AbstractID: 9538 Title: Commission of 2.5 mm ModuLeaf MLC for Stereotactic Radiation Therapy

Purpose: Improvements of MLC technology in radiotherapy, including smaller leaf sizes, allow greater accuracy in delivering radiation doses to the target with better conformality. For example, the high ablative doses used in hypo-fractionated stereotactic body radiotherapy (SBRT) require high precision in dose delivery, thus high precision in commissioning the MLC system to verifiy MLC accuracy. The purpose of this study was to evaluate the procedure and challenges in the commissioning and application of 2.5-mm small-leaf MLC. **Method and Materials:** Siemens' newly-developed Moduleaf MLC (MMLC) with 2.5mm leaf-size was commissioned for SBRT. Step-by-step QA and application procedures for SBRT commission guidelines were followed. Error tolerance and QA results were analyzed through the entire commission process from beam data preparation, to treatment planning system commission, to treatment plan verification. The commission was divided into 3 phases: mechanical commission, software commission, and comprehensive commission. Isocenter accuracy was assured for mechanical precision. For software commission, the effect of small field factor was analyzed. In comprehensive phase, a single field and a head-and-neck case were tested with the QA standard. **Results:** The commission and clinical implementation of 2.5mm MMLC were described in this study, with provided guidelines for QA procedures from beam data collection and modeling to treatment planning methodology. The accuracy of the MLC mechanic isocenter was within 0.2 mm. At the same time, the treatment modalities with or without the flatten filter were compared, and they were consistent to each other except for the dose-rate effect. Different MMLC clinical protocols, from SBRT to head-and-neck and intracranial treatments, have been suggested. **Conclusions:** After strictly following the physical QA requirements, we successfully commissioned the new mounted-on 2.5mm MMLC for SRS/SBRT. In the follow-up studies, clinical applications with MMLC will be further compared to other on-site SRS systems, including Gamma-Knife, and Tomotherapy system.