiple liver (a, b, c, d) and bone metastases were still iodine avid (e, f).

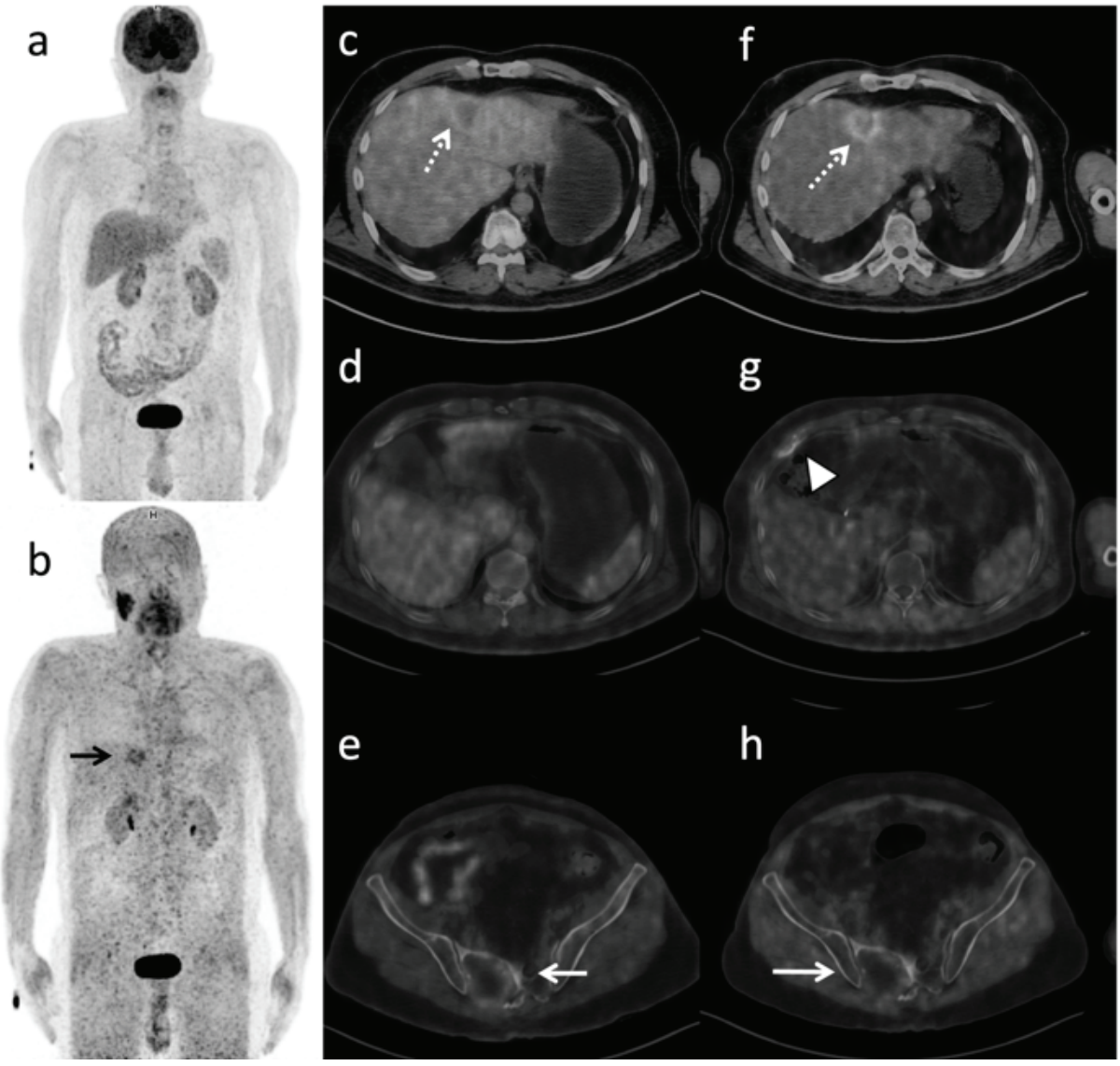

Figure 4. ^{18}F-FDG PET/CT was repeated 3 months after the third radioiodine therapy (a), and mild ^{18}F-FDG uptake was detected in bone lesions (d, e) with continuing ^{18}F-FDG negativity in the liver (c). In the same week, Gallium-68 (^{68}Ga)-FAPI-04 PET/CT imaging was performed (b) and moderate ^{68}Ga-FAPI-04 uptake was detected in hepatic metastases, while ^{18}F-FDG was negative (f). Also, mild peripheral ^{68}Ga-FAPI-04 uptakes were seen in bone metastases (g, h) like as ^{18}F-FDG. Four months later last ^{18}F-FDG scan was performed and stable disease was detected with no signs of progression as to the previous scan. The last viewed Tg level decreased to 26.5 µg/L.

Distant metastatic disease at the time of diagnosis is rarely encountered in differentiated thyroid carcinoma (DTC) and usually occurs in the lungs and skeleton (1,2). Liver metastasis are seen even rarer (<1%). Radioiodine therapy is a valuable radionuclide in practice for treating DTC when they concentrate iodine (3,4). PET/CT serves a limited contribution to the diagnosis, but it has a significant impact in the management of DTC, especially at increased Tg levels (5,6). Response assessment can be investigated by PET/CT for an option to I-131 scan (7). As shown in the current case, ^{68}Ga-FAPI-04 may also take a place and add benefit in the restaging of metastatic DTC (8).

Ethics

Informed Consent: The patient gave written informed consent for imaging modalities and permitted publication of his medical data.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: G.T., Ö.E.F., R.Ş., T.F.Ç., Concept: G.T., G.A., T.F.Ç., Design: G.T., G.A., T.F.Ç., Data Collection or Processing: G.T., Ö.E.F., R.Ş., Analysis or Interpretation: G.T., G.A., T.F.Ç., Literature Search: G.T., Writing: G.T., T.F.Ç.

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