Dual-phase 11C-choline PET/computed tomography in the early evaluation of prostate cancer recurrence.

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Abstract

PURPOSE: The aim of this study was to assess dual-phase C-choline PET/computed tomography (CT) for differentiating benign from malignant lesions in patients with biochemical recurrence of prostate cancer.

MATERIALS AND METHODS: We prospectively studied 56 patients with prostate cancer treated by surgery (n=22) or radiotherapy (n=34) who had hypermetabolic foci on C-choline PET/CT determined for biochemical recurrence (prostate-specific antigen 1.23-9.9 ng/ml). We used the dual-phase technique, calculating the standardized uptake value (SUV) for early (SUVearly) and late (SUVdelay) acquisitions and the difference between the two (SUVvariation) to determine whether tracer uptake remained stable or increased (accumulative pattern) or decreased (washout pattern). We used t-tests to compare mean and receiver operating characteristic curve analysis (SUVearly/SUVdelay/SUVvariation vs. benign/malignant).

RESULTS: We identified 106 hypermetabolic foci (34 local, 10 inguinal, 34 infradiaphragmatic, 14 supradiaphragmatic, and 14 in bone). We identified 34 local foci (eight after prostatectomy and 26 after radiotherapy). The eight postsurgical foci had an accumulative pattern and recurrence was confirmed (three histology, five follow-up). Of the 26 postradiotherapy foci, three had a washout pattern and follow-up ruled out recurrence; 23 had an accumulative pattern and recurrence was confirmed (14 histology, nine follow-up). The 10 inguinal foci had a washout pattern and were reactive (three histology, seven follow-up). The 34 infradiaphragmatic foci had an accumulative pattern and were malignant (34 follow-up). Of the 14 supradiaphragmatic foci, the three with a washout pattern were benign (three histology) and the 11 with an accumulative pattern were malignant (11 histology). Of the 14 foci in bone, two had a washout pattern and corresponded with signs of spondyloarthropathy. On the receiver operating characteristic curve analysis, SUVvariation best discriminated benign from malignant lesions [area under the curve (AUC)=0.993], followed by SUVdelay (AUC=0.933) and finally SUVearly (AUC=0.665).

CONCLUSION: Dual-phase PET/CT with C-choline is technically feasible despite this tracer’s short physical half-life and is useful for discriminating benign from malignant lesions. SUVvariation accurately discriminated between benign and malignant lesions.

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