AbstractID: 11263 Title: A support vector machine (SVM) classifier identifies from prone CT simulation the optimal set up for breast radiotherapy

Purpose: To determine *optimal* (prone vs. supine) treatment positions for breast radiotherapy by classifying geometric features extracted from *prone* CT scans.

Method and Materials: CT scans from patients enrolled in NYU 05-181 Protocol were studied to discern predicting factors for optimizing treatment positions for breast radiotherapy. Each of the 400 patients accrued for this protocol underwent CT simulation and planning in both supine and prone positions. The treatment set up was chosen based on maximum sparing of heart and lung. Since the results demonstrated that most patients were best treated prone, we studied whether a support vector machine (SVM) classifier could successfully predict optimal position based on a single prone CT scan and limit a second supine CT only to the minority of women best treated supine. To build this classifier, prone CT scans of NYU 05-181 were de-identified and exported in DICOM RT format. Three-dimensional shape and distance features were computed from organs at risk and the planning target volume in the CT scans. We used a k-fold cross validation procedure to test the performance of the SVM classifier.

Results: Images of 36 patients (23 prone-treated and 13 supine-treated) were used. Preliminary results indicate that breast volume, heart and lung involvement in the treatment field are significant predicting factors. A weighting of 1:5 (prone-treated: supine–treated) was used when determining the soft margin hyper plane of the SVM classifier. The purpose is to increase the specificity [true-supine/(true-supine+false-prone)] of the classifier since patients classified as prone will not receive a validation supine CT scan. A sensitivity [true-prone/(true-prone+false-supine)] of 87% and a specificity of 92% was achieved using 11 geometric features and the SVM classifier.

Conclusion: Preliminary data support the use of a feature-based classification to predict the optimal treatment position from prone CT scans.