

## The role of PET-CT in radiotherapy planning – part 1 & 2.

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The advantages of using PET/CT for radiotherapy planning are considered to be many; only one scan is needed since both the anatomical localisation and the metabolic uptake of the tumour is studied at the same time. This is relevant especially for patients with head and neck<sup>1,5</sup> cancer, malignant lymphomas<sup>2,3</sup> and lung cancer<sup>4,5</sup> where the distance from the tumour to organs at risk is often very short. We also believe that patients with cervical<sup>5v</sup>-, esophageal<sup>7</sup>- and anal cancer<sup>8</sup> can benefit from PET/CT in the radiotherapy planning process. Oppositely to traditional CT-based radiotherapy where only the relevant region is scanned we always perform a whole-body examination, which in approximately 10-15% reveals a more advanced disease with the presence of distant metastasis. The process of PET/CT scanning for radiotherapy use is as follows; preparation for the PET/CT scan is of usual. During the FDG distribution time, the patient drinks oral contrast media for the CT scan. Shortly before the scan the intravenous contrast media is prepared. It is injected with an automatic pump in order to hold a constant flow rate and to be able to schedule the time of injection depending on which body region to be focused on<sup>9</sup>. In many cases, the patient is fixed in immobilisation devices for the radiation treatment and this equipment is also used for the PET/CT scan. The image quality is improved if the patient is scanned with arms up over the head. An exception is, however, head and neck cancer patients who are scanned with their arms down. We use an external laser based positioning system, the same system as the one used in the radiotherapy department during the treatment. Positioning, marking and tattooing are performed according to the guidelines in radiotherapy. When the scan is finished, the datasets have been reconstructed and the images have been read, the PET positive tumour including loco-regional metastasis, if any, are delineated on the fused PET/CT scan as well as regions of interest (ROI) on each transaxial slice with a distance of approximately 3 mm. The delineation is performed by the nuclear medicine physician. Then the ROIs are, together with the CT scan, transferred to the dose planning system by a standard DICOM transport. Working with PET/CT every day, we are convinced of the usefulness of the PET/CT for radiotherapy. However, as when every kinds of new modality is introduced, clinical trials to verify this is needed.

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