

AbstractID: 10710 Title: Quality Assurance for Total Marrow irradiation (TMI) using Helical Tomotherapy

Purpose: Helical Tomotherapy (HT) offers advantages for total marrow irradiation (TMI) patients. The purpose of this study was to perform a more rigorous validation of TMI treatment plans using two types of radiation QA phantoms. **Methods and Materials:** *Cylindrical solid water phantom:* Several different delivery quality assurance (DQAs) were generated at different anatomical sites of the PTV of an actual TMI patient. The DQAs were performed using an ion chamber for point absolute dose measurement and EDR film for relative dose profiles. The ion chamber dose and film dose profiles were compared with the expected dose and dose profiles calculated from the treatment planning station (TPS). *Rando Phantom:* A HT TMI treatment plan was generated using a Rando phantom as the patient. The prescription was 80% of the PTV receives 12 Gy. A DQA was also generated based on this plan. The same CT image set acquired for planning the patient was also used as the CT scan for the DQA phantom. Film profile dose measurements were performed in transverse planes in between slabs making up the phantom. **Results:** For Rando TMI treatment plan, the mean dose of the PTV was 12.34 ± 0.65 Gy and the other organ doses were also well below currently accepted normal tissue tolerances. The absolute dose measurement and isodose distribution comparisons between planned and delivered doses on both coronal and transverse direction were within the clinical tolerance limit. **Conclusion:** Dose verification to the large TMI PTV delivered by the HT system was performed using an ion chamber and film in a cylindrical solid water phantom at multiple treatment sites along the patient's axis. Both the absolute point doses and relative dose profiles were within the clinical tolerance of $\pm 3\%$. A Rando phantom can be used for more rigorous QA by eliminating differences between an actual patient and a phantom.