# AbstractID: 11364 Title: Comparison of Helical Tomotherapy, MLC-based IMRT, and 3D-Conformal radiation modalities in BEUD utilization and analysis

**Purpose:** To examine the clinical effectiveness of radiobiologically-centered treatment plans utilizing Helical Tomotherapy (HT), MLC-based IMRT, and 3D-Conformal Radiotherapy treatment plans by allowing the use of radiobiological parameters to supplement current treatment planning techniques and to develop $P_+ - \bar{\bar{D}}$ diagrams that can further describe the efficacy of treatment plans. Finally, to provide a closer association between clinical outcome and treatment delivery.

**Method and Materials:** Two cases of lung cancer were examined. Treatment plans were developed using the HT, IMRT, and 3D-CRT modalities. The radiobiological analysis was based on the probabilities of complication-free tumor control ($P_+$), overall injury ($P_I$), overall benefit ($P_B$), and the biologically effective uniform dose ( $\bar{\bar{D}}$ **)** as common prescription point. These radiobiological measures were used to evaluate the different treatment plans when used in concert with standard dosimetric criteria.

**Results:** For both patients, $P_I$ is lower and $P_+$ is higher in the HT modality than in both IMRT and 3D-CRT. $\bar{\bar{D}}$ is lower for HT than in the other modalities. Between IMRT and 3D-CRT exclusively, 3D-CRT delivers better $P_I$ in both patients. The DVHs show better treatment planning and delivery with HT. This implies a reduction in the delivered dose to the spinal cord and heart, which have much smaller volumes and have dose delivery controlled in the Treatment Planning System as OARs.

**Conclusion:** The use of radiobiological parameters to improve treatment delivery and clinical outcome is shown to be effective in this examination. The HT modality showed lower $P_I$ than both IMRT and 3D-CRT. Furthermore, analysis with a greater number of lung cases and OARs is needed to establish whether radiobiologically-based treatment planning can be established as an effective clinical tool for better radiation delivery and positive clinical outcomes.