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Comparison between microPET-based and biodistribution-based dosimetry of a 152Tb-labelled antibody in tumour-bearing mice

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Aim. To assess the feasibility of mouse-specific, microPET- based dosimetry of an antibody labelled with 152Tb. Image-based absorbed dose estimates were compared with dosimetry results obtained from the extrapolation to 152Tb of a classical biodistribution experiment using the same antibody fragment labelled with 111In.
Methods. The scFv78-Fc fusion protein targeting TEM-1 was conjugated with the chelator CHX-DTPA, and then labelled with either 152Tb or 111In. Micro-PET images of four female mice bearing sarcoma were acquired 4, 24 and 48 h after the i.v injection of 152Tb-CHX-DTPA-scFv78-Fc. After count/activity camera calibration, time-integrated activity coefficients (TIACs) were obtained for the following compartments: heart content, lungs, liver, kidneys, intestines, tumor and whole body. For comparison, radiation dose estimates of 152Tb-CHX-DTPA-ScFv78-Fc were extrapolated from mice dissected 4, 24, 48 and 96 h after the injection of 111In-CHX-DTPA-scFv78-Fc (3–5 mice per group). Imaging-derived and biodistribution-derived organ TIACs were used as input in the 25 g mouse model of OLINDA2. Tumor absorbed doses were obtained using the OLINDA2 sphere model. Finally, the relative percent difference (RD%) between absorbed doses obtained from imaging and biodistribution were calculated.
Results: RD% between microPET-based dosimetry and biodistribution-based dose extrapolations were +12, −14 and +17 for the liver, the kidneys and the tumors, respectively. Compared to biodistribution, the imaging method significantly overestimates the absorbed doses to the heart and the lungs.
Conclusions: MicroPET-based dosimetry of 152Tb is feasible, and the comparison with organ harvesting resulted in acceptable dose discrepancies for body districts that can be segmented on CT.

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