



An Incidental Solitary Plasmacytoma of Bone Mimicking Neuroendocrine Tumor Metastasis on ⁶⁸Ga-DOTATATE Positron Emission Tomography/Computed Tomography

⁶⁸Ga-DOTATATE Pozitron Emisyon Tomografi/Bilgisayarlı Tomografi Görüntülemesinde Nöroendokrin Tümör Metastazını Taklit Eden İncidental Soliter Kemik Plazmasitomu

Duygu Has Şimşek¹, Serkan Kuyumcu², Bilge Bilgiç³, Emine Göknur Işık⁴, Cüneyt Türkmen², Işık Adalet²

¹Tokat State Hospital, Clinic of Nuclear Medicine, Tokat, Turkey

²Istanbul University Istanbul Faculty of Medicine, Department of Nuclear Medicine, Istanbul, Turkey

³Istanbul University Istanbul Faculty of Medicine, Department of Pathology, Istanbul, Turkey

⁴Hitit University, Çorum Training and Research Hospital, Department of Nuclear Medicine, Çorum, Turkey

Abstract

A 54-year-old woman with suspicion of neuroendocrine tumor (NET) was referred for ⁶⁸Ga-DOTATATE positron emission tomography/computed tomography (CT) imaging due to clinical findings. A well-defined osteolytic lesion on the corpus of the third lumbar vertebra was evident on CT images with mild uptake of ⁶⁸Ga-DOTATATE, which led to suspicion of NET metastasis. Histopathologic examination revealed solitary plasmacytoma of the bone. The patient received local external radiotherapy for plasmacytoma. This case indicates that other diseases expressing somatostatin receptors may be inaccurately reported as tumor recurrence and highlights the importance of meticulous evaluation of positive findings.

Keywords: ⁶⁸Ga-octreotide, DOTA(0)-Tyr(3)-, positron emission tomography/computed tomography, plasmacytoma, neuroendocrine tumors

Öz

Nöroendokrin tümör (NET) şüphesi bulunan 54 yaşındaki kadın hastaya ⁶⁸Ga-DOTATATE pozitron emisyon tomografisi/bilgisayarlı tomografi (BT) görüntüleme yapıldı. Lomber 3. vertebrada BT görüntülerinde tanımlanan osteolitik lezyonda düşük düzeyde ⁶⁸Ga-DOTATATE tutulumu izlenmesi nedeniyle NET metastazı açısından şüpheli bulundu. Histopatolojik örnekleme soliter kemik plazmasitomu olarak sonuçlandı. Hasta plazmasitoma nedeniyle lokal eksternal radyoterapiye yönlendirildi. Bu olgu somatostatin reseptörlerini eksprese eden diğer hastalıkların tümör nüksü olarak yanlış raporlanabileceğini ve pozitif bulguların dikkatli değerlendirilmesinin önemini vurgulamaktadır.

Anahtar kelimeler: ⁶⁸Ga-oktreotid, DOTA(0)-Tyr(3)-, pozitron emisyon tomografisi/bilgisayarlı tomografi, plazmasitom, nöroendokrin tümörler

Address for Correspondence: Duygu Has Şimşek MD, Tokat State Hospital, Clinic of Nuclear Medicine, Tokat, Turkey
Phone: +90 356 214 54 00 E-mail: dr.duyguhas@hotmail.com **Received:** 19.05.2015 **Accepted:** 24.11.2015

©Molecular Imaging and Radionuclide Therapy, Published by Galenos Publishing House.
This article is distributed under the terms of the "Creative Commons Attribution NonCommercial 4.0 International Licence (CC BY-NC 4.0)".

Introduction

The primary indication of ^{68}Ga -DOTA-conjugated peptide positron emission tomography/computed tomography (PET/CT) is neuroendocrine tumor (NET) imaging (1). However, tumors that express somatostatin (SST) receptors other than NETs can also be visualized by ^{68}Ga -DOTA-conjugated peptide PET/CT (2). In vitro studies with plasma cell lines have shown that the SST is expressed on malignant plasma cells (3). In our case, a solitary bone plasmacytoma (SBP) in the lumbar spine showed increased ^{68}Ga -DOTATATE uptake mimicking bone metastasis in a patient with suspected NET recurrence.

SBP is characterized by a solitary bone lesion that shows infiltration by plasma cells without evidence of anemia, hypercalcemia, or renal involvement suggesting systemic myeloma (4). SBP may involve any bone but most often affects the axial skeleton, particularly the vertebra, pelvis, ribs and pectoral girdle (4).

Case Report

A 54-year-old woman with suspicion of NET was referred for ^{68}Ga -DOTATATE PET/CT due to clinical findings. A well-defined osteolytic lesion on the corpus of the third lumbar vertebra extending to the right pedicle was evident on CT images (Figure 1a, b; arrows). The corresponding PET images (Figure 1c, d; arrows) demonstrated mild uptake of ^{68}Ga -DOTATATE, which led to suspicion of NET metastasis.

