adjacent structures. For these patients a mask was created from the GTV by a 2cm expansion after which the GTV itself was removed (figure C,D), effectively registering the adjacent structures. This method was evaluated on five weekly fractions of 24 patients. The second method was applied on patients with a non-attached tumor. In this method the local rigid registration was expanded by a scaling factor such that the regressing tumor in the CBCT was magnified to the original size of the tumor of the reference CT-scan during the registration (figure G,H). This method was applied on 5 patients and also five weekly fractions were evaluated. Bland-Altman analysis was applied to quantify the limits of agreement between these registration methods and the clinically approved registrations. All automatic registrations were visually validated to assess the success rate.

Results: The limits of agreement between the registration method for regressing tumors attached to surrounding structures showed limits of agreement with the clinical method of -2.6—2.9mm for the LR direction, -2.9—2.8mm for the CC direction and -3.1—3.2mm for the AP direction. The alignment differences between these two methods were 1.3 (LR), 1.4 (CC) and 1.4 mm (AP) systematically and 1.0, 1.1 and 1.2mm randomly. This automatic method had a success rate of 91%.

The limits of agreement between the registration method for non-attached tumors and the clinical method were larger with -6.0—4.1mm (LR), -8.5—7.1mm (CC) and -3.3—4.3mm (AP). The alignment differences between these two methods were 4.0 (LR), 3.9 (CC) and 3.6mm (AP) systematically and 4.0, 3.3 and 2.4mm randomly. The success rate of these automatic registrations was 100%.

Conclusions: The registration method developed for regressing tumors attached to surrounding structures proved to be a reliable method for automatic tumor registration. The registration method for regressing non-attached tumors is promising but needs further investigation on a larger patient cohort.

OC-0077

Are pitch and roll compensations required in all pathologies? A data analysis of 2945 fractions

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Purpose/Objective: Nowadays, new linear accelerators can be equipped with a 6D robotic couch, providing two additional rotational motion axes: pitch and roll. We have evaluated the clinical efficacy of a 6D Robotic couch-top in CBCT image-guided radiotherapy (IGRT) over the first 6 months usage of the new EDGE linac (Varian). The data were analyzed in order to classify the pathologies for which the pitch and roll compensations could play a crucial function.

Materials and Methods: The couch compensations of 2945 fractions from 376 patients treated on the PerfectPitch™ 6 degrees of freedom couch were analyzed. Of these patients, 169 were brain, 114 lung, 54 liver, 26 pancreas, and 16 prostate. During setup, the patient anatomy from planning CT was aligned to the kV-CBCT and the 6D movements were executed. Information related to pitch and roll were extracted by proper querying of the Microsoft SQL server ARIA database where all the couch displacements are automatically stored. Mean values and standard deviations were calculated for all regions. Kolmogorov-Smirnov (KS) and two tail t-student tests were performed to verify the normal distribution and the significance of the differences, respectively.

Results: Considering all the data, mean pitch and roll adjustments were: -0.10±0.92 and 0.12±0.96; while the mean absolute values of both adjustments were 0.58±0.69 and 0.69±0.72 (p<0.01). Brain showed the highest mean absolute values with 0.73±0.69 and 0.80±0.78; while the lowest values were for pancreas with 0.36±0.47 and 0.40±0.58. T-test was significant for brain vs. liver, pancreas and prostate. Collective corrections greater than 0.5, 1.0, 2.0 were observed in, respectively, 79.8%, 61.0%, and 29.1% for brain; 56.7%, 39.4%, and 6.7% for pancreas. Table 1 reports all the data analysis. No significant differences for months, number of fractions, dose per fraction were found.

Table 1: Absolute pitch and roll adjustments (mean ± st.dev.) for brain, lung, prostate, pancreas, liver. Collective corrections greater than 0.5, 1.0, 2.0 for the same regions are reported, too.

Conclusions: Adjustments in all six dimensions, including unconventional pitch and roll rotations, improve the image registration for all pathologies. In limited available resources we suggest to start the 6D robotic couch implementation on brain tumors. Relative to the manual corrections, the automated 6D robotic process increased the efficiency of alignment when pitch and roll corrections were warranted.

OC-0078

Impact of tumor invasion on seminal vesicles mobility in radiotherapy of T3b prostate cancer

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Purpose/Objective: Fiducial markers are proven to be reliable to locate the prostate during radiotherapy. Several studies have shown however, that the seminal vesicles may move independently from the prostate corpus, which may undermine adequate coverage of tumor invasion in the seminal vesicles in marker based prostate IGRT. We hypothesize that the vesicles become more rigid in case of tumor infiltration and are thus adequately covered by marker based IGRT. The aim of this study was to assess the relationship between the progressiveness of tumor invasion in

Figure 1: Examples of clinical registration with (A,E) and without (B,F) shaped region of interest. Registrations tailored to regressing tum oors with (C,G) and without (D,H) shaped region of interest. Figures A-D illustrate a tumor to an adjacent structure. Figures E-F illustrate a non-attached tumor.