

AbstractID: 11741 Title: Pattern Distance Method Analysis on Potential Clinical Benefit in using 2.5mm Width Leaf MLC-Based IMRT

Purpose: To develop a comprehensive evaluation of IMRT plans from different treatment planning software (TPS) and different MLC leaf width using dose volume histogram (DVH) parameters and biological equivalent dose (BED).

Method and Materials: Four pelvis IMRT treatment plans were studied on a Siemens Linac with 1cm leaf MLC and 2.5 mm mount-on moduleaf MLC. The plans were originally done in Eclipse TPS (v8.1) with 1cm MLC (named plan E-1). Then CT slices and contoured anatomy structures were transferred to XKnife RT TPS (v4), where two new plans were carried using 1cm and 2.5 mm MLC, respectively (named plan X-1, X-0.25), following the same constraints as in Eclipse TPS for target and organ at risk (OAR).

To evaluate the 3 plans (E-1, X-1, X-0.25) from different TPS and using different width of MLC, three parameters were used to develop a comprehensive evaluation method: target volume ratio (TVR), PTV homogeneity H, and fraction biological equivalent dose (BED).

Then each IMRT plan is represented by a point in 3-dim space {TVR, H, BED}. The pattern differences between those points reflect the differences between IMRT algorithms, e.g. planning algorithm difference between plan points E-1 and X-1, MLC width difference between plan points X-1 and X-0.25.

Results: Our results showed that the IMRT plans using 2.5 mm MLC (plan X-0.25) always had better tumor dose coverage and conformity than plans using 1cm MLC in the same TPS (plan X-1), with smaller values of TVR and H in the 3-dim plot (Fig.1). But BED for X-1 plans was higher than X-0.25 plans.

Conclusion: A pattern comparison method was developed to evaluate IMRT plans. This method may help to define the clinical benefit of using small width MLC in radiation therapy. The comparison results may be further verified by dosimetry measurements.