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Comparative Evaluation of Tc-99m Octreotide, Synthesized by Different Labeling Methods: For Diagnostic Accuracy Assessment in Neuro-endocrine Tumors

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Neuro-endocrine tumors (NETs) are ranked among uncommon tumors but owing to their multicentric origin, often pose a clinical challenge for their diagnosis and treatment. Developing countries like Pakistan, PET based tumor's somatostatin receptor (SSR) imaging is limited, Tc-99m based are the key imaging tool for diagnosis, management and assessment of therapy response. Aim : Two HYNIC-TATE radiopharmaceuticals (RP-1 & RP-2) of different origin, methods of labeling and excipient as RP-1(a single vial) while RP-2 (two vial-(HYNIC Conjugate + co-ligand) were used to compare their in-vitro quality and clinical diagnostic efficacy in histo-pathologically known NETs and others for the imaging of SSR avidity, evaluated for utilization in PRRT therapy. The clinical sensitivity, specificity, positive (PPV) and negative predictive values (NPV) of SSR scintigraphy were calculated and compared.

Methods: Freshly eluted sodium pertechnetate was used for radiolabeling. The radiochemical purity was checked as per specifications and injected to 75 patients (43 Male, 32 Female: Age: 87-22) of known primary and secondary neuro-endocrine tumors (known histopathology and prognostic markers i.e. synaptophysin, chromogranin and Ki-67 Index). Their Tc-99m-OCT scans were correlated with histopathology, CT and/or MRI reports.

Results: It was found that RP-1 average radio labeling efficiency was 96.4±0.2% as complex, 2.4±0.2% as hydrolyzed and 2.6±0.3% free pertechnitate, while in RP-2 was 98.3 ±0.5% labeled, 1.82±0.4 % hydrolyzed and 0.9±0.1% as free pertechnitate. Out of 75 in 39 patients, imaging were performed with RP-1, 23 were found to be true positive, 7 as True negative (T/P) while 9 as false negative (F/N), with sensitivity, specificity, and PPV, NPV of 71.87%, 100%, 100% and 43.75% , while in 36 scan screened with RP-2, 22 were T/P, 6 as T/N, 8 as F/N, with 75.8%, 100%, 100% and 50% sensitivity, specificity, PPV and NPV. For assessment of lesion site specificity, 14 patients with hepatic lesions were imaged with RP-1, showing 71.4% T/P, 21.4 % T/N, while with RP-2, 81.8% as T/P, 18.18% as T/N. Similarly, in NET of lung, both had 100% T/P result. 1 patient of pheocromocytoma was conducted with RP-2 and was found to be T/P. 1 Patient of papillary urothelial carcinoma found as T/P with both radiopharmaceuticals and 1 patient of small cell NET-Gall Bladder, base line scan and post chemotherapy scan with time interval of 6 months, showed progression in disease.

Conclusion: The SSR scintigraphy of NET with RP-2 as compared to RP-1 had better labeling efficiency with more sensitivity but equal specificity, having similar positive and negative predictive values. Both can be used for staging and follow-up assessment of patients. Developing countries where accessibility of PET-CT and Gallium derived diagnosis is not very feasible, gamma camera for scintigraphy, augmented by SPECT-CT much enhance the diagnostic accuracy and assessment of treatment response via these radiopharmaceuticals. Keeping this in view, in future the study can be performed by enhancing the number of patients imaged by SPECT-CT and thus further assessing the diagnostic capabilities of these kits.

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