



Unusual Soft Tissue and Muscle Metastases in Papillary Thyroid Carcinoma: Insights from ^{131}I Scintigraphy and ^{18}F -FDG PET/CT

Papiller Tiroid Karsinomunda Olağanüstü Yumuşak Doku ve Kas Metastazları: ^{131}I Sintigrafi ve ^{18}F -FDG PET/BT'den Elde Edilen Bulgular

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Abstract

Distant metastases from well-differentiated thyroid carcinoma typically involve the lungs and bones. We report a rare case of metastatic papillary thyroid carcinoma presenting as soft tissue lesion, detected by Iodine-131 whole-body scintigraphy in a 44-year-old asymptomatic male. The patient had previously undergone a total thyroidectomy and bilateral modified radical neck dissection, receiving radioiodine for pT3bN1bMx multifocal classical papillary thyroid carcinoma. Further evaluation with ^{18}F -fluorodeoxyglucose positron emission tomography/computed tomography revealed additional sites of soft tissue and muscle metastasis, along with extensive nodal, lung, and skeletal involvement. These findings indicated advanced disease with a poor prognosis, necessitating a change in the treatment plan.

Keywords: Iodine-131, thyroid cancer, ^{18}F -fluorodeoxyglucose positron emission tomography/computed tomography, soft tissue metastasis, muscle metastasis

Öz

İyi farklılaşmış tiroid karsinomundan kaynaklanan uzak metastazlar tipik olarak akciğerleri ve kemikleri etkiler. Kırk dört yaşındaki asemptomatik bir erkekte iyot-131 tüm vücut sintigrafisi ile tespit edilen, yumuşak doku lezyonu olarak ortaya çıkan nadir bir metastatik papiller tiroid karsinomu olusu sunuyoruz. Hasta daha önce total tiroidektomi ve bilateral modifiye radikal boyun diseksiyonu geçirmiştir ve pT3bN1bMx multifokal klasik papiller tiroid karsinomu için radyoijod tedavisi almıştır. ^{18}F -florodeoksiglukoz pozitron emisyon tomografisi/bilgisayarlı tomografi ile yapılan ileri değerlendirme, yaygın lenf nodu, akciğer ve iskelet tutulumu ile birlikte ek yumuşak doku ve kas metastazı bölgeleri ortaya çıkardı. Bu bulgular, kötü прогнозlu ilerlemiş bir hastalığı işaret ediyordu ve tedavi planında değişiklik yapılmasını gerektiriyordu.

Anahtar Kelimeler: iyot-131, tiroid kanseri, ^{18}F -fluorodeoksiglukoz pozitron emisyon tomografisi/bilgisayarlı tomografi, yumuşak doku metastazı, kas metastazı

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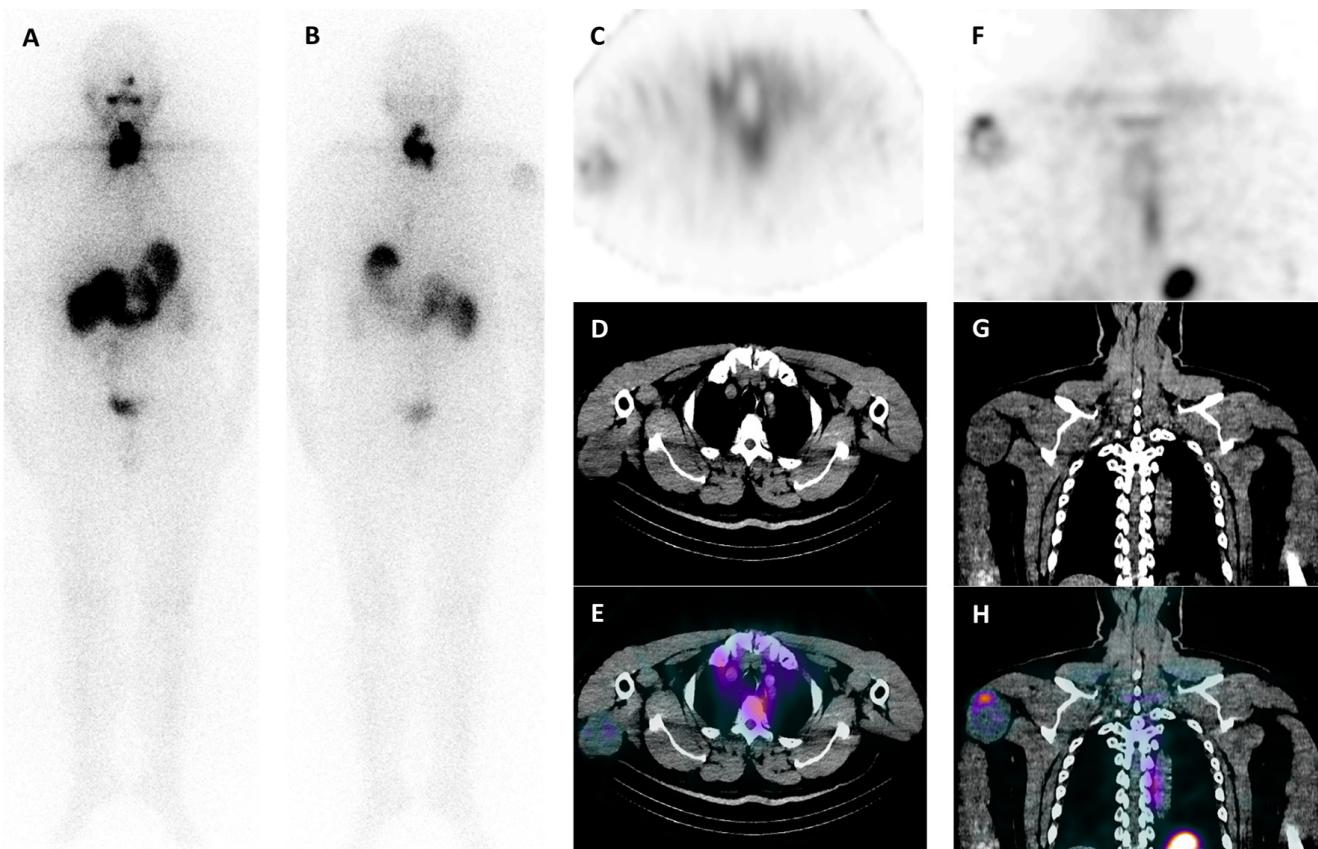


