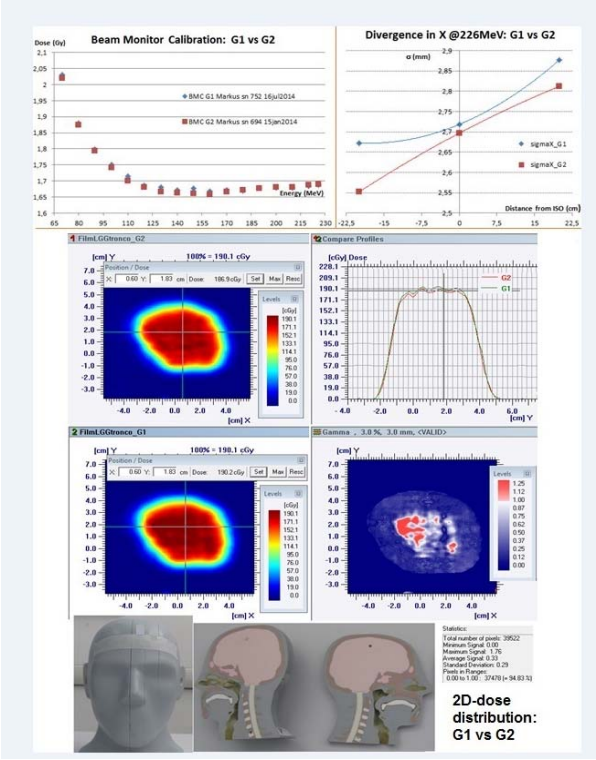

Conclusions: Results of this study suggest that a matching between our two gantries seems feasible, thus potentially allowing for a significant time saving in both TPS commissioning and clinical operations. We will test additional clinical indications to see whether the results of this study apply to all relevant treatment scenarios.

PO-0823

Evaluation of the accuracy of Cyberknife tumor tracking using gafchromic EBT3 films

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Purpose/Objective: The purpose of this study was to evaluate the accuracy of the Cyberknife tumor tracking system with gafchromic EBT3 films and triple-channel film dosimetry.

Materials and Methods: The CT scan of the Easy Cube Phantom (Sun Nuclear, FL) was acquired with the clinical parameters used for Cyberknife patients. The Easy Cube Phantom was mounted on the ET Gating Phantom (Brainlab, GE), which can move along the superior-inferior axis of the patient to simulate the respiratory motion of a lung tumor. A gafchromic EBT3 film was positioned between two slabs of the Easy Cube while a PinPoint ionization chamber was placed in an appropriate insert. 8 fiducial markers were inserted into the Easy Cube for the treatment set-up and for the tracking.

The synchrony tracking method was used for the template QA plan: the patient's plan was recalculated on the Easy Cube phantom and centred in the sensitive volume of the ionization chamber. The dose distributions were calculated with Ray-Tracing algorithm.

The EBT3 films were calibrated with a 6 MV linear accelerator (Trilogy, Varian), from 0 to 15 Gy.

A total of 8 patients were evaluated statically (no motion of the ET Gating Phantom) and in different dynamic conditions (e.g. motion amplitude from 10 to 25 mm), for a total of 40 cases.

The films were scanned using an Epson 10000XL scanner (transmission mode, 48-bit colour, 96 dpi resolution) and the planar dose distributions were built with the multichannel film analysis performed by the FilmQA Pro software (Ashland, NJ).

Calculated and measured planar dose distributions were compared with the gamma analysis method, both in static and in dynamic irradiation conditions. The local gamma passing rates (%GP) were evaluated using three difference acceptance criteria: 3% 3mm threshold (TH) = 10%, 2% 2mm TH = 20% and 2% 1mm TH = 50%.

PinPoint absolute dose measurements were also compared with the TPS doses, calculated in the sensitive volume of the chamber.

Results: The percentage of treatments passing the gamma analysis (95% of dose points that comply the acceptance criteria) was 100% for all the three criteria. The %GP ± SD were 99.8 ± 0.2 for the 3% 3mm criteria, 95.8 ± 2.0 for the 2% 2mm and 97.2 ± 1.2 for the 2% 1mm criteria. No significant differences were found between the static and the dynamic cases. The percentage differences between calculated and measured PinPoint dose range from -1.0 to 7.5 with a mean value of 4.0 ± 2.8.

Conclusions: Preliminary results obtained with EBT3 gafchromic films and the triple-channel analysis show an excellent agreement between calculated and measured dose distributions in all the cases. First of all, we can definitely assert that this is an efficient method for pretreatment patient-specific QA. Furthermore, no significant differences were found between the static cases and the different motion conditions, confirming the validity of this method to evaluate the accuracy of Cyberknife tumor tracking system.

PO-0824

Influence of the biological target volume modeling on ionization cluster-size distributions using Geant4-DNA

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Purpose/Objective: The aim of this study was to evaluate the influence of the geometrical detail of description of the biological target volume on the topology of ionization clusters induced by protons and alpha particles of different energies using Geant4-DNA. A simplified geometry would have the advantage of speeding up calculations but may lead to inaccurate results compared to a detailed DNA model.

Materials and Methods: Two geometrical descriptions of the biological target volume at the level of a single chromatin fiber containing $18{\cdot}10^3$ base pairs (bp) have been considered for the Monte Carlo calculations. The detailed geometry (GeomHist) included a realistic molecular description of the DNA double helix (2.3 nm diameter) wrapped around cylindrical histones. Based on the assumption that relevant