



## $^{68}\text{Ga}$ -PSMA-11 PET/CT in a patient with non-PSA-secreting undifferentiated prostate cancer before and after treatment with cabozantinib

Carlos Artigas<sup>1</sup> · N. Plouznikoff<sup>1,2</sup> · T. Gil<sup>3</sup> · I. Duran Derijckere<sup>1</sup> · M. Herchuelz<sup>1</sup> · I. Libert<sup>4</sup> · P. Flamen<sup>1</sup>

Received: 12 March 2019 / Accepted: 20 May 2019 / Published online: 4 June 2019  
© Springer-Verlag GmbH Germany, part of Springer Nature 2019

A 47-year-old man was diagnosed 3 years previously with a metastatic poorly differentiated non-neuroendocrine prostate adenocarcinoma, Gleason score 9, with low initial prostate-specific antigen (PSA) level (4.5 ng/mL). Multiple therapeutic lines were employed: docetaxel, androgen-deprivation therapy, abiraterone, cabazitaxel, cyclophosphamide and carboplatin. The patient presented with intense left iliac bone pain, a nearly undetectable PSA level and a significant increase in carcinoembryonic antigen (CEA, 140 ng/mL).  $^{68}\text{Ga}$ -PSMA PET/CT performed at that time point demonstrated an extensive [1] demonstrated extensive metastatic disease with prostate-specific membrane antigen (PSMA) overexpression in lymph nodes, lungs, liver and bone lesions, especially the left iliac bone (a), with substantial involvement of adjacent soft tissues (b). The tumour board recommended trying cabozantinib (40 mg/day) [2], a multikinase inhibitor, obtained for use on compassionate grounds. A good clinical response with cessation of opioids was observed 3 months later, but CEA had continued to

increase (377 ng/mL).  $^{68}\text{Ga}$ -PSMA-11 PET/CT demonstrated an important decrease in size and PSMA expression of most metastases (d). However, new metastatic lesions were noted, mainly in the liver (c), suggesting resistant clone selection.

Non-PSA-secreting prostate cancer is rare, has a poor prognosis and can be clinically hard to follow [3]. There is a need for a better understanding of this entity, for which additional tumour markers and the use of modern imaging techniques are required.  $^{68}\text{Ga}$ -PSMA-11 PET/CT should thus be considered in patients with undifferentiated prostate cancer, even those with low/undetectable PSA level. Moreover, this is the first case documenting the effects of cabozantinib on PSMA expression, which are possibly linked to its anti-VEGFR2 properties, since PSMA can be overexpressed in the membrane of neovessels [4]. Such variations in PSMA expression should be considered when selecting patients for  $^{177}\text{Lu}$ -PSMA radioligand therapy [5].

