

AbstractID: 10183 Title: Evaluation of the need for simultaneous orthogonal gated setup imaging

Purpose: As many clinics would prefer to use a pair of kV radiographs for gated patient setup, it is important to quantify the possible errors that could occur due to the non-simultaneity of the acquisitions.

Method and Materials: The data set from 11 patients includes internal and external coordinates acquired at 30Hz during multi-fraction SBRT treatments. We simulated a gated setup procedure which included an AP radiograph, followed by a lateral radiograph. The time interval between the two radiographic acquisitions was set to a minimum of 30 seconds based on our clinical experience. The setup position is derived from a combination of both the initial (AP) and the second (LAT) image in the following way: $LR_{\text{setup}} = LR_{\text{initial}}$, $SI_{\text{setup}} = SI_{\text{initial}} + (SI_{\text{second}} - SI_{\text{initial}})/2$, $AP_{\text{setup}} = AP_{\text{second}}$. The 3D error is then the magnitude of the vector from the initial position to the setup position. The calculation was done for every exhale phase in the data for which there was another one at least 30 seconds later at an amplitude within 2 mm from the first. In all, 1908 data points were analyzed.

Results: The 3D error is found to be less than 2 mm for 91% of the data points and less than 3 mm for 97% of the data. The maximum error found was 7.5 mm. 97.5% of the second acquisitions could be completed within 35 seconds of the first. The maximum time interval found was 42 seconds. No correlation was found between the length of the time interval and the 3D error.

Conclusion: When acquiring gated radiographs for patient setup, no large setup errors should be expected if those images are not taken simultaneously.

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