Histopathologic evaluation of the lesion was recommended in order to differentiate bone metastasis of NET from other SST expressing pathologies. Histopathologic examination demonstrated diffuse neoplastic plasma cell infiltration in the bone marrow (Figure 1e). Immunohistochemical staining revealed immunoglobulin λ -light chain antibodies in the tumor, and CD38 antibody positivity on the cell membrane (Figure 1f). All findings indicated SBP with supporting clinical data. The patient received local external radiotherapy for plasmacytoma.

Literature Review and Discussion

^{68}Ga -DOTA-conjugated peptide PET/CT is the imaging modality of choice for NETs for the detection of metastatic disease or local relapse, and it affects therapeutic approach in more than 40% of patients (5,6,7). The most common sites of NET metastasis are the liver, lymph nodes and bone (8). The presence of bone metastasis has vital clinical importance on treatment management, since it has been shown that bone metastasis is associated with poor overall survival (6).

Although results of ^{68}Ga -DOTA-conjugated peptide PET/CT in NETs are remarkable other tumors that express SST (predominantly SST2, SST3 and SST5), such as lymphomas,

breast and lung cancers, thyroid cancers, gastrointestinal stromal tumors, prostate cancers and plasmacytoma/multiple myelomas, can also be avid for ^{68}Ga -DOTA-conjugated peptide PET/CT, thus misleading the physician (2).

It is not unusual that SBP has avidity of ^{68}Ga -DOTATATE. Previous studies have shown that ^{111}In -pentetretotide SST scintigraphy is an alternative method to display in vivo multiple myeloma/SBP activity, especially in patients with relapsing disease and a more aggressive type of myeloma (9). In our case, a solitary osteolytic vertebral lesion with mild ^{68}Ga -DOTATATE uptake is less likely to be a metastasis because skeletal lesions of NETs are mostly osteosclerotic. The metastasis due to NETs are osteolytic only in 10% of the cases (10). A histopathologic evaluation was required for the definite diagnosis of the bone lesion and the patient was diagnosed with SBP, not relapse.

Degenerative diseases in the spine can also lead to increased ^{68}Ga -DOTATATE uptake. Klinaki et al. (11) reported a case with Modic changes in L4-5 vertebrae that have caused ^{68}Ga -DOTATATE uptake probably due to increased blood supply or infiltration with activated lymphocytes. Putzer et al. (12) reported a false positive lesion caused by extensive vertebral osteophytes with an inflammatory component.

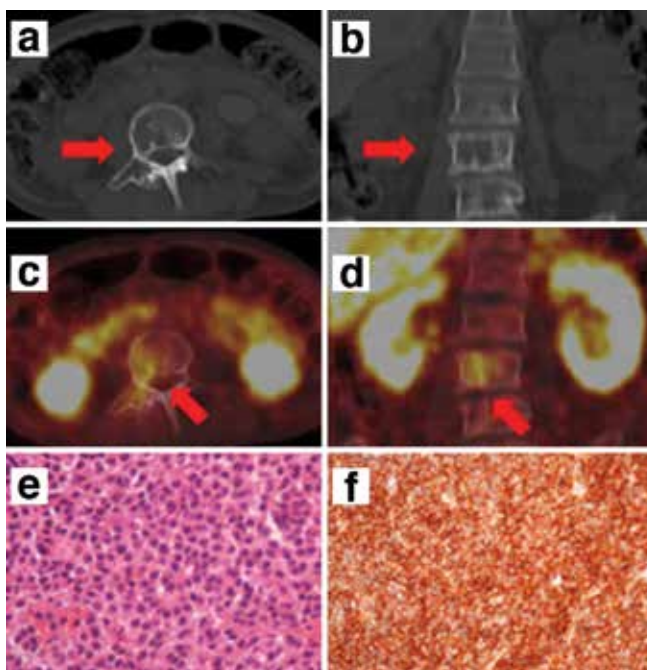


Figure 1. Transaxial (a)-coronal (b) computed tomography images; transaxial (c)-coronal (d) positron emission tomography/computed tomography fusion images; diffuse neoplastic plasma cell infiltration in the bone marrow (e) and CD38 antibody positivity on the cell membrane (f) in immunohistochemical and histopathologic examinations. A well-defined osteolytic lesion on the corpus of the third lumbar vertebra extending to the right pedicle (a, b arrows) showing mild ^{68}Ga -DOTATATE uptake (c, d arrows)

In the literature, there are two case reports describing 68Ga-DOTATATE avid vertebral hemangiomas (13,14). The characteristic pattern in CT may help in distinguishing vertebral hemangioma and bone metastasis. A fibrous dysplasia of the bone also demonstrated significant 68Ga-DOTATATE uptake as reported by Kuyumcu et al. (15).

68Ga-DOTATATE has significant clinical impact that direct patients either to surgery or to systemic/palliative therapy. Thus, physicians should be careful when evaluating any lesion. Multiple bone lesions may be mistaken as metastases, and solitary lesions may reveal other diagnoses.

