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POSTER

Imaging of prostate cancer with [¹¹C] choline PET

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[¹¹C]Choline has recently been introduced as a potential tracer for tumor imaging with positron emission tomography (PET). Choline acts as a precursor of phospholipids which are essential components of all cell membranes. We evaluated the feasibility of [¹¹C]choline PET in the imaging of prostate cancer and the association between the uptake of [¹¹C]choline and the histological grade of malignancy, Gleason score, volume of prostate and prostate specific antigen (PSA).

Methods: Fourteen patients with histologically confirmed prostate cancer and four patients with benign prostatic hyperplasia were studied with [¹¹C]choline PET. A mean dose of 430±31 MBq of [¹¹C]choline was injected intravenously and a dynamic emission acquisition of prostate was performed for 30 min followed by a static 10-min emission scan over lower abdominal region. The uptake of [¹¹C]choline was measured as a standardized uptake value (SUV) and as a kinetic influx constant (K_i) obtained from graphical analysis.

Results: Both cancerous and hyperplastic prostate were well visualized with [¹¹C]choline against low or moderate tracer accumulation in the bladder and rectal wall. The measured radioactivity in urine was invariably low. The mean SUV of the untreated tumor was 6.0±3.4 (range, 3.6-15.5; n=12) and the mean K_i was 0.238±0.107 min⁻¹ (range, 0.134-0.351; n=4). No correlation between the tumor uptake of [¹¹C]choline and the histological grade, Gleason score, volume of prostate or PSA could be demonstrated. Two patients who had started neoadjuvant antiandrogen treatment before PET had low SUVs of 1.8 and 2.8. The mean SUV and the mean K_i of benign hyperplastic prostate were 3.5±1.0 (range, 2.0-4.5; n=4) and 0.119±0.076 min⁻¹ (range, 0.065-0.173; n=2), respectively.

Conclusions: Prostate cancer can be imaged with [¹¹C]choline PET. Good uptake gradient between tumor and adjacent normal tissues supports the application of [¹¹C]choline imaging for planning of conformal high-dose radiotherapy. Further studies with a larger number of patients are warranted to determine the ultimate role of [¹¹C]choline PET in the initial staging of prostate cancer and in the detection of recurrent disease.

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Restaging and local control in Diffusion-weighted MRI versus Multislice CT (MS-CT) of primary rectum carcinoma after combined radiochemotherapy

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Purpose: To evaluate the diagnostic potential of DW-MRI versus gold-standard MS-CT in the diagnosis of patients suffering from primary carcinoma of the rectum (cT3, low- and high-grade) with histopathology and therapy outcome. A restaging of T-classifications is very important for planning surgery, using a total rectum-extirpation or only resection, and for local control. Non-response was compared with recurrence.

Patients and Method: 29 patients with primary carcinoma of the rectum were prospectively investigated (1999-2003) in a study with neoadjuvant combined radiochemotherapy. Restaging was made at a 1.5 T Magnetom in comparison with a Multislice CT. The diffusion-weighted spin-echo-planar sequence (EPI) was tested because of the diagnostic difficulties (posttherapeutic edema and fibrosis) in restaging with MS-CT after therapy.

Results: Restaging in DW-MRI before surgery in correlation with histopathological result: therapy responder in 12 patients (pT2) in 7 patients (pT1) and in 4 patients (pT0). Non-responder 6 patients (pT3). Tumor-progress was not specified. DW-MRI specified non-responder in every case and responder in 19 of 23 patients (pT2 as pT1). MS-CT failed in the restaging of responder in 7 patients and of non-responder in 4 patients. 3 of these 4 non-responder with rectal resection surgery (none of responder) had a presacral recurrence.

Conclusion: DW-MRI is better in diagnostic findings after combined radiochemotherapy. Other studies about DW-MRI as a new oncological parameter in correlation with follow-up are necessary.

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Nuclear medicine in diagnosis of skeletal invasion by Hodgkin's disease.

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Purpose: To compare diagnostic accuracy of standard methods of bone and bone marrow.

Material and methods: Study group consisted of 155 (pts) with Hodgkin's disease. Whole body bone marrow (BMS) and bone (BS) scanning were performed in all 155 cases. Focal and diffuse changes of tracer uptake were considered as signs of BM metastatic invasion. Forty two "high risk" patients had unilateral bone marrow biopsy which was obtained from the iliac crest. Discordant results of examinations were settled on the basis of additional survey (MRI, X-ray, CT) at presentation and during follow-up.

Results: Fifty five pts had scintigraphic signs of bone marrow invasion: focal changes were revealed in 61, multifocal and diffuse in 25 cases. Postive results of BS were mentioned in 41 cases. Nine pts had BM invasion according to histological examinations of BM. False positive results were revealed in 5 pts- for BMS, 3 pts- BS. Biopsy was always considered correct. False negative results were mentioned in 6 pts - BMS, 29 Pts - BS and 12 pts - BM biopsy. Sensitivity, specificity and accuracy were as follow: 91.4%, 94.8%, 92.9% for BM scanning; 49.1%, 97%, 80.6% for bone scanning, 36%, 100%, 70.7% for BM biopsy.

Conclusion: In the evaluated pts with HD BM scanning was the most accurate and sensitive method of skeletal survey.

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Breast cancer staging with 99mTc-Tetrofosmin and 99mTc-MIBI: intraindividual comparison.

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In spite of the technical improvements introduced in recent years, mammography (MG) still has some diagnostic limitations. The most widely used radiopharmaceutical for breast scintigraphy is 99mTc-MIBI. Scintimammography (SM) with 99mTc-Tetrofosmin is currently under investigation. The aim of this study was to evaluate the clinical usefulness of scintimammography with 99mTc-Tetrofosmin and 99mTc-MIBI in primary breast cancer staging intraindividually. Forty nine women (mean age 50.45, range 32-77) with palpable breast mass and clinical and/or mammographic findings suggesting T1-2 N0-1 breast cancer underwent SM: 15 patients with 99mTc-Tetrofosmin and 34 patients with 99mTc-MIBI. Multiple planar views in the supine and prone position and subsequent SPECT were obtained on a gamma-camera Diacam (Siemens), 15 min. postinjection (activity 550-740MBq). All of the patients underwent surgery the day after SM. Pathological examination showed 35 tumours and 35 true positive (TP) SM lesions in 33 patients (two of the patients were with bilateral carcinoma). The mean tumour diameter was 19.2 mm. In 6 patients only benign fibro-cystic lesions with true negative (TN) 99mTc-Tetrofosmin scans (4 pts) and TN 99mTc-MIBI scans (2 pts) were found. Metastatic lymph node involvements were found in 19/35 tumours with 18 axillary and 1 parasternal involvements. 99mTc-MIBI SM established only one FN case with lymph node involvement. One FP axillary lymph node metastases was detected on the 99mTc-Tetrofosmin SM. Overall sensitivity, specificity and accuracy for Tetrofosmin and MIBI SM in detection of breast carcinoma T1T2 and N0-2 amounted 100%, 92.8%, 96.4% and 94.4%, 100%, 97% respectively. PPV and NPV were 93.3%, 100% and 100%, 94% respectively for both radiopharmaceuticals. SPECT reconstruction might be helpful in excellent separation of the small breast lesions in the left breast from the myocardium. No significant difference between the tracers was observed in the breast cancer staging. 99mTc-MIBI demonstrates higher clinical value in positive cases. Our data suggest a clinical role of SM as a complement to conventional mammoscintigraphy and both methods are promising for women in whom MG and/or US show suspicion lesions.