optimization algorithm PRO-II and AAA absorbed dose calculation algorithm. Dosimetric verification is mostly performed with ArcCheck (Sun Nuclear Corp.), a cylindrical detector array.
Methods. Several parameters are analysed in the obtained data set: total MU, treatment time and usual OAR limits values (Quantec) are compared in key risk organs: rectum, bladder and femoral heads.
Results and conclusions. Neither the treatment time nor the values obtained for bladder and rectum (V50, V60, V65, V70, V80 and mean dose) show statistically significant differences. Nevertheless, we do find them in D1cm3 femoral heads: 27 ± 3.9 Gy for RA vs. IMRT 36.8 ± 4.02 Gy, D50% body: 520 ± 155 cm^3 for RA y 924 ± 311 cm^3 in IMRT and total MU: RA 553 ± 30 vs. IMRT 824 ± 70. RA plans get better sparing dose values to D1 cm^3 femoral heads and an assessable peripheral dose and total MU reduction.

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Total body irradiation (TBI) 3-D treatment planning

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Introduction. TBI is often used in conditioning regimens prior to bone marrow transplantation.
Aim. We describe a 15 MV photon beam irradiation technique with customized lungs shields.
Methods. A total dose of 10 Gy in 5 fractions on 3 consecutive days, with a gap of at least 6 h between fractions, will be delivered to the patient. The prescribed dose to the lungs is reduced to 8 Gy. The patient undergoes one torax CT scan (3 mm slice thickness) to determine the lung shields and a whole body CT scan (1 cm slice thickness), which will be used to calculate the dose distribution. In our institution it has been established a two parallel opposed beams (AP/PA) treatment technique at extended SSD distance (4 m), applied in different fractions (the patient lying on his side and switching position). Treatment fields are centered at the height of the pelvis. The reference point for dose specification is defined at mid-pelvis. Lungs are shielded during the PA irradiation. 3-D treatment planning is performed using XiO Treatment Planning System (ELEKTA). A TBI-specific 15 MV photon beam machine has been commissioned for this purpose. The dose calculation algorithm is superposition. During the treatment delivery, in-vivo dosimetry (OmniPro-InViDos) is performed to obtain an online dose verification. Six or more detectors are attached to the patient's body surface at dose-relevant points (head, lungs and pelvis). Mid-point doses are computed based on the entrance and exit doses.
Results. There is a good agreement between the planned dose and the mid-point doses obtained from the in-vivo measurements.
Conclusions. 3-D-TBI-planning guarantees a sufficiently homogeneous dose in the target volume under optimal sparing of the lungs. A whole body dose distribution can be obtained, which allows more precise dose adjustments during the planning process.

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Variation and reproducibility of SUV for use in radiotherapy contouring with PET/CT

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Objectives. The Standardized Uptake Value (SUV) is a useful tool to aid in the contouring in radiotherapy. Usually a SUV value of 2.5 or the 40% of the maximum value of SUV is used as background to contouring the lesion in the PET images. The SUV value depends on various physical and biological effects. The aim of this work is to test the reproducibility of the different modes of SUV calculation, its dependence with noise, reconstruction algorithm and concentration, to determine the most optimal parameter.
Materials and methods. We use a NEMA chest phantom with F-18 containing 6 spheres of volumes between 0.5 and 26.5 ml, with an initial background concentration of 0.5 uCi/ml. The lesion-to-background ratio was 1/10. Acquisitions were taken on a PET-CT Philips Gemini TF every two hours to see the change in SUV with noise and concentration. Studies were reconstructed using different algorithms and different bed times.
Results. SUVmax and SUVpeak depend on noise and reconstruction algorithm, with differences up to 20%. The SUVmean depends on selected volume with a variation of up to 15%. The SUVmedian shows less dependence on the selected volume, varying less than 1.5%. Also its dependence on noise and reconstruction algorithm is much lower than that of SUVmax. Variations of up to 30% in SUVmax are present due to dead time effects in higher dose concentrations.
Conclusions. Is important to choose the most stable and reproducible SUV calculation in order to minimize the effects of its possible variations. According to this study, the value that best meets these requirements is the SUVmedian.

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