This case indicates that other diseases expressing SST receptors may be inaccurately reported as tumor metastasis and highlights the importance of meticulous evaluation of positive findings.

Ethics

Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: Duygu Has Şimşek, Cüneyt Türkmen, Concept: Duygu Has Şimşek, Design: Duygu Has Şimşek, Data Collection or Processing: Duygu Has Şimşek, Bilge Bilgiç, Analysis or Interpretation: Duygu Has Şimşek, Serkan Kuyumcu, Işık Adalet, Literature Search: Duygu Has Şimşek, Emine Gökür Işık, Writing: Duygu Has Şimşek.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

- Ambrosini V, Nanni C, Fanti S. The use of gallium-68 labeled somatostatin receptors in PET/CT imaging. *PET Clin* 2014;9:323-329.
- Sollini M, Erba PA, Fraternali A, Casali M, Di Paolo ML, Froio A, Frasoldati A, Versari A. PET and PET/CT with 68gallium-labeled somatostatin analogues in Non GEP-NETS Tumors. *ScientificWorld Journal* 2014;2014:194123.
- Dimopoulos MA, Moulouopoulos LA, Maniatis A, Alexanian R. Solitary plasmacytoma of bone and asymptomatic multiple myeloma. *Blood* 2000;96:2037-2044.
- Bataille R, Sany J. Solitary myeloma: clinical and prognostic features of a review of 114 cases. *Cancer* 1981;48:845-851.
- Has Şimşek D, Kuyumcu S, Turkmen C, Sanli Y, Aykan F, Unal S, Adalet I. Can complementary 68Ga-DOTATATE and 18F-FDG PET/CT establish the missing link between histopathology and therapeutic approach in gastroenteropancreatic neuroendocrine tumors? *J Nucl Med* 2014;55:1811-1817.
- Skoura E, Michopoulou S, Mohmaduvsh M, Panagiotidis E, Al Harbi M, Toumpanakis C, Almukhailed O, Kayani I, Syed R, Navalkisoor S, Ell PJ, Caplin ME, Bomanji J. The Impact of 68Ga-DOTATATE PET/CT Imaging on Management of Patients with Neuroendocrine Tumors: Experience from a National Referral Center in the United Kingdom. *J Nucl Med* 2016;57:34-40.
- Ambrosini V, Campana D, Bodei L, Nanni C, Castellucci P, Allegri V, Montini GC, Tomassetti P, Paganelli G, Fanti S. 68Ga-DOTANOC PET/CT clinical impact in patients with neuroendocrine tumors. *J Nucl Med* 2010;51:669-673.
- Scarsbrook AF, Ganesan A, Statham J, Thakker RV, Weaver A, Talbot D, Boardman P, Bradley KM, Gleeson FV, Phillips RR. Anatomic and functional imaging of metastatic carcinoid tumors. *Radiographics* 2007;27:455-477.
- Agool A, Slart RH, Dierckx RA, Kluijn PM, Visser L, Jager PL, Vellenga E. Somatostatin receptor scintigraphy might be useful for detecting skeleton abnormalities in patients with multiple myeloma and plasmacytoma. *Eur J Nucl Med Mol Imaging* 2010;37:124-130.
- Gibril F, Doppman JL, Reynolds JC, Chen CC, Sutliff VE, Yu F, Serrano J, Venzon DJ, Jensen RT. Bone metastases in patients with gastrinomas: a prospective study of bone scanning, somatostatin receptor scanning, and magnetic resonance image in their detection, frequency, location, and effect of their detection on management. *J Clin Oncol* 1998;16:1040-1053.
- Klinaki I, Al-Nahhas A, Soneji N, Win Z. 68Ga DOTATATE PET/CT uptake in spinal lesions and MRI correlation on a patient with neuroendocrine tumor: potential pitfalls. *Clin Nucl Med* 2013;38:e449-453.
- Putzer D, Gabriel M, Henninger B, Kendler D, Uprimny C, Dobrozemsky G, Decristoforo C, Bale RJ, Jaschke W, Virgolini IJ. Bone metastases in patients with neuroendocrine tumor: 68Ga-DOTA-Tyr3-octreotide PET in comparison to CT and bone scintigraphy. *J Nucl Med* 2009;50:1214-1221.
- Brogstetter C, Hofmockel T, Kotzerke J. (68)Ga DOTATATE uptake in vertebral hemangioma. *Clin Nucl Med* 2014;39:462-463.
- Skoura E, Alshammari A, Syed R, Sajjan R, Bomanji J. Adolescent With 68Ga DOTATATE-Avid Vertebral Hemangioma Mimicking Metastasis in PET Imaging. *Clin Nucl Med* 2015;40:e378-379.
- Kuyumcu S, Ozkan ZG, Sanli Y, Yilmaz E, Mudun A, Adalet I, Unal S. Physiological and tumoral uptake of (68)Ga-DOTATATE: standardized uptake values and challenges in interpretation. *Ann Nucl Med* 2013;27:538-545.