Conclusions: Results exhibited a good synchronization between 4D-PET and the system used to register the respiratory wave, accurate enough to use it for clinical purpose. For the 4 types of movement, the cranio-caudal displacement between the syringe from the 4D-PET and ANZAI were less than 2.30 mm. Moreover, mean difference showed that in most of the cases, curves were out of phase. This might lead to a systematic error in the tumour position. It could be interesting to run more measurements for different cycles and 4D-PET acquisitions if we want to modify the margins for the GTV due to the use of 4D-PET for tumor contouring.

PO-0984
Treatment plan intercomparison for SBRT in a national context: final results from 53 centers

Purpose/Objective: The purpose of this work is to investigate whether a particular technology can provide superior SBRT treatment plans in a real context, characterized by different radiation technologies (linac and treatment planning systems), and different modality for planning (optimization strategies and team experience).

Materials and Methods: Three inter-comparison studies have been designed for prostate, liver, and lung lesions. Five contoured CT sets, the dose objective to target and a list of constraints for organs at risk, were sent to the participants. A total of 53 centers across Italy joint the studies: 14 for liver metastases, 14 for prostate lesions, 25 for lung nodules. Table 1 summarizes the irradiation techniques of each center.

Results: For the prostate and lung studies, all participants were able to achieve the objective of dose to target and to respect the constraints on organs at risk. For the liver study, 5 participants did not comply with the constraint on the healthy liver, and 1 center did not achieve the objective of dose to the target in one of the five cases. A large difference between centers emerges in the three studies, due to the differences in the maximum dose and homogeneity accepted; no significant correlation between the irradiation techniques and dose volume histogram was found.

Conclusions: Despite the large difference in the irradiation technique used, the principal goal of a SBRT approach was achieved by all institutions in almost all patients, for both dose coverage to target and dose sparing to organs at risk in all three regions considered. In our analysis, the optimization strategy decided by the planner plays a predominant role respect to the technology utilized. Inter-comparison of DVH could be a useful tool to standardize treatment planning of stereotactic treatments, in particular before starting a clinical multi-institution trial.

PO-0985
How accurate is lung IMRT and VMAT delivery? A multi-centre audit as part of the Isotoxic IMRT trial
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Purpose/Objective: Inhomogeneities around lung tumours may reduce the accuracy of dose calculation by the planning system. The use of IMRT or VMAT can include small field segments which exacerbate these issues. Isotoxic IMRT is a multi-centre non-randomised feasibility study of isotoxic dose escalation using IMRT, for stage III non-small cell lung cancer patients. As part of the pre-trial QA, a dosimetry audit was undertaken to verify accurate delivery of the planning benchmark case.

Materials and Methods: An ArcCheck diode array (Sun Nuclear) was used to measure fluences from the treatment delivery, and apply standard gamma analysis. Half of the Multiplug central insert was replaced by lung equivalent material (St. Bartholomew’s Hospital, London, UK) to simulate an inhomogeneous environment. Point and planar dose readings near the interface were acquired using a 0.125cc ion chamber (PTW Semiflex), and GafChromic EBT3 film (ISP) (Figure 1).

Results: 2 pilot centres and 7 trial centres were visited, a total of 14 distinct combinations of planning and delivery system. Gamma analysis of the entry and exit dose fluence showed good agreement, with mean pass rates of 100% (range 98-100%) and 99% (97-100%) for tolerances of 4%/3mm and 3%/3mm respectively. Central point doses all agreed within ±2.4%. Film gamma analysis gave mean pass rates of 96% (88-100%) and 92% (78-99%) for tolerances of 4%/3mm and 3%/3mm respectively. These are lower than for the array fluences because of proximity to the low density interface.

Conclusions: This multi-centre audit of complex IMRT delivery provides confidence in the accuracy of a range of planning and delivery systems in an inhomogeneous environment. Along with other aspects of trial QA, it assures that trial outcomes will not be undermined by unintended variations in delivered doses.

Can radiotherapy dose distribution be related to outcome? An analysis of the SCOPE 1 oesophageal cancer trial data

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Purpose/Objective: By applying the Mean Distance to Conformity (MDC) index proposed by Jena et al (1) to the dose distribution of a radiotherapy plan, the conformity of the 95% isodose line to the Planning Treatment Volume (PTV) can be measured, allowing both overdosing of normal tissue and underdosing of the target volume to be measured by the OverMDC and UnderMDC respectively. The aim of this study was therefore to analyse this aspect of treatment planning, in addition to volume of PTV and the treatment delivery method (3D conformal or Intensity Modulated Radiotherapy), and relate to patient outcome.

Materials and Methods: The OverMDC and UnderMDC of the 95% isodose line (V95 for 50Gy prescribed dose) to the PTV was calculated using a Matlab script based in CERR (2) for 97 patients from the SCOPE 1 trial (a National Cancer Research Institute (NCRI) and Cancer Research UK (CRUK) funded Phase II/III two arm trial of definitive chemoradiotherapy (dCRT) in oesophageal cancer) (3). Kaplan-Meier and multivariate analysis was undertaken in EULCID (4) with further tests in Microsoft Excel and IBM’s SPSS.

Results: A statistically significant breakpoint in the overall survival data, independent of cetuximab, was found according to OverMDC metric (0.44cm, p<0.05). This was not the case with UnderMDC. There was a statistically significant difference in PTV volume either side of the OverMDC breakpoint (Mann Whitney p<0.001). There was a statistically significant difference in OverMDC value dependent on the treatment delivery method (mean IMRT=0.21cm, mean 3D-CRT=0.41cm Mann Whitney p=0.001). OverMDC did not remain significant in a multivariate analysis that included age, sex, staging, tumour type, position, PTV volume and GTV length.

Conclusions: We have shown in univariate analysis that a patient’s OverMDC has a significant correlation with overall survival, independent of Cetuximab. OverMDC is strongly related to IMRT and to a lesser extent with PTV volume. We recommend careful attention to all aspects of plan quality, not just adequate coverage of the PTV.