AbstractID: 3001 Title: Tumor motion and tumor shape changes during radiotherapy of bladder cancer

Purpose: First, to quantify bladder tumor motion in three dimensions. Secondly, to relate the motion to changes in bladder filling. Thirdly, to evaluate shape and volume changes of the GTV during the course of the radiotherapy.
Method and Materials: CT images were obtained for 21 bladder cancer patients. Next to the planning CT scan, each patient underwent 8 to 11 follow-up CT scans. These scans were matched on the bony anatomy. Patients were instructed to empty their bladder and drink 250 cc water one hour prior to acquisition. Tumor, bladder and rectum were delineated manually. For each patient, the variation in tumor position (day-to-day tumor motion) was determined by calculating the shift of the center of gravity (CG) of each GTV relative to the mean CG. These shifts were compared with model results from a previous study, concerning patients with a healthy bladder. The correlation between bladder volume and GTV position was determined. To study GTV shape changes, we matched all GTVs and determined the residual shape errors in terms of SDs.
Results: Tumor motion was largest in Cranial-Caudal and A-P direction and ranged from 0.1 to 0.9 cm. The movement was strongly correlated with the bladder filling and the tumor location on the bladder wall. The average SD of the GTV shape changes, excluding the 10% highest values, ranged from 0.1 to 0.35 cm. The SD of the GTV volume ranged from 0.5 to 13 cc and was not dependent on the GTV volume. We found no significant volume time trend.
Conclusions: We demonstrated that, despite large differences in bladder filling, variations in GTV shape were small. We could not prove any GTV volume trend with time. Geometrical uncertainties of the GTV position were mainly caused by variation in bladder volume and depended strongly on the GTV location.