

## AbstractID: 4994 Title: A prototype rotational immobilization system for a proposed static-gantry microRT device with tomographic capabilities

**Purpose:** Proposed small animal irradiation devices are typically isocentric gantry systems. Multi-axis gantry systems require significant resources to develop and maintain. A static gantry system could provide the functionality of a multi-axis gantry via subject rotation if subject motion could be minimized. In this study, we evaluated internal organ motion of mice within a prototype immobilization device during rotation.

**Method and Materials:** Mice were anesthetized and immobilized in a prototype device designed to rigidly support animal positioning during rotation along the cranio-caudal axis. The head and tail of the mouse were allowed to extend beyond the immobilization device as an internal control. Validation of internal and external immobilization was assessed using computed tomography imaging at multiple rotation angles. CT images were co-registered (translated/rotated) using our research treatment planning system (CERR) into a common reference frame. Internal organ motion was assessed qualitatively by examination of internal anatomy in overlaid multi-plane CT images. Quantitative evaluation of organ motion was assessed by delineating organ structures in CERR and comparing relative organ volumes and centers of mass.

**Results:** CT imaging demonstrated minimal exterior contour changes (<1mm) in the immobilized regions during rotation. Un-immobilized regions demonstrated the expected gravitational positional changes. Internal organs demonstrated sub-millimeter changes in organ centers of mass (heart and lung) and small (<5 mm<sup>3</sup>) changes in volume during rotation. These variations were similar to the differences when the same CT was re-contoured multiple times by the same operator and likely represent intra-observer contouring variations.

**Conclusion:** A microRT device with a stationary irradiator, collimator, tomographic imaging system, and rotating subject would reduce the overall cost and complexity of the unit. This study demonstrates rotational immobilization of small animals is feasible.

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