and used the MRiPlanner (Spectronic Medical AB, Sweden) for the clinical implementation study, forty patients with localized prostate cancer were included for treatment according to an MRI-only workflow based on the validated methods. A CT was acquired after the MR examination, but only strictly used in the background for evaluation of the implementation process.

**Results**

For the tasks preceding the clinical study, the following results were obtained: The validation study of the sCT confirmed that MRiPlanner can be used clinically with negligible differences between sCT and CT dose distributions for target and relevant organs at risk. The CTV using MRI-only for delineation was consistently smaller (18%) than using CTV for a combined CT/MR workflow. A dedicated multiecho gradient echo sequence was shown to be a feasible and reliable way for manual identification of fiducial markers (100%). CBCT was a clinically feasible QA procedure for MRI-only RT of prostate cancer patients. Thereby all the methods developed for the clinical study was working appropriately. In the clinical study, 39 of 40 patients completed their treatment with no major deviations. One patient was too large for the field of view of the MR-scanner.

**Conclusion**

The results of this prospective clinical trial demonstrate that a successful MRI-only implementation can be achieved with a fine detailed work plan and thoroughly validated methods. One patient was excluded due to a large body contour, a problem that has been solved in a later process during our work. Our results confirm that the CT can successfully be entirely excluded. MRI-only RT enables a high precision RT technique with simplified logistics and less workload.

**EP-2064 A novel method for GTV generation for large-scale analysis of lung cancer patients planned with 4DCT**

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**Purpose or Objective**

Lung cancer patients undergoing stereotactic ablative body radiotherapy receive 4DCT for treatment planning. Often, an internal gross target volume (iGTV) is directly delineated without defining a GTV. However, the GTV volume and shape are important parameters for prognostic and dose modelling. In this study, we demonstrate and validate a new method to automatically generate the GTV, on any phase, directly from the iGTV.

**Material and Methods**

Eleven 4DCT data-sets and delineations were collected from an institutional archive; each plan had a contoured iGTV. The method assumes deformation of the GTV is negligible across the respiratory cycle (A). Therefore, inversely, if the iGTV should encompass the GTV volume at all positions across the respiratory cycle (A). Therefore, inversely, if the iGTV is translated by the registration displacements of each phase to a reference phase, e.g. 50%. Registration performance was assessed by the mean and standard deviation (SD) of the correlation ratio cost function. Figure 1 demonstrates the GTV generation method. The iGTV should encompass the GTV volume at all positions across the respiratory cycle (A). Therefore, inversely, if the iGTV is translated by the registration displacements of each phase to the reference (B), the intersection of all translated iGTVs will recreate a GTV volume in the reference coordinate frame, GTVgen (C).

**Figure 1** - Visual representation of the results for a volume. The red and green planes represent the result of method 1 and 2, respectively. The volume corresponds to the manual delineation of the breast’s CTV.
Using cone beam CT, a workflow was developed and tested. A QA method for process. A dedicated gold fiducial detection tool for MR Target delineation directly on the T2w image was and used the MRiPlanner (Spectronic Medical AB, Sweden) cohorts, the following tasks were performed: We validated reduce costs. The purpose of the MR Imaging is also an integral part of treatment planning, The use of imaging has a crucial role in radio Physics, Lund, Sweden; E. Persson

Purpose or Objective

For validation, a radiation oncologist contoured the GTV on the 50% phase (GTV50). For comparison, surface distance to agreement (DTA) was calculated by extracting the absolute perpendicular distance from the surface of GTVgen to GTV50, with mean and SD recorded. For geometric comparison, the volume (V) and surface area (A) were extracted and ratios calculated. For shape, the ratio of sphericity, $S = (m^*(1/3)(6V)^*(2/3))/A$, was calculated. To assess position, the vector distance between centre of mass (COM) was extracted.

Results

Mean registration cost function was 0.95. The mean tumour motion amplitude calculated as vector of three directions was 7.47mm (range: 2.75-12.60mm). All tumours analysed were T-stage 1 or 2. Six patients had an upper lobe tumour and five had a lower lobe tumour. Observer variation is reported as 1.2-1.8mm SD (Peulen et al., 2015). The distance variability, DTA SD, is within the range of observer variation (Fig. 2A). Pictorial examples (Fig. 2B) display good agreement. GTV shape was highly accurate. GTV volume was well estimated and a ratio change represents small volume difference.

Patient 5 displayed worst results, with a 3.5mm COM deviation and largest sphericity ratio, however, the segmented volume is accurate. Patient 7 provides an example of higher DTA SD but this seems to be driven by observer disagreement, rather than issues with algorithm performance.

Conclusion

This study presents and validates a method for automatically generating the GTV from an iGTV. The technique provides a representation of the GTV that is accurate within observer variation. This method supports calculating delivered dose to the GTV without additional delineation and will facilitate large-scale retrospective analysis of patients treated in the routine setting.

EP-2065 Simulation PET-CT vs diagnostic PET-CT fusion in head and neck RT: volumetric and planning implications

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Purpose or Objective

To evaluate the dosimetric impact of an automated threshold SUV based delineation method on simulation PET-CT (sPET-TC) compared to manual delineation target volumes on diagnostic PET-CT (dPET-CT) fused with simulation-CT in head and neck (H&N) radiotherapy.

Material and Methods

Ten consecutive H&N cancer patients underwent to sPET-CT in treatment radiotherapy set-up. A specific sPET-CT acquisition protocol was optimized by the medical physicist. All patients also underwent to whole body dPET-CT that was co-registered and fused with planning CT using a rigid algorithm (mutual information intensity-based metrics).

1. GTVs were delineated using an automated threshold method at 50% of the intra-lesion SUV max (t50%GTV), both on sPET-CT and dPET-CT. GTVs differences were analyzed in terms of volumetric absolute values, Jaccard Index (JI) and distances from centroids, in order to evaluate shift errors. GTV were manually