Results: The median survival time was 1.82 years (95% CI - 1.57; 2.06). A univariable analysis was performed for SUV descriptors and metabolic features. Results for the statistically significant metabolic features (p-value<0.05) are shown in Table 1. AVAI of 0.5 and 1, and AVRI of 10% showed a high correlation (Pearson correlation = 0.999, 0.992 and 0.995) with GTV. Both AVRI of 80% and 90% (Pearson correlation = 0.888) revealed a good prognostic value, outperforming the SUV descriptors.

Conclusions: Based on our study, a high rate of tumour growth and disease progression seen by repeated FDG-PET/CT was significant (p=0.06) for overall survival.

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Results: Median time interval between the diagnostic and planning FDG-PET/CT scan was 43 days (range 22-140 days). After the planning FDG-PET/CT, 3/19 (15.8%) patients were not amenable for SBRT anymore due to diagnosis of nodal metastases (interscan interval: 22, 51, and 95 days, respectively). No patients were found to have distant metastases. In the remaining 16 patients, no additional lesions were found, but one patient had progression in tumour diameter and two in SUVmax values. Notwithstanding, the lesions were still eligible for SBRT. Overall, timing occurred in 6/19 (31.6%) of patients, all but one with an interscan interval of more than 43 days (average 60 days, range 22-95 days). Overall, the upstaging probability with an interscan interval of less than 3 weeks was 0%. Furthermore, an SUVmax above median (9.50) on the diagnostic FDG-PET/CT scan was of borderline significance(p=0.06) for overall survival.

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cardiopulmonary system, we hypothesize that the radiation dose delivered to the heart is likely to be an important contributor to the development of dyspnea, especially so in patients with cardiac comorbidity. Interestingly, while it has been shown that radiation to the heart increases the long-term risk of a cardiac event, insufficient research has been carried out on the short-term (3-6 months) effects of cardiac comorbidity and heart irradiation on the risk of radiotherapy-induced lung damage. Does the heart matter for RILT? Are there specific cardiac comorbidities associated with a higher probability of lung damage? Is there a short-term pulmonary effect from (excessive) heart irradiation? These research questions will be addressed in the talk, and recent promising evidence on this topic will be discussed.

SP-0331
CT-based scores during head-neck IGRT: Deformation and density variations
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Compared to 3D conformal radiotherapy (3DCRT), the advent of intensity modulated Radiotherapy (IMRT) for head and neck cancer patients (HNC) gave the possibility to dramatically reduce the dose to normal-irradiated structures, and this is reported to be correlated to a reduced toxicity suffered by the patient. Nevertheless, even with IMRT, different toxicities continue to affect the quality of life of HNC patients after RT, being xerostomia and dysphagia two of the most important. In this context, it could be of particular interest the assessment of parameters able to predict individual patient tissue reactions during the treatment and possibly the risk of developing acute and/or late toxicity. This information could be used in order to select patients that may gain advantages by the implementation of personalized adaptive treatments and/or supportive therapies with the aim of reducing toxicity.

Structural and volume variations of tissues/organs may be a sign of a radiation induced damage and could be measured using different imaging modalities. Image guided RT (IGRT) itself represents a powerful database of computed tomography (CT) images acquired during the treatment course, that in principle could be used to derive information regarding the tissues and organs reaction; also diagnostic CT images collected during the treatment for adaptive re-planning are another important source of available, high-quality CT information.

Organs at risk (OAR) in HN region, such as parotid glands (PGs) or constrictor muscles, are known to undergo large volume and shape changes during RT treatments (that can be easily detected by CT images acquired during IGRT), and this is reported to be related to organ dysfunction. For example, PGs are known to shrink during HN treatment. In literature it is reported that the volume reduction at the end of therapy of 30-35 fractions/45 days is around 30-35%.

On the other hand, density variation of organs during the treatment course may be considered as a surrogate of changes in tissue structure and therefore a potential measure of a radiation induced functional damage. Based on CT-images, it is possible to directly measure density variations in terms of Hounsfield units (HU) difference between images acquired during the treatment course. Focusing on PGs, recent hystopathological studies of tissue samples showed a reduction of the acinar cells number, with a relative increase of fat component in irradiated PGs compared to not irradiated, and this data is likely to be measured by CT-based density variation. Consistently, PGs density variation was found to vary significantly during the RT course in a large population of patients treated with IMRT; the largest variation was found during the first half part of the treatment compared to end (p-value=0.0001). Moreover, the early PGs density/volume variations, i.e.during the first two weeks of treatment, were found to be good predictors of the final changes at the end of the therapy (AUC=0.75, p-value=0.0001). Importantly, the median early PGs density variation resulted to be significantly different for a group of 25 patients with a prospectively assessed acute xerostomia score (CTC v3.0) during the treatment course.

CT-based biomarkers assessed during the RT treatment course, such as volume, density and texture parameters, should be considered as promising scores which are likely to be surrogates of organ damage and consequently related to the probability risk to develop acute and/or late toxicity.

PROFFERED PAPERS: PHYSICS 7: INTRA-FRACTION MOTION MANAGEMENT
OC-0332

Kilovoltage intrafraction motion monitoring and target dose reconstruction for liver SBRT delivered by VMAT
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Purpose/Objective: Volumetric modulated arc therapy (VMAT) enables efficient delivery of highly conformal doses, but intrafraction tumor motion may lead to target dose distributions that differ markedly from the planned dose. The aim of this study was to measure the 3D target motion by continuous kV imaging during liver SBRT treatments delivered by VMAT and to reconstruct the actual target dose by use of the monitored motion.

Materials and Methods: Five patients with liver metastasis and 2-3 implanted gold markers received SBRT in three fractions of 18.75 Gy or 25 Gy. The CTV was delineated on the mid-ventilation phase of a 4DCT scan. Margins of 3 mm in the axial plane and 10 mm in the sup-inf directions were added to form the PTV. A VMAT plan with 5-6 arcs was designed to give minimum target doses of 95% (CTV) and 67% (PTV). Abdominal compression was used for all patients. Daily cone-beam CT was used for marker based patient setup and continuous kV images (5Hz) and MV images (8-13 Hz) were acquired during treatment delivery with an On-Board Imager and an AS500 or AS1000 PortalVision system, respectively (Varian). Offline, the intra-treatment 3D trajectory of one gold marker was estimated from its projected 2D trajectory in the kV images by a probability based method. For three patients, those with coplanar arcs and high resolution MV imaging (AS1000) the marker was segmented in all MV images with marker visibility at one fraction, which provided an independent measure of the kV 3D position estimation error. For all fractions the 3D marker motion was used to reconstruct the delivered target dose by a previously validated method that mimicks target motion by dividing the VMAT beams into sub-beams with different isocenter shifts and uses Eclipse (Varian) for dose calculation. The dose reconstruction included interplay effects and physical path length changes, but not target deformations or shifts relative to the gold marker. The reduction in D95 (minimum dose to 95% of the CTV) relative to the planned D95 was calculated for all fractions.

Results: The gold marker was visible in all kV images and in 32% of the MV images. The MV images showed that the kV 3D position estimation had mean rms errors of 0.36 mm and 0.55 mm in the resolved and unresolved directions of the kV imager, respectively. Fig A shows the