Results: Before RT, the ADC values were comparable for all patients. Considering group A, the mean ADC value before RT was $1.24 \times 10^{-3}$ mm²/s, lower than the ADC after RT ($1.38 \times 10^{-3}$ mm²/s) (Figure 1). Moreover, an increase in mean dose to the penile bulb corresponded to higher variations of ADC ($p<0.05$, Table 1). On the contrary, in group B, the mean ADC values remained almost unchanged ($1.20 \times 10^{-3}$ mm²/s before RT, $1.20 \times 10^{-3}$ mm²/s after RT) (Figure 1); nevertheless, the linear regression analysis showed an ADC decrease tendency depending on time, as highlighted by the negative correlation between ADC changes and the amount of days after RT ($p<0.05$, Table 1).

Conclusion: In patients with DWI acquired early after RT completion, ADC value in penile bulb increased and its increment was correlated with higher mean dose to the penile bulb; this behavior could be explained by the inflammatory status that normally follows RT. The group of patients acquired at least three months after RT, on average, didn't show a difference in ADC value, but it was observed that increasing time from RT completion was correlated with decreasing of ADC values. This can be possibly explained by a physiological resolution of the inflammation phase and the possible beginning of fibrosis. These preliminary results obviously need confirmation in a larger population.

Purpose or Objective: To investigate whether structural patterns of cervical lymph nodes (LNs) on CT and T2-weighted Magnetic Resonance (T2-w MR) images, using texture analysis, predict tumor control to chemoradiotherapy (CRT) of head and neck squamous cell carcinoma (HNSCC).

Material and Methods: 14 patients with pathologically confirmed HNSCC treated with CRT were considered. All patients underwent two serial MR examinations (including T2-w images), one before (MR1) and one mid-CRT (MR2). All slices containing pathologic LNs were manually contoured by a dedicated HN radiologist both MR studies; in addition, LNs on MR1 were automatically deformed on planning CT (pCT) by an elastic registration method. Seventeen volumetric and textural features were then extracted from MR1, MR2 and the pCT: volume-based indices (volume, orientation, eccentricity, equivalent diameter), histogram-based indices (mean intensity, variance, entropy, skewness, kurtosis), GLCM (Grey-Level Co-occurrence Matrix)-based indices (energy, ASM, correlation, homogeneity, entropy, contrast, dissimilarity) and fractal dimension. During at least 1 year of follow-up (median follow-up time, 2 years) 9 LNs were classified as being controlled (without evidence of disease during follow-up on MRI and PET-CT) and were labeled as RC LNs; 7 LNs were classified as having regional failure (pathology proven residual tumor at neck dissection after CRT or during the follow up) and were labeled as RF LNs. Both pre-treatment features (MR1 and pCT) and mid-treatment features (MR2 and differences between MR1 and MR2) were considered to discriminate between RC and RF. The classification analysis was performed using Fisher’s linear discriminant analysis and the accuracy was estimated using the leave-one-out approach.

Results: Box-and-whisker plots of the features with higher classification accuracy in the two groups are reported in Figure 1. In general, pre-RT features had a higher discriminative power than mid-treatment parameters. Entropy measured on CT (93.8%) reached the best accuracy, with higher values of entropy related to RF LNs. The best parameter of MR1 was kurtosis (accuracy=81.3% with higher values for RC LNs). Half-way through RT, the best indices were skewness for MR2 (accuracy=78.6% with higher values for RC LNs) and the variation in contrast (accuracy=71.4% with higher positive variations for RF LNs).

Conclusion: Our preliminary results show that RC LNs have a lower CT entropy and higher MR1 kurtosis, suggesting that more homogeneous LNs before treatment may better respond to CRT, probably due to limited areas of necrosis and hypoxia. Pre-RT features had a higher discriminative power over mid-treatment ones, probably due to transitory inflammatory processes masking and confounding MR2.

Table 1. Results for linear regression correlation (R squared and p values), between ADC changes and mean dose to the penile bulb/day from RT completion and DWI acquisition (Timing). Results are reported for the two patient groups described in the text.

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EP-1859
Tumor control assessment on cervical lymph nodes using texture analysis on CT and T2w-MRI images
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Purpose or Objective: To investigate whether structural patterns of cervical lymph nodes (LNs) on CT and T2-weighted Magnetic Resonance (T2-w MR) images, using texture analysis, predict tumor control to chemoradiotherapy (CRT) of head and neck squamous cell carcinoma (HNSCC).

