AbstractID: 8492 Title: Radiobiological comparison of Helical Tomotherapy and MLC-based IMRT for brain and cranio-spinal tumors

Purpose: In order to estimate better the clinical effectiveness of the Helical Tomotherapy and MLC-based IMRT radiation modalities a radiobiological assessment was performed. This was achieved by employing additional physical and radiobiological criteria.

Material and Methods: Two brain and cranio-spinal cancers were investigated. For each cancer type, a linac MLC-based step-and-shoot IMRT plan and a Helical Tomotherapy plan were developed. The treatment plans of the MLC-based IMRT were developed on the Philips treatment planning station (Pinnacle 7.6 software release), whereas the dedicated Tomotherapy treatment planning station was used for the HT plans. The different treatment plans were compared using dosimetric criteria and the biologically effective uniform dose (BEUD) together with the complication-free tumor control probability (P_+).

Results: The applied plan evaluation method shows that in the brain cancer case the HT treatment gives similar results with the MLC-based IMRT (P_+ of 66.0% and 63.4%, respectively). The total control probabilities, P_B are 79.5% and 76.6%, whereas the total complication probabilities, P_I are 13.4% and 13.1%. In both cases, the dose limiting tissue is the Speech Area. In the cranio-spinal cancer case, the HT treatment plan is much better than the MLC-based IMRT plan with P_+ values of 84.1% and 28.4%, respectively. The P_B values are 86.4% and 51.3%, whereas the P_I values are 2.3% and 23.0%. In the case of HT, the lung is the dose limiting tissue (1.7%) whereas in the case of MLC-based IMRT the dose limiting tissues are the lung (8.1%) and the left kidney (14.2%).

Conclusions: Both MLC based-IMRT and HT are suitable for treating often large PTVs while minimizing the volume of the organs at risk receiving high dose. However, in certain more complex clinical cases the HT radiation modality may show clearly better properties in producing very conformal and clinically effective dose distributions.