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The prognostic impact of pretreatment dual-phase 18F-FDG-PET SUVmax in nasopharyngeal carcinoma
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Purpose/Objective: To evaluate the role of pretreatment dual-phase 18F-FDG-PET maximum standardized uptake (SUVmax) in predicting the outcome of nasopharyngeal carcinoma (NPC).

Materials and Methods: A total of 140 patients with newly diagnosed NPC were prospectively treated with IMRT plus neoadjuvant or concurrent chemotherapy between January 2006 and December 2008. Pretreatment SUVmax at 60 minutes (SUV1) and 150 minutes (SUV2) after injection of 18F-FDG were collected. We investigated the effects of SUVmax of primary tumor (SUV1-primary, SUV2-primary) and neck lymph nodes (SUV1-neck, SUV2-neck) on locoregional failure-free survival (LRFFS), distant metastasis failure-free survival (DMFFS) and overall survival (OS).

Results: In univariate analysis, the 5-year rate of OS for patients with SUV1-primary <12.9 was significantly higher than those with SUV1-primary ≥12.9 (87.0% vs 72.2%, p=0.044). SUV2-primary, SUV1-neck and SUV2-neck did not affect OS significantly. All SUVs of primary tumor and neck lymph nodes have significant effects on DMFFS (SUV1-primary < vs. ≥72.5, 89.1% vs. 70.8%, p=0.004; SUV2-primary < vs. ≥72.8, 88.6% vs. 76.4%, p=0.022; SUV1-neck < vs. ≥78.1, 91.0% vs. 71.8%, p=0.003; and SUV2-neck < vs. ≥13.7, 94.7% vs. 80.5%, p=0.024, respectively). All SUVs had no significant effect on LRFFS. In multivariate analysis, except for N stage, SUV1-primary, SUV2-primary and SUV1-neck were significantly independent predictors of DMFFS (hazard ratio=4.313, 95% CI=1.447-12.855, p=0.009; hazard ratio=1.999, 95% CI=1.541-14.785, p=0.006; and hazard ratio=3.769, 95% CI=0.985-14.420, p=0.053, respectively).

Conclusions: The SUV1-primary predicts OS by univariate analysis. The SUV1-primary, SUV2-primary and SUV1-neck were independently prognostic factors of distant failure.

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Accelerated Helical Tomotherapy versus RapidArc in a head and neck cancer treatment planning study
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Purpose/Objective: To create Helical Tomotherapy (HT) plans for treating patients with oropharyngeal cancer (OPC) with the same treatment time as RapidArc (RA) Volumetric Modulated Arc Therapy (VMAT).

Materials and Methods: We made both a double arc RA plan on Eclipse and a standard HT plan on TomoHD™ according to the ICRU 83 guidelines in 5 OPC patients. In 32 fractions, a simultaneous integrated boost technique was planned to deliver 69.12 Gy (2.16 Gy / fraction) to the high risk volume (PTV) of the GTV + 1cm and 56 Gy (1.75 Gy / fraction) to the PTV of the remaining primary tumor region and the bilateral elective lymph node regions. Guidelines for all the organs at risk (OARs) were given. By modifying the beam width from 2.5 cm to 5.0 cm, elevating the pitch and lowering the modulation factor, we created Tomo Fast (TF) plans in which treatment times were equal to those in the RA plans. The homogeneity index (HI), the conformity index (CI), the mean dose, the Dnear-max (D2) and the Dnear-min (D98) of the PTVs were analyzed as well as the mean dose and specific critical doses and volumes of 26 OARs. Differences between the individual plans of the treatment planning systems were analyzed using repeated measures ANOVA.

Results: With a mean treatment time of 3.05 min for RA and 2.89 min for TF, PTVmean coverage was more homogeneous with TF (mean HI 0.07; SE 0.01) than with RA (mean HI 0.10; SE 0.01), while PTVactive was most homogeneous with RA. Mean doses to the parotid glands were identical for RA and TF: 25.62 Gy and 25.34 Gy for the contralateral and 32.02 Gy and 31.96 Gy for the ipsilateral gland, respectively. Spinal cord, cricopharyngeal muscle and cranial part of the esophagus received a lower mean dose when planned with TF, the glottic larynx when planned with RA. V20 of the lungs, mean dose of inner ears, brain and eyes, and the integral dose were higher with TF than with RA, probably due the 5 cm beam width related cranial-caudal gradient extension. For details, see enclosed Table.

Conclusions: This study shows that it is possible to treat OPC patients with TF as fast as with RA while giving comparable target coverage and sparing of most critical organs. However, with TF the higher dose to the organs at the cranial and caudal end of the target volume and the higher integral dose, both due to the extended cranial-caudal gradient, needs consideration. Moreover, compared to regular HT, both these faster techniques lose a (major) part of HT’s OAR sparing capacity.

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Understanding the impact of two pharyngeal axis delineation guidelines for planning definition in head & neck IMRT
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Purpose/Objective: Optimisation of swallowing outcome after curative radiotherapy is multifaceted and requires maintaining the functional integrity of multiple pharyngeal axis structures. Recent dose/volume/outcome data (DVO) demonstrates a correlation between laryngeal dose and late dysphagia complication. Accurate and reliable DVO data demands consistent delineation, yet several guidelines for the delineation of the pharyngeal axis exist. This is a comparative study of two delineation guidelines of the pharyngeal axis and the implications that differences between them may have on dosimetry.

Materials and Methods: The pharyngeal axis (inclusive of superior (SPCM), middle (MPCM) and inferior pharyngeal constrictors (IPCM), cricopharyngeus(CP), oesophageal inlet (OI)) were retrospectively contoured by one clinician on five consecutive patients with SCC head and neck, utilising two different sets of delineation guidelines (G1 (1)

Conclusions: This study shows that it is possible to treat OPC patients with TF as fast as with RA while giving comparable target coverage and sparing of most critical organs. However, with TF the higher dose to the organs at the cranial and caudal end of the target volume and the higher integral dose, both due to the extended cranial-caudal gradient, needs consideration. Moreover, compared to regular HT, both these faster techniques lose a (major) part of HT’s OAR sparing capacity.