the tumor were targeted for an IMRT boost. In this step, doses to PTV-FDG were 70.2 Gy; 1.8 Gy/day and to PTV-FMISO were 76.05 Gy; 1.95 Gy/day. Treatment plans were generated without exceeding the normal tissue tolerance.
Results. The GTV-FDG was highly variable and ranged between 17.91 cm^3 and 248.58 cm^3 (median 94.82 ± 104). The GTV-FMISO ranged between 0.57 cm^3 and 37.55 cm^3 (median 12.26 ± 16 cm^3), representing 13% of GTV-FDG .The GTV-FDG and GTV-FMISO ranged between 17.24% and 100% (median 76.25 ± 39%). In the majority of cases the hypoxic subvolume was diffusely dispersed in multiple areas of the whole PTV. With a median follow-up of 10 months there was not any local recurrence.
Conclusion. ^{18}F-FMISO-PET imaging could be used for a hypoxia-directed intensity-modulated radiotherapy approach in lung cancer. Dose escalation was shown to be feasible under the constraint of limiting normal tissue doses. In the majority of cases the hypoxic subvolume is within the volume defined by ^{18}F-FDG PET/CT.

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Influence of 4DCT and PET/CT on treatment planing in lung cancer radiotherapy

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Purpose. The aim of this study was to evaluate the effects of 4DCT and FDG-PET/CT registration on treatment planning in lung cancer patient and to compare the results achieved with those obtained with the PTV margins currently used in 3DCT.
Material and methods. Five NSCLC patients stage I-II with contraindication to surgery underwent radiotherapy. The median age was 74.8 ± 4.8 y.o. Histology was 2 squamous, 2 adenocarcinoma and one NSCLC. Patients were imaged using 3DCT (slowCT/4s) free breathing, 4DCT free breathing 10 phases and FDG-PET/CT all three performed on the same day in the treatment position and co-registered in order to allow comparisons. PET images were interpreted by a nuclear medicine physician. A radiation oncologist contoured GTVs on 3DCT and all 10 phases of the 4DCT for each patient. PET positive GTVs were countored using 50% SUVmax. For 3DCT images a CTV-3D was generated from GTV-3Ds by adding up 5 mm and afterwards PTV-3D was generated from CTV-3D with a margin of 1–1.5 cm. In 4DCT the ITV was build encompassing the PET-GTVs and the GTVs delineated in all 10 phases. PTV-4D was created by expanding the ITV with a 7 mm margin. Organ at risk (OARs) were countored. Treatment plans were designed and calculate for both PTVs.
Results. DHV shows a mean volume of the PTV-3D of 284 ± 96 cm^3, which was greater than the mean PTV-4D volume, which was 160 ± 54 cm^3. The mean decrease of the PTV volume obtained with 4DCT was 123 ± 43 cm^3, which represents a reduction of 42%. The V20 were 11.22 ± 3.1% for 3DCT and 8.5 ± 4.7% for 4DCT. V20 improved with 4DCT by only 2,7% but the mean lung dose was decreased by 21% for ipsilateral lung and 26% for contralateral. No significant differences were found for the rest of OARs.
Conclusion. 4DCT and PET/CT based treatment planning is feasible and it provides significant dosimetric advantages over 3DCT, such as allows personalized and smaller PTV volumes, improving mean lung doses and reducing intraobserver variability in PTV delineation.

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Initial outcomes in lung cancer treatment with VMAT

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Purpose. To report acute toxicity, quality of life (QOL) and dosimetric parameters in radiation treatment of advanced lung cancer with Volumetric Modulated Arc Therapy (VMAT) – RapidArc and IGRT.
Methods. Fifty-five consecutive patients, with inoperable tumour, were treated with VMAT to a median dose of 67.4 Gy (range 60–74 Gy). Treatment delivery was performed with two partial or total arcs. IGRT was made with daily CBCT. Acute toxicity was scored following RTOG criteria and QOL with EORTC-QLQ-C30 and EORTC-QLQ-LC13.
Results. From a dosimetric point of view, VMAT plan fulfilled all our dose constraints. PTV volume median: 333.03 cm^3 (87.50–1442.66 cm^3). The mean dose coverage 95% of PTV volume: 98.66 ± 1.03% lung: V5 = 60.01 ± 15.21%, V10 = 42.44 ± 2.32%, V20 = 21.22 ± 6.33%, mean lung dose (MLD) was 13.87 ± 3.63 Gy; esophagus V66 = 3.76 ± 5.26%, V50 = 20.01 ± 14.58%, V35 = 32.80 ± 15.55% and mean esophagus dose: 24.14 ± 8.8 Gy; spinal cord D1% = 32.85 ± 7.96 Gy; heart V45 = 2.79 ± 4.42%. Acute toxicities were 1 patient with grade 3 esophageal toxicity, 2 with grade 2 and 52 with grade 1. No other toxicities were observed. QLQ-C30 showed between start to end of the treatment: cough and haemoptysis improved and dysphagia worsened. No changes in dyspnea were observed. QLQ-LC13: Physical and role functioning improved while asthenia and appetite loss worsened.
Conclusions. VMAT outcomes are very promising and toxicity rates were mild for inoperable lung cancer. Further follow-up is required to assess late toxicity and disease control.

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