AbstractID: 10501 Title: Improvement of IMRT plan quality with non-isocentric beam arrangement for head and neck cancers

Purpose: Selection of beam orientations are sometime limited by geometric confliction raised from isocentric setup. The recent introduction of robotic couch (e.g., Treago, Siemens) in linac room opens door for using non-isocentric beams. We study the dosimetric advantages of using non-isocentric beams over conventional isocentric beams for IMRT of head and neck cancers.

Method and Materials: Because of complicated anatomic geometric relationship between planning target volumes (PTV) and surrounding organs at risk (OAR), IMRT plan quality for head and neck cancers is often affected by the selection of beam orientations. In this work, isocentric and non-isocentric IMRT plans were generated for 10 representative head and neck cases using a treatment planning system (XiO, CMS). Non-isocentric beams were determined based on the locations, sizes and shapes of the PTV and OARs with appropriate gantry/couch angle and couch position, to maximally avoid direct expose of OARs. Same dose volume constraints were used in the generation of isocentric and non-isocentric plans. The two plans were compared using various parameters, including conformity index (CI), uniformity index (UI), V30 (volume receiving 30 Gy) and V15, and an overall plan quality indicator, f_{EUD} calculated based on the equivalent uniform doses (EUD) for both targets and OARs.

Results: The dose coverage and uniformity of PTV are generally comparable between the two plans for the cases studied. Normal tissue sparing is however improved with non-isocentric plan. For example, the values of V30 of parotid gland, V30 and V15 of cord, for non-isocentric plans are reduced with p-values = 0.032, 0.040 and 0.049, respectively. Comparison of f_{EUD} shows that the overall plan quality for a non-isocentric plan is improved.

Conclusion: Non-isocentric beam arrangement, which can be efficiently delivered with a robotic couch, can improve IMRT plan quality for head and neck cancers as compared to the conventional isocentric beams.