Figure 1. A 44-year-old man received 120 mCi (4440 MBq) of Iodine-131 (^{131}I), 12 weeks after total thyroidectomy and bilateral modified radical neck dissection, for pT3bN1bMx multifocal classical papillary thyroid carcinoma. Histopathology showed extensive lymph node metastases, capsular and vascular invasion, extrathyroidal extension, and lymphovascular permeation of the isthmus. Preoperative contrast-enhanced computed tomography of the neck revealed numerous enlarged bilateral cervical lymph nodes and a right thyroid lesion, without lung or bone metastases. The 120 mCi activity was selected empirically, following institutional protocols and American Thyroid Association guidelines for high-risk differentiated thyroid carcinoma with extensive nodal involvement and possible distant spread. Post-therapy ^{131}I whole-body scintigraphy (A and B) demonstrated multiple foci of increased tracer uptake in the neck and a faint focus in the right posterior shoulder. A subsequent single photon emission computed tomography/computed tomography of the chest (C, D, and E axial view; F, G, and H coronal view) identified an ^{131}I subcutaneous soft tissue lesion in the right posterior shoulder measuring 4.1x5.9x6.0 cm (AP x W x CC), with no distinct separation from the right triceps muscle. The stimulated (thyroid stimulating hormone >100 mIU/L) serum thyroglobulin (Tg) level prior to ^{131}I therapy was elevated (>5000 ng/mL; normal range 3.5-77 ng/mL), despite a positive anti-Tg antibody, (247.5 IU/mL; normal <115 IU/mL). Biopsy of the shoulder lesion confirmed metastatic papillary thyroid carcinoma.

