^{177}Lu-Dota-Tate, a Radiotherapeutic Agent for Treatment of Neuroendocrine Cancers

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Peptide Receptor Radionuclide Therapy (PRRT) employing radiolabeled somatostatin analog peptides, particularly ^{177}Lu-DOTA-TATE (^{177}Lu-labeled DOTA coupled Tyr3-Octreotate Figure-1), is now an established therapeutic modality for the treatment of patients suffering from a wide variety of inoperable neuroendocrine cancers over-expressing somatostatin receptors. In the last decade, PRRT has gained momentum and at present is being routinely used as a therapeutic regimen in a limited number of countries. India, with a large population, has a significant number of patients who require PRRT and this need to be provided at a reasonable cost due to the limited affordability of a large mass of population. The challenge associated with PRRT using ^{177}Lu-DOTA-TATE lies in its preparation with adequately high specific activity so that the required dose could be administered to the cancerous lesions without saturating the limited number of receptors available on the target. Since the radiopharmaceutical is prepared at the hospital radiopharmacy, just prior to administration in patients, the available specific activity of ^{177}Lu at the time of preparation should be considered for formulation of the agent with

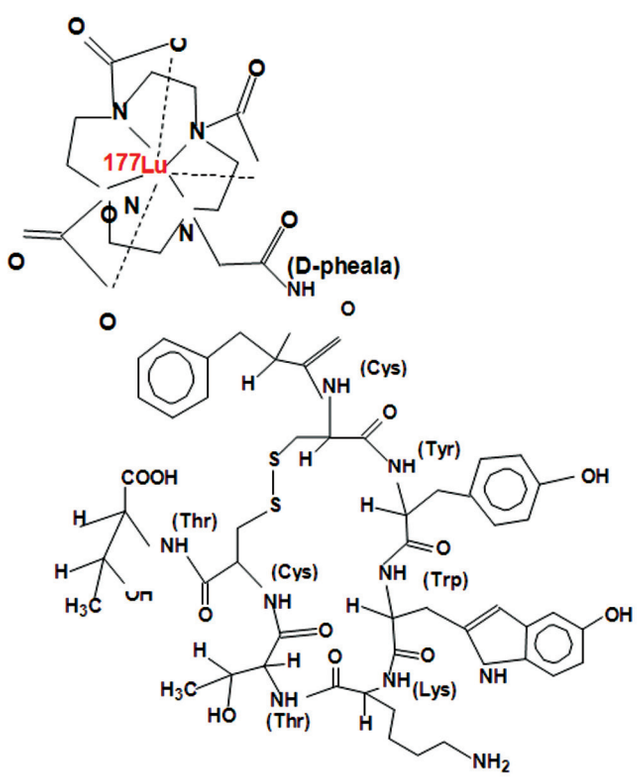

Fig. 1: Structure of ^{177}Lu-DOTA-TATE

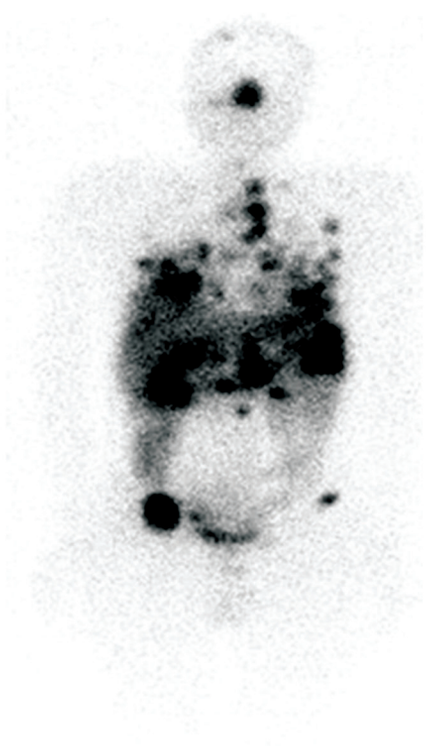

Fig. 2: Whole-body scintigraphic image of a neuroendocrine cancer patient treated with 7.4 GBq of 177Lu-DOTA-TATE

highest specific activity and thus ensuring maximum therapeutic efficacy. Accordingly, a suitable method for the 'in-situ' preparation of patient dose of ^{177}Lu-DOTA-TATE was developed in 2007 in our laboratory using the ^{177}Lu produced in BARC. This therapeutic modality was introduced for the first time in India in 2008 for the treatment of cancer patients in collaboration with Department of Nuclear Medicine, All India Institute of Medical Sciences (AIIMS), New Delhi. Subsequently, to cater to the need of increasing number of cancer patients, PRRT has been started in nine other nuclear medicine centres across our country and more than 1000 patients (on an average 3-4 doses per patient) have benefitted from this therapeutic modality till date. To simplify the protocol for preparation of this radiopharmaceutical at the user end, we have developed a freeze-dried kit of DOTA-TATE in 2012, for the preparation of up to 7.4 GBq patient dose of ^{177}Lu-DOTA-TATE. This single-vial kit, which enables a convenient and single-step preparation of the agent using ^{177}Lu having specific activity $\geq$740 MBq/μg, has been successfully used for the treatment of patients in a couple of nuclear medicine centres in India. Further clinical evaluation of the freeze-dried DOTA-TATE kit is presently being pursued in collaboration with our clinical partners. Awareness of the effectiveness of PRRT and consequently the interest for use of ^{177}Lu-DOTA-TATE is increasing in India.