AbstractID: 6931 Title: Dosimetrical measurement and registration of a high definition multi-leaf collimator treatment

Dosimetrical measurement and registration of a high definition multi-leaf collimator treatment

During the last few years, Multi-leaf-collimator Systems (MLC) have replaced lead alloy blocks for field shaping. However, the well-defined field edge achieved with divergent cerrobend blocks can not be copied with the MLC. Due to the stepping of the leaves, the border of the irradiated volume results in an undulated dose pattern. A high-definition-MLC system (HDI) has been developed and installed on the linear accelerator for use in conformal radiotherapy. The HDI technique utilizes the dynamic shift of the 3D-target volume to feather the multi-leaf collimator defined field edges. During each feathering, the leaf positions are adjusted according to the updated target projection in the MLC plane. The treatment couch motion, generated by the HDI system, is 3D and varies depending upon the gantry, collimator, and table angles, and upon the resolution chosen for the HDI group. The resulted field edges are highly conformal to the treatment volume. The purpose of this work is to study the physical characteristics of the system and to provide tools of registering treatment verification images. As table moves during a treatment, regular treatment verification films are blurred. The EPID system is used to image the dynamic radiation treatment, and we developed tools to register the segmented treatment fields and to provide a treatment verification image of the entire treatment. The results of this study indicate that the HDI technique can be a useful tool for treating small, or highly irregular shaped targets, or for sparing adjacent critical structures for certain cases.