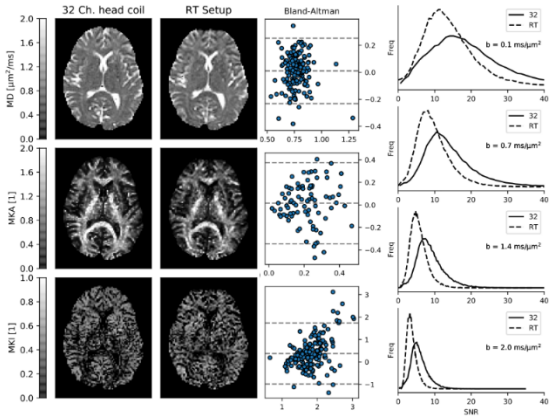

Conclusion

As expected, the RT coil impacted data quality, indicating that approximately 33% of the brain volume may suffer signal bias due to the noise floor. This effect can be remedied by scanning with a 3x3x3 mm3 resolution, which would compensate for the loss of performance. We note that the impact is primarily on MKi, which is observed to be most sensitive to noise. In summary, we have presented a quantitative analysis that supports the use of tensor-valued encoding in the context of RT, using flex-coils in a representative geometry.

PO-1689 TCP assessment of PET-derived dose prescriptions accounting for the underlying oxygen distribution

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Purpose or Objective

To investigate the clinical feasibility and evaluate the corresponding Tumor Control Probability (TCP) of different dose painting strategies accounting for the underlying oxygen distribution at sub-millimeter scale.

Material and Methods

A previously developed model of a tumour (3 cm radius, 10^6 cm^{-3} cell density, voxel size 200 x 200 x 200 mm^3) with two concentric regions with different levels of oxygenation expressed in terms of distributions of partial oxygen pressure (*original-pO_2 distribution*) was used. The temporal variability of acute hypoxia was also accounted. The uptake of a PET tracer (FMISO) corresponding to the *original-pO_2 distribution* was determined using a previously proposed conversion function (*f*). To mimic a PET image of the simulated tumor, the uptake-distribution was convoluted with a Gaussian 3D filter to reach a typical PET image voxel size (2 x 2 x 2 mm^3), resulting in a *derived-uptake distribution*. From the *derived-uptake distribution*, a *derived-pO_2 distribution* was determined using the inverse of function (f^{-1}). The hypoxic target volume (HTV) was then delineated (10 mmHg threshold level) and the dose per voxel to overcome radio-resistance for 95% TCP calculated. Two different dose painting strategies (DPS) were then considered: by contour (DPBC) and by box (DPBOX). The DPBC prescribed two levels of uniform dose to the GTV and HTV, as proposed in a previous work. The DPBOX consists of clustering the target volume in boxes (10 mm voxel size) and assigning the maximum dose for a given TCP within each box. To determine the clinical feasibility of the DPS, the simulated tumor was located in the lung of an anthropomorphic phantom and photon VMAT plan was made. The agreement between the dose distribution based on the DPS and the clinically feasible one was evaluated using Quality Dose Volume Histograms. The plan was further evaluated in terms of TCP considering the original pO_2 distribution with the finest resolution.

Results

Figure 1A shows the TCP as function of the number of fractions for the two DPS used in this study. The DPS involving 5 fractions as in an extremely hypofractionated schedule lead to low values of TCP because of the low resolution of the PET images. For a low number of fractions in general, DPBOX is potentially superior as dose prescription strategy than DPBC. The TCP for a schedule involving a larger number of fractions was close to 95% for both DPS. The high quality of the plan in terms of the ability to mimic the prescribed dose by the DPS evaluated as QVH for a 10-fraction plan is shown in Figure1B. The TCP for the planned dose in this case considering the original underlying pO_2 distribution was 90%.

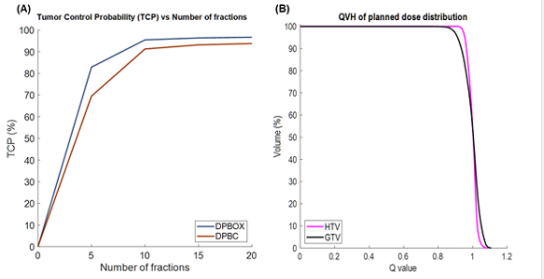

Fig. 1 (A) TCP evaluated using the original pO_2 distribution for the two different DP strategies (DPBOX and DPBC) as a function of the number of fractions. (B) Quality Volume Histogram (QVH) of the planned dose distribution based on the intended dose distribution.

Conclusion

Dose prescription and optimisation approaches based on PET information on tumour hypoxia have to account for the limitations in image resolution, as well as the physical characteristics of the dose deposition and optimization algorithms. These are aspects that could prevent such strategies from reaching their expected clinical impact.

PO-1690 SUVmax and tumor size in 18 F PET-CT as predictors for early response after lung SBRT

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Purpose or Objective

The aim of this study was to evaluate SUVmax and tumor size (TZ) as parameters of early response, quantified in 18 F-FDG PET-CT, after lung SBRT for primary tumors and oligometastases.

Material and Methods

The inclusion criteria of this retrospective study were: **1)** NSCLC and oligometastases treated between April 2015 and November 2017 by SBRT; **2)** Presence of 18 F-FDG PET CT, before and after SBRT, for at least two subsequent evaluation; **3)** >= 1 follow-up year. For the analysis, the following parameters were define: **1)** *SUVmax* - the highest uptake value over all pixels within the region of interest **2)** *Tumor size (TZ)*- a measurable lesion measure in its greatest diameter in cm.

Tumor response assessment was done by two criteria: Metabolic: 1**)** *Complete Response (CR)* - SUVmax after SBRT (SUVpost) in the treated tumor region was almost the same as the SUVs in the surrounding regions; 2**)** *Partial Response (PR)* - SUVpost was smaller than previous SUV (SUVpre), but was greater than the SUVs in the surrounding