

**AbstractID: 2665 Title: Assessment of intrafraction motion and rotation during head and neck treatments based on 6D analysis of daily stereoscopic Xray imaging.**

**Purpose:**

To determine intrafraction motion and rotation of patients immobilized with a 5-point thermoplastic mask for head and neck treatments.

**Method and Materials:**

13 patients were consecutively assigned to use a 5-point thermoplastic mask. Patients were positioned by tracking of infrared markers (IR) fixed to the immobilization device and stereoscopic Xray images were used for setup verification. Repositioning was carried out as needed, rotations were not corrected. Movements during treatment were monitored by real-time IR-tracking. Intrafraction motion and rotation was assessed by a 6-degree-of-freedom (6D) fusion of Xray images taken before and after all 385 treatments with DRR images generated from the planning CT data. The latter evaluates the patient's movement within the thermoplastic mask, where IR-tracking only evaluates the mask's movement.

**Results:**

The maximum intrafraction movement detected by IR-tracking showed a shift (mean (SD; range)) of 0.5(0.5; 3.8), 0.5(0.3; 1.9), 0.6(0.4; 3.3) mm in the vertical, longitudinal and lateral direction respectively and rotations of 0.2(0.1; 0.7), 0.2(0.1; 0.7) and 0.3(0.2; 1.0) degree about the vertical, longitudinal and lateral axis respectively.

The 6D fusions demonstrate intrafraction patient displacements of -0.5(1.2; 7.4), 0.3(0.7; 5.3), 0.0(0.7; 5.7) mm in the vertical, longitudinal and lateral direction respectively and rotations of -0.1(0.6; 4.1), 0.1(0.7; 8.3) and -0.2(0.8; 8.2) degree about the vertical, longitudinal and lateral axis respectively.

The standard deviations and ranges found with 6D fusion are significantly larger than detected by IR-tracking. This indicates the latter underestimates the magnitude of the actual patient's intrafraction motion and rotation.

**Conclusion:**

The 6D image fusion is a useful tool to evaluate the actual patient's intrafraction motion and rotation and shows the latter is not negligible. Thus, immobilization alone is not sufficient to allow narrow treatment margins.

**Conflict of Interest:**

This work was supported by BrainLAB AG Germany and Orfit Industries Belgium.