Conclusion: This study has shown that the position and volume of the stomach of a patient over the course of treatment is highly variable. In order to minimise the risk of toxicity of the stomach during treatment using high dose regimes (>50Gy) a stomach filling protocol may be required. Further work with a larger patient dataset is ongoing and the feasibility of stomach filling protocols will be explored. Normal 0 false false false EN-GB JA X-NONE

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Evaluation of CBCT protocols in craniospinal RT for pediatric medulloblastoma: a preliminary study
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Purpose or Objective: The use of IGRT technologies, such as cone beam CT, improves treatment delivery accuracy: given that reduction of radiation dose is particularly relevant in pediatrics, an ideal IGRT method would minimize dose while enabling adequate visualization of relevant anatomy for target localization. However, setup accuracy parameters and predictors have not been extensively evaluated. We describe the preliminary results of a prospective evaluation of a low-dose CBCT protocol for IGRT in pediatric craniospinal radiation therapy.

Material and Methods: Various low-dose CBCT protocols with CTDI of 0.1-2 mGy/scan were prepared, and patient and IGRT characteristics were recorded in real-time. Different reconstruction algorithms were used to optimize cone beam images and registrations. Setup accuracy was quantified by hexapod table translations and rotations (6 dof) between planning CT vs daily CBCT acquisition. The shift vector magnitudes in polar coordinates were calculated. Descriptive statistics were performed (t-test). All these evaluations were made for craniospinal and for posterior fossa irradiation.

Results: Table 1 shows the parameters values (dose and image quality) of the examined protocols. Taking into account the results, clinical protocols were defined for the three target volumes considered. Two patients (180Gy/13frs CSI + 180Gy/17frs post fossa) were studied with 30 daily pre-treatment CBCT. For the first patient, early phase of radiation therapy was delivered with anaesthesia. In CSI treatment, where junctions between beams are critical, only translations movements were considered. In cranial isocenter localization mean table shifts were 5.84 ± 0.98 mm (fast low dose), 3.84 ± 3.21 mm (fast high dose) and 3.84 ± 3.21 mm (fast low dose, A) and 3.84 ± 3.21 mm (fast high dose, with and without anaesthesia respectively; in the spinal setup evaluation mean table shift was 7.3 ± 2.1 mm (fast low dose, A) and 8.7 ± 0.2 mm (fast low dose). 6.8 ± 0.2 mm (fast high dose). Difference between setup accuracy according to patient’s cooperation, with and without anaesthesia, is statistically relevant (p<0.05) for cranial localisation and not for the spine localisation and the statistical significance persists considering also the overall treatment. On the other hand difference between setup accuracy according to patient dose does not show statistical difference.

Conclusion: CBCT-derived table shifts for investigations with LD-CBCT and with HD-CBCT were statistically similar, suggesting that for pediatric radiation therapy setup evaluation can be safely performed with lower-dose IGRT. Moreover, these data support implementation of a LD-CBCT protocol also in pediatric hyperfractionated accelerated radiotherapy.

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Definition of thresholds to detect anatomy changes using Delivery Analysis software for Tomotherapy
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Purpose or Objective: To determine the analysis parameters for quantitative assessment of the dosimetric impact of differences between the measured and calculated MVCT detectors sinograms. This difference is directly related to patient positioning and/or anatomical changes.

Material and Methods: Tomotherapy HD v5.0 associated to Delivery Analysis (DA) software (beta version) has been used for patient treatments. Consistency of MLC functioning is assessed by comparing opening-closing time measured by detectors versus calculated during planning. The quality assurance of the device validates its functioning. Detector response stability is continuously monitored (sd/mean=0.05%). DA software analyzes the difference of the detectors sinogram between a reference fraction and the fraction of the day, its influence is measured through the patient. The specific differences to a patient will therefore depend on its positioning and/or anatomical variations. From the analysis of each treatment session, alert thresholds will be defined.

Results: Considering margins used and expected dose accuracy, parameters of 2mm (DTA) and 3% (dose) were used associated to a threshold of 99% for gamma index analysis. We use them as a baseline to verify detectability on various treatments. With this level of detectability, the presence of gas in pelvic localizations, a loss of weight linked to a variation of 5mm thickness is detected. In the context of lung tumors, a reduction in tumor volume (associated with lung density change) is detected. The interpretation of these differences is not easy because of the movement of such gases, we have then added a condition for further analysis: three consecutive fractions not meeting the criterion result in a complete analysis or 15% of non consecutive fractions (conventional fractionation). A less than 95% result is immediately analyzed to determine visually on the MVCT scanner the reason: if it is weight loss, a new planning is realized.

Conclusion: Two strong points should be noted: a color code is associated to analysis results (red/green : fail/pass) and permits a relevant and fast systematic analysis. This information also applies to non-imaged areas, such as for medulloblastoma: although the MVCT is not acquired over the