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Radiosynthesis of technetium-99m labelled methotrexate: biodistribution and preliminary evaluation as potential imaging agent in soft tissue and bone sarcoma

Syed Ali Raza Naqvi^{1,*}, Tauqir A. Sherazi², Rashid Rasheed¹ and Syed Jawad Hussain Gillani³

¹Government College University, Pakistan

²COMSATS University Islamabad, Pakistan

³Institute of Nuclear Medicine Oncology and Radiotherapy (INOR), Pakistan

Soft tissue and bone sarcomas appear as rare but life threatening cancers, which can develop both in males and females with almost equal probability. Methotrexate (MTx) is a chemotherapeutic agent which is used in the treatment of soft tissue and bone sarcomas; hence can be used as diagnostic agent after radio-labeling with gamma emitting radionuclide. In this study, the lyophilized kit of MTx was formulated to prepare ^{99m}Tc-MTx for imaging of biopsy proven soft tissue and bone sarcomas patients. The radiosynthesis showed $>96 \pm 0.16\%$ labeling efficiency. ^{99m}Tc-MTx biodistribution profile of animal model and normal subject scintigraphic study showed that the tracer mainly excreted through kidneys. No clinical signs of toxicity were observed in normal volunteer subjects and patients up to six hours post injection. Out of five (5) patients with known tumor, 03 showed T/NT ratios >5.0 (compared to normal T/NT ratio i.e. ~ 1.0). However, 2 patients who were radiologically disease negative on completion of chemotherapy showed normal T/NT ratios. Preliminary results showed ^{99m}Tc-MTx can be studied in detail as a focal point in multicenter investigations to mature its use as imaging and staging of various MTx avid lesions.

Keywords: Radiosynthesis, Biodistribution, ^{99m}Tc-methotrexate, Imaging agent, Soft tissue sarcoma, Bone sarcoma, Clinical study.

Biography:

Syed Ali Raza Naqvi is a radioanalytical chemist and working as an associate professor of analytical chemistry in the department of Chemistry, Government college university, Faisalabad Pakistan; whose work has focused on the development of radiopharmaceuticals for diagnosis and therapy of neuroendocrine tumors and bacterial infections. Since neuroendocrine tumors are commonly inoperable, they require targeted therapy for treatment. For these tumors, Naqvi advanced peptide receptor radionuclide therapy (PRRT) using ¹¹¹In-labeled minigastrin peptides. He recently expanded his studies to include the radiolabeling of fluoroquinolone derivatives for the diagnosis of deep-seated bacterial infections. Naqvi is a principle investigator for three research projects on radiopharmaceuticals/radiodiagnostics, and he has authored a book titled Nuclear Analytical Techniques.