

¹⁷⁷Lu-DOTATATE and ¹⁷⁷Lu-prostate-specific membrane antigen therapy in a patient with advanced metastatic radioiodine-refractory differentiated thyroid cancer after failure of tyrosine kinase inhibitors treatment

ABSTRACT

Patients with radioiodine-refractory differentiated thyroid cancer (RrDTC) have only a limited or no benefit from radioiodine therapy. For these patients, tyrosine kinase inhibitors have demonstrated encouraging results in advanced RrDTC. Nevertheless, these therapies are related with substantial side effects and a high cost. Somatostatin receptor-based therapies have shown promising findings in advanced RrDTC. Recently, prostate-specific membrane antigen (PSMA) expression was seen in advanced RrDTC in imaging studies. This study presents a case of RrDTC who was treated with ¹⁷⁷Lu-DOTATATE and ¹⁷⁷Lu-PSMA, presumably as a first report in this regard.

Keywords: ¹⁷⁷Lu, DOTATATE, prostate-specific membrane antigen, radioiodine-refractory differentiated thyroid cancer

INTRODUCTION

Patients with radioiodine-refractory differentiated thyroid cancer (RrDTC) have only a limited or no benefit from radioiodine therapy so that they need other treatment strategies such as surgery and/or external irradiation to provide a systemic approach to prevent metastatic tumor spread. Tyrosine kinase inhibitors have demonstrated encouraging results in advanced RrDTC but is associated with substantial side effects and a high cost. Somatostatin receptor (SSTR)-based therapies have shown promising findings in advanced RrDTC.^[1,2] Recently, prostate-specific membrane antigen (PSMA) expression was seen in advanced RrDTC in imaging studies.^[3]

This study presents a case of RrDTC who was treated with ¹⁷⁷Lu-DOTATATE and ¹⁷⁷Lu-PSMA, and is presumably the first report in this regard.

CASE REPORT

The patient was a 42-year-old man who had a progressive disease with neck and lung metastases and was treated with 25.9 GBq (700 mCi) ¹³¹I and also sorafenib for 6 months. The patient had progressive dyspnea due to massive pleural effusions and also repeated surgical intervention in thorax [Figure 1a]. The last radioiodine therapy with 7.4 GBq was given after a long period sorafenib treatment, which was associated with the patient experiencing severe side effects. The

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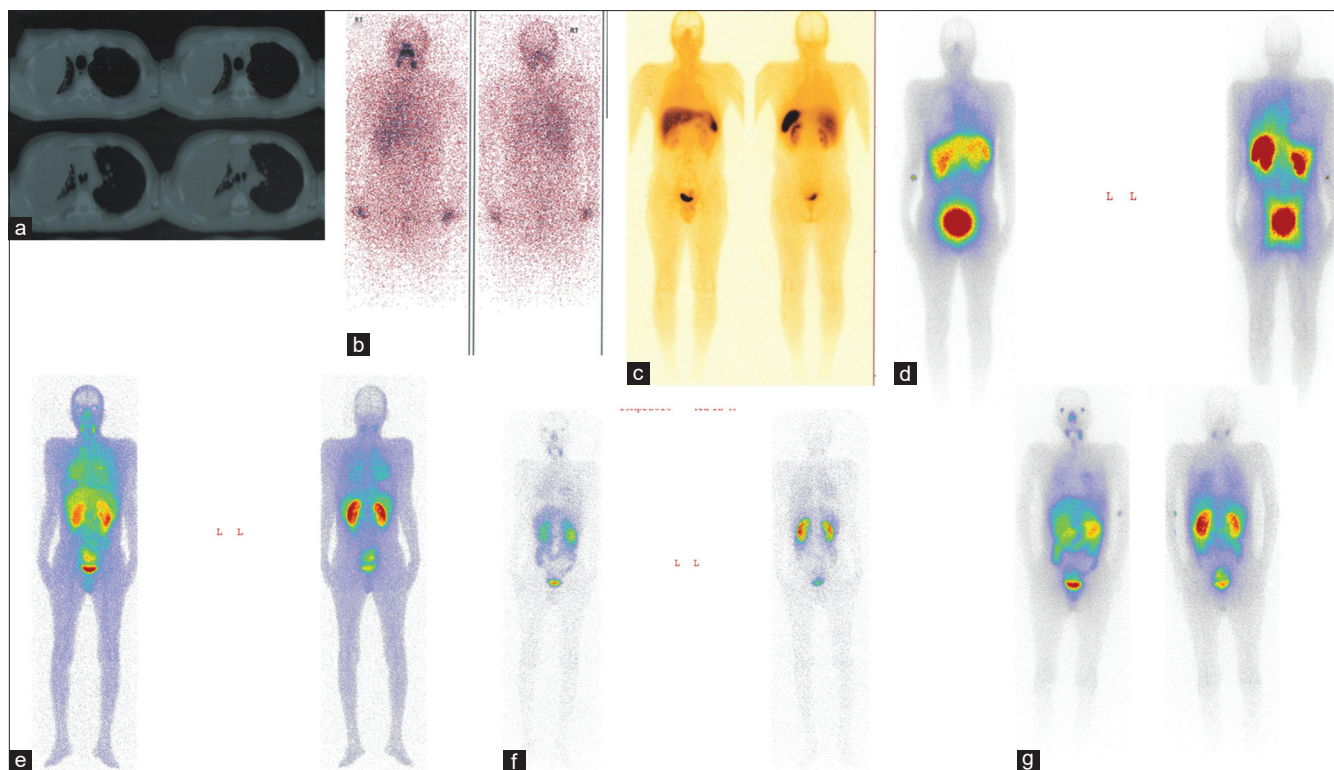


