AbstractID: 8912 Title: Early assessment of treatment response in hematopoietic disease using [18F]FLT PET imaging

**Purpose:** Assessment of treatment response in hematopoietic diseases like leukemia is essential for disease management and routinely performed after therapy via bone marrow biopsy, an invasive and ineffective predictor of treatment response. We developed a molecular imaging based methodology for bone marrow assessment and applied it to leukemia patients during their chemotherapy for early assessment of treatment response.

**Method and Materials:** Six adult leukemia patients and ten adult subjects with normal bone marrow were injected with 5mCi 18F-FLT, a marker of cellular proliferation, and received whole body PET/CT scans. Leukemia patients were treated with standard induction chemotherapy and imaged at progressively earlier time points during therapy. Normal bone marrow was used to establish baseline assessment parameters including bone marrow mean SUV, SUV distribution, and heterogeneity of the axial distribution of bone marrow uptake from the pelvis to neck. Leukemic bone marrow was assessed and therapy responders were compared with non-responders. Responders were distinguished from non-responders based upon clinical outcome of therapy.

**Results:** Mean bone marrow SUV of responders was lower than that of non-responders (0.76±0.05 vs. 1.60±0.14, p=0.0054). For responders, the SUV distribution dramatically shifted toward lower SUVs than in normal patients. This shift was considerably smaller in non-responders. Axial distribution of bone marrow uptake was more heterogeneous in non-responders than responders, and this heterogeneity may explain the poor predictive power of the bone marrow biopsy, which is a point measurement. Measurement of treatment response was not significantly affected by the time of assessment.

**Conclusion:** FLT PET imaging was used for early assessment of treatment response in leukemia patients during chemotherapy. Treatment response was characterized by bone marrow mean SUV, SUV distribution, and heterogeneity of the axial distribution. Given the limitations of bone marrow biopsy, FLT PET imaging provides a superior tool for assessment of treatment response in hematopoietic diseases.