AbstractID: 5093 Title: Systematic study of inter-fractional variations for anatomic sites from head to feet.

Purpose: Inter-fractional variations in patient set-up and anatomic changes are usually site specific. This work aims to systematically study these inter-fractional variations for anatomic sites from head to feet based on the daily MV CT images collected using helical tomotherapy.
Methods and Materials: A total of first 51 patients treated at various anatomic sites using a helical tomotherapy system (Hi-Art, Tomotherapy Inc.) were analyzed. Daily Tomotherapy MV CT acquired prior to each treatment were used to correct for daily setup error online. A total of 6120 translational shifts and rotational corrections were performed for the 51 patients. The daily serial MV CT and the planning CT were also used to determine inter-fractional anatomic changes off-line. The data for three representative patient cases, pancreas, uterus, and soft tissue sarcoma, are presented.
Results: Inter-fractional set up errors in skull, brain, and head and neck are significantly smaller than those in chest, abdomen/pelvic, and extremity. The translational shifts are mostly within 3 mm in skull, brain, and head and neck, while they are within 6 mm for other sites. The inter-fractional anatomic changes were significant. For example, during the course of treatment, the pancreas moved up to ±20 mm, and volumes of the uterus and sarcoma varied up to 30% and 100%, respectively.
Conclusions: The inter-fractional variations in patient setup and in shapes, sizes and positions of both targets and normal structures can be significant and are site specific. The helical Tomotherapy technology has the capability of quantifying and addressing these variations. The data presented in this work dealing with several anatomic sites may be useful in developing adaptive radiotherapy.