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parameters regardless response. Texture analysis on T2w and CT images could be effective in tumor control assessment and warrants further investigation.

**EP-1860**

**PET/MR in radiation oncology - how to correct for attenuation caused by flat table top?**

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**Purpose or Objective:** The implementation of hybrid PET/MR scanners overcame the issues of PET-MR images registration, which proved to carry complementary information useful in many aspects of RT. However, it introduced new challenges.

To assure the same patient positioning during imaging and RT, dedicated MR-compatible flat table tops (FTT) are required. While these FTT cause attenuation and scatter artefacts in PET/MR scans, both scatter and attenuation were degraded. PET/CT with FTT exhibited attenuation artefacts. In PET/MR scans both scatter and attenuation artefacts were observed. IQ was significantly improved by the use of FTT's PET-TS µMap (cf. Figure C-G).

**Material and Methods:** PET images of a 12l cuboid canister and round cylinder filled with 40 MBq 18F-FDG in an aqueous solution; 0.9% NaCl and 0.2mmol/l Gd-D03A-butrol as well as a modified NEMA phantom (all spheres of 11.3ml volume), filled with 18F-FDG in 8:1 activity ratio were acquired in both a Biograph TrueV PET/CT and a Biograph mMR PET/MR (Siemens). Measurements were performed with and without the presence of the FTT (X-tend ApS). A transmission scan (PET-TS) of the FTT was performed in a GE Advance PET with an inbuilt 68Ge/68Ga source. MR markers visible in PET were used for coregistration. An attenuation map (µMap) was derived from PET-TS and additionally used for PET/MR image reconstruction. Activities measured in the spheres of the NEMA phantom and longitudinal activity profiles in the cylinder were compared between PET/CT and PET/MR images acquired with scanner inbuilt attenuation correction (AC) methods. Canister images were evaluated by computing the uniformity index (UI) using a sliding window approach with a 5x5 voxel ROI (0.8ml volume) on slice-by-slice basis. Advantages of the use of PET-TS were compared to standard correction methods.

**Results:** The (MAX-MIN)/AVR ratios of the mean activity measured in the six spheres of the modified NEMA phantom were as follows (without and with the FTT, respectively): in PET/CT 1.7% and 6.2%; in PET/MR 2.6% and 6.8%. The longitudinal activity profiles measured in the cylinder are shown in the Figure (A-B). The best IQ was found in PET/CT without FTT. Compared to these images, PET/MR images were degraded. PET/CT with FTT exhibited attenuation artefacts. In PET/MR scans both scatter and attenuation artefacts were observed. IQ was significantly improved by the use of FTT’s PET-TS µMap (cf. Figure C-G).

**Conclusion:** The use of the PET-TS derived µMap can reduce artefacts in PET/MR. The deteriorated AC visible in PET/CT images is caused by the transformation from CT attenuation to PET attenuation that is not valid for materials used in the FTT. This proves that CT based AC may not be sufficient to perform AC in PET/MR scanner. Although the UI measure provides an indication of IQ, it is of limited use for evaluating systematic artefacts caused by incorrect AC. Further improvements are currently explored to improve the quality of the PET-TS µMap and to integrate it better into the image reconstruction.

**EP-1861**

**Effect of respiratory motion on extracted textural features in tumour CT images**

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2Royal Surrey County Hospital NHS Foundation Trust, Department of Medical Physics, Guildford, United Kingdom

**Purpose or Objective:** Texture analysis in CT is dependent on image resolution which is deteriorated by respiratory motion. The aim was to characterize the effect of respiratory motion on the performance of Laplacian of Gaussian (LoG) filters in extracting textural features as they have been shown in the literature to correlate to response and patient survival in non-small cell lung cancer.

**Material and Methods:** The modulation transfer function (MTF) was calculated in an in-house designed phantom that represents different scales of spatial frequency. This was made of Polymethyl methacrylate (PMMA) with size 131 mm x 121 mm x 30 mm. It had four sections; each with a square lattice of cubes of different sizes to give spatial frequencies (0.08, 0.1, 0.12, 0.166 1/mm). The cubes were filled with a solution of sucrose and high purity water with low (2%), medium (4%), and high (8%) concentration. The phantom was scanned static and moving on a GE discovery CT scanner (GE healthcare, Ohio, USA) with a reconstructed voxel size of 0.98 mm x 0.98mm x 1.25 mm. The phantom was attached to a dynamic thorax phantom (CIRS Company, Virginia, USA) to simulate a respiratory motion of 4 seconds period and a 1.00