AbstractID: 4992 Title: Dosimetric Impact of Changed FLT Uptake in AML Patients Treated with Chemotherapy

Purpose: The PET radiotracer [F-18]FLT (3'-deoxy-3'-[F-18]fluorothymidine), used to measure cellular proliferation, has the potential to validate the efficacy of chemotherapy. We investigate the effect of chemotherapy on the biological distribution and radiation dosimetry of FLT in patients with acute myeloid leukemia (AML).
Method and Materials: Cellular proliferation was measured in adult AML patients injected with 5 mCi of FLT. Dynamic and whole body PET/CT scans were acquired one day prior to chemotherapy and one week after the completion of chemotherapy using a GE Discovery PET/CT Scanner. Organs were manually contoured in the PET images at multiple time points and time-activity curves were generated for each contoured organ. Organ cumulative activities, organ radiotracer doses, and total body dose were determined using the standard adult male model and the RADAR method of dose calculation.
Results: The biological distribution of FLT changed as a result of chemotherapy and this redistribution affected individual organ and total body radiation doses. The toxic effect of the chemotherapeutic drugs on the leukemia cells resulted in a five-fold reduction of FLT activity in the bone marrow post-chemotherapy. This reduction in the bone marrow uptake was accompanied by a three-fold increase in FLT activities and radiation doses to the liver, kidneys, gallbladder, and adrenals while that of the spleen doubled. The total body radiation dose increased 30% post-chemotherapy, given identical bladder voiding conditions.
Conclusion: Systemic therapies such as chemotherapy can lead to significant changes in the biological distribution and dosimetry of radiotracers used in PET imaging for treatment assessment. Knowledge of these changes could impact the administered radiotracer dose to patients. Care should be taken in determining a suitable radiotracer dose for each specific case in order to avoid unnecessary dose yet maintain appropriate signal-to-noise ratios.