AbstractID: 13072 Title: The feasibility of dose delivery error prediction of IMRT fields using support vector machine

Purpose: To verify the feasibility of dose delivery error prediction of intensity modulated radiation therapy (IMRT) fields for the support of optimized IMRT planning. **Method and Materials:** We supposed that IMRT dose delivery errors were mainly caused by limitations in the dose delivery mechanisms in the case of dynamic MLCs, especially using sliding window method. Firstly, we developed a program to extract dynamic properties of MLCs from MLC plan files and dose delivery expectation data. Secondly, actual dose delivery distributions were measured by irradiating IMRT fields to EPID. The gamma criteria(γ) distributions simultaneously were calculated with standards of 3% dose error and 3mm dislocation. Thirdly, a support vector machine (SVM) is trained with a database, which is composed of dynamic properties and binary gamma criteria distributions ($\gamma \geq 1$ or $\gamma < 1$). The optimal hyper-plane is given by SVM to classify groups. **Results:** 11 IMRT field data of prostate cancer were used to find a hyper-plane of SVM, and other 2 IMRT fields were used to verify the performance of a trained hyper-plane. We found that the velocity of leaf collimator edge and prescribed dose value at each point mainly cause dose delivery error through iterated SVM classification tests. The error prediction results show high specificity (0.945) and accuracy (0.837), and relatively low sensitivity (0.452). **Conclusions:** This work indicated the potential for optimized IMRT plan, allowing for mechanical limitation of dynamic MLCs. The dose delivery error prediction of IMRT planning can be essential information to maximize accuracy of IMRT planning. It can be also minimize cost to perform quality assurance (QA) process for IMRT. Low sensitivity of our preliminary results may be caused by insufficient IMRT field number used to train SVM. However, high specificity and accuracy show high feasibility of dose delivery error prediction of IMRT fields using support vector machine.