This article is part of the Topical Collection on Image of the Month

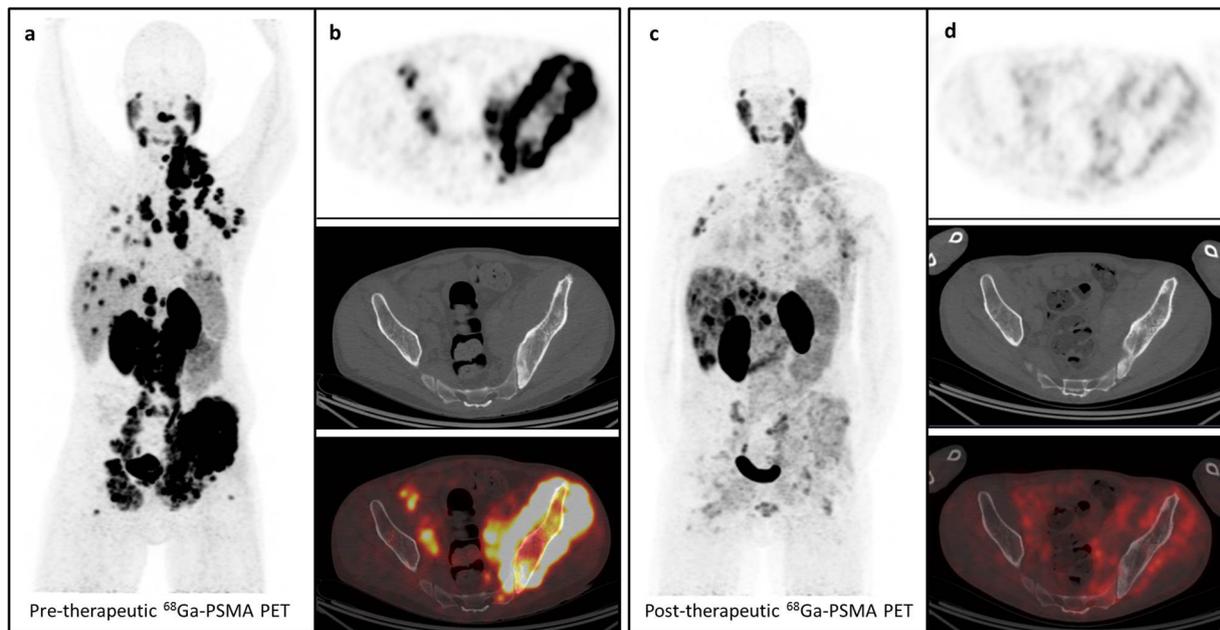
✉ Carlos Artigas  
carlos.artigas@bordet.be

<sup>1</sup> Department of Nuclear Medicine, Institut Jules Bordet, Université Libre de Bruxelles (ULB), Rue Hégér Bordet, 1, 1000 Brussels, Belgium

<sup>2</sup> Department of Nuclear Medicine, Centre Hospitalier de l'Université de Montréal (CHUM), Montreal, Quebec, Canada

<sup>3</sup> Department of Oncology, Institut Jules Bordet, Université Libre de Bruxelles (ULB), Brussels, Belgium

<sup>4</sup> Department of Palliative and Supportive Care, Institut Jules Bordet, Université Libre de Bruxelles (ULB), Brussels, Belgium



**Compliance with ethical standards** Following the patient's death, consent for publication was obtained from his immediate family.

**Conflicts of interests** None.

## References

1. Afshar-Oromieh A, Malcher A, Eder M, Eisenhut M, Linhart HG, Hadaschik BA, et al. PET imaging with a [<sup>68</sup>Ga]gallium-labelled PSMA ligand for the diagnosis of prostate cancer: biodistribution in humans and first evaluation of tumour lesions. *Eur J Nucl Med Mol Imaging*. 2013;40:486–95.
2. Basch EM, Scholz M, de Bono JS, Vogelzang N, de Souza P, Marx G, et al. Cabozantinib versus mitoxantrone-prednisone in symptomatic metastatic castration-resistant prostate cancer: a randomized phase 3 trial with a primary pain endpoint. *Eur Urol*. 2019;75:929–37.
3. Lee DK, Park JH, Kim JH, Lee SJ, Jo MK, Gil MC, et al. Progression of prostate cancer despite an extremely low serum level of prostate-specific antigen. *Korean J Urol*. 2010;51:358–61.
4. Artigas C, Alexiou J, Garcia C, Wimana Z, Otte FX, Gil T, et al. Paget bone disease demonstrated on (<sup>68</sup>Ga)PSMA ligand PET/CT. *Eur J Nucl Med Mol Imaging*. 2016;43:195–6.
5. Scarpa L, Buxbaum S, Kendler D, Fink K, Bektic J, Gruber L, et al. The <sup>68</sup>Ga/<sup>177</sup>Lu theragnostic concept in PSMA targeting of castration-resistant prostate cancer: correlation of SUVmax values and absorbed dose estimates. *Eur J Nucl Med Mol Imaging*. 2017;44(5):788–800.

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.