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Images in Medical Research

Diagnostic Value of PET/CT for Predicting of Neoadjuvant Chemotherapy Response

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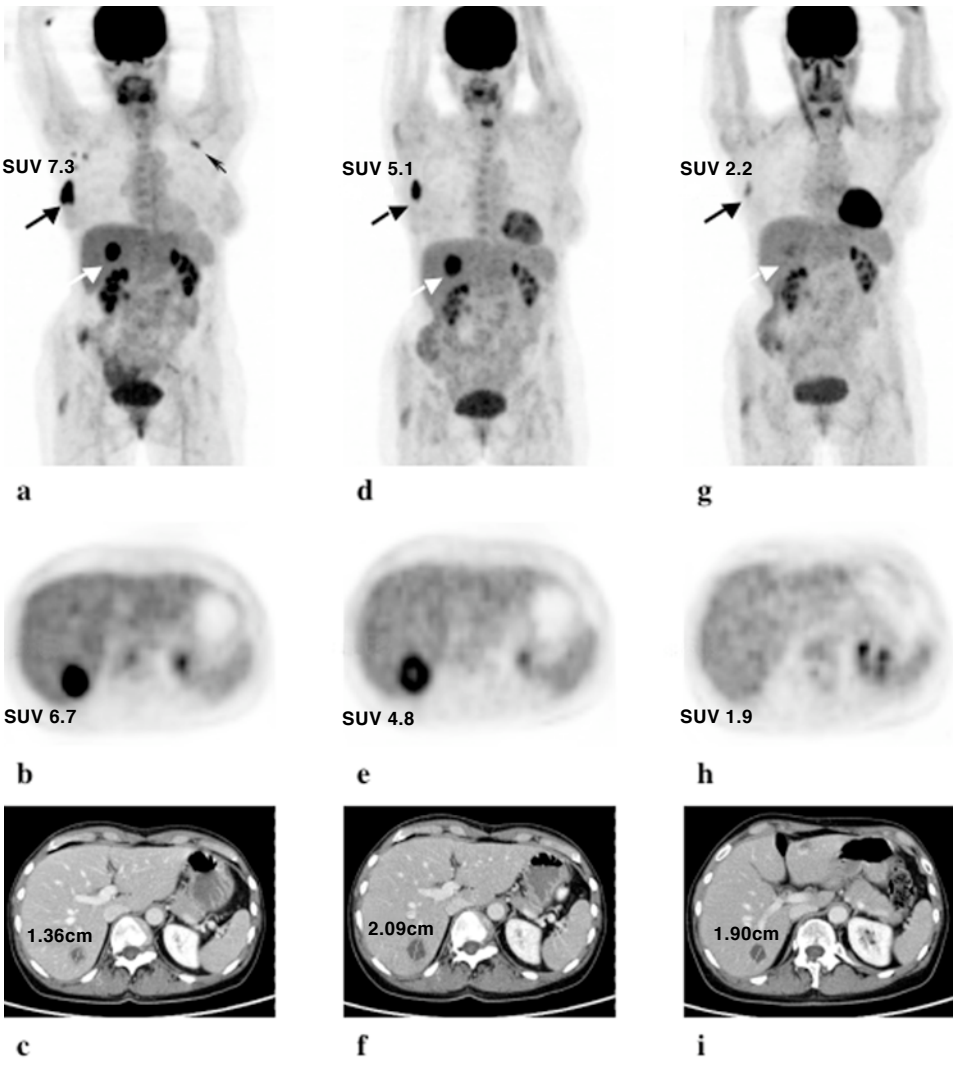
A 52-year-old woman with metastatic breast cancer underwent ^{18}F-FDG-PET/CT examinations for therapy monitoring. The pretherapeutic ^{18}F-FDG-PET/CT study (a-c) shows the breast cancer on the right side (black arrow), ipsilateral axillary lymph node metastases, a large liver metastasis (white arrow) and a rib metastasis (small black arrow). The ^{18}F-FDG-PET/CT study 2 weeks after beginning of the first cycle of primary chemotherapy (d-f) with epirubicin/cyclophosphamide (EC) shows a decreased ^{18}F-FDG activity of the breast cancer and the metastases. The quantitative ^{18}F-FDG measurement of the mean



standardized uptake value (SUV) of the liver metastasis showed a significantly decrease of radiotacer uptake of 30 %. The visual simulated ^{18}F-FDG increase in the liver metastasis is caused by initial effects such as neovascularisation and inflammatory cell infiltration within the tumor boundaries and the surrounding tissue. CT (f) revealed an increased necrosis of 50 % of the liver metastasis and a progressive sclerosis of the lytic rib metastasis which could misinterpreted as tumor progression. Morphological imaging procedures rely on anatomical structure changes of diseases and allow the detection of changes in tumor size and volume, but do not allow a differentiation between viable tumor tissue and fibrotic scar tissue. The morphological criteria of reduction of tumor volume as evidenced of response to therapy requires a certain time delay after initiation of therapy and may be masked by unspecific effects (e.g. oedema as a result of necrosis). The posttherapeutic ^{18}F-FDG-PET/CT study (g-i) shows qualitative and quantitative a decreased activity and volume of all tumor lesions.

The cellular uptake of the ^{18}F-labeled glucose analog 2-fluoro-2-deoxy-D-glucose (^{18}F-FDG) is a sensitive and valuable marker for metabolic alterations of cancer cells that is fundamental not only in the detection of a wide variety of malignancies but also for predicting of neoadjuvant chemotherapy response and is more accurate than morphological imaging methods. Thus it is expected that 18F-FDG-PET will be useful in reducing the costs of cytotoxic therapy and the unnecessary side-effects of ineffective chemotherapy.

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