First demonstration of leukemia imaging with the proliferation marker 18F-fluorodeoxythymidine.

Acute myeloid leukemia (AML) is a neoplasm of hematopoietic stem cells with partial or complete loss of the ability to differentiate but with preserved proliferation capacity. The aim of our study was to evaluate if the in vivo proliferation marker 3'-deoxy-3'-18F-fluorothymidine (FLT) is suitable for visualizing leukemia manifestation sites and if 18F-FLT is a surrogate marker for disease activity.

METHODS: In this pilot study, 10 patients with AML underwent pretherapeutic imaging with 18F-FLT PET or 18F-FLT PET/CT. The biodistribution of 18F-FLT was assessed 60 min after intravenous injection of the radiotracer. Standardized uptake values were calculated for reference segments of bone marrow, spleen, and normal organs. 18F-FLT PET in 10 patients with benign pulmonary nodules and the absence of malignant or inflammatory disease served as controls.

RESULTS: Retention of 18F-FLT was observed predominantly in bone marrow and spleen and was significantly higher in AML patients than in controls (mean 18F-FLT SUV in bone marrow, 11.5 and 6.6, P<0.05; mean 18F-FLT SUV in spleen, 6.1 and 1.8, P<0.05). Outside bone marrow, focal 18F-FLT uptake showed extramedullary manifestation sites of leukemia in 4 patients (meningeal disease, pericardial, abdominal, testicular, and lymph node), proven by other diagnostic procedures.
CONCLUSION: This pilot study indicated that PET using 18F-FLT is able to visualize extramedullary manifestation sites of AML and reflects disease activity. Because 18F-FLT uptake in bone marrow is caused by a combination of both neoplastic and normal hematopoietic cells, the correlation of 18F-FLT uptake in bone marrow and leukemic blast infiltration did not reach statistical significance.