Figure 1: The different imaging modalities in a 42-year-old man with a radioiodine-refractory differentiated thyroid cancer. Computed tomography scan of thorax (a); post ^{131}I ablation whole-body scan (b); $^{99\text{m}}\text{Tc}$ octreotide scintigraphy (c); post ^{177}Lu -DOTATATE whole-body imaging (d); 2 and 24 h prostate-specific membrane antigen scintigraphy (e and f) and post ^{177}Lu -prostate-specific membrane antigen whole-body imaging (g)

posttreatment whole-body imaging showed a faint uptake in the involved neck and lung regions [Figure 1b]. Few months later he underwent octreotide scintigraphy which depicted faint uptake in the neck and lung [Figure 1c], and he immediately received 7.4 GBq ^{177}Lu -DOTATATE, and also posttherapy whole-body imaging which demonstrated some uptake in the neck and lung [Figure 1d]. The patient showed continued disease progression and severe dyspnea which required repeated hospitalization. Based on the promising findings of ^{68}Ga -PSMA,^[3,4] Our multidisciplinary team proposed PSMA scanning which showed more uptake than octreotide scan in the involved regions [Figure 1e and f]. He then received 7.4GBq ^{177}Lu -PSMA, and once more the posttherapy whole-body imaging revealed more uptake than posttherapy whole-body imaging following ^{177}Lu -DOTATATE [Figure 1g]. The patient died 2 weeks posttherapy unexpectedly due to cardiac arrest. It should be mentioned that the number of hospitalization after PRRT were fewer than before. Also, an interesting clinical point was that the respiratory function improved in the early days after therapy, so that although he could not walk alone before PRRT, he was able to walk alone for hours in the early days after PRRT.

DISCUSSION

In this study, we present both ^{177}Lu -DOTATATE and ^{177}Lu -PSMA therapies in a patient with RrDTC.

Recently, Roll *et al.* presented findings of five RrDTC patients with limited further therapeutic options and documented expression of SSRT using ^{68}Ga -DOTATATE-PET/CT received 2–4 cycles of PRRT with ^{177}Lu -DOTATATE. They demonstrated that only one out of five patients depicted a partial response, whereas three patients had a progressive disease. One patient had discordant findings between stable imaging results albeit rising Tg levels.^[2]

Overall, recent studies demonstrate heterogeneous results ranging from progressive disease under PRRT to favorable results with disease control in up to 60% of patients.^[1,5,6] To the best of our knowledge, the literature is scarce regarding ^{177}Lu -PSMA therapy in the patients with RrDTC, so further studies are needed to evaluate this subgroup of DTC.

Such cases illustrate the potential complexity, and interdisciplinary strategies that may end in managing dilemmas. It appears that there is a need for a multidisciplinary pragmatic approach for a change in the management of patients with RrDTC.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients

understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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