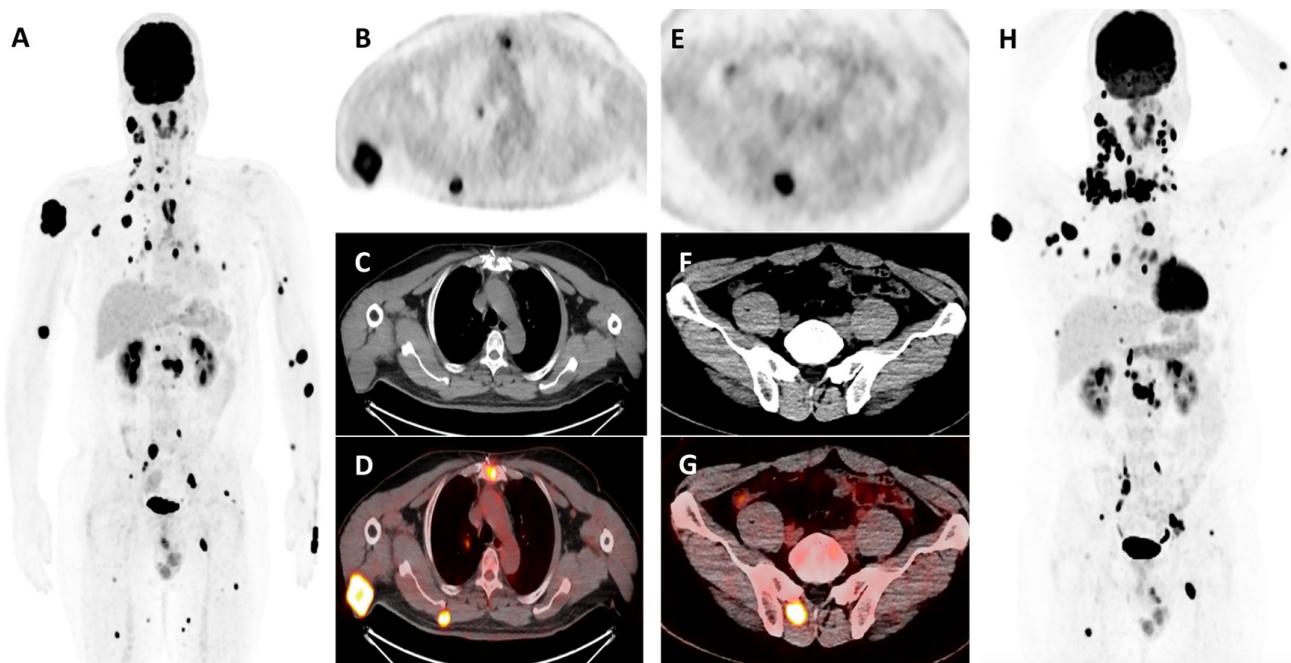


Figure 2. Subsequent ^{18}F -fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F -FDG PET/CT) (A) revealed ^{18}F -FDG-avid malignancy in the thyroid bed with extensive nodal metastases in the neck, chest, and abdomen. Additionally, metastases were identified in the lungs, bones, and soft tissues of the bilateral upper limbs, prominently in the right posterior shoulder (B, C, and D axial view). There was also involvement in muscles, including the right trapezius, right intercostal, bilateral paraspinal, bilateral thigh, and left gluteus, with prominent involvement in the right paraspinal muscle (E, F, and G axial view). Following these findings, radioiodine therapy was discontinued, and the patient began treatment with the tyrosine kinase inhibitor (TKI) lenvatinib. After eight months on lenvatinib, a follow-up ^{18}F -FDG PET/CT demonstrated disease progression, with multiple new ^{18}F -FDG-avid lesions despite some regression in previously noted sites. The initial suppressed serum thyroglobulin (Tg) level was 34.8 ng/mL (thyroid stimulating hormone of 0.19 mIU/L), increasing to 96.8 ng/mL, before TKI initiation, indicating disease progression. Following TKI therapy, suppressed Tg levels decreased to 0.36 ng/mL on later follow-up before rising again to 268.0 ng/mL, suggesting ongoing disease activity. Distant metastases in differentiated thyroid carcinoma occur in approximately 5% to 10% of cases, typically affecting the lungs and bones (1). Less common sites of dissemination, such as the liver, brain, soft tissue, and muscle, often indicate dedifferentiation of the disease and may arise years after the initial diagnosis (2,3). Soft tissue and muscle metastases from papillary thyroid carcinoma are rare and frequently identified incidentally on imaging due to the asymptomatic nature of most cases (2,4). These metastases generally signify advanced and widely disseminated disease, as in this case (2,4). However, there are reports of solitary soft tissue and muscle metastases in some patients (3,5,6). Soft tissue and skeletal muscle are considered unfavorable environments for tumor proliferation due to factors such as anti-tumor cytokines (e.g., interleukin adenosine and leukemia inhibitory factor); the removal of lactic acid; mechanical disruption of tumor cells; inappropriate pH levels; variable blood flow; and continuous muscle motion (1,2,4,7,8). Nevertheless, soft tissue and muscle metastasis can occur via multiple mechanisms, including intramuscular lymphatic spread, hematogenous dissemination, and perineural transmission (7). In this context, ^{18}F -FDG PET/CT is crucial when serum Tg levels are disproportionately high and do not correlate with Iodine-131 (^{131}I) whole-body scan findings (9). It helps identify iodine-refractory or dedifferentiated lesions, revealing occult metastases not seen on ^{131}I imaging (9,10). In this case, the detection of soft tissue metastasis on ^{131}I whole-body scintigraphy, along with extensive hypermetabolic ^{18}F -FDG-avid lesions in unexpected sites, indicated a poor prognosis and shorter survival (1,2,8,9,10), necessitating a change in treatment strategy.

Ethics

Informed Consent: The patient provided written informed consent.

Footnotes

Authorship Contributions

Surgical and Medical Practices: M.F.M.R., S.Z.A.H., Concept: M.F.M.R., S.Z.A.H., Design: M.F.M.R., S.Z.A.H., Data Collection or Processing: M.F.M.R., S.Z.A.H., Analysis or Interpretation: M.F.M.R., S.Z.A.H., Literature Search: M.F.M.R., S.Z.A.H., Writing: M.F.M.R., S.Z.A.H.

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