
Abstract:
A recently developed (18)F-labeled PET tracer for somatostatin receptor (sstr) imaging, N(alpha)-(1-deoxy-D-fructosyl)-N(epsilon)-(2-[18]F)fluoropropionyl)-Lys(0)-Tyr(3)-octreotate (Gluc-Lys([18F]FP)-TOCA), was evaluated in patients with sstr-positive tumors by assessing the pharmacokinetics, biodistribution, and diagnostic performance in comparison with [(111)In]DTPA-octreotide.

METHODS: Twenty-five patients with different sstr-positive tumors were included in the study and were injected with 105 +/- 50 MBq Gluc-Lys([18F]FP)-TOCA. PET was performed up to 120 min with 2 different dynamic imaging protocols. Tracer kinetics in tumors and nontumor tissues and tumor-to-background ratios were described by region-of-interest analysis and standardized uptake values (SUVs). In 16 patients, sstr scintigraphy with [(111)In]DTPA-octreotide was performed (whole-body scans and SPECT). Two independent experts on PET and gamma-camera scans performed lesion counts. RESULTS: Gluc-Lys([18F]FP)-TOCA showed a fast and intense tumor accumulation as well as a rapid clearance from blood serum (biexponential elimination, with the half-lives of the initial and the terminal elimination phase calculated as t(1/2)(1) = 2.3 +/-
1.3 min and $t(1/2) = 26.4 \pm 14.6 \text{ min}$, respectively. Tumor-to-background ratios at 16 \pm 9 min and 34 \pm 12 min were as high as 80\% and 90\% (\% of maximum ratios), respectively. Tumors showed high SUVs ranging from 13.7 \pm 2.3 (tumors in lung) up to 26.9 \pm 15.4 (abdominal tumors). Tracer distribution within tumor and nontumor tissues was stable up to 120 min (except spleen). No significant bowel activity was observed. Comparison of 29 tumors located in the liver showed a mean tumor-to-background ratio of 5.3 \pm 2.6 for Gluc-Lys(\[(18)F\]FP)-TOCA vs. 4.6 \pm 3.3 for \[(111)In\]DTPA-octreotide ($P = 0.24$). Visual image analysis revealed a significantly higher number of lesions (factor of 2.4) and improved interobserver correlation ($r = 0.99$ vs. 0.86) for PET.

CONCLUSION: Gluc-Lys(\[(18)F\]FP)-TOCA PET allows fast, high-contrast imaging of sstr-positive tumors. The biokinetics and diagnostic performance of Gluc-Lys(\[(18)F\]FP)-TOCA are superior to \[(111)In\]DTPA-octreotide and as far as can be derived from the literature comparable with \[(68)Ga\]-DOTA-d Phe(1)-Tyr(3)-octreotide (\[(68)Ga\]DOTATOC).