Imaging of prostate cancer with PET/CT and radioactively labeled choline derivate.

Abstract:
PET- and PET/CT using [(11)C]- and [(18)F]-labeled choline derivate are increasingly being used for imaging of prostate cancer. The value of PET- and PET/CT with [(11)C]- and [(18)F]-labeled choline derivate in biochemical recurrence of prostate cancer has been examined in many studies and demonstrates an increasing importance. PET/CT, in comparison to PET, improves especially the lesion localization as well as characterization. Primary prostate cancer can be detected with moderate sensitivity using PET and PET/CT using [(11)C]- and [(18)F]-labeled choline derivate--the differentiation between benign prostatic hyperplasia, prostatitis, or high-grade intraepithelial neoplasia (HGPIN) is not always possible. At the present time, [(11)C]-choline PET/CT is not recommended in the primary setting but may be utilized in clinically suspected prostate cancer with repeatedly negative prostate biopsies, in preparation of a focused re-biopsy. Promising results have been obtained for the use of PET and PET/CT with [(11)C]- and [(18)F]-labeled choline derivate in patients with biochemical recurrence. The detection rate of choline PET and PET/CT for local, regional, and distant recurrence in patients with a biochemical recurrence shows a linear correlation with PSA value at the time of imaging and reaches about 75% in patients with PSA> 3 ng/ml. Even at PSA values below 1 ng/ml, the recurrence can be diagnosed with choline PET/CT in
approximately one-third of the patients. PET and PET/CT with [(11)C]- and [(18)F]-choline derivates can be helpful in the clinical setting for choosing a therapeutic strategy in the sense of an individualized treatment: an early diagnosis of recurrence is crucial to the choice of optimal treatment. Especially important for the choice of treatment is the exact localization of the site of recurrence: local recurrence, recurrence as lymph node metastasis, or systemic recurrence, as it has direct influence on individual therapy. This article reviews the use of PET and PET/CT with [(11)C]- and [(18)F]-labeled choline derivates in prostate cancer imaging with special emphasis on patients with biochemical recurrence. We briefly provide an overview of PET tracers for prostate cancer imaging, the rationale of using choline derivatives for prostate cancer imaging and discuss the contribution of choline PET/CT in patients suffering from prostate cancer with an emphasis on recurrent disease. Furthermore, we provide an outlook on future prospects of choline PET/CT imaging for therapy guidance and monitoring in the framework of